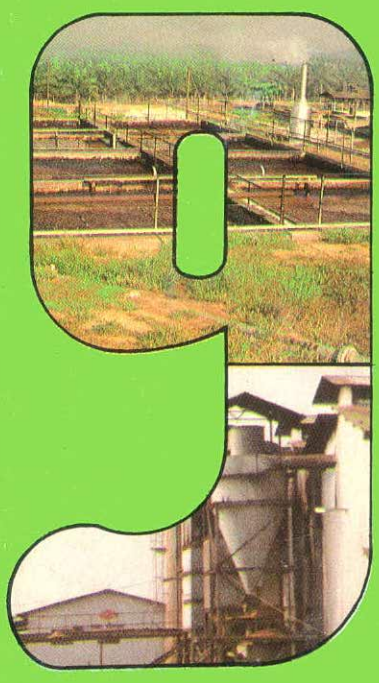

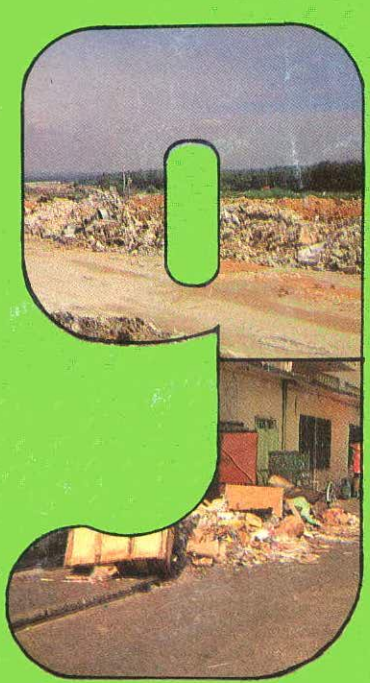

LAPORAN TAHUNAN KUALITI ALAM SEKELILING 1979

LAPORAN KUALITI ALAM SEKELILING TAHUN 1979

Disediakan
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OKTOBER 1982

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ENVIRONMENTAL POLICIES AND ADMINISTRATION

INTRODUCTION

For centuries mankind has lived seemingly confident of the permanence and nurturing capacity of nature. Since the 1960's it has become increasingly recognised that Nature is by no means an infinite asset to be exploited at will but rather a fragile and finite resource in need of comprehensive protection and environmentally sound management. As we moved into the 70's, it was recognised that the high rates of economic growth, necessary and desirable as they were, particularly to developing countries, did not in themselves guarantee the easing of urgent and pressing social and human problems. Whilst the concern with the human environment in developing countries reinforced the commitment to development, it also at the same time served to provide new dimensions to the development concept itself. In this respect, 1972 was a landmark year signalling the beginning of a new and more enlightened epoch with the convening at Stockholm of the momentous United Nations Conference on the Human Environment with its terse slogan "Only One Earth". The Conference resulted in a Plan of Action on a world-wide basis to improve the human environment and at its urging a new organ of the United Nation System, namely, the United Nations Environment Programme (UNEP), established with headquarters in Nairobi, Kenya, the first such organ within the United Nations system to have its headquarters appropritely enough in a developing country and charged with a mandate to play a catalytic role in implementing elements of the action plan.

Environment consciousness in Malaysia can be said to date from as far back as the 1920's when various Water Enactments in three East Cost States of Peninsular Malaysia establishing what has since become the National Park were passed. In addition, the land Conservation Act, 1960, and the National Land Code 1965 are other examples of legislation containing provisions for the protection of the environment.

Malaysia faces the twin tasks of forging ahead with rapid economic growth in order to provide for the material conditions of an acceptable standard of living. At the same time one is acutely conscious that our economy depends, and will continue to depend on the renewable resource sectors and these for a relatively small country like ours are limited, fragile and in dire need of comprehensive protection. Improved standards of living are unfortunately accompanied by high levels of personal consumer goods and services. The manufacture and delivery of consumer goods is accompanied by generation and accumulation of industrial wastes which damage our environment with respect to land, water and air. In the quest for prosperity and industrialisation, man rides roughshod over other inhabitants of planet Earth and until fairly recently communities have more often than not been prepared to accept the fact that developments of all kinds will adversely affect the natural environment and that true development cannot take place but at the expense of the environment. A sensible balance has to be struck so that development proceeds apace without destruction. That process is by no means an easy or simple one, more so in a dynamic setting with frequent changes occuring in key variables.

Striking a sensible balance thus calls for eternal vigilance coupled with imaginative and innovative actions as part of an overall strategy to help maintain the right balance between these two seemingly conflicting demands of development and environmental protection/conservation.

Moreover, Malaysia has a three-tier system of Government - Federal Government, the State Governments and the Local Authorities - with each level having legislative and administrative competence in specific fields and through their actions with potential for impacting on the environment. This implies division of responsibilities among the three levels of Government, placing a premium on fine-tuning to

enlist willing co-operation and achieve effective co-ordination so that available resources of manpower and funds are deployed to good purpose, avoiding waste through frittering resources by spreading them too thinly or on the other extreme by duplication of efforts.

The environmental problems we have today are simply Nature's way of kicking back at us for the thoughtless ways we have treated her in our struggle for existence. The year 1975 marked the begining of a new emphasis on the environment in Malaysia - a turning point, a year when the quality of life became more than a phrase; "environment" and " pollution" have since become everyday household words, standing for many years on the threshold of national prominence, but now the focus of nationwide concern.

Desiring to include the gradually rising environmental costs of development in its planning and investment dicision, the Government has already responded to evolve appropriate policies and programmes which would ensure that economic development goes hand in hand with sound management of the environment. Evidence of such action includes:

* Adoption of the Environmental Quality Act, 1974.
* Establishment of the Division of Environment in 1975 now under the Ministry of Science, Technology and Environment.
* Provision of a chapter on "Environment and Development" in the Third Malaysia Plan document.
* Initiation of pollution control measures, air and river basin surveys.

Malaysia's strategy for solving environmental problems involves both preventive and restorative measures and includes both environmental planning and pollution control.

ENVIRONMENTAL POLICY FORMULATION AND OBJECTIVES

The economic growth, progress and wealth of a nation depend largely on adequate resource availability as well as the systematic development and exploitation of these resources, both renewable and non-renewable. However, the capacity of these resources in being part of the whole ecological system is not unlimited. There would be seemingly limits of growth.

This will depend on the prudent management of these resources, in particular how development adversely affects these resources, thus influencing their productivity. The capacity of the environment to produce essential renewable resources must be maintained, restored or improved, as otherwise, it will give rise to counter-productive side-effects on the environment.

It is important, therefore, that environmental policies are integrated into development planning and regarded as part of the overall framework of economic and social planning. The environment should be integrated as another dimension of the process of development. It should, in fact, be realised that the environmental protection approach is a resource managemant concept while economic development tends generally to be pursued as a resource use concept. The whole objective of integrating environmental planning into development is to incorporate resource managemant ideas into the process of planning for resource use.

The overall objective of environmental managemant in Malaysia should therefore take due account of the following factors:-

* the impact that population growth and Man's activities in resource development, industrialization and urbanization have on the environment;

* the critical importance of maintaining the quality of the environment relative to the needs of
* the population, particularly in regard to the productive capacity of the country's land resources in agriculture, forestry, fisheries and water;
the need to maintain a healthy environment for human habitation;
* the need to preserve the country's unique and diverse natural heritage, all of which contribute
* to the quality of life; and

* the interdependence of social, cultural, economic, biological and physical factors in determining the ecology of man.

ENVIRONMENTAL QUALITY COUNCIL

The Environmental Quality council established under Section 4 of the Environmental Quality Act 1974 under the chairmanship of Y.B. Tan Sri Datuk Hamzah bin Sendut, D.M.P.N., P.G.D.K., P.S.M., D.J.N., P.P.T., met on three occasion in the course of the year.

RANGE OF DUTIES AND RESPONSIBILITIES UNDERTAKEN BY THE DIVISION OF ENVIRONMENT

The environmental mandate under the Act is nothing less than improving the quality of life of our people to this the Government is totally committed. In this respect the Act is wide-ranging in scope and a strategy providing for systematic and selective implementation has been adopted.

A priority task has therefore been to contain and deal with existing environmental problems that has accumulated over the years.

In accordance with the above strategy, pollution control has been the punch-line activity and efforts of the Division of Environment were concentrated on the development of administrative procedures and regulations for pollution control. The oil palm and rubber industries were identified to be the most chronic sources of water pollution and priority was given to the control of pollution from these sources. It took the Division of Environment nearly two years of preparatory work and consultations before establishing suitable standards for oil palm and rubber effluent discharges and formulating appropriate regulations for their control. Finally the two important Regulations namely Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulation, P.U.(A) 342/1977 and Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulation, P.U.(A) 338/1978 were enforced on 1.7.78 and 1.4.79 respectively. About 149 palm oil mills and 215 rubber factories throughout Malaysia have been brought under control under these Regulations.

Similarly air pollution in the main town centres and suburbs was becoming widespread through smoke, dust and gaseous emissions from factories and industrial activities generally and from the fast growing motor vehicle population. In addition, effluent discharges from these factories and noise pollution were serious hazards to health and well-being. Three other Regulations, namely, Environmental Quality (Clean Air) Regulations, P.U. (A) 280/1978, Environmental Quality (Sewage and Industrial Effluents) Regulations, P.U. (A) 12/1979 and motor Vehicles (Control of Smoke and Gas Emission) Rules, P.U. (A) 414/1977 have been enforced to alleviate these problems. Another set of Regulations directed at control of noise pollution is being developed.

Another area of environmental concern which has been given priority attention is marine pollution where a National Contingency Plan for the mitigation and control of oil spills has been developed in co-operation with the Marine Department, Peninsular Malaysia and other related agencies. A sum of $23

million has already been allocated to obtain the necessary equipment, boats, fast patrol craft etc. Also set of regulations to control marine pollution due to discharge from ship and dumping into the seas is currently being developed.

ORGANISATIONAL SET-UP

The environment Division is headed by a Director-General of Environmental Quality appointed by the Honourable Minister of Science, Technology and Environment under Section 3(1) of the Environmental Quality Act. During the year under review, Encik S.T. Sundram, JSM, served as Director General until 25th. November, 1979 in addition to his substantative duties as Deputy Secretary-General of the Ministry and since 26th. November, 1979 as full time Director-General of Environmental Quality. The Division is structured into three units namely, the Water Pollution Unit, Air Pollution Unit, each headed by a Director, and the Administration Unit headed by a Principal Assistant Director. The organisational structure of the three units is as given in Appendix 'A'. The Division has since grown to its present complement of 20 professional staff and expanded secretariat with support services..

The major activities in the pollution control programme are:-

* Baseline studies, and monitoring of water and air quality including marine environment.
* Investigation of complaints.
* Development of water and air quality criteria and standards.
* Protection of groundwater and soil environment.
* Compilation of source inventory.
* Presiting evaluation of new industrial sources and licensing.
* Development of regulations and effluent and emission standards.
* Enforcement of regulations of point and mobile sources.
* Documentation of control technology and other information.
* Data processing.
* Development and co-ordination of the National Contingency Plan to combat oil spills.

REGIONAL DEVELOPMENT AUTHORITY

Branch offices of the Division of Environment have been established in Lembaga Kemajuan Pahang Tenggara (DARA) and Lembaga Kemajuan Trengganu Tengah (KETENGAH) respectively with effect from 1979. The establishment of these special environmental units was in compliance with conditions set by international funding agencies. Awareness of the need to take environmental factors into account in carrying out their projects had increasingly permeated the regional development authorities.

Thus December, 1979 saw the establishment of a task force on environment established jointly by the five regional development authorities with DARA designated to provide secretariat services initially

CONCLUSION

The Division of Environment has already taken the first step by devising Regulations to deal with the urgent problem of pollution control. However, emission and discharge controls are in themselves inadequate to cope with wide-ranging nature of environmental problems. Ordinary prudence dictates that, in planning for development, attention needs to be focussed not only on economic factors of resource availability like labour and capital and the technology envisaged but also on likely environmental impacts. This underscores the urgent need for development in the 1980s to be planned and implemented taking explicit account of the environment so that our valuable resources could be developed and harnessed on a sustained basis to confer enduring benafits.

Basically, therefore, the most effective method of controlling environmental problems lies in the advance or forward planning in environmentally-related activities in terms of the long-term conservation of environmental assets. To this end, it is, therefore necessary to ensure that the imperatives of environmental protection are integrated into development projects to avoid environmental degradation and costly time-consuming remedial measures.

In addition to proper environmental planning towards environmental management, we need new knowledge, new perception and new attitudes not only at all levels of the Government but also the private sector and the individual citizen. What is needed is a basic rethinking of the way our society looks at problems and makes decisions especially as regard the management and development of our natural resources. Environmental education has a vital role in developing a new perception and awareness in society towards the environment.

The Division of Environment has already moved into the areas of environmental planning, resource managemant monitoring and environmental education with initial effort focussed on land-use planning and industrial location. To this end it has developed non-statutory means of control in the form of guidelines.

STATE OF THE ENVIRONMENT

WATER

Malaysia is endowed with abundant water resources. The country's water bodies are diverse, raging from small tributaries to major rivers, lakes, ponds, estuaries, coastal waters and marine waters. They serve a variety of uses including domestic and industrial water supply, fishery, irrigation, transportation and recreation. It is in this light that the preservation of high quality of water for domestic, industrial, fishery, agriculture and other ancillary purposes and the restoration of the degraded water bodies through sound management and conservation programmes rank among the priorities of national development efforts.

Current Problems

The current problems of water pollution arise as a result of development of Malaysia's land and other resources, renewable and non-renewable, the discharge of undersirable waste products and effluents in the process of urbanisation and industrialisation and agricultural runoffs.

The major activities in land and resource development which affect water are mining, new agricultural settlements, replanting of existing agricultural lands, logging, housing, establishment of new townships and general infrastructure development. These activities affect water in broadly similar ways, namely, soil erosion, siltation of rivers and alteration of once stable hydrological regimes. These in turn give rise to the needs for flood control, regulation of stream flows and purification of water supplies.

One particular facet of these problems is seen in the adverse effects brought about by recurring floods. Apart from direct loses during floods and the cost incurred to repair resultant damage, there are also indirect losses which result from disruption of economic activities and diversion of manpower and other resources to undertake flood relief operations.

The other important cause of water pollution is discharge of industrial effluents into water courses stemming from industrial activities. In the Malaysian context this is significant since the industrial sector has been for a number of years the fastest growing sector of the national economy. Our environmental problems tend to be more often then not the side-effects of unplanned or poorly land-use in past years.

Municipal wastes which enter water bodies include sewage from households, commercial establishments, restaurants, public markets and industries. The absence of sewerage systems in most parts of the country in the main cause of pollution from municipal sources. Only 12% of the urban population are using flush toilets connected to the community water-borne sewerage system. A further 44.3% of the urban population are using flush toilets connected to septic and 34.7% are served by the 'bucket' system while 9% have no facilities whatsoever. In the rural areas, only 58.2% of the rural population are served by sanitary latrines (pits/septic tanks).

Agricultural runoffs are a major source of nutrients, pesticide residues and sediments. The need to increase agriculture production as part of the strategy for development, therefore, gives rise to increased water pollution problems. Contributing to the potential agricultural nutrient load of water bodies are animal wastes and chemical fertiliser residues.

Pollutants in the marine environment, apart from those due natural causes, can be tracted largely to multiple human activities and are by no means confined to Malaysia's territorial limits, as some

pollutants are likely to be introduced into our waters through atmospheric and aquatic drift. The main activities that cause pollution are forest clearance and land development including agriculture; terrestrial and seabed excavations including trawling; domestic outfalls; pest control in agriculture and public health; deliberate and operational discharge from ship; industrial outfalls; combustion of fossil fuels; and nuclear waste disposal. The effects of the indiscriminate discharge of ballast waters and slops by passing tankers and ships particularly in the Straits of Malacca is aggravated by oil spills resulting from tanker accidents.

The Straits of Malacca is a hazardous waterway. In parts it is shallow for large vessels and in certain stretches its narrowness poses significant navigational risks and hazards. This makes it prone to oil tanker accidents. The incident involving the Japanese tanker 'Showa Maru' in 1976 and that of the collision of the Philippine tanker 'Diego Silang' with the Russian vessel 'Vystok' in 1977, spilling in each case some 6000 tons of crude oil serves to reinforce this concern. It is estimated that an average of 150 vessels use the Straits monthly, with oil tankers including Very Large Crude Carriers (VLCC's) accounting for over a quarter of total.

Malaysia's interest in the marine environment has been reflected in the growing importance given to this aspect in environmental policy measures. This stems from the fact that Malaysia has a relatively long coastline of about 4830 km (3000 miles). Furthermore, as a country she is endowed with valuable marine resources. The special characteristics of the Malaysian coastline are evident from the extensive beaches which serve as national amenities and tourist attractions and mangrove swamps amounting to 113,279 hectares (279,800 acres) in Peninsular Malaysia, 173,684 hectares (429,000 acres) in Sarawak and 365,910 hectares (903,800 acres) in Sabah. The mangrove swamps represent one of the most productive ecosystems in the world.

The Straits of Malacca also ranks as an important fishing ground to Peninsular Malaysia accounting for about 70% of the total fish landings or 400,000 tons in 1976. Fishing activities in these waters also provide gainful employment for over 50,000 fishermen. Export of fish and fish products accounted for export earning of about 166 million dollars in 1975.

The Present State of Water Pollution in Malaysia

The problem of water pollution has reached a level for concern in a number of areas in the country. To name a few, the Klang River basin, the Juru River basin (Prai), the Skudai River basin (Johor) and the Malacca River basin are known to be grossly polluted. A preliminary appraisal of water quality data on Malaysian rivers, in respect of 1976 has revealed that 42 rivers can be considered heavily polluted, another 16 moderately polluted, and a further 7 as facing potential pollution problems.

Based on the extent of pollution of various sources and the corresponding impact on the environment, water pollution sources are classified into three groups namely, palm oil mill wastes, natural rubber processing wastes, and sewage and other industrial effluents.

Table below gives the pollution load generated by these wastes.

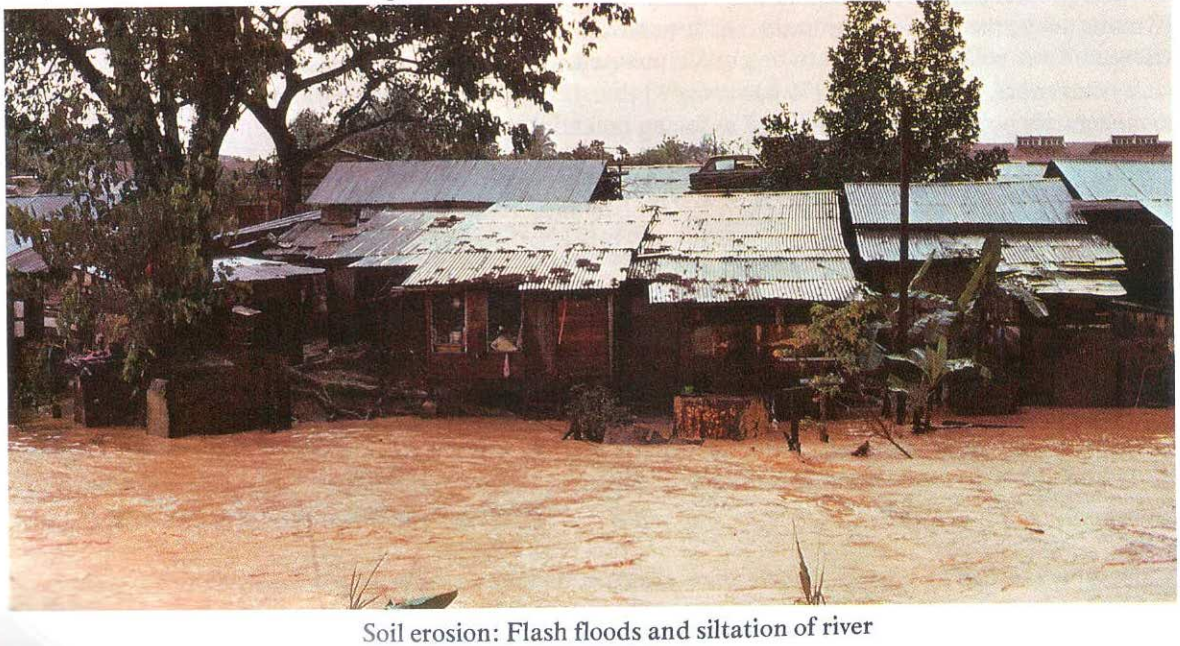
SOURCE	NUMBER	B.O.D. Load tonnes/day	VOLUME OF EFFLUENT Cu.m/day	POLLUTION EQUIVALENT (million)
Palm Oil	130	284	14,200	5.7
Rubber	375	208	116,000	4.1
Other Industries	6000	124	412,000	2.4
Sewage		214	207,000	13.98

It is evident from the above that palm oil and rubber industries together account for about 60% of the total industrial pollution load.

The breakdown of pollution load on an industry-by-industry basis puts the palm oil industry at 34.2% rubber 25.1%, other industries 14.9% and sewage 25.8%. It is therefore evident that the wastewater volume and B.O.D.load contributed by the industrial sources is three times that contributed by domestic sewage. Pollution from industrial sources can be said be a feature affecting water resources throughout the country.

Table below shows the industrial wastewater profile by type of industry.

TYPE OF INDUSTRY	VOLUME OF EFFLUENT (10 m /year)	B.O.D. (tonnes/year)	SUSPENDED SOLID (tonnes /year)
Food manufacturing	49,960	12,120	15,050
Manufacture of Industrial Chemical and other chemical products	43,460	10,430	16,900
Manufacture of Textiles	26,230	13,270	8,300
Beverage Industry	2,390	1,170	1,380
Manufacture of Paper and Paper Products	920	140	390
Basic Metal Industries	740	120	1,230
Total	123,600 (90.64 million gal /day	37,250 (274,000 (Ib/day)	43,250 (318,000 Ib /day)



Soil erosion: Flash floods and siltation of river

From the above table it is evident that 97% of the wastewater discharge is accounted for by three categories of manufacturing industry namely food manufacturing, 40.4%, industrial chemicals, 35.2% and textiles, 21.5%.

In 1977 a survey of the Juru River basin receives waste from the Prai Industrial Estate was carried out. Analysis of effluents samples from the factories revealed the discharge of toxic heavy metals such as mercury, lead, zinc, chromium and cadmium amounting to about 23kg/day (50Ib/day) over the entire Juru River basin. According to a similar survey of the Klang River basin carried out by a firm of consultants in 1973, toxic heavy metals were also discharged from the industrial estate in Kuala Lumpur, Petaling Jaya and Sungai Renggam (at present Shah Alam) amounting to approximately 3,600 kg/day (8,000 Ib/day).

For lack of carefully planned baseline or minitoring studies on marine pollution, there is a paucity of information available in Malaysia. What information there is takes the form of a few reports on investigations carried out on isolated occurrences of marine pollution in the coastal areas.

In a marine pollution survey carried out in the coastal waters around Penang Island in April 1970, coliform counts (E.coli.) exceeding 1800/100 ml were recorded in seawater in 8 out of the 10 stations sampled.

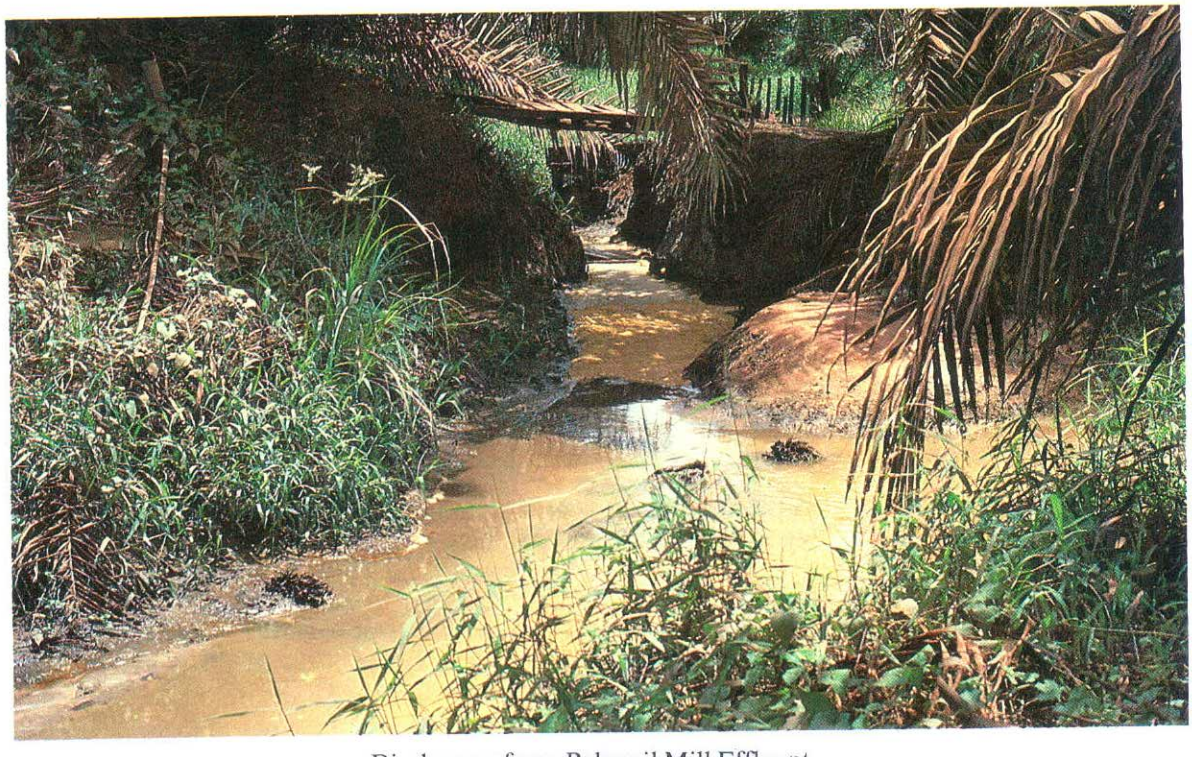
In another study of marine pollution carried out in the Straits of Johore in July/August 1974, extremely high counts of E. coli were observed, both in the coastal waters of the Straits as well as in the estuarine waters of Sungai Scudai and Sungai Tebrau, which drain into the Straits. In the coastal waters, counts exceeding 18,000/100 ml were recorded from samples taken at three out of 7 localities. The samples taken at 4 out of 6 localities in Sungai Scudai showed counts exceeding 18,000/100 ml whilst samples taken at two localities in sungai Tebrau showed maximum counts of 16,000 and 9,000 respectively.

A study of the hydrobiology and fisheries of the Straits of Penang between 1973 and 1976 has shown that certain areas contain a fairly high content of organic matter in the water. High BOD values were recorded and rich primary production and high standing crop of zooplankton was observed. The rich primary productivity is primarily due to constant enrichment by raw sewage discharged into the Straits daily.

A report in 1975 from the local authority revealed that about 3.5 million gallons of sewage as being discharged daily. This high nutrient content has given rise to large quantities of dinoflagellates such as Noctiluca, Gymnodium, Ceratium, which are potential red-tide' organisms. Various other bacteriological studies in the Penang Straits have been done. One such study in 1972 indicated high levels of coliform and E. coli bacteria. High levels of E. coli have been detected in the Penang Harbour, the sewage outfall and the Middle Bank with readings from 430/100 ml to 9000/100 ml.

The coastal waters of the South China Seas are relatively less polluted than the Malacca Straits. However, with the increase in oil exploration and rigging activities off the coast of Peninsular Malaysia as well as off the coast of East Malaysia, it can be reasonally expected that there will be concomitant increase in coastal marine pollution. Almost 57% of the accessible beaches on the east coast, stretching from Kota Bahru to Mersing in Johore was found to be contaminated by oil residues in the form of tar.

Another important but underrated pollutant is solid wastes. It is not an uncommon sight to come across large quantities of solid wastes in the form of plastic bags, wood and other debris littered on beaches or floating in the water. The exact quantum of solid waste that is disposed into the marine environment is not easily determined.



Discharge of raw Palm oil Mill Effluent

AIR

Public awareness of air pollution problems increases the need for effective management of the country's air quality. The country's air pollution problems, although not as widespread nor as serious in extent as those prevailing in other countries, nevertheless, deserve priority attention. Air pollution is already approaching serious proportions in a number of areas like Prai and Mak Mandin (Penang), Kuala Lumpur, Petaling Jaya and Johor Bahru and beginning to be noticeable in towns like Ipoh and Georgetown. The problem is expected to grow both in complexity and extent, given the country's accelerated tempo of industrialisation and urbanisation.

Current Problems

The transport sector, particularly motor vehicles accounted for the major share of the pollutants generated. The motor vehicle population in Peninsular Malaysia has increased nearly three fold from about 669,000 vehicles in 1970 to about 2 million in 1979. Of these, about 8½% are diesel-powered vehicles with the balance being petrol-driven.

The other sources of pollution are fuel combustion from stationary sources, emissions from industrial processes and solid wastes.

The Environment Division has to date identified about 5,000 air pollution sources in Malaysia. Among these are some 13 thermal power plants, 7 cement plants, 341 quarries, 1,598 timber-based industries, 184 brick and clay works, 23 glass works, 112 metallurgical works, 371 chemical works, 186 palm oil-related industries, two petroleum refineries, 136 feed mills, 698 rubber smoke houses, 1,258 rice

mills and 150 fishmeal plants. Housed within these industrial premises are some 1,550 boilers and furnaces and 350 incinerators. In addition, there are 250 waste disposal sites scattered throughout the country. The boilers, furnaces and incinerators burn liquid fuel and solid fuel which emit dark smoke when not properly operated. The waste disposal sites are sources of smoke when solid wastes are burnt in the open. They are also sources of odour, flies and rodents.

Problems due to noise and radiation have been minimal. Cases have been reported of a few factories generating excessive noise at night. Noise from wood-working factories and engineering workshops also have generated complaints.

The Present State of Air Pollution

About 622,000 tonnes of pollutants were emitted into the atmosphere as a result of fuel combustion. The pollutants comprised 48.7% carban monoxide, 31.3% sulphur dioxide, 11.2% oxides of nitrogen, 6% hydrocarbons, and 2.8% grit and dust.

Motor vehicles, together with aircraft and rail transport, contributed approximately 96% of the total hydrocarbons and 70% of the total oxides of nitrogen generated by fuel combustion in Malaysia.

Power stations were responsible for 22.5%of the total annual fuel oil consumption of 1.799 million tonnes emitting 46.1% of the total sulphur dioxide released, followed by industries emitting 51.6%. With regard to the total particulate emission, woodburning accounted for approximately 40%.

Major pollutants in Petaling Jaya area consisted principally of particulates, sulphur dioxide and oxides of nitrogen emitted as a result of fuel combustion.

Surveys carried out at representative industrial and residential areas in Kuala Lumpur and Petaling Jaya showed high levels of suspended particulates. In one industrial site in Petaling Jaya, the 24-hour monthly average was 158 ug/Nm , and in a residential area in Petaling Jaya, it was 79 ug/Nm , all of which exceeded accepted international goals in respect of air quality.

Discharge of black smoke from sawmills
(Jalan Setapak, Kuala Lumpur)

LAND

Soil erosion and siltation rank among the serious environmental problems faced by Malaysia.

The widespread occurrence of soil erosion in this country has been closely associated with the opening up of new land for agricultural purposes, logging activities, urbanisation, infrastructure development in rural and urban areas and mining. Large scale tin mining has a long history in Malaysia stretching back to the turn of the century. Since about 1908, tin has been mined mainly employing the open-cast method and dredging.

Current Problems

Land under forest is still being cleared without any ecological consideration and is posing an extremely difficult problem. Over the last 10 years approximately 3,000 square kilometers (¾ million acreas of primary forests have been clear-felled for agriculture. This rate of deforestation if maintained in the future will intensify problems of soil erosion and silting. One obvious consequence of siltation, apart from its effects on aquatic life, is the impact in terms of increased cost of water treatment and generation of hydroeletric power.

The Present State of Land Pollution

Little is known about the extent and magnitude of soil erosion in the country. A recent study by the Ministry of Health on the Klang Valley estimated that approximately one million tons of silt was carried down by the river annually, mainly due to urban and housing development and mining activities.

The immediate effects of this problem have brought about a high sediment load in our rivers, the destruction of fish and other aquatic life, floods and the loss of fertile top soil impoverishing the land. Past records and experience have shown that siltation brings about a reduction in the carrying capacity of the river leading to flooding. Extensive flood mitigation works such as those in respect of Sungai Klang, Sungai Kinta and Sungai Gombak are both expensive and time-consuming.

Nearly all major rivers in country have raised banks formed by deposition of silt during floods. For example, the banks of Sungai Kelantan in its lower reaches are as much as 20 feet higher than the surrounding areas whilst those of Sungai Perak are some 10 to 15 feet higher.

In the case of mining, large areas of land have been left without rehabilitation, contrary to the provisions of mining leases under which they were worked causing aesthetic and other problems.

Excessive sedimentation from uncontrolled mining activities has caused the old township of Kuala Kubu to be buried under silt. Costly engineering works had to be carried out to save the townships of Serendah and Bentong from suffering a similar fate. A similar problem is faced by Telok Anson (now Telok Intan), as also Kampong Batu Bidai situated at the mount of Sungai Kinta.

The effect of siltation on water intake has reached a serious level as well. In the Cameron Highlands, for example, siltation has resulted in increased maintenance and operating costs in respect of electric power generation.

SOLID WASTES

Solid wastes in Malaysia can be classified into:-

- Municipal wastes;
- Solid industrial waste; and
- Nightsoil

Municipal wastes consist of many different substances from a multitude of sources. Such wastes include garbage, rubbish, ashes, street sweeping, carcasses of dead animals and market wastes.

The solid industrial wastes include construction waste (building waste) factory waste (packaging materials, food waste, spoilt material of metal, wood, cardboard, textiles etc.), factory refuse (fuel residues) and refinery waste.

Nightsoil is mainly collected from towns where the bucket system still lingers on.

Irresponsible disposal of solid wastes

Current Problems

It is estimated that 3.7 million tons of waste is being generated and disposed of annually in Malaysia, incurring an expenditure of about 60 million ringgit. The most popular form of disposal of solid wastes is by the use of sanitary landfills. There are between 250 to 300 disposal sites in use by some 236 local authorities before restructuring exercise in Peninsular Malaysia.

In terms of quantity of waste being disposed, more than 44% is by controlled tipping at designated landfills. This is accounted for by 17% of the local authorities. While open burning is widely practised by 55% of local authorities the quantity so disposed accounts for only 24 percent. Incineration is practised by 2% of the local authorities but less than 1 percent of the waste is disposed of in this manner. More than 4,800 tons of waste is being disposed of monthly directly into rivers and oceans by less than one percent of the local authorities. More than 30 percent of the waste is disposed of in a haphazard manner by about 25 percent of the local authorities. In terms of expenditure on waste disposal, the cost range from $9.00 to $12.00 per person in Petaling Jaya and the Federal Territoty.

On an average, 0.01 hectares (0.186 acres) per 1,000 people is currently used in Peninsular Malaysia for municipal waste disposal purposes. The City of Kuala Lumpur and the State of Malacca, Kedah and Johor are found to be running out of available land for waste disposal. The densely populated State of Perak and Penang appear to have sufficient land, with the former utilising mining land and the latter reclaiming land from the sea. Certain other States namely Selangor, Negeri Sembilan, Pahang, Kelantan, Trengganu and Perlis, may at a later stage of development run out of landfill sites. It is estimated that 40% of these disposal sites will be filled up in the next 5 year and another 30% in 10 years.

Current State of Solid Waste Pollution

Complaints received by the Division of Environment suggest that there is hightened sensitivity to possible health hazards and odour nuisances stemming from uncollected or improper disposal of waste. There has been a marked increase annually over the preceding three years in the number of complaints received from the public.

At least 30,000 tons of particulates are emitted annually into the atmosphere through open burning of wastes at municipal disposal sites. Many residents have experienced nuisance from odour, flies, mosquitoes, rodents and other pests as a result of indiscriminate dumping of organic waste at landfill sites in their neighbourhood.

Contamination of surface and subsurface waters as the result of runoffs of leachates from waste dumping sites is increasing at a rapid rate but is yet to be assessed and quantified. Where waste dumps are located in low-lying areas on river banks prone to tidal action, the refuse has been known to get carried into the river system.

The beneficial use of rivers and streams for life-support is often abused and these waterbodies are often used as carriageways or pathways of refuse to the sea. Consequently, the waters are directly polluted and the natural flow of the river systems gets interrupted. Floating debris and municipal refuse have been observed in several rivers.

FORESTRY

Ecologically, the forest of Malaysia are one of the oldest and most complex among the least understood ecosystems in the world. The flora consists of more than 8,000 species of seed plants about

30% of which are trees. The dominant tree family is the Dipterocarpaceae which has a whole range of timber trees of commercial value. The forests of Malaysia continue to play a significant role in national development.

The development of forests for socio-economic purposes may have biological, physical and chemical impacts on the environment; from a long-term standpoint it does affect the quality of life and hence the tremendous rate of depletion of these resource is cause for concern to foresters, naturalists and environmentalists alike.

Current Problems

A consequence arising from land and resource development has been the steady depletion of natural forest habitats so essential for the preservation of wildlife and natural flora, and the reduced availability of natural scenic areas with recretion and tourism potential. There is also loss of genetic deversity in the thousands of species of organisms living in the forests which may be of potential importance for plant breeding and the control of pests and diseases in agriculture and forestry. The need for the preservation of representative samples of Malaysia's natural forest ecosystem with its constituent flora and fauna cannot be over-emphasised. Failure to do so will be tantamount to a disservice to succeeding generations.

Another issue of importance is the need to conserve and manage our water resources wisely. Water stress is increasingly felt. Forested land forms all the watersheds of importance and is critical to catchment areas which are sources of abstraction for public water supplies. With growing population pressure the demand for domestic and industrial water is increasing while the opening up of land for (one sentence) agricultural purposed.

The Present State of the Forest in Malaysia

Malaysia, which comprises an area of some 33.0 million ha. is one of the few developing countries which still has a substantial portion of its land area under forest. The total land area under forests has been estimated to be 19.3 million ha. or approximately 58.4% of the total land area of the country (see Table below).

Table Area Under Forest ('000 ha.)

	Peninsular Malaysia	Sabah	Sarawak	Total
Land Area	13,169	7,394	12,455	33,018
Forest Area	6,567	3,294	9,432	19,293
Percentage of land under forest	49.9	44.5	75.7	58.4

Out of 19.3 million ha. of forests, 2.4 million ha. are peat swamps and 0.36 million ha. are mangrove forests.

Permanent Forest Estate (PFE)

Forestry is inherently a long-term industry which calls for far-sighted planning and enduring commitment. Of overriding importance is security of tenure in the form of a Permanent Forest Estate

(PFE). The area designated as Permanent Forest Estate is about 11.6 million ha., the breakdown by regions being as follow:-

Peninsular Malaysia	5.1 million ha.
Sabah	3.3 million ha.
Sarawak	3.2 million ha.
	11.6 million ha.

The management of the Permanent Forest Estate (PFE) is to be guided by the objective of optimising social, economic and environmental benefits in accordance with the principles of sound forest management.

The Imminent Crisis

The rate of reafforestation by silvicultural treatment and enrichment planting has failed to keep pace with the rate of forest harvesting. In Peninsular Malaysia only 10% of the harvested areas has been silviculturally treated. This is far from the minimum area required to ensure a sustained yield from the PFE of about 75,000 ha. per year. The task has been made more difficult as the exploitation progressed to the hills. Agricultural development has also made inroads into available reafforested land.

If the current logging rate of about 373,000 ha. annually is allowed to continue within the agri-conversion forests and the permanent forest estate, it is estimated in respect of Peninsular Malaysia that all these forests would be depleted of timber resources within 11 years. When this happens, there will be a crunch in the local supply after which supply from the proposed PFE will not be sufficient to cater even for projected local consumption. The absence of sufficient regenerated or treated forests further renders the possibility of sustained production somewhat remote.

The implication of such an eventuality are extremely serious. Besides the direct impacts on the export-oriented industries, employment opportunities, state revenues and local supply and demand for raw materials, the effects on the environment could be equally, if not more, serious.

Forest Policy and Legislation

In effecting proper management and development of the valuable tropical forest resource consistent with environmental needs, the Government approved for the first time in 1978 by decision of the National land Council a National Forestry Policy for Peninsular Malaysia. Strategic moves contemplated involve:-

* Sealing down the rate of forest areas opened for timber exploitation;
* maximizing the utilization of the timber resources;
* carrying our reafforestation operations on schedule; and
* carrying out more concerted efforts in Research and Development (R & D).

Uniform forestry legislation for Peninsular Malaysia is being prepared to replace the various State Forest Enactments passed between 1921 and 1935 and Rules there under in the interest of more effective enforcement and to provide for the needs of forest conservation.

NATIONAL PARKS & WILDLIFE RESERVES

In total 5.8% of the land area in Peninsular Malaysia, 0.63% in Sarawak and 1.4% in Sabah have been set aside as National Parks and Wildlife Reserves under the Governments' programme for conservation and preservation of flora and fauna. These areas are in their pristine stage, dominated by canopy tree species of the family **Dipterocarpaceae** and contain diverse genetic material.

The preservation of representative samples of Malaysia's natural forest ecosystem with its constituent flora and fauna has continued to be accorded due importance. Such natural forest habitats are indispensable as they play a truly significant role in the preservation of the watershed, in the maintenance of the hydrological cycle while serving as a permanent resource of scientific, cultural and recreation of value.

RENEWABLE AND NON-RENEWABLE RESOURCES

For many years the major environmental problems in Malaysia stemmed predominantly from the lack of development and inadequate infrastructure facilities, in short, poverty itself seemed polluting. It was thus that the country for nearly a decade and more after Merdeka (independence) opted in successive plan periods for accelerated development programmes spanning mining, forestry, estate development, agriculture, land settlement and industrial development. The high rate of economic development had made substantial inroads into the reserves of minerals, soils, forests and water to an extent where a condition of near-utilisation might well be reached by the end of the present century.

From the Malaysian experience, it is crucial for the smaller developing countries to protect the source of their wealth, both currently available and future, on the principle that renewable resources can best be husbanded from healthy environment. In addition, these countries must be constantly aware that, given their limited size, their most basic resources are finite, and thus far-sighted resource husbandry is of prime importance.

In recent years, there has been some serious re-thinking in developed and developing countries alike on the directions in which future course of development should proceed. In many ways, these endeavours have been prompted by new perceptions on the need for harmonisation of goals and policies of economic development with those of environmental protection and improvement for ensuring a better quality of life for the people.

It has now become increasingly clear that the problems of environmental protection are inseparable from the problems of economic development. They are, in fact, two sides of the same coin. It is prudent that environmental protection is approached as a dimension of economic development in all aspects, since we want neither an immaculate environment nor all-out economic development at the expense of the environment.

In the past, there has been a tendency to equate the development goal with the narrowly conceived objective of economic growth as measured by the rise in gross national product. It is increasingly recognised today that high rates of economic growth, necessary and essential as they are, do not by themselves quarantee the easing of urgent social and human problems. Indeed in many countries high growth rates have been accompanied by increasing unemployment, rising disparities in income both between groups and between regions and the deterioration of social and cultural conditions. A new emphasis is thus being placed on the attainment of social and cultural goals as part of the development process. The recognition of environmental issues in developing countries is an aspect of this widening of the development concept. It is part of a more integrated or unified approach to the development objectives.

Such perceptions of the role of environmental management vis-a-vis national development is particularly relevent to developing countries like Malaysia, dependent on natural resources for generation of economic activities.

The economic growth, progress and well-being of a nation depend largely on adequate resource availability as well as the systematic development and harnessing of these resources, both renewable and non-renewable. However, the continuing availability of these resources in the context of the whole ecological system is by no means guaranteed without sound environmental management benefitting from advances in science and technology.

Much depends on the prudent management of resources and the extent to which such utilisation impacted upon the environment. The capacity of the environment to produce essential renewable resources must be maintained, restored or improved. Failing this, one can expect deleterious side-effects on the environment, which negate to some extent the hoped-for benefits from development.

Malaysia, compared to most developing countries, is fortunate in that is has seemingly abundant resources, ranging from forests, land, fossil fuels, minerals, to the most basic resource of all-water. All these have been experiencing fast growth in rate of use, and in the course of its development, various environmental problems have arisen.

Case for Environmental Considerations in Resource Management

Considering the close inter-relationship between resource development and environmental quality in the context of economic well-being, prudent management of natural resources taking due account of the outer limits and carrying capacity is called for. Resource development, therefore, has to be approached on an integrated basis within the framework of space and time, focussing on environment as an important dimension to bring about optimum benefits from economic and social development. Essentially it should aim at:-

* Minimizing wastes in the process of resource development and utilisation and recycling of wastes;

* developing appropriate technology for management and control of wastes;

* mitigating residual environmental problems.

Since development of natural resources implies deliberate changes to the environment through various activities, conscious effort is needed to regulate these changes in the interests of sustained development in an environmentally sound manner. The task of effectively regulating these changes calls for prudent long-term management of available resources.

Strategy for Appropriate Resource Management

Ideally for impact, institutional arrangements for resource management should be on an integrated and centralised basis. In the case of Malaysia, however, responsibility for resource management is currently shared by a number of government agencies and ministries and this feature is compounded by the division of responsibilities between the Federal and State Governments. This in itself should not be regarded as sufficient to infer that the goals and objectives of resource management are beyond hope of attainment, given sufficient understanding of inter-relationships and linkages.

Resource management is currently being carried out both at Federal and State levels by the various agencies responsible for the development of specific resources. However, in matters concerning land and forestry, an integrated approach has been evolved through the National Land Council and the National Forestry Council in terms of broad-based policy guidance.

The machinery and the commitment to planning already exist. What is needed is the development of an enlarged planning methodology such that the environmental dimension is incorporated in an integrated way into development planning right from the project indentification stage. The integration of environmental factors into resource management would imply a broader definition of development goals than quantitative increase in the gross national product. Generally speaking the optimal development process should be one which sets as one of its main objectives, the satisfaction by present and future generation of their basic requirements without transgressing the outer limits of biospheric tolerance of man's activities. There is a delicate balance involved and it demands very careful consideration. For such rational management to be achieved, techniques need to be developed to deal adequately with the full range of social and environmental, in addition to economic, costs and benefits of development-related activities. It is necessary to find techniques for quantifying the impact of development projects on environment, both favourable and unfavourable, so that society can choose among projects with a fuller knowledge of their social costs and benefits. All too often the social costs of various projects have been ignored in the intitial appraisal especially in a laisse-faire system, to that society's awareness of many of the environmental disruptions resulting from these projects came at too late a stage when construction was still underway. It is important that the social costs should be ascertained before undertaking development projects, so that society can carefully choose whether these costs are still worthwhile in relation to economic and social benefits of the project, whether some of the costs could and should be minimised in the designing of the project, and whether some of the costs could and should be postponed through adoption of alternative options.

ROLE OF THE GOVERNMENT

In the light of these factors, Malaysia's strategy for environmental management highlights:-

* Environmental Assessment encompassing monitoring, research and review.
* Planning
* Controlling
* Decision making in such areas as resource allocation, land use and socio-economic development.

The first essential task is logically environmental assessment which seeks to examine, assess and evaluate the environmental conditions prevailing in various localities through the air and water quality monitoring programes, baseline studies and source emission inventory surveys which are currently undertaken by the Environment Division of the Ministry of Science, Technology and Environment. These activities are geared to provide not only the fundamental inputs for development planning, but are also useful in themselves for the formulation of pollution control programmes. The information so generated is also invaluable as feedback to help determine whether the environmental standards need reviewing and to pinpoint problem areas needing attention.

POLLUTION ABATEMENT AND CONTROL

ENVIRONMENTAL POLLUTION CONTROL APPROACH

Pollution control is the punchline activity in any programme for environmental protection and the enhancement of environmental quality. Important as they are for controlling existing and future environmental problems, these measures must, however be planned and designed within the framework of the growth targets of the Development Plan, and be in the line administrative procedures at both the Federal and State levels.

In the final analysis, these control measures should be in conformity with the legislative and administrative competence between the Federal and State Governments. To this end, the Environment Division has adopted a two-pronged approach encompassing.

(i) Statutory means; and
(ii) Non-statutory means

Statutory Means are adopted in areas are expressly within the ambit of the Environmental Quality Act, 1974 of other environmental Federal legislations. The non-statutory means, on the other hand, are resorted to in areas which are not amenable to regulation by Federal legislations including areas within the competence of State Governments. Matters such as land, water, agriculture, forestry, mining soil erosion, drainage and irrigation, which are fundamentally important in environmental management fall with in teh purview of the State and Concurrent Lists in the Federal Constitusion. It is in these areas that the non-statutory means must be resorted to with circumspection to avoid undue administrative conflicts and overlaps.

The statutory means are being effectively used in terms of the various Regulations under the Environmental Quality Act, 1974 and the Road Traffic Ordinance 1958. The Regulations so far enforced included:-

(i) Environmental Quality (Prescribed Premisis) (Crude Palm Oil) Regulation, 1977, P.U.(A).342/1977.
(ii) Environmental Quality (Clean Air) Regulations, 1978.P.U.(A)280/1978
(iii) Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978, P.U.(A)338/1978.
(iv) Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979-P.U.(A)12/1979
(v) Motor Vehicles (Control of smoke and Gas Emission) Rules 1977-P.U.414/1977

While the first four are made under the Environment Quality Act, 1974 and hence applicable to the whole of Malaysia, the last mentioned having been made under the Road Traffic Ordinance 1958, is applicable to Peninsular Malaysia only. These Regulations are principally intended to control industrial pollution in the form of discharges and emissions which damage our commonly-shared resources, namely land, air and water. However, they are by no means sufficient in themselves in tackling the whole gamut of environmental issues. This is evident from the fact that the development of land and natural resources can also give rise to serious environmental problems. Nevertheless, these Regulations are significant in the control of pollution from point sources.

Under these Regulation, the approach to control consists of the establishment of standards for the reduction of pollutants, enforced by both legal and administrative methods including levying of pollution

charges. The rationale for levying pollution charges is to bring home to industry the need to move in the direction of pollution control.

It is evident from the above that although the mandate to protect the environment would be set in motion by the Environment Division, it is unrealistic to expect it to be overly involved with the minutiae of detailed technical procedures and the control mechanism for coping with various environment-related matters (e.g. use of pesticides, mining discharges) when there are in existence agencies with competence in these areas backed up by specific legislation. Further, it is only logical for such agencies to take due account of environmental factors in the course of implementing their programmes as this would help to push forward the frontiers of environmental management.

In the discharge of this responsibility, the Environment Division has given priority to the formulation of guidelines for environmental control in respect of land-use. To this end, it has formulated giudelines for the siting and zoning of industries for the benefit of State Governments. In addition, development work was initiated on respect of guidelines for the prevention and control of siltation and erosion, which has come to represent major threats to the quality of the environment. In addition to these guidelines, the Environment Division has also offered advice to a whole spectrum of agencies, both at Federal and State levels, on environmental matters referred to it from time to time.

WATER POLLUTION CONTROL STRATEGY

Ideally, the ambient quality of water throughout the country should be maintained at the highest level of purity. This would require the most stringent of discharge regulations applied to all discharged into the rivers. Not only would such a policy be difficult to implement, it could not expect to pass any cost-benefit test at the resource allocation stage. The most practicle policy would then be that the quality of inland waters of Malaysia be protected and enhanced having due regard to their beneficial uses and aesthetic considerations. The principal beneficial uses of the surface waters in this country are domestic water supply, fishery irrigation and industrial water supply.

A systematic approach to water pollution control of inland waters entails the establishment of water quality control regions. To this end, a total of 65 river basin control regions have been established in Malaysia. Of these, 49 are in Peninsular Malaysia, 9 in Sarawak and 7 in Sabah. Details of these are to be found in Figure 1 and 2.

For each specific benefical use, such as drinking, industrial water supply, fishery and irrigation, the corresponding water quality characteristics or criteria required to support these uses are clearly specified and water quality standards set. This forms the basis of the entire work related to water quality management. Thereafter the discharge of industrial effluents will have to be controlled by regulating them through the establishment of appropriate effluent discharge standards.

The Envinronmental Quality Act, 1974 provides broad powers for the protection and enhancement of environmental quality. These powers include control of effluent discharges into the environment either through licensing of industrial premises or through the specifying of acceptable conditions of discharge. In either case, the discharge standards are the main instruments of pollution control.

Ideally formulation of discharge standards for industrial effluents would involve the determination of the sources of water pollution within a river basin, the total pollution load discharged into the watercourses, the assimilative capacity of the receiving waters to absorb wastes without detriment to the benefical uses and the degree of treatment needed having regard to the sum total of pollution sources within the control region.

This approach involves substantial manpower, considerable lead time and sizeable expenditure. Further, it does not lend itself to prompt enforcement action which is called for to curb and contain the already existing pollution load as well as to overcome the emerging pollution problems due to rapid industrialisation and urbanization. It was, therefore, decided that the most pragmatic approach for the present is the formulation of fixed standards with exceptions in special case.

Having due regard to these factors, adoption of fixed standards with exceptions where necessary was opted for as being pragmatic in all the circumstance, having due regard to the environment. Taking into account the polluting nature and the potential impact on the environment, water pollution sources in Malaysia have been classified into three broad categories for better control, namely palm oil mill effluent, natural rubber processing effluent, and sewage and(other) industrial effluents. Different modes of control have been resorted to for each of these categories to achieve the objectives of environmental protection. High priority was given to the control of pollution from palm oil and rubber industries by reason of their being major polluters and widespread geographical distribution in relation to the nation's water resources at risk

Formulation of Discharge Standards and Control Mechanism

(i) Palm Oil and Rubber Industries

As palm oil and rubber are the mainstay of the national economy, great care had to be taken in the formulation of standards. These standards have to be not only environmentally sound but also standards within the framework of economies and available technology. To this end, it was decided to formulate a 4-generation set of effluent standards for oil palm effluent, a 3-generation set for the block rubber factory effluent and a 3-generation set for the latex concentrate factory effluent based on available and economically viable technology. A number of committees comprising representatives from relevant government agencies and the industry were appointed to develop and recommend appropriate standards for the palm oil mill and rubber factory effluents. The standards shown in Tables I, II and III respectively were incorporated into the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulation, 1977 and the Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978.

Control is effected through a system of licensing in respect of prescribed premises within the meaning of Section 18 of the Environmental Quality Act, 1974. This proved successful in respect of both palm oil mill and rubber factories.

Under the licensing procedure appropriate conditions are attached to each licence. The effluent standards constitute the principal conditions attached to licences. While these effluent standards are generally applied on a Malaysia-wide basis, the Director General is empowered in appropriate cases to impose more stringent conditions of permissible effluent discharge standards where justified by the environmental situation in specific cases. A novel feature of the palm oil mill and rubber factory effluent control regulations in the levy of effluent-related fees based on the pollution load discharged in terms of B.O.D.

During the initial years of implementation, compliance with the discharge standards of 5,000 ppm B.O.D. was not mandatory both to allow sufficient lead time for the building and commissioning of treatment systems and for the further development of relevant technology. However, in order to give industry a push in the direction of installing treatment system, an effluent-related fee pitched at a realistic level was charged applying the 'polluter pays' principle.

Thus an average-sized mill (20-30 metric tons capacity) discharging effluent having a B.O.D. concentration of 5000 ppm paid an effluent-related licence fee of approximately of $4,500. The same average-sized mill, if discharged raw effluent (i.e. effluent without any form of treatment), was required to pay approximately $140,000 irrespective of the ultimate mode of disposal.

Mills were also permitted to dispose of their untreated effluent onto land in which event licence fee was charged at the rate of $50/- per 1000 metric tons of effluent disposed onto land. In addition, the higher rate charge of $100/- per metric ton of B.O.D. was levied except where the Director-General was satisfied that the discharge of effluents with B.O.D. excess of 5000 ppm would not cause any adverse environmental effects.

A total $3.5 million was collected by way of fees during the first year of implementation of the Regulations.

During the 2nd year of implementation which commenced on 1st, July, 1979 it was mandatory for mills to reduce their B.O.D. to at least 2000 ppm and licence fee was levied at the rate of $10/- per ton of B.O.D. discharged.

The charging of the hugh effluent-related fees as well as the granting of incentive by way of waiver of fees for research on effluent treatment technology had expedited the pace of research and some breakthroughs had been achieved in palm oil mill effluent treatment technology. In the absence of suitable technology from elsewhere which could be the subject of possible technology transfer, Malaysia can justly claim credit to have developed its own technology to treat palm oil wastes and protect its environment.

The Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978-P.U.(A) 338/1978 came into force on 1st April, 1979. The approach to control was similar to that in respect of palm oil mill effluent. As technology was available locally to conform with the standards for effluents for Standard Malaysian Rubber (SMR) factories stipulated in the Regulations,compliance with the standards was mandatory from the start without the option of payment of effluent-related fees.

(ii) Sewage and Other Industrial Effluents

The standards for sewage and other industrial effluents were based on the water criteria applicable for specific beneficial uses of surface waters in this country, namely, domestic water supply, fisheries, irrigation and industrial water supply. For this purpose, two sets of standards were formulated, namely, Standard A, a rather stringent standard applicable to discharges of effluents into inland waters within water supply catchment areas and Standard B, a more related standard applicable to discharges of effluents into any other inland waters. Control is exercised through the prescription of acceptable conditions of discharge within the meaning of Section 21 of the Environmental Quality Act, 1974 as in the Environmental Quality (Sewage and Industrial Effluents) Regulations, 1979 which came into force on 1st January, 1979. The acceptable condition set out in the form of standards are given in Table IV.

Performance

With the effective enforcement of the Environment Quality (Prescribed Premises) (Crude Palm Oil) Regulation, 1977 and the Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, 1978, it was estimated that 80 percent of the industrial pollution would have been overcome. The achievement in terms of compliance with these Regulations is summarised below:

(i) Palm Oil Industry

During the first year of implementation of the palm oil mill effluent control regulations, 130 palm oil mills were licensed. If all the mills had complied with the level of 5000 ppm, a 75% reduction in pollution load would have resulted. In the event, the actual reduction was only 22%. From this, the inference can be drawn that a vast majority of the mills opted to pay effluent-related fee rather than install treatment systems in time.

During the second year of enforcement, the standard of 2000 ppm was made mandatory. By the year end, 84 out of the 130 palm oil mills had installed their treatment plants, 16 mills were in the process of completing their treatment systems and the remaining 30 mills had submitted for approval their proposals of treatment systems and schedules of implemention. The last mentioned belonged to public sector agencies and found genuine difficulty in finding suitable land to build their treatment plants.

(ii) Natural Rubber Industry

Under the rubber factory effluent control regulations which came into force on 1st. April, 1979, 45 latex concentrate and 170 Standard Malaysian Rubber (SMR) and Conventional Grade factories were licensed. Almost three-fourths of these factories had proper treatment systems and were able to comply with the standard of 300 ppm for SMR factories. As regards latex concentrate factories, since the technology for waste treatment was still in the process of being developed, the factories were practising only 'good house-keeping' rules. Some one-fourth of the factories were not able to build their treatment plants for lack of sufficient land.

(iii) Other Industries

All industries (other than palm oil and rubber) which already existed at the time of gazetting of the Environmental Quality (Sewage and Industrial Effluent) Regulations, 1979 had the benefit of a 2-year 'grace period' incorporated into the Regulations for them to build, install and commission treatment system. By the year end a significant number of factories were in the process of building their treatment plants. Examples of such industries are as follows:-

(i) food processing;
(ii) textiles;
(iii) electronics;
(iv) chemicals;
(v) breweries; and
(vi) tanneries

A measure of the problem in respect of environmental sanitation in Malaysia is evident from the fact that by way of sewage disposal facilities only 11.9% (333,000) of the urban population was using flush toilets connected to community water-borne sewerage system. A further 44.3% of the urban population was using flush toilets connected to septic tanks and 34.7% was served by the 'bucket system' while 9% had no facilities. With the proposed extension of sewered areas in Kuala Lumpur, Penang and ten other urban centres under the Third Malaysia Plan period, it was anticipated that even so, only 11.0% (478,000) of the urban population would be using facilities connected to community water-borne sewerage systems by 1980. Thus it can be conceded that sewerage development was lagging when compared to the fact that 72.6% of the urban population and 50% of the rural population had access to potable water supply while 55% of the rural population and 85% of urban poulation were served with electricity.

However, it is encouraging to note that financial allocations for the sewerage increased significantly during the Third Malaysia Plan period, the amount being $202 million compared to only $22 million

under the Second Malaysia Plan and $10 million under the First Malaysia Plan. Furthermore, the Federal Government can be said to have entered into definite commitments through providing grants to the respective State Governments and local authorities for the implementation of Phase I of the Sewerage Projects for Kuala Lumpur, Ipoh, Penang, Butterworth/Bukit Mertajam, Shah Alam, Johore Bahru and Bangi. Under the Fourth Malaysia Plan, a number of these projects are expected to proceed into the design and implementation stages, with Master Plan and feasibility studies carried in respect of a number of medium-sized towns.

AIR POLLUTION CONTROL STATEGY

Air pollution control seeks to ensure satisfactory air quality consistent with the health and well-being of the people and to sustain plant and animal life.

I deally air quality criteria need to be established for specific air pollutants that outline the effects of pollution on human beings, animals, vegetations and materials. Taking into account these criteria the air quality standards can be developed which stipulate the threshold levels of air pollutants for protecting health. If the ambient air quality or the projected air quality in the wake of development falls short of air quality standards, a control programme is needed. The stringency of control involved will depend on the degree of divergence between the existing or future air quality and the quality standards. As soon as the desirable target improvements are assessed, emission standards prescribing limits on the concentrations of air pollutants released from a source can be set.

This strategy known as the air quality management strategy permits long term planning to prevent air pollution. Moreover, it is also possible to integrate a whole mix of policies including urban planning, energy and transport policies into an alternate approach to achieve or maintain the desired air quality. The strategy can be considered as having a built-in safety device to prevent air pollution from reaching concentrations in excess of those stipulated.

One of the drawbacks of the strategy is the somewhat incomplete picture of the effects of air pollution on human beings. In addition there are serious gaps in techniques for estimating future air quality. In consequence there is a margin of error involved in the establishment of air quality standards as a series of assumptions have to be made. Furthermore, there is also a need for continuous evaluation of the accuracy of the air quality projections made in the planning stages as additional information becomes available in the course of implementing the control programmes. In the Malaysian context, there is a distinct lack of air quality information.

A second control strategy is represented by the Best Practicable Means (BPM) approach. This strategy is based on the rationale that control standards and regulations need to be based on the best available yet economically feasible control technology. The standards and regulations are systematically enforced and atmospheric surveillance systems operated to monitor the effectiveness of the control strategy. From the results so obtained control standards and regulations can be reviewed with a view to modification to ensure satisfactory air quality.

Other salient features of the Best Practicable Means (BPM) approach are:

(a) Requirements vary as between new and existing plants since in the case of the latter, stringent requirements might not prove practical.

(b) The more stringent controls for new installations will take account of the most advanced and proven technology which is cost-effective.

(c) Emission standards based on the B.P.M. are generally uniform throughout the country.

(d) It is the quickest and most practical way to achieve an improved ambient air quality around large stationary industrial sources.

In line with the above, an air pollution control programme has been developed involving two main elements, a short term programme based on the Best Practicable Means approach and a long term programme based on the Air Quality Management approach.

Formulation of Emission Standards and Control Mechanism

Air emissions can be broadly classified according to whether they emanate from stationary or mobile sources. Stationary sources comprise industrial combustion, solid waste incineration, evaporative losses and industrial processes including thermal power plants. Mobile sources are accounted for by internal combustion engines such as motor vehicles, aircrafs, railway engines, construction equipment and powered vessels.

Some of the most common air pollutants include particulate matter, sulphur dioxide, carbon monoxide, hydrocarbons. oxides of nitrogen, ozone and a host of toxic fumes, gases and malodorous emissions.

(i) Stationary Sources

There is no shortage of control technology for abating dust and grit nuisance, especially those emitted from industrial furnacess. Abatement systems range from simple, cheap, settling chambers, through various types of cyclone arrestors to large and expensive bag filter plants and electrostatic precipitators. All these methods have been widely used. An oil-fired plant with a properly designed stack should not produce smuts impregnated with sulphuric acid as a result of sulphur emission due to fuel oil combustion.

Smoke emissions for short periods on starting up is unavoidable. Continous smoke is a sign of inefficient operation or that the plant is obsolescent. The solution would involve the modernisation of plant which in turn is a techno-economic decision.

Sulphur dioxide is produced when fossil fuels which contain sulphur impurities are burnt. The fuel oil used by Malaysian industry has a sulphur content of about 3.5%. From the point of view of keeping the ambient air quality or ground level concentrations within threshold limits, consistent with health criteria a cost effective way would be to use properly sited stacks of adequate height and designed to disperse the flue gas so that the ground level concentrations of sulphur dioxide may be kept as low as possible. Other methods of controlling ground level concentrations of sulphur dioxide involve the removal of the pollutant before it is emitted from the stacks, the use of low sulphur fuel and desulphurisation of sulphur containing fuels. For economic reasons the tall stack method is still the preferred method.

Given the present state-of-the-art in technology, there is no valid reason to tolerate emissions of toxic or hazardous chemical fumes since they could be prevented without undue economic strain. Indeed most modern chemical plants have good pollution control measures incorporated in the process design itself.

Some of the more unpleasant forms of air pollution are the results of malodorous emissions from offensive trades such as small establishments processing fish and animal wastes, foof residues, rubber,

leather tanneries all of which can cause considerable nuisance of a localised nature. Substantial improvement can be effected through good house-keeping, and suitable plant design. In cases of small scale operations, it might well be cheaper to resite the plant away from residential areas.

Control of air pollution from industrial sources is effected through the Environmental Quality (Clean Air) Regulations, 1978 which came into force on 1st. October, 1978.

Under the Regulations, certain industrial installations with the potential to pollute would not be allowed to be located within 1000 metres of a residential area without prior written approval from the Director General of Environmental Quality. Table V gives a list of new installations not permitted without prior approval, to be located within or in close proximity to residential areas. It is also stipulated that burning of industrial or trade wastes can only be carried out in an approved incinerator. The installation, resiting or alteration of fuel burning equipment such as incinerators, boilers, kilns, furnaces as well as chimneys must have the prior written approval of the Director General of Environmental Quality. Open burning of industrial wastes or refuse is prohibited. Exceptions are leaves and yard trimmings, fires set as part of good traditional agricultural practices and fire fighting purposes. In all other cases, a licence must first be obtained from the Director General of Environmental Quality.

With effect from 1st. October, 1978 smoke emissions from new industrial or trade premises should not be darker than shade No. 1 on the Ringelmann Chart for fuel burning equipment utilising liquid fuel and should not be darker than shade No. 2 on the Ringelmann Chart for fuel burning equipment utilising solid fuel. For facilities which were in operation before 1st. October, 1978 the smoke emissions should not be darker than shade No. 2 on the Ringelman Chart for both solid and liquid fuel burning equipment with effect from 1st. March, 1979. For starting up and soot blowing operations, allowance is made for short periods of dark smoke emission provided that these periods are less than 5 minutes in any period of one hour and that the total period of such emission should not exceed an aggregate of 15 minutes in any period of 24 hours.

The Clean Air Regulations also prescribe standards for the emission of air impurities such as solid particles, metals and metallic compounds; gaseous substance such as acid gases, sulphuric acid mist, chlorine, hydrogen chloride, flourine, hydroflouric acid, hydrogen sulphide and oxides of nitrogen; and dust or solid particulate emissions from asphaltic concrete plants, Portland cement plants as well as facilities discharging asbestos and free silica. Three types or emissions standards namely Standards A, B & C are prescribed. Standard C is for compliance by all new facilities established after 1st. October, 1978. Existing facilities in operation before 1st. October, 1978 are required to comply with Standard A by 1st. October, 1980 and Standard B by 1st. October, 1981. Standards A, B & C for air impurities are shown in Table VI.

Additionally, all industries should use the best practicable means to prevent the emission of noxious or offensive substances (including odours) and to render harmless and inoffensive those subtances necessarily dicharged. Noxious and offensive substances are listed in Table VII.

Occupiers of industrial or trade premises could apply to the Director General of Environmental Quality for a licence to contravene the Regulations. Issuing of licence would be comtemplated only in the event of valid reasons as non-availability of control technology or prohibitively high cost of control devices. The Director General would first have to be satisfied that in so approving the health and well being of the people would not be jeopardised.

Any person who contravenes the Regulations without a licence would be liable to a fine of up to $10,000 or an imprisonment for a period of up to two years or to both and to a further fine of not

exceeding $1,000 a day for every day that the offenced is continued. Certain offence prescribed under the Regulations are compoundable. The maximum compound fee is $500/-

(ii) Mobile Sources

Among the mobile sources, motor vehicles are the major air pollution sources. The tally of motor vehicles registered in Peninsular Malaysia numbered just under 2 million of 1979. Of these 92% of the vehicles were petrol driven while 8% were diesel vehicles.

Although the quantum of air pollutants discharged per vehicle might be small, the aggregrate or pollution from vehicles accounted for a substantial part of the total air pollution load. It has been estimated that motor vehicles contribute over 40% of the total air pollutants emitted into the atmosphere as a result of combustion. Over 80% of petrol-powered vehicle emissions consisted of carbon monoxide with the rest comprising hydrocarbons, oxides of nitrogen, sulphur dioxide and particulates. Particulate emissions were chiefly of lead and carbon. Tetraethyl lead is added to petrol as an antiknock compound to increase its octane rating. The lead content of petrol in Malaysia at 0.84 gm/litre among the highest in the world. While the exhaust emissions from petrol powered vehicles are smokeless, it is true that toxic gases are present.

Most heavy duty vehicles used for hire or reward such as buses and trucks and almost all Taxis and minibuses are diesel - powered. Theoretically, diesel engines by reason of its more complete combustion are more efficient than petrol engines and therefore emit less carbon menoxide and hydrocarbons. However larger amounts of oxides nitrogen, sulphur oxides, aldehydes and particulates are emitted. Furthermore, the maintenance of the engine can vary the exhaust composition considerably.

Public complaints are always directed towards diesel vechicles because of the smoke emissions and exhaust odour. Generally a diesel-powered vehicle in good operating condition should not emit excessive smoke. Most of the diesel-powered vehicles on Malaysian roads have been found to be emitting excessive dark smoke.

As a first step towards minimising exhaust emissions from motor vehicles, the Motor Vehicle (Control of Smoke and Gas Emissions) Rules, 1977 were gazetted under the Road Trafic Ordinance, 1958. The Rules were brought into force on 15th. March 1978. Under these Rules, an emission standard of 50 Hartridge Smoke Units for exhaust smoke from diesel vehicles was stipulated. The standard corresponds to a certain smoke density which could be measured with a smoke meter. The Rules also require that all petrol vehicles registered on or after the Rules had come into force should be so constructed or equipped with such device as to prevent the escape of gas from the crankcase, thus eliminating the discharge of hydrocarbons from this source.

In-depth studies would need to be carried out to determine the air pollution significance of exhaust emission from pertrol driven vehicles and the approriate control strategy.

Performance

The enforcement of the Environmental Quality (Clean Air) Regulations 1978 and the Motor Vehicle (Control of Smoke and Gas Emmission) Rules, 1977 had somewhat reduced air pollution problems due to open burning, dark smoke as well as emissions of particulates and other air impurities. Better achievement can be expected with the recruitment of more trained enforcement staff as well as greater degree of cooperation from factories. Enforcement activities are outlined below:

(i) Control and Abatement of Air Pollution from Stationary Sources

During the year, enforcement officers visited industrial facilities to check whether the Regulations were complied with. Examples of non-compliance included emitting excessively dark smoke for periods longer than stipulated, open burning of wastes, installing chimneys or incinerators or fuel burning equipment without prior approval of the Director General of Environmental Quality and emitting air impurities in concentrations higher than the standards stipulated. A number of actions were taken against factories for non-compliance with the Regulations. These actions ranged from issuing of warning letters and holding of dialogue sessions to ensure compliance through licensing factories with specific conditions attached, revoking or suspending licences already issued, to the imposition of fines, prosecution and issue of prohibition orders. In 1979, a total of 85 factories were issued warning letters. Similarly 27 factories were given directives to forward information or clarification within a specified time frame regarding the operation of their factories or the installation of pollution control equipment. A total of six factories that disregarded warning letters had their offences compounded. In each case a compounding penaltly of $150/- was imposed and paid.

(ii) Control and Abatement of Air Pollution from Mobile Sources

For the control and abatement of pollution from mobile sources such as motor vehicles, the Motor Vehicles (Control of Smoke and Gas Emission) Rules, 1977 were enforced.

Enforcement officers of the Environment Division, the Road Transport Department and the Police are empowered to enforce the Rules. In this respect, the Environment Division had together with the Police conducted numerous enforcement campaigns. The campaigns consisted of kerbside smoke tests of diesel-powered vehicles conducted at strategic points in Kuala Lumpur and a number of bigger urban centres such as Petaling Jaya, Seremban, Melaka Muar, Batu Pahat, Johor Bahru, Rawang, Ipoh, Pulau Pinang, Butterworth, Alor Star and Kuantan. In the course of 1979, a total of 2489 diesel vehicles were stopped with the assistance of the police for inspection and of these 1612 vehicles were tested. A total of 750 car owners were issued summonses and a further 445 vehicle owners/operators were given written warning.

OTHER ACTIVITIES IN ENVIRONMENTAL POLLUTION CONTROL

The other major thrusts in the pollution programme were:

* Presiting evalution of new industrial sources
* Monitoring and serveillance
* Investigation of and action on complaints
* Research into effluent treatment technology
* Marine pollution control
* Noise pollution control

Presiting Evaluation of New Industrial Sources

In the case of all new factories, written permission is required to be obtained from the Director-General of Environmental Quality before construction of the factories can be proceeded with. This requirement is in the interest of ensuring that pollution control measures are taken into account from the planning stage itself. In the process of evaluations, the siting of industry will be a factor to be

given careful consideration. This evaluation procedure would help to bring about cost-effective pollution control measures in the long term.

During 1979, a total of 476 applications were received for the establishment of factories of which 217 necessitated presiting evaluation.

Monitoring and Surveillance

An essential part of the pollution control programme consists of urban air and water quality assessment encompassing two major activities, namely, baseline studies and ambient air and water quality monitoring.

The primary objectives of the water quality monitoring and serveillance programme can be summarised as follows:

* To safeguard against the presence of toxic substances through surveillance of rivers in respect of beneficial uses (drinking water, fishery, irrigation).

* To detect any changes in river water quality as early as possible so as to enable remedial measures to be taken.

* To assess the adequacy and effectiveness of standards prescribed under the relevant Regulations.

* To provide a data base for predicting the effects of any development project to be carried out within a river basin.

Baseline studies help to identify the status of the river basins in terms of the sources and nature of pollutants and the pollution load, the assimilative capacity of the rivers in the basin to absorb wastes without detriment to the designated beneficial uses. Further, the information so obtained is helpful in establishing stations in strategic locations for routine water quality monitoring and surveillance. Detailed knowledge of river basins is also helpful in long-term environmental planning, particularly with respect to the type of industries that could be located in any particular river basin and in terms of gauging the potential for baneficial uses of a river.

Routine water quality monitoring and surveillance is necessary to ensure that water quality standards and objectives are met.

Programme of regular monitoring and baseline studies, which commenced in March 1978, continued into 1979 baseline studies were carried out in 15 river basins and a total of 188 samples taken.

As regards monitoring, a total of 4464 samples were taken from 503 water quality stations established in the various rivers in Peninsular Malaysia. Six important parameters for which analyses were carried out were for the determination of:

i) Nitrate-Nitrogen;
ii) Ammoniacal Nitrogen;
iii) pH;
iv) B.O.D.5 at 20° C;
v) C.O.D.; and
vi) Suspended solids

In addition, analyses were also carried out for other parameters such as heavy metals, dissolved oxygen, cyanides and pesticides in respect of selected number of samples.

The frequency of monitoring varied from river to river ranging from once-a-month to once-a-year sampling depending on the number of palm oil mills, rubber factories, pollution incidents and the prevailing conditions of the river.

The monitoring results indicated that generally 50 percent of the rivers had reached critical pollution levels at one point or another. On the other hand, not all rivers were polluted at any point in time along their total length or breadth except for the following rivers:

*	Merbok River	—	B.O.D at 20°mg/1 $\geqslant$5 mg/1
*	Juru River	—	pH($>$9.0 ($<$6.0
*	Benut River	—	pH$<$5.7
*	Sepang River	—	Ammoniacal 0.32 mg/1 Nitrigen

Merbok River used to be the estuarine and lower part of a larger river system that is now called Muda River which in the past 100 years or so has been made to discharge directly into the straits of Malacca through a man-made estuary. The lower reached of the Merbok River is under tidal influence and receives mainlay intreated sewage from teh township of Sungai Petani with a current population of more than 50,000. In addition, 10 rubber factories discharge fully or partially treated effluents into the river system.

The Juru River Basin is heavily populated and has a range of economic activities ranging from manufacturing industry to livestock farming and agriculture.

The Benut River Basin has acidic soil (low pH) and most parts of the Basin are under rubber smallholdings or are swampy.

The Sepang River Basin supports a pig population of more than 120,000 heads and six palm oil mills within a small catchment areas of 252 square miles (653 sq. Km.)

Table VIII and IX show the polluted rivers in Peninsular Malaysia in 1978 and 1979 respectively in terms of suspended solids, BOD 5 at 20°C, ammoniacal-nitrogen, PH and nitrate-nitrogen. These tables also show the maximum or minimum for pH values determined in 1978/79 within the classified water quality control regions.

The trend is a disturbing one. More rivers were silted up in 1979 than in 1978. Thirty two river basins had suspended solids content more than 100 ppm in 1979, compared to only 20 in 1978. Notably, the Klang River had suspended sediment load as high as 4.2 percent of its total discharge.

At least one-third of the rivers in Peninsular Malaysia were found to carry higher organic load in 1979 compared to 1978. Johor River has reached BOD concentration as high as 7000 mg/l. With the exception of Klang, Juru, and Merbok Rivers which received organic loads from multiple sources, incidence of organic pollution in almost all the other cases was attributable to palm oil effluent discharges. In the case of the Perlis River, however, effluent from a sugar mill was the main culprit.

Seventeen rivers reached an ammoniacal-nitrogen concentration higher than 1.0 mg/l in 1979 compared to twelve rivers in 1978. The maximum concentration of 121 mg/l was detected in the Buluh River which receives wastes generated by 5 palm oil mills and pig rearing activity covering more than 60,000 heads all within a small catchment area less than 400,000 hectares (250 squre miles). The same river was found to have reached nitrate-nitrogen concentration as high as 20.6 mg/l compared to an acceptable limit of 10 mg/1 which is the threshold limits for the onset of methemoglobinemia in infants. Merbok River was also found to have exceeded this limits in 1978.

More rivers turned acidic in 1979 compared to 1978 due to pollution. In the case of the Benut River however the water was found to be naturally acidic. This could also apply somewhat to the Benut River which in addition also received palm oil wastes. Only the Prai and Klang Rivers flowing through the most developed areas in Malaysia were found to have reached pH values exceeding 9.0 indicating alkaline conditions attributable to a whole mix of industrial and domestic discharges.

In summary, the above analysis presents a disquieting picture of trends in water quality. There is, however, a good reason to expect a turn for the better in the coming years as the Environmental Quality (Sewage and Industrial Effluent) Regulations gain widespread compliance. Given the accelerated tempo of development, a matching improvement in silt-load might not well be achieved, indeed could even worsen in the absence of effective mitigating measures.

As regards the presence of heavy metals biocides, data available is as yet scanty to pass considered judgement but could well continue to give cause for concern.

The objectives of the air monitoring and surveillance programme are as follows:-

* To characterise existing ambient air quality

* To identify long term trends in ambient air quality

* To evaluate the effectiveness of air pollution control measures.

* To provide basic data for evaluating the effects of development projects within a certain area.

Two types of monitoring stations, namely long term and short term, are established. Long term stations serve to identify overall air quality regional and national trends. Short term stations are set up where specific information on air quality is not provided by the long term stations eg. air pollution due to a polluting source or a cluster of polluting sources. Long term stations are permanent stations located quite far apart from one another while short term stations are temporary station sited at close proximity to a polluting source.

The major pollutants measured under the air quality monitoring and surveillance programme include suspended particulates (also smoke and dust), sulphur dioxide, carbon monoxide, nitrogen oxides, hydrocarbons, ozone and lead.

The air monitoring programme started in 1977 when a total of nine temporary station were set up for short periods in the Batu Caves quarry area and in the vivinity of a cement plant in Rawang to measure suspended particulate levels. Measurements were carried out with the help of two high volume samplers.

In January 1978, four long term stations comprising two High Volume Samplers (HVS) and two Three Gas Samplers (TGS) were set up at two sites under the WHO/UNEP Global Environmental

Monitoring System Programme (GEMS). Each site was equipped with one HVS and one TGS, the latter being used to measure sulphur dioxide (SO2) level. One site was located within an industrial area while the other in a residential area both in Petaling Jaya.

Beginning from April 1978 a number of temporary stations were set up to measure the total acidity using two Eight Port Samplers (EPS). Later that year, fourteen Dust Deposition Gauge (DDG) stations and three Huey Sulphation Plate (HSP) stations were set up to measure dust fallout and sulphur dioxide levels respectively. By the end of the year, there were a total of twenty monitoring stations located in sixteen sites mostly within the Klang Valley. For the first time a number of filter samples from HVS stations were analysed for lead content.

Throughout 1979, the national air quality network was expanded to cover all States in Malaysia except Perlis, Malacca and Sabah. By the year end, there was a network of 147 stations representing a 7-fold increase in the number of monitoring stations. These comprised 78 DDG stations, 49 HSP stations, 6 EPS stations, 12HVS stations and 2 TGS stations. Table X gives the distribution by State of the monitoring stations. Table XI shows the types of monitoring stations and sampling frequency. A total of 1600 air quality samples were collected and analysed in 1979. Of these 849 samples were analysed by the Chemistry Department and some 751 samples were analysed by the Environment Division. Table XII gives the break down by types of samples collected.

The monitoring result indicated that the total suspended particulate (TSP) levels (annual mean) in a typical residential area (Damansara Utama) was 79 ug/m3 with a maximum level of 182 ug/m3 and a minimum level of 35 ug/m3. On the other hand, the TSP levels (annual mean) over three industrial areas was 158 ug/m3 with a range of 67 - /498 ug/m3.

Overall the TSP levels recorded in industrial areas were double those at residential areas. The Malaysian Environmental Quality Standards Committee (MEQSC) had proposed a 24 - hour standard of 100 ug/m for industrial areas and 50 ug/m for non-industrial areas in respect of TSP. Results indicate that on average, the TSP levels at both industrial and residential areas exceeded the respective proposed standards.

Over the residential area, the deposited dust (DD) level (annual mean) was 206 mg/m2/day with a range of 47 - 476 mg/m2/day. The one month standard proposed by MEQSC for DD level was 130 mg/m2/day. In the case of the industrial area (in Petaling Jaya), the DD level (annual mean) was 238 mg/m2/day with a range of 65 - 473 mg/m2/day. These values were fairly close to those obtained from the residential area with most readings below the DD standard of 392 mg/m2/day for industrial areas was 158 ug/m3 with a range of 67 — 498 ug/m3.

Sulphur dioxide (SO2) levels in the industrial areas were still low. Measurements conducted in six industrial areas throughout the country recorded SO levels of less than 100 ug/m3. One or two stations near major fuel combustion sources registered levels ranging between 100 - 170 ug/m3. For a residential area (Damansara Utama) the sulphur dioxide level was below 5 ug/m3. The SO2 standard for ambient air proposed by MEQSC was 200 ug/m3 for an industrial zone and 125 ug/m3 for non-industrial zone.

One of the major pollution problems in Malaysia is quarry dust. Large-quantities of rock dust are generated during blasting and crushing operations.

Three dust gauges set up around the Batu Caves quarries during the months of October and November indicated very high levels of dust ranging from 1500 - 2550 mg/m3/day. More than half of the collected dust consisted of undissolved matter. These values are well in excess of the one month standard of 392 mg/m2/day for an industrial area with complex sources proposed by MEQSC.

Dust monitoring conducted at the Ampang Quarry area at two different sites recorded 300 mg/m^2/day and 800 mg/m^2/day of dust load.

Investigation of Complaints

Press reports and letters of complaint directed to the Division of Environment pertaining to Malaysia's inland waters can serve as an indicator of the degree of public awareness and sensitivity to pollution in a particular river or other inland waters. This view may be considered somewhat simplistic in that it does not take into account the socio-cultural and other factors and which impinge on the awareness of and sensitivity to pollution and the scope for articulation of the grievances of people in adversely affected areas. Complaints through the press or in writting have been a valuable source of feedback for assessement of the effectiveness of pollution control strategy and other measures adopted under it.

An analysis of the complaints channelled to or received by the Environment Division since its inception in 1975, shows palm oil mills as the major cause of complaints and the largest agro-industrial source of pollution accounting for 30% of the total number of complaints.

Yet another major target of complaints is the rubber processing industry which accounts for 24% of the total number of complaints. This in turn is followed by complaints in respect of other industries totalling 9%. Complaints were also directed over piggery wastes (8%), sugar mills (2%) and domestic sewage (6%). Breakdown is provided in Fig. 3.

In 1979, there were 55 water pollution incidents in Peninsular Malaysia. More than 50% of the complaints were in respect of agro-based industries, namely palm oil mills (30%) and rubber processing factories (24%). 10% were due to mining activities and siltations; 8%, pig wastes; 8% industrial wastes; and sewage accounted for 6%. Of the 55 incidents, 42% was related to domestic water supply, 20% effected fishery and 14% was in respect of irrigation. Breakdown is given in Fig. 4.

The number of air pollution complaints (including noise) received during 1979 totalled 176. Most of these were reported by members of the public including individuals and groups of residents. Some of them came from community leaders in the affected areas and others through press reports. Individual members of the public either write or telephone the Environment Division, while complaints from groups of residents are in writing.

The complaints received could be classified according to the nature of pollutant (smoke, dust etc.) and the type of industrial source causing it. About 36% of the complaints received were attributed to dust; 21%, smoke; 12%, noise; 12%, odour; 1%, gaseous pollutants; and the balance of 18% not falling into any of the above categories. Over 17% of the complaints were caused by the operation of timberbased industries such as sawmills and plywood factories; 6%, quarry works; 5%, rubber factories; 4%, fish processing factories; 3% rice mills, engineering works; 3%, iron and steel works; 2%, cement and concrete works; and 1% chemical works. The remaining 56% of the complaints came from other industries including food on account of drinks and beverages, textiles and electronics etc.

A breakdown of the 1979 complaints according to the nature of the pollutants and the type of industries giving rise to the complaints is given in Table XIII and XIV.

Research into Effluent Treatment Technology

Following the enforcement of the palm oil mill and rubber factory effluent control regulations, the tempo of research on effluent treatment technology has been stepped up significantly with the popular methods being disposal onto land as fertilizer and oxidation pond system.

In addition to its enforcement responsibilities, Environment Division has also been involved in a coordinating and catalytic role in promoting the development of treatment technology. In an effort to stimulate research to achieve reduction in B.O.D. level well beyond that currently attainable, the Environment Division has involved itself in cooperative endeavours with other organisation, both locally and abroad. Domestically a pilot scale project initiated by the Chemistry Department with support facilities by FELDA at Trolak (Perak) is a case in point. On a wider scale, a research study funded by the Canada-based International Development Research Centre (IDRC) with consultancy services provided by the Asian Institute of Technology (AIT) Bangkok and support facilities locally by the Chemistry Department, FELDA and the Environment Division was initiated.

Research up to the time of reporting has indicated that the oxidation pond system with a detention time of 80 to 120 days for the anaerobic unit could bring down the B.O.D. level to 2000 ppm.

Research on the treatment of rubber factory effluents was carried out by the Rubber Research Institute of Malaysia (RRIM) with support facilities provided by the rubber industry. Work was also initiated on development of treatment technology for piggery waste. Involved in this project were the Standards and Industrial Research Institute of Malaysia (SIRIM), the Department of Environmental Studies of Universiti Pertanian Malaysia (UPM), the Department of Veterinary Services Malaysia, and the State Government of Malacca.

Marine Pollution Control Strategy

The threat to the marine environment in Malaysia is pervasive as it comes from abroad and from within. It involves pollution from external sources brought into Malaysian waters by way of tankers, cargo ships, wind, current and drift and it also involves pollution from internal sources arising from Malaysia's development activities.

The customary pollution from ships rank high among other sources in terms of complexities, as it is not an easy subject to control as in the case of land-based sources which ordinarily fall within national jurisdiction. Due to its geographical location, the Straits of Malacca is vulnerable to oil pollution. The Straits of Malacca has in recent times not only become one of the busiest seaways but is also reputed to have one of the highest accident rates.

In dealing with problem, the Government has devised a strategy comprising the following activities:

* National Contingency Plan for the Mitigation and Control of Oil Spills.
* Control of pollution from sea-based sources.
* Control of pollution from land-based sources.
* Monitoring and surveillance.

In the light of the above strategy, the long term objective is to develop a comprehensive approach to the preservation of the marine environment and the prevention and control of marine pollution.

(i) **The National Contingency Plan**

Priority was given to the formulation and implementation of the National Contingency Plan for the Mitigation and Control of Oil Spills in the Straits of Malacca for reasons already explained.

The Plan was formulated by the Environment Division through an inter-agency planning group and was approved by the Cabinet on 23rd. June, 1976 with a directive for implementation in conjunction with the Marine Department.

The Plan is geared to promote a mechanism for co-ordinating Government's response capability for effective recovery and containment of oil spills with minimum environmental impact. As such the plan promotes co-ordination and direction of Federal, State and even local response systems as well as the private sector capability to handle oil pollution incidents.

In essence, the Plan hinges on four basic principles which apply in any oil spill incident:-

* Limit the size of the spill;

* Contain the spill;

* Recover the oil wherever possible; and

* Minimise environmental damage.

Under the Plan, three operational centres will be established namely at the Port of Penang, Port Klang and Port of Johore and each will have an area co-ordinator drawn from the Marine Department which is also the leading agency for clean-up operations.

The National Plan will be invoked in cases of both minor and major oil spills. In case of minor spills, the nearest co-ordinator undertakes early corrective measures to organise the clean-up operation. However, when the spill appears to be assuming major proportions, resources from all marine related agencies including the Royal Malaysian Navy (TLDM) will be deployed and directed by the National Oil Spill Control committee under the aegis of the Environment Division. The Plan entails an efficient telecommuniacation system to provide the link not only between the stricken vessel and the Harbour Master but also among the relevant Government agencies.

The Plan is to be regarded as the basic framework for a co-ordinated efforts in clean-up of oil spills. It needs to be augmented from time to time as the need arises, with the support of users of the Straits of Malacca.

Apart from the Contingency Plan, the Government has given consideration to develop a scheme for enhancing navigational safety in the Straits of Malacca. To this end, agreement has been reached in principal among the Government of Indonesia, Malaysia and Singapore on Traffic Separation Scheme for the Straits of Malacca approved by International Maritime Consultative Organisation of IMCI (now International Maritime Organisation or IMO)

(ii) **Oil Spills**

During the year, a total of 9 oil spills were reported and clean-up action was undertaken by the Environment Division together with the Marine Department.

The amount of oil spilled ranged from 10 to 50 tons. Damage to property, plants, crops and animal life resulted in one case and compensation claims amounted to about $23,000(Malaysian).

(iii) **Control of Pollution from Sea-based Sources**

Regulation for the control of oil discharges and disposal of wastes from ships and the dumping of wastes into the marine environment, in conformity with the Environment Quality Act 1974 and the applicable international conventions are in the process of being drafted.

(iv) **Control of Pollution from Land-Based Sources**

Discharges from land-based sources into the marine environment are controlled through the various Regulations formulated under the Environmental Quality Act, 1974.

(v) **Monitoring and Surveillance**

The Environment Division has organised baseline studies and monitoring programmes on coastal areas which for this purpose are divided into 4 control regions. During 1979 about 220 sampling stations and 88 beach tar stations were established. Samples were taken for physical, chemical and biological analysis. These preliminary baseline studies will help to establish permanent monitoring stations at which samples will be taken at a suitable frequency.

The Division of Environment also participated in the IOC/IGOSS/WMO/UNER pilot project for marine pollution (petroleum) monitoring which was launched on 15th. January, 1979.The project aims at obtaining a global picture of the extent of oil pollution on the marine environment and involves the determination of hydrocarbons, visible oil, dispersants and tar on beaches.

It is expected that apart from the baseline studies undertaken by the Environment Division, more scientific research on specific problem-oriented areas with emphasis on marine ecosystem will be generated. To underpin these activities, the Ministry of Science,Technology and Environment has set up the Marine Pollution Sub-Committee under the aegis of the National Scientific Development and Research Council (MPKSN) to review and co-ordinate research activities on the marine environment.

Noise Pollution Control

(i) **Noise Control Strategy**

Noise or unwanted sound is becoming increasingly recognised as an unjustified intrusion into the even tenor of human well-being. A pointer to public attitude on noise pollution is the rising trend indeed cresendo of complaints received by the Environment Division over the past three and a half years. These were 7 cases of complaints in 1976, 17 in 1977, 19 in 1978 and not less than 27 in 1979.

Fully sensitised to the gravity of the noise problems, both in and around urban conurbations, the Environment Division has been actively looking into ways and means for its control and abatement.

Noise levels in the environment can be reduced or limited by emission control. Environmental noise control can be implemented through the use of environmental noise standards. These standards can be met by control at source by limiting the number of sources, by the physical separation of noise sources well away from people, and by changes in work methods and systems. These sources include activities from transportation (motor vehicle, aircraft and express boats) industry and construction. The Environmental Quality Act. 1974 contains enabling provisions for the making of regulations on noise control.

Legislation for zoning of different land uses such as industrial, commercial, residential and agricultural represents yet another complementary approach on noise control. Noise limits could be specified for zones and only premises and activities in conformity would be permitted with all others under surveillance through some form of lisencing.

Apart from legislations to regulate noise pollution, through the judicious exercise of the power to grant planning approval, the problems can be tackled right from the drawing-board stage. This could well be achieved through the Environmental Impact Assessment (EIA) process where noise is among the major factors to be considered.

The effective control of environmental noise requires the active involvement of all levels of government. Given that constitutionally land administration and land use are within the purviewof the State Government, guidelines could be prepared and recommended administratively for adoption in the local context. A case in point is noise from aircraft in the vicinity of busy airports.

(ii) **Noise Control Programme**

The Environment Division set up a national committee in July 1979 to examine the need for legislation on noise and to draw up the necessary regulations. The committee which comparises representatives from universities as well as from various Government agencies such as the Factories and Machinery Department, Highway Planning Unit, Standards & Industrial Research Institute of Malaysia (SIRIM), the Ministry of Health, the Road Transport Department, Radio and Television Malaysia, the Police and the Civil Aviation Department had its first meeting towards the end of July 1979.

This committee in turn formed three working groups as follows to formulate draft guidelines/regulations for the control of noise from specific sources:-

* Aircraft noise

* Industrial noise

* Motor vehicle noise

Two major noise surveys were conducted in 1979. In early May, a survey was carried our in Cukai (Trengganu) at the request of the Highway Planning Unit of the Ministry of Works and Public Utilities. Measurements of noise levels were recorded to provide data for the design of a road by-pass. In July, the Environment Division jointly with University Teknologi Malaysia (UTM) carried out a comprehensive noise survey in Kuala Lumpur to determine the noise levels in typical land-use areas such as residential, commercial, industrial, institutional and recreational. This survey is to provide additional baseline data for the future planning of Kuala Lumpur including the need for specific noise control legislation.

Apart from the run-of-the-mill complaints on noise pollution, the Environment Division also looked into complaints regarding sonic booms triggered off by supersonic Concorde flights. The sonic boom is a shock wave system generated by an aircraft when flying at a speed greater than that of sound. In response to these complaints, a programme was drawn up to monitor the boom and this included:-

* Monitoring of booms by officers of the Environment Division.

* Personal interviews (using pre-prepared questionnaires) with residents including fishermen in coastal areas in Negeri Sembilan and Johore; and

* Investigation of reports from members of the public sensitised to sonic booms.

* Analysis of fish landings with the co-operation of the Fisheries Department.

* Physical measurements of the sonic boom once the necessary equipment was acquired.

In the event the results of monitoring were inconclusive mainly as duration of monitoring was rather short and any possible adverse effects on the spawning of fish and other aquatic life would by its very nature be a long term one.

ENVIRONMENTAL PLANNING

Environmental planning refers to a whole spectrum of planning activities bearing on the protection and enhancement of environmental quality. In this respect, environmental planning is an essential tool for effective environmental management which focuses on the control and prevention of pollution and the protection and enchancement of environmental quality.

The environment is not to be considered as antithesis of development rather as an additional dimension to help enhance the hoped-for benefits from development and in the process strengthen the prospects for smooth implementation while also generating alternative options for the decision-makers.

In this sense, environmental planning helps to ensure that both long and short term prospects are harmonised while at the same time enabling conscious choices to be made based on full knowledge of the possible impacts on society.

Environmental planning calls for the integration of environmental factors into land use planning and zoning, the use of environmental impact assessment procedures and the integration of environmental dimension into resource planning in the interest of environmentally sound and sustained developments.

GUIDELINES FOR THE SITING AND ZONING OF INDUSTRIES

Most of Malaysia's environmental problems are attributable to haphazard location of industries and incompatible siting of industrial projects cheek of jowl with residential areas. They are inherited from an era when little or no thought was given to harmonious existence with nature. The usefulness of zoning is self-evident. To be truly effective, however, zoning must be comprehensive in scope and enforced strictly. In the Malaysian context in addition it calls for co-ordination between Federal and State Agencies.

The purpose of environmental planning guidelines is to provide guidance to planning and development agencies directly to assist them in taking environment control measures in the planning and implementation of their development programmes. In particular, the guidelines on the siting and zoning of industries provide guidance to planners on the location of industrial estates and individual industries within them to ensure that adequate buffer distances are provided between industrial establishments and residential areas. It also provides guidance to the State Authorities and local authorities responsible for the planning of residential areas vis-a-vis industrial areas.

The strategy adopted in preparing the guidelines involves the classification of industries according to their potential to generate air, water, land and noise pollution. Four groups of industries namely Light, General 'A', General 'B' and Special Industries were selected and for each group of industries, buffer distances between them and residential areas were recommended.

For Light Industries, which are those generally sited in industrial lots near housing estates and which, by nature of their processes, should not create air, water, land dan noise pollution and should not generate large quantities of solid wastes, buffer distances of between 200 to 500 meters were recommended.

General Industries Group 'A' are industries generally sited in industrial zones or estates next to built up areas. They must not produce toxic and dangerous materials including toxic heavy metals that are likely to be discharged as wastes into watercourse used for domestic water supply. Sufficient buffer distance of at least between 500 - 1000 meters should be provided between these industries and the residential areas in order to cushion any minor pollution effects from general activities within the factories.

General Industries Group 'B' are those that may produce pollution in the form of dusts, odour, fumes and noise and may generate considerable quantities of solid wastes and require treatment for liquid wastes. These industries may generally be sited in industrial estates separated by buffer distance of between 1000 and upwards of 1500 meters in relation to residential areas.

Special Industries on the other hand must be located in specially designated industrial areas with sufficient buffer distances of at least between 1500 to 3000 meters. For some 'dirty' and/or potentially hazardous industries, such as pulp and paper mills, integrated steel mills, power station, refineries, petrochemical plants, primary aluminium works, cement works, acid manufacturing works, quarry works etc, buffer distance greater than 3000 meters should be considered on a case by case basis.

The buffer zones between the industries and residential areas as well as between individual industrial areas/estates can be developed into green belts, agricultural land, or developed into commercial areas, parks or kept as open spaces or recreational areas namely, put to land-uses not incompatible with their main function.

It has been recommended that maximum buffer distances should be used for the planning of new industrial estates. Where conditions are favourable for dispersal of pollutants, buffer distances shorter than the maximum may be used. Existing industrial estates are not expected to conform to the recommended buffer distances especially where the industries have been emplaced in the industrial lots and the residential areas adjoining the industrial estate already in place. However, where an adjustment can still be made, e.g. by selecting the types of industries to be emplaced on the lots or by amending the layout plan for the industrial estate in relation to the residential areas and vice-versa, it should be done wherever possible.

ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE AND GUIDELINES

The Government is fully sensitised to the growing environmental problems in the wake of the accelerated tempo of development activities since Merdeka in a determined bid to bring about a better quality of life for all Malaysians.

In the Third Malaysian Plan, (1976-80) it was underscored that environmental improvement and protection would received the full attention of the Government in the planning and implementation of programmes. Furthermore there was recongnition that it was vital to keep the objectives of development and environmental conservation in balance so that the benefits of development are not negated by environmental damage and disruption.

To this end, Government stated that in the evalution of all relevant projects, an assessment of the overall impact of these projects on the environment would be undertaken and that Ministries and Departments as well as the private sector would be required, before embarking on the implementation of such projects, to identify all likely environmental effects as well as the means to overcome them.

In March 1977, the Environment Division within the Ministry of Science, Technology and Environment set up an ad hoc penal consisting of 18 Ministries and Agencies to advise on the formulation of an environmental impact assessment procedure.

A proposed Environmental Impact Assessment Procedure formulated by the ad hoc panel was presented to the National Development Planning Committee (NDPC) which at a meeting in April 1978 approved in principle the proposed Procedure and its implementation plan and directed action to finalise

the proposed Procedure in the light of submission to the Cabinet Committee on Investment for a final decision.

In January 1979, the services of Mr. John O'Brien, a New Zealand consultant were made available under Colombo Plan arrangement by the Government of New Zealand to assist Malaysia in developing further the procedure and guidelines. The consultant during his one year assignment helped to prepare a handbook known as Environmental Impact Assessment Handbook - Procedure and Guidelines which has substantially simplified the proposed procedure. This has since received the endorsement in principal of the Environment Quality Council.

The primary purpose of the environmental impact assessment is to show up the likely environmental consequences of proposed projects thus alerting the project proponents, decision-makers and the general public so that actions to mitigate these may be put in hand. An important consequence is to help build into the decision-making process a continuing conciousness of environmental considerations and to generate alternative options so that in the final analysis, more rational dicision-making results.

The Procedure provides for:-

* Preliminary assessment of selected projects

* Detailed assessment of those projects for which significant residual environmental impacts have been indentified in the preliminary assessment

* Review of detailed assessment reports

Preliminary assessment could be carried out corresponding in time to the prefeasibility study phase of the project with the detailed assessment if justified, undertaken during the feasibility study phase of the project. The review of detailed assessment report should be completed within a period of two months and there should ordinarily be no extra burden on the project proponents as this expected to be conducted simultaneously with evalution of the feasibility report.

The review is entrusted to a committee or panel comprising 13 members with the Director-General of Environmental Quality as chairman. The remaining members of the Panel are drawn from specialists in various environment-relate fields such as ecology, natural resources, human health, social and cultural affairs as well as representatives of various key professions and related Government agencies.

The types of environmental impacts generally considered in EIA are environmental pollution, mismanagement of resources, undue depletion/degradation of natural resources, loss of habitat, aesthetic pollution and general impairment of the quality of life.

EIA will draw the attention of project planners not only to the requirements of the Environmental Quality Act, 1974 and Regulations thereunder, but also to the requirements of other environment-related legislations, codes of practice and guidelines.

A form of public participation through established representative community-based organisations is provided for under the proposed Procedure. If necessary, seminars and workshops at strategic location will be held to help focus on the issues involved.

The Procedure is envisaged to apply to all development works and projects initiated within the public and private sectors. These comprise Federal and State Government projects, private sector projects

financed wholly or partly by the Federal of State Government and private sector projects requiring a licence, permit or approval from any Federal or State agency.

The Procedure will be phased in during the Fourth Malaysia Plan period and envisaged to be implemented fully in the Fifth Malaysia Plan period. Initially only a limited number of projects will be subjected to the Procedure. With increase in staff capability and experience, more and more projects will be made subject to the Procedure.

GUIDELINES FOR PREVENTION AND CONTROL OF SOIL EROSION AND SILTATION

In Malaysia, the occurrence of widespread soil erosion is attributable to logging activites, mining and clear-felling of forest for agriculture, road construction, housing and general infrastructure development activities in the urban and rural areas, and also the practice of shifting cultivation, even though this is a practice in certain areas only.

Even though the occurrence and effects of soil erosion and siltation have long been observed throughout the country, our efforts to overcome or allegiate the problem are not equal to the magnitude of the problem. In the absence of vigorous remedial and preventive measures it could well seriously impair our plans for accelerated socio-economic development. One manifestation of this problem is the high sediment load in many of our rivers. In addition it exacts a heavy toll on fisheries, contributes to flooding and loss of top soil resulting in decreased fertility of land. Past records and experience have shown that siltation can bring about a reduction in stream capacity causing channel overflows thus resulting in floods. Extensive flood prevention projects, and example being the Klang River flood mitigation scheme have drained budgetary resources over a number of years that could well have been devoted to other uses.

Soil erosion and landslips resulting from uncontrolled mining activities had caused the township of Kuala Kubu to be burried under silt. Costly engineering works had to be carried out to save the townships of Serendah and Bentong from suffering a similar fate. This is also the problem faced by Teluk Anson (Now Teluk Intan) and Kampong Kalun Bidai, the latter situated at the mounth of the Kinta Rivers. The effects of siltation of water supply has also reached serious proportions. Several such cases have been referred to the Environment Division by the Public Works Department and Drainage and Irrigation Department. Soil erosion and siltation also affect the useful life of a hydroelectric dam. In the Cameron Highlands, for example, damage and increased maintenance and operating cost to hydroelectric generation has been reported.

In addition, housing development, road construction and logging activities have also contributed to high sediment load in a number of our rivers in the country such as Perak River and Klang River.

Recognising the gravity of the problem, the Environment Division organised a series of meetings between 1977 and 1979 bringing together experts from various government agencies and institutions of higher learning in the country to inter alia, indentify the problem areas, review the existing laws. regulations and practices on soil conservation and land use, and to recommend guidelines and specific measures for the prevention and control of soil erosion and siltation. The experts were of the opinion that existing provisions under the various legislations relating to soil conservation could be enforced effectively if there are specific guidelines to help development agencies involved in planning, design and implementation of development projects that are likely to give rise to soil erosion or siltation.

The guidelines, after their formulation, were presented to the meeting of the Federal — State Liaison Committee held in July 1979 in Ipoh, Perak. The meeting took note of these guidelines and decided that

they be implemented in respect of development projects in housing, road construction, logging agriculture, mining and quarrying.

The guidelines contain practical and well-defined specifications for preventive measures to control erosion and siltation through silt traps, flood spillways, retention and other appropriate structures. It specifies the manner in which earthworks should be carried out such as the maximum permissible gradient of cut of slope, duration of earthworks and other activities to cutting, levelling, filling and the like prevent soil erosion.

Specification for construction of roads during logging operations and provision of reserves of vegetative belt on both sides of natural waterways during forest clearing for agriculture is also mentioned. Other conservation measures include terracing, bunding grass-cover and run-off ponds.

In the case of mining and quarrying, the permissible levels for suspended solid matter to be discharged into water courses are specified. Further the guidelines prohibit any discharge of effluent from a dumping area other than by means appropriate authorities.

It is intended that the guidelines should be presented to the National Land Council for approval with a view to subsequent adoption by State Governments.

GUIDELINES FOR THE DISPOSAL OF SOLID WASTES ON LAND

In Malaysia, the disposal of solid wastes by controlled tipping on sanitary landfills would continue to be the most favoured method for years to come. In accordance with the strategy of non-statutory means of control, the Environment Division under the Ministry of Science, Technology and Environment has prepared the guidelines entitled "Recommended Code of Practice for the Disposal of Solid Waste on Land" as an essential pre-requisite to proper solid waste management. The guidelines are intended to help municipalities and other local authorities in their efforts towards satisfactory waste disposal practices.

The objectives of the guidelines are to meet the need for the selection environmentally acceptable landfill disposal sites and for their proper development and management on sound engineering principles so as to bring about improvements in disposal practices at relatively low cost, as well as to reclaim land for useful future use. It details recommended procedures which should be adopted for the safe and hygienic disposal of solid wastes on land by the method of controlled tipping (sanitary landfill). Since all sections of the Code will not be applicable in each and every case, the recommended practice may need to be adopted, modified and operated taking into account local conditions and circumstances.

ENVIRONMENTAL EDUCATION, TRAINING AND INFORMATION

ENVIRONMENTAL EDUCATION

The basic causes of our environmental troubles are complex and deeply embedded. In recent times, there has been a tendency to put a premium on convenience and comfort of modern housing, transportation, communication and recreation paying little or no heed to Man operating in harmony with his natural environment. Vast amounts of resources and energy have been consumed without understanding how our way of life may choke off open space, forests, clean air and clean water. Such deep-rooted causes cannot be corrected overnight nor simply legislated away.

At this point of time,in practice, it is difficult, if not impossible, to make inroads into the traditional methodology and approach of project evaluation adopted by development planners and decision-makers. More fundamentally, our failure to preceive the environment as a totality and to understand and recognise the fundamental interdependence of all its parts including Man himself, the lack of systematic studies to demostrate clearly in a comprehensive and measurable manner the assessment of benefits accruing from environmental measures and the constraints imposed by competing policy priorities and alternative claims on resources have led to the expediency of all too often ignoring the environmental dimension in resource management. The developing countries in particular need some assurance, and perhaps conclusive proof, that environmental management, far from being a handicap, can be actually a plus in helping to ensure sound resource management and hence boost the prospects of successful plan implementations. It should, be evident that the environmental protection approach is a resource management concept while economic development as generally pursued in the past is a resource use concept and the underlying objective of integrating the environmental dimension into development is to harness resource management in the interests of sustained development.

Generally speaking the optimal development process should be one which sets, as one of its main objectives, the satisfaction by present and future generations of their basic requirements without transgreesing the outer limits of biospheric tolerance of Man's activities. There is a delicate balance involved which demands careful consideration. For such rational management to be achieved, methods must be developed to deal more adequately with the full social and environmental, not just the economic, costs and benefits of a whole array of development-related activities. It is necessary to find techniques for quantifying the impact of development projects on environment, both favourable and unfavourable, in short, environmental indicators, so that the society can choose among projects with a fuller knowledge of social costs and benefits. All too often the social costs of various projects have been played down, if not altogether ignored, in the initial project appraisal so that society's awareness of many of the environmental degradation and disruptions came at too late a stage to influence the project already under way or completed. It is important that the social costs should be ascertained as far as possible before embarking on development projects, so that society can carefully consider whether these costs are still worthwhile weighing the other economic and social benefits of the projects, whether some of the costs could and should be minimised in the design of the project, and whether some of the costs could not be forestalled or mitigated through adoption of appropriate technology.

What is needed is, therefore, new knowledge, newperceptions, new attitudes and values — and these must extend to all levels of government and throughout the private sector as well: to industry; to the professions; to each individual citizen in his work place and in his home. It calls for nothing less than a basic reform in the way our society looks at problems and makes decisions.

In this respect the education system has a key role to play. Education utilising the findings of science and technology should play a catalytic role in promoting awareness and a better understanding of

environmental concerns. It must foster positive patterns of conduct towards the environment and be an influence for the better thus bringing about rational use of natural resources.

Professional environmental managers must be trained to deal with pollution, land use planning and all the other technical requirements of a quality environment.

The immediate task ahead is to put across this new thinking based on a clearer understanding of the inter-relationships among population, resources, development and environment. Armed with this knowledge and a sense of alertness, the people will be better prepared to cope with the less wholesome aspects of changes they are going through in the name of development. In the process they will develop a healthy environmental conscience and the capability to deal with the more basic environmental problems on their own.

The Environment Division embarked on a programe of non-formal environmental education mainly through the mass media, seminars and its quaterly publication "SEKITAR" (launched in June 1979 as the official organ of the Environment Division) of which three inssues were produced in the course of 1979.

In addition, three national seminars were organised as follows:-

* National Seminar for Environmental Co-ordinators in the Public Sector (3-5 April, 1979).

* National Seminar on the Protection of the Marine Environment and Related Ecosystems (21-23 June, 1979).

* National Air Quality Management Training Seminar (15-26 October, 1979).

In conjunction with the observance in Malaysia of 1979 as the "International Year of the Child", the Environment Division participated in the Sub-Committee for the Environment and Recreation convered by the Ministry of Welfare Services. On the rationale that schoolchildren should rightly be made aware of the environmental problems facing the country in order to enable them to apply their minds to actions geared towards a cleaner and healthier environment for all, special attention was paid to activities involving them directly. To this end, the winning entry in an art competition with the environment as the theme was reproduced on posters and disrtibuted to schools. In addition, a booklet on "Our Environment and Pollution" for secondary schools was printed and distributed in co-operation with the Ministry of Welfare Services and the Ministry of Education.

During the observance of the World Environment Day in June, several programmes geared to bring about environment awareness among people were organised. These included the following:

* Message by the Honorable Minister of Science, Technology and Environment on radio and television.

* Message by the Honourable Minister to secondary schools.

* Poster related to the current World Environment Day theme for distribution to all Government agencies,universities and libraries.

* Postal franking at major post offices.

* Special Documentary on the environment in conjunction with Radio and Television Malaysia (RTM)

* Pedestrian malls in selected sites in several urban centres throughout the country.

* Tree-planting campaigns.

* Seminars.

Papers were presented by officers of the Environment Division at several seminars, both locally and abroad, and talks given to citizens groups, and at universities, other institutions of higher learning and schools quite apart from a number of Press statements on a whole gamut of environment-related matters.

TRAINING

Training for staff of the Environment Division was provided mainly through attendance at international and national workshops as well as courses. In addition, lectures were conducted by the senior members of the staff of the Environment Division as well as by quest lecturers from the local universities and other visiting personagers from environment-related organisations such as UNEP, WHO and consultant firms. During 1979, 3 officers were norminated to attend courses overseas, two at the Asian Institute of Technology (AIT) Bangkok and one at the International Institute of Hydraulic and Environmental Engineering, Delft, the Netherlands.

Locally academic training in environmental sciences was provided by Universiti Pertanian Malaysia (UPM) leading to B.Sc. (Env. Studies). This is a professional qualification and is geared to meet the manpower needs of environmental control and related activties. The course is structured to produce environmental managers and planners for national development and environmentally related areas of resource management.

A full meetings, workshops and seminars participated in by staff members is given as Appendix 'B'

ROLE OF NON-GOVERNMENTAL ORGANISATION

Mention must be made of the significant role played by non-governmental organisations (NGO's) in helping to develop increased public awareness in environmental issues and in articulating grievances. Through this role they able to complement governmental efforts in environmental education and also produce valuable feedback. To this end, the Environment Division has endeavoured to maintain and develop contacts with citizens groups in Malaysia.

INFORMATION

For meaningful choice in terms of environmentally sound devlopment strategies, there must have been developed first workable cost-effective technologies and techniques which are available to the decision-maker. Crucial to rational and informed decision-making is reliable, relevant and up-to-date information. This holds the key to sound environmental management which in essence is largely a matter of making the best of nature's resources to meet man's basic and other felt needs without making inroads into and undermining the ecological base on which sustained development depends. The environment,

therefore, is not to be viewed in isolation from other factors that influence the development process just as on the other side of the ledger true development cannot take place in total disregard to the environment. It must instead be looked at and dealt with in relation to population-its dynamics, its pattern of distribution and how gainfully employed-natural resource endowment and their avaibility for use and the development and application of technologies as major interacting elements within the larger framework of development. In the ultimate analysis it is not by any of these elements, but in the web of positive interaction among them that the goal of sound development will be achieved. Rational decision-making with a view to a better environment for all cannot possibly be realised in a climate of near ecological illiteracy. The purpose of any environmental information system is to furnish its users with the tools needed for arriving at rational choices in the quest for harmonious and sustainable development with population habitat and resources in balance. All too often, however, government planners, decision-makers, and even scientists from developing and industrialised countries alike, are hampered by the lack of adequate information in the face of rapidly multiplying environmental problems. Choices are often based on inadequate information and insufficient understanding resulting all too often in unsuccessful development efforts sometimes with desastrous effects on man and his environment.

International Environmental Information Systems

The rapid emergence and growth of environmental issues, coupled with their diversity, outpaces the ability of any nation, however rich and determined, to find the requisite solutions to environmental problems and to explore all the alternative technologies and other options open to it. A global co-operative effort through which nations may pool experience and expertise pertaining to common environmental issues is the logical solution.

In recognition of this, delegates to the 1972 United Nations (Stockholm) Conference on the Human Environment decided to establish two important information system, namely, the International Referral System now known as INFOTERRA and the International Register of Potentially Toxic Chemicals (IRPTC) as elements of the global EARTH-WATCH programme. These systems were conceived, designed and established as a mechanism through which any nation would have access to environmental information from every other nation which participates in the system. They facilitate the availability, exchange and interchange of environmental information within and between nations, and indeed, catalyse the establishment of environmental information systems within nations. The developing countries stand to benefit most from these systems not only by exchanging information with other nations at similar stages of development where solutions to common problems are also being sought but also by obtaining information from industrialised countries which may enable them to avoid some of the technological pitfalls.

INFOTERRA

INFOTERRA was established in 1977 with the following objectives:-

* To meet the need for development of national systems as well as for an international and interdisciplinary information system on environmental matters:

* To provide easy access, particularly to those developing countries, to the sources of environmental information they need;

* To ensure that the system is flexible enough for appropriate variants while retaining a common format for international use;

* To provide the education and training needed for the development and operation of the system;

* To provide environmental information support for all United Nations activities in particular the United Nations Environment Programme (UNEP)

INFOTERRA operated via a decentralised network of National Focal Point (NFP) designated by government to co-ordinate environmental information wihtin a country. Regional Points designated with intergovernmental agreement co-ordinate activities within regional groupings of countries while sectoral focal points are chosen by UNEP to concentrate on aspects of specific environmental topics internationally.

The main activities of focal points are:

* To collect, code and classify sources of environmental information and to maintain these sources in a national directory;

* To transmit to INFOTERRA records and sources which the Focal Point considers should be available to the International System;

* To hold and maintain a copy of the INFOTERRA International Directory;

* To handle information requests from users, and channel those which it cannot answer to the INFOTERRA Programme Activity Centre (PAC) in Nairobi;

* To assist in evaluation and improvements in INFOTERRA

INFOTERRA activities are financed at the global level as a project from the Fund of UNEP and at the national level by each member country. By the end of 1979, a total of 100 countries of which two-thirds are developing countries had joined INFOTERRA. Malaysia's membership in INFOTERRA is recent, dating back to July 1979 when the Environment Division was designated as the National Focal Point. Malaysia also participated in the first major network meeting in INFOTERRA partner countries since 1977 in Moscow from 1-5 October, 1979.

During 1979, the Malaysian Focal Point responded to 4 queries which were relayed to INFOTERRA PAC in Nairobi. The queries covered noise abatement, technology on dust control and treatment technology for piggery wastes.

IRPTC

The IRPTC was established in 1976 with the following objective:

* To facilitate access to existing date on the affects of chemicals on man and his environment, and thereby contribute to a more efficient use of national and international resources available for the evalution of effects of chemicals and their control;

* On the basis of information in the Register, to identify the important gaps in existing knowledge on the effects of chemicals, and call attention to the need for research to fill those gaps;

* To identify, or help identify, potential hazards from chemicals, and to improve the awareness of such hazards;

* To provide information about national, regional and global policies, regulatory measures and standards and recommendations for the control of potentially toxic chemicals;

IRPTC operated via an international network of national correspondents designated by government. As at March 1979, 96 countries had designated National Correspondents. The Environment Division was designated the Malaysian National Correspondent in August 1978. The initial tasks of a National Correspondent will be to publicise and promote IRPTC and to maintain close contact with individuals, egencies and institutions involved with control of chemicals in the country and to communicate pertinent information received from IRPTC PAC in Geneva. The responsibilities of a National Correspondent include:

* To assist the development of the query — response service by transmitting queries to the IRPTC PAC and then transmitting replies to the enquirer;

* To assist in acquiring information on new developments concerning chemicals including legislation for the control of chemicals, criteria documents and reports on chemicals, on accidents and incidents involving release of chemicals into the environment and on other information systems relevant to IRPTC;

* To Promote the use of IRPTC services in the country.

IRPTC has since collected a vast amount of information, national and international documents, monographs and dossiers on toxic effects of chemicals, national regulations and international conventions concerning control of chemicals. IRPTC also has on file information on more than 30,000 chemical listed in the Registry of Toxic Effects of Chemical Substances (RTECS) of the National Institute for Occupational Safety and Health (NIOSH)

INTERNATIONAL AND REGIONAL AFFAIRS

Malaysia continued to play an active role at the international and regional levels in a spectrum of activities pertaining to environmental management. In large measure, these activities resulted from involvement in environment-related programmes through membership of the 58-nation Governing Council of the United Nations Environment Programme (UNEP) and other specialised agencies of the United Nations. In the case of U.N.E.P., Malaysia served a second three-year-term (1978-1980) on the Governing Council.

UNITED NATIONS ENVIRONMENT PROGRAMME

The United Nations Environment Programme was established by the United Nations General Assembly in December 1972 to play a catalytic and co-ordinating role following the epochal United Nations Conference on the Human Environment held in Stockholm (Sweden in June, 1972. Its Secretariat is located in Nairobi (Kenya).

For impact, UNEP operates through programmes covering major 'activity' sectors like Health, Agriculture, Education, Industry and functional activities which fall into two broad areas, namely Environmental Assessment and Envinronmental Management. Underpinning both functions are supporting measures necessary to carry them out which include education, training, information and technical assistance.

Over the years, UNEP has commendably carved a niche for itself within the United Nations system and evolved a work programme commensurate with the resources available. In terms of priority subject areas, three are noteworthy, namely:

(1) The Global Environmental Monitoring System (GEMS)
(2) The International Referral System for Sources of Environmental Information (INFORTERRA); and
(3) The International Register of Potentially Toxic Chemicals (IRPTC).

and these activities, taken together go by the name of EARTHWATCH. 1979 saw active involvement by Malaysia in all three activities, with the Environment Division co-ordinating activities at the national level.

Cooperation and collaboration in the work programme of the World Health Organization (WHO) was facilitated by the establishment at Serdang, Selangor within the campus of Universiti Pertanian Malaysia of a Regional Centre for Promotion of Environmental Planning and Applied Science or PEPAS. This Centre also serves as the centre for UNEP/GEMS programme activities in the region.

REGIONAL AFFAIRS

In terms of involvement in environmental activities at the regional level, the focus was on the work programme developed by the Asean Experts on the Environment established under the Committee on Science and Technology (ASEAN—COST). The work programme so developed has come to be known as the Asean Sub-Regional Environment programme (ASEP) with the following as priority areas:-

* Marine Environment (East Asian Regional Seas Programme)
* Environmental Management including the Environmental Impact Assessment.
* Nature Conservation and Terrestrial Ecosystems

* Industry and Environment
* Environmental Education and Training
* Environmental Information

Malaysia hosted the Second Meeting of the Asean Experts on the Environment at Penang from 17 -20 September, 1979. This meeting reviewed the recommendations of the First Meeting of the Asean Experts on the Environment, held in Jakarta on 18-20 Dicember, 1978 and deliberated on ASEAN-UNEP co-operation as well as on ways and means of intensifying ASEAN regional co-operation in the field of environment. In doing so, it reiterated the urgency and importance of regional co-operation in the field on environment among the ASEAN countries in view of their geographical proximity to one another and the broad similarities of problems faced, actual and emerging.

It addressed itself to both urgent priorties and other priorities including the Regional Seas Programme, Environmental Impact Assessment, Industry and Environment, and wildlife and Nature Conservation. The Draft Action Plan for the East Asian Regional Seas, prepared by the Geneva - based UNEP Regional Seas programme Activity Centre was fully supported by the member countries, as it pollution. The Meeting recommended that this Draft Action Plan be further considered at the level of a separate working Group.

In pursuing the development of Environmental Impact Assessment, the meeting highlighted the need to identify, carry out and exchange representative ASEAN case studies on Environmental Impact Assessment in respect of key sectors. such as ports and harbours, mining, water resources and non-conventional energy sources (including nuclear energy). If further strongly recommended that all ASEAN industrial complementation projects be subject to detailed Environmental Impact Assessment. With regard to the programme on Industry and Environment, the meeting emphasized the need for a special programme geared to identifying specific problem areas in relation to the development of appropriate pollution control technology.

Following this meeting the Director-General of Environmental Quality, Malaysia served as the Interim Coordinator until the Third Meeting in Manila in May 1980.

In the context of regional environmental activities due mention must be made of the significant role played by the Bangkok-based Regional Office for Asia and the Pacific of UNEP under the able leadership of MR. Suriyakumaran. In this respect, assistance has aslo been forthcoming from the Office of the Regional Representative of the United Nations Development Programme in Kuala Lumpur.

A noteworthy feature of 1979 was the prominence given to environmental issues at a number of regional conferences, in particular at the 20th Session of the Asian-African Legal Consultative Committee (Soul. 19-26 February, 1979, and the XIVth Pacific Science Congress of the Pacific Sciences Association (Khabarovsk, USSR, August-September, 1979).

At the bilateral level, annual inter-governmental meetings at the Ministerial level got under way between Malaysia and Singapore. The first such meeting was held in Singapore from 1st to 3rd December, 1979 and discussed a number of environmental topics of mutual interest.

Table 1 Four Generation Sets of Effluent Standards For Palm Oil Industry (Effective Date: Beginning of July 1)

Parameters \ Year	1978	1979	1980	1981
Biochemical Oxygen Demand (BOD), 3-days, 30°: mg/1	5,000	2,000	1,000	500
Chemical Oxygen Demand (COD); mg/1	10,000	4,000	2,000	1,000
Total Solids; mg/1	4,000	2,500	2,000	1,500
Suspended Solids; mg/1	1,200	800	600	400
Oil and Grease; mg/1	150	100	75	50
Ammoniacal-Nitrogen; mg/1	25	15	15	10
Organic-Nitrogen; mg/1	200	100	75	50
pH	5.0-9.0	5.0-9.0	5.0-9.0	5.0-9.0
Temperature, °C	45	45	45	45

Table II: Three Generation Sets of Effluent Standards For SMR And Conventional Grade Factory Effluent (Effluent Data: Beginning of April 1)

Parameters \ Year	1979	1980	1981
pH	6-9	6-9	6-9
BOD at 30°C; mg/1	300	200	100(50*)
COD; mg/1	750	500	250
Total Solids; mg/1	1,000	1,000	—
Suspended Solids; mg/1	250	250	150(100*)
Total Nitrogen; mg/1	100	100	40+
Ammoniacal Nitrogen; mg/1	70	70	60+

* This additional limit is the arithmetic mean value determined on the basis of a minimum of four samples taken at least once a week for four weeks consecutively.

\+ Value on filtered sample

Table III: Standards for Latex Concentrate Factory Effluent (Effective Date: Beginning of April 1)

Parameters \ Year	1980	1981	1982	1983
pH	6-9	6-9	6-9	6-9
BOD; mg/1 (3 days at 30°C)	450	300	200	100(50*)
COD; mg/1	1,500	1,000	500	400
Total Solids; mg/1	2,500	2,000	1,000	—
Suspended Solids; mg/1	1,000	800	250	150(100*)
Total Nitrogen; mg/1	450	350	350	300
Ammoniacal Nitrogen; mg/1	350	300	300	300

* This additional limit is the arithmetic mean value determined on the basis of a minimum of four samples taken at least a week for four weeks consecutively.

TABLE IV: ACCEPTABLE LIMITS OF DISCHARGE

THIRD SCHEDULE

ENVIRONMENTAL QUALITY ACT 1974
ENVIRONMENTAL QUALITY (SEWAGE AND INDUSTRIAL EFFLUENTS) REGULATIONS 1979

[**Regulation** 8 (1), 8 (2), 8 (3)]

PARAMETER LIMITS OF EFFLUENT STANDARDS A AND B

			Standard	
			A	B
	(1)	(2)	(3)	(4)
(i)	Temperature	°C	40	40
(ii)	pH Value	—	6.0-9.0	5.5-9.0
(iii)	BOD_5 at 20°C	mg/1	20	50
(iv)	COD	mg/1	50	100
(v)	Suspended Solids	mg/1	50	100
(vi)	Mercury	mg/1	0.005	0.05
(vii)	Cadmium	mg/1	0.01	0.02
(viii)	Chromium, Hexavalent	mg/1	0.05	0.05
(ix)	Arsenic	mg/1	0.05	0.10
(x)	Cyanide	mg/1	0.05	0.10
(xi)	Lead	mg/1	0.10	0.5
(xii)	Chromium, Trivalent	mg/1	0.20	1.0
(xiii)	Copper	mg/1	0.20	1.0
(xiv)	Manganese	mg/1	0.20	1.0
(xv)	Nickel	mg/1	0.20	1.0
(xvi)	Tin	mg/1	0.20	1.0
(xvii)	Zinc	mg/1	1.0	1.0
(xviii)	Boron	mg/1	1.0	4.0
(xix)	Iron (Fe)	mg/1	1.0	5.0
(xx)	Phenol	mg/1	0.001	1.0
(xxi)	Free Chloride	mg/1	1.0	2.0
(xxii)	Sulphide	mg/1	0.50	0.50
(xxiii)	Oil and Grease	mg/1	Not Detectable	10.0

Table V

NEW INSTALLATIONS WITHIN RESIDENTIAL AREAS NOT PERMITTED WITHOUT PRIOR APPROVAL

(*a*) Any equipment, plant or facility that may discharge or emit smoke as dark as or darker than shade No. 1 on a Ringelmann Chart.

(*b*) Any equipment, plant or facility used for the purpose of heating or generating of power that is rated to consume—

(i) pulverised fuel;

(ii) any solid fuel at 20 kilogrammes or more per hour; or

(iii) any liquid or gaseous matter at 10 kilogrammes or more per hour.

(*c*) Any equipment, plant or facility that emits any solid particle exceeding 0.5 kilogrammes per hour.

(*d*) Any equipment, plant used for grain milling or polishing and consumes 1.5 kw and above.

(*e*) Any wood working machinery that consumes 0.75 kw and above.

(*f*) Any equipment or facility used in the manufacture, packing or repacking of paints, varnishes, lacquers and all pesticides listed in the First Schedule to the Pesticides Act 1974.

(*g*) Any equipment, plant or facility used in the manufacture, packing or repacking of industrial chemicals, in the process of which mercury, antimony, arsenic, cadmium, zinc, lead, copper or any compound thereof is emitted.

(*h*) Any equipment, plant or facility used in the manufacture, packing or repacking of fish manure or animal feed or fertilizer.

(*i*) Any equipment or plant used in the manufacture of asbestos containing products.

Source : Environmental Quality (Clear Air) Regulations 1978 P.U.(A) 280 page 752

Table VI

EMISSION STANDARDS FOR AIR IMPURITIES

Source: Environmental Quality (Clean Air) Regulations 1978
PU (A) 280 Pgs. 745 - 747

Substance Emitted	Source of Emission	Standards		
1. Solid particles concentration in the heating of metals		Standard A: 0.3 gm/Nm^3 Standard B: 0.25 gm/Nm^3 Standard C: 0.2 gm/Nm^3		
2. Solid particles concentration in other operations		Standard A: 0.6 gm/Nm^3 Standard B: 0.5 gm/Nm^3 Standard C: 0.4 gm/Nm^3		
3. Metals and metallic compounds.		Std. A gm/Nm^3	Std. B gm/Nm^3	Std. C gm/Nm^3
Mercury		0.02	0.01	0.01
Cadmium		0.025	0.015	0.015
Lead		0.04	0.025	0.025
Antimony		0.04	0.025	0.025
Arsenic		0.04	0.025	0.025
Zinc		0.15	0.1	0.1
Copper		0.15	0.1	0.1

Substance Emitted	Source of Emission	Standards
4. (a) Acid Gases	Manufacture of sulphuric acid	1. Equivalent of: Standard A: 7.5 Standard B: 6.0 Standard C: 3.5 gramme of sulphur trioxide /Nm^3 of effluent gas, 2. Effluent gas free from persistent mist.
(b) Sulphuric acid mist or sulphur trioxide or both	Any source other than combustion process and plant for manufacture of sulphuric acid as in (a) above.	1. Equivalent of: Standard A: 0.3 Standard B: 0.25 Standard C: 0.2 gramme of sulphur trioxide/ Nm^3 of effluent gas. 2. Effluent gas free from persistent mist.
(c) Chlorine gas	Any source	Standard A: 0.3 Standard B: 0.25 Standard C: 0.2 gramme of hydrogen chloride/Nm^3
(d) Hydrogen chloride	Any source	Standard A: 0.6 Standard B: 0.5 Standard C: 0.4 gramme of hydrogen chloride/Nm^3
(e) Fluorine, hydroflouric acid, or inorganic fluorine compound	Manufacture of aluminium from alumina	Equivalent of: Standard C: 0.02 gramme of hydrofluoric acid/Nm^3 of effluent gas.
(f) Fluorine, hydroflouric acid, or inorganic fluorine compound	Any source other than manufacture of aluminium from alumina as in (e) above	Equivalent of: Standard A: 0.15 Standard B: 0.125 Standard C: 0.100 gramme of hydrofluoric acid/Nm^3 of effluent gas

Substance Emitted	Source of Emission	Standards
(g) Hydrogen sulphide	Any source	Standard A: 6.25 Standard B: 5.00 Standard C: 5.00 parts per million volume for volume
(h) Oxides of nitrogen	Manufacture of nitric acid	Equivalent of: Standard A: 4.60 Standard B: 4.60 Standard C: 1.7 and effluent gas substantially colourless gm. of sulphur trioxide/Nm^3
(i) Oxides of nitrogen	Any source other than Combustion processes and manufacture or nitric	Equivalent of: Standard A: 3.0 Standard B: 2.5 Standard C: 2.0 gramme of sulphur trioxide/Nm^3
5. Dust and solid particles		Std. A gm/Nm^3 | Std. B gm/Nm^3 | Std. C gm/Nm^3
	ASPHALT CONCRETE PLANT	
	Stationary plant	0.5 | 0.4 | 0.3
	Mobile Plant	0.7 | 0.7 | 0.4
	PORTLAND CEMENT PLANT	
	Kiln	0.4 | 0.2 | 0.2
	Clinker, cooler finish grinding and others	0.4 | 0.2 | 0.1
6. Asbestos and Free silica		0.4 | 0.2 | 0.12

Table VII

NOXIOUS AND OFFENSIVE SUBSTANCES

Muriatic acid.

Sulphuric acid and sulphuric anhydride.

Sulphurous acid and sulphurous anhydride.

Nitric acid and acid forming oxides of nitrogen.

Chlorine and its acid compounds.

Bromine and its acid compounds.

Iodine and its acid compounds.

Fluorine and its compounds.

Arsenic and its compounds

Ammonia and its compounds

Cyanogen compounds.

Pyridine.

Bisulphide of carbon.

Chloride of sulphur.

Acetylene.

Sulphuretted hydrogen.

Volatile organic sulphur compounds.

Fumes from benzene works.

Fumes from cement works.

Fumes from fish manure works.

Fumes from pesticides formulating and manufacturing works.

Fumes from asbestos product works.

Fumes from tar works.

Fumes from parafin oil works.

Fumes containing copper, lead, antimony, arsenic, mercury, zinc, aluminium, iron, silicon, calcium, or their compounds.

Smoke, grit and dust.

Fumes containing uranium, beryllium, cadmium, selenium, sodium, potassium or their compounds.

Carbon monoxide.

Acetic anhydride and acetic acid.

Aldehydes.

Amines.

Fumes containing chromium, magnesium, manganese, molybdenum, phosphorus, titanium, tungsten, vanadium or their compounds.

Maleic anhydride, maleic acid and fumaric acid.

Products containing hydrogen from the partial oxidation of hydro-carbons.

Phthalic anhydride and phthalic acid.

Picolines.

Fumes from petroleum works.

Acrylates.

Di-isocyanates.

Fumes containing chlorine or its compounds.

Source : Environmental Quality (Clean Air) Regulations 1978
PU (A) 280 Pages 754-755

Table VIII The Most Polluted Rivers in Peninsular Malaysia, in the Descending Order of Maximum Values Determined in 1978

Suspended Solids (ppm)		BOD_5 at 20°C (mg/1)		Ammoniacal Nitrogen mg/1		pH < 7		pH > 7		Nitrate-Nitrogen (mg/1)	
Kelang	18,210	Johor	1260	Kelang	75	Batu Pahat	3.0	Prai	9.6	Merbok	10.9
Melaka	4280	Kedah	464	Juru	33	Juru	3.1	Juru	8.9		
Perak	4005	Juru	320	Merbok	14	Melaka	3.1	Kluang	8.5	Kelang	9.8
Buluh	2000	Perak	280	Johor	7.8	Buluh	3.4			Buloh	5.7
Trengganu	1100	Kelang	200	Muda	6.6	Skudai	3.5				
Langat	1000	Merbok	188	Linggi	4.8	Benut	3.7				
Selangor	963	Pahang	150	Buluh	3.9	Kedah	3.7				
Muar	945	Linggi	35	Perai	3.7	Kuantan	3.8				
Linggi	790	Perai	25	Melaka	3.0	Linggi	3.9				
Juru	545	Buluh	22	Perak	1.9	Johor	3.9				
Johor	455	Muar	9	Kedah	1.4	Muar	4.0				
Prai	235	Muda	8	Skudai	1.2	Kerian	4.2				
Kedah	210	Skudai	7			Langat	4.6				
Pahang	191	Melaka	5	Batu Pahat	0.5						
Tengi	191			Pahang	0.5	Tengi	5.7				
		Batu Pahat	4								
Skudai	180	Kerian	4								
Kelantan	150										
Benut	135										
Muda	110										
Merbok	90										

Note: In 1978 a total of 1536 samples were analysed/ collected from 338 water quality stations (i.e. more than one station per 30,000 hectares)

Table IX : The Most Polluted Rivers in Peninsular Malaysia, in the Descending Order of Maximum Values Determined in 1979

Suspended Solids (ppm)		BOD_5 at 20°C (mg/1)		Ammoniacal Nitrogen (mg/1)		pH < 7		pH > 7		Nitrate-Nitrogen (mg/1)	
Kelang	42,219	Johor	7000	Buluh	121	Langat	2.8	Kelang	9.0	Buluh	20.6
Linggi	27,175	Rompin	4490	Sepetang	56	Juru	3.0	Perak	8.5		
Sepetang	13,345	Buluh	1240	Merbok	46	Batu Pahat	3.0			Sepetang	9.8
Buluh	12,855	Kelang	395	Juru	35	Sepang	3.1				
Melaka	10,002	Merbok	340	Linggi	15	Buluh	3.3				
Langat	7,041	Juru	290	Johor	14	Linggi	3.5				
Rompin	4,860	Kemaman	220	Kelang	9.0	Bernam	3.5				
Perak	4,645	Sepetang	168	Melaka	7.4	Muar	3.5				
Johor	3,800	Perak	160	Sepang	5.4	Melaka	3.6				
Bernam	2,897	Perlis	120	Perlis	3.8	Benut	3.8				
Selangor	2,759	Endau	96	Rompin	3.7	Prai	4.0				
Kurau	2,040	Linggi	50	Perak	2.8	Paka	4.0				
Kemaman	780	Dungun	32	Skudai	1.8	Sepetang	4.0				
Paka	500	Kedah	25	Kemaman	1.7	Johor	4.3				
Batu Pahat	465	Skudai	17	Langat	1.4	Rompin	4.5				
Kuantan	380	Perai	15	Muda	1.3	Pahang	4.6				
Perlis	375	Langat	15	Kurau	1.0	Tengi	4.9				
Kedah	360	Jejawi	10	Jejawi	8.9	Kuantan	5.2				
Pahang	337	Kuar	8	Kedah	0.8	Pontian	5.3				
Juru	295	Melaka	7	Kerian	0.7	Jejawi	5.5				
Benut	290	Batu Pahat	6	Pontian	0.7	Kemaman	5.6				
Pontian	250	Sepang/Jimah	4	Batu Pahat	0.6	Kurau	5.6				
Muar	240	Muar	4	Tengi	0.4	Kedah	5.6				
Perai	225			Muar	0.4						
Skudai	225										
Merbok	215										
Kelantan	210										
Dungun	180										
Sedili	140										
Endau	135										
Muda	125										
Kuar	100										

Note: In 1979, a total of 4464 samples were analysed/collected from 503 water quality stations (i.e. more than one station per 26,000 hectares).

Table X : Distribution of monitoring station by state 1979

State \ monitoring station	HVS	DDG	TGS	EPS (AC & SI)	HSP	Total
Northern Region	2	19	-	3	11	35
Perlis	-	-	-	-	-	-
Kedah	2	9	-	-	-	11
Pulau Pinang/Seberang Prai	-	7	-	2	8	17
Perak	-	3	-	1	3	7
Central/Region	10	30	2	1	14	57
Selangor/W.Persekutuan	10	26	2	1	10	49
Negeri Sembilan	-	4	-	-	4	8
Melaka	-	-	-	-	-	-
Southern Region	-	7	-	2	5	14
Johor	-	7	-	2	5	14
Eastern Region	-	13	-	-	10	23
	-	5	-	-	5	10
Trengganu	-	3	-	-	2	5
Kelantan	-	5	-	-	3	8
DARA	-	-	-	-	-	-
KETENGAH	-	3	-	-	3	6
Sabah Region	-	-	-	-	-	-
Sarawak Region	-	6	-	-	6	12
Total	12	78	2	6	49	147

Table XI : Types of monitoring stations and sampling frequency

monitoring station	No. of samples per month
HVS	5 - 15 filters
DDG	1 sample
TGS	15 samples
EPS	8 filters + 8 samples
HSP	1 plate

Note Sampling frequency may vary depending on the necessity and the manpower available.

Table XII : Air Quality samples collected and analysed during 1979

Monitoring station & sample / State	@ HVS filter	* DDG sample	* TGS sample	EPS * Total Acidity	EPS @ Smoke sample	* HSP plate	Total
Northern Region	77	66	-	126	126	33	428
Perlis		-	-	-	-	-	-
Kedah	77	27	-	-	-	-	104
Pulau Pinang/Seberang Prai		27	-	84	84	24	219
Perak	-	12	-	42	42	9	105
Central Region	445	157	215	23	23	44	907
Selangor/W. Persekutuan	445	141	215	23	23	35	882
Negeri Sembilan	-	16	-	-	-	9	25
Melaka	-	-	-	-	-	-	-
Southern Region	-	18	-	80	80	9	187
Johor	-	18	-	80	80	9	187
Eastern Region	-	9	-	-	-	9	18
Pahang	-	4	-	-	-	5	9
Trengganu	-	-	-	-	-	-	-
Kelantan	-	5	-	-	-	4	9
DARA	-	-	-	-	-	-	-
KETENGAH	-	9	-	-	-	3	12
Sabah Region	-	-	-	-	-	-	-
Sarawak Region	-	26	-	-	-	22	48
Total	522	285	215	229	229	120	1600

Key: @ Analysis carried out by D.O.E. = 751 samples
* Analysis carried out by Jabatan Kimia = 849 samples

Key

(i) HVS - High Volume Sampler

(ii) DDG - Dust Deposit Gauge

(iii) TGS - RAC Three Gas Sampler

(iv) EPS (AC - Eight Port Sampler (Total Acidity)
EPS (SI) - Eight Port Samples (Smoke Indicator)

(V) HSP - Huey Sulphation Plate

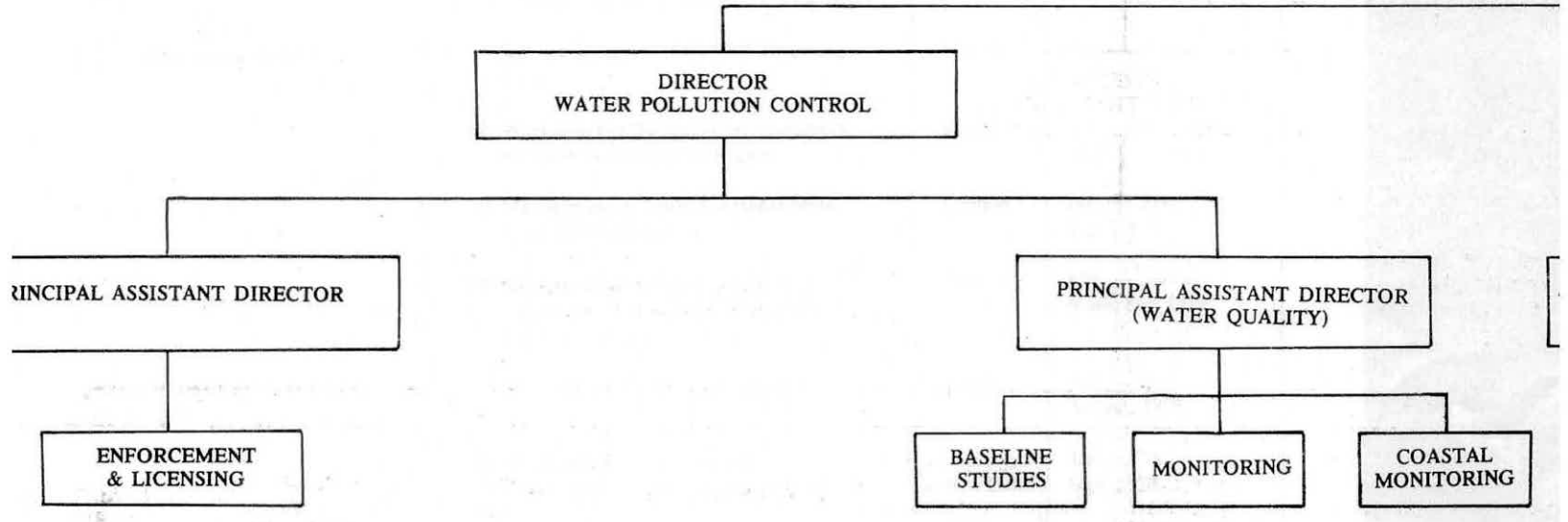
Table XIII : Complaints Received according to types in 1979

Types of Complaints	Total	%
Particulates	84	36.2
Smoke/Fumes	49	21.1
Noise	27	11.6
Gas	2	0.9
Odour	27	11.6
Others	43	18.5
Total	232	100.0

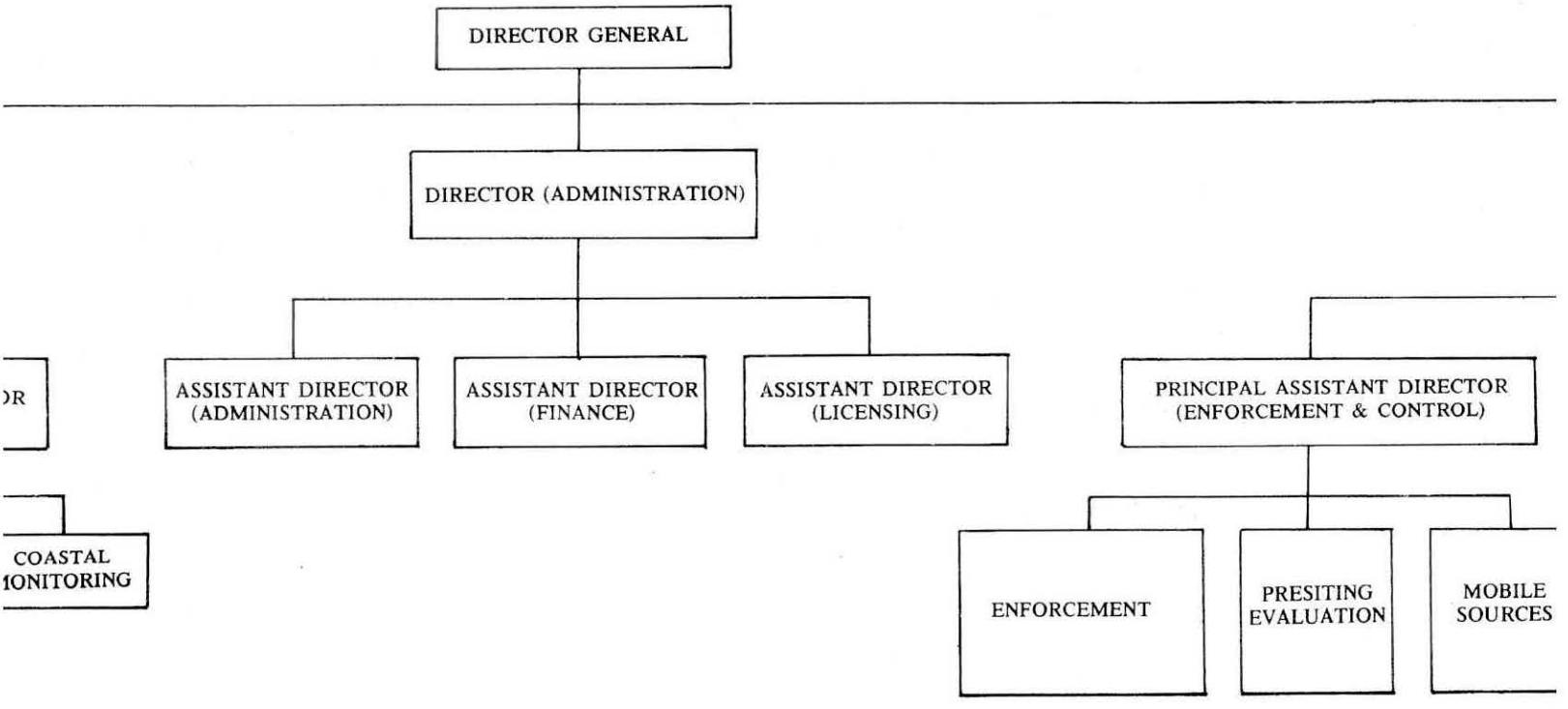
Table XIV : Complaints received according to types of sources in 1979

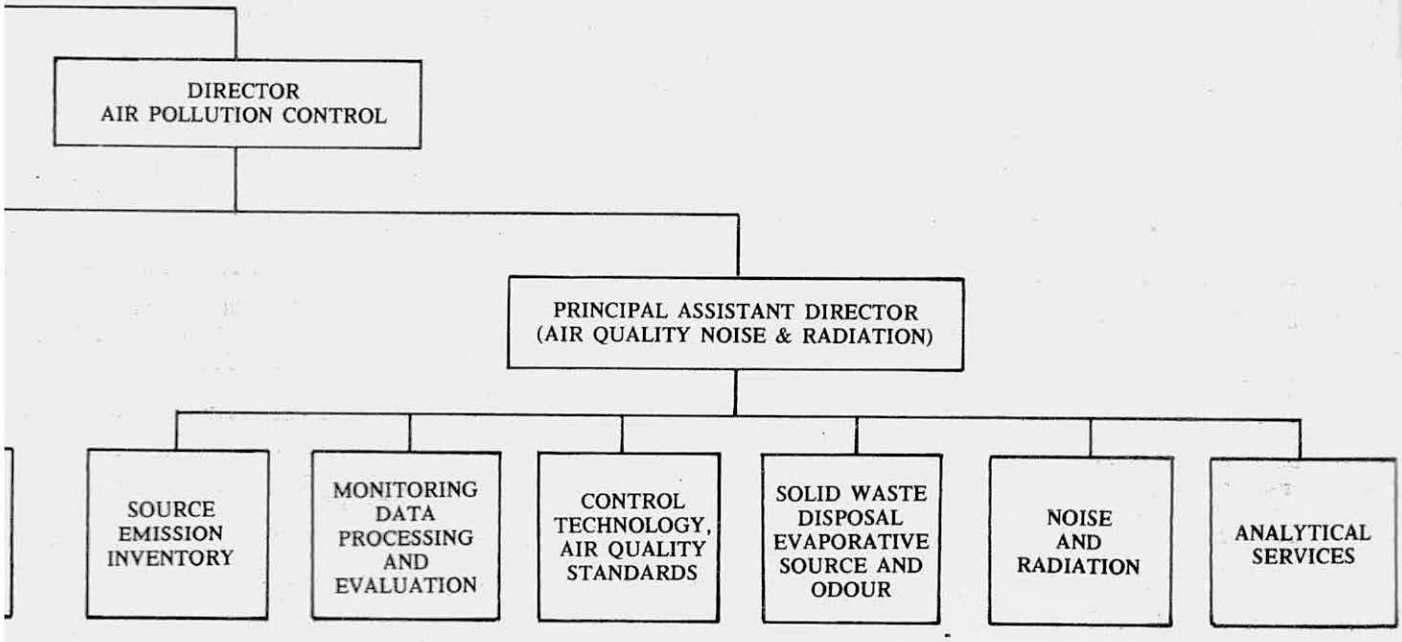
Types of Sources	Total	%
Wood based industries	31	17.6
Rubber Factories	9	5.1
Metallurgical works	5	2.8
Chemical works	1	0.6
Feedmill and Fishmeal Factories	7	4.0
Rice mills	6	3.4
Concrete and Cement works	3	1.7
Quarries	10	5.7
Engineering workshops	6	3.4
Others	98	55.7
Total	176	100.0

Appendix 'A'


DIRECTOR
WATER POLLUTION CONTROL
RINCIPAL ASSISTANT DIRECTOR
PRINCIPAL ASSISTANT DIRECTOR
(WATER QUALITY)
ENFORCEMENT
& LICENSING
BASELINE
STUDIES
MONITORING
COASTAL
MONITORING

ORGANISATION CHART OF THE DIVISION OF ENVIRONMENT
MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT




DIRECTOR
AIR POLLUTION CONTROL
PRINCIPAL ASSISTANT DIRECTOR
(AIR QUALITY NOISE & RADIATION)
SOURCE EMISSION INVENTORY
MONITORING DATA PROCESSING AND EVALUATION
CONTROL TECHNOLOGY, AIR QUALITY STANDARDS
SOLID WASTE DISPOSAL EVAPORATIVE SOURCE AND ODOUR
NOISE AND RADIATION
ANALYTICAL SERVICES

APPENDIX 'B'

Name and Post	Course/Seminar/Visit	Place	Date
1. Mr. S.T. Sundram, J.S.M. Director-General	Consultative Meeting on Methodology and Techniques for Identification and Incorporation of Environmental Dimensions in Development.	Bangkok	12th. — 19th. February 1979
2. Mr. A. Maheswaran, K.M.N.	i) Seventh Session of the UNEP Governing Council	Nairobi	April, 1979
	ii) Workshop For National Correspondents In The Asia And Pacific Region	Bangkok	1st. — 3rd. August 1979
	iii) Management & Control of Heavy Metals in the Environment	London	18th. — 21st. Sept. 1979
	iv) Meeting of the Scientific Advisory Committee on International Register of Potentially Toxic Chemicals.	Geneva	12th. — 16th. November, 1979
3. Mr. Goh Kiam Seng, K.M.N. Director (Air)	i) Meeting on Air Services Agreement	London	8th. — 10th. August, 1979
	ii) Discussion with officers from Department of Civil Aviation in New Delhi	New Delhi	3rd. — 7th. Sept. 1979
	iii) Technical Officers Conference on Air Pollution	Singapore	21th. March — 27th. April, 1979
4. En. Abu Bakar bin Jaafar Principal Assistant Director (Water)	i) Third UN Conference on the Law of the Sea	Geneva New York	19th. July — 24th. August, 1979
	ii) The First ASEAN Group Meeting On Marine Science	Jakarta	12th — 14th June, 1979
5. Mr. Godwin a/l Singam Principal Assistant Director (Water)	i) Conference Asia Africa Legal Consultative Committee	Korea	February, 1979
	ii) Training Course for Environmental Sound Management & Utilization of River Basins.	USSR	12th. Sept. — 14th. November, 1979
6. Mr. Tan Meng Leng, Principal Assistant Director (Air)	Technical Officers Conference on Air Pollution	Singapore	3rd. — 7th. Sept. 1979
7. Mr. Ho Yueh Chuen Environmental Control Officer	i) UNESCO Training Course in Microbiology on the Village Level in Service of An Environmental Management Based rural Development.	Indonesia	8th. — 24th. Jan. 1979
	ii) Official Visit of Hon. Minister of Science, Technology and Environment.	Singapore	1st. — 3rd. Dec. 1979
8. Mr. Patrick Tan Hock Chuan, Environmental Control Officer	Workshop on Oil Spill Chemicals	France	26th. — 28th. Nov., 1979

Name and Post	Course/Seminar/Visit	Place	Date
9. Mr. Soo Ah Kan, Environmental Control Officer	M. Sc In Environmental Technology and Management	Bangkok	Sept. 1979 — Sept. 1981
10. Cik Norhayati binti Mustapha, Environmental Control Officer	Course on Water and Wastewater Engineering	Bangkok	Sept. 1979 — Sept. 1981
11. Cik Hasmah Harun, Environmental Control Officer	Meeting on INFOTERRA/UNEP Managers	USSR	1st. — 5th. Oct. 1979
12. Puan Rosnani binti Ibarahim, Environmental Control Officer	Conference on Clean Air	Singapore	3rd. — 7th. Sept. 1979
13. Mr. Wong Foon Meng, Environmental Control Officer	Visit To Investigate The Progress of Palm Oil Effluent Treatment	Bangkok	Dec. 1979
14. En Sajali bin Hj. Kip Environmental Control Officer	i) Technical Officers Conference	Singapore	3rd. — 7th. Sept. 1979
	ii) Solid Waste Management	Bangkok	3rd. — 10th. Dec. 1979
15. En. Abdul Aziz bin Abdul Rasol, Environmental Control Officer	i) Technical Officers Conference	Singapore	3rd. — 7th. Sept. 1979
	ii) Training Seminar in Environmental Management	Indonesia	8th. Oct. — 3rd. Nov., 1979
16. Mr. Lee Heng Keng, Environmental Control Officer	Technical Officers Conference	Singapore	3rd. 7th. Sept. 1979
17. En. Hashim bin Daud, Environmental Control Officer	Fellowship Post Graduate Course In Environmental Science and Technology	Holland	24th. — Oct. 1979 — 8th. Sept. 1980
18. En. Shamsudin bin Hj. Abdul Latiff, Environmental Control Officer	Conference on Clean Air	Singapore	3rd. — 7th. Sept., 1979
19. Mr. Dasarathan Murugasan Rao, Assistant Environmental Control Officer	Third Course of Maritime Administration on the Prevention & Control of Pollution	Sweden	6th. — 18th. August. 1979
20. En. Mohd. Shariff bin Mustapha, Assistant Environmental Control Officer	Diploma Course of Royal Society of Health in Air Pollution Control	Singapore	26th. June, 1979 — 8th. Oct. 1979
21. Mr. Ng Aik Tong, Assistant Environmental Control Officer	Water Pollution Control Sewage Works Engineering	Japan	6th. Sept. — 14th. Dec. 1979
22. Mr. Christie Joseph Theseira, Assistant Environmental Control Officer	Training Course In Implementing Environmental Improvement in Human Settlement for Promoting Family Well-Being.	Manila	27th. Oct. — 7th. Dec., 1979
23. Mr. Robert Lin Hock Kee, Assistant Environmental Control Officer	Training in sewerage	Singapore	June 1979 — Sept. 1979

Name and Post	Course/Seminar/Visit	Place	Date
24. En. Mohd. Sanusi bin Sulaiman, Assistant Environmental Control Officer	Course on Hydrology	Singapore	Oct. 1979
25. En. Mohd. Radzuan bin Yusof, Assistant Environmental Control Officer	Training Course on Oil Pollution	Singapore	27th. — 31st. Aug. 1979