MALAYSIA

ENVIRONMENTAL QUALITY REPORT 1989

Department of Environment

Ministry of Science, Technology and the Environment
29 September, 1990

ISSN 127-6433

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FOREWORD

In fulfilling one of the principal duties of the Director General of Environmental Quality as mandated by section 3(1)(i) of the Environmental Quality Act, 1974, the Environmental Quality Report 1989 is hereby published.

The Report outlines the various environmental programmes and activities undertaken by the Department of Environment throughout the year and reflects to a large extent the concerted efforts made by all concerned in Malaysia to control and prevent pollution as well as to protect and enhance the quality of the environment.

The state of the environment with respect to air, river water, coastal and marine water quality continued to be monitored in 1989 with the aim of determining the change in its quality. The necessary assessment on the state of the environment is a prerequisite to both short and long term management measures that need to be taken to effect the expected maintenance and sustenance of the natural systems and the environment. Such a monitoring effort would also provide an assessment on the effectiveness of the environmental pollution control programmes that have been undertaken and help to identify the research gap for the purpose of strengthening the existing programmes or formulating new ones.

In 1989 the state of ambient air quality assessed in terms of suspended particulates and airborne lead deteriorated slightly whilst the state of river water quality experienced a slight improvement. Generally, the quality of coastal waters in Malaysia remained unchanged.

Pollution abatement and control via the enforcement of pollution control regulations under the Environmental Quality Act, 1974 continued to serve as an important function of the Department. Environmental pollution complaints serve as an important means of feedback from the public, indicating the areas where pollution control need to be tightened, and co-ordination with other environment-related agencies need to be strengthened.

The year 1989 witnessed yet another significant event when two sets of Regulations and an Order to control the management and disposal of toxic and hazardous wastes or otherwise known as scheduled wastes were implemented. These new regulatory requirements are to complement the existing 12 regulations which are currently being enforced.

In achieving the objectives of sound and sustainable development, the Department of Environment stepped up the implementation of the mandatory environmental impact assessment (EIA) procedure and requirements. The number of major projects subject to the Environmental Quality (Prescribed Activities)(Environmental Impact Assessment) Order of 1987 had doubled, 106 in 1989 compared to 57 in 1988.

With the growing concern over a number of global environmental issues, the Langkawi Declaration on Environment was endorsed by the Commonwealth Heads of Government at Langkawi, Malaysia on 21 October, 1989. This Declaration further strengthens the commitment of all concerned to make further progress toward the type of development that is not only reaching the masses but also sustainable for the welfare and socio-economic well-being of all generations.

I have a pleasant duty in presenting, herewith, this Environmental Quality Report for the consideration and perusal of all concerned over the state of our environment.

(Dr. ABU BAKAR JAAFAR, KMN)
Director General of Environmental Quality
Malaysia

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CHAPTER 1
ENVIRONMENTAL POLICIES AND STRATEGIES

ENVIRONMENTAL POLICIES AND STRATEGIES

Introduction

Environmental management in Malaysia is well into its second decade. Preventive approach continues to be given greater emphasis in the pursuit of development that is sustainable both economically and ecologically. The environmental policy objectives as outlined in the Fifth Malaysia Plan (1986-1990) provide the guiding principles for the formulation and realization of national efforts to eradicate poverty and to provide the necessary amenities for meeting basic human needs, including clean air, safe drinking water, hygienic and nutritious food, decent clothing, and adequate housing.

The year 1989 witnessed significant events, both nationally and internationally. At the national level, the enactment of more regulations, particularly for the control and safe disposal of toxic and hazardous wastes, marked an important milestone in the management of wastes in Malaysia. The Langkawi Declaration on Environment, issued by the Commonwealth Heads of Government on 21 October, 1989, provides an affirmative programme of action to help protect and conserve the planet Earth. United Nations General Assembly Resolution 44/228 calls for the convening of the United Nations Conference on Environment and Development in Brazil in 1992, requires specific programmes and strategies on Malaysia's part, so as to, inter-alia ensure a successful outcome of the Conference.

In the fifteenth year of the implementation of the Environmental Quality Act, 1974, pollution abatement and control continued to serve as an important function of the Department of Environment. Pollution abatement and control via the enforcement of pollution control regulations under the Act complement and are complemented by other activities including inventory of pollution sources, environmental quality monitoring and land-use planning process. This function can also be said to involve the greatest degree of interaction with the public, the industry and other Government Departments, in particular at the state and local levels.

The success of the Department's enforcement programmes are reflected in several ways; from environmental monitoring data, waste emission loadings and public complaints. In terms of organic loading into inland waters, the loading from the crude palm oil and raw natural rubber industries have been reduced by between 56 to 99 per cent. However, the loads from sewage and animal husbandry have not attained the same measure of success due to the relatively slow implementation of treatment facilities and high capital costs involved. Air quality monitoring in the last five years indicates that the problem is under control. Most prominent is the reduction of lead (Pb) in the atmosphere following the enforcement of the regulatory requirements to reduce lead levels in gasoline.

The application of environmental impact assessment in planning is increasing significantly since the implementation of the Environmental Quality (Prescribed Activities)(Environmental Impact Assessment) Order 1987. The siting of any major projects prescribed under the Order requires assessment to determine the extent of impact that such a project will have or likely to have on the environment. In 1989 more than 100 projects have been assessed and forwarded to the respective state authorities for further consideration.

National Environmental Policy Objectives

The overall objectives of environmental management in Malaysia is based on the following environmental policy objectives:

(a) to maintain a clean and healthy environment;

(b) to maintain the quality of the environment relative to the needs of the growing population;

(c) to minimise the impact of the growing population and human activities relating to mineral exploration, deforestation, agriculture, urbanisation, tourism, and the development of other resources on the environment;

(d) to balance the goals for socio-economic development and the need to bring the benefits of development to a wide spectrum of the population against the maintenance of sound environmental conditions;

(e) to place more emphasis on prevention through conservation rather than on curative measure, inter alia by preserving the country's unique and diverse cultural and natural heritage;

(f) to incorporate an environmental dimension in project planning and implementation, inter alia by determining the implication of the proposed projects and the costs of the required environmental mitigation measures through the conduct of Environmental Impact Assessment studies; and

(g) to promote greater co-operation and increased co-ordination among relevant Federal and State authorities as well as among the ASEAN Governments.

The ultimate aim of the Federal Government working in close co-operation with the State Governments is to ensure as far as possible that all man's activities are in balance with his environment. To this end, in recognizing that the environment transcends national boundaries, the Government will also co-operate with Foreign Governments either directly or through competent regional and international organisations.

Strategies in Environmental Management

In order to achieve the national environmental objectives, the Department of Environment continued to adopt the three-pronged strategy based on pollution control and prevention, the integration of environmental factors in project planning and implementation, and environmental inputs into resource and regional development planning.

Pollution Control and Prevention

Under the Environmental Quality Act, 1974 new regulatory requirements were introduced to control the management and disposal of toxic and hazardous wastes.

The requirements which were formulated in two sets of Regulations and an Order are to complement the existing Regulations which are found to be inadequate in so far as to control the new and emerging environmental problems arising from the generation, storage, treatment, transportation and disposal of toxic and hazardous wastes. The control strategy is based on the "cradle-to-grave" concept of waste management. It begins when the waste is generated and ends at the disposal site.

However, in the management of toxic and hazardous wastes, a strategy that the Department of Environment favours more is towards reducing the problem at source. Proper planning in production processes and raw materials used is essential in avoiding waste generation. Good

)use-keeping practices in industrial or produc-)n processes as well as waste re-utilisation)uld further minimise the volume of waste nerated which require ultimate disposal. This ·ategy becomes particularly important when ere is presently a severe shortage of treat-ent and disposal facilities to receive the rious types of toxic and hazardous wastes nerated in the country.

vironmental Inputs to Resource d Regional Development Planning

ıe Department continued to promote com-ehensive and holistic approach in develop-ent planning by incorporating environmental :tors into land-use plans such as regional plans, ıster plans, structure plans, local plans or source development plans.

tegrated Project Planning

the integrated project planning approach, vironmental considerations are integrated :o project planning and implementation made ssible via a mandatory requirement under :tion 34A of the Environmental Quality ımendment) Act 1985. The section requires yone who intends to carry out a prescribed tivity to first conduct a study to assess the vironmental impact that will arise from the escribed activity as well as the mitigating easures to overcome them. The prescribed tivity or the proposed project could not be plemented until the report of such study is proved by the Director General of Environ-ent. The Environmental Quality (Prescribed :tivities) (Environmental Impact Assessment) ·der 1987 enforced since 1 April, 1988 speci-d some 19 categories of activities requiring vironmental impact assessment prior to pro-:t approval or implementation.

neral Environmental Programmes

e above three-pronged strategy is supported other on-going environmental programmes ıt include environmental monitoring; environmental education, information and training; environmental research and development; inter-agency and Federal-State co-operation and programmes co-ordination through the State Environmental Action Committees as well as through bilateral, regional and international legal and institutional arrangements.

New Direction

Sectoral Environmental Unit

Environmental issues are interlinked with development policies and practices. The environmental impact of actions in one sector are often felt in other sectors. Internalization of environmental considerations in sectoral policies and programmes are essential to achieve sustainable development. In this regard, key Ministries and Government agencies will have to establish their respective environmental units to handle their own environment related matters. Such Ministries and Government agencies ought to advance policies and programmes that would help attain the goals of sustainable development and integrate environmental considerations in their decision-making processes.

Pro-active Response to Global Environmental Issues

The world's attention is now focussed on global environmental issues such as depletion of the ozone layer, transboundary movements of hazardous wastes, climate change, and conservation of biological diversity. International actions taken to address these issues will inevitably affect Malaysia directly or indirectly. Thus, concrete strategies need to be formulated to counter any adverse implications to the country.

Intensification of Environmental Research and Development in Priority Areas (IRPA)

Research and Development on the areas of population, land, seas and marine environment, atmosphere, natural resources, energy and technology need to be strengthened and promoted in

both private and public sectors. Prudent management of the environment must acquire beforehand its scientific or socio-economic basis for action.

National Environment Policy

In the light of the Langkawi Declaration on Environment and to meet the aspirations of the Declaration, the Department of Environment, with inputs from government and non government organisations would intensify it efforts towards the necessary formulation c national environment policy that meets envi ronmental challenges to the year 2000 an beyond.

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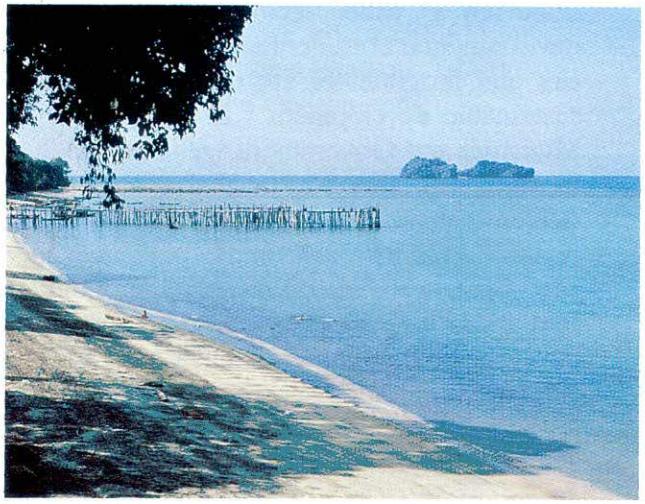
Sound and Sustainable Development .....



Photographs by:

Maketab

..... Minimal Impact to Our Natural Environment

CHAPTER 2
ENVIRONMENTAL QUALITY COUNCIL

ENVIRONMENTAL QUALITY COUNCIL

Introduction

The Environmental Quality Council (EQC) established under section 4(1) of the Environmental Quality Act 1974, is a body to advise the Minister on matters pertaining to the Act and also on any matter referred to it by the Minister. In addition, the Council has also provided guidance to the Department in the formulation of policies and strategies related to environmental protection and management.

Membership

The members of the Environmental Quality Council in 1989 were as follows:

Name and Designation

1. Y.Bhg. Tan Sri Datuk Dr. Hamzah bin Sendut
   DMPN, PGDK, PSM, DJN, PPT
   (Chairman)

2. Encik Kong How Kooi
   Deputy Secretary General,
   Ministry of Science, Technology and the Environment

3. Tuan Haji Ithnin bin Hj. Hassan
   Principal Assistant Director,
   Industry Division,
   Ministry of Trade and Industry

4. Y.Bhg. Dato' Ir. Tuan Haji Shahrizaila bin Abdullah, DSK, KMN, PCM, BSK
   Director General,
   Department of Drainage and Irrigation,
   Ministry of Agriculture

5. Ir. Tuan Haji Abdul Jalil bin Mahmud
   Director General,
   Department of Factories and Machinery,
   Ministry of Labour

6. Y.Bhg. Dato' Syed Sidi Idid bin Syed Abdullah Idid, DPCM, DMP, ASDK
   Deputy Secretary General (Operation),
   Ministry of Transport

7. Ir. Lum Weng Kee, KMN
   Director,
   Engineering Services Division,
   Ministry of Health

8. Encik Wilfred Lingham
   Permanent Secretary,
   Ministry of Tourism and Environmental Development, Sabah

   Alternate:
   Encik Yeo Boon Hai
   Senior Environmental Officer,
   Ministry of Tourism and Environmental Development, Sabah

9. Encik Darell Tsen Nyuk Choi
   Permanent Secretary,
   Ministry of Environment and Tourism
   Sarawak

   Alternate:
   Encik Michael Napil Jawip
   Principal Assistant Secretary,
   Ministry of Environment and Tourism,
   Sarawak

10. Ir. Runny Poh
    Head of Safety,
    Engineering and Safety Unit,
    Petroleum Nasional Berhad
    (PETRONAS)

11. Ir. Ng Swee Kong
    Representative,
    Malaysian Oil Palm Growers Council
    (MOPGC)

12. Encik A.S. Machado
    Representative,

The Federation of Malaysian Manufacturers
(FMM)

Alternate:
Encik G. Krishnan
The Federation of Malaysian Manufacturers
(FMM)

13. Ir. Yeo Siow Poh
Representative,
Malaysian Rubber Producers Council
(MRPC)

Alternate:
Dr. Haji Badri bin Muhammad
Malaysian Rubber Producers Council
(MRPC)

14. Prof. Dr. Sham bin Sani
Deputy Vice Chancellor (Academic and Research)
Universiti Kebangsaan Malaysia

Alternate:
Dr. Ahmad Badri bin Mohamad
Head,
Department of Botany,
Universiti Kebangsaan Malaysia

15. Ir. Gurmit Singh K.S.
President,
Environmental Protection Society of Malaysia
(EPSM)

16. Y.Bhg. Datuk Haji Mohd. Ishak bin Haji Mohd. Ariff, DSPN, SMS, PPT, KMN, PJK
President,
Malaysian Professional Centre

17. Ir. Goh Kiam Seng, KMN
Acting Director General
of Environmental Quality
Department of Environment
(Secretariat)

Activities

In 1989, the Council met three times as scheduled. The meetings were held at the Perak State Secretariat Office, Ipoh on 22nd February, at Pahang State Secretariat Office, Kuantan on 5th July, and at Kuala Lumpur City Hall on 27th November 1989. Among the important agenda tabled in the meetings included the First and Second Meeting between Ministers and State Executive Councillors In-charge of Environmental Matters, National Environmental Award, World Environment Day Celebration, Air Quality Monitoring, Coastal Erosion Protection Programme, Status of the Related Regulations on the Management of Scheduled Wastes, Basel Convention and the Montreal Protocol.

The detailed list of all the working papers submitted to the Council in 1989 is given in Table 2.1. Since 1977, 41 meetings were held and 93 working papers presented (refer Table 2.2). Of the 93 working papers discussed, 22 (24 per cent) were on legal matters, 53 (57 per cent) on programme matters, and the remaining 18 (19 per cent) on other issues.

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Table 2.1

Department of Environment: Working Papers Submitted to the Environmental Quality Council, 1989

Date	Title	Subject
22.2.1989	1. First Meeting Between Ministers and State Executive Councillors In-charge of Environmental Matters	Programme, Coordination
	2. Air Quality Monitoring in Department of Environment	Programme, Air Quality Monitoring
	3. World Environment Day Celebration 1989 at National Level	Programme, World Environment day
15.7.1989	1. Status of the Related Regulations on the Management of Scheduled Wastes	Legal, Toxic and Hazardous Wastes
	2. Basel Convention on the Transboundary Movement of Hazardous Wastes	Issues, Toxic and Hazardous Wastes
	3. Status of the Montreal Protocol on Substances that Deplete the Ozone Layer	Issues, Ozone Layer
22.11.1989	1. Industrial Investment and Corporate Response to Sustainable Development in Malaysia	Programme, Environmental Perspective
	2. Coastal Erosion Protection Programme and its Effect on the Environment	Programme, Erosion Protection
	3. National Environmental Award	Programme, Environmental Award
	4. Second Meeting Between Ministers and State Executive Councillors In-charge of Environmental Matters	Programme, Coordination

Table 2.2

Department of Environment: Working Papers Submitted to the Environmental Quality Council, 1977-1989

Subject	Number of Working Papers		Percentage
1. Legal Matters			
1.1 Regulations			
Clean Air		3	
Crude Palm Oil		2	
Emissions from Diesel Engines		1	
Raw Natural Rubber		2	
EIA		1	
Lead in Petrol		1	
Motor Vehicle Noise		2	
Sewage and Industrial Effluents		1	
Waste, Toxic and Hazardous		3	
1.2 Standards			
Palm Oil		2	
Rubber		1	
Water Quality		1	
1.3 Legislation			
Amendments		2	
	Sub Total	22	24
2. Programme Matters			
2.1 Planning			
Environmental Award		1	
Environmental Education		5	
Environment Impact Assessment (EIA)		3	
Environmental Perspective/Report		6	
Erosion Protection		1	
Guidelines		6	
Klang Valley		1	
Seminar		3	
World Environment Day		6	
2.2 Operations			
Air Quality Monitoring		2	
Clean Air		1	
Contingency Plan		4	
Enforcement		1	
EQA		1	
EQC		1	
Marine, Oil Spills		1	
Motor Vehicle		1	
Palm Oil		1	
Rubber		1	
Sewage and Industrial Effluents		1	
Water Quality Monitoring		1	
2.3 Coordination		6	
	Sub Total	54	57
3. Issues			
Air Pollution		1	
Annual Report		1	
Environmental Issues		3	
Marine Pollution		2	
Noise		1	
Ozone Layer		2	
Piggery Waste		2	
Pollution Complaints		2	
Sewage		1	
Waste, Toxic and Hazardous		2	
Water Pollution		1	
	Sub Total	18	94
	Total	94	100

CHAPTER 3
ADMINISTRATION

ADMINISTRATION

Organisational Structure

The Department of Environment is headed by a Director General who is appointed under section 3(1) of the Environmental Quality Act, 1974. The Department is structured into three functional divisions as shown in Figure 3.1 namely, Planning and Development, Operation, and Administration. In addition, eight regional offices have been set up and are located in Butterworth, Ipoh, Kuala Lumpur, Johor Bahru, Kuantan, Kuala Terengganu, Kuching and Kota Kinabalu.

Planning and Development Division

The main function of the Planning and Development Division is to ensure that environmental factors are taken into consideration at all stages of development or project planning, to document pollution control technologies, to increase public awareness, to promote regional and international co-operation in the field of environmental management and also to formulate and review environmental guidelines and regulations. The Division consists of three sections namely Evaluation, Development, and Programme Formulation. Activities of these sections are as follows:

Evaluation Section

- environmental impact assessment
- environmental inputs to development planning
- natural resources assessment

Development Section

- environmental education
- regional and international affairs
- registration of new industrial premises
- environmental pollution control
- technology documentation
- environmental information, procurement and dissemination

In 1989, two major activities under the Development Section i.e. presiting evaluation of new industrial premises and approval of fuel burning equipment were handed over to the Regional Offices for implementation.

The section only maintain a register of all new development projects subject to the Environmental Quality Act 1974 (Amendment 1985) and liaises with the inventory unit of the Operation Division for updating the inventory of sources and their emission loads.

Programme Formulation Section

- development of criteria and standards
- formulation of regulations
- development of guidelines
- toxic and hazardous waste management
- chemical risk assessment

Operation Division

The function of the Operation Division is to plan, review and coordinate the enforcement and monitoring programmes conducted by the regional offices. The Division has two main sections, namely, Enforcement and Monitoring. Activities of these sections include:

Enforcement Section

- source inventory
- marine pollution control
- licensing
- co-ordination and planning of enforcement programmes
- co-ordination of mobile sources and noise control programmes

Monitoring Section

- co-ordination and planning of environmental quality monitoring programmes
- environmental data management and computerisation
- instrument services
- technical training
- special studies

Administration Division

The function of the Administration Division is to manage matters pertaining to finance, personnel, support services as well as security of the Department. Activities of this Division include:

- general administration and co-ordination
- personnel administration
- finance
- registration of fees collected and licences issued
- support services

Regional Offices

The main functions of Regional Offices are to carry out environmental quality monitoring and enforcement of the Environmental Quality Act, 1974 (Amendment) 1985 as well as the various regulations made under the Act. The offices also provide advisory services to the state authorities regarding sound environmental planning. Activities of the Regional Offices include:

- air, river, and coastal water quality monitoring
- enforcement
- investigation of complaints
- project siting
- approval of fuel burning equipment
- environmental awareness and education programmes
- general administration and finance
- state liaison

Finance

Operation Expenditure

The Department's total operating expenditure for 1989 was M$8 750 239.64. About 59 per cent of the operating expenditure was for staff emolument and related expenditures, 35 percent was for services and supplies and 6 percent for assets. Figure 3.2 shows the Department's operating expenditure for the period 1980-1989.

Development Expenditure

The total allocation for development in 1989 was M$2.63 million, and a sum of M$1 557 950.55 or 59 per cent of the allocation was spent for the purchases of equipment. The Department's expenditure for the period 1980-1989 is also shown in Figure 3.2.

Revenue

Revenue collected in 1989 amounted to M$950 964.70. There was an increase of 44 per cent compared to the total revenue collected in 1988. Effluent related fees accounted for 77 per cent of the total revenue, while compounds and fines collected under the Environmental Quality (Clean Air) Regulations 1978 amounted to 13 per cent. Other sources of revenue including the sale of environmental regulations booklets and documents, accounted for another 10 per cent of the revenue.

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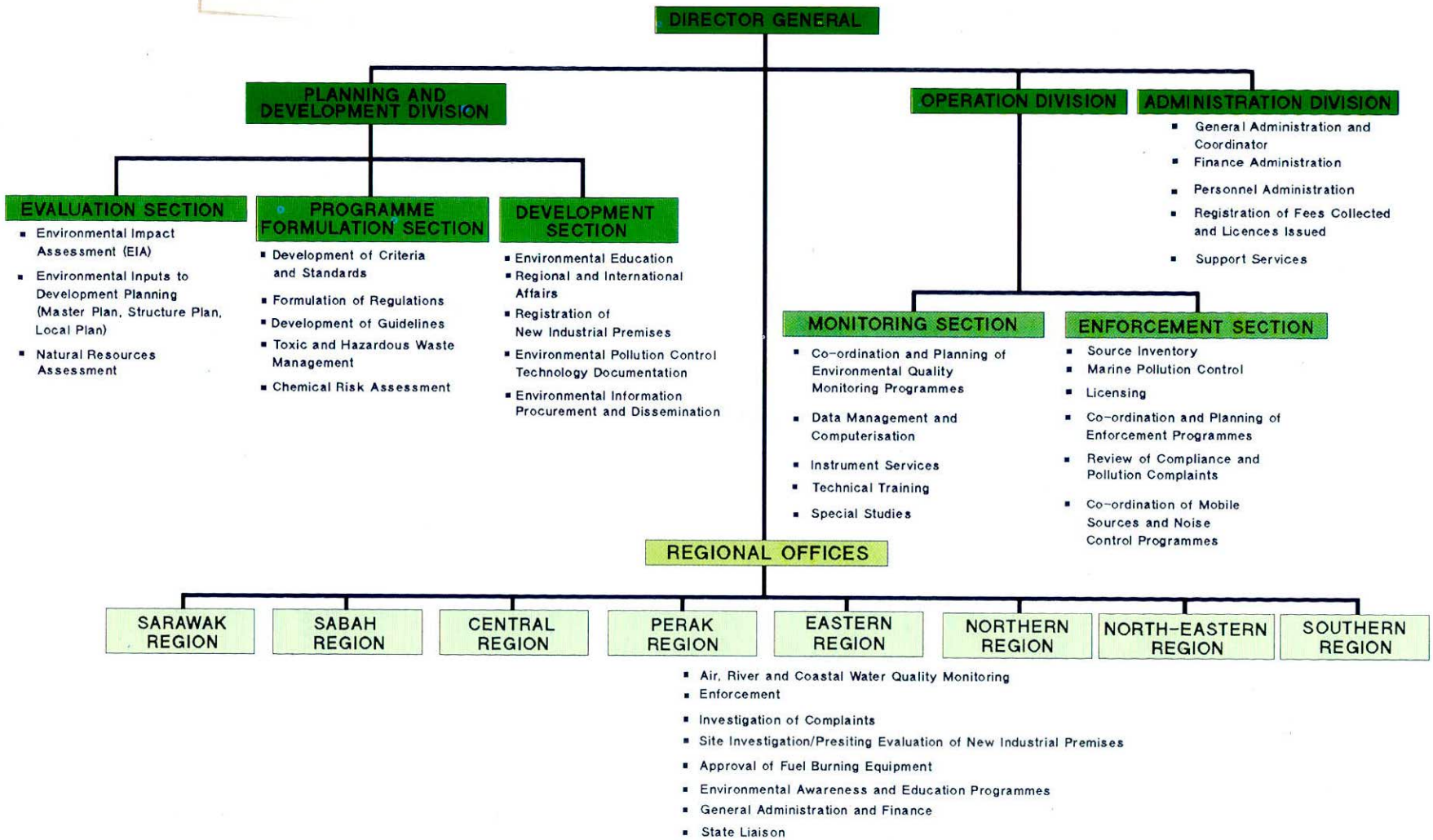
Figure 3.1 Department of Environment: Organisational Structure, 1989



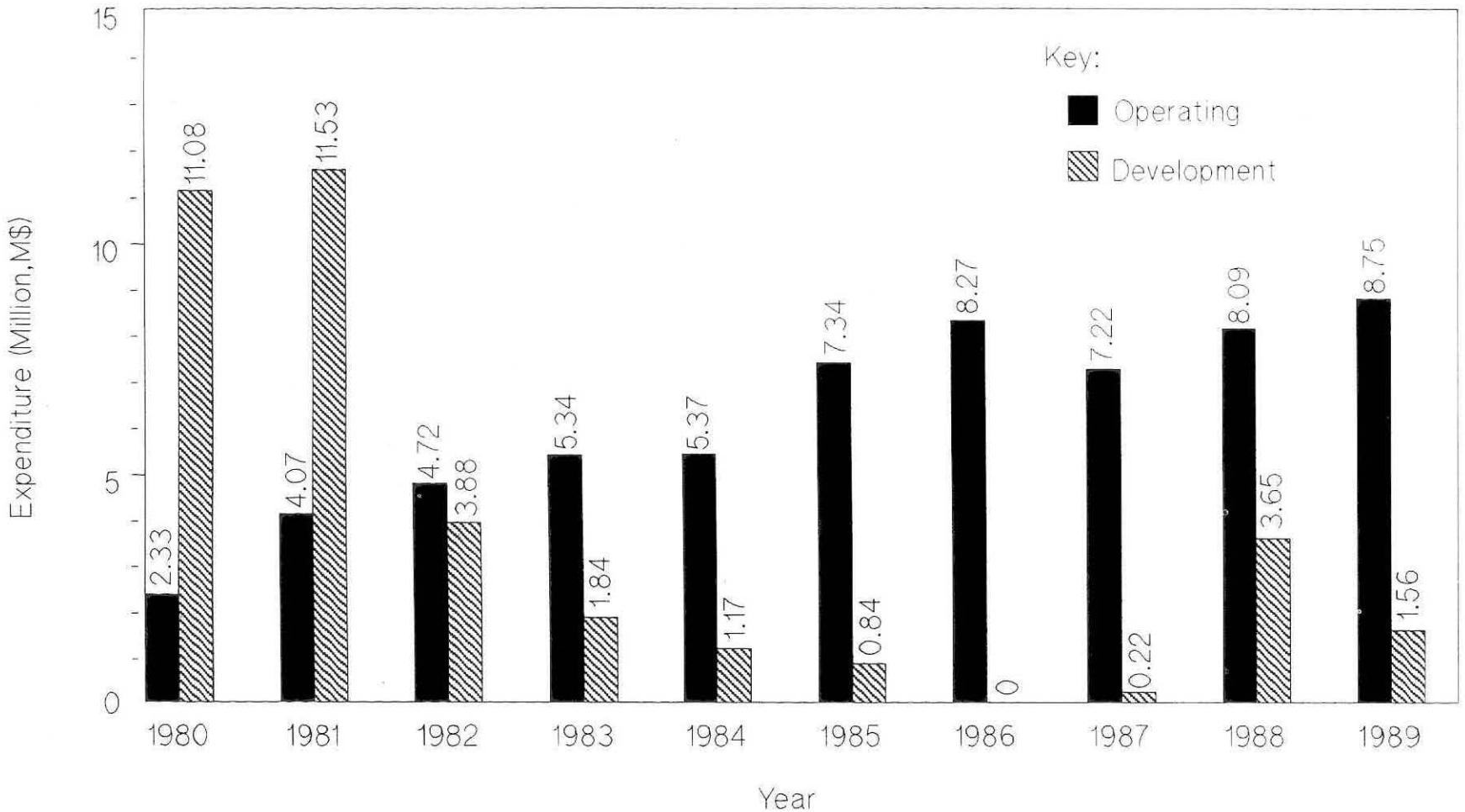


Figure 3.2 Department of Environment: Operating and Development Expenditure, 1980–1989

CHAPTER 4
ENVIRONMENTAL QUALITY MONITORING AND SURVEILLANCE

ENVIRONMENTAL QUALITY MONITORING AND SURVEILLANCE

Air Quality

Under the Air Quality Monitoring Programme, measurements of total suspended particulates (TSP), atmospheric lead, and dust fallout at 224 monitoring stations were continued. Tables 4.1 and 4.2 show the distribution of monitoring stations for TSP, dust fallout and lead in residential, industrial, commercial and rural areas of the country. In 1989, there was a total of 32 monitoring stations for TSP, an increase of 9.4 per cent from 1988, and 192 stations for dust fallout, an increase of 19.3 per cent from a total of 161 in 1988.

Table 4.3 indicates the sampling performance for dust fallout and TSP. Total number of samples for TSP expected in 1989 was 2511, a decrease of 2 per cent from 1988 expected number of samples. The actual number of samples collected, however, was 1677 compared to 1666 in 1988. Hence, percentage of achievement for TSP sampling has increased from 65 in 1988 to 67 in 1989. Dust fallout sampling performances were found to be satisfactory at a level of 92 per cent.

River Water Quality

In 1989, the River Water Quality Monitoring Programme was continued. A total of 86 rivers were monitored. The number of samples collected were 3079 samples from 562 monitoring sites. However, due to inaccessibility and logistic problems, 26 sites were dropped. Six new monitoring sites were selected, principally based on the complaints received by the Department of Environment, the establishment of new water pollution sources and the need to protect the beneficial uses of water resources.

The water quality parameters measured are based on the physico-chemical and biological characteristics of water. In-situ water quality measurements include parameters such as turbidity, dissolved oxygen, salinity, temperature, pH and electrical conductivity while laboratory analysis was performed on as many as 30 other chemical and biological parameters when deemed relevant. These also include bacteriological indicator parameters, pesticides and detergents. The water quality analyses carried out in 1989 and their breakdown according to parameters are presented in Figure 4.1.

Coastal Water Quality

In 1989, a preliminary review of all the coastal water quality monitoring sites was completed. As a result, 152 sites were selected for coastal water quality monitoring and 11 sites were dropped. The sites were selected to represent areas of beneficial uses especially for recreational purposes as well as for indicating pollution arising from river inputs. Tables 4.4 and 4.5 list all coastal waters and river estuaries monitoring stations in the country.

A minimum of six samples were collected at all sites except for the state of Sarawak where only four samples were collected from each site. A total of 775 samples were collected and analysed by the Chemistry Department for physical, chemical and biological parameters.

In addition, training for sediment sampling was conducted for staff of Regional Offices involved in coastal monitoring programmes. They would be expected to carry out sediment sampling when the sediment samplers are made available. In order to equip the Regional Offices further in the implementation of their monitoring activities, four Regional Offices were

supplied with inflatable dinghies and outboard motors. The remaining four Regional Offices will receive theirs in 1990.

Groundwater Quality

As a follow-up to the initial work done in 1988 towards establishing groundwater monitoring programmes, a request was made by the Department of Environment for a consultancy assistance from WHO/PEPAS to carry out a study entitled "Development of Environmental Quality Surveillance and Monitoring Programmes for Toxic Pollutants". Phase 1 of the study was conducted in May-June 1989 while phase 2 was scheduled to take place immediately after the completion of a project proposed under the groundwater quality monitoring programmes entitled "Groundwater Quality Monitoring Network in Malaysia" which was tentatively scheduled to start in May 1989 for a duration of six months. Due to some problems, the project was delayed, thus phase 2 of the study.

Four main activities were carried out during phase 1 of the above mentioned study:

(a) determination of sites for environmental monitoring of groundwater pollution;

(b) development of guidelines for site investigations;

(c) development of a cost-effective programme for monitoring of substances in groundwater samples;

(d) recommendations on equipment and skilled manpower required to execute groundwater monitoring programme.

The terms of reference for phase 1 of the proposed project on Groundwater Quality Monitoring Network in Malaysia was reviewed by a technical committee comprising representatives from related government agencies and universities. Upon receiving approval from the Implementation and Co-ordination Unit of the Prime Minister's Department, offers were made to local universities to submit, based on the agreed terms of reference, their technical and financial proposals for the project. After thorough appraisal of the proposals a decision was made that the Universiti Teknologi Malaysia be offered to carry out the project.

Special Studies

In 1989 several special studies were carried out to cater for the various needs of the Department particularly to investigate persistent environmental pollution problems and to establish baseline information on emerging pollution problems. They were water pollution studies, air pollution studies and marine pollution studies.

Table 4.6 describes the major studies carried out in 1989 and the findings.

Noise

In 1989, noise measurements were carried out in several major towns in Peninsular Malaysia including Ipoh, Kuantan, Kuala Terengganu, Pulau Pinang, Melaka, Johor Bahru, Seremban and Alor Setar. The main objective of the studies was to set-up an initial database for the formulation of appropriate noise guidelines and regulations.

The Mobile Noise Monitoring Unit officially launched on 10 June, 1989 by the Honourable Deputy Minister of Science, Technology and the Environment was used in carrying out this programme. The Unit which was equipped with modern equipment enabled more comprehensive data collections to be made.

The types of noise monitored include noise from traffic, industries as well as community and entertainment industries. Community noise survey was conducted in residential areas, hospital wards, schools and shopping complexes whilst entertainment noise was measured at discotheques, lounges, night-clubs and amusement arcades.

ENVIRONMENTAL QUALITY MONITORING

Coastal Water Monitoring

Photographs by: Marine Unit

Sediment Sampling

Total Suspended Particulates Sampling

Photograph by: Air Quality Unit

Community Noise Measurement

Photograph by: Izzuddin

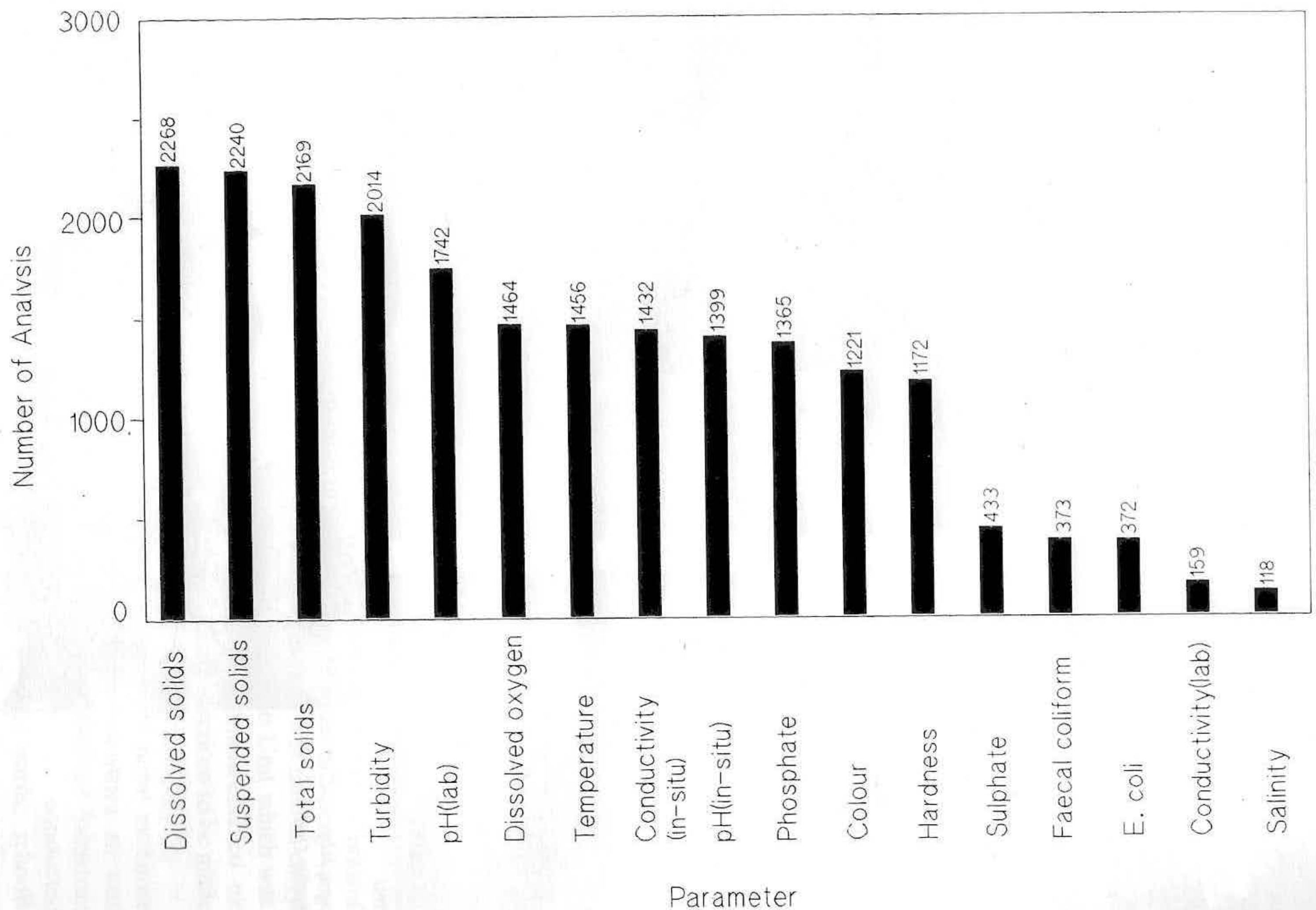
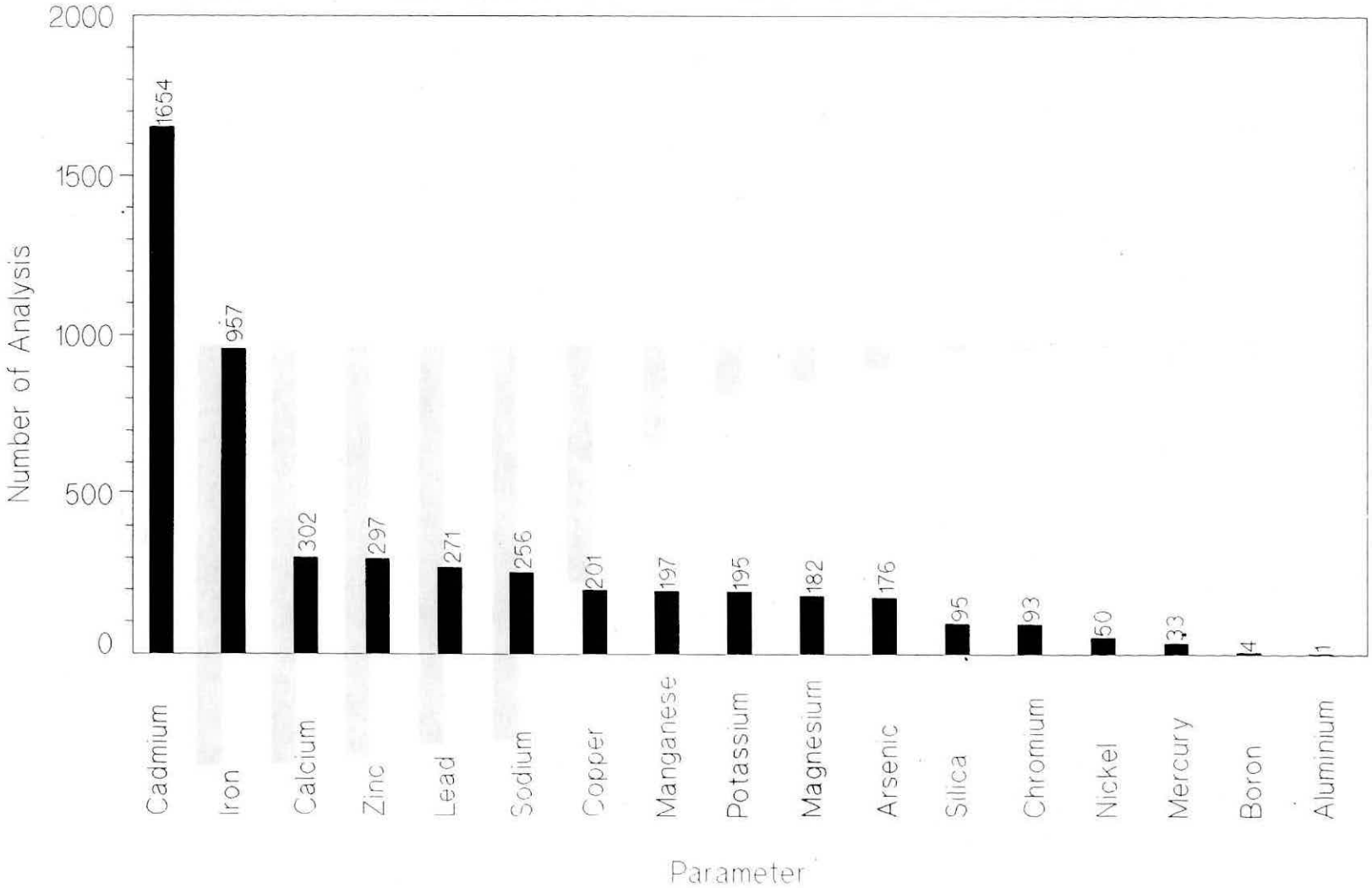


Figure 4.1 Malaysia: Number of Analysis for Physical, Biological and Chemical Parameters of the Monitored River Waters, 1989



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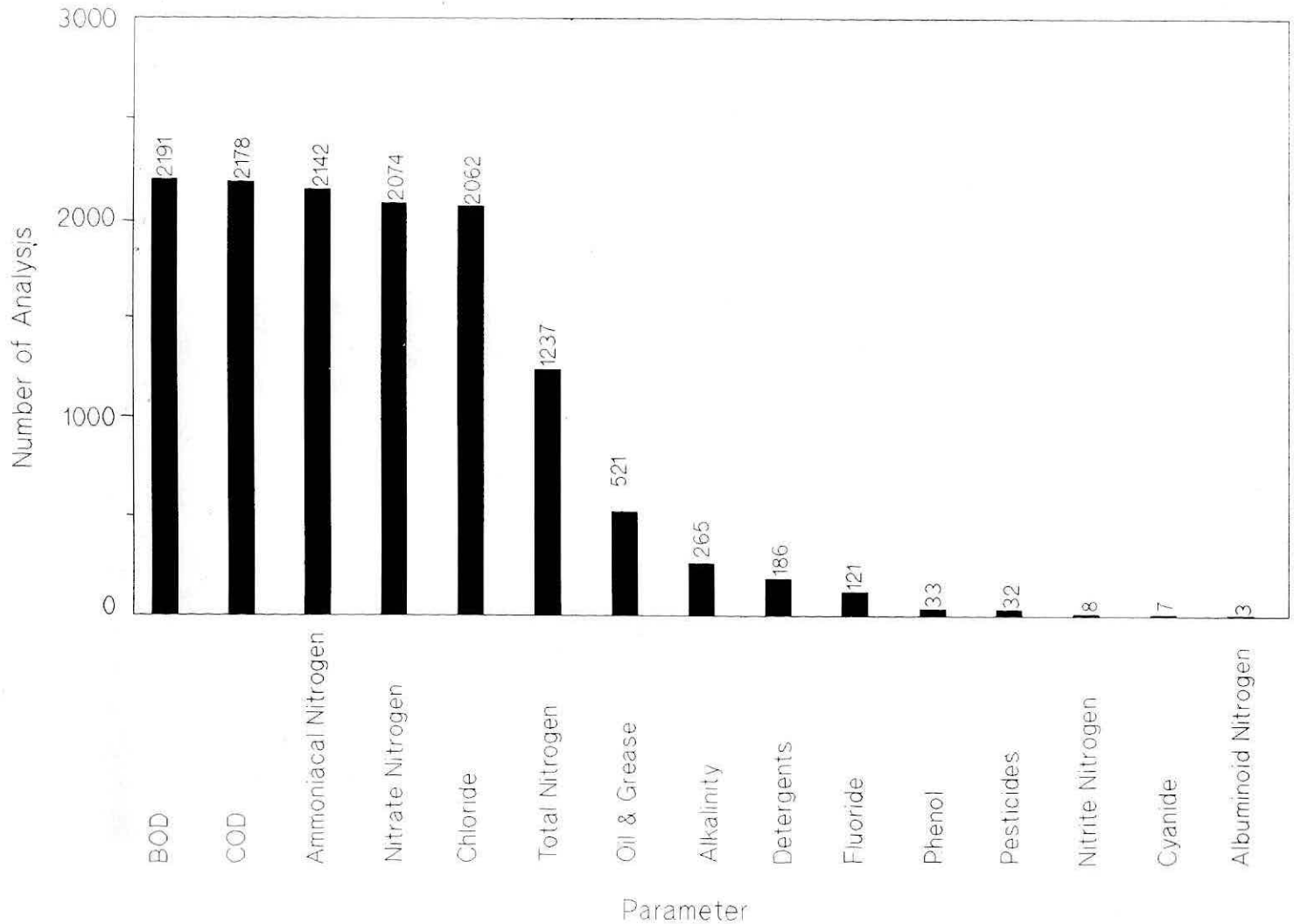

Figure 4.1 Malaysia: Number of Analysis for Physical, Biological and Chemical Parameters of the Monitored River Waters, 1989

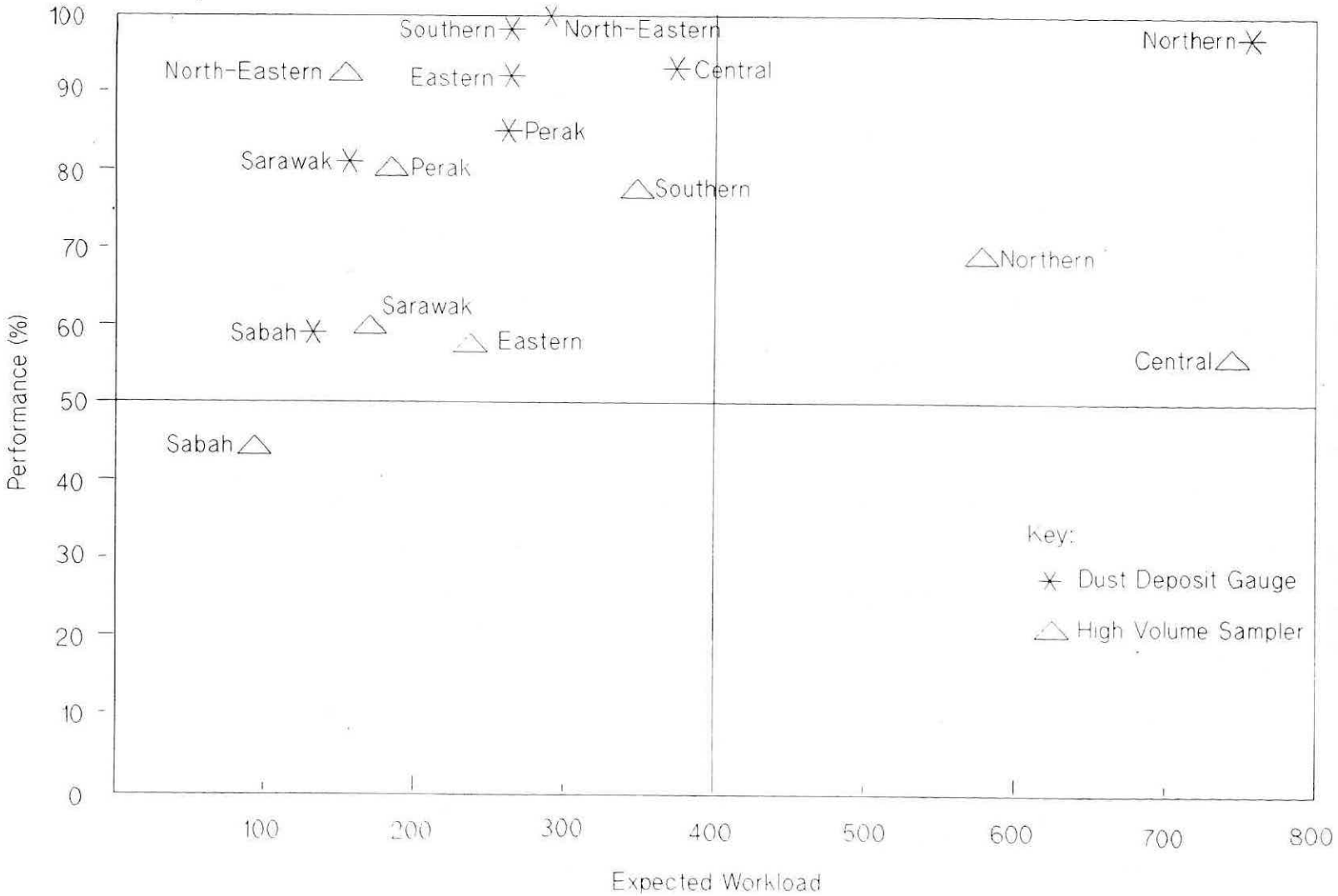

Figure 4.2 Department of Environment: Air Quality Monitoring Performance, 1989

Table 4.1

Malaysia: Distribution of Air Quality Monitoring Stations for Total Suspended Particulates, 1989

Type / State	Source		Ambient			Total
	Industries	Traffic	Residential	Commercial	Rural	
Johor	2 *	1 *	1 *	1 *	-	5
Kelantan	-	-	-	-	-	-
Kedah	1 *	-	-	-	-	1
Melaka	-	-	-	-	-	-
Negri Sembilan	-	-	-	-	-	-
Pahang	1 *	1 *	2 *	-	-	4
Perlis	-	-	-	-	-	-
Perak	1 *	-	-	1 *	-	2
Seberang Perai/Pulau Pinang	1 *	2 *	1 *	-	1	5
Sabah	-	-	1 *	-	-	1
Sarawak	2	-	-	-	-	2
Selangor	2 *	1 *	1 *	-	-	4
Terengganu	1 *	-	-	1 *	-	2
Wilayah Persekutuan	-	5 *	1 *	-	-	6
Total	11	10	7	3	1	32

Note:

* Lead content in the air, is also monitored.

Table 4.2

Malaysia: Distribution of Air Quality Monitoring Stations for Dust Fallout, 1989

Type / State	Source	Ambient			Total
	Industries	Residential	Commercial	Rural	
Johor	16	5	1	-	22
Kelantan	7	1	-	-	8
Kedah	10	1	1	-	12
Melaka	5	-	1	-	6
Negri Sembilan	4	2	1	-	7
Pahang	14	4	2	-	20
Perlis	8	-	1	-	9
Perak	21	-	1	-	22
Seberang Perai/Pulau Pinang	16	5	2	1	24
Sabah	8	3	-	-	11
Sarawak	9	3	1	-	13
Selangor	14	4	-	-	18
Terengganu	15	1	2	-	18
Wilayah Persekutuan	1	-	1	-	2
Total	148	29	14	1	192

Table 4.3

Malaysia: Sampling Performance of High Volume Sampler (HVS) and Dust Deposit Gauge (DDG) by Region, 1989

Region	HVS			DDG		
	Expected Number of Samples	Actual Number of Samples	Percentage of Achievement	Expected Number of Samples	Actual Number of Samples	Percentage of Achievement
Central	751	430	57	374	349	93
Eastern	237	138	58	264	242	92
Northern	582	406	70	757	736	97
North-Eastern	152	141	93	288	288	100
Perak	182	148	81	262	223	85
Southern	347	272	78	264	259	98
Sabah	91	41	45	132	78	59
Sarawak	169	101	60	156	126	81
Total	2511	1677	67	2497	2301	92

Table 4.4
Malaysia : Coastal Water Monitoring Stations, 1989

State	Coastal Monitoring Stations	
	Station Number	Location
JOHOR	1334925	Perairan Kukup
	1335923	Tanjung Pelepas (Kuala Sungai Pulai)
	1437921	Pantai Lido
	1437920	Hospital Tun Aminah
	1437951	Janakuasa Elektrik Tun Ismail
	1438919	Pelabuhan Pasir Gudang
	1341961	Pantai Tanjung Setapa
	1542914	Pantai Desaru
	1841911	Pantai Teluk Mahkota
	2339960	Pantai Seri Pantai
	2538958	Pantai Air Papan
	2538959	Pantai Teluk Gorek (Penyabong)
KEDAH	5603905	Pantai Merdeka
	5603906	Luar Pantai Merdeka
	6497914	Kampung Triang,Pulau Langkawi
	6398913	Pantai Kuah, Pulau Langkawi
	6398914	Pantai Langkawi Island Resort
	6498915	Pantai Pasir Hitam,Pulau Langkawi
	6498916	Pantai Tanjung Rhu,Pulau Langkawi
	6497901	Teluk Ewa,Pulau Langkawi
	6397902	Pantai Chenang,Pulau Langkawi
	6297903	Pantai Tengah,Pulau Langkawi
	6297901	Tanjung Lembong,Pulau Langkawi
KELANTAN	5835905	Pantai Ruku
	6023908	Pantai Irama, Bachok
	6123909	Pantai Sabak
	6122903	Pantai Chinta Berahi
	6231910	Pantai Sri Tujuh
MELAKA	2320909	Pantai Tanjung Bidara
	2221908	Pantai Kundur
	2221910	Pantai Kundur
	2221906	Pantai Rembang
	2123911	Pulau Besar
N.SEMBILAN	2418914	Pantai Port Dickson-Batu 10
	2418913	Pantai Port Dickson-Batu 8
	2418912	Pantai Port Dickson-Batu 8
	2418905	Pantai Port Dickson-Batu 7

State	Coastal Monitoring Stations	
	Station Number	Location
	2418906	Pantai Port Dickson Batu 5
	2517907	Port Dickson-Bandar
	2517909	Port Dickson-LLN
PAHANG	3833909	Pantai Teluk Gelora
	3833915	Pantai Batu Hitam
	3933901	Pantai Muhibbah, Balok
	4133903	Pantai Cherating
	3833910	Pantai Teluk Chempedak
	3833911	Luar Pantai Teluk Chempedak
	2841930	Pantai Tioman Island Resort
	2841924	Pantai Kampung Teluk Salang
	2841923	Pantai Kampung Tekek
PERAK	4205923	Pantai Teluk Batik
	4305924	Pantai Pasir Panjang
	4205908	Pantai Pasir Bogak
P.PINANG	5303906	Kawasan Perusahaan Prai 1
	5303907	Kawasan Perusahaan Prai 2
	5303926	Kawasan Perindustrian Prai
	5203910	Selat Pulau Pinang Selatan 1
	5303911	Selat Pulau Pinang Selatan 2
	5303913	Selat Pulau Pinang Selatan 3
	5303912	Selat Pulau Pinang Utara
	5402904	Pantai Batu Feringgi (Hotel Casuarina)
	5402915	Pantai Batu Feringgi (Hotel Rasa Sayang)
	5502901	Pantai Miami
	5201918	Pantai Gertak Sanggul
	5201919	Pantai Tanjung Karang (Gertak Sanggul)
	5202923	Teluk Tempoyak
	5402913	Pantai Teluk Bahang
	5402912	Pantai Teluk Bahang(Hotel Mutiara)
	5403906	Pantai Bersih
	5202901	Batu Maung
	5303901	Gelugor
	5203901	Selat Pulau Pinang Selatan 1
	5403902	Persiaran Gurney
SABAH	5053901	Teluk Brunei,Sipitang
	5555907	Pantai Manis,Papar
	6565917	Pantai Bak-Bak,Kudat
	6161911	Pantai Dalit,Tuaran
	5656904	Pantai Tanjung Aru (Restoran Lido)

State	Coastal Monitoring Stations	
	Station Number	Location
	5656908	Pantai Tanjung Aru (Roller Skating)
	5656914	Pantai Tanjung Aru (Pantai No.3)
	5560901	Pantai Lokawi
	5251938	Pantai Tanjung Aru,Labuan
	5251938	Pantai Layang-Layangan, Labuan
	5151934	Pantai Sabah Golf,Pulau Labuan
SARAWAK	1704905	Pantai Bako
	1704906	Luar Pantai Bako
	3230913	Pantai Bintulu
	3230914	Luar Pantai Bintulu
SELANGOR	2616926	Pantai Bagan Lalang
	3013908	Selat Kelang Utara
	2712902	Pantai Morib
TERENGGANU	4334926	Pantai Kijal
	4434938	Pantai Kemasik
	4833917	Pantai Rantau Abang
	4231934	Pantai Chendering
	5331935	Pantai Batu Buruk
	5825903	Pantai Bukit Keluang

Table 4.5

Malaysia : River Estuary Monitoring Stations, 1989

State	River Estuary Monitoring Stations	
	Station Number	Location
JOHOR	2024932	Kuala Sungai Muar
	1729930	Kuala Sungai Batu Pahat
	1730962	Kuala Sungai Lurus
	1437946	Kuala Sungai Melayu
	1437922	Kuala Sungai Skudai
	1437919	Kuala Sungai Segget
	1438943	Kuala Sungai Tebrau
	1438918	Kuala Sungai Masai
	1440916	Kuala Sungai Johor
	2438905	Kuala Sungai Mersing
KEDAH	6102908	Kuala Sungai Kedah
	5903919	Kuala Sungai Sala
	5704901	Kuala Sungai Merbok/Sungai Dedap
	5603904	Kuala Sungai Merbok
	5503901	Kuala Sungai Muda
KELANTAN	6222901	Kuala Sungai Kelantan
MELAKA	2122903	Kuala Sungai Melaka
N.SEMBILAN	2517910	Kuala Sungai Lukut
	2319901	Kuala Sungai Linggi
PAHANG	2834919	Kuala Sungai Rompin
	3533913	Kuala Sungai Pahang
	3833906	Kuala Sungai Tanjung Lumpur
PERAK	4007901	Kuala Sungai Perak
	4994919	Kuala Sungai Kurau
	5003921	Kuala Sungai Piandang
	4806925	Kuala Sungai Sepetang
PERLIS	6401901	Kuala Sungai Perlis
P.PINANG	5104901	Kuala Sungai Kerian
	5204901	Kuala Sungai Jejawi
	5304904	Kuala Sungai Juru
	5303908	Kuala Sungai Prai

State	River Estuary Monitoring Stations	
	Station Number	Location
SARAWAK	1898901	Kuala Sungai Semantan
	1898902	Luar Kuala Sungai Semantan
	1702903	Kuala Sungai Santubong
	1702904	Luar Kuala Sungai Santubong
	1604907	Kuala Sungai Sarawak
	1605908	Luar Kuala Sungai Sarawak
	2112909	Kuala Batang Rajang
	2112910	Luar Kuala Batang Rajang
	3130911	Kuala Batang Kemena
	3130912	Luar Kuala Batang Kemena
	4349915	Kuala Sungai Miri
	4449916	Luar Kuala Sungai Miri
	4449917	Luar Kuala Sungai Miri
SELANGOR	2517922	Kuala Sungai Sepang
	3013909	Kuala Sungai Kelang
	2913903	Kuala Sungai Langat-Selat Lumut
	2814925	Kuala Sungai Langat-Jugra
	3312915	Kuala Sungai Selangor
	3808924	Kuala Sungai Bernam
TERENGGANU	4234929	Kuala Sungai Chukai
	4534922	Kuala Sungai Kerteh
	4634920	Kuala Sungai Paka
	4734918	Kuala Sungai Dungun
	5232911	Kuala Sungai Marang
	5331907	Kuala Sungai Terengganu

Table 4.6
Malaysia: Special Studies, 1989

Type of Study	Description/Findings
1. Short Term Studies	
a) Port Dickson	Study of effluent discharge and faecal coliform die-off rates from surface drains outfalls was done at Bt. 7, Teluk Kemang, Port Dickson in tandem to a study of the marine water quality carried out by the Marine Monitoring Unit. Sunlight is an important factor in reducing the faecal coliform from the seawater. The faecal coliform counts were found to be lower for samples collected away from the beach. In term of suspended solids the levels at Port Dickson were relatively low.
b) Pasir Gudang	The seawater of the Straits of Johor (East) was being polluted by the industries from Pasir Gudang. This causes numerous complaints received from the Singapore Government as the pollution problem caused "fish kills" at several fish cage-culture projects. From the study, it was established that the main problem was due to the discharge of effluent containing oil and grease from palm oil refineries.
c) Kemaman, Terengganu	A study of air pollution from Perwaja Terengganu Sdn. Bhd. steel mill at Teluk Kalong, Kemaman, Terengganu was carried out. From the study, it was established that dust pollution was a serious problem and it was especially so because of lack of air pollution control system. The mill is located far from any major residential areas but the dust problem was affecting industries nearby.
d) Sungai Kinta, Perak	Sungai Kinta water pollution study was done at the request of the Perak Regional Office. Final results of the river water quality sampling are still pending. However, preliminary results indicated that sewage is a major contributor to pollution in Sungai Kinta.
e) Lingai, Terengganu	A study on the relationship of heavy mist/smoke and traffic accident rate at Lingai, Terengganu was carried out. From the study, it was observed that

	Lingai Brick Factory is the source emitting dense mist/smoke. Topographical and weather conditions could further aggravate the pollution problem of the area.
f) Sanitary Surveys	The sanitary surveys of water intake points, and their catchment areas were carried out jointly with the Ministry of Health and Department of Public Works (Water Supply Division). The catchment areas covered were: i) Sungai Rangkap, Gombak District ii) Sungai Ampang, Gombak District iii) Bukit Tampoi, Dengkil, Kuala Langat District From the surveys, it was found that Sungai Ampang is clean with no potential pollution problem. Sungai Rangkap is also clean but with potential problem from sources such as campers. Bukit Tampoi catchment area is faced with pollution from nearby factories and housing estates.
g) Sungai Skudai, Johor	The Sungai Skudai Study was carried out after receiving several complaints from the Public Utilities Board (PUB), Singapore. The river is polluted by factories within the river basin as well as pig farms, solid wastes disposal sites and sewage from housing estates and towns.
2. Long Term Studies	
a) Acid Rain Study	Samplings of rain water were carried out for a year at several selected stations in the Klang Valley. From the analysis of the data, it was found that the acidity of rain water is well within the acceptable values.
b) Sungai Damansara Study	The study, an integrated project sponsored by IRPA (Intensification Research in Priority Areas) carried out together with the Forest Research Institute of Malaysia (FRIM), Drainage and Irrigation Department and Universiti Malaya is still on-going.
c) Acid Rain Impact on Surface Waters	Several abandoned mining pools and surface waters reservoirs were studied. Initial findings indicated that acid rain has no impact on our surface waters due to large buffering capacity of these waters.

CHAPTER 5
STATE OF THE ENVIRONMENT

STATE OF THE ENVIRONMENT

Introduction

The state of the environment with respect to air, river water, coastal and marine water quality continued to be monitored in 1989. The aim was primarily to determine the change in the quality vis-a-vis the increase or decrease in pollution loads introduced into the environment. More importantly the information on the state of the environment is used to assess the effectiveness of short and long term environmental pollution control programmes and to identify the direction of future research activities to be carried out for the purpose of strengthening the existing programmes or formulating new environmental management programmes.

Air Quality

The industrial and vehicular traffic congested areas in the country continued to record high levels of particulates, whilst the levels of particulates remained relatively low in the commercial, residential and rural areas. As for lead content in the air, the levels have increased slightly in the commercial, industrial and residential areas but more significantly in the areas of heavy vehicular traffic. The dust fallout levels which were used to indicate localised dust problem remained high in both the industrial and commercial areas. The following paragraphs describe further the state of air quality with respect to total suspended particulates, atmospheric lead, and dust fallout.

Total Suspended Particulates (TSP)

In 1989, monitoring stations located in heavy vehicular traffic areas recorded high mean levels of total suspended particulates (TSP) as shown in Figure 5.1. The areas recorded the highest annual mean concentration of 132 ug/m^3 (refer Table 5.1). Five out of six stations monitored recorded annual mean concentrations exceeding the Recommended Malaysian Annual Guideline[a]. The station located at the Kajang Police Station recorded the highest annual mean concentration of 158 ug/m^3 from a total of 21 daily observations. All monitoring stations located in areas of heavy vehicular traffic complied with the Recommended Malaysian Daily Guideline[b] with the exception of the station at Kajang Police Station that recorded exceedance of two out of 21 daily observations. The values obtained were 286 and 283 ug/m^3.

As shown in Figure 5.2 industrial areas recorded fairly high mean levels of TSP in the country. The annual mean concentration for the nine stations was 97 ug/m^3. Five out of nine stations monitored recorded annual mean values exceeding the Recommended Malaysian Annual Guideline. The station located at Johnson and Johnson, Petaling Jaya recorded the highest annual mean concentration of 150 ug/m^3 from a total of 47 daily observations. All monitoring stations located in the industrial areas complied with the Recommended Malaysian Daily Guideline except the station located at the Johor Port Authority which recorded an exceedance of two out of 61 daily observations. The values recorded were both 267 ug/m^3.

Levels of TSP recorded by monitoring stations located in the commercial areas are as shown in Figure 5.3. The annual mean concentration for the three stations was 90 ug/m^3. The station located at the Central Market, Ipoh recorded the highest annual mean concentration of 114 ug/m^3 which exceeded the Recommended Malaysian Annual Guideline. All the monitoring

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Note

a The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m^3 (annual mean of 24-hour measurements)

b The Recommended Malaysian Daily Guideline for Total Suspended Particulates is 260 ug/m^3 (mean of 24-hour measurements)

stations located in commercial areas, however, complied with the Recommended Malaysian Daily Guideline.

As indicated in Figure 5.4 monitoring stations located in residential areas in the country recorded low levels of TSP except the station at SIRIM, Shah Alam that recorded an annual mean concentration of 97 ug/m^3. The station also recorded the maximum daily value of 196 ug/m^3. The annual mean concentration obtained from the five monitoring stations was 70 ug/m^3. All the stations located in the residential areas complied with the Recommended Malaysian Daily Guideline.

The only monitoring station located in the rural area recorded an annual mean value of 76 ug/m^3 which is well within the Recommended Malaysian Annual Guideline. The Daily Guideline was also complied with and the maximum value recorded was 105 ug/m^3.

Figure 5.5 shows that on the whole in 1989, there was a slight increase in the annual mean concentrations of TSP in all areas monitored.

Atmospheric Lead

Monitoring results obtained in 1989 for atmospheric lead showed that areas of heavy vehicular traffic in the country recorded the highest annual mean concentration of 1.45 ug/m^3 from a total of 323 daily observations (refer Table 5.2). This was followed by residential, industrial and commercial areas which recorded annual mean concentrations of 0.36, 0.23 and 0.10 from a total of 79, 237 and 107 daily observations respectively.A maximum daily value of 3.00 ug/m^3 was recorded.

Analysis of three month moving averages showed that four out of 16 stations did not comply with the Recommended Guideline[c]. The station located at the Bangsar Dental Clinic exceeded the Recommended Malaysian Guideline[c] all the time. Stations located at the Pudu Post Office, Science Centre and City Hall recorded 67, 50 and 11 per cent non-compliances respectively

Figure 5.6 shows that generally in 1989, levels o lead in the air for commercial, residential anc industrial areas have increased slightly. The levels in the areas of heavy vehicular traffic or the other hand increased significantly, much coulc have been due to the rapid increase in the motor vehicle population.

Dust Fallout

Table 5.3 shows that in 1989, industrial area recorded the highest dust fallout level of 148 mg m^2/day. Commercial and residential areas re corded annual mean monthly concentration o 145 and 130 mg/m^2/day respectively. Both the industrial and commercial areas recordec levels exceeding the Recommended Malaysiar Guideline[d]. The residential areas, however recorded otherwise (see Figure 5.7).

River Water Quality

The state of river water quality in Malaysia fo 1989 on the whole indicates a slight improve ment. The appraisal of water quality data collected is based on the water quality index fo five parameters: Biochemical Oxygen Demanc (BOD5), Ammoniacal-Nitrogen (NH3-N) Suspended Solids, pH and Chemical Oxyger Demand. The water quality data was compared to the Malaysian Interim National Water Qual ity Standards for Class III Water Use (fishery water supply with extensive treatment anc livestock drinking).

Out of a total of 86 major rivers monitored, three rivers namely Sungai Juru, Sungai Kelang anc Sungai Ibai were seriously polluted whilst 3(rivers fell within the slightly polluted categor

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Note

c The Recommended Malaysian Guideline for lead is 1.5 u m^3(three months averaging period)

d The Recommended Malaysian Guideline for Dust Fallout i 133 mg/m^2/day (annual mean of monthly values)

and the remaining 49 rivers were classified as clean. Most of the polluted rivers (75 per cent) were those flowing on the west coast of Peninsular Malaysia. It was encouraging though to note that two of the most polluted rivers in the country, Sungai Juru and Sungai Kelang experienced a slight improvement in its overall water quality at a rate of 0.12 per cent and 1.16 per cent respectively.

Despite the slight improvement in the overall trends of water quality for the period of 1985-1989, less satisfactory observation was made for three important water quality parameters namely Biochemical Oxygen Demand, Suspended Solids and Ammoniacal-Nitrogen as shown in Table 5.4. The organic pollution which is expressed as BOD5 had deteriorated at the rate of 0.37 per cent whilst the levels of ammoniacal-nitrogen and suspended solids deteriorated significantly and slightly at 10.17 per cent and 1.89 per cent respectively. The deterioration in water quality indicated heavy and uncontrolled loadings of organic wastes and silt into the water courses.

Biochemical Oxygen Demand (BOD5): Organic Pollution

Generally in 1989, the quality of the river water in terms of organic pollution remained unchanged. Industrial and domestic discharges accounted for major components of the organic load. Figures 5.8a and 5.8b show the classification of rivers with respect to organic pollution as expressed by BOD5.

Four rivers were seriously polluted in 1989 as compared to only three rivers in 1988. The rivers falling under this category were Sungai Juru, Sungai Perlis, Sungai Merbok and Sungai Kelang all of which are situated on the west coast of Peninsular Malaysia. Out of these four seriously polluted rivers, Sungai Juru and Sungai Kelang showed a slight improvement. Thirteen rivers (15 per cent) fell in the slightly polluted category and the remaining 69 rivers (80 per cent) were classified as clean. All the 21 rivers monitored in Sarawak and 14 rivers from a total of 17 rivers monitored in Sabah were classified as clean rivers.

Suspended Solids (SS): Soil Erosion and Sedimentation

In 1989, suspended solids as an indicator of soil erosion that resulted in river sedimentation and siltation continued to pose a major environmental problem in Malaysian rivers. This can be associated with the intensive land clearings, uncontrolled development, mining and logging activities in the catchment areas.

A total of 41 rivers (48 per cent) were classified as seriously polluted, 14 rivers (16 per cent) were slightly polluted whilst the remaining 31 rivers (36 per cent) were clean (see Figures 5.8a and 5.8b).

Out of the 41 seriously polluted rivers, only four rivers namely Sungai Juru, Sungai Kelang, Sungai Sarawak and Sungai Batang Tatau showed slight improvement. The distribution of these rivers were, 15 in the west coast and 3 in the east coast of Peninsular Malaysia, 9 in Sarawak and 14 in Sabah. All the polluted rivers in Sabah were found to deteriorate at a high net rate of 12.48 per cent.

Ammoniacal-Nitrogen (NH3-N): Pollution by Sewage and Animal Waste

Among all the five key parameters used in the appraisal of river water quality data, ammoniacal-nitrogen was the parameter with the highest deterioration rate at 10.17 per cent (refer to Table 5.4). This indicates that the affected rivers continued to receive heavy pollution loadings from partially and untreated domestic sewage and animal wastes. A total of 28 rivers (33 per cent) fell under the very polluted category, 19 rivers (22 per cent) were found to be slightly polluted and the remaining 39 rivers (45 per cent) were considered clean. As shown in Figure 5.9a, the worst affected rivers were Sungai Merbok, Sungai Juru, Sungai Perai, Sungai

Buluh, Sungai Kelang and Sungai Sepang.

Monitoring results for the period of 1985 to 1989 showed that 20 rivers out of the 39 clean rivers had deteriorated at a net rate of 2 per cent. Only seven rivers from the total of 47 polluted rivers had improved, namely Sungai Raja Hitam, Sungai Chukai, Sungai Paka, Sungai Dungun, Sungai Terengganu, Sungai Setiu and Sungai Kelantan whilst Sungai Kurau did not indicate any change. The other 39 polluted rivers including all the 28 rivers which fell under the very polluted category were found to deteriorate at a net rate of 25 per cent.

It was also noted that 75 per cent of the seriously polluted rivers were those on the west coast of Peninsular Malaysia. However, in the east coast, Sabah and Sarawak, ammoniacal-nitrogen was not a major problem with the exception of Sungai Kuantan, Sungai Endau, Sungai Pahang, Sungai Kemaman, Sungai Sarawak, Sungai Putatan and Sungai Silabukan (see Figures 5.9a and 5.9b).

Heavy Metals Pollution

In 1989, heavy metals were monitored in 26 selected rivers. The selection of these rivers was based on the significant levels of heavy metals detected over the past years and the presence of the most probable pollution sources in the river basins. The concentrations of these metals ranged from non-detectable to 3.60 mg/l for lead (Pb), 0.002 mg/l for mercury (Hg), 5.50 mg/l for cadmium (Cd), 1.10 mg/l for copper (Cu), 9.00 mg/l for zinc (Zn) and 0.175 mg/l for arsenic (As). The rivers with highest concentration of metals were Sungai Batu Pahat, 3.60 mg/l of Pb; Sungai Sepetang, 0.002 mg/l of Hg; Sungai Kelang, 0.002 mg/l of Hg and 9.00 mg/l of Zn and 0.175 mg/l of As; Sungai Pahang, 1.10 mg/l of Cu and Sungai Labok, 5.59 mg/l of Cd.

Table 5.6 indicates the levels of heavy metals in the selected rivers monitored in Malaysia. As expected, greater number of non-compliances of heavy metals were indicated by rivers situated in the west coast of Peninsular Malaysia due to more extensive land use and industrialisation. Lead was found to be the major heavy metal pollutant for Sungai Kedah, Sungai Merbok, Sungai Perai, Sungai Bernam, Sungai Tenggi, Sungai Kelang, Sungai Selangor, Sungai Pahang, Sungai Terengganu, Sungai Miri, Sungai Sugut and Sungai Labok with more than 50 per cent of the total samples exceeding the standard of 0.02 mg/l.

Out of 16 rivers monitored for copper, three rivers recorded high percentages of samples exceeding the standard value of 0.012 mg/l. The rivers were Sungai Bernam in Peninsular Malaysia, and Sungai Miri and Sungai Sugut in East Malaysia with 67, 60 and 57 per cent non-compliances respectively.

Mercury concentrations in the river waters had improved significantly in 1989, where none of the rivers sampled showed non-compliance. Similar pattern was observed for cadmium concentrations although there were still few rivers with low percentages of non-compliances. On the other hand, there was a slight deterioration of zinc levels in three rivers, namely Sungai Kelang, Sungai Linggi and Sungai Melaka.

Sungai Sugut, where copper is mined extensively on the upstream of the river basin, was the only river indicating non-compliance in arsenic concentration. However, this finding did not represent the overall condition of this river due to insufficient number of samples analysed.

Nutrients

Tables 5.7 and 5.8 show that in 1989, the rivers monitored remained clean in terms of nitrate but were polluted with phosphate and sulphate. It was also noted that most of the rivers affected were those located on the west coast of Peninsular Malaysia where active agricultural and pig farming activities are being practised.

Almost 62 per cent of the rivers monitored recorded phosphate levels exceeding 0.1 mg/l.

on-compliances range from 2 per cent to as gh as 100 per cent. Sungai Juru and Sungai ;pang each recorded 100 per cent non-compli- ıce. The highest level of phosphate recorded,)wever, was 30 mg/l in Sungai Perlis with the)n-compliance percentage of 30. It was also)served that none of the samples taken from ıngai Juru and Sungai Sepang in 1989 com- ied with the interim standard for phosphate.

lthough all rivers detected very low levels of trates, Sungai Melaka detected a maximum lue of 20.80 mg/l. However, its median value ıs still below the specified standard for nitrate ıich is 7.0 mg/l.

ightly high sulphate levels were detected in ıngai Merbok, Sungai Jejawi, Sungai Raja Hitam ıd Sungai Sepang. A maximum value of 3,480 g/l of sulphate content in river water was corded in Sungai Perai but the median value ıs well within the permissible value of 200 g/l for domestic water supply.

oastal and Marine Water Quality

ıe coastal waters of Malaysia, as in the previ- ıs years, continued to be contaminated with oil ıd grease, total suspended solids, and coliform ;fer Figure 5.10). However, the degree of ıntamination remained unchanged, although rtain locations seemed to be slightly ;teriorating.

even river mouths were found to be grossly ılluted with faecal contamination, the values which always exceeded the proposed interim ındard of 100 MPN/100ml. Heavy metals such cadmium, chromium, copper, lead and nickel ;re also detected at a number of monitoring ;ations with values exceeding or within the oposed standard. Detailed assessment of ntamination is described below.

ıecal contamination

ecal coliform is normally used as an indicator r sewage contamination arising both from domestic as well as animal wastes.

Overall, the states with the most polluted coastal waters in terms of the most probable number (MPN) of faecal coliform per 100 ml of water sample, listed in descending order were Sarawak, Perak, Pulau Pinang and Pahang while other states indicated less than 50 per cent of observations exceeding the proposed interim standard for conservation of marine aquatic resources of 100 MPN/100 ml (see Figure 5.11).

The coastal waters of the recreational beaches of Malaysia were not contaminated with faecal coliform except in few isolated locations, namely Pantai Batu Maung, Pantai Telok Tempoyak, Batu Ferringhi (Casuarina) and Pantai Bersih in Pulau Pinang; Pantai Telok Gelora, Pantai Batu Hitam and Pantai Telok Chempedak situated in the state of Pahang and Pantai Batu Buruk in Terengganu, whereby all the results obtained always exceeded the proposed interim standard of 100MPN/100 ml. This was mainly due to high population density whilst animal wastes contributed to the faecal contamination in the coastal waters of Gertak Sanggul in Pulau Pinang.

In addition, a number of river estuaries, namely Kuala Sungai Merbok, Kedah; Kuala Sungai Prai, Pulau Pinang; Kuala Sungai Kelang, Selangor; Kuala Sungai Segget and Kuala Sungai Mersing, both in Johor; Kuala Sungai Terengganu, Terengganu; Kuala Sungai Kelantan, Kelantan and Kuala Sungai Piandang, Kuala Sungai Sepetang, Kuala Sungai Kurau and Kuala Sungai Perak, all located in the state of Perak were found to be grossly contaminated with faecal coliform as the results observed always exceeded the proposed interim standard for conservation of marine aquatic resources of 100 MPN/100 ml. Again, high population density coupled with inadequate facilities for sewage treatment attributed to high faecal coliform counts in these river estuaries.

Total Suspended Solids

The degree of contamination by suspended solids continued to be serious. The coastal waters of Kelantan, Perak and Terengganu seemed to be most affected in terms of suspended solids contamination followed by the states of Pahang, Sabah, Pulau Pinang and Kedah/Perlis, listed in descending order. Figure 5.12 reflects the overall situation faced by the states in 1989.

In terms of river estuaries monitored for suspended solids, Kuala Sungai Kedah, Kedah; Kuala Sungai Juru, Pulau Pinang; Kuala Sungai Sepetang, Kuala Sungai Kurau and Kuala Sungai Perak, all located in Perak; Kuala Sungai Melaka, Melaka; Kuala Sungai Lurus, Johor; Kuala Sungai Rompin and Kuala Sungai Pahang both situated in Pahang; Kuala Sungai Kelantan, Kelantan; and in Terengganu, Kuala Sungai Terengganu, Kuala Sungai Marang, Kuala Sungai Dungun, Kuala Sungai Paka, Kuala Sungai Kertih and Kuala Sungai Chukai were found to be among the most problematic. High suspended solids content in the river estuaries is usually associated with land development activities carried out in the upland and adjacent areas.

Oil and Grease

Malaysian coastal waters were most seriously contaminated with oil and grease compared with suspended solids and faecal coliform. Overall, the states of Melaka, Negri Sembilan, Selangor, Terengganu, Kelantan and Sabah were found to be seriously affected by oil and grease contamination. Elsewhere contamination was less than 50 per cent. Figure 5.13 shows the overall oil and grease contamination for all the states in 1989.

Heavy Metals

The coastal waters of Malaysia were still affected by heavy metals. Specifically the coastal waters of the northern states of Peninsular Malaysia were heavily contaminated with cadmium, copper, lead, mercury and nickel. Figures 5.14 to 5.19 show the levels of heavy metals contamination in each state.

Beach Tar Sampling

Beach tar sampling was carried out on selected beaches especially on beaches designated for recreational purposes.

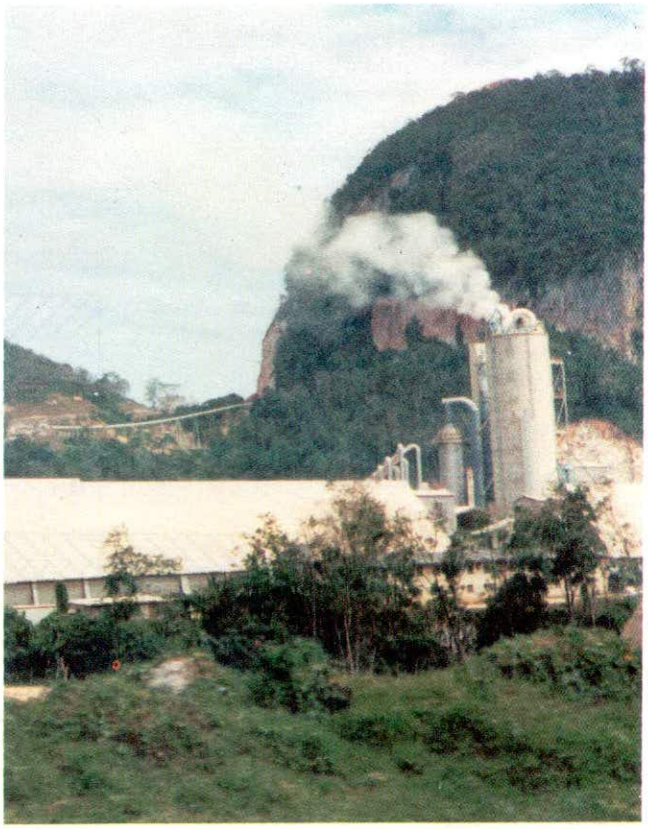
A number of beaches namely Pantai Telok Gorek, Pantai Air Papan, Pantai Sri Pantai and Pantai Tanjung Setapa, all of which are located in the state of Johor, were found to be grossly contaminated with tar balls during certain periods of the year.

Table 5.9 shows the distribution of tar balls along the Malaysian coastline for 1989.

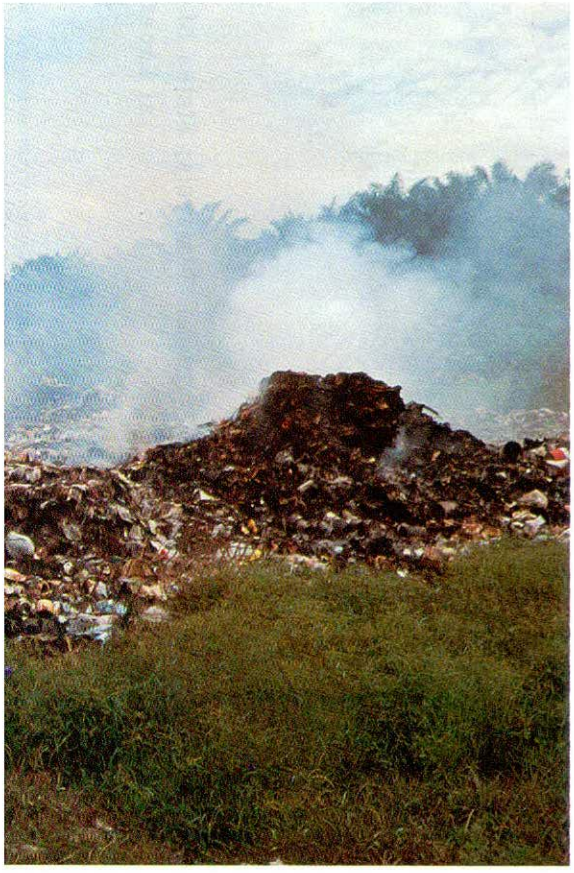
- oOo -

SOURCES OF AIR POLLUTION

An Iron Smelter
Photograph by:
Norazman



A Cement Plant
Photograph by: Sa'ari



Open Burning
Photograph by: Johan

A Sawmill
Photograph by:
Rosli

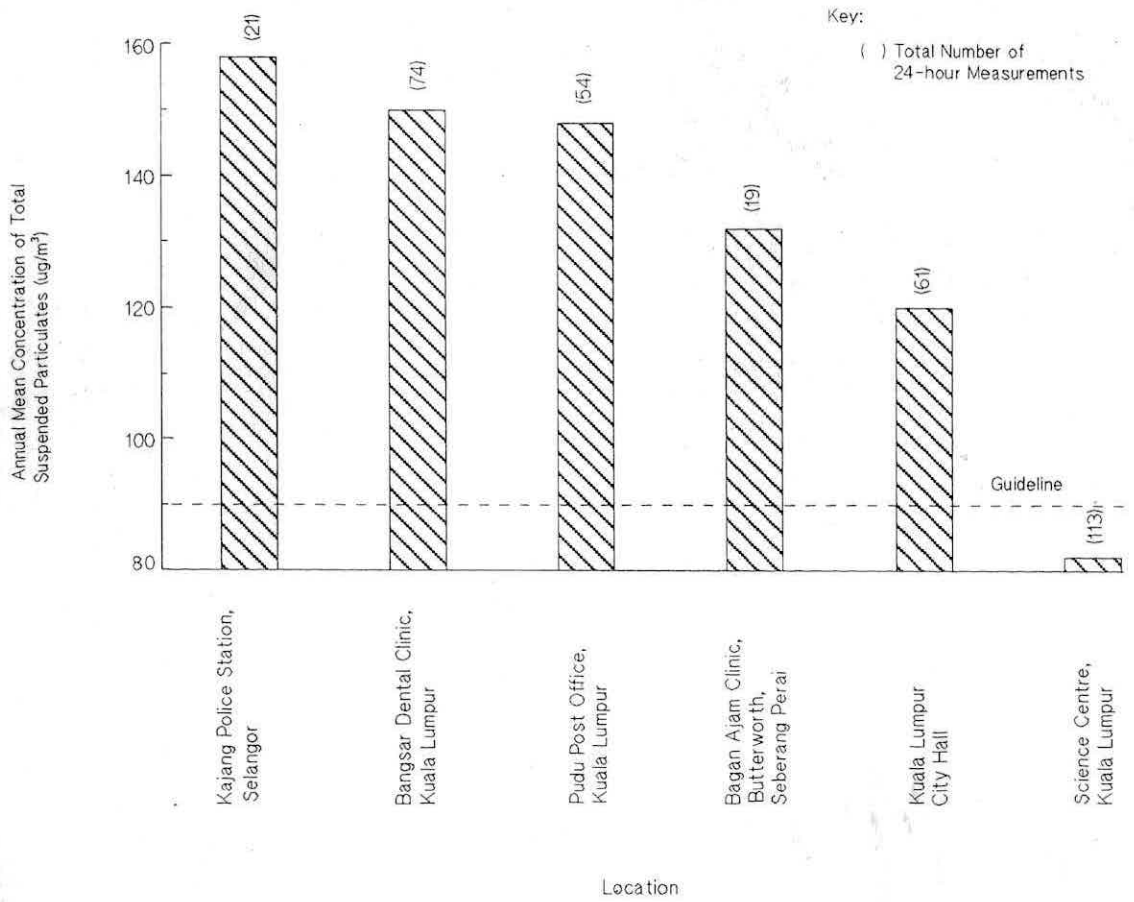


Figure 5.1 Malaysia: Status of Air Quality. Total Suspended Particulates at Location of Heavy Vehicular Traffic, 1989

Note:

The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m³ (annual mean of 24-hour measurements)

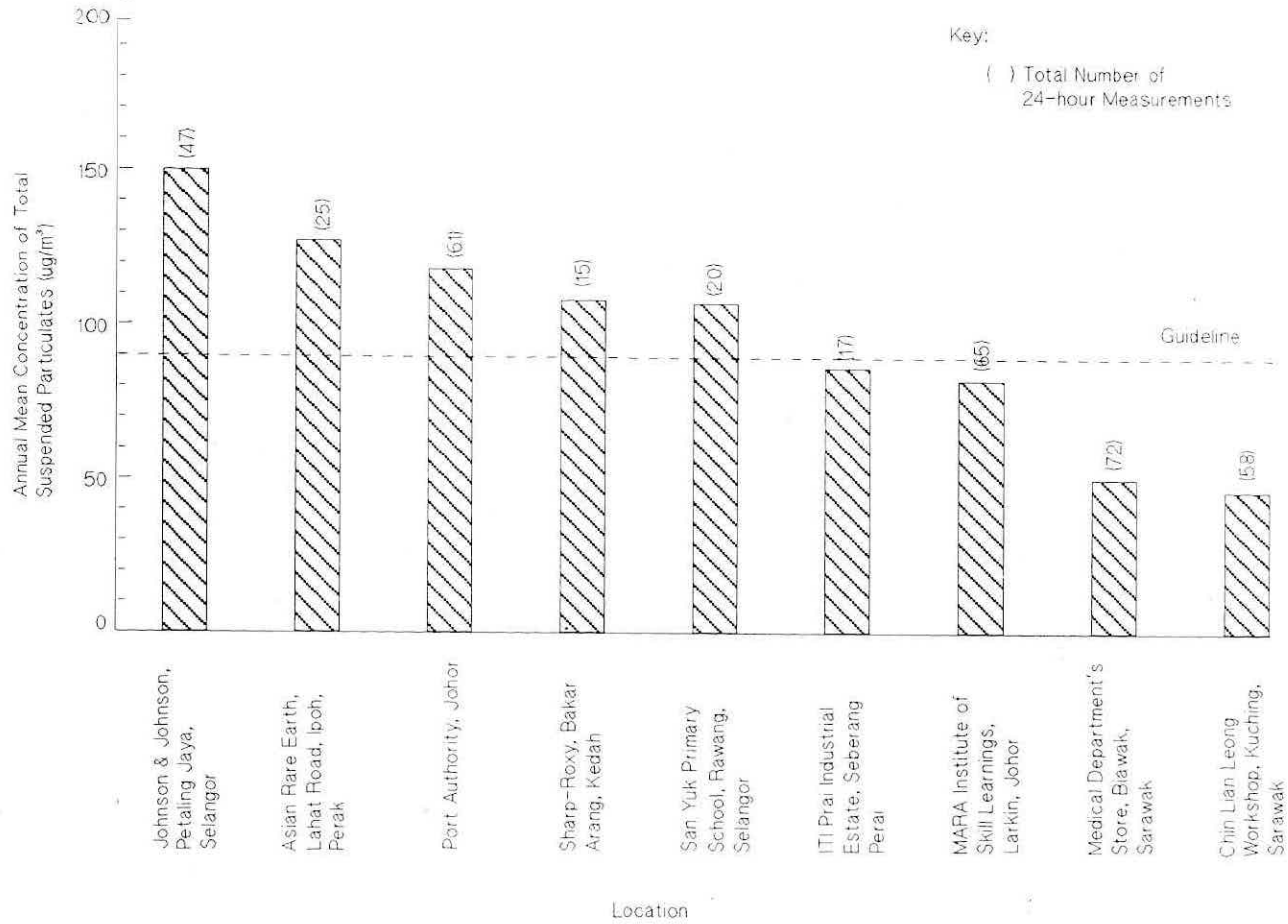


Figure 5.2 Malaysia: Status of Air Quality. Total Suspended Particulates in Industrial Areas by Location, 1989

Note:

The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m³ (annual mean of 24-hour measurements)

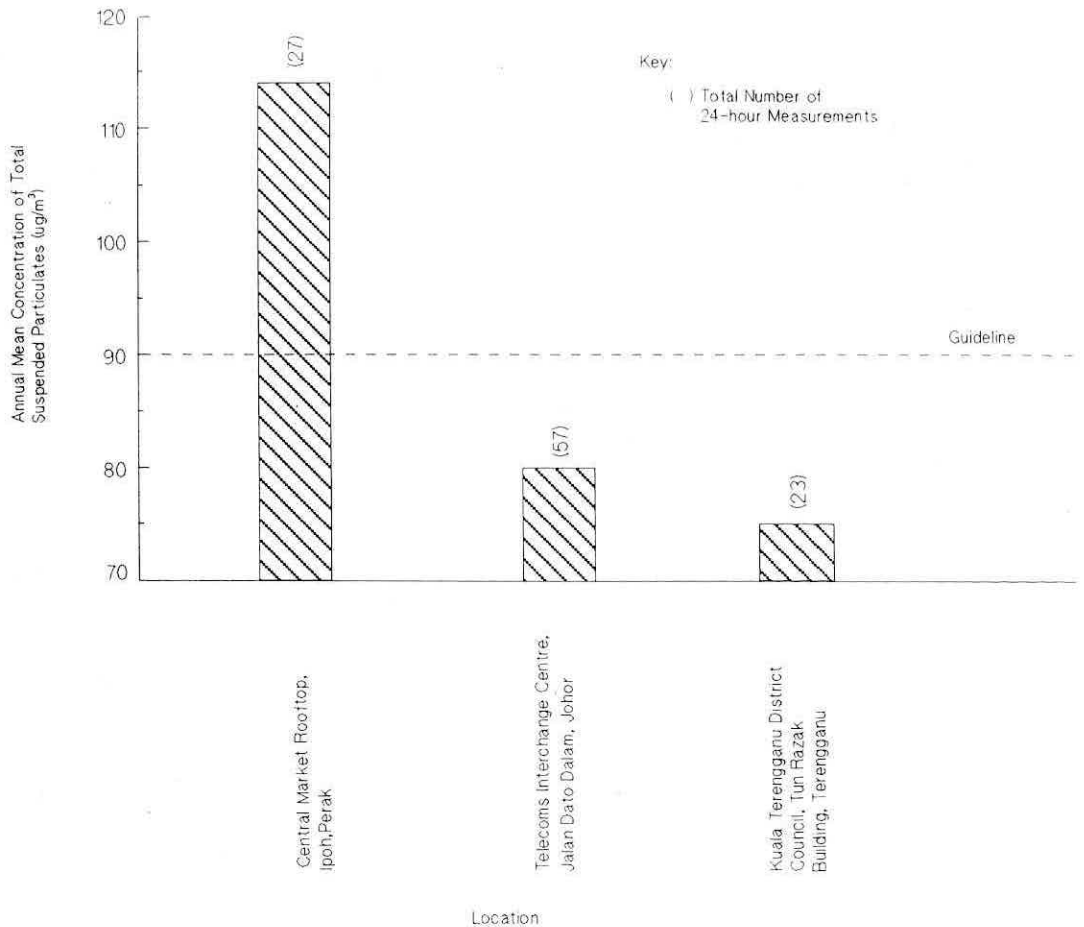


Figure 5.3 Malaysia: Status of Air Quality. Total Suspended Particulates in Commercial Areas by Location, 1989

Note:

The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m³ (annual mean of 24-hour measurements)

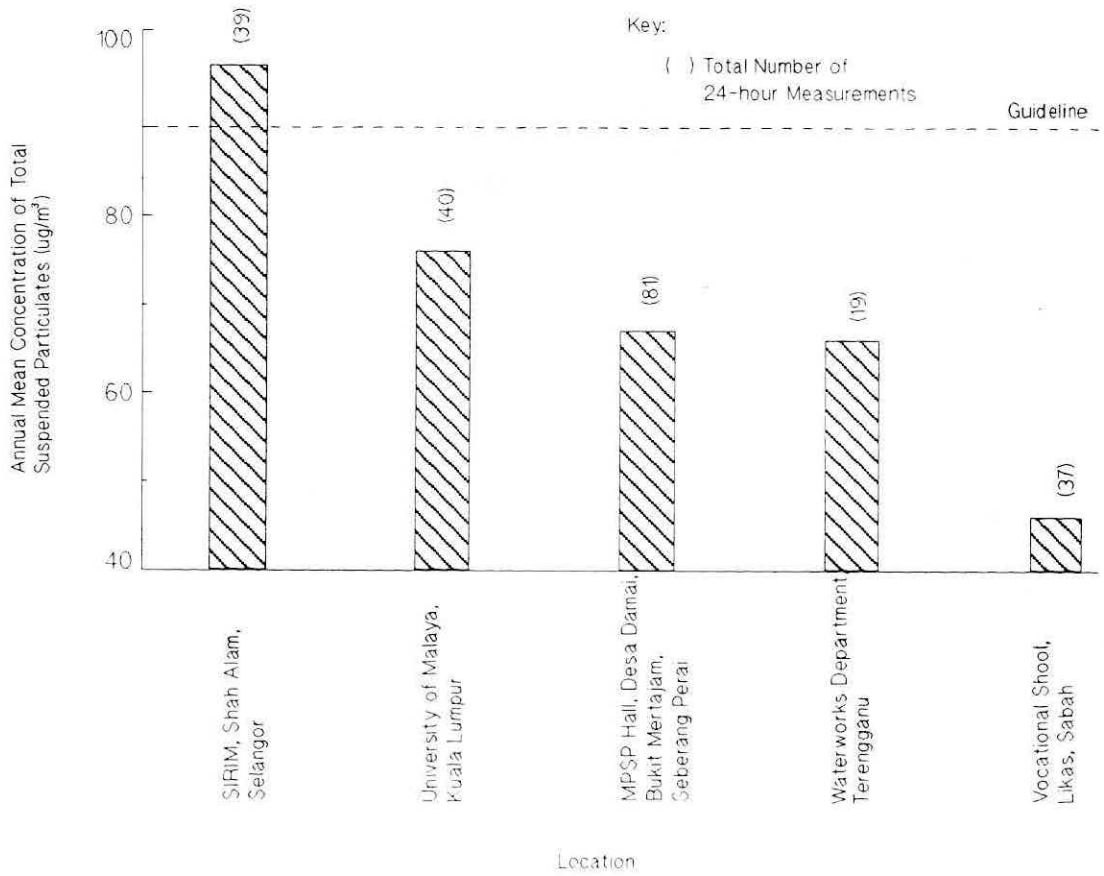


Figure 5.4 Malaysia: Status of Air Quality. Total Suspended Particulates in Residential Areas by Location, 1989

Note:

The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m³ (annual mean of 24-hour measurements)

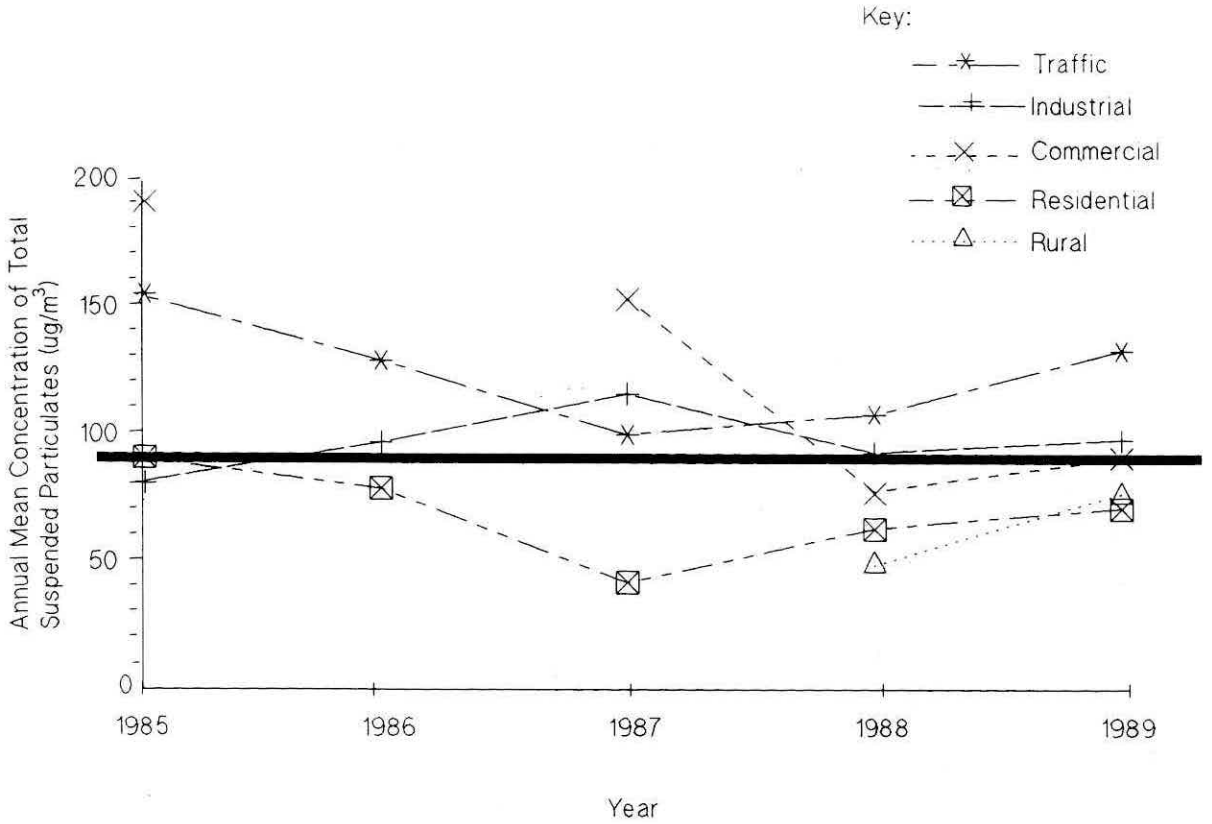


Figure 5.5 Malaysia: Status of Air Quality. Annual Mean Concentrations of Total Suspended Particulates, 1985–1989

Note:

The Recommended Malaysian Annual Guideline for Total Suspended Particulates is 90 ug/m^3 (annual mean of 24-hour measurements)

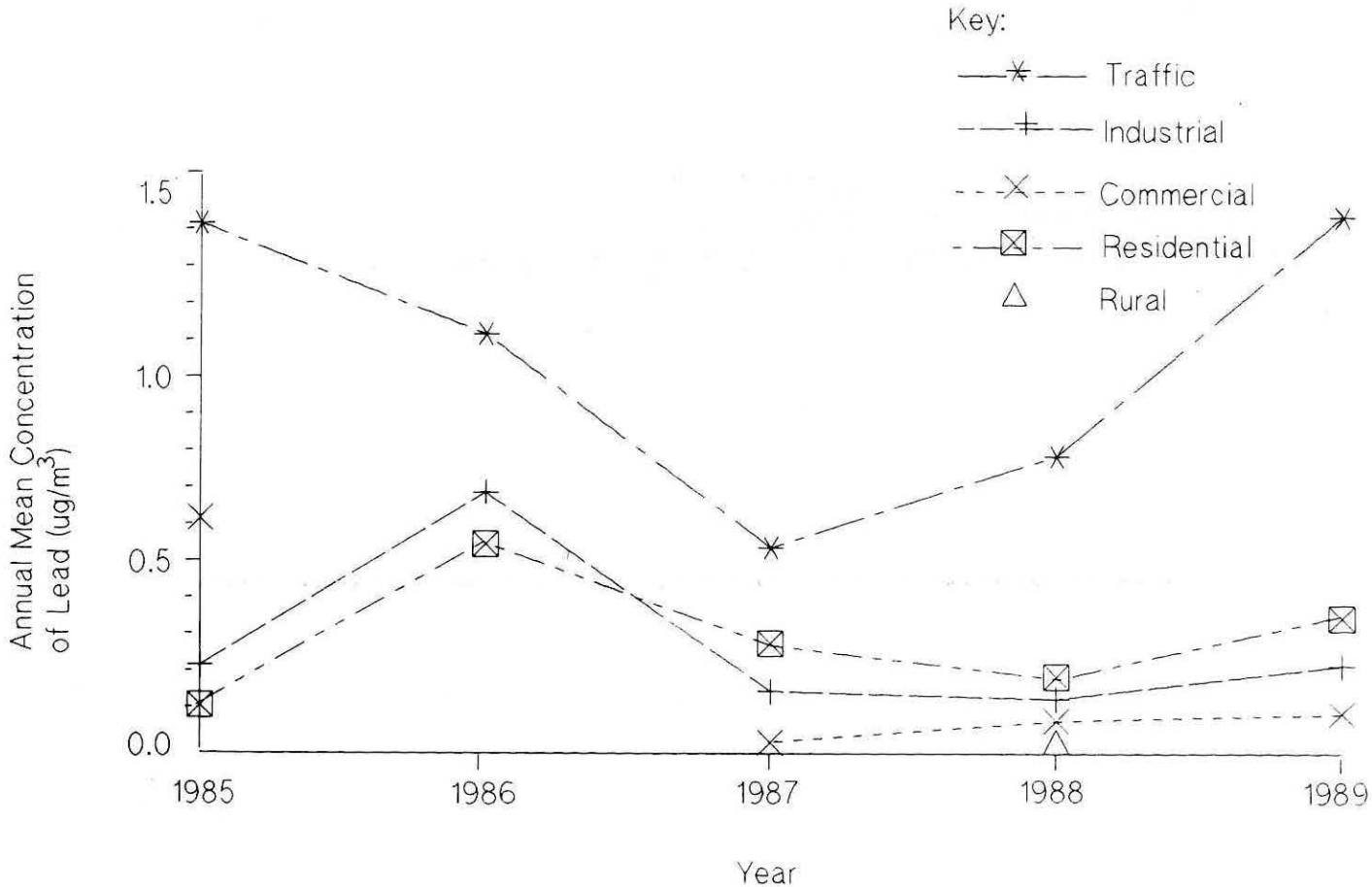


Figure 5.6 Malaysia: Status of Air Quality. Annual Mean Concentrations of Lead Levels, 1985–1989

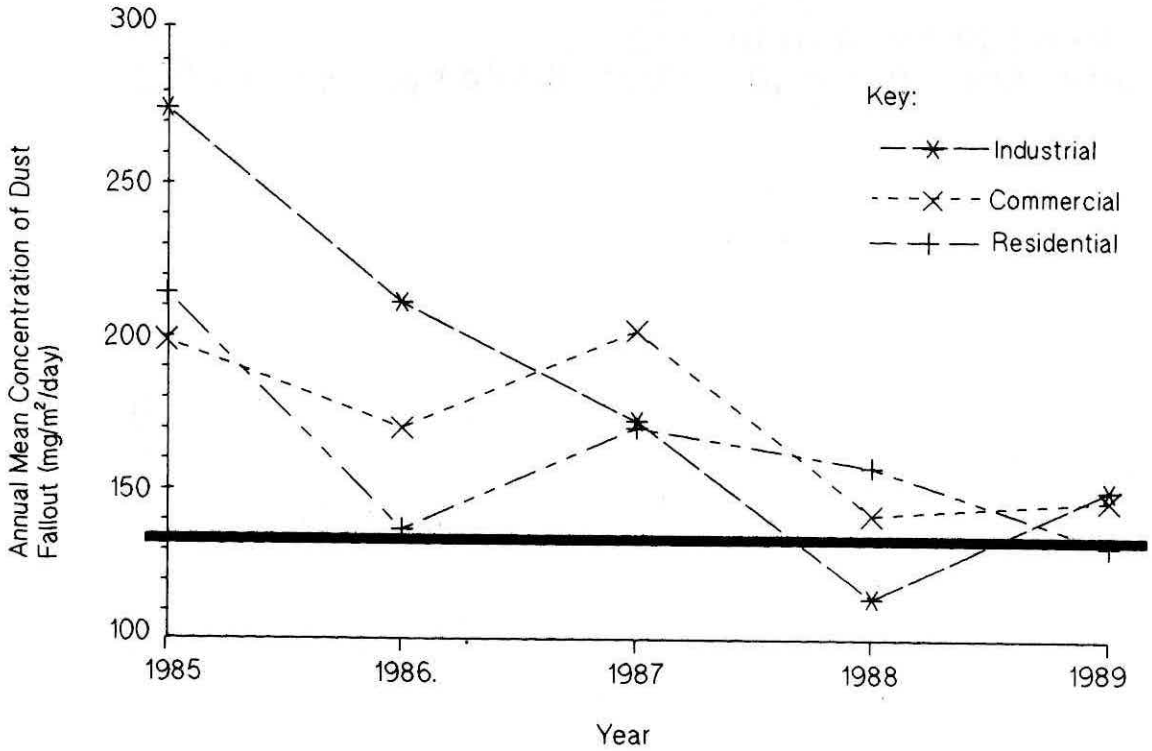


Figure 5.7 Malaysia: Status of Air Quality. Annual Mean Concentrations of Dust Fallout, 1985-1989

Note:

The Recommended Malaysian Guideline for Dust Fallout is 133 mg/m²/day (annual mean of monthly averages)

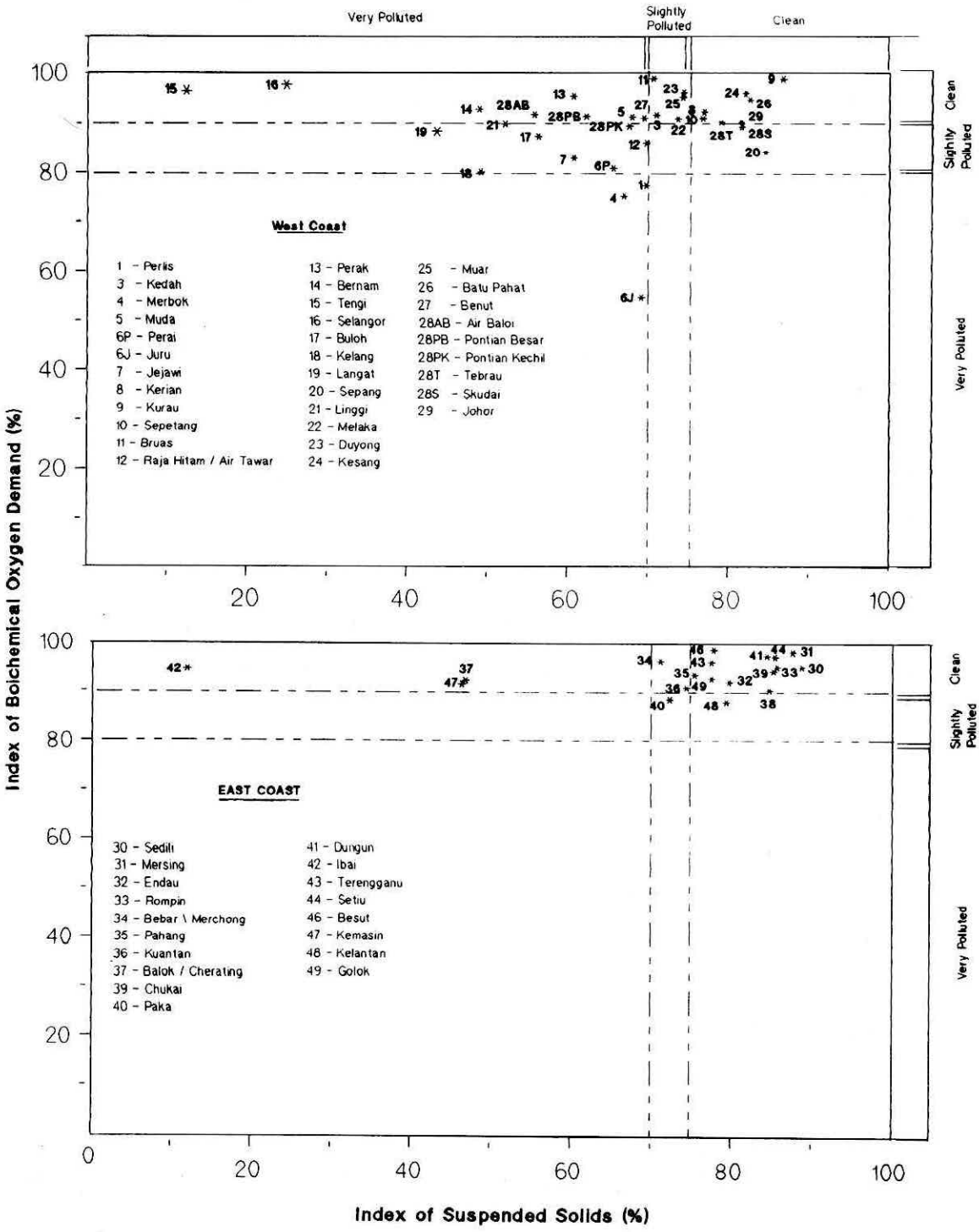


Figure 5.8a Peninsular Malaysia: River Water Quality in Terms of Index of Biochemical Oxygen Demand and Suspended Solids, 1989

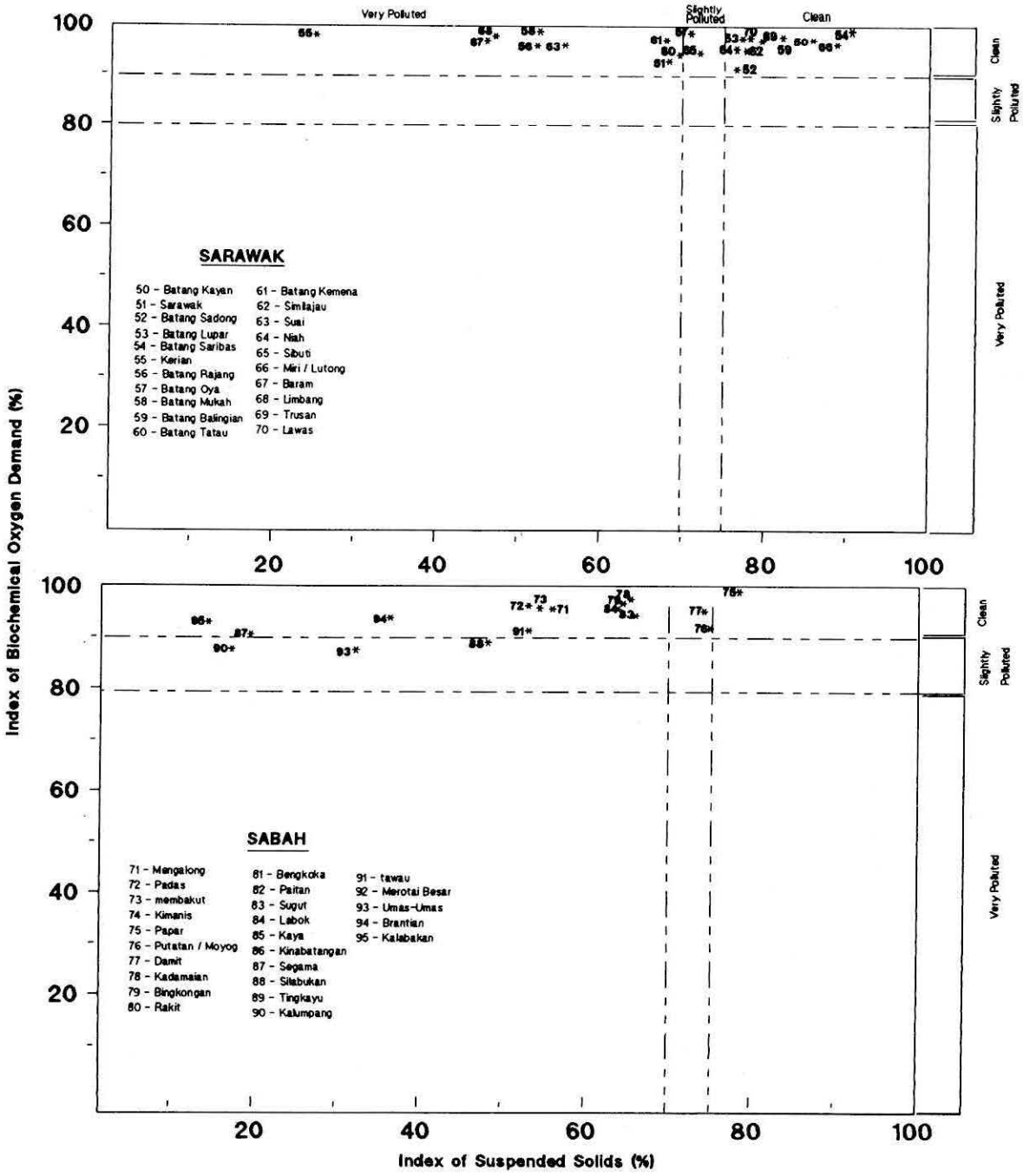


Figure 5.8b East Malaysia: River Water Quality in Terms of Index of Biochemical Oxygen Demand and Suspended Solids, 1989

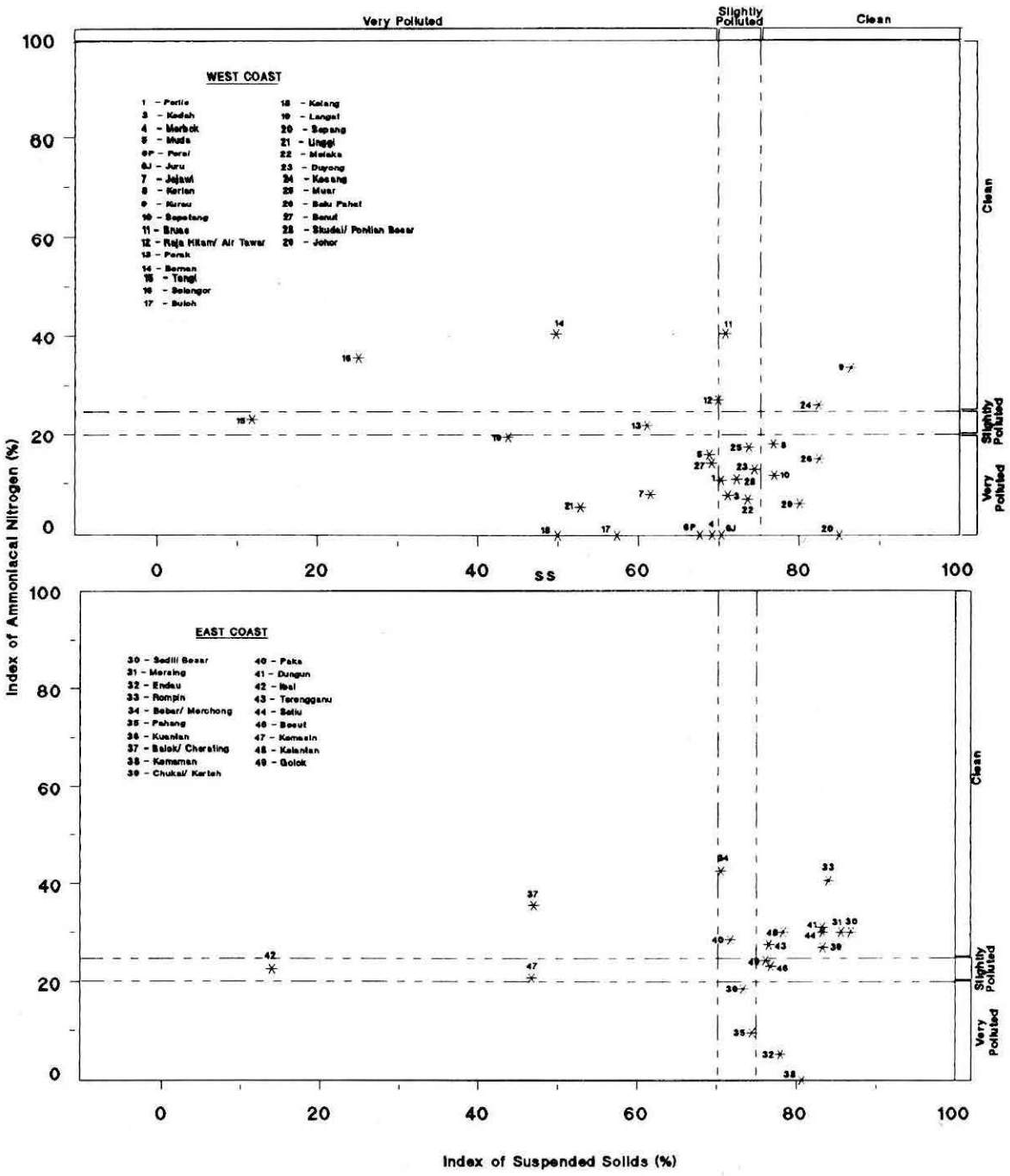


Figure 5.9a Peninsular Malaysia: River Water Quality in Terms of Index of Ammoniacal Nitrogen and Suspended Solids, 1989

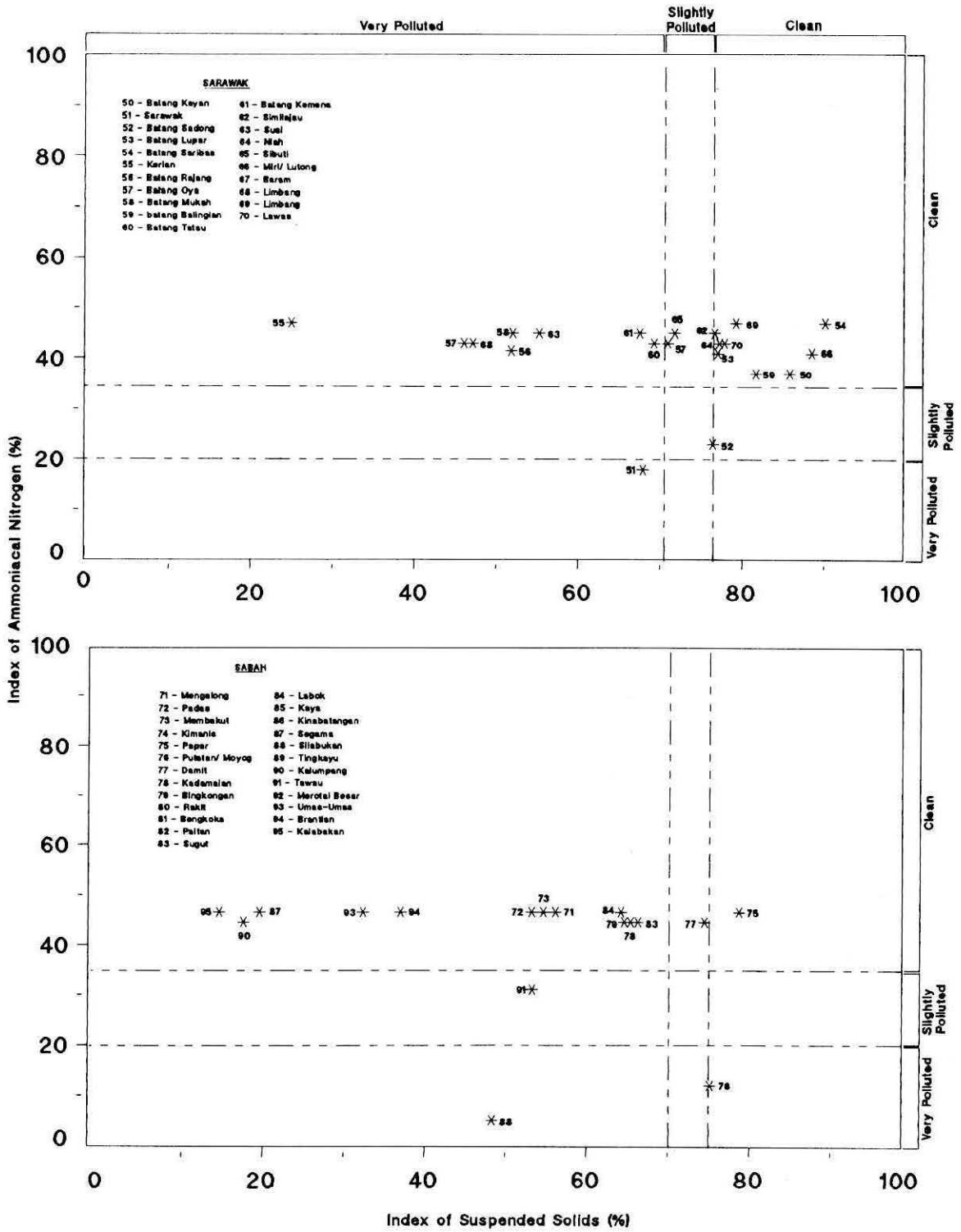


Figure 5.9b East Malaysia: River Water Quality in Terms of Index of Ammoniacal Nitrogen and Suspended Solids, 1989.

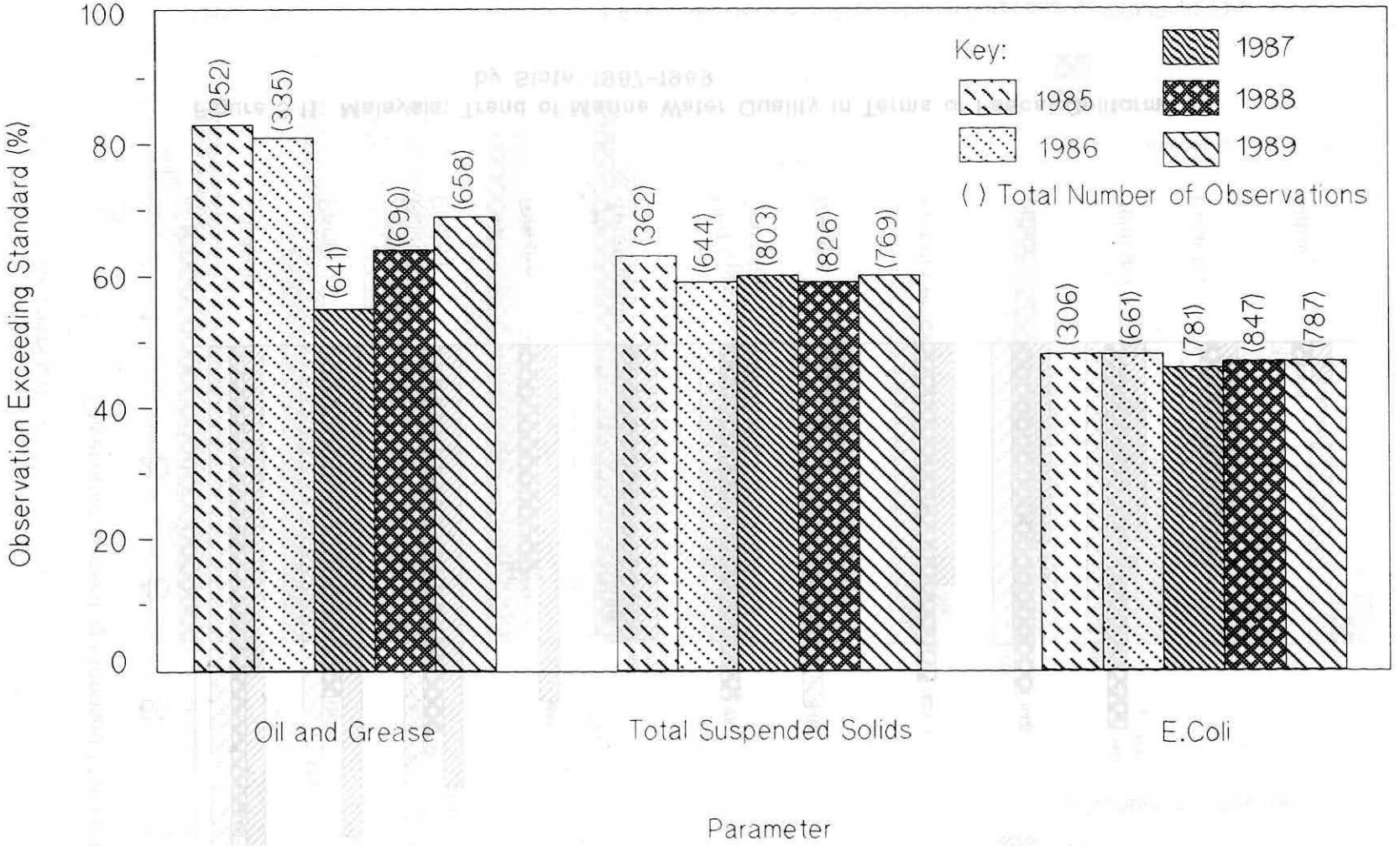


Figure 5.10 Malaysia: Annual Observations of Marine Water Quality in Terms of Oil and Grease, Total Suspended Solids and Faecal Coliform, 1985–1989

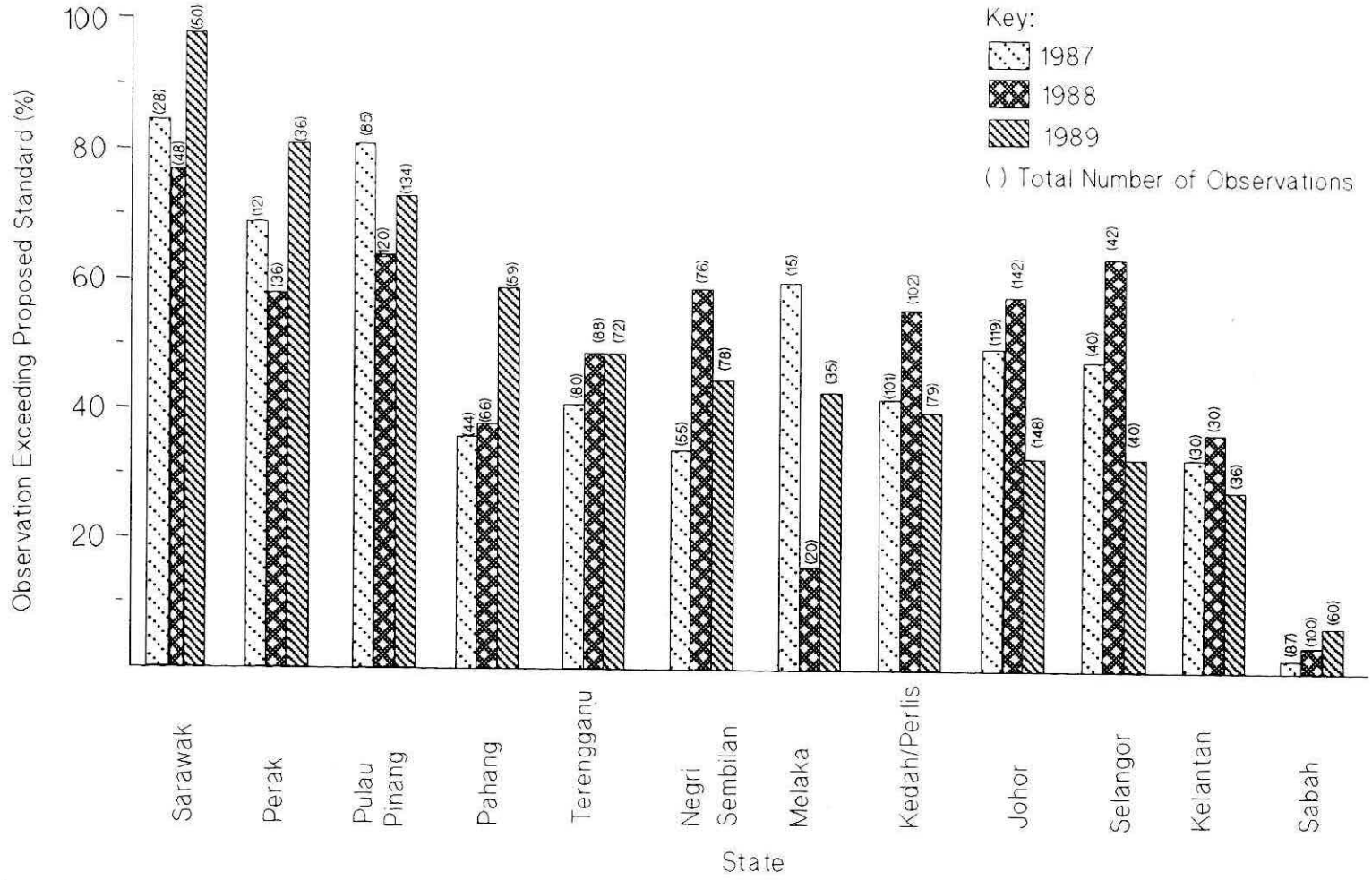


Figure 5.11 Malaysia: Trend of Marine Water Quality in Terms of Faecal Coliform by State, 1987–1989

Note: The Proposed Interim Standard of Faecal Coliform for Recreational Purposes is 100MPN/100ml

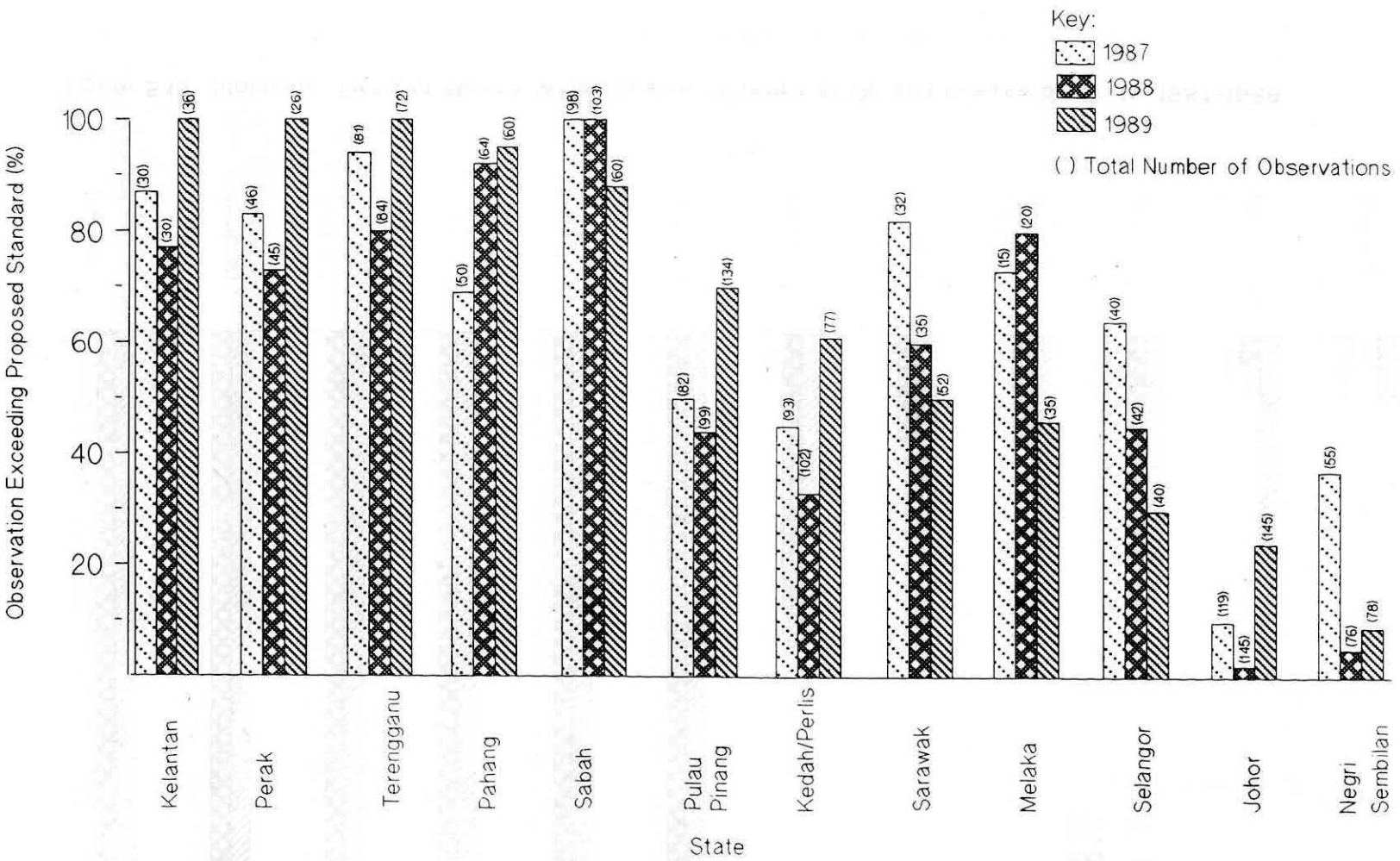


Figure 5.12 Malaysia: Trend of Marine Water Quality in Terms of Total Suspended Solids by State, 1987–1989

Note: The Proposed Interim Standard of Suspended Solids for Recreational Purposes is 50 mg/l

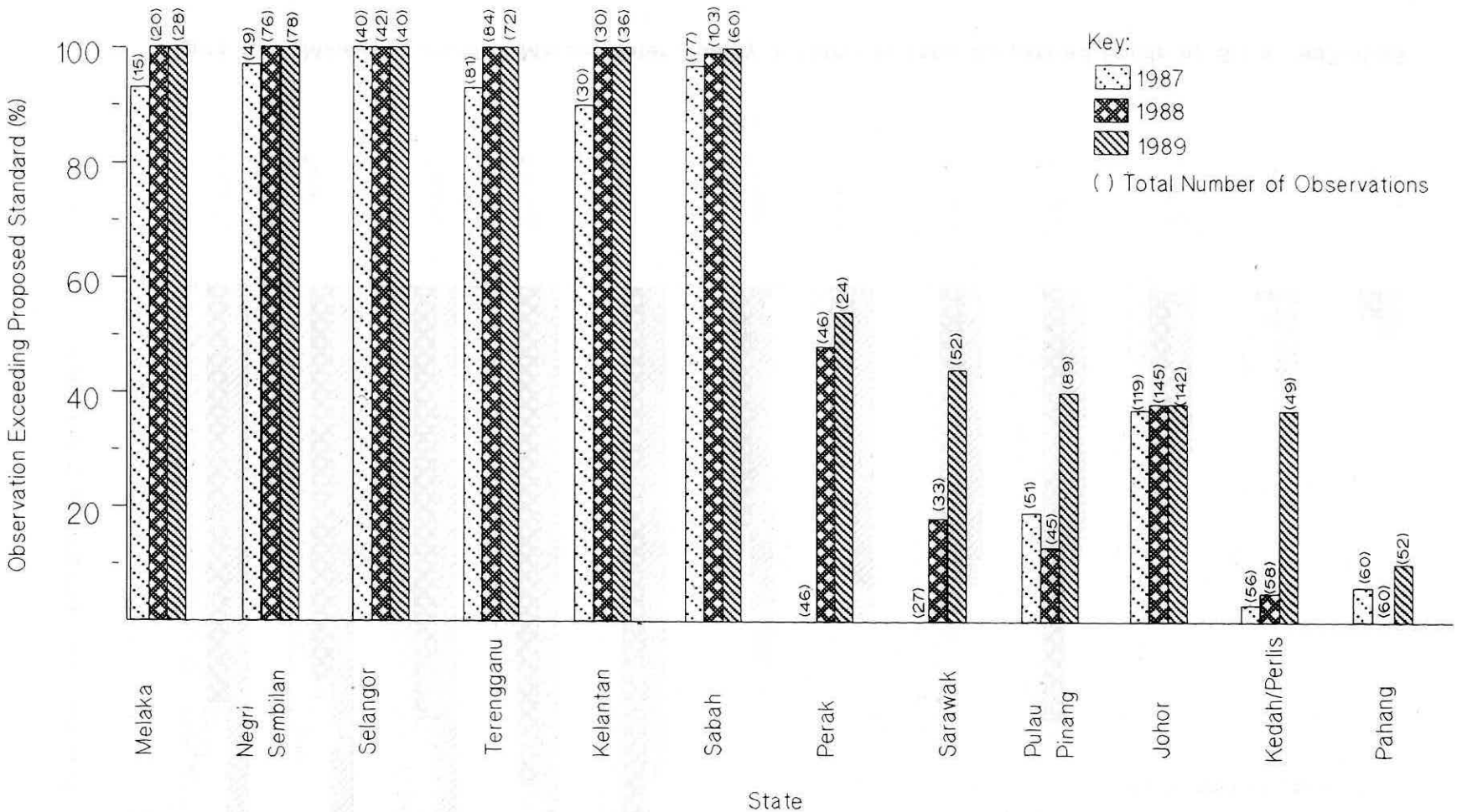


Figure 5.13 Malaysia: Trend of Marine Water Quality in Terms of Oil and Grease by State, 1987-1989

Note: The Proposed Interim Standard of Oil on Conservation of Marine Aquatic Resources is 0.0 mg/l

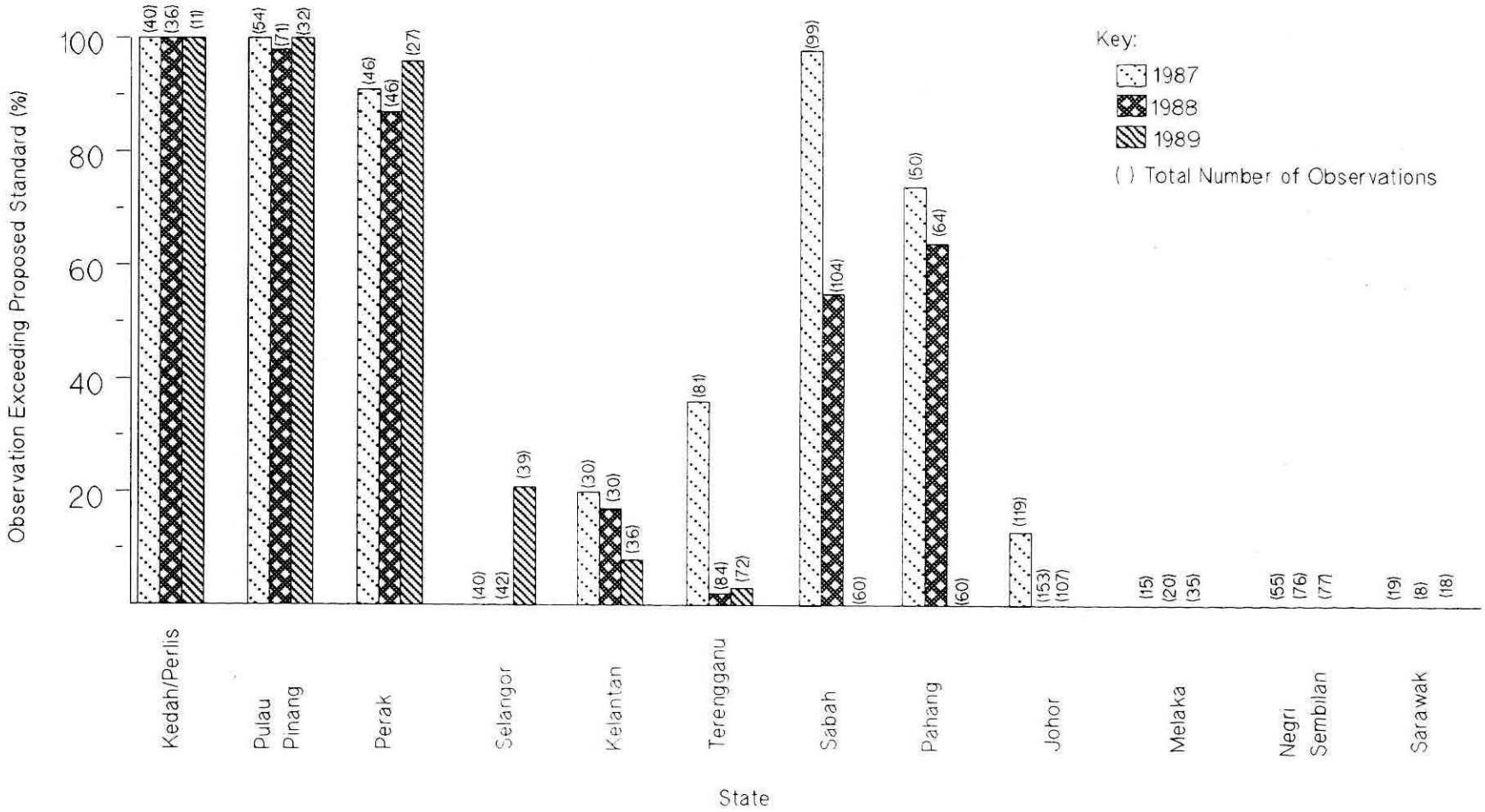


Figure 5.14 Malaysia: Trend of Marine Water Quality in Terms of Cadmium by State, 1987–1989

Note: The Proposed Interim Standard of Cadmium on Conservation of Marine Aquatic Resources is 0.005 mg/l

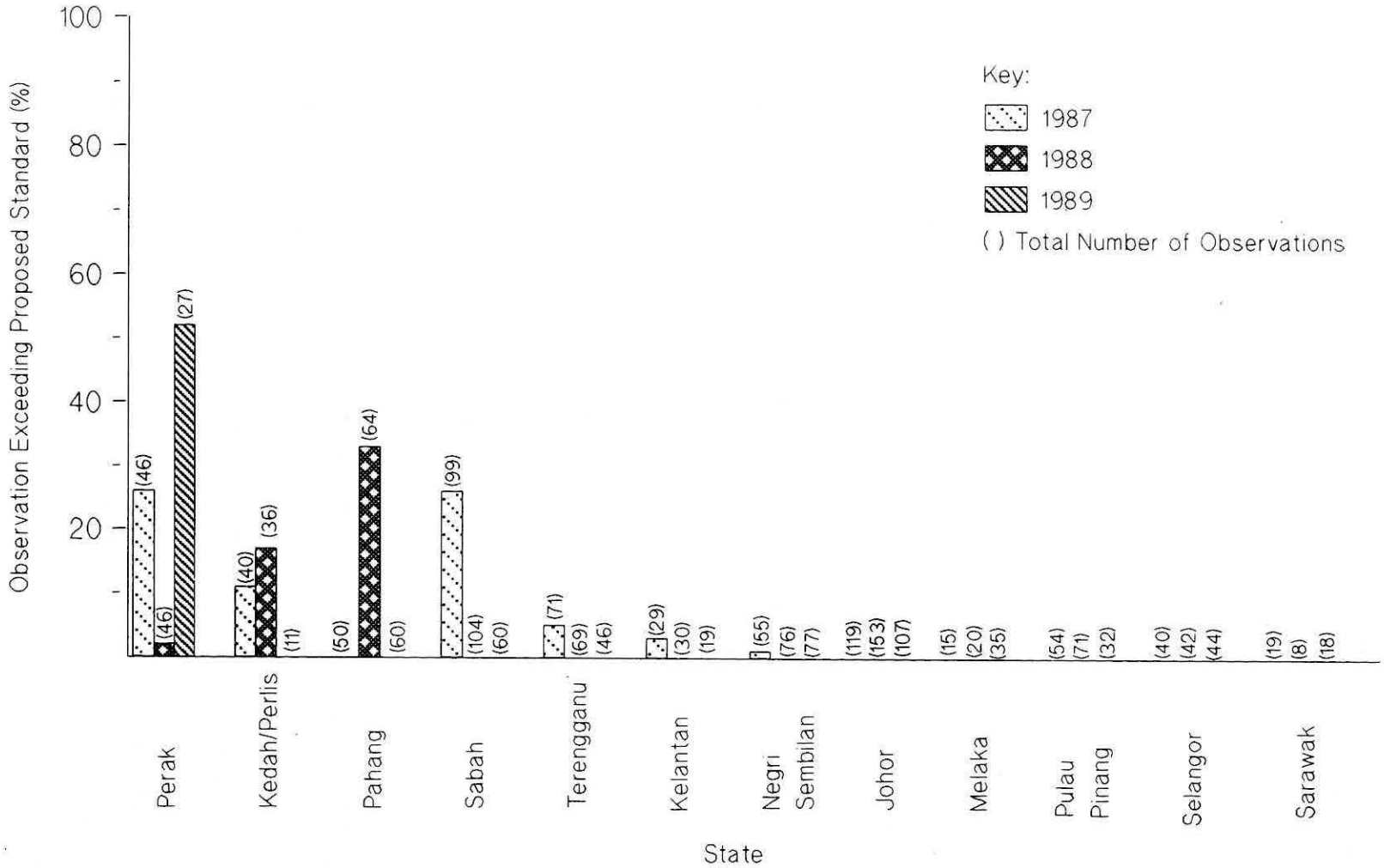


Figure 5.15 Malaysia: Trend of Marine Water Quality in Terms of Chromium by State, 1987–1989

Note: The Proposed Interim Standard of Chromium on Conservation of Marine Aquatic Resources is 0.01 mg/l

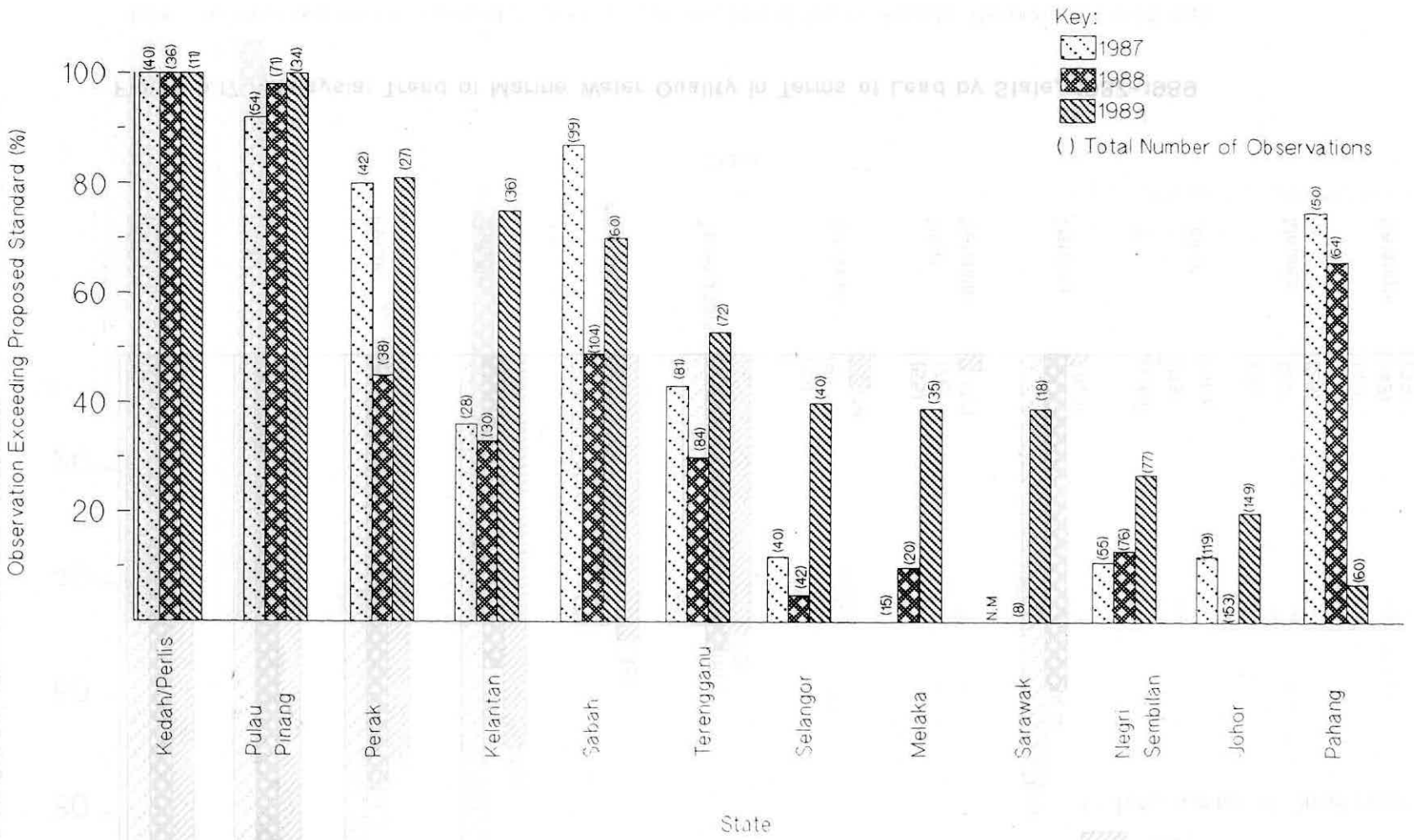


Figure 5.16 Malaysia: Trend of Marine Water Quality in Terms of Copper by State, 1987–1989

Note: The Proposed Interim Standard of Copper on Conservation of Marine Aquatic Resources is 0.01 mg/l

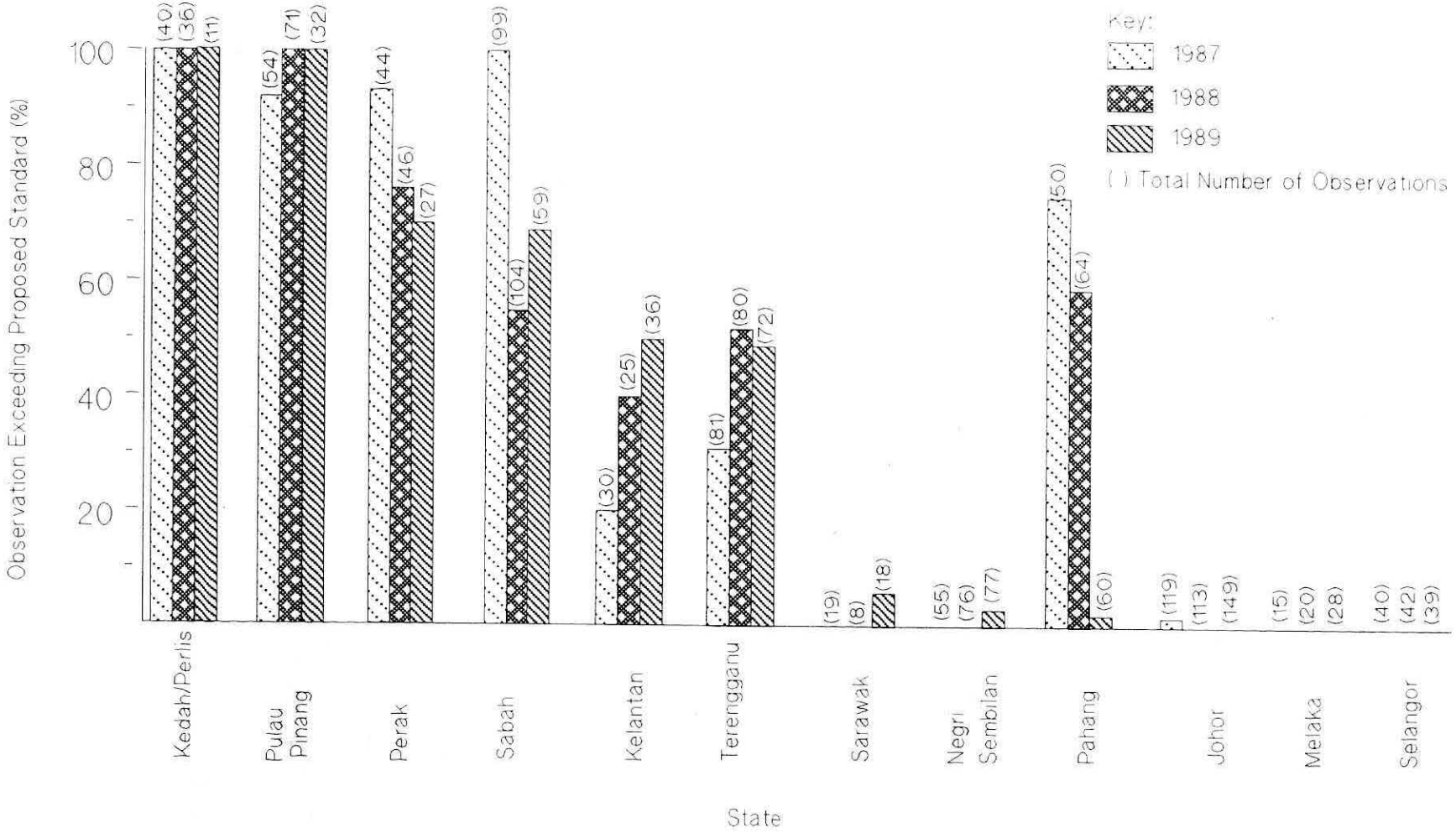


Figure 5.17 Malaysia: Trend of Marine Water Quality in Terms of Lead by State, 1987–1989

Note: The Proposed Interim Standard of Lead on Conservation of Marine Aquatic Resources is 0.05 mg/l

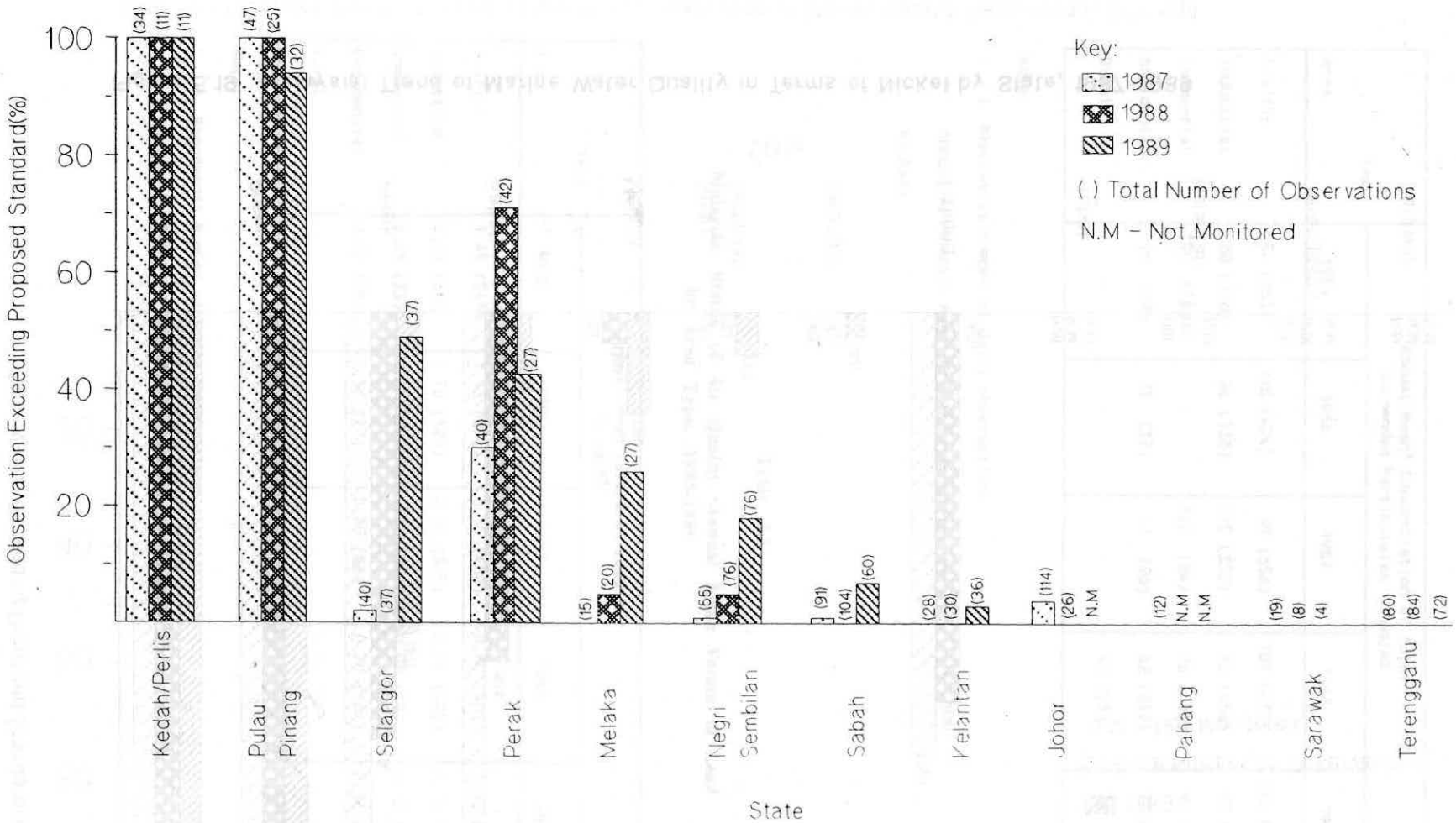


Figure 5.18 Malaysia: Trend of Marine Water Quality in Terms of Mercury by State, 1987–1989

Note: The Proposed Interim Standard of Mercury on Conservation of Marine Aquatic Resources is 0.0005 mg/l

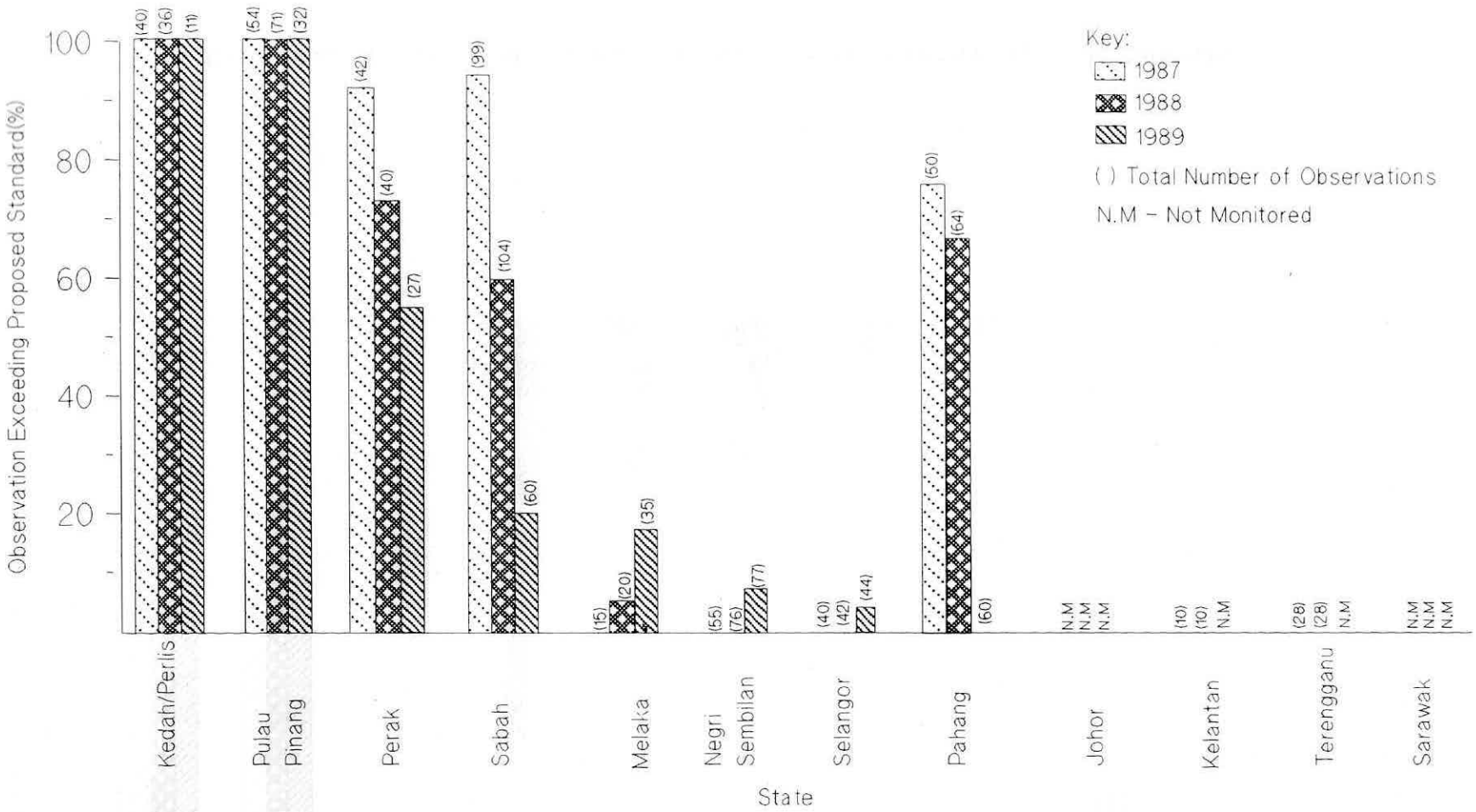


Figure 5.19 Malaysia: Trend of Marine Water Quality in Terms of Nickel by State, 1987–1989

Note: The Proposed Interim Standard of Nickel on Conservation of Marine Aquatic Resources is 0.01 mg/l

Table 5.1

Malaysia: Status of Air Quality. Annual Mean Concentration of Total Suspended Particulates by Area Type, 1985-1989

Area \ Year	Annual Mean* Concentration of Total Suspended Particulates in ug/m3				
	1985	1986	1987	1988	1989
Traffic	154 (253)	128 (424)	99 (656)	107 (477)	132 (342)
Industrial	80 (116)	96 (138)	115 (352)	92 (456)	97 (380)
Commercial	190 (18)	-	152 (84)	76 (151)	90 (107)
Residential	90 (69)	78 (37)	41 (96)	62 (243)	70 (216)
Rural	-	-	-	49 (53)	76 (10)

Note:

( ) Represents number of daily observations

* Annual Arithmetic Mean of 24-hour measurements

\- No Data

Table 5.2

Malaysia: Status of Air Quality. Annual Mean Values of Lead by Area Type, 1985-1989

Area \ Year	Annual Mean Values of Lead in ug/m3				
	1985	1986	1987	1988	1989
Traffic	1.43 (241)	1.13 (291)	0.55 (480)	0.80 (501)	1.45 (323)
Industrial	0.23 (30)	0.70 (125)	0.16 (345)	0.14 (305)	0.23 (237)
Commercial	0.63 (23)	-	0.02 (20)	0.08 (78)	0.10 (107)
Residential	0.12 (55)	0.56 (27)	0.29 (86)	0.20 (182)	0.36 (79)
Rural	-	-	-	0.02 (46)	-

Note:

( ) Represents Number of Daily Observations

No Data

Table 5.3

Malaysia: Status of Air Quality. Annual Mean Monthly Values of Dust Fallout by Area Type, 1985-1989

Year / Area	Annual Mean Monthly Values of Dust Fallout in mg/m^2/day				
	1985	1986	1987	1988	1989
Industrial	272.57	209.30	170.71	112.47	147.95
Residential	212.48	134.94	168.40	155.47	129.61
Commercial	196.80	168.20	200.00	139.70	144.59

Table 5.4

Water Quality Classification Based on Index Values

Parameter	Index Range (%)		
	Clean	Slightly Polluted	Very Polluted
Overall	>80	60-80	<60
BOD	>90	80-90	<80
Ammoniacal Nitrogen	>35	20-35	<20
Suspended Solids	>75	70-75	<70

Table 5.5a

Malaysia: Status and Trend of River Water Quality, 1985-1989

Index	Clean Rivers	River Water Quality			Net Rate of Change (%)	River Pollution			Polluted Rivers	
		Improved	Not Changing	Deteriorated		Improved	Not Changing	Deteriorated	Slightly Polluted	Seriously Polluted
General	16	15	0	1	+2.85	58	1	11	63	7
BOD-5 days	68	36	0	32	-0.37	10	0	8	13	5
Ammoniacal Nitrogen	38	17	0	21	-10.11	10	1	37	31	17
Suspended Solids	30	14	0	10	-1.89	20	1	35	21	35

Note:

\+ Quality Improving

\- Quality Deteriorating

Table 5.5b

Malaysia: Status and Trend of River Water Quality, 1985-1989

Area	Status	WQI			AN			BOD-5days			SS			Total			
		+	0	-	+	0	-	+	0	-	+	0	-	WQI	AN	BOD	SS
A	Clean	2	0	0	2	0	2	21	0	12	10	0	9	2	4	33	19
	Slightly polluted	39	0	2	9	1	17	7	0	5	9	0	5	41	27	12	14
	Very polluted	3	0	2	0	0	17	1	0	2	4	0	11	5	17	3	15
B	Clean	5	0	0	14	0	3	12	0	8	3	0	4	5	17	20	7
	Slightly polluted	14	1	1	1	0	3	1	0	0	1	0	2	16	4	1	3
	Very polluted	0	0	0	0	0	0	0	0	0	5	1	5	0	0	0	11
C	Clean	8	0	1	1	0	16	3	0	12	1	0	3	9	17	15	4
	Slightly polluted	1	0	5	0	0	0	0	0	0	0	0	4	6	0	0	4
	Very polluted	1	0	1	0	0	0	1	0	1	1	0	8	2	0	2	9

Note:

A - Peninsular Malaysia
B - Sarawak
C - Sabah

AN - Ammoniacal Nitrogen
BOD - Biochemical Oxygen Demand
SS - Suspended Solids

\+ - Improved
\- - Deteriorated
0 - No change

Table 5.5c

Malaysia: Status and Trend of River Water Quality, 1985-1989

Area	Status	1985				1986				1987				1988				1989			
		WQI	AN	BOD	SS	WQI	AN	BOD	SS	WQI	AN	BOD	SS	WQI	AN	BOD	SS	WQI	AN	BOD	SS
Peninsular Malaysia	clean	2	4	32	15	2	5	36	20	1	7	33	22	1	8	35	27	20	6	34	19
	slightly polluted	38	33	15	13	40	27	9	13	43	21	12	8	45	29	9	7	25	17	10	11
	very polluted	9	12	2	21	7	17	4	16	5	21	4	19	2	11	4	14	3	25	4	18
Sarawak	clean	1	11	17	7	0	8	15	6	6	11	16	8	1	20	18	7	18	19	21	10
	slightly polluted	20	3	1	5	17	6	1	3	11	5	3	3	18	0	1	0	3	1	0	2
	very polluted	0	0	0	6	1	1	1	8	2	1	0	8	0	0	0	12	0	1	0	9
Sabah	clean	17	22	19	7	14	22	22	6	7	20	17	8	9	19	19	7	11	14	14	2
	slightly polluted	5	0	3	3	8	0	0	5	12	0	2	2	10	0	0	2	6	1	3	1
	very polluted	0	0	0	12	0	0	0	10	1	0	0	10	0	0	0	10	0	2	0	14

Note:

AN - Ammoniacal Nitrogen
BOD - Biochemical Oxygen Demand
SS - Suspended Solids

The Sub-Indexes for AN, SS and BOD are derived from the Rating Curve, 1985 - 1988.

The Sub-Indexes for AN, SS and BOD are derived by using Mathematical Formula, 1989.

Table 5.6

Malaysia: Levels and Non-Compliances of Heavy Metals in Selected Rivers, 1989

Heavy Metals		River Name						
		Perlis	Kedah	Merbok	Perai	Jejawi	Kerian	Sepetang
Pb	Number of Samples	-	11	6	15	-	-	13
	Samples Exceeding Std (%)	-	100	100	100	-	-	0
	Minimum	-	0.05	0.10	0.05	-	-	ND
	Maximum	-	0.05	0.10	0.25	-	-	ND
	Median	-	0.05	0.10	0.05	-	-	ND
Hg	Number of Samples	-	11	6	15	-	-	11
	Samples Exceeding Std (%)	-	0	0	0	-	-	0
	Minimum	-	ND	ND	ND	-	-	ND
	Maximum	-	ND	ND	ND	-	-	ND
	Median	-	ND	ND	ND	-	-	ND
Cd	Number of Samples	-	28	2	4	-	-	13
	Samples Exceeding Std (%)	-	0	0	25	-	-	0
	Minimum	-	0.006	0.007	0.007	-	-	ND
	Maximum	-	0.006	0.007	0.013	-	-	ND
	Median	-	0.006	0.007	0.007	-	-	ND
Cu	Number of Samples	-	-	-	-	-	-	13
	Samples Exceeding Std (%)	-	-	-	-	-	-	50
	Minimum	-	-	-	-	-	-	ND
	Maximum	-	-	-	-	-	-	0.02
	Median	-	-	-	-	-	-	ND
Zn	Number of Samples	-	-	-	-	-	-	-
	Samples Exceeding Std (%)	-	-	-	-	-	-	-
	Minimum	-	-	-	-	-	-	-
	Maximum	-	-	-	-	-	-	-
	Median	-	-	-	-	-	-	-
As	Number of Samples	2	11	6	15	2	2	14
	Samples Exceeding Std (%)	0	0	0	0	0	0	0
	Minimum	ND	ND	ND	ND	ND	ND	ND
	Maximum	ND	ND	ND	ND	ND	ND	0.05
	Median	ND	ND	ND	ND	ND	ND	0.02

Note :

i) ND indicates measurement below limit of detection.
ii) The limit of detection for the aboved mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As are respectively 0.005, 0.001, 0.001, 0.01, 0.01 and 0.001 mg/l.
iii) The recommended standards for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As with respect to Class III are respectively 0.02, 0.004, 0.01, 0.012, 0.4 and 0.4 mg/l.

Table 5.6

Malaysia: Levels and Non-Compliances of Heavy Metals in Selected Rivers, 1989

Heavy Metals		River Name					
		Pahang	Terengganu	Kelantan	Miri	Sugut	Labok
Pb	Number of Samples	32	11	20	5	30	15
	Samples Exceeding Std (%)	47	64	25	60	63	53
	Minimum	ND	ND	ND	ND	ND	ND
	Maximum	0.70	0.10	0.10	0.10	0.19	0.37
	Median	0.02	0.05	ND	0.05	0.03	0.04
Hg	Number of Samples	7	10	19	3	-	-
	Samples Exceeding Std (%)	0	0	0	0	-	-
	Minimum	ND	ND	ND	ND	-	-
	Maximum	0.001	ND	ND	0.001	-	-
	Median	ND	ND	ND	0.001	-	-
Cd	Number of Samples	31	12	20	4	30	15
	Samples Exceeding Std (%)	10	0	0	0	0	7
	Minimum	ND	ND	ND	0.001	ND	ND
	Maximum	0.13	ND	ND	0.002	ND	5.50
	Median	ND	ND	ND	0.001	ND	ND
Cu	Number of Samples	24	12	20	5	30	15
	Samples Exceeding Std (%)	46	50	35	60	57	40
	Minimum	ND	ND	ND	ND	ND	ND
	Maximum	1.10	0.10	0.2	0.12	0.12	0.07
	Median	0.01	0.01	ND	0.12	0.02	0.02
Zn	Number of Samples	23	11	17	-	30	15
	Samples Exceeding Std (%)	0	0	0	-	0	0
	Minimum	ND	ND	ND	-	0.03	0.02
	Maximum	0.20	ND	0.10	-	0.21	0.16
	Median	0.06	ND	ND	-	0.05	0.05
As	Number of Samples	19	12	20	5	1	-
	Samples Exceeding Std (%)	0	0	0	0	100	-
	Minimum	ND	ND	ND	ND	1.0	-
	Maximum	0.020	ND	ND	0.002	1.0	-
	Median	0.002	ND	ND	0.001	1.0	-

Note :

i) ND indicates measurement below limit of detection.
ii) The limits of detection for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As are respectively 0.005, 0.001, 0.001, 0.01, 0.01 and 0.001 mg/l.
iii) The recommended standrads for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As with respect to Class III are respectively 0.02, 0.004, 0.01, 0.012, 0.4 and 0.4 mg/l.

Table 5.6

Malaysia: Levels and Non-Compliances of Heavy Metals in Selected Rivers, 1989

Heavy Metals		River Name						
		Perak	Bernam	Tengi	Selangor	Kelang	Langat	Linggi
Pb	Number of Samples	32	3	3	6	65	12	27
	Samples Exceeding Std (%)	10	67	67	50	45	16	22
	Minimum	ND	ND	ND	ND	ND	ND	ND
	Maximum	0.15	0.15	0.05	0.08	1.73	0.05	0.06
	Median	ND	0.05	0.03	0.02	0.02	0.01	0.01
Hg	Number of Samples	30	3	1	2	65	9	24
	Samples Exceeding Std (%)	0	0	0	0	0	0	0
	Minimum	ND	ND	ND	ND	ND	ND	ND
	Maximum	0.001	0.002	ND	ND	0.002	ND	0.001
	Median	ND	0.001	ND	ND	ND	ND	ND
Cd	Number of Samples	32	3	3	2	65	9	29
	Samples Exceeding Std (%)	0	33	0	0	0	0	0
	Minimum	ND	ND	ND	ND	ND	ND	ND
	Maximum	ND	0.08	ND	ND	ND	0.01	ND
	Median	ND	ND	ND	ND	ND	ND	ND
Cu	Number of Samples	19	3	-	2	65	-	-
	Samples Exceeding Std (%)	16	67	-	0	17	-	-
	Minimum	ND	ND	-	ND	ND	-	-
	Maximum	0.03	0.03	-	ND	0.02	-	-
	Median	ND	0.03	-	ND	ND	-	-
Zn	Number of Samples	32	-	1	4	70	9	29
	Samples Exceeding Std (%)	0	-	0	0	9	0	14
	Minimum	ND	-	ND	ND	ND	0.04	ND
	Maximum	0.05	-	ND	0.24	9.00	0.01	4.87
	Median	ND	-	ND	0.03	0.06	0.05	0.04
As	Number of Samples	32	3	1	2	63	9	22
	Samples Exceeding Std (%)	0	0	0	0	0	0	0
	Minimum	0.01	ND	0.008	0.006	0.001	ND	ND
	Maximum	0.05	ND	0.008	0.019	0.175	0.016	0.034
	Median	0.04	ND	0.008	0.013	0.024	0.009	0.018

Note :

i) ND indicates measurement below limit of detection.
ii) The limits of detection for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As are respectively 0.005, 0.001, 0.001, 0.01, 0.01 and 0.001 mg/l.
iii) The recommended standards for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As with respect to Class III are respectively 0.02, 0.004, 0.01, 0.012, 0.4 and 0.4 mg/l.

Table 5.6

Malaysia: Levels and Non-Compliances of Heavy Metals in Selected Rivers, 1989

Heavy Metals		River Name					
		Melaka	Muar	Batu Pahat	Skudai	Tebrau	Johor
Pb	Number of Samples	12	31	47	21	6	29
	Samples Exceeding Std (%)	17	0	2	0	16	0
	Minimum	ND	ND	ND	ND	ND	ND
	Maximum	0.06	ND	3.60	ND	0.08	ND
	Median	0.01	ND	ND	ND	ND	ND
Hg	Number of Samples	6	-	-	23	-	-
	Samples Exceeding Std (%)	0	-	-	0	-	-
	Minimum	ND	-	-	ND	-	-
	Maximum	ND	-	-	ND	-	-
	Median	ND	-	-	ND	-	-
Cd	Number of Samples	12	31	32	20	6	29
	Samples Exceeding Std (%)	0	0.6	0	0	0	0
	Minimum	ND	ND	ND	ND	ND	ND
	Maximum	ND	1.8	ND	ND	ND	ND
	Median	ND	ND	ND	ND	ND	ND
Cu	Number of Samples	-	31	48	39	24	30
	Samples Exceeding Std (%)	-	6	0	0	0	7
	Minimum	-	ND	ND	ND	ND	ND
	Maximum	-	0.23	ND	ND	ND	0.06
	Median	-	ND	ND	ND	ND	ND
Zn	Number of Samples	12	39	29	23	6	30
	Samples Exceeding Std (%)	8	0	0	0	0	0
	Minimum	ND	ND	ND	ND	ND	ND
	Maximum	0.83	ND	ND	ND	ND	ND
	Median	0.03	ND	ND	ND	ND	ND
As	Number of Samples	6	43	47	23	-	29
	Samples Exceeding Std (%)	0	0	0	0	-	0
	Minimum	ND	ND	ND	ND	-	ND
	Maximum	0.007	0.008	0.008	0.008	-	0.004
	Median	0.003	ND	ND	ND	-	ND

Note :

i) ND indicates measurement below limit of detection.
ii) The limits of detection for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As are respectively 0.005, 0.001, 0.001, 0.01, 0.01 and 0.001 mg/l.
iii) The recommended standards for the above mentioned heavy metals, viz., Pb, Hg, Cd, Cu, Zn, As with respect to Class III are respectively 0.02, 0.004, 0.01, 0.012, 0.4 and 0.4 mg/l.

Table 5.7

Peninsular Malaysia: Nutrients Levels and Non-Compliances of River Water Quality, 1989

Name of River	Nitrate Nitrogen (mg/l)					Sulphate (mg/l)					Phosphate (mg/l)				
	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 7.0 mg/l (Per cent)	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 200 mg/l (Per cent)	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 0.1 mg/l (Per cent)
Perlis	15	0.20	3.30	0.40	0	15	4.0	129.0	19.0	0	15	0.01	30.00	0.33	80
Kedah	30	0.15	0.45	0.20	0	30	1.0	272.0	11.0	3	30	0.01	12.50	0.14	47
Merbok	21	0.10	1.30	0.40	0	21	7.0	1140.0	149.0	29	21	0.02	1.40	0.43	67
Muda	56	0.01	0.70	0.30	0	56	1.0	98.0	7.0	0	56	0.01	22.00	0.19	54
Perai	32	0.10	2.45	0.55	0	32	1.0	3480.0	19.0	13	32	0.02	20.40	0.46	69
Juru	20	0.10	2.30	0.28	0	20	17.0	52.0	32.0	0	20	0.34	6.40	0.68	100
Jejawi	8	0.10	0.95	0.58	0	8	6.0	1620.0	19.0	25	8	0.10	0.80	0.11	50
Kerian	6	0.10	0.55	0.33	0	6	3.0	21.0	14.0	0	6	0.02	0.85	0.27	50
Kurau	13	0.02	0.82	0.23	0	13	ND	ND	ND	0	13	0.02	0.04	0.03	0
Sepetang	23	0.08	1.97	0.33	0	23	13.4	13.4	13.4	0	23	0.02	0.33	0.09	22
Beruas	6	0.13	0.57	0.33	0	-	-	-	-	-	6	0.02	0.06	0.04	0
Raja Hitam	9	0.07	0.98	0.43	0	9	58.5	1500.0	746.0	22	9	0.01	1.11	0.09	33
Perak	85	0.08	9.78	0.33	1	85	3.5	38.0	10.0	0	85	0.01	15.00	0.13	26
Bernam	18	0.04	0.49	0.20	0	18	8.9	740.0	374.5	6	18	0.05	0.12	0.08	6
Tengi	6	0.08	0.35	0.20	0	-	-	-	-	-	6	0.06	0.20	0.11	67
Selangor	18	0.17	0.85	0.35	0	-	-	-	-	-	18	0.01	0.60	0.08	44
Buloh	20	0.16	1.58	0.43	0	20	3.6	151.3	6.6	0	20	0.01	1.93	0.45	80
Kelang	181	0.02	9.24	0.31	1	-	-	-	-	0	181	0.01	3.57	0.23	89
Langat	43	0.03	0.82	0.36	0	43	0.2	31.3	2.0	0	43	0.01	0.37	0.10	35
Sepang	11	0.01	0.42	0.11	0	11	1071.0	1647.9	1515.6	36	11	0.13	2.07	0.31	100
Linggi	63	0.08	3.50	0.56	0	63	0.7	11.3	3.3	-	63	0.01	1.60	0.20	84
Melaka	32	0.11	20.80	0.63	3	-	-	-	-	-	32	0.01	0.36	0.19	69
Duyong	8	0.10	0.82	0.35	0	-	-	-	-	-	8	0.01	0.14	0.01	13
Kesang	12	0.18	0.70	0.33	0	-	-	-	-	-	12	0.01	0.19	0.12	58
Muar	80	0.12	1.50	0.40	0	80	0.2	1150.0	11.9	4	80	0.01	19.00	0.08	41
Batu Pahat	59	0.10	1.80	0.30	0	59	3.1	166.0	67.8	0	59	0.01	0.36	0.04	22
Benut	30	0.10	1.60	0.34	0	30	4.1	10.2	7.4	0	30	0.01	1.42	0.04	20
Air Baloi	11	0.20	1.40	0.28	0	-	-	-	-	-	11	0.03	0.24	0.09	45
Pontian Besar	15	0.14	1.40	0.60	0	15	0.1	0.1	0.1	0	15	0.02	0.61	0.10	47
Pontian Kechil	6	0.18	0.70	0.22	0	6	0.4	0.4	0.4	0	6	0.01	0.16	0.03	33

Note:

- No Analysis
ND Not detected

Table 5.7

Peninsular Malaysia: Nutrients Levels and Non-Compliances of River Water Quality, 1989

Name of River	Nitrate Nitrogen (mg/l)					Sulphate (mg/l)					Phosphate (mg/l)				
	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 7.0 mg/l (Per cent)	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 200 mg/l (Per cent)	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 0.1 mg/l (Per cent)
Tebrau	8	0.16	2.24	0.40	0	8	7.60	543.00	41.85	13	8	0.01	0.08	0.02	0
Skudai	39	0.10	6.40	0.36	0	39	0.09	8.70	3.95	0	39	0.01	16.00	0.10	41
Johor	80	0.04	1.40	0.34	0	80	2.50	23.20	6.80	0	80	0.01	3.59	0.05	20
Sedili Besar	47	0.08	1.00	0.24	0	47	119.00	119.00	119.00	0	47	0.01	0.01	0.01	0
Mersing	6	0.08	0.28	0.17	0	-	-	-	-	-	6	0.01	0.03	0.03	0
Endau	49	0.10	1.00	0.38	0	49	0.30	21.40	3.80	0	49	0.01	1.90	0.04	33
Anak Endau	10	0.03	1.20	0.08	0	-	-	-	-	-	-	-	-	-	-
Rompin	52	0.01	2.50	0.17	0	-	-	-	-	-	-	-	-	-	-
Bebar/Merchong	7	0.06	0.09	0.08	0	-	-	-	-	-	-	-	-	-	-
Pahang	160	0.02	4.00	0.25	0	160	0.20	48.00	3.45	0	160	0.01	1.00	0.07	8
Kuantan	28	0.03	4.80	0.17	0	28	1.50	6.10	3.65	0	-	-	-	-	-
Balok/ Cherating	15	0.03	0.32	0.03	0	-	-	-	-	-	-	-	-	-	-
Kemaman	24	0.20	1.48	0.46	0	-	-	-	-	-	24	0.01	0.15	0.04	8
Chukai/Kerteh	15	0.23	2.47	0.43	0	-	-	-	-	-	15	0.01	0.15	0.02	7
Paka	12	0.10	1.07	0.38	0	-	-	-	-	-	12	0.01	0.20	0.05	17
Dungun	15	0.26	1.07	0.43	0	-	-	-	-	-	15	0.01	0.05	0.03	0
Ibai	6	0.43	1.32	0.55	0	-	-	-	-	-	6	0.01	0.20	0.06	17
Terengganu	28	0.20	1.48	0.39	0	28	0.02	0.07	0.3	-	28	0.01	0.10	0.01	0
Setiu	4	0.21	0.40	0.28	0	-	-	-	-	-	4	0.05	0.05	0.05	0
Besut	6	0.21	2.31	0.29	0	-	-	-	-	-	6	0.01	0.03	0.02	0
Kemasin	6	0.16	1.98	0.26	0	-	-	-	-	-	6	0.01	0.05	0.03	0
Kelantan	39	0.16	2.31	0.36	0	-	-	-	-	-	39	0.01	0.20	0.01	3
Golok	3	0.23	0.33	0.26	0	-	-	-	-	-	3	0.01	0.01	0.01	0

Note:

No analysis

Table 5.8

East Malaysia: Nutrients[a] Levels and Non-Compliances of River Water Quality, 1989

NAME OF RIVER	Nitrate Nitrogen (mg/l)					Phosphate (mg/l)				
	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 7.0 mg/l (Per cent)	Number of Samples	Minimum	Maximum	Median	Samples Exceeding 0.1 mg/l (Per cent)
SARAWAK										
Btg. Kayan	22	0.02	0.24	0.05	0	22	0.03	0.03	0.03	0
Sarawak/ Samarahan	72	0.02	0.70	0.16	0	72	0.03	1.40	0.11	36
Btg. Sadong	48	0.02	3.00	0.08	0	48	0.01	0.80	0.05	15
Btg. Lupar	49	0.02	0.55	0.08	0	49	0.03	1.00	0.05	2
Btg. Saribas	2	0.02	0.05	0.03	0	-	-	-	-	-
Kerian	6	0.08	0.15	0.10	0	6	0.03	0.05	0.04	0
Btg. Rajang	64	0.02	1.60	0.10	0	64	0.03	0.25	0.03	5
Btg. Oya	8	0.02	0.25	0.17	0	-	-	-	-	-
Btg. Mukah	8	0.15	0.20	0.18	0	8	0.03	0.03	0.03	0
Btg. Balingian	3	0.02	0.25	0.06	0	3	0.03	0.03	0.03	0
Btg. Tatau	4	0.04	0.18	0.13	0	4	0.10	0.10	0.10	0
Btg. Kemena	12	0.03	0.32	0.08	0	12	0.10	0.10	0.10	0
Similajau	4	0.16	0.28	0.20	0	4	0.04	0.04	0.04	0
Suai	4	0.06	0.32	0.25	0	4	0.02	0.05	0.03	0
Niah	12	0.18	0.72	0.28	0	12	0.04	0.10	0.04	0
Sibuti	16	0.12	0.80	0.26	0	16	0.02	0.10	0.05	0
Miri/Lutong	13	0.04	0.56	0.20	0	13	0.02	0.17	0.03	8
Btg. Baram	8	0.06	0.28	0.21	0	8	0.02	0.05	0.04	0
Limbang	8	0.04	0.28	0.15	0	8	0.01	0.04	0.02	0
Btg. Trusan	2	0.14	0.20	0.17	0	-	-	-	-	-
Lawas	2	0.08	0.10	0.09	0	-	-	-	-	-

Note:

- No analysis
a No analysis for sulphate

Table 5.9

Malaysia: Beaches Occasionally Contaminated with Tarballs, 1989

State	Beach	Maximum value recorded (gram per metre strip)
Johor	Pantai Desaru	79.7
	Pantai Tanjung Setapa	434.0
	Pantai Sri Pantai	841.7
	Pantai Air Papan	1915.0
	Pantai Teluk Gorek	2253.3
Kelantan	Pantai Sabak	79.8
	Pantai Irama, Bachok	160.0
Melaka	Pantai Tanjung Bidara	0.8
	Pantai Rombang, Tanjung Keling	0.8
	Pantai Kundur, Tanjung Keling	1.0
	Pulau Besar	8.1
Negri Sembilan	Port Dickson, Batu 10	0.3
	Port Dickson, Batu 5	1.5
	Port Dickson, Batu 8	1.5
	Port Dickson, Batu 7	12.5
Pahang	Pantai Batu Hitam	0.9
	Tioman Island Resort	21.3
Perak	Pantai Pasir Bogak	21.0
Selangor	Pantai Morib	9.4
Terengganu	Pantai Rantau Abang	68.9

CHAPTER 6
POLLUTION ABATEMENT AND CONTROL

POLLUTION ABATEMENT AND CONTROL

Introduction

Since 1981, the bulk of the work of enforcing the Regulations is carried out by the Regional Offices. Co-ordination, evaluation and overall planning continue to be the responsibilities of the Headquarters. Problematic and appeal cases are dealt with at the Headquarters as well. Also carried out at Headquarters, are activities related to the collection of revenue namely the issuing of licences for prescribed premises and contravention.

In 1989, records show that not less than 3676 industrial sources were visited under the enforcement programmes of all the 14 Regulations introduced under the Environmental Quality Act, 1974. This number represents an increase of 3 per cent over the number of visits carried out in 1988.

In summary, for the year 1989, the powers of the Department of Environment for pollution abatement and control were widened with the implementation of Regulations for managing scheduled wastes. Refer APPENDIX 7.1. Potential sources of pollution were estimated to have increased by 6 per cent for air pollution and 20 per cent for water pollution. Despite these additional responsibilities, enforcement activities had to be carried out by the same number of manpower and at the same amount of operating expenditure. As such, activities had to be prioritised and balanced between the needs of the private sector, the public and the Department's own duties and obligations.

The enforcement of the earliest sets of Regulations to control the prescribed premises of crude palm oil and raw natural rubber factories have shown satisfactory results, in particular the reduction of organic loads into the inland waters. Legal action continued to be taken against a number of premises, and most of the offences were related to negligence and lack of proper maintenance of treatment plant and pollution control equipment.

As far as other sources of pollution were concerned, the sheer volume of sources and their rapid increase posed problems of inspection to ensure compliance with both air and water pollution control requirements. Many who established factories prior to the enforcement of pollution control regulations continued to face difficulties in installing and operating the necessary waste plant as a result of land constraints and the encroachment of land uses incompatible with industrial uses. Consequently, licences for contravention continued to be issued for those unable to comply with the relavent requirements.

The enforcement on mobile sources was stepped up in 1989 in particular, in the Klang Valley. For the last three years, the level of compliance has been maintained at 84 per cent. The reduction of lead (Pb) in petrol progressed satisfactorily in anticipation of the forthcoming reduction in the lead in petrol to 0.15g/l by 1 January, 1990.

The enforcement of the Regulations for the management of toxic and hazardous or scheduled wastes in mid-1989 resulted in a hectic programme of consultations and dialogues as well as the prerequisite implementation of notification procedure, inventory of waste generation and processing licensing applications.

With regard to marine pollution control, efforts to improve oil spill response capabilities of both the private and public sectors were continued.

Environmental Legislation

Two new sets of Regulations and an Order were gazetted and enforced with effect from 1 May 1989, making a total of fifteen, the number of

Regulations, Rules and Orders enforced by the Department of Environment as listed out in APPENDIX 6.1:

i) Environmental Quality (Scheduled Wastes) Regulations 1989;

ii) Environmental Quality (Prescribed Premises)(Scheduled Wastes Treatment and Disposal Facilities) Order 1989; and

iii) Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations 1989.

Sources of Pollution

The Department of Environment maintains an inventory of sources of air and water pollution. The inventory is constantly updated to take into account new sources and those which have closed down permanently or moved to new sites. Data for the inventory is obtained from several sources; enforcement visits by personnel both from the Regional Offices and Headquarters, application forms submitted for prior approval of installations of boilers and chimneys, and through information contained in questionnaires as well as those submitted by industry and from relevant Government Departments and agencies.

Sources of Air Pollution

The major sources of air pollution identified in Malaysia can be classified into three major groups: mobile sources, industrial stationary sources and solid waste disposal sites. An inventory of these sources is given in Table 6.1. Petrol-powered vehicles account for 93 per cent of the mobile sources of pollution. Fuel combustion at power stations, boilers, furnaces and incinerators account for 32 per cent of the stationary sources of pollution. With regard to open burning at solid waste disposal sites, checks by the Department at 29 out of 102 sites showed that open burning was being carried out at all the sites. Although only 28 per cent of the sites were visited in 1989, complaints received and investigation reports submitted revealed that open burning was a regular occurrence at most disposal sites.

Figures 6.1 and 6.2 show the distribution of mobile and stationary sources, respectively in each state. It is evident that Selangor, Perak and Wilayah Persekutuan together account for 42 per cent and 36 per cent respectively of the total number of these two types of sources.

Mobile sources represent the largest source of pollution in terms of number and Table 6.2 presents details of the various types of vehicles registered in Malaysia in 1989. Motorcycles account for 59 per cent and private cars 31 per cent of the total number of vehicles, the remainder comprising vans, lorries, taxis, buses and other types (including tractors and cranes). Comparison with records of 1988 indicates an increase of 6 per cent in both private car and motorcycle ownership. In addition, diesel-powered vehicles account for almost 7 per cent of the total number of vehicles.

The inventory of new fuel burning equipment by the Department in 1989 (Table 6.3) shows a decrease of 27 per cent compared with 1988. However, in terms of fuel consumption, the new equipment approved are estimated to be using about four times the amount of fuel used by those approved in 1988.

Air Pollution Load

Emissions of particulates, CO, NO_x, SO_x and HCs were estimated for 1989 based on emission factors of production rate, material, quantity and type of fuel and control equipment used. Tables 6.4, 6.5, 6.6 and 6.7 show some estimated air pollution loads generated by mobile sources, fuel burning equipment and industrial sources. Estimates of newly approved fuel burning equipment in 1989 (without control equipment) show that 1855 metric tonnes of SO_x would be emitted from the use of both solid and liquid fuels (Table 6.5). From Table 6.6, it is evident that the emissions of particulates, in particular

from the cement and quarrying industries, are major contributors to air pollution. Table 6.7 shows that emissions depend on fuel consumption. Among the major pollutants examined, it has been found that the estimated amount of SO_x emitted in 1989 varies markedly with 1988 and 1987. The most significant reduction has been from several power stations which are using natural gas instead of fuel oil and diesel (Figure 6.3). However, if the emission load of the same pollutants is compared with the emissions from mobile sources, the contribution from mobile sources has increased from 59 per cent in 1987 to 80 per cent of the total in 1989.

Sources of Water Pollution

The major stationary sources of water pollution have also been accounted for. Table 6.8 shows that the food and beverage industries account for 41 per cent of the total number of industrial sources discharging into inland waters. The crude palm oil and raw natural rubber industries form 21 per cent of the sources followed by the rubber products industry (15 per cent); chemical products industry (15 per cent); textile and leather products (8 per cent) and paper products (3 per cent).

The sources of water pollution continued to be concentrated on the west coast of Peninsular Malaysia while only 7 per cent are found in Sabah and Sarawak. The majority of sources are found in Selangor, Johor and Pulau Pinang which account for almost 50 per cent of the major sources (Figure 6.4). In these three states, the food and beverage industry makes up 42 per cent and rubber products, 61 per cent of the total in each category.

Water Pollution Load

Organic Load

The organic load generated and discharged into inland waters has been estimated in terms of Biological Oxygen Demand (BOD). The most significant contributor is domestic sewage which contributes 80 per cent of the total load in 1989. Table 6.9 provides estimates of organic pollution loads from four sectors namely, the crude palm oil and raw natural rubber industries; other manufacturing industries; animal husbandry (pig rearing); and the population. Increase in the load from 1988 is estimated to be 2 per cent for domestic sewage and 9 per cent for animal husbandry. In contrast, the organic loads from both the crude palm oil and raw natural rubber industries, the major organic sources of pollution in the 1970's, have remained steady in the last four years.

Abatement and Regulatory Control of Pollution

From the enforcement activities carried out at both the Federal and Regional levels, the status of compliance with the respective Regulations have been examined.

Crude Palm Oil Mills

In 1989, a total of 254 mills processing crude palm oil were licensed or in the process of being licensed under section 18(1) of the Environmental Quality Act, 1974 and to comply with standards of discharge specified under the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 (Amended 1982). For the licensing period 1 July, 1989 to 30 June 1990 there were still cases of late application after the stipulated period ending 31 March 1990 despite reminders and unchanged method of renewal. Late application penalty fees imposed amounted to $39 754.46 (Table 6.10). This amount is more than thrice the charges collected during the previous year. Although efforts were taken by the Department to encourage early renewal, some mills preferred to pay the penalty rather than apply early. Such practices have resulted in late issuance of licences and additional workload for the Regional Offices.

Figure 6.5 illustrates the growth of the crude palm oil industry in the country in the last 12 years. Compared to the first year of enforcement of the Regulations, the crude palm oil industry has grown as much as 94 per cent from 131 in 1978 to 254 in 1989. The maximum growth of the industry was during the period 1985 to 1986 during which there was a rise in hectarage under oil palm and favourable export prices for palm oil.

Since the enforcement of the Environmental Quality (Prescribed Premises)(Crude Palm Oil) Regulations 1977, the total revenue collected in licensing the industry has decreased by about 88 per cent in 1989 (Figure 6.6). Figure 6.6 shows a remarkable reduction in effluent-related fees collected over the 12-year period of 1978 to 1989. This reduction in revenue reflects the tremendous reduction in pollution load discharged by this industry. In accordance with the Department's objectives of maximum waste utilisation and zero discharge, this means that total organic load has been successfully reduced by 99 per cent since 1978.

The Department of Environment, in enforcing the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977, has emphasized the reduction of the Biological Oxygen Demand (BOD) 3-day; 30°C of the effluents discharged. However, in July, 1989 after consultation with the Tripartite Consultative Council and the Malaysian Palm Oil Growers Council, additional parameters were incorporated as licence conditions for mills practising watercourse discharge. For this purpose, the palm oil mills involved (62 per cent of the total) were informed of the additional licensing conditions to be imposed. The mills were given a grace period of six months during which compliance with the additional parameters were monitored.

Results of monitoring 153 palm oil mills during this period showed that 83 per cent complied with discharge standards for oil and grease; 93 per cent complied with standards for ammoniacal nitrogen and total nitrogen. The results obtained were satisfactory considering the duration given for compliance (Table 6.11). However, despite ten years of enforcing the level for the B.O.D, only 83 per cent were found to comply with the stipulated level of 100 mg/l. The poor performance was traced to improper management of treatment systems, the use of undersized systems as well as increased milling capacity during the peak crop season.

Over the year, three mills had their licences suspended for poor management of treatment systems and discharge of raw effluent without prior treatment. The mills concerned were allowed to operate again after corrective actions had been taken. It is only three mills were taken to court under section 16(1) of the Environmental Quality Act, 1974 for non-compliance of licensing conditions.

Raw Natural Rubber Factories

A total of 205 licences were issued to raw natural rubber factories regarding compliance with standards under the Environmental Quality (Prescribed Premises)(Raw Natural Rubber) Regulations 1978. Figure 6.5 shows the total number of raw natural rubber factories licensed from 1978 to 1989. Compared to the first year of enforcement of the Environmental Quality (Prescribed Premises)(Raw Natural Rubber) Regulations 1978 , the number of factories in production has decreased as much as 6 per cent from 217 in 1979 to 205 in 1989. This can be attributed to a number of factors, including depressed prices resulting from weak world demand as well as the conversion of rubber hectarage to other crops.

For the licensing period of 1 April, 1989 to 31 March, 1990 there were still cases of late application after the stipulated period ending 31 December, 1988 and one case of renewal after expiry of licence. Penalty imposed under section 13 of the Environmental Quality Act, 1974 amounted to $12 628.85, more than twice the figure collected in 1988 (Table 6.10). Four factories were given approval to process latex

concentrate in additon to SMR and one factory had its licensing conditions varied under section 11 of the Act. However, with the reduced demand for latex concentrate especially from the rubber-based manufacturing industries, two out of the four factories approved to process latex concentrate as well as SMR have not started production. In addition, four factories; three Standard Malaysian Rubber (SMR) and conventional grade factories and one latex concentrate factory, stopped operations in 1989.

Assessment of the total revenue collected in licensing the raw natural rubber industry since 1979 shows a reduction of 44 per cent in fees collected in 1989 (Figure 6.6). Over the period 1982-1989 effluent-related fees collected from this industry based on pollution load discharged have remained stagnant due to the slow development of new factories.

During 1989, 96 per cent of the raw natural rubber factories were able to comply with the effluent discharge standards. Non-compliance was found to have been caused by lack of maintenance and overloading of treatment systems.

Complaint cases, mainly concerned with malodour still persist eventhough efforts taken by the Department and to some aspect, the industry, to ensure good-housekeeping had been followed and proper control equipment installed. Relocation of the rubber factories and control of new development in the vicinity of existing factories seem to be the solution to these problems and need to be studied by the relevant approval authorities.

Over the year, five factories were taken to court under section 16(1) of the Environmental Quality Act, 1974 for not complying with the licensing conditions and two factories were found guilty under section 18(1) of the Act for operating without a licence.

Treatment technology has not varied much over the years. However, efforts by the industry and the Rubber Research Institute of Malaysia (RRIM) to look into new technologies especially in terms of waste recovery and utilisation still continue. In this aspect, RRIM and Yokohama Rubber Co. Ltd. of Japan has come up with a special process to recover and concentrate the natural serum; a waste and major pollutant from the rubber processing factories which is normally treated due to its high organic content and offensive smell from the biodegradation of this organic matter, as a fertilizer source. Besides this, RRIM has also looked into the agronomic potential of the natural rubber serum powder from the rubber factories. Some progress has been achieved and more advanced technologies in the field of waste recovery and utilisation are anticipated.

Manufacturing Industries

Manufacturing industries, other than the crude palm oil and raw natural rubber industries, are regulated under the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 and the Environmental Quality (Clean Air) Regulations 1978.

The Manufacture of Rubber Products

The rubber-based industry, in particular those using latex as raw material continued to grow in 1989 as the medical examination glove market was very demanding. Consequently, the number of factories manufacturing rubber products tripled in 1989 compared to 1987. Table 6.12 shows the distribution of latex-based factories according to regions. 55 per cent of the factories are located in the Federal Territory of Kuala Lumpur and Selangor. Out of the total number in 1989, about 60 per cent are manufacturing medical examination gloves. The problem of contamination of vulcanised rubber (VR) particularly in SMR, still prevails. In order to safeguard the quality of Malaysian rubber, the Department of Environment has allowed the practice of open burning of the VR wastes for the last two years. This is in contravention of section 22(1) of the Environmental Quality Act,

1974 and under licence specified in regulation 12 of the Environmental Quality (Clean Air) Regulations 1978. However, this is only an interim measure in view of efforts by the relevant authorities in finding a long-term solution. At the end of 1989, MIDA proposed that conditions on the method of rubber waste disposal be included for all new and existing rubber-based industries.

Metal Finishing Industries

As identified in previous surveys the metal finishing industries (including electroplating, galvanising and anodising) continue to pose problems as a major contributor of heavy metals pollution to our inland waters. Based on the Department's inventory, 107 companies have been identified as producing waste acids and alkalis; and also sludges containing heavy metals such as nickel, chromium and copper (Table 6.13). 53 per cent of these companies are concentrated in Selangor and Federal Territory but are scattered in six areas around Batu Caves, Ampang, Puchong, Sungai Besi, Shah Alam and Kapar, Kelang. No such industries have been identified in Kelantan, Terengganu and Perlis. However, 90 per cent of the existing metal finishers can be classified as medium and small-scale operators. Compliance with effluent discharge standards is very poor and factors which contribute to non-compliance include incompatible and temporary location of the operations, the costs of treatment compared with capital costs, and prospects of the industry in relation to their manufacturing industries. These factors, together with spatial constraints are further compounded by the new Regulations which classify some of the wastes generated as 'scheduled wastes'. Several government agencies including local authorities, MIDA, SIRIM and the Department of Environment are looking into the alternatives towards solving this problem. The CSC COMMANSAT/IDEA Study that is described in Chapter 10, is one of the co-ordinated efforts towards managing wastes from this source; the objective being the establishment of a Common Wastewater Treatment Facility.

Hotels and Condominiums

The bigger hotels and condominiums in selected resorts in Pahang, Perak, Pulau Pinang and Negri Sembilan were inspected in 1989. In Kuantan and Pulau Pangkor, hotels were found to be using individual units of septic tanks or activated sludge for treatment of sewage. The systems were found to be satisfactory, producing effluents containing acceptable levels of E.coli. The same type of treatment systems are employed by hotels in Port Dickson and Penang. However, the coastal areas of both will soon benefit when the Central Sewerage System for Penang North Coast is commissioned in the middle of 1990 and the project for Port Dickson is implemented.

Contravention Licence

The Environmental Quality Act, 1974 provides for establishments not able to comply with acceptable conditions of discharge of wastes into various segments of the environment to apply for contravention licence. Contravention of acceptable conditions of emission of wastes into the atmosphere is provided for under section 22(1); and for discharge into inland waters under section 25(1) of the Act. Figure 6.7 shows the number of applications of licence between 1984 and 1989. Applications to discharge wastes into the atmosphere have increased by 450 per cent whereas those to discharge wastes into inland waters have decreased by 55 per cent.

Contravention Licence under Section 22(1), Environmental Quality Act, 1974

A contravention licence is allowed for open burning of wastes only if it is the only economically practicable method of disposal and the burning is not likely to cause pollution problems to those residing in nearby areas. Such licences formed 90 per cent of the licences issued. Licence was also issued for cases of incinerator

not of approved design; and emission of dark smoke and particulates. In 1989, the number of applications for contravention licence under section 22 (1) of the Act has increased to 136, 84 per cent higher than 1988. The breakdown for the applications according to type of industry and type of contravention required are shown in Tables 6.14 and 6.15. This increase can be attributed to the rubber-based industries which had to burn their vulcanised rubber waste as directed by the rubber licensing authorities to prevent SMR contamination due to resale of these wastes as rubber cuplumps by unscrupulous persons. Licences for rubber-based factories formed 58 per cent of the total number of licences issued.

However, licences for open burning were approved for genuine cases only and burning was carried out only at suitable sites. In the case of wood-based industries, minimising of waste generation and utilisation of waste as fuel for boilers and drying purposes have been promoted.

As at 31 December, 1989, 50 contravention licences were issued (37 per cent); and 13 (9 per cent) were rejected. The processing of the remainder were delayed due to the applicants failure to submit all the required information and other reasons, including the applicant being found not to have obtained the necessary permits from the Department of Environment and other relevant authorities.

Contravention Licence under Section 25(1), Environmental Quality Act, 1974

In 1989, 73 applications for licence under Section 25(1) of the Act were received and processed as compared to 75 applications received in 1988. The applications were made for the purposes of contravening acceptable conditions of effluent discharge specified in regulation 8, Environmental Quality (Sewage and Industrial Effluents) Regulations 1979. Applications were received from various industries but the majority were from the rubber-based industry especially those that produce rubber examination gloves (26 per cent). This differed from the previous years when applications received previously were mainly from the food-processing industry. This could be attributed to the fact that the rubber examination gloves plants were quickly set-up, in the rush to meet the unprecedented demand for examination gloves. These plants went into production without adequate provisions for the treatment of effluents produced from their operations and thus faced non-compliance with the discharge limits. Applications for licence were made for the time required to install effluent treatment plants. However, some of these rubber-based industries were unable to install effluent treatment plants due to the sharp drop in demand for their products and therefore, those who had not secured contracts for their products had little choice but to cut down their production and to operate below capacity and thus were faced with financial difficulties.

The reasons given by industry in applying for contravention licence were varied. As shown in Table 6.17, 38 per cent of the applications received in 1989 cited reasons of time for construction of treatment plant upgrading (15 per cent); financial constraints (9 per cent); proposal for discharge into a central sewerage plant (8 per cent), and the remainder cited other reasons including lack of land and lack of treatment technology. Throughout 1989, 53 licences were issued (73 per cent of applications) and the remainder were rejected on grounds of non-justification for contravention and incomplete submissions.

Management of Scheduled Wastes

During the 8-month period ending 31 December, 1989, notification forms were sent out to about 900 companies identified as waste generators. The notification of the generation of scheduled wastes is required under regulation 3 of the Environmental Quality (Scheduled Wastes) Regulations 1989. Generators who were storing their wastes on-site were monitored to ensure that the wastes were properly stored and inventories maintained.

During this period, many consultations and discussions were held with industry and dialogue sessions were organised for various organisations including the FMM and the Association of Battery Manufacturers. The Department also received many enquiries about the establishment of facilities prescribed as scheduled wastes treatment and disposal facilities.

Table 6.18 is an indication of the number of recorded enquiries and the number of applications for the setting up of storage/collection, off-site recovery, incineration and land treatment facilities.

In addition, the Department approved two consignments of scheduled wastes for recovery and ultimate disposal in Japan and the U.K. respectively. The movement of wastes were carried out in line with the requirements of the Cairo Guidelines and the Basel Convention.

Mobile Sources

Black Smoke Emission

Control of excessive black smoke emission from diesel-powered motor vehicles under the Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977 was enhanced with the purchasing of ten Pajeros. These vehicles were utilised as mobile test stations, doubling as roving squads by all the Regional Offices throughout the country.

In 1989, the Department of Environment, with the co-operation of the Traffic Police and the Road Transport Department conducted 448 enforcement campaigns throughout the country; the highest since enforcement began in 1979. From these campaigns, 42 284 vehicles were tested using the Hartridge Smokemeter. 7 085 drivers/vehicle owners were served with summons for violating the limit of 50 Hartridge Smoke Units (HSM). The overall percentage of compliance was found to be 83 per cent, compliance having been steady since 1985 (Figure 6.8).

Figure 6.9 shows the breakdown for the types and number of vehicles summoned and the compliance percentage in 1989. The highest percentage of compliance was by lorries (89 per cent); followed by buses and others (vans and pick-ups) (78 per cent); taxis (75 per cent); and private cars (74 per cent). In terms of numbers of summons, the highest violators were again lorries, followed by buses, taxis, vans and pick-ups, and private cars.

Table 6.19 shows enforcement statistics for 1987, 1988 and 1989. It is noted that overall compliance in 1989 has decreased. This can be attributed to increased campaigns within city areas particularly in the Klang Valley. Such campaigns have resulted in more buses and taxis being tested and subsequently summoned for non-compliance. Analysis of the distribution of offences in the states also confirms that the lowest level of compliance was in Kuala Lumpur followed by Melaka and Selangor (see Table 6.20 & Figure 6.10).

Besides enforcement on in-use vehicles, the Department also carries out smokechecks on new vehicle models at local assembly plants. From random checks carried out in 1989, all 34 vehicles (including 13 lorries, 8 vans, 7 land cruisers, 3 buses and 3 pick-ups) were found to comply with the stipulated smoke limit.

The Department also responds to public complaints of excessive black smoke emission through the reporting card system. Vehicles reported were traced and called up for testing to verify the complaints. Subsequently, a total of 111 diesel vehicles were tested in 1989 resulting with 16 (14 per cent) failures of compliance (ie. 60 buses tested with eight failures; 11 taxis tested with three failures; 21 lorries tested with two failures; three private cars tested with two failures; two vans tested with one failure and one pick-up tested, no failure). All failed vehicles were directed to take necessary steps to meet the emission standard.

Lead in Petrol

Compliance with lead concentration requirements in petrol, under the Environmental Quality (Control of Lead Concentration in Motor Gasoline) Regulations 1985 was monitored through sampling programmes. A total of 127 samples of both Premium and Regular grades of petrol were taken for analyses from all petrol manufacturers and suppliers in Malaysia. 48 samples were taken from oil refineries and storage depots, while the remaining 79 samples were from petrol kiosks, selected at random. The results from the analyses show that all samples met the stipulated standard of 0.4 g/l.

The present lead level of 0.4 g/l will be further reduced to 0.15 g/l on 1 January, 1990. Discussions with individual oil companies and meetings with the petroleum industry and other related agencies were regularly held to sort out and monitor their implementation programmes and progress on compliance with the forthcoming reduction in lead level. It is anticipated that the petroleum industry would be able to comply with the above requirement without difficulty.

Motor Vehicle Noise

Enforcement of the Environmental Quality (Motor Vehicle Noise) Regulations 1987 continued to concentrate on noise emissions from motorcycles. 43 enforcement campaigns were carried out in 1989 where about 800 motorcycles were tested. Only 512 motorcycles (64 per cent) complied with the two sets of limits (95 dB(A) for 125 cc and below and 99 dB(A) for 125 cc and above). Those motorcycles which did not comply were fined accordingly.

Legal Action

The Environmental Quality Act, 1974 provides penalties for cases of omission or neglect to comply with the Act or the Regulations made under the Act.

Failure to comply with stipulated acceptable conditions of discharge of wastes into the atmosphere and into inland waters may result in litigation. So far, offenders have been charged under Sections 16, 18, 25 and 37 of the Environmental Quality Act, 1974 and regulations 8, 11, 15, 36 and 40 of the Environmental Quality (Clean Air) Regulations 1978. Figure 6.11 shows the annual number of cases taken to court in the 10-year period between 1980 and 1989. 1984 was the year when 93 cases (25 per cent of the total) were prosecuted.

The distribution of offences prosecuted by state during the same period is illustrated in Figure 6.12. Johor accounts for 20 per cent; Selangor 15 per cent; and Perak 12 per cent of the total number of prosecutions. The lowest numbers were in the states of Negri Sembilan, Melaka and Perlis accounting for a total of eight out of 370 (2 per cent).

Prosecutions

In 1989, only 22 cases were prosecuted and a total of $42 700 were collected in fines. Tables 6.21 and 6.22 provide details of offences committed. It can be seen that failure to comply with conditions of licence and discharge of wastes into inland waters without licence constitute the main (64 per cent) of offences under section 16 and section 25 of the Environmental Quality Act, 1974. Only 23 per cent were prosecuted for offences under the Environmental Quality (Clean Air) Regulations 1978. Analysis of the Department's records indicate that the majority of cases prosecuted in court were prescribed premises i.e. the rubber and palm oil mills followed by textile mills. Records show that the prescribed premises were negligent in the operation of their treatment plants and were unable to comply with the required discharge standards. For example, a rubber mill with previous records of repeated violations was fined a maximum amount of $10 000 by the court. With regard to textile mills, they were prosecuted for failure to install treatment systems after advice and warning letters had been issued and ample time given for

their installation. Two wood-based industries were issued specific orders to cease operation until satisfactory remedial actions had been taken.

Compounds

Offences are compoundable under the following Regulations:

- Environmental Quality (Clean Air) Regulations 1978;
- Environmental Quality (Motor Vehicle Noise) Regulations 1987;
- Environmental Quality (Scheduled Wastes) Regulations 1989;
- Environmental Quality (Prescribed Premises) (Scheduled Wastes and Disposal Facilities) Regulations 1989.

In 1989, a total of 179 compounds were issued for various offences under the Environmental Quality (Clean Air) Regulations 1978 and a sum of $107 650 was collected. Table 6.23 lists out the types of offences for the years 1987, 1988 and 1989. It is clear that offences under regulation 11, namely open burning of wastes account for the majority in each year; accounting for 63 per cent of the compounds issued in 1989.

The wood-based industries continue to be the highest sector to be fined (55 per cent). Out of a total of 110, 29 or 26 per cent of the wood-based industries compounded are located in Sarawak, followed by 16 per cent in Selangor and 12 per cent in Pahang.

Generally, industries faced problems in disposing their wastes and the reasons can be attributed to lack of local R & D support on cost-effective methods of waste treatment and recycling, inavailability of suitable disposal sites, and lack of skilled workers to operate and maintain the more sophisticated systems. In addition, there is some inertia from the industries themselves in efforts towards managing their wastes in a proper and environmentally-sound manner. Concerted efforts are necessary in order to overcome the problems of waste disposal and the resulting environmental pollution problems. As such both the public and private sectors should co-operate to ensure that there are adequate facilities for industrial wastes to cater for existing as well as future industries.

Marine Pollution Control

The Environmental Quality Act, 1974 and its Amendment of 1985 provide for the control of discharge of oil, mixture containing oil and wastes into Malaysian waters. To date, discharges from land-based sources into inland waters (including "any part of the sea abutting on the foreshore") are controlled under the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979.

Currently, sea-based pollution is controlled via preventive measures such as the Traffic Separation Scheme. This scheme which has been implemented since 1981 has been found to be effective in reducing vessel accidents in the Straits of Melaka and the Singapore Straits. Enforcement of pollution control from vessels will be provided for in the amendment to the Merchant Shipping Ordinance 1952, to be enforced by the Marine Department. These new provisions will also contain elements for co-operation between the Marine Department and the Department of Environment in matters related to the protection of the marine environment. In the event of an oil spill, the Oil Spill Contingency plan, first formulated in 1975 and revised accordingly, the latest being the formulation of the National Contingency Plan in 1989, will be activated.

Oil Spill Incidents

Since the major oil spills of the 1970s, the Department of Environment has been monitoring sightings of oil spills in Malaysian waters. Figure 6.13 shows the annual number of oil spills reported between 1980 and 1989. During the

10-year period, the most number of spills (20 per cent) were recorded in 1988. In terms of location, 51 per cent of the spills occurred in port areas.

In 1989, 22 oil spills, which can be classified as minor and remedial actions were on a local scale, were sighted and reported. Twelve of the spills were sighted in the South China Sea, eight in the Straits of Melaka and one each in the Straits of Singapore and the Johor Port Authority area. Table 6.24 shows the location and number of oil spill sightings. The costs of cleaning up the spill in the Johor Port Authority area amounted to $2 608.70.

In the past, oil spills were identified to have been due to different causes including bilge/bunkering, grounding, load transfer, tank cleaning and discharges from oil platforms. Figure 6.14 shows the causes identified for spills which were recorded during the period 1980-1989. During the period, the cause of 45 spills (30 per cent) were discharges of bilge and from bunkering whilst the causes of 43 spills (29 per cent) could not be identified.

In 1989, 36 per cent of the oil spills were found to have originated from oil platforms, especially in the South China Sea (Table 6.25). The parties concerned were alerted and directed to rectify the situation. Apart from regular maintenance, the operators have also been advised to upgrade their oil spill response capabilities.

Oil Spill Response Planning

The National Oil Spill Contingency Plan

The National Oil Spill Contingency Plan has been finalised. The implementation of the Plan is based on the tiered response concept depending on the location and magnitude of spills. There are three tiers of response: local, area, and national/international response. Each response involves the activation of the respective plan at local, area, or international level. From the paper exercise that was held on 9 December, 1989, it was found that the tiered concept of the National Plan is an effective one. However, certain aspects of line of communication need to be strengthened in order to smoothen the implementation of the Plan.

The most important tier of the National Plan is the local response. It is imperative that potential locations such as port areas and oil depots have their own local contingency plans together with oil combating equipment in order to respond effectively to an oil spill. The states of readiness to respond to oil spills at different port areas are shown in Table 6.26. The Penang Port Commission is the forerunner, having prepared a contingency plan and acquired a tug-boat for spraying of dispersants. The Port Authority of Kuantan has also acquired several equipment for the application of dispersants. In order to assist port authorities, a "Seminar on Preparation of Local Plans and Budgeting Procedure for Acquiring Oil Spill Response Equipment" was successfully held on 12 December, 1989. The seminar, organised by the Department of Environment was attended by representatives from most of the port authorities. With regard to oil depots, most of the oil companies, in particular those operating crude oil terminals and refineries, are equipped with oil combating equipment. Equipment such as oil booms, skimmers, and dispersant spraying equipment have been acquired in the last decade. However, these equipment need to be upgraded in line with the requirements of the National Contingency Plan, as facilities of the oil companies will be called upon to assist in the event of a large oil spill.

At the international level, steps have been taken to establish a 'Standard Operating Procedure' for joint oil spill combat in the Brunei Bay and the waters bordering Malaysia and Brunei Darussalam. This co-operative response plan is expected to be finalised in 1990. Meanwhile the Marine Pollution Communications and Response Procedure was updated; in particular the lists of personnel to contact during oil spills. A new arrangement was also introduced into the Pro-

cedure whereby officers from the Department are required to accompany the Marine Department during oil spill investigations.

The "Guidelines on the Use of Dispersants" to combat oil spills were updated in 1989 to include four more new dispersants. The approval of dispersants is based on specifications set by the Department of Environment.

Work on the compilation of information pertaining to ships calling at our oil terminals/ depots commenced in 1989. Terminals/Depots operators are required to submit monthly reports on the type of ships, amount of oily wastes discharge, and types of cargo on board the ships. Based on the reports submitted, it has been found that ships do not discharge any oily wastes at the terminals/depots as most of them are of segregated ballast tank and clean ballast tank types.

Apart from the compilation of information related to marine pollution and other information regarding coastal and marine resources, which are essential in the event of an oil spill, the Department of Environment has improved its communication facilities by equipping its Communication Centre with radio and facsimile facilities.

Most of the marine-related agencies are directly or indirectly involved in the control and protection of the marine environment. They carry out their respective responsibilities through a multitude of strategies and programmes. With expanded economic activities and promulgation of various international laws and agreements, aspirations and duties have also increased. There is now a need to explore new ground, harmonise present strategies and programmes and minimise resources to attain national goals. Steps have been taken to establish a master plan of programmes and strategies for marine environment protection and this is expected to commence in 1990.

Public Complaints

The investigation of complaints has been an important activity to respond to requests for the Department to enforce the Environmental Quality Act, 1974 and its Regulations as well as to assist the public towards finding solutions to their problems, which in some cases may be under the jurisdiction of other Government Departments/ Agencies.

Figure 6.15 shows the annual number of complaints between 1986 and 1989. In the last four years, complaints about mobile sources have accounted for 21-43 per cent of the annual number of complaints, the remainder being complaints concerned with industrial and other sources of pollution (including animal husbandry, construction activities and nuisance problems).

Complaints in 1989

In 1989, a total of 817 complaints[1] was recorded to have been handled by the Department of Environment; at Headquarters and the Regional Offices. Forty per cent of the total are complaints regarding mobile sources.

The distribution of the complaints is illustrated in Figure 6.16 where Wilayah Persekutuan Kuala Lumpur accounts for 43 per cent, followed by Selangor which accounts for 21 per cent of the total. The least complaints were in Sabah, with only seven complaints throughout the year. In all the states, it is evident that air pollution far exceeds water and noise pollution as the major problem. For example, in Wilayah Persekutuan Kuala Lumpur, 93 per cent of the total of 351 complaints are concerned with air pollution.

1 **The number of complaints, number of sources of pollution and the nature of pollution do not tally because one complaint may consist of two or more sources and nature of environmental pollution problem.**

Overall in the country, 84.6 per cent of the complaints have been classified as air pollution complaints, 11.1 per cent are related to noise, and 2.2 per cent are water pollution problems (Figure 6.17). Figure 6.18 shows that out of only 18 complaints concerning water pollution, seven complaints (39 per cent) were about palm oil mills and only one about a rubber mill. In contrast, Figure 6.19 shows that a total of 672 sources have been identified in connection with air pollution complaints, 48 per cent of which are mobile sources and almost 15 per cent are wood-based industries. Complaints concerning air pollution have been seen to contribute significantly to the annual number of complaints. An examination of records kept for the last ten years reveals that air pollution complaints due to industrial sources have decreased slightly in 1988 and 1989 compared to the highest in 1987 (Figure 6.20). Similarly, complaints about smoke and fumes have decreased while those about odour have increased by 62 per cent in 1989 compared to the number in 1985. Particulates, which have been the major problem throughout the 10-year period continue to be the most significant air pollution problem in 1989, accounting for 42 per cent of the total.

One of the air pollution problems frequently publicised by the mass media is open burning of wastes at solid waste disposal sites. Table 6.27 lists this type of complaints recorded by the Department from 1985 to 1989. It can be seen that the most number (13) was recorded in 1989 and 70 per cent were concerned with sites located in the Klang Valley, in particular Petaling Jaya. Problems have arisen as a result of several factors, including lack of environmental considerations during selection of dumping site and poor disposal methods, compounded by the need for improved security measures and acceptable ways of managing scavengers who operate at the dumping sites.

- oOo -

Deployment of Oil Booms to Contain Oil Spill at Sea

Photographs by:
Rusli

OUTSTANDING POLLUTION PROBLEMS

Uncontrolled Discharge from Small and Cottage Industries

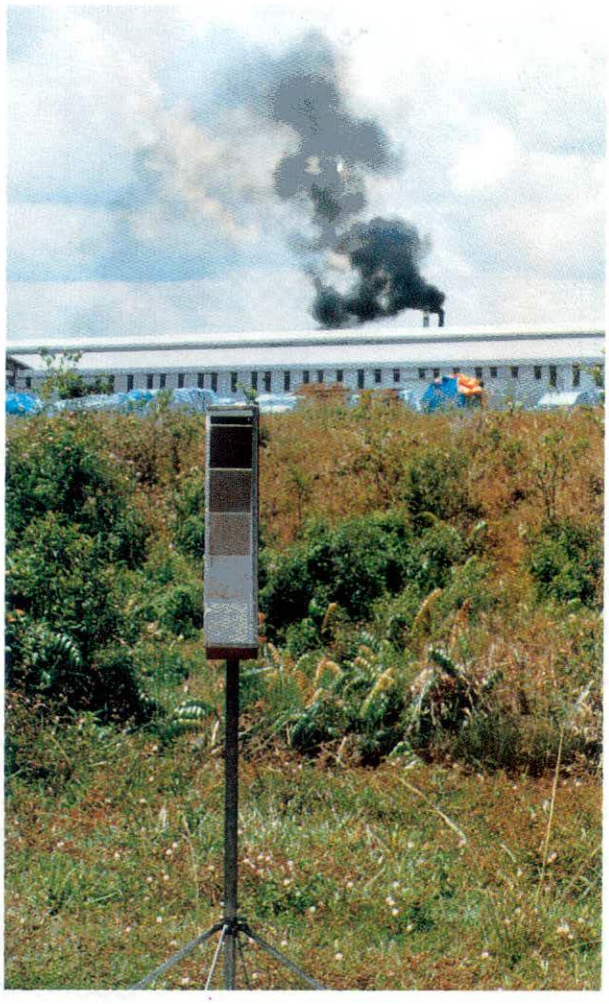
Photograph by:
Maketab

Open Burning of Rubber Wastes

Photographs by:
Subki

COMPLIANCE CHECK

Photographs by:
Suhaimi



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Mizu

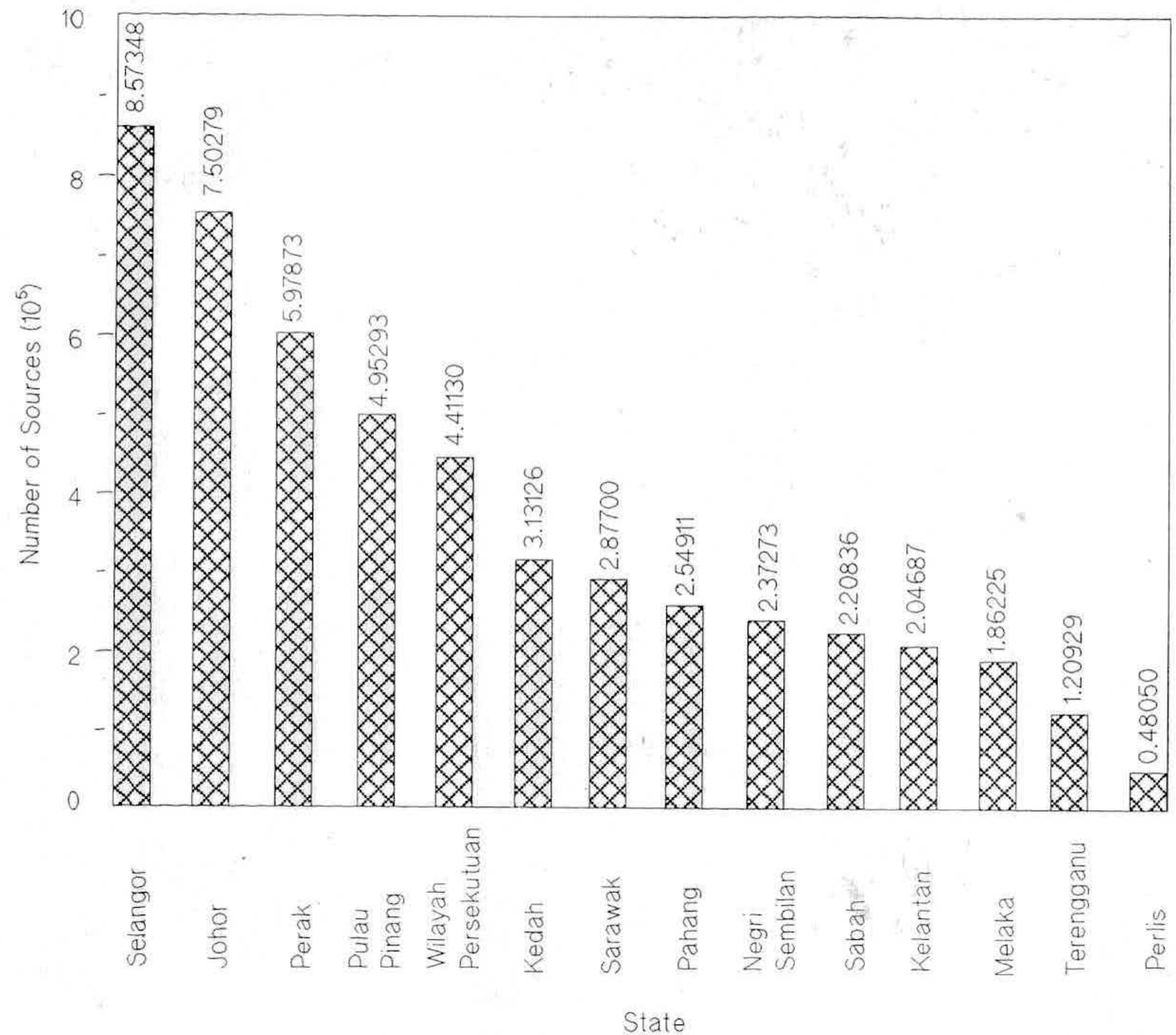

Figure 6.1 Malaysia: Cumulative Number of Motor Vehicles by State as at 31 December, 1989

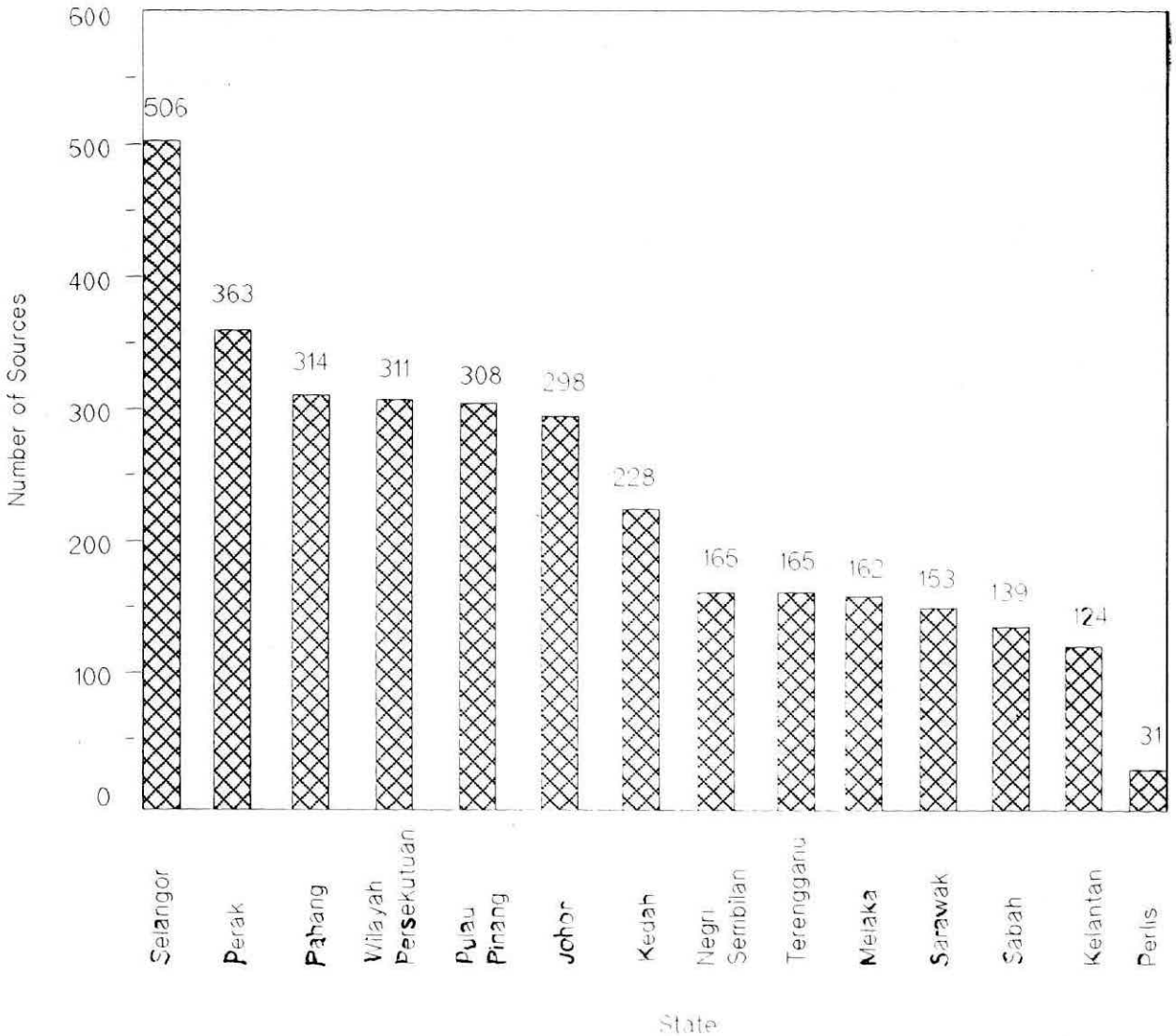

Figure 6.2 Malaysia: Distribution of Significant Stationary Air Polluting Sources by State, 1989

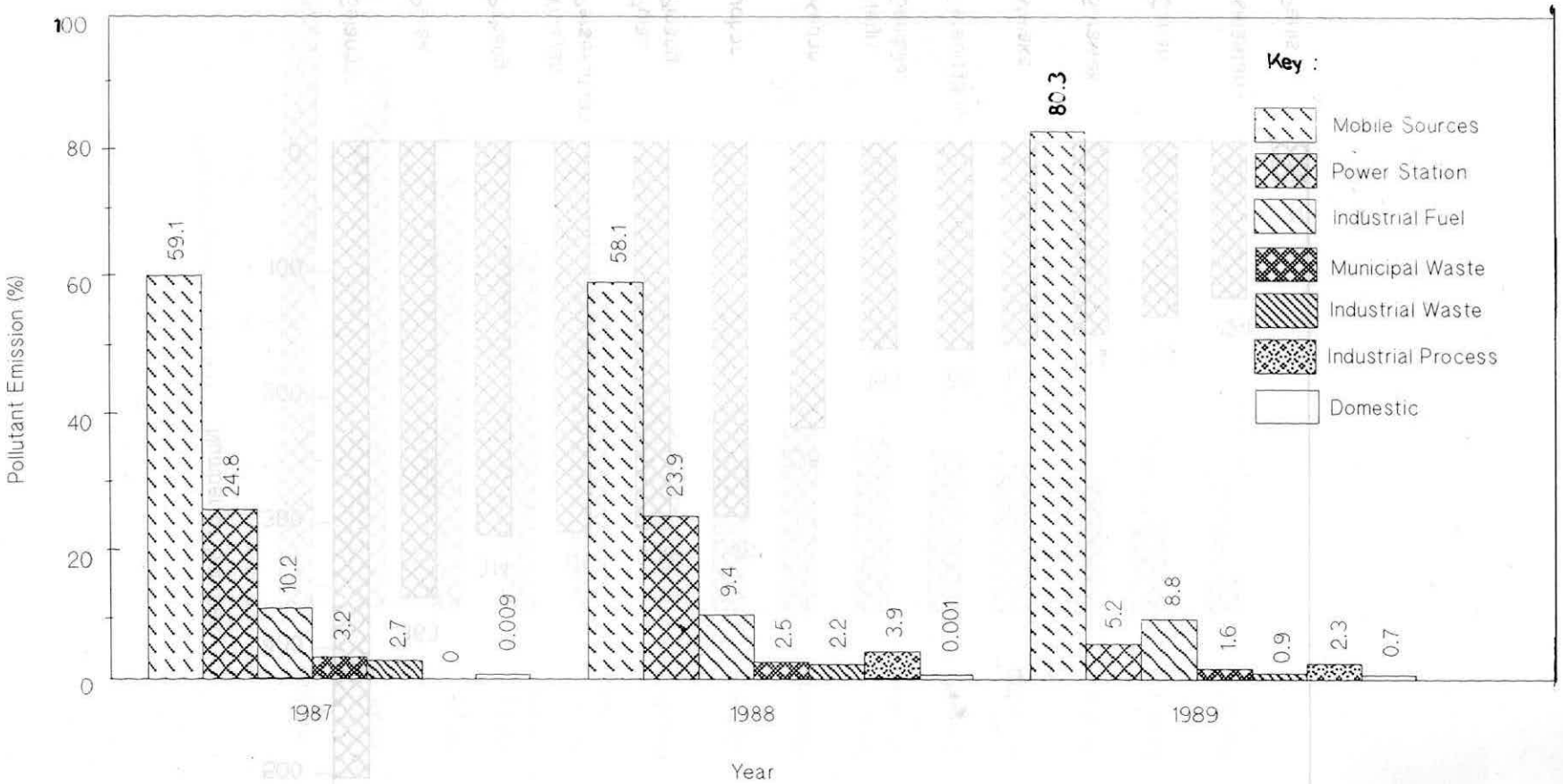

Figure 6.3 Malaysia: Trend of Uncontrolled Emission of Pollutants to the Atmosphere by Major Sources, 1987–1989

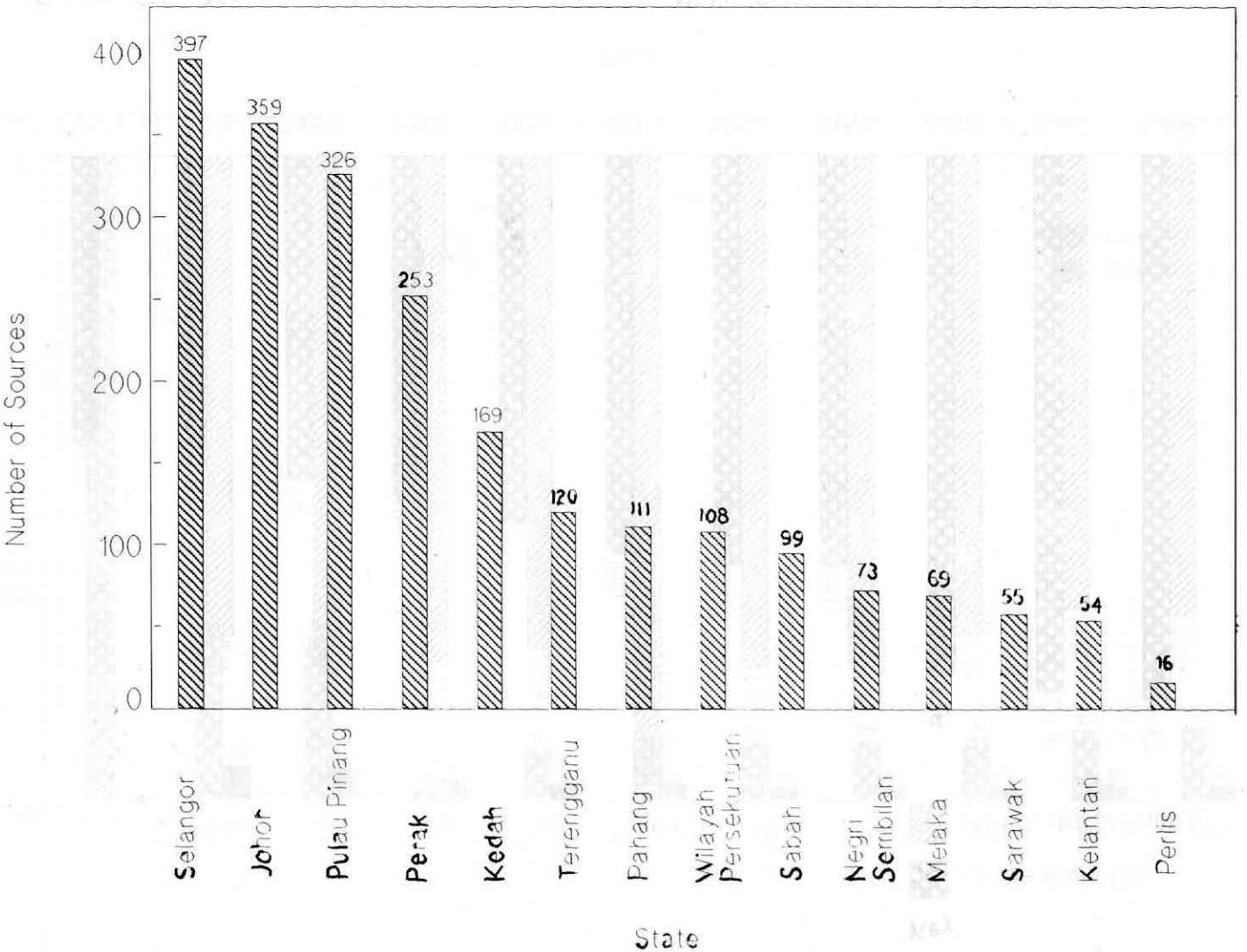

Figure 6.4 Malaysia: Distribution of Major Stationary Sources of Water Pollution, 1989

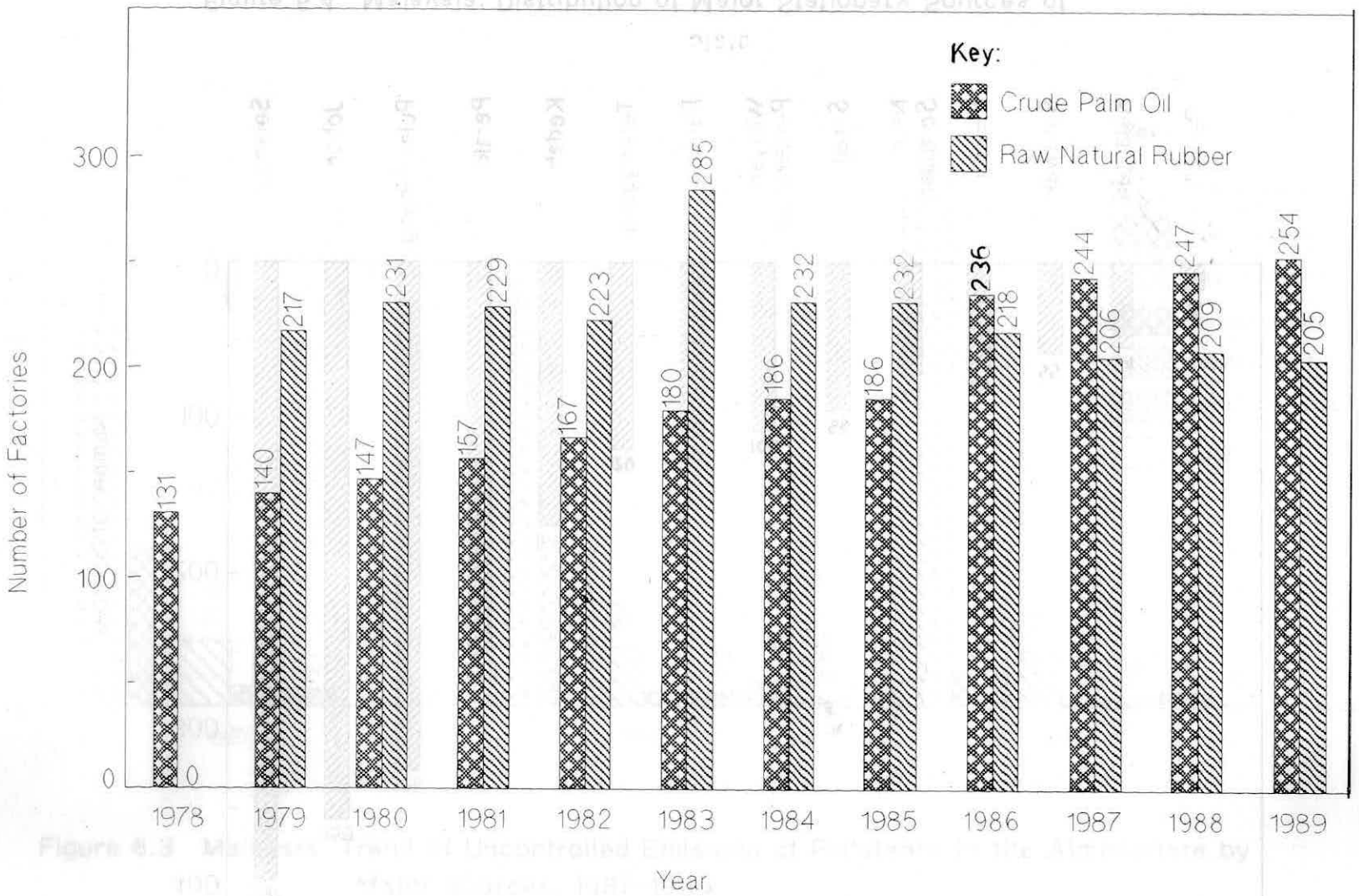

Figure 6.5 Malaysia: Total Number of Crude Palm Oil and Raw Natural Rubber Factories, 1978–1989

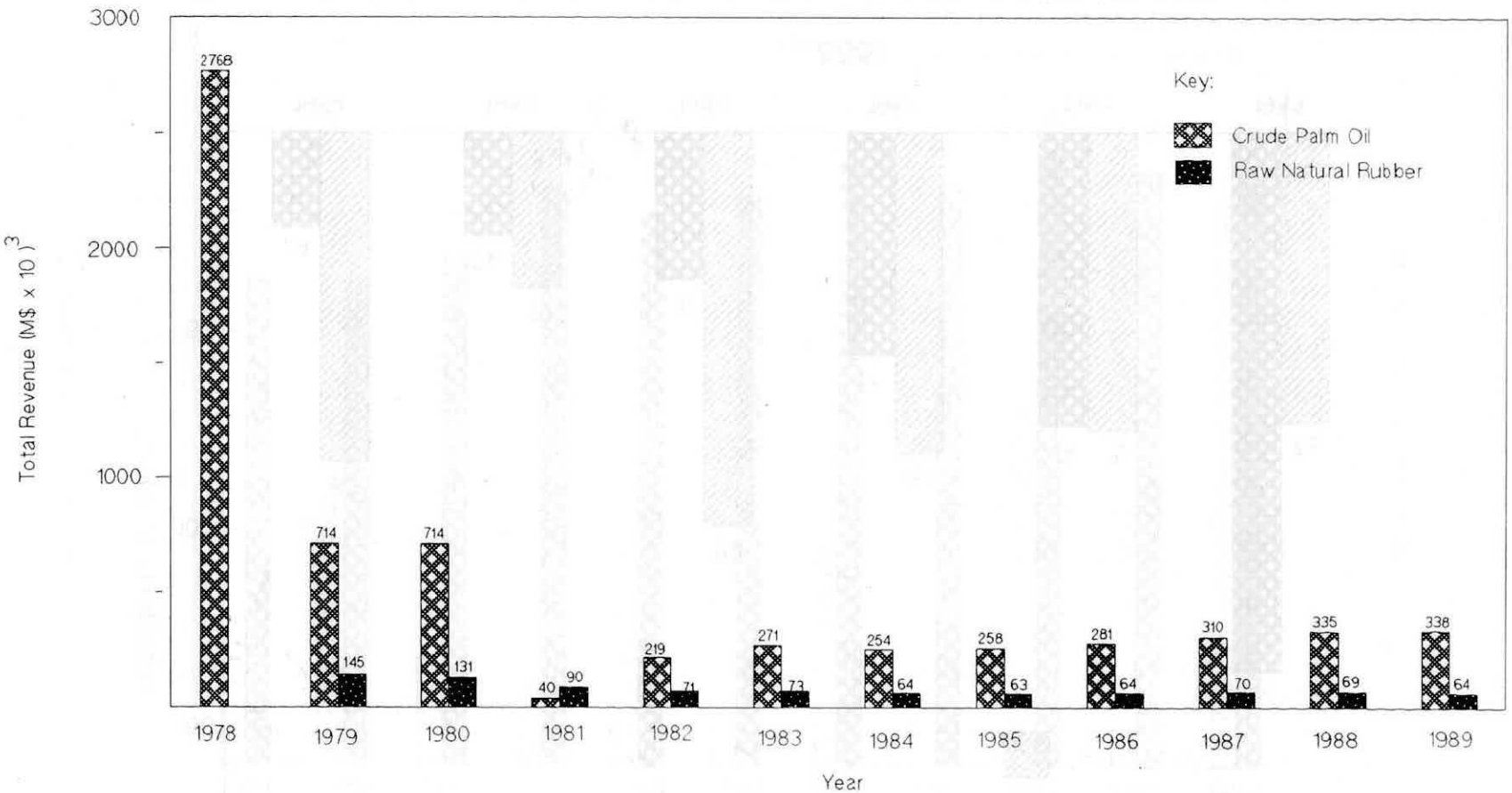

Figure 6.6 Malaysia: Total Revenue Collected in Licensing Crude Palm Oil and Raw Natural Rubber Industries, 1978–1989

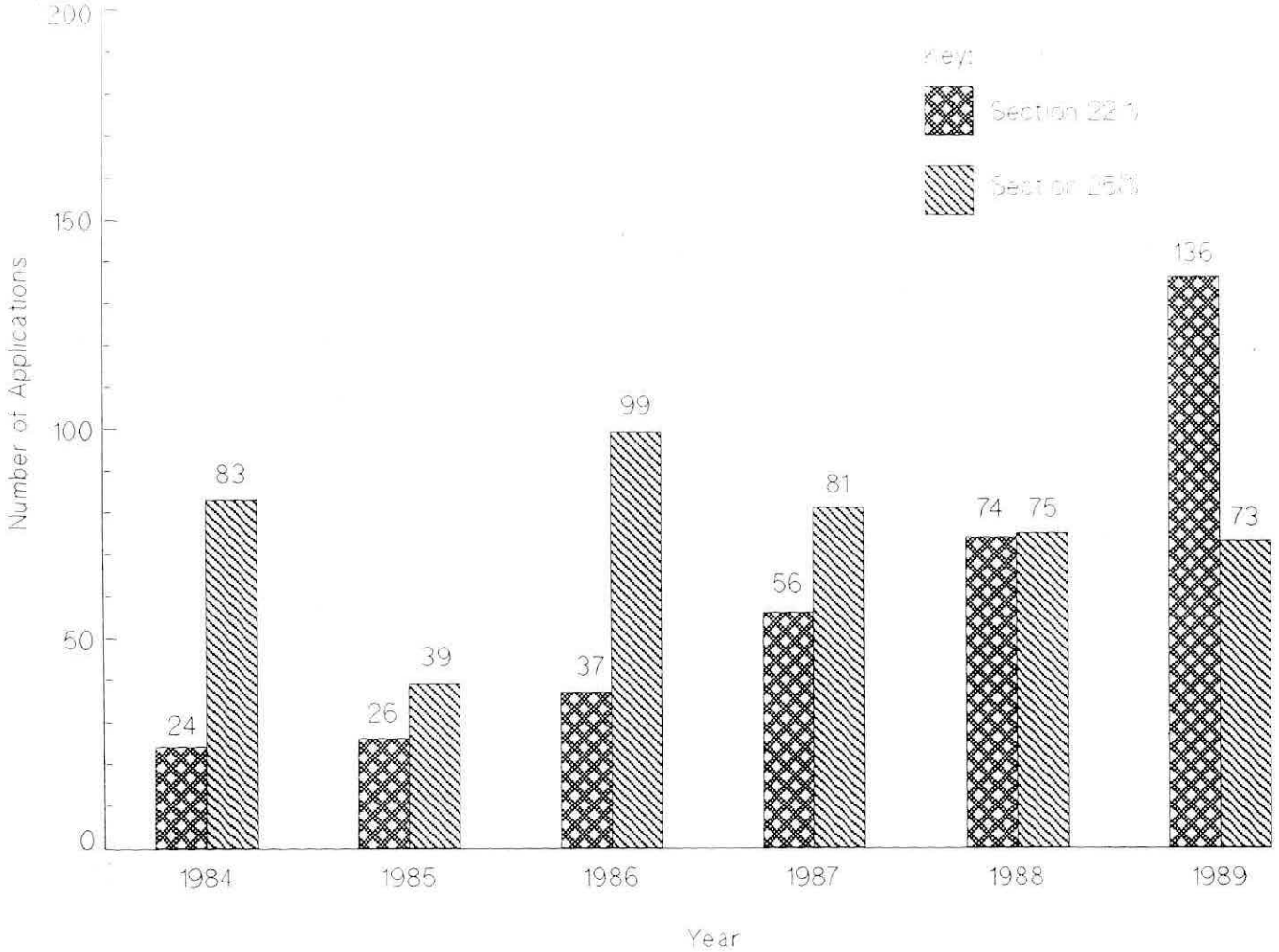

Figure 6.7 Malaysia: Number of Applications of Contravention Licence under Section 22(1) and Section 25(1), Environmental Quality Act, 1974, 1984–1989

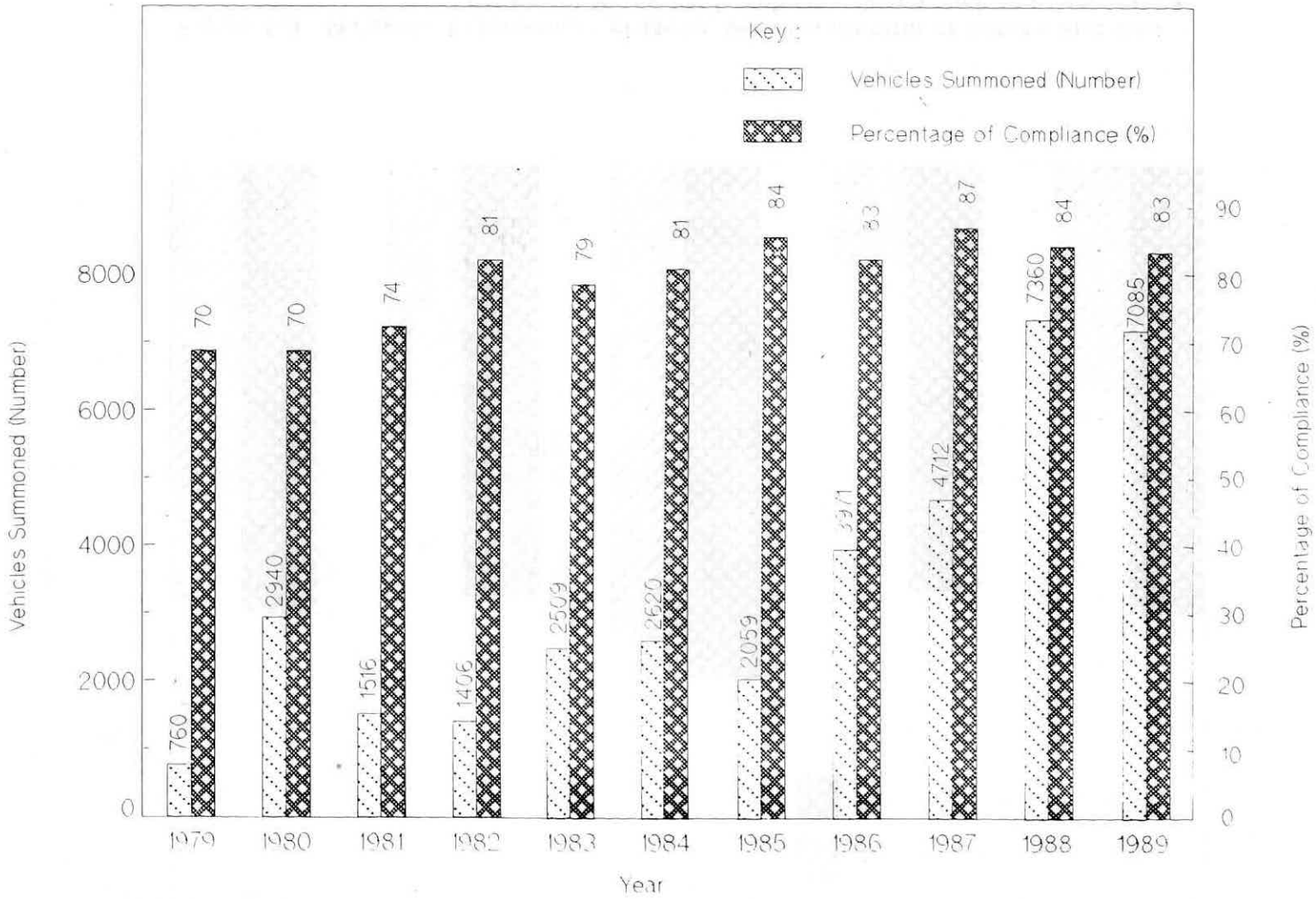

Figure 6.8 Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977. Vehicles Summoned and Percentage of Compliance, 1979-1989

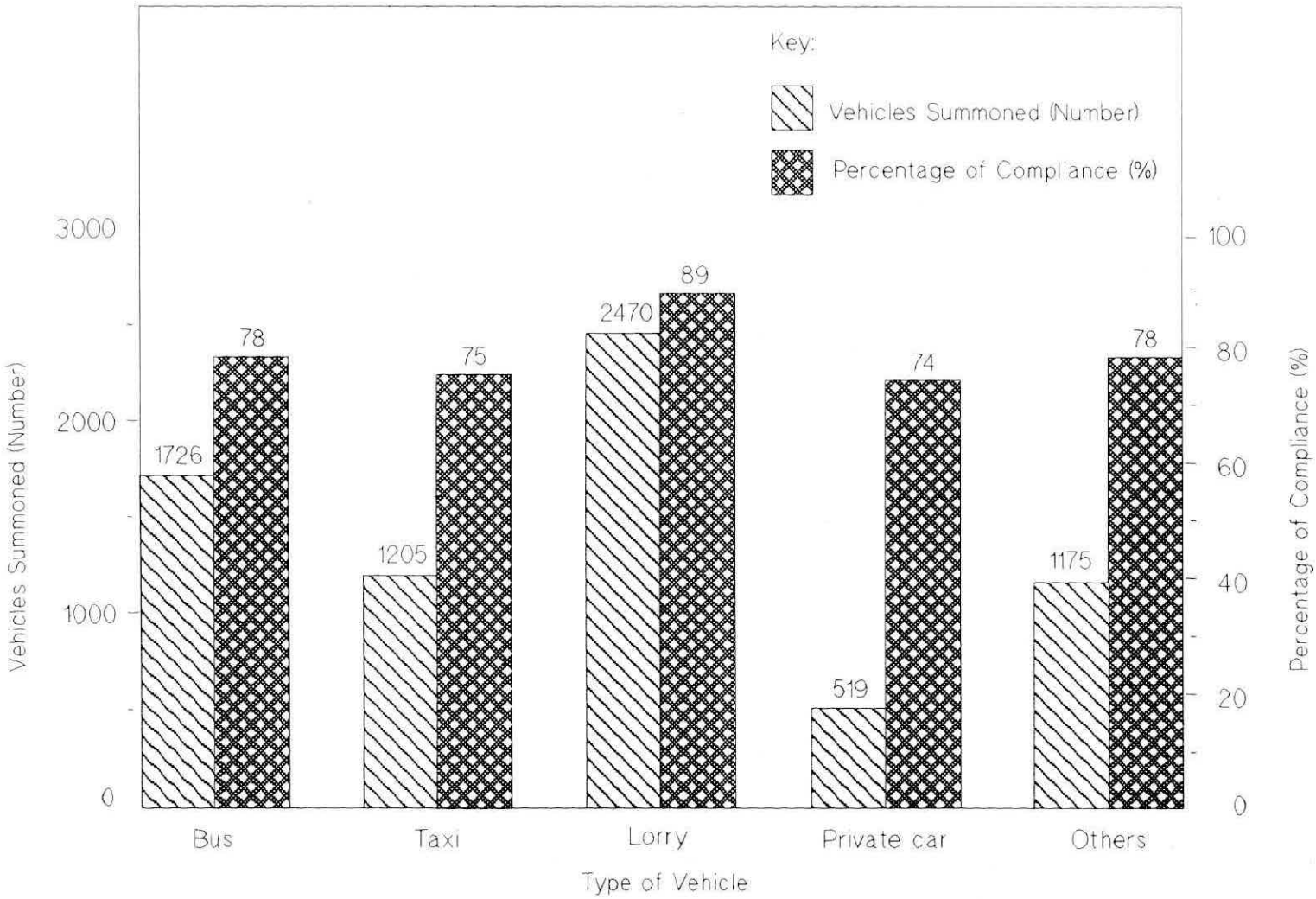

Figure 6.9 Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977. Vehicles Summoned and Percentage of Compliance According to Type of Vehicle , 1989

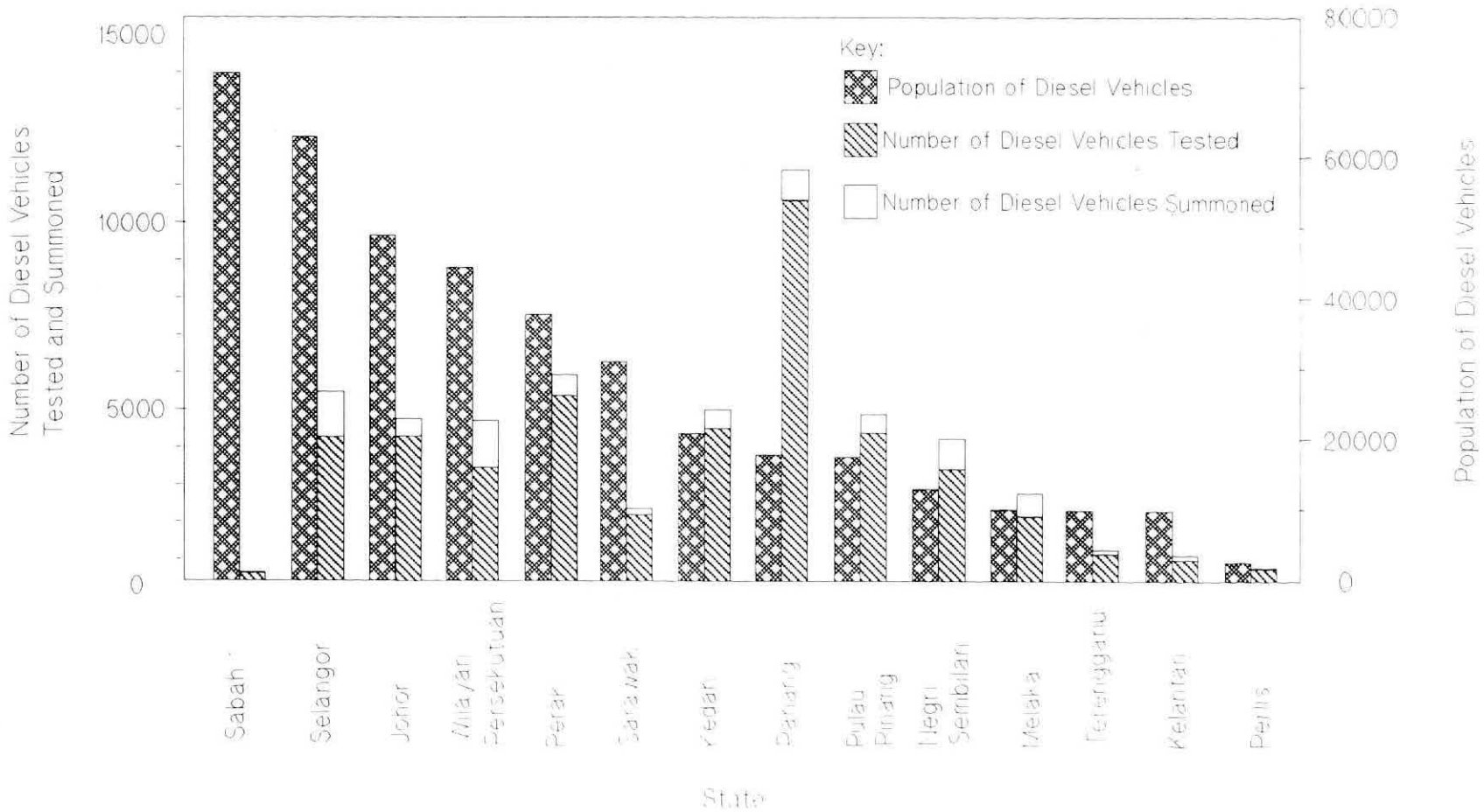

Figure 6.10 Malaysia: Diesel-Powered Vehicles Population, Inspected and Summoned for Excessive Smoke Emission by State, 1989

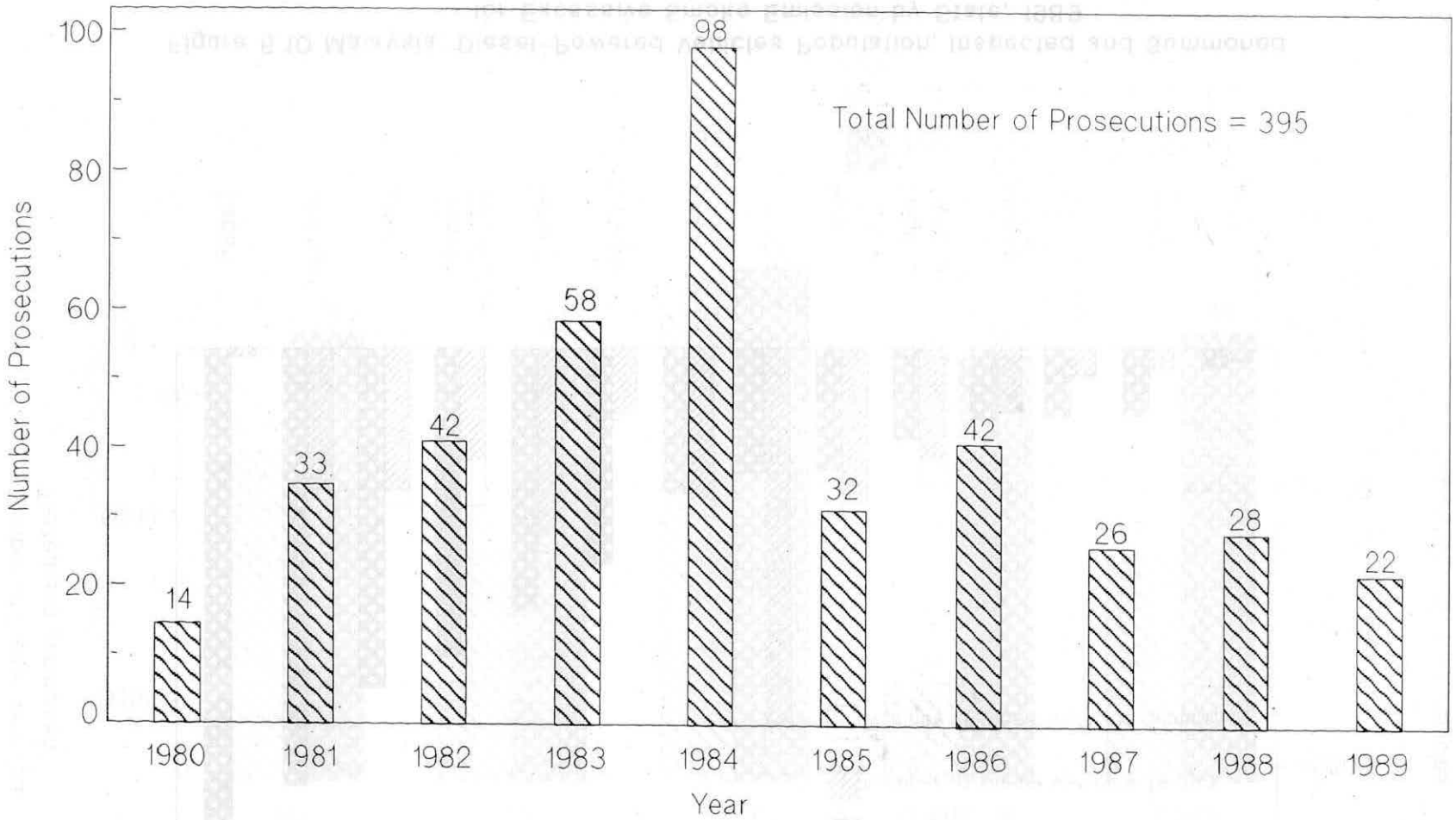

Figure 6.11 Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974 and the Environmental Quality (Clean Air) Regulations 1978. Number by Year, 1980–1989

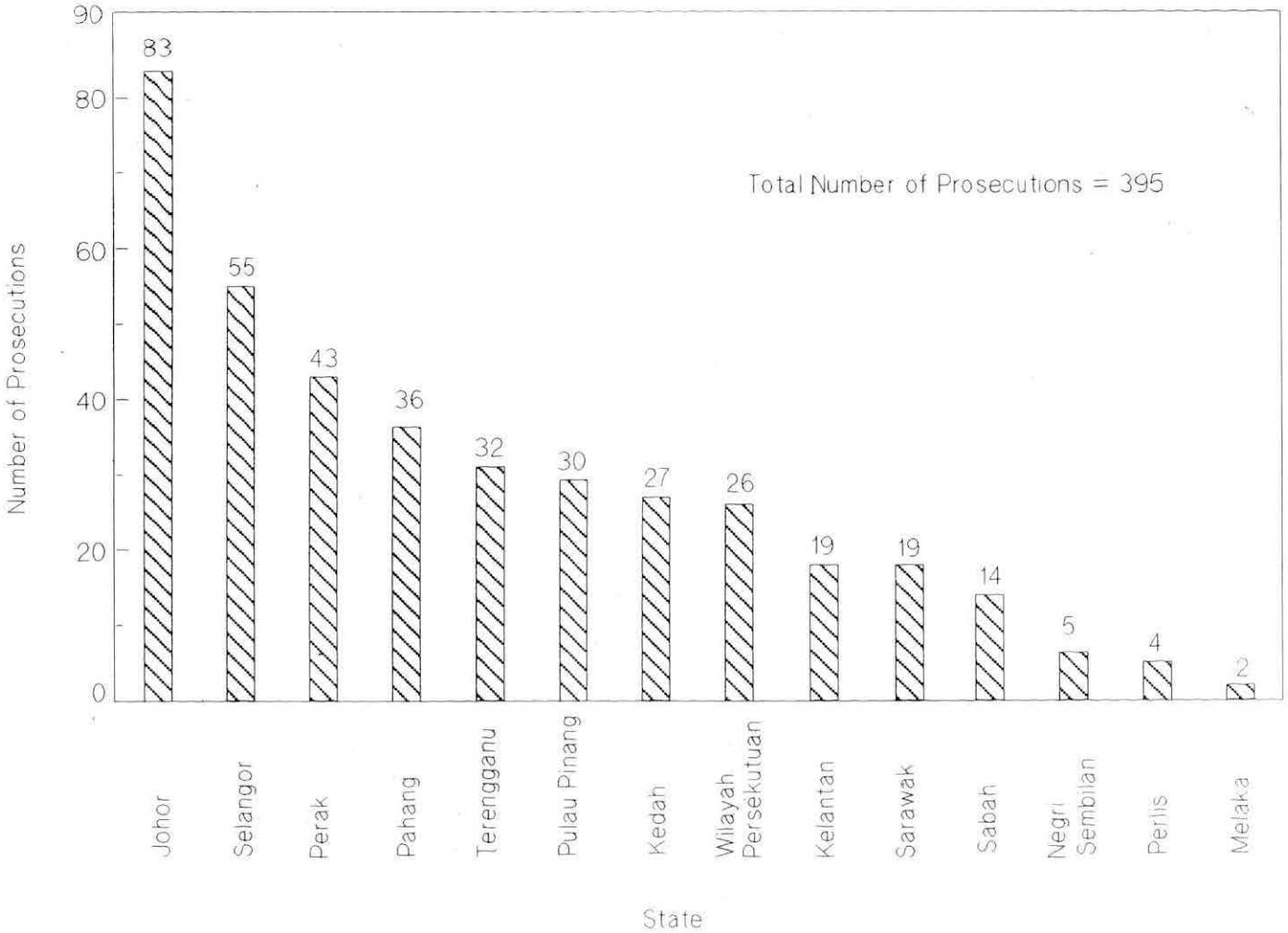

Figure 6.12 Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974 and the Environmental Quality (Clean Air) Regulations, 1978. Number by State, 1980–1989

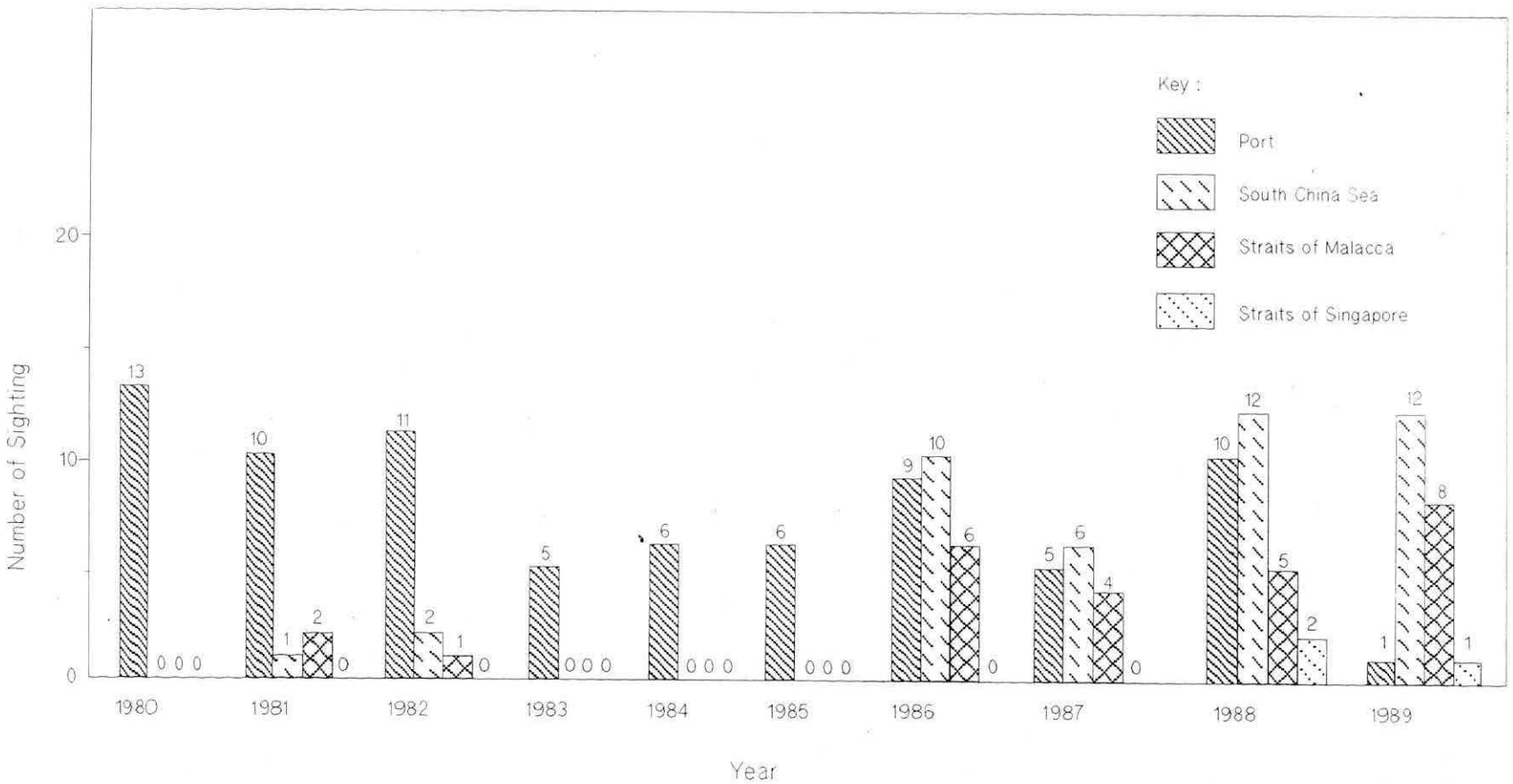

Figure 6.13 Malaysia: Oil Spill Sighting by Location, 1980–1989

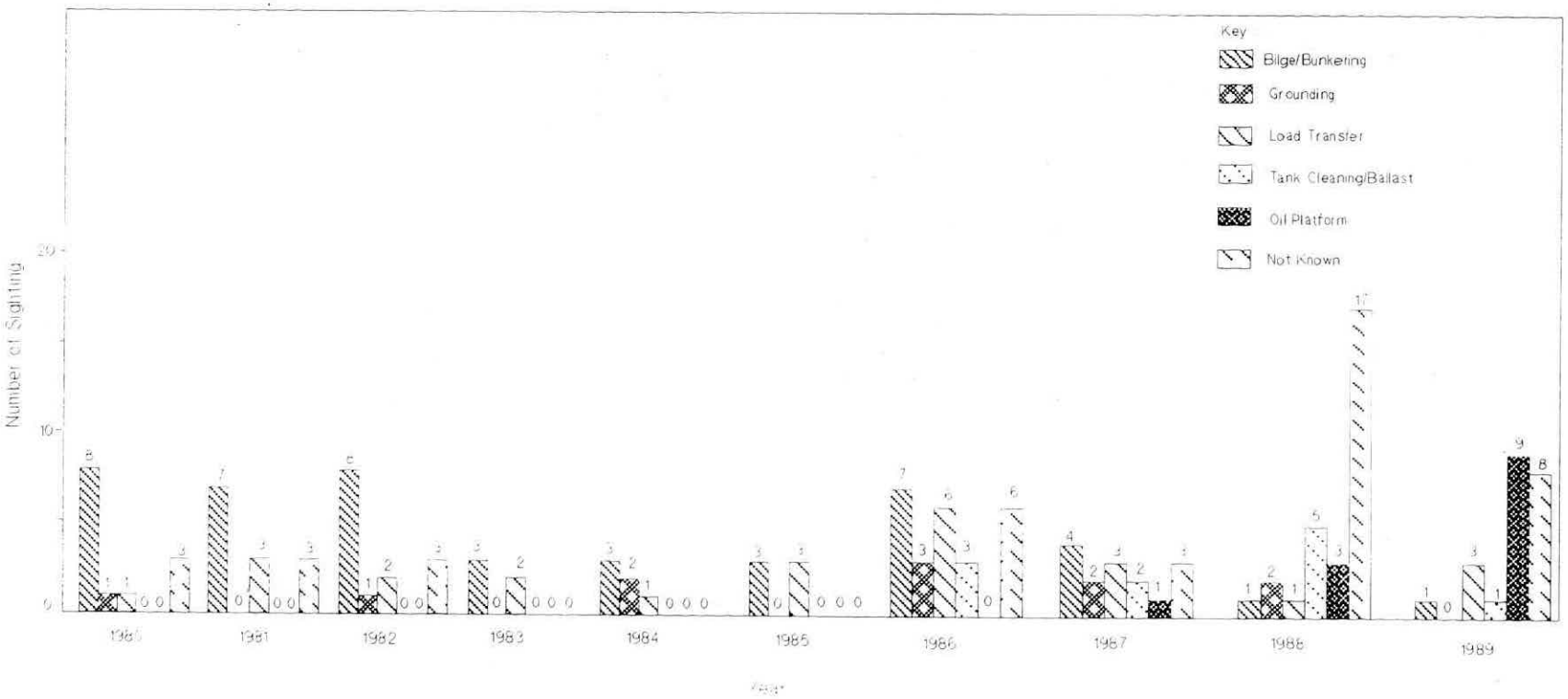

Figure 6.14 Malaysia: Oil Spill Incident. Number of Sources, 1980–1989

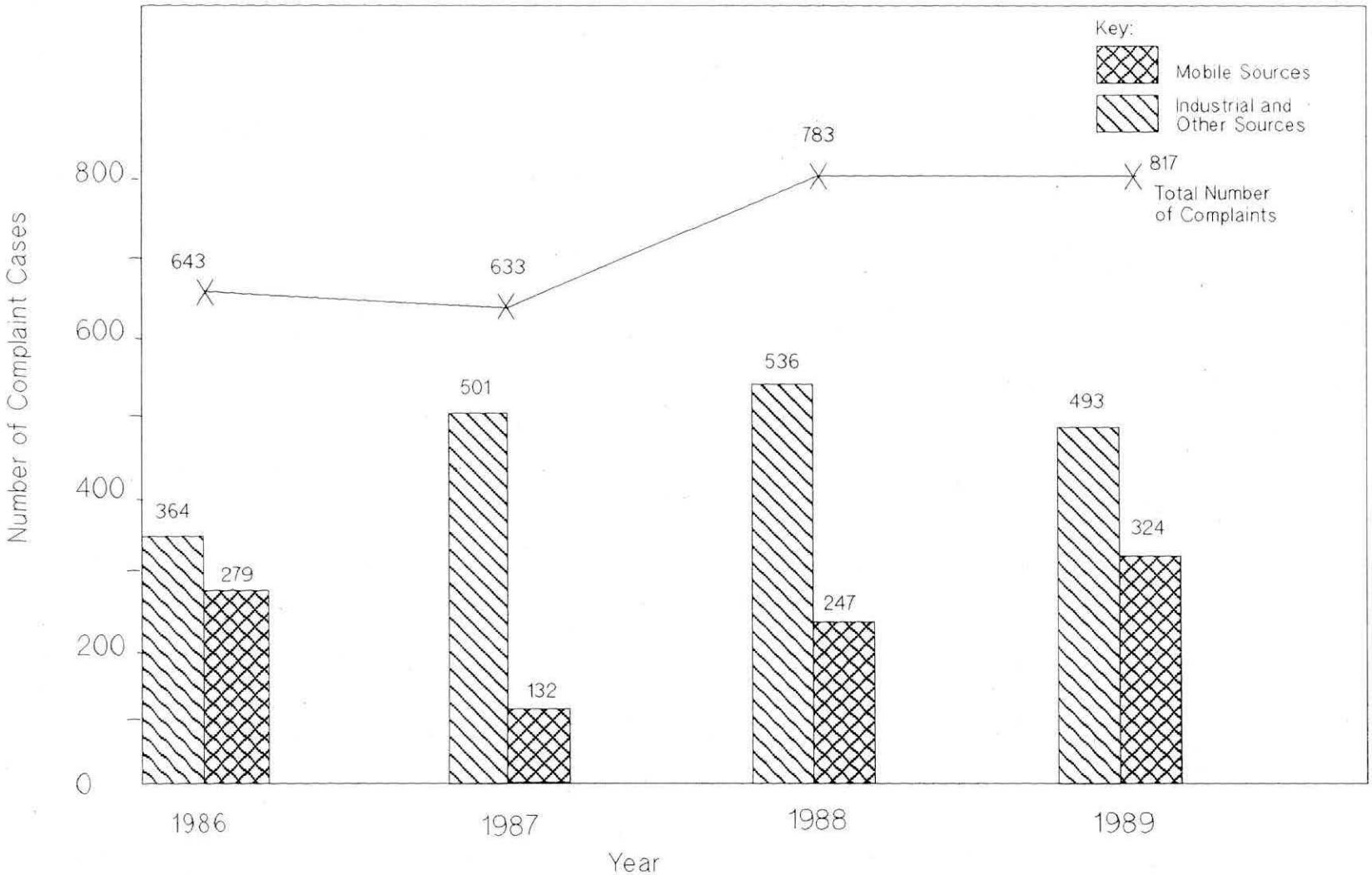

Figure 6.15 Malaysia: Trend in the Total Number of Complaint Cases Received by the Department of Environment, 1986–1989

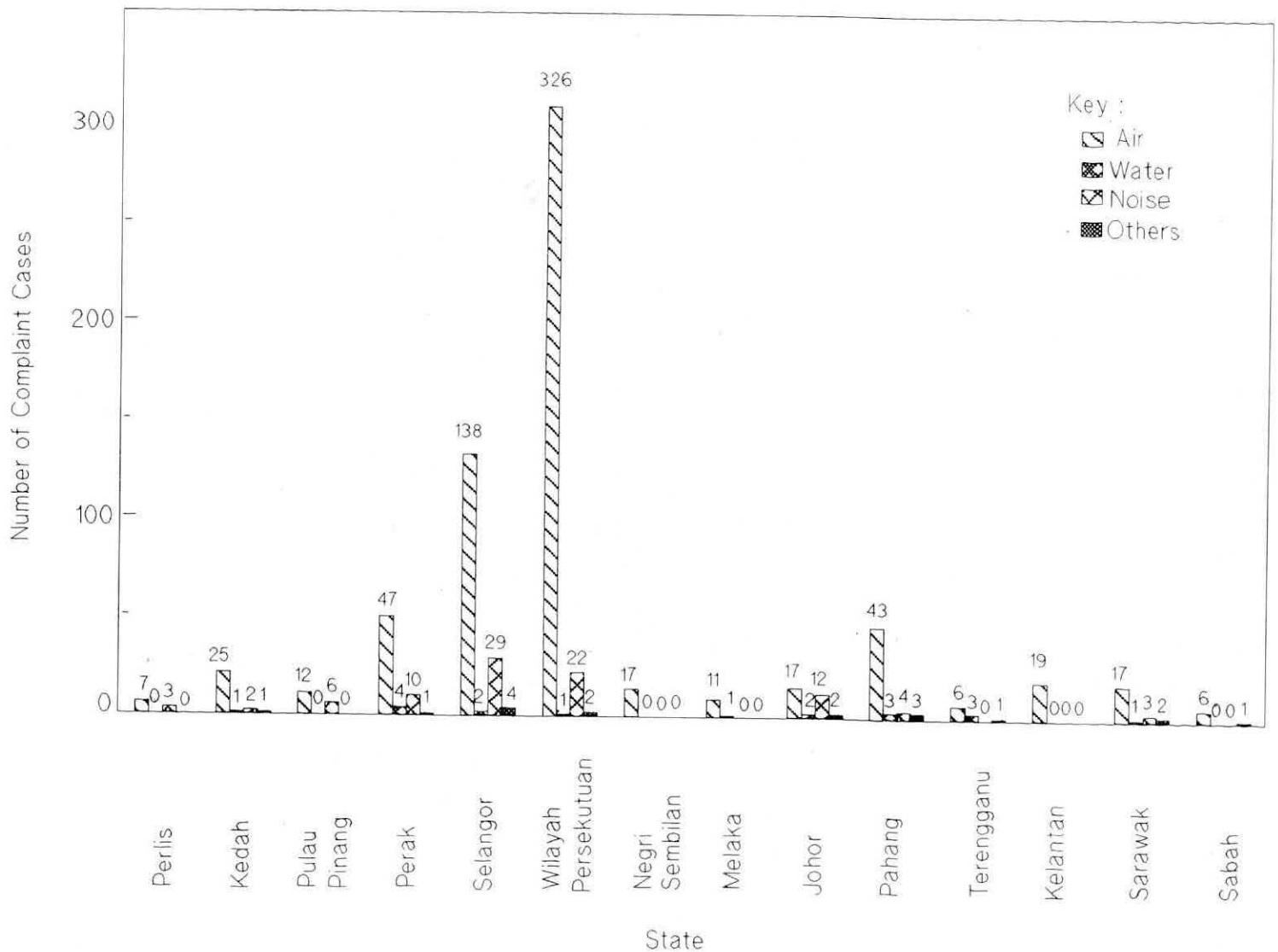

Figure 6.16 Malaysia: Nature of Pollution Complaints by State, 1989

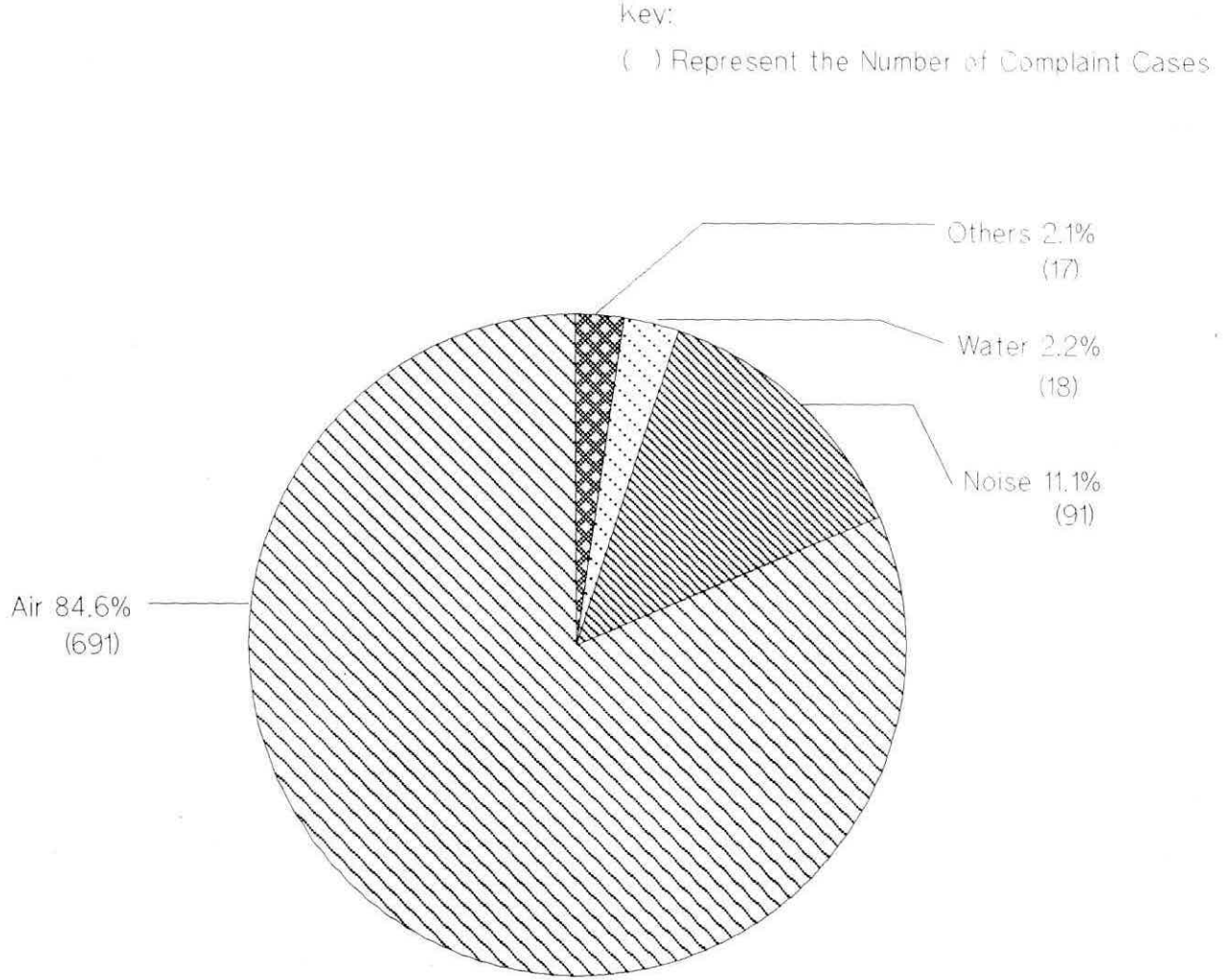

Figure 6.17 Malaysia: Nature of Complaints Received by Department of Environment, 1989

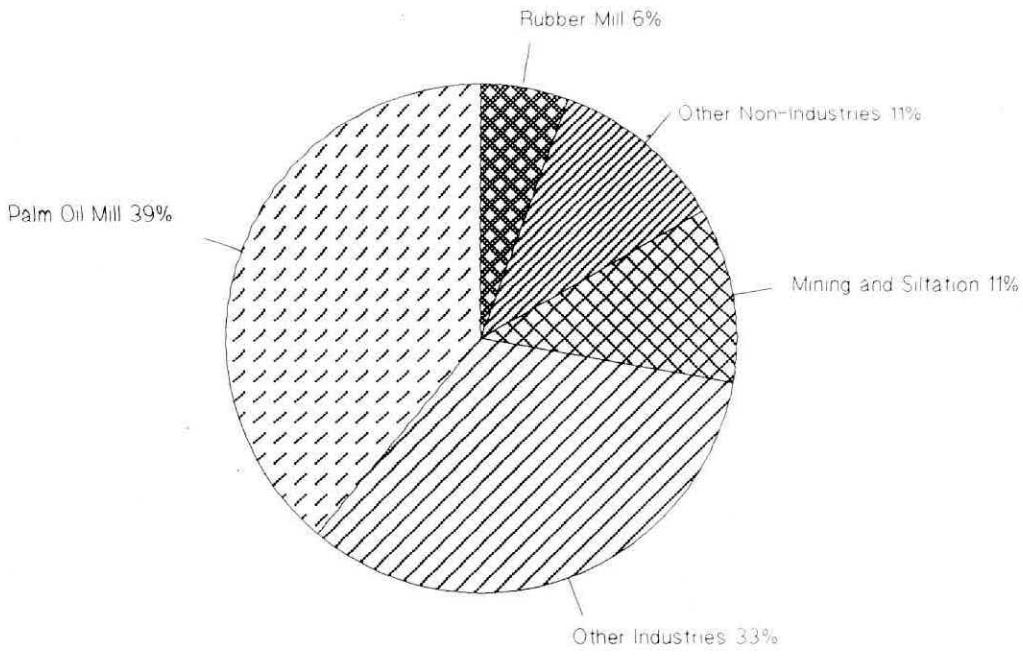

Figure 6.18 Malaysia: Sources of Water Pollution Complaints, 1989

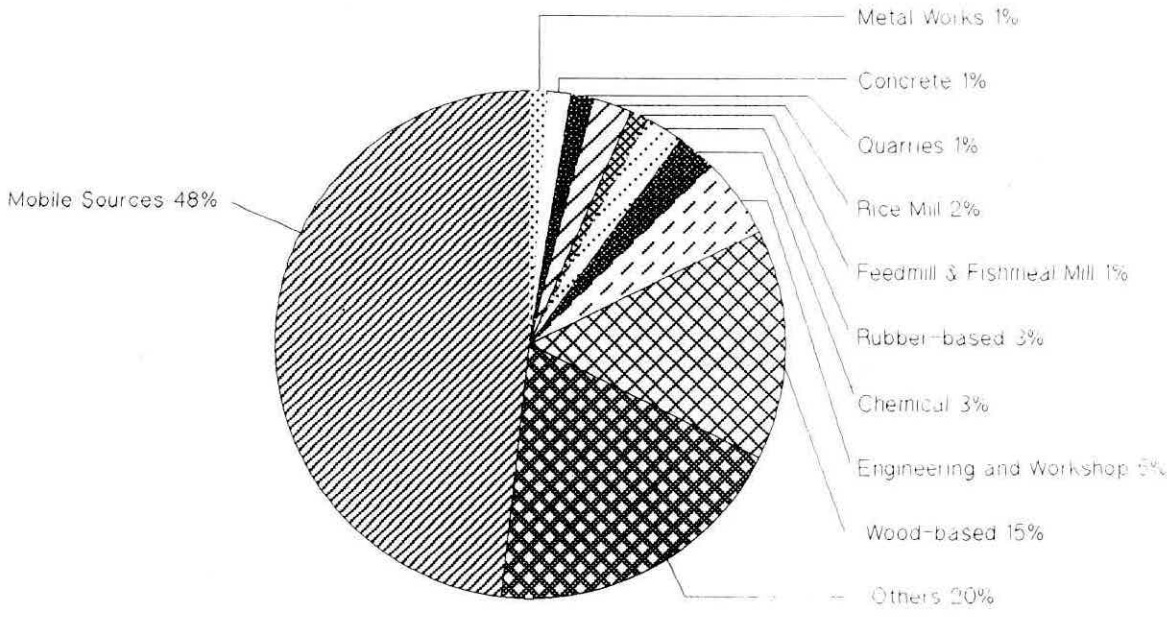

Figure 6.19 Malaysia: Sources of Air Pollution Complaints, 1989

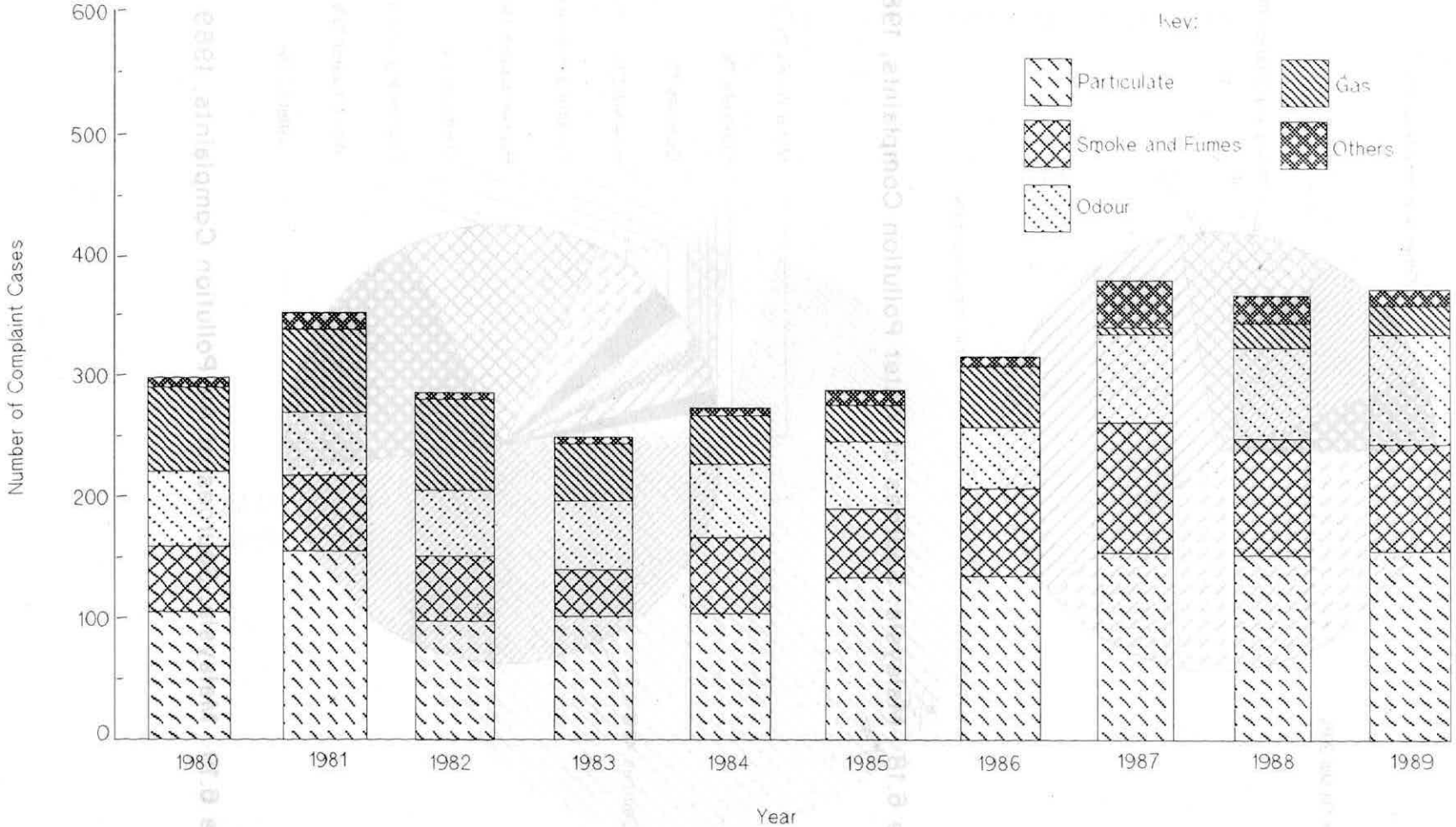

Figure 6.20 Malaysia: Industrial Air Pollution Complaint Cases. Number by Nature of Complaint, 1980–1989

Table 6.1

Malaysia: Potential Air Pollution Sources, 1989

Type of Sources	No.of Sources		
	1987	1988	1989
I. Stationary Sources			
a. Chemical Industries			
- Pesticides and Fertilizer	5	5	5
- Acid Manufacturing	6	6	6
- Chemical Manufacturing	198	198	196
- Paint and Varnish	19	19	19
- Plastics and Resin	88	92	92
- Soaps and Detergents	9	9	9
	325	329	327
b. Food and Agriculture			
- Animal Feed	-	4	4
- Fishmeal Mill	189	189	185
- Palm Oil Mill	250	250	250
- Rice Mill	250	373	352
- Rubber Mill	209	209	209
- Rubber Products Manufacturing	69	77	78
- Smoke House	700	700	682
	1667	1802	1760
c. Metal Industries			
- Aluminium Works	19	19	18
- Foundries	295	297	295
- Iron and Steel Mill	24	24	24
- Lead Smelter and Related Works	4	4	4
- Tin Smelting	4	4	4
	346	348	345
d. Mineral Products			
- Asbestos Works	5	5	5
- Asphalts and Concrete Batching	60	62	62
- Bricks Work Clay and Clay Works	94	98	96
- Cement Products	176	178	178
- Glass Work	28	29	27
- Lime and Plaster Works	321	321	320
- Portland Cement Manufacturing	5	5	5
- Stone Quarrying	305	355	324
	994	1053	1017
e. Petroleum Industry			
- Petroleum Refineries	5	5	5
- Miscellaneous Petroleum Process	28	28	28
- Gas Processing	24	24	24
	57	57	57

f. Wood-based Products and Others			
- Charcoal Making	520	547	522
- Pulp and Paper Recycling	6	6	6
- Paper Products	51	54	53
- Sawmills	1047	1079	1066
	1624	1686	1647
g. Fuel Combustion Sources			
- Thermal Power Station	14	14	14
- Boiler and Furnaces	2040	2141	2209
- Incinerator	214	223	234
	2268	2378	2457
Total I	7281	7653	7610
II. Mobile Sources			
- Motor Vehicles			
- Petrol Powered	4211566	3974845	4208947
- Diesel Powered	353508	275013	298177
Total II	4565074	4250758 **	4507124 ***
III. Solid Waste Disposal *			
- Municipal Waste Disposal Site	89	38	29
- Municipal Incinerator	2	2	2
Total III	91	40	31
Grand Total	4572446	4258451	4514765

Note:

* Open Burning Practice detected at Solid Waste Disposal Sites.

** Number of Motor Vehicles until December, 1988 for Peninsular Malaysia only.

*** Number of Motor Vehicles until December, 1989 for Peninsular Malaysia only.

Table 6.2

Peninsular Malaysia: Number of Motor Vehicles until December, 1989

Type of Vehicle	Number of Vehicles			Percentage
	Petrol-Powered	Diesel-Powered	Total	
Motorcycle	2678995	-	2678995	59.4
Taxi	9975	14962	24937	0.6
Private Car	1366532	38815	1405347	31.2
Van and Lorry	140756	136103	276859	6.1
Bus	1387	19192	20579	0.5
Others	11302	89105	100407	2.2
Total	4208947	298177	4507124	100.0
Percentage	93.4	6.6	100.0	

Source: Road Transport Department, Malaysia.

Table 6.3

Malaysia: Inventory of Fuel Burning Equipment (FBE) Approval, 1989

Type of FBE	Fuel Consumption (tonnes/year)	Approvals	
		Number	Percentage
I. BOILER			
1. Solid Fuel	154.00	20	14.9
2. Liquid Fuel	594.20	48	35.8
II. INCINERATOR			
1. Wood-Based	-	2	1.5
2. Palm Oil Mill	54.00	3	2.2
3. Others	0.03	3	2.2
III.OTHER FBE			
1. Furnace	0.80	3	2.2
2. Heater			
- Solid Fuel	1.70	1	0.8
- Liquid Fuel	3.40	9	6.7
3. Generator	342.90	35	26.1
4. Dryer	0.90	3	2.2
5. Burner	4.50	5	3.7
6. Reactor	-	-	-
7. Oven	0.07	1	0.8
8. Cupola	0.70	1	0.8
Total	1157.20	134	100.0
Total 1988	260.6	183	-
1987	257.3	196	-

Table 6.4

Malaysia: Estimate of Emission of Air Pollutants from Mobile Sources, 1989

Type of Vehicle	Number [1]	Pollutant Load ('000 metric tonnes)				
		Particulates	SOx	NOx	HC	CO
GASOLINE FUEL						
Motorcycle	1607397	0.100	0.010	0.04	5.7	9.8
Taxi	5985	0.060	0.020	0.40	0.5	13.8
Private Car	819919	2.000	0.500	9.90	13.9	369.0
Lorry and Van	84454	0.500	0.100	2.50	3.4	98.8
Bus	832	0.006	0.002	0.07	0.1	0.9
Others	6781	-	-	-	-	-
Total	2525368	2.666	0.632	12.91	23.6	492.3
DIESEL FUEL						
Taxi	8977	0.090	0.200	0.5	0.09	1.8
Private Car	23289	0.050	0.080	0.2	0.05	0.9
Lorry and Van	81662	0.700	1.600	19.6	1.60	12.2
Bus	11515	0.200	0.500	6.0	0.60	3.7
Others	89105	-	-	-	-	-
Total	214548	1.040	2.380	26.30	2.34	18.6
Grand Total	2739916	3.706	3.012	39.21	25.94	510.9
Percentage	-	0.6	0.5	5.2	4.5	87.7

Note:

1

60% of the total vehicles registered in Peninsular Malaysia considered running on the road. (Road Transport Department, 1989)

Table 6.5

Malaysia: Pollutant Emission Load from Major Fuel Burning Equipment[1] by Industrial Sector, 1989

Industry	Emission Load (metric tonnes)						Total
	Liquid Fuel	Solid Fuel					
	SOx	Particulate	SOx	NOx	CO	HC	
Rubber Factory	72.67	-	-	-	-	-	72.67
Palm Oil Mill	159.87	440.70	-	33.05	-	-	633.62
Quarry	83.67	-	-	-	-	-	83.67
Food	405.50	8.90	1.22	8.90	17.45	31.58	473.55
Textile	70.11	-	-	-	-	-	70.11
Wood-based	-	40.22	5.22	40.22	78.86	142.72	307.24
Paper and Printing	30.76	15.75	2.16	15.75	30.89	55.91	151.22
Chemicals	241.51	-	-	-	-	-	241.51
Rubber Product	493.15	-	-	-	-	-	493.15
Non Metal	26.32	-	-	-	-	-	26.32
Iron and Steel	42.74	7.34	1.01	7.34	14.40	26.06	98.89
Electrical	153.40	-	-	-	-	-	153.40
Commercial Building	37.97	-	-	-	-	-	37.97
Institution	27.19	-	-	-	-	-	27.19
Total	1844.85	512.91	9.61	105.26	141.60	256.27	2870.51
Total 1988	1717.10	172.10	396.00	187.00	693.00	1207.00	4185.20

Note:

1 Approved by the Department of Environment in 1989

Table 6.6

Malaysia: Estimated Emission Loads from Various Industrial Processes, 1989

Industry	Emission Load (metric tonnes/year)				
	Particulates	SOx	NOx	HC	CO
Sea Food	2.5	-	-	-	-
Sago Tapioca	941.9	-	-	-	-
Malt Liquor	-	-	-	-	-
Paper and Pulp	211.7	26.0	-	133.0	301.9
Paint Varnish	-	-	-	-	-
Fertilizer and Pesticides	645.9	-	1024.8	-	-
Chemical Products	1605.0	-	55.0	-	-
Clay Products	44.6	-	-	-	-
Cement and Cement Products	7741.6	-	-	-	-
Quarrying	5521.9	-	-	-	-
Iron, Steel Foundries and Tin	23.0	-	-	-	-
Total	16438.1	26.0	1079.8	133.0	301.9
Total 1988	23701.1	9521.5	1863.4	203.0	1136.0

Table 6.7

Malaysia: Emission of Air Pollutants from Fuel Burning Sources, 1989

Sources	Fuel Burning	Consumption[1] (000 tonnes/ year)	Major Pollutants (000 tonnes/year)				
			Particulates	SOx	NOx	HC	CO
Power Station	Natural Gas Fuel Oil Diesel	990 2051 233	0.29 2.13 -	9.90 20.41 -	11.40 27.17 -	0.02 0.27 -	0.32 1.35 -
Total I		3274(46.7)	2.42	30.31	38.57	0.29	1.67
Industry	Natural Gas LPG Kerosene Diesel Fuel Oil Coal	367 49 14 1856 595 189	0.12 0.01 0.04 3.95 1.70 0.12	3.67 0.001 0.12 18.65 5.65 1.80	1.32 0.13 0.03 13.92 4.46 1.41	0.02 0.003 0.005 0.76 0.22 0.09	0.08 0.01 0.003 1.09 0.19 0.19
Total II		3070(43.7)	5.94	29.89	21.27	1.098	1.563
Domestic and Commercial	Natural Gas LPG Kerosene Diesel Fuel Oil	60 330 241 39 2	0.02 0.14 0.72 0.08 0.006	0.60 0.003 2.04 0.39 0.01	0.09 0.59 0.55 0.29 0.01	0.01 0.02 0.09 0.02 0.007	0.03 0.05 0.05 0.02 0.006
Total III		672(9.6)	0.966	3.043	1.53	0.147	0.156
Grand Total		7016 (100)	9.24 (6.66)	63.243 (45.57)	61.37 (44.22)	1.535 (1.11)	3.389 (2.44)
Grand Total 1987 1988		 6323 6809	 10.4 10.9	 252.9 234.0	 58.7 38.1	 1.5 1.6	 3.0 3.2

Note:

[1] Source: Ministry of Energy, Telecommunications and Post

( ): Indicate percentage value

Table 6.8

Malaysia: Distribution of Major Stationary Sources of Water Pollution, 1989

State	Major Water Pollution Sources							
	Palm Oil Mill	Raw Natural Rubber	Rubber Product	Food and Beverage	Textile and Leather	Paper	Chemical Product	Total
Perlis	-	-	1	14	1	-	-	16
Kedah	3	29	21	98	8	2	8	169
Pulau Pinang	5	9	44	158	56	11	43	326
Perak	36	30	28	131	12	5	11	253
Selangor	31	13	122	92	20	14	105	397
Wilayah Persekutuan	-	4	30	21	9	13	31	108
Negri Sembilan	12	22	13	15	1	2	8	73
Melaka	3	11	14	21	7	3	10	69
Johor	64	49	32	130	45	7	32	359
Pahang	55	17	4	33	-	1	1	111
Terengganu	10	3	8	84	15	-	-	120
Kelantan	6	11	1	28	4	1	3	54
Sabah	24	4	3	48	5	11	4	99
Sarawak	5	3	2	38	-	3	4	55
Total	254	205	323	911	183	73	260	2209

Table 6.9

Malaysia: Organic Pollution Load Discharged According to Sector, 1986-1989

Year	1986		1987		1988		1989	
Sector	BOD Load [1]	Population Equivalent [2]	BOD Load	Population Equivalent	BOD Load	Population Equivalent	BOD Load	Population Equivalent
1. Agro-based Industries (Palm Oil and Rubber)	11	0.22	11	0.22	11	0.22	11	0.22
2. Manufacturing Industries	30	0.60	20	0.40	19	0.38	21	0.42
3. Agriculture (Animal Husbandry)	55	1.10	55	1.10	55	1.10	60	1.20
4. Population (Sewage)	314	6.28	348	6.96	358	7.16	366	7.32
Total	410	8.20	434	8.68	443	8.86	458	9.16

Note:

1 BOD load in tonnes/day

2 Population equivalent (in millions) using BOD load of 0.05 kg/capita/day

Table 6.10

Malaysia: Revenue Obtained from Prescribed Premises, 1987-1989

Year	Prescribed Premise (Industry)	Processing Fees (M$)	Effluent-Related Fees (M$)	Late Fees (M$)	Recovery of Fees (M$)	Total Revenue (M$)
1987	Crude Palm Oil	24,400.00	284,406.14	930.00	276.93	310,013.07
	Raw Natural Rubber	20,600.00	41,780.17	7,124.19	725.56	70,229.92
	Total	45,000.00	326,186.31	8,054.19	1,002.49	380,242.99
1988	Crude Palm Oil	24,700.00	299,101.81	11,368.80	375.90	335,546.51
	Raw Natural Rubber	20,900.00	42,350.80	5,120.00	961.01	69,331.81
	Total	45,600.00	341,452.61	16,488.80	1,336.91	404,878.32
1989	Crude Palm Oil	2,540.00	295,720.35	39,754.46	928.59	338,943.40
	Raw Natural Rubber	2,050.00	42,787.12	12,628.85	6,580.49	64,046.46
	Total	4,590.00	338,507.47	52,383.31	7,509.08	402,989.86

Table 6.11

Malaysia: Status of Compliance of Palm Oil Mills (Watercourse Discharge) by Parameter, July-December, 1989

Parameter	Compliance (Per Cent)
pH	95
BOD3@30 °C	83
Suspended Solids	80
Oil and Grease	83
Ammoniacal Nitrogen	93
Total Nitrogen	93

Table 6.12

Malaysia: Distribution of Latex Based Factories, 1981-1989

Region	Number of Factories		
	1987	1988	1989
Federal Territory/Selangor	30	58	128
Perlis/Kedah/Pulau Pinang	19	36	43
Johor	7	15	26
Perak	7	22	17
Negri Sembilan/Melaka	8	12	15
Pahang	1	1	2
Kelantan	1	1	1
Total	73	145	232

Source: Malaysia Rubber Exchange and Licensing Board, 1989

Table 6.13

Malaysia: Distribution of Metal Finishing Industries, 1989

State	Number of Sources	Number having Partial/Complete Effluent Treatment Plant
1. Selangor	33	7
2. Federal Territory	24	No Treatment
3. Perak	14	4
4. Pulau Pinang	13	3
5. Johor	11	3
6. Melaka	6	3
7. Kedah	3	3
8. Negri Sembilan	1	No Treatment
9. Sabah	1	No Treatment
10. Sarawak	1	No Treatment
Total	107	23

Table 6.14

Malaysia: Contravention Licence under Section 22(1), Environmental Quality Act, 1974. Number by Type of Industry, 1984-1989

Type of Industry	Year					
	1984	1985	1986	1987	1988	1989
Rubber-based Industry	-	-	-	-	2	79
Wood-based Industry	17	16	26	40	55	46
Palm Oil Mill	1	3	1	4	3	2
Rice Mill	-	-	-	4	4	3
Others	6	7	10	8	10	6
Total	24	26	37	56	74	136

Table 6.15

Malaysia: Contravention Licence under Section 22(1), Environmental Quality Act, 1974. Number by Type of Contravention, 1984-1989

Type of Contravention	Year					
	1984	1985	1986	1987	1988	1989
Open Burning of Wastes	16	13	24	45	51	123
Operation of Incinerator not of Approved Design	4	4	10	5	16	1
Emission of Dark Smoke	3	2	2	4	2	3
Emission of Particulates	1	1	-	1	3	7
Others	-	6	1	1	2	2
Total	24	26	37	56	74	136

Table 6.16

Malaysia: Contravention Licence Applications under Section 25(1), Environmental Quality Act, 1974. Number by Type of Industry, 1987-1989

Type of Industry	Year		
	1987	1988	1989
Rubber-based	-	-	19
Food	21	20	12
Palm Oil Refineries	13	6	6
Textile	8	6	6
Beverage	9	10	5
Chemical	6	9	3
Paper	4	2	3
Electrical Goods	1	2	1
Others	19	12	18
Total	81	75	73

Table 6.17

Malaysia: Contravention Licence Applications under Section 25(1), Environmental Quality Act, 1974. Number by Justification, 1987-1989

Justification	Year		
	1987	1988	1989
Construction of Treatment Plant	26	34	28
Upgrading of Treatment Plant	12	8	11
Financial Constraint	4	5	7
Discharge into Central Sewerage Plant	11	9	6
Lack of Land	20	10	5
Lack of Treatment Technology	3	4	4
Others	5	5	12
Total	81	75	73

Table 6.18

Malaysia: Processing of Enquiries for Establishment of Facility for Management of Scheduled Wastes, 1989

Type of Facility	Number	
	Enquiries	Licence Application
1. Off-site storage/collection	23	5
2. Off-site treatment	1	-
3. Off-site recovery	6	3
4. Scheduled waste incinerator	4	2
5. Land treatment	5	1
6. Secure landfill	-	-
Total	39	11

Table 6.19

Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977, 1987-1989

Subject	Year														
	1987					1988					1989				
Total Number of Diesel Vehicles Registered [1]	265,651					275,913					298,177				
Number of Enforcement Campaigns	302					440					448				
Total Number of Vehicles Stopped for Inspection	35,513					44,978					42,284				
Type of Vehicles	L	B	T	O	PC	L	B	T	O	PC	L	B	T	O	PC
Number of Summons Issued	1751	881	771	656	653	2821	1080	1268	1291	900	2470	1726	1205	1165	519
Total Number of Summons Issued	4,712					7,360					7,085				
Type of Vehicles	L	O	T	B	PC	L	B	O	T	PC	L	B	O	T	PC
Percentage Compliance	90	87	85	84	68	88	85	80	77	67	89	78	78	75	74
Overall Percentage of Compliance (%)	87					84					83				

[1]

Source: Road Transport Department, Malaysia

Note:

Type of Vehicles

L = Lorry
B = Bus
T = Taxi
PC = Private car
O = Others

Table 6.20

Malaysia: Offences under the Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977, 1988-1989

State	Number of Vehicles				Compliance (Per Cent)	
	Stopped for Inspection		Summoned			
	1988	1989	1988	1989	1988	1989
Pahang	10,773	10,150	886	746	92	93
Sabah	471	203	33	18	93	91
Sarawak	1,482	1,778	246	168	83	91
Perlis	327	332	9	34	97	90
Perak	3,722	4,957	751	560	80	89
Kedah	3,701	4,095	260	490	93	88
Johor	7,231	3,871	380	464	95	88
Pulau Pinang	2,309	3,970	197	492	91	88
Terengganu	805	735	91	116	89	84
Kelantan	1,003	578	176	118	82	80
Negri Sembilan	1,523	3,000	496	818	67	73
Selangor	7,990	3,845	2,600	1,206	67	69
Melaka	1,236	1,737	510	611	59	65
Wilayah Persekutuan	2,405	3,033	725	1,253	70	59
Total	44,978	42,284	7,360	7,094	84	83

Table 6.21

Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974. Number by Type, 1987-1989

Section	Type of Offence	Year		
		1987	1988	1989
16	Failure to comply with conditions of licence.	8	4	8
18	Operation and use of prescribed premises without licence.	-	-	2
24	Pollution of soil or surface of any land without any licence.	1	-	-
25	Emission of wastes into any inland water without licence.	1	13	6
37	Failure to furnish information	4	1	1
Total		14	18	17

Table 6.22

Malaysia: Offences Prosecuted under the Environmental Quality (Clean Air) Regulations 1978. Number by Type, 1987-1989

Regulation	Type of Offence	Year		
		1987	1988	1989
8	Installation of incinerator without approval	-	-	1
11	Open burning of wastes	6	6	1
15	Emission of dark smoke	2	2	1
36	Installation of fuel burning equipment without approval	2	1	1
38	Erection of chimney without approval	2	1	1
40	Operation of facilities without of control equipment	1	-	-
Total		13	10	5

Table 6.23

Malaysia: Offences Compounded under the Environmental Quality (Clean Air) Regulations 1978. Number by Type, 1987-1989

Regulation	Type of offence	Year		
		1987	1988	1989
7	Using incinerator not of approved design	5	-	-
8	Installation of incinerator without approval	13	-	15
11	Open burning of wastes	150	46	112
15	Emission of dark smoke	32	9	17
36	Installation of fuel burning equipment without approval.	66	15	62
38	Erection of chimney without approval.	38	13	58
40	Operation of facilities without control equipment	3	4	14
45	Failure to render assistance by owner/ occupier.	-	-	1
	Total	307	87	279

Table 6.24

Malaysia: Oil Spill Sighting and Recovered Cleaning Cost by Location, 1989

Location	No. of Sighting	Cost M ($)
1) Port	1	2608.70
2) Straits of Malacca	8	Nil
3) South China Sea	12	Nil
4) Straits of Singapore	1	Nil
Total	22	2608.70

Table 6.25

Malaysia: Oil Spill Incident. Number of Sources, 1989

Sources	No. of Cases
1) Oil Platform	8
2) Load Transfer	3
3) Bilge/Bunkering	1
4) Tank Cleaning/Ballasting	1
5) Rupture (pipe)	1
6) Not Known	8
Total	22

Table 6.26

Malaysia: Status of Contingency Plan and Oil Spill Combating Equipment at Port, 1989

Port		Status of Oil Spill Control		
Location	Operator	Contingency Plan	Equipment	
			Type	Quantity
1) Pulau Pinang	Penang Port Commission	Yes	Tug-boat for dispersant spraying	2 units
2) Pelabuhan Kelang	Klang Port Authority	No	None	
3) Pelabuhan Johor	Johor Port Authority	No	None	
4) Pelabuhan Kuantan	Kuantan Port Authority	No	Knapsack sprayer Conweb absorbent pad Jet and spray nozzle Delivery hose Chemical Dispersant	2 units 400 units 2 units 5 units 400 lit.
5) Tanjung Berhala	Kemaman Supply Base	No	None	
6) Sibu	Rajang Port Authority	No	None	
7) Kuching	Kuching Port Authority	No	None	
8) Bintulu	Bintulu Port Authority	No	None	
9) Miri	Miri Port Authority	No	None	
10) Sabah	Sabah Port Authority	No	None	

Table 6.27

Malaysia: Complaint Cases of Open Burning Practices at Solid Waste (Garbage) Disposal Sites, 1985-1989

Local Authority Controlling Disposal Sites	1985	1986	1987	1988	1989	Total
1. Kuala Muda			2			2
2. Kulim		1	1			2
3. Seberang Perai		1	2			3
4. Kuala Kangsar			1		1	2
5. Teluk Intan		1				1
6. Ipoh				1	1	2
7. Kinta Selatan				1		1
8. Petaling	1		1	2		4
9. Shah Alam	1	2			2	5
10. Petaling Jaya	3	1			5	9
11. Gombak			2			2
12. Hulu Langat			1	2	1	4
13. Dewan Bandaraya Kuala Lumpur	1	1	1	1	1	5
14. Johor Bahru	1				1	2
15. Manjung					1	1
16. Temerloh	1					1
17. Bentong	1					1
Total	9	7	11	7	13	47

Note:

Open Burning is an offence under Regulation 11 of the Environmental Quality (Clean Air) Regulations 1978