

CHAPTER 19 - ENVIRONMENT AND SUSTAINABLE RESOURCE MANAGEMENT

- I. Introduction
- II. Progress, 1996-2000
- III. Prospects, 2001-2005
- IV. Conclusion

LIST OF TABLES

Table 19-1 Emission Of Pollutants To The Atmosphere By Source, 1995-1999

Table 19-2 River Water Quality, 1995-1999

Table 19-3 Solid Waste Generated, 1996-2000

LIST OF CHART

Chart 19-1 Quantity Of Scheduled Waste Generated, 1995-1999

Chapter 19

Environment and Sustainable Resource Management

19

ENVIRONMENT AND SUSTAINABLE RESOURCE MANAGEMENT

I. INTRODUCTION

19.01 During the Seventh Plan period, environmental and natural resource issues continued to be addressed to ensure that development was balanced and sustainable. Efforts to integrate environmental considerations into development planning were intensified, and the relevant institutional, legislative and regulatory mechanisms were strengthened. In addition, the use of cleaner technologies was promoted and a market-based approach to address environmental and resource issues was introduced. Environment education and awareness campaigns were also launched to foster an environment-friendly society.

19.02 During the Eighth Plan period, emphasis will be placed on addressing environmental and resource management issues in an integrated and holistic manner. Steps will be taken to identify prudent, cost-effective and appropriate management approaches that yield multiple benefits in order to ensure that development is sustainable and resilient. Efforts will be continued to address air pollution, mitigate degradation of rivers, improve marine and groundwater quality, as well as deal with waste in a comprehensive manner. The management of natural resources will be enhanced by strengthening land use planning, extending the Biodiversity Action Plan to the various states, expanding the sustainable management of forests and addressing multiple-use issues in marine areas. Efforts will also be channelled at promoting environmental performance measurements and market-based instruments as well as engaging communities in addressing environmental and natural resource issues.

II. PROGRESS, 1996-2000

Environmental Management

19.03 *Air Quality.* During the Plan period, the overall air quality remained stable at good to moderate levels as indicated by the Air Pollution Index (API).

The status of air quality was closely monitored by the Department of Environment (DOE) through 50 air-quality monitoring stations throughout the country. The three main sources of air pollution were mobile sources, namely, vehicles, and stationary sources such as factories and thermal-power generation plants as well as the burning of municipal and industrial wastes, each contributing 74 per cent, 22 per cent and 4.5 per cent, respectively in 1998, as shown in *Table 19-1*. Efforts were focused on reducing the emissions from motor vehicles and two new regulations on motor engines were introduced in 1996, namely the Control of Emissions from Diesel Engines Regulations and the Control of Emissions from Petrol Engines Regulations. In addition, enforcement efforts by the DOE, Royal Malaysian Police and the Road Transport Department were stepped up to reduce black smoke emission from diesel-powered engines. A review of the Environmental Quality (Clean Air) Regulations 1978, was also initiated to improve control over emissions from industrial sources.

19.04 The air quality deteriorated between September and October 1997, mainly due to the formation of haze from transboundary sources. The Government initiated action to coordinate efforts at the regional level to control the transboundary sources of haze, while the DOE started programmes to control local sources that worsened the haze situation. These included airborne surveillance by the Royal Malaysian Police and other relevant agencies and stricter enforcement on open burning, which resulted in a reduction in the number of cases of open burning by 1998. The increased use of unleaded petrol, from 31 per cent in 1992 to 84 per cent in 1998, resulted in a significant decrease in airborne lead in urban areas. As a measure to coordinate the efforts of the various agencies involved in controlling local sources of air pollution and to initiate remedial plans for recurring haze episodes, a Management and Disaster Relief Committee was established in 1998.

TABLE 19-1

EMISSION OF POLLUTANTS TO THE ATMOSPHERE BY SOURCE, 1995-1999
(‘000 tonnes)

<i>Source</i>	<i>1995</i>	<i>%</i>	<i>1996</i>	<i>%</i>	<i>1997</i>	<i>%</i>	<i>1998</i>	<i>%</i>	<i>1999</i>	<i>%</i>
Mobile	3,385.97	84.3	2,722.90	81.8	2,905.80	81.1	2,402.80	73.8	1,852.90	76.3
Stationary	477.57	11.9	577.87	17.4	573.06	16.0	706.50	21.7	461.40	19.0
Burning of Wastes	153.14	3.8	29.78	0.8	104.08	2.9	146.50	4.5	114.20	4.7
Total	4,016.68	100.0	3,330.55	100.0	3,582.94	100.0	3,255.80	100.0	2,428.50	100.0

19.05 *Water Quality*. During the Plan period, based on samples from 900 monitoring stations in 120 rivers, the DOE classified 32 rivers as clean, 75 as slightly polluted and 13 rivers as highly polluted, as shown in *Table 19-2*. The main sources of river water pollution were from the discharge of domestic sewage, manufacturing, pig farming, agricultural production and land clearing and earthworks. A Groundwater Monitoring and Reporting Network was established in Peninsular Malaysia in 1996, followed by Sarawak in 1999 and Sabah in 2000. This helped in the evaluation of the status and extent of groundwater contamination, and in instituting measures to protect groundwater from being contaminated.

19.06 To provide a more efficient and cost-effective management system in the handling of *domestic wastewater* and to reduce the discharge of inadequately treated wastewater into the rivers, multipoint sewerage systems were constructed and upgraded, while existing ones were refurbished. By the end of 1998, *Indah Water Konsortium* took over the running of sewerage facilities in 84 out of the 145 local authorities and managed 5,373 treatment plants and 770,570 septic tanks, of which 266 treatment plants were refurbished and 352,090 septic tanks desludged. Consequently, there was an improvement in the quality of raw water in some states as shown from the overall decline in the total coliform count in raw water from 28.1 per cent in 1995 to 15.7 per cent in 1998. In addition, pig farms were relocated, and more effective pig waste treatment techniques were introduced to mitigate the discharge of animal waste into waterways.

19.07 With regard to *marine water* monitoring, samples collected from 237 stations indicated that the main contaminants of the coastal waters of all states were oil and grease, total suspended solids (TSS) and the bacteria *Escherichia*

TABLE 19-2

RIVER WATER QUALITY, 1995-1999

Category	1995		1996		1997		1998		1999	
	No.	%								
Very Polluted	14	12.2	13	11.2	25	21.4	16	13.3	13	10.8
Slightly Polluted	53	46.1	61	52.6	68	58.1	71	59.2	75	62.5
Clean	48	41.7	42	36.2	24	20.5	33	27.5	32	26.7
Number of Rivers Monitored	115	100.0	116	100.0	117	100.0	120	100.0	120	100.0

coli (E. coli). Almost 94 per cent of the samples were polluted by oil and grease, 73 per cent by TSS and 30 per cent contained *E. coli*. Joint airborne surveillance operations were carried out by the DOE, the Police Air Wing and the Air Force Unit of the Ministry of Defence, to detect illegal dumping of oil and waste in the Straits of Malacca and the South China Sea. In 1999, 48 cases of oil spillage were reported in Malaysian waters, of which illegal discharging was responsible in 32 cases. Five of these cases were successfully prosecuted and fined.

19.08 *Solid Waste*. The rapid growth in the urban population due to rural-urban migration and natural growth as well as changing consumption patterns contributed to an increase in the generation and composition of solid waste, as shown in *Table 19-3*. The estimated amount of waste generated by the urban population in 2000 was 11,940 tonnes per day or 0.8 kilogram per capita per day. This large amount of solid waste strained existing landfill sites, and the majority of disposal grounds were considered unsanitary landfills or merely open dumps. The problem was compounded by cases of open burning being reported at dumpsites.

19.09 To ensure a more efficient waste management system, the privatization of solid waste management was started on an interim basis. Two of the four consortia involved started collection of solid waste in 26 of the 145 local authorities by the end of the Plan period. Overall, a total of 23 municipal disposal sites was upgraded to ensure proper disposal. The Government also conducted awareness campaigns to encourage the reduction, reuse and recycling of waste materials.

19.10 *Toxic and Hazardous Waste*. During the 1995-1999 period, there was a marked increase in the generation of toxic and hazardous waste due to rapid industrialization. Over the Plan period, an average of 431,000 tonnes of scheduled waste was generated per annum, mainly from the metal finishing, electronics, textile, chemical and chemical-related industries, as well as from agricultural and domestic activities, and clinical waste from hospitals, as shown in *Chart 19-1*.

19.11 Comprehensive legislation was promulgated to regulate the use, storage, handling, transport and labeling of hazardous substances as well as for the safe disposal and treatment of toxic and hazardous waste. A National Contingency Plan was developed to deal with accidental spillage of toxic and hazardous waste. The Government also launched the Malaysian Agenda for Waste Reduction (MAWAR) Programme to encourage industries to formulate strategies to reduce waste. A fully integrated toxic waste treatment and disposal facility was also

TABLE 19-3

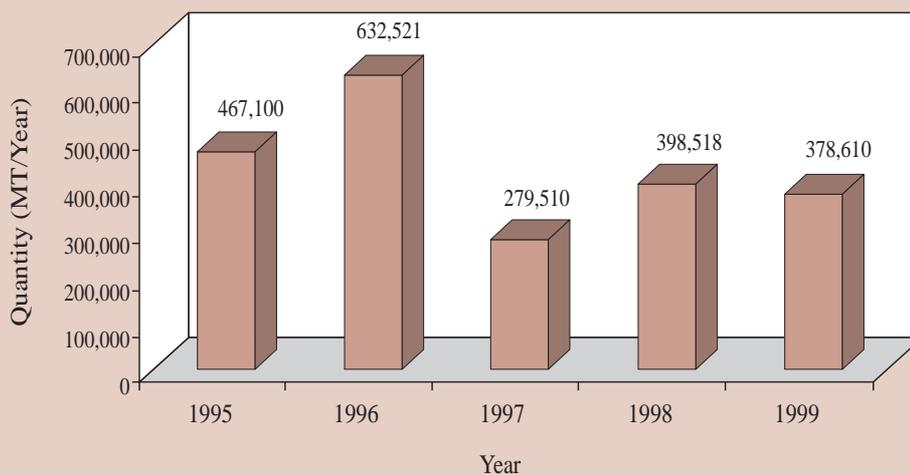
SOLID WASTE GENERATED, 1996-2000
(‘000 tonnes)

<i>Area</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000¹</i>
Kuala Lumpur	n.a.	n.a.	1,058	1,070	1,082
Selangor	n.a.	n.a.	1,169	1,204	1,240
Pahang	n.a.	n.a.	202	206	210
Kelantan	n.a.	n.a.	123	126	129
Terengganu	n.a.	n.a.	119	122	125
Negeri Sembilan	245	250	267	278	291
Malacca	192	200	208	216	225
Johor	854	890	927	956	1,005
Perlis	26	27	28	28	29
Kedah	507	538	569	560	631
Pulau Pinang	570	591	611	630	648
Perak	672	696	719	741	763
Total	3,066	3,192	6,000	6,137	6,378

Note: ¹ Estimates
n.a. = not available

CHART 19-1

QUANTITY OF SCHEDULED WASTE GENERATED, 1995-1999



established in Bukit Nanas, Negeri Sembilan. The facility, which is managed by a private company, was operational in 1998. The establishment of this facility has to some extent, relieved industries of the need to store hazardous waste within their compounds. By end 2000, the facility received 216,500 tonnes of toxic and hazardous waste for treatment and disposal from 1,002 companies.

Natural Resource Management

19.12 During the Plan period, natural resources continued to be important for the nation's development. With the increase in demand and pressure upon natural resources, the Government monitored and managed the utilization of natural resources to ensure sustainable development. Steps were also taken to further integrate environmental aspects into land use planning and management.

19.13 *Land Resources.* The management of land resources was improved through more integrative land use planning and the increased use of remote sensing technology. The *Doktrin Perancangan dan Pembangunan Sejagat* (DPPS), which stresses development that is balanced and sustainable from the economic, social, spiritual and environmental aspects, was made the basis of land use planning and development activities, and served as the foundation for the planning and development of Putrajaya and Cyberjaya. A guideline for the implementation of the DPPS was issued to guide all future development. In addition, the Town and Country Planning Department (TCPD) applied the Integrated Resources Planning and Management (IRPM) system, whereby the environmental impacts of a proposed land use are assessed at the planning stage and strategic environmental assessments conducted, as was the case for the Paya Indah Wetlands Sanctuary in Selangor. During the Plan period, nine Structure Plans were amended and 78 Local Plans that took into account conservation and environmental aspects were prepared. Steps were also taken to prepare a National Spatial Plan for the country, to provide strategic guidelines on development, use and conservation of land by integrating socio-economic and sectoral policies into physical planning.

19.14 Physical planning guidelines were established to ensure sustainable development. A total of 32 guidelines was issued by the TCPD, covering development of coastal areas, islands, open space, housing, retention ponds, solid waste disposal, conservation of trees and for environmentally sensitive areas. Nevertheless, development began to encroach upon sensitive areas such as forest reserves and water catchments, causing flash floods, periodic water scarcity and landslides. The non-compliance with the conditions in the Development, Structure and

Local Plans, the lack of enforcement and weaknesses in delineating clear buffer zones resulted in the horizontal sprawling of development into new areas for which development was not earlier planned. Steps were taken to adopt a more comprehensive and coordinated approach to land use planning to address these issues.

19.15 *Water Resources.* During the Plan period, several states experienced periodic water scarcity. This was caused by extended dry spells, and was compounded by the increasing demand for water, polluted water sources and the encroachment of development into water catchments. In this regard, the Government formed a National Water Resources Council in 1998 to provide a forum for a holistic approach for the planning and management of water resources. A National Water Resources Study for Peninsular Malaysia was completed in 2000 to determine the availability of water resources and water demand up to 2050. The river-basin approach to water management in Malaysia was initiated with the establishment of *Lembaga Urus Air Selangor* (LUAS) in 1999. In addition, various awareness campaigns were held with the cooperation of the relevant non-governmental organizations (NGOs) to promote the wise use of water and river conservation in general, especially through the annual *Cintailah Sungai Kita* campaigns.

19.16 *Biodiversity.* The National Biodiversity Policy, which provides a framework for integrating and consolidating biodiversity programmes and projects in the country, was launched in April 1998. In line with the Policy, the capacity of several conservation agencies were strengthened and management plans were drawn-up for a number of protected areas. These included the preparation of a masterplan to reinforce the protected area system of Peninsular Malaysia, a capacity building project for the Wildlife Department in Sabah, improving the management of totally protected areas in Sarawak and collaboration between universities in Malaysia and Denmark on conservation education and training. A Nature Education and Research Centre was also established in the Endau-Rompin National Park in Johor, and management plans are being prepared for the Krau Wildlife Reserve in Pahang, the Perlis State Park, the Maliau Basin in Sabah, as well as biodiversity conservation projects in the Tabin Wildlife Reserve and the Kinabatangan area in Sabah. The Management Plan for Malaysia's first site established under the RAMSAR Convention on Wetlands of International Importance Especially as Waterfowl Habitat, at Tasek Bera in Pahang, was completed in 1999 and a study to promote the sustainable development of the Main Range highlands in Peninsular Malaysia was launched in 2000. In addition, Kinabalu Park in Sabah and Gunung Mulu National Park in Sarawak were declared World Heritage Sites in 2000.

19.17 *Forest Resources.* Efforts to manage forests sustainably were intensified and multiple-use forestry was promoted. In 2000, the permanent forest reserve totaled about 14.33 million hectares, compared with 14.29 million hectares in 1995. The Government continued to manage its forest resources sustainably, including expanding the role of timber certification, and was actively engaged in fulfilling Malaysia's commitment towards achieving the International Tropical Timber Organization's Year 2000 objective, when all timber traded in the international market must be produced from forests that are sustainably managed.

19.18 Management emphasis shifted from mainly timber production to the simultaneous sustainable production of desirable outputs encompassing water, non-timber forest produce such as rattan, bamboo, medicinal plants, resins and dyes, as well as the enhancement of the protective functions of forests. Apart from stabilizing the environment, the forest was an increasingly popular attraction for local and foreign tourists, as a valuable source of recreation with natural resources such as waterfalls, rapids, unique rock formations, flora, fauna, wetlands, and scenic panorama. A total of 95 forest recreation areas was developed by the various state forest departments. Several bilateral projects with various international agencies such as the Danish Cooperation on Environment and Development (DANCED), the Japanese International Cooperation Agency (JICA) and the German Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) were successfully completed. The projects included the preparation of an Integrated Management Plan for Sustainable Use of Johor Mangrove Swamp Forests; Sustainable Management of Peat Swamp Forests in Selangor and Pahang; Extraction and Processing of Forest Residues and Small Dimension Logs in Terengganu; a Multi-Storied Forest Management project in Perak; and the establishment of a Forest Mobile-Training unit.

19.19 *Energy and Mineral Resources.* During the Seventh Plan period, the Government gave due emphasis to the sustainable development of depletable resources in energy production and use as well as on the diversification of energy sources. The renewable energy (RE) potential in the country was assessed, including a consideration of the legal, regulatory and financial frameworks needed to encourage RE. The model State Mineral Enactment, which provides for the orderly, efficient and environment-friendly exploration and mining of minerals as well as ensuring that post-mining activities are undertaken to convert ex-mining land to other economic uses, was adopted by the States of Sabah and Selangor.

19.20 *Coastal and Marine Resources.* During the Plan period, integrated coastal zone management plans were prepared for the States of Sabah, Sarawak and Pulau Pinang to reconcile conflicting use and to ensure sustainability of coastal resources. A pilot study to develop an integrated shoreline management plan for north Pahang was also conducted. Based on the input and outcome of these plans, steps were taken to prepare a National Coastal Zone Policy to identify and provide for uniform and minimum standards for the replication of the integrated coastal zone management plans to the other states.

Other Initiatives

19.21 During the Plan period, the Government continued to implement programmes to increase the level of *environmental awareness* among Malaysians as well as to disseminate environmental information to a wider spectrum of the population. These efforts were complemented by activities carried out by the private sector and NGOs. In addition, several of the larger corporations began to display greater environmental awareness, including adopting ISO 14001 to ensure that their processes were environment-friendly.

19.22 In the area of *environmental health*, an Environmental Health Research Centre was established in the Institute of Medical Research in September 1997. The Centre's efforts contributed to an improved understanding of the needs for a safe and healthy environment. It established networks with institutions of higher learning and served as a clearing house for researchers and policy makers, environmental health and occupational health practitioners as well as the community.

19.23 On the industrial front, SIRIM Berhad established a Cleaner Technology Extension Service and a Cleaner Technology Information Service, which offered services in *cleaner technology* audits, contract research, consultancy and on the technical aspects of waste management, occupational safety and health as well as risk assessments. SIRIM implemented six full-scale cleaner technology demonstration projects in selected companies and established a database on cleaner technology. It also completed cleaner technology audits for 40 companies, of which more than 90 per cent were small- and medium-scale industries (SMIs) in the food, electroplating, textile and rubber products industries.

19.24 Malaysia continued to participate in *international environment initiatives* and fora to safeguard its interests and to contribute towards sustainable development. Malaysia was an active participant in several important multilateral environmental

negotiations such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change (UNFCCC). In these fora, Malaysia stressed the common but differentiated responsibilities of developed and developing countries; the principle of fair and equitable sharing of benefits from the use of biological resources; as well as the role of developed countries in taking the lead in reducing their emissions, providing financial resources and facilitating the transfer of technologies. Malaysia actively implemented its commitments to international initiatives and Conventions, particularly, by integrating the critical action programmes of Agenda 21 into its development plans. A pilot Local Agenda 21 project involving four local authorities was also launched to integrate environmental considerations into their development planning and management, through consensus building and a participatory approach by mobilizing relevant stakeholders.

III. PROSPECTS, 2001-2005

19.25 During the Eighth Plan period, the Government will continue to place emphasis on the proper management of the environment and natural resource base. A major challenge will be to attain the nation's environmental and natural resource goals efficiently and to reduce the negative environmental impact of development activities. Steps will be taken to identify and implement prudent, cost-effective and appropriate management approaches that yield multiple benefits in order to ensure an economically competitive, sustainable and resilient future. Specifically, the major environmental and natural resource challenges include ensuring access to clean air and water; providing adequate food without excessive use of chemicals; providing energy services without environmental degradation; developing healthy urban environments; and conserving critical natural habitats and resources.

19.26 The Government will adopt early preventive measures and will apply the precautionary principle to address environment and natural resource management issues. In this regard, the strategic policy thrusts for environment and sustainable resource management will be as follows:

- *reducing the energy, materials, pollution and waste intensity of urban-industrial activity to address air pollution, mitigate deterioration in water quality and waste disposal;*

- ❑ *increasing the use of fiscal policy in pursuit of environmental objectives and promoting the use of appropriate market-based instruments and self-regulatory measures among industries;*
- ❑ *promoting environmental performance measurement and strengthening the database for environmental decision-making;*
- ❑ *empowering local authorities and engaging communities in addressing environmental issues; and*
- ❑ *enhancing land use planning, intensifying biodiversity conservation and the sustainable management of forests as well as improving the management of maritime affairs.*

Environmental Management

19.27 *Air Quality.* Efforts will be continued to address air pollution, particularly that caused by mobile sources. This will include the strict control of emissions from motor vehicles, especially motorcycles; the use of more efficient engines and efficient exhaust systems; and promoting the use of public transportation and electric vehicles in urban areas. The usage of leaded petrol will be phased out and efforts will be continued to further reduce the sulphur content in diesel. The natural gas distribution network will be expanded to increase the use of natural gas, particularly in the transport sector. The greater use of natural gas and the adoption of clean coal technology will also be encouraged to reduce emission from power plants. In terms of air quality management, new approaches based on the concepts of air quality zones or air shed management will be introduced. The approach entails the management of air quality based on a particular locality or region and will enable the authorities to identify the factors affecting air quality more accurately and facilitate the implementation of mitigating measures.

19.28 *Water Quality.* The Government will step-up efforts to mitigate the deterioration of rivers, marine and groundwater quality. New approaches for river system management and rehabilitation will be introduced, including an integrated river-basin management system. With regard to marine water quality, the DOE together with the Police Air Wing will increase the frequency of airborne surveillance to monitor the illegal dumping of oil and waste by vessels.

19.29 In order to further reduce and improve the discharge of wastewater, the Government will continue to upgrade existing sewage treatment plants and build 10 new plants and three central sludge treatment facilities to supplement the plants to be constructed by the private sector. Standards that are more stringent will also be introduced, including the imposition of fees for wastewater discharge, to induce industries to install better wastewater treatment facilities. In tackling water pollution originating from the agriculture sector, focus will be given to promoting sound cultivation practices and the use of advanced agricultural methods including precision farming. The Pesticides Board and related agencies will be strengthened and legislation will be reviewed to control the field application of pesticides as well as the proper disposal of pesticide containers. Programmes to train and educate pesticide users on the safe handling of pesticides, including environmental aspects, will be intensified.

19.30 *Solid Waste*. During the Eighth Plan period, the collection and disposal of solid waste will be improved with the completion of the solid waste privatization process. As part of the efforts to implement an integrated waste management system, a solid waste transfer station and incinerator will be constructed in the Federal Territory of Kuala Lumpur. In addition, the Government will consider the adoption of a comprehensive waste management policy to address issues of waste reduction, reuse and recycling. Relevant studies and demonstration projects will be carried out to ascertain the viability and the acceptability of a waste recycling industry. Local authorities will be encouraged to introduce various initiatives and appropriate economic approaches such as incentives and collection charges to reduce the amount of household waste. With regard to industrial wastes, industrial parks will be encouraged to build waste disposal sites for improved management and proper disposal of their waste. A clearing house mechanism to facilitate industrial symbiosis, whereby one industry's waste could be another's resource, will also be established.

19.31 *Hazardous Waste and Toxic Chemicals*. Measures will be taken to improve the response from industries, particularly the SMIs, to use the existing toxic waste treatment facility at Bukit Nanas, Negeri Sembilan. In addition, more transfer stations will be built at strategic locations to support and facilitate the collection and storage of toxic and hazardous waste.

19.32 Existing environmental protection measures, laws, regulations, and guidelines will be reviewed to improve their effectiveness in controlling *toxic chemicals*. These will be complemented by the provision of appropriate incentives

for the proper management of hazardous chemicals, promotion of cleaner technology processes, training of relevant personnel and instilling greater awareness among relevant industries and the public.

19.33 *Noise Pollution.* The DOE will continue to monitor noise pollution by assessing noise exposure levels at premises that are regarded as sensitive noise receivers, such as hospitals, schools and residential areas. Appropriate measures, including the formulation of guidelines, will be taken to ensure that the level of noise exposure is within permissible limits.

Natural Resources Management

19.34 *Land Resources.* The Government will intensify on-going efforts as well as introduce new approaches to strengthen land use planning. This will include the identification of integrated planning for environmentally sensitive areas or *Kawasan Sensitif Alam Sekitar* (KSAS). All states will be encouraged to identify, map and gazette environmentally sensitive areas as State KSAS, to prevent inappropriate development from encroaching into these areas. In addition, new physical planning guidelines will be developed to improve environmental quality and conserve natural resources. Among others, these guidelines will cover urban regeneration, “brownfield” development in urban areas, optimal land development and development in catchments. In addition, the Town and Country Planning Act 1976, will be reviewed to enhance the role of the relevant authorities, strengthen enforcement and clearly delineate buffer zones to control urban sprawl.

19.35 *Water Resources.* Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. To ensure adequate and safe water, as well as clean rivers and minimal flooding, a National Water Policy will be formulated to provide the framework for water conservation and management. The Policy will address several challenges, including managing water resources efficiently and effectively, flood occurrences, and emphasizing the need to keep development to a level that is within the carrying capacity of river basins while protecting and restoring the environment. It will also emphasize the integrated river-basin approach, the protection of catchments and reservoirs and addressing issues of inter-state and inter-basin water transfers. In addition, state governments will be encouraged to establish water management bodies such as LUAS to ensure proper planning, monitoring, enforcement and management of water resources on a river-basin basis.

19.36 To reduce exploitation of new water sources, emphasis will be given to demand-side management of water instead of concentrating on water supply. This will include measures to improve the efficiency of supply and use, and recycling water, including studying the feasibility of rainwater harvesting. The use of market-based instruments such as rebates, tax credits, and disincentives such as charging actual costs, penalties and fines, will be considered to help convey to users the true value of water and reduce wastage. In addition, awareness campaigns and public education programmes will stress the critical importance of water in daily life and the need for conservation even in non-crisis times. A crucial challenge will be to reduce the amount of water leakages and wastage. Aging facilities will be refurbished or replaced to enable utilities to save water. Industries will also be encouraged to recycle and reuse water and wastewater in their own plants.

19.37 Groundwater exploration will be conducted in the main river basins, to identify potential aquifers and outline protection zones to conserve groundwater resources. Guidelines and relevant regulations will be formulated to control activities that can pollute groundwater resources. Groundwater research will be intensified and better coordinated to provide a unified database.

19.38 *Biodiversity*. During the Eighth Plan period, the Government will implement the Biodiversity Action Plan in the various states. Regulations will be introduced to control access to biological resources and to address biosafety issues relating to genetically modified organisms. Management plans will be formulated for all protected areas to ensure their integrity and to promote them as conservation, research and eco-tourism areas. Critical habitats that need protection will be identified and the national biological database will be further developed to facilitate implementation of the Biodiversity Action Plan.

19.39 *Forest Resources*. The sustainable management of forests will be continued to conserve biodiversity, protect watersheds and water catchments, improve water quality as well as ensure a sustainable supply of forest products. Sustainable logging practices will be expanded, multiple-use forestry encouraged and timber certification established. In this regard, Malaysia's sustainable forest management system, based on the Malaysian Criteria and Indicators system, is expected to be fully operational during the Eighth Plan period. In addition, state governments will be encouraged to adopt a development-oriented concession system for natural resources in order to encourage private sector participation in the rehabilitation of forests.

19.40 *Energy and Mineral Resources.* Environmental considerations will continue to be given due importance in the sustainable development of the energy sector. RE and energy efficiency programmes will be promoted, particularly in the industrial and commercial sectors. The exploration, extraction and utilization of mineral resources will be optimized while emphasizing the need for environmental protection. Steps will be taken to ensure that mineral deposits are not sterilized by other development. In line with the provisions of the Mineral Development Act 1994, states will be encouraged to adopt the model State Mineral Enactment by legislating their own State Mineral Enactments before the end of the Plan period. This will facilitate the full implementation of the National Mineral Policy, which is intended to develop the domestic mineral-based industry.

19.41 *Coastal and Marine Resources.* The overall management of maritime affairs will be reviewed to address multiple-use conflicts in marine areas, alleviate pressure on the marine environment from pollution and enhance marine and coastal biological diversity. An Integrated Shoreline Management Plan will be prepared for the entire shoreline of the country as part of efforts in enhancing beach conservation and restoration. A coordinating mechanism for oceanographic research will also be established. The Environmental Quality, Fisheries and Exclusive Economic Zone Acts, will be streamlined and reconciled to better manage offshore fishing efforts and strengthen maritime enforcement.

Other Initiatives

19.42 The creation of a sustainable future depends in part, on the knowledge and involvement of the people, as well as an understanding of the consequences of individual actions. Towards this end, the Government will continue efforts to enhance the level of *environmental awareness* and *civic consciousness* among the people. The DOE will step-up its efforts to promote and enhance public understanding of environmental issues through the publication of environment information booklets, pamphlets and posters. The operation and services of DOE's enviro-library will be expanded. Environmental education courses and environment-based co-curricular activities under the Ministry of Education will be strengthened. The private sector, NGOs and the media will also be encouraged to continue their active role in the protection and maintenance of the environment, especially through the promotion of a community-based approach.

19.43 Industries, particularly the SMIs will be encouraged to adopt *cleaner technologies* in their production processes. In this regard, SIRIM Berhad will intensify efforts to collect and disseminate information on cleaner technologies

to increase the general environmental awareness in the industrial sector. SMIs will be encouraged to take advantage of the funding facilities available at the Small and Medium Industries Development Corporation (SMIDEC) to undertake environmental related activities. To enhance overall environmental management, training programmes will be conducted to encourage firms to adopt company-wide environmental management practices, including environmental costing, auditing, reporting and life cycle assessments, as well as ISO 14001.

19.44 To ensure improved planning in addressing environmental and resource issues, the Government will initiate a *sustainable development indicators* system. The system will include natural resource accounting, environmental auditing and environmental costing. Efforts will be directed at collecting data in an integrated manner to facilitate analysis on the sustainability of a sector or state. These indicators of sustainability will enable the Government to ascertain the impact various sectors have on the environment, making it easier to plan remedial action.

19.45 The Government will continue to monitor and participate in *international environmental negotiations*. This is to ensure that policies and measures proposed at these fora do not impose restrictions on Malaysia's development or discriminates against products from developing countries based on their environmental characteristics. Appropriate common positions and approaches will be developed with ASEAN and other like-minded developing countries to address these issues. Domestically, Malaysia will take steps to fulfil its Convention obligations and to ensure that its programmes and projects are in line with its commitments.

IV. CONCLUSION

19.46 During the Seventh Plan period, the Government intensified efforts to integrate environmental considerations into development planning and strengthened the relevant institutional, legislative and regulatory mechanisms. The thrust during the Eighth Plan period will be to reach the nation's environmental and natural resource goals efficiently and to reduce the negative environmental impact of development activities. Consequently, the Government will strive to ensure that the environment is clean, healthy and productive, capable of sustaining the nation's needs and aspirations. An appropriate mix of policies, practices and technologies, will be put in place to ensure socially and environmentally sustainable economic development.