MALAYSIA

ENVIRONMENTAL QUALITY REPORT 1991

Department of Environment

Ministry of Science, Technology and the Enviroment
22 April 1992

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FOREWORD

As mandated by Section 3(1)(i) of the Environmental Quality Act (EQA) 1974 and in accordance with one of the principal duties of the Director General of Environmental Quality, Malaysia, the Environmental Quality Report (EQR) 1991 is hereby published.

Unlike its predecessors, the 1991 Report comes in a new format to reflect the Department of Environment's growing functional coverage and describes the various environmental programmes and activities undertaken by the Department throughout the year 1991. In doing so the Report would also reflect to a certain extent efforts of all concerned to control and prevent pollution as well as to protect and enhance the quality of the environment.

The year 1991 marks another significant milestone in Malaysia towards achieving the twin objectives of environmentally sound and sustainable development. The first year of the immediate implementation of the Sixth Malaysia Plan, 1991-1995 (6MP), saw steps being taken towards the formation of the National Council for the Environment, as outlined in the 6MP's Environment chapter; the newly added role of the Department of Environment (DOE) as a developmental as well as regulatory agency with the approval of its new organisational structure; the October launching of the Malaysia Environment Week to commemorate the Langkawi Declaration on the Environment with the Royal Proclamation of October 21 as Malaysia Environment Day by His Majesty the Yang Di Pertuan Agong, Sultan Azlan Shah; followed by an overwhelming response of the business community with the formation of the Business Council for Sustainable Development (BCSD) in Malaysia. Never before had the level of environmental awareness and public concerns over the subject matter reached such heights, evident in the increasing coverage by the mass media on the environment.

The state of environment in terms of the quality of air, surface, coastal and marine waters continued to be monitored in 1991 with the aim of determining changes in quality. In view of the earlier than usual publishing deadline of this Report, ie. April instead of September, qualitative assessment could only be done subject to availability of analytical results at the time of reporting, ie. the latest being for samples submitted for analysis around mid 1991 for water quality and October 1991 for air quality. This part of the Report, ie. within the 'Monitoring' portion of the chapter on "Pollution Control", has therefore to be read in the context of a mid or partial year review.

The year 1991 in a nutshell, continued to reveal sewage and animal wastes as major surface water polluters, followed closely by silt. Vehicular and industrial emissions constituted the main air pollutants, which together with open burning of wastes, domestic or otherwise, have been identified as local contributors to the Haze, a phenomenon that seems set to stay in this region come third quarter of the year. One positive development was the marked reduction of lead in the atmosphere, a direct consequence of the gradual replacement of leaded petroleum by the unleaded variety.

Pollution abatement and control via the enforcement of the EQA 1974 and Regulations made thereunder, together with environmental monitoring, still constitute the principal tasks of the Department, complemented by pollution-preventive and developmental programmes that encompass evaluation of Environmental Impact Assessment (EIA) reports, review and formulation of Regulations and Guidelines, promotion of formal and non-formal environmental education, wider dissemination of environmental data and information, including the increasing use of the DOE library by the public; and greater participation of Malaysia in external (bilateral, regional and international) environmental affairs.

Throughout 1991 cooperation in environmental matters at bilateral, regional and international levels continued, in particular via the Malaysia-Singapore Joint Committee on the Environment (MSJCE), the ASEAN Senior Officials on the Environment (ASOEN), and the National Steering Committee for the United Nations Conference on Environment and Development (NSC UNCED). Negotiations for a Framework Convention on Climate Change and for a Biological Diversity Convention, as well as Meetings of Parties to the Montreal Protocol continued to remain in Malaysia's international agenda in the build-up to UNCED, June 1992, in Brazil.

I hereby present, with pleasure, this Environmental Quality Report 1991 for the consideration and perusal of all concerned with the well being of the environment.

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

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ENVIRONMENTAL POLICIES AND STRATEGIES

ENVIRONMENTAL POLICIES AND STRATEGIES

Introduction

The year 1991 marked the onset of a new era under the Sixth Malaysia Plan or 6MP (1991-1995) within which environmental policy objectives had clearly reasserted the importance of environment vis-a-vis enhancement of science and technology development. Contamination of waterways by indiscriminate use of chemicals, uncontrolled discharge of toxic waste from industrial activities were among the issues highlighted in the 6MP, and indeed, as shall be seen in the following chapters, these were the very issues addressed by the Department of Environment's prevention and control strategies for 1991.

The year also saw the emergence of the Second Outline Perspective Plan (OPP2) 1991-2000, which in essence is a projection of the aspirations of the 6MP to the 21st century. As it happened, in view of the recently propagated Vision 2020 that targets at a completely modern Malaysia in terms of technological advancement, the OPP2 was timely in giving priority to "responsible and well-balanced exploitation of natural resources to safeguard the requirements of future generations". This not only parallels the concept of Environmentally Sound and Sustainable Development (ESSD) but, in emphasizing strategies for environmental protection plus nature and natural resources conservation into all development plans and programmes, would serve decision-makers well in making Vision 2020 a balanced reality.

The 6MP's call for greater environmental consciousness among public and private sectors, and reiteration of 'environment is the responsibility of all' was met with increased efforts in environmental education through awareness campaigns that involved all and sundry, from government agencies and the mass media to school nature clubs, NGOs and corporate giants, culminating in the first ever Malaysia Environment Day and Week cum commemoration of the Langkawi Declaration on the Environment (LDE), in October 1991. The event was a fitting tribute to the LDE, which, as described in the 6MP, epitomised our commitment to the global plan of action aimed at eradicating poverty and arresting possible environmental degradation, thereby promoting ESSD.

In line with aspirations of the LDE, work to prepare a national and regional (in the context of ASEAN as well as Asia and the Pacific) stand for the United

Clown Fish and the Anemone - Symbiotic partners within the Environment

Nations Conference on Environment and Development (UNCED) increased in momentum together with involvement in related fora pertaining to the Montreal Protocol, Climate Change and Biological Diversity. Involvement was of such intensity that before the end of the year, Malaysia had acquired a reputation of being the 'champion of developing nations' in her insistence on fairness and equity rights in view of the relatively low pollution quota, historically, of the poor compared to the rich nations, especially in the matter of energy consumption patterns and subsequent emissions of greenhouse gases.

Among the other significant happenings of 1991 was a major reorganisation of the Department of Environment and establishment of 2 new state offices, one in Alor Setar to cover Kedah and Perlis, the other in Melaka to cover Melaka and Negeri Sembilan. Progress in the management of toxic and hazardous wastes reached a high point in final agreement on a centralised treatment facility, then pending submission of a detailed Environmental Impact Assessment (EIA). An Environment Hotline introduced for Selangor and the Federal Territory of Kuala Lumpur made waves in environmental enforcement throughout the Klang Valley. Stricter air pollution control was implemented in the wake of the recurring Haze, which was aggravated more by an external factor, ie. the forest fires in Kalimantan and Sumatra, than by the relatively insignificant local sources; whereupon contravention licences for open burning were withdrawn from areas worst hit and a special Haze committee set up at Ministry level to facilitate information exchange on climate monitoring.

While enforcement and monitoring, collectively termed pollution control under the new structure, continue to be the mainstay of the Department's programmes, Development and Prevention components have gained in importance as testified by the preceding paragraphs on environmental education, international affairs and EIA implementation. One memorable development in the New Programme Formulation section was the formation of the Law Review Committee which pooled resources from all agencies with jurisdiction over environment-related matters in an effort to streamline enforcement of the various legislations and forward recommendations to improve current shortcomings in environmental management. Preparation of the final report of this committee was envisaged to complete in 1992.

National Environmental Policy Objectives

The objectives of environmental management in Malaysia continue to be based on fundamental environmental policy directives elucidated in the 3rd and

Mangrove - A widely underestimated national treasure

5th Malaysia Plans, reinforced by the 6MP, as follows:

(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 cooperation and increased coordination among relevant Federal and State authorities as well as among the ASEAN Governments.

Strategies in Environmental Management

In order to achieve the national environmental objectives, the Department of Environment now adopts a strategy based on pollution control and prevention.

Pollution Control

The enforcement of the Environmental Quality Act, 1974 and the 15 sets of Regulations thereunder continued to play a significant role in environmental management in particular for the control of air and water pollution and more recently in the management of scheduled wastes.

Cooperation and coordination of enforcement on motor vehicles between the Road Transport Department, the Traffic Police Department and the DOE have been instrumental in efforts to curb black smoke emissions from diesel-powered motor vehicles. In addition the introduction of unleaded petroleum into the market has tremendously contributed to reduction of lead in the atmosphere.

Prevention

Assessment

Environmental Impact Assessment (EIA) which was made a mandatory requirement under section 34A of the Environmental Quality Act, 1974 requires anyone who intends to carry out a prescribed activity to first conduct a study to assess the environmental impact that will arise from the prescribed activity as well as the mitigating measures to overcome them. The prescribed activity or the proposed project is not allowed to commence until the report of such study has been evaluated and approved by the Director General of Environmental Quality. The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 specifies 19 broad categories of activities requiring EIA prior to project approval or implementation.

This strategy requires commitment and close cooperation of all parties involved in implementing the EIA Procedure in Malaysia, namely, the project proponent, the assessor or consultant, the relevant approval authority, the enforcement agency (DOE), experts and specialists as well as the public and public interest groups.

Environmental Input to Development

The Department continued to promote a comprehensive and holistic approach in development planning by incorporating environmental factors into resource untilization plans, including land-use, regional plans, master plans, structure plans or local plans. Development projects not subjected to EIA are screened, with valuable inputs from the regional or state offices of DOE which carry out Presiting Evaluation on the ground.

Centre of Investment at MIDA

As 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 are encouraged to establish their respective environmental units to handle environment-related matters. Towards this end, the Centre which has a senior DOE officer attached to MIDA, assists in processing of industrial applications by providing the environmental component and making known environmental requirements.

Developmental Programmes

The pollution control and prevention strategy is supported by other on-going environmental programmes that include training,environmental monitoring; environmental education, information dissemination, new programme formulation, inter-agency and Federal-State cooperation and coordination, and international environmental affairs. The last is achieved through inter-agency committees, meetings of Federal Heads of Department, Federal-State Liaison Committee, Environmental Quality Council (EQC), Ministers and State ExCos in charge of the Environment (MEXCOE); as well as through bilateral, regional (ASOEN) and international legal and institutional arrangements (UNCED et al).

Cool Forest - Serenity not found in the urban jungle

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. In 1991 EQC put more efforts on strategies relating to environmental education and awareness especially in promoting public participation in environmental protection. As such, visits were made to industrial areas, housing development estates and other premises of activity with impact on the environment to ensure that mitigating measures to prevent and reduce environmental degradation were being implemented successfully.

Membership

The members of the Environmental Quality Council in 1991 were as follows:

Name and Designation

1. Y.Bhg. Tan Sri Datuk Dr. Hamzah bin Sendut (Chairman)

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

3. Tuan Haji Mohd. Salleh Zakaria
   Principal Assistant Director
   Industry Division
   Ministry of International Trade and Industry

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

5. Ir. Harminder Singh
   Acting Director General
   Department of Factories and Machinery
   Ministry of Human Resources

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

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

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

9. Encik Darrell Tsen
   Permanent Secretary
   Ministry of Environment and Tourism
   Sarawak

10. Ir. Tuan Haji Ahmad Ibrahim
    Engineering and Safety Unit
    Petroleum Nasional Berhad (PETRONAS)

11. Dr. Haji Mohd. Tusirin bin Haji Mohd. Nor
    Representative
    Malaysian Oil Palm Growers Council (MOPGC)

12. Tuan Haji Mohamed Saufi bin Haji Abdullah
Representative
The Federation of Malaysian
Manufacturers (FMM)

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

14. Asso. Prof. Dr. Ahmad Badri bin Muhammad
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
President
Malaysian Professional Centre

17. Dr. Abu Bakar Jaafar
Director General of Environmental Quality
Department of Environment (Secretariat)

Activities

In 1991, The Council met 3 times, as follows:-

(i) 25 February 1991 in Kucing, Sarawak

(ii) 3 June 1991 in Port Dickson,
Negeri Sembilan Darul Khusus

(iii) 9 December 1991 in Kuala Lumpur.

Among the issues consistently deliberated by the EQC through 1991 were the following:

- the central-to-local government sewerage grants,
- progress of the centralised toxic waste treatment facility, and
- review of the EIA mechanism.

The latter eventually gave rise to the formation of an EQC Sub-committee on EIA, which was to meet regularly beginning 1992 in an effort to iron out operational and legal problems in EIA implementation.

A regular feature in the EQC meet which was hosted at different locations each time, was the State of the Environment (SOE) Report, usually presented by the DOE State Director concerned. This enabled the EQC members to familiarise themselves with the situation on the ground and interact directly with state personnel involved, thereby facilitating any recommendations to be made to the Minister of Science, Technology and the Environment.

In Kuching, visits to the Sarawak and the Forest Museums plus 2 Bintawa sawmills enlightened the EQC on local environmental issues. In Port Dickson, beside the regular SOE Report for the state of Negeri Sembilan, briefings on the Gazettement of Water Catchment areas and the Pig-Farms Centralisation exercise were given by the state authorities, providing an insight to topical matters in Negeri Sembilan.

The detailed list of all the working papers submitted to the Council in 1991 is given in **Table 2.1**. Since 1977, 46 meetings were held and 106 working papers presented as reflected in **Table 2.2**.

Table 2.1

Department of Environment: Working Papers Submitted to the Environmental Quality Council, 1991

Date	Title
25.2.1991	Kuching, Sarawak
	1. United Nations Conference on Environment and Development (UNCED)
	2. Environmental Quality Report 1989
3.6.1991	Port Dickson, Negeri Sembilan Darul Khusus
	1. The Petroleum Development and Environment Conservation and Management - A PETRONAS Perspective
	2. Role/Commitment of Professional Organisations to Ecology (Environmental Protection and Management in Malaysia)
	3. Compliance Status of Cement Factories in Malaysia
9.12.1991	Kuala Lumpur
	1. A Preliminary Review on the Operational and Legal Problems of EIA in Malaysia

Table 2.2

Department of Environment: Working Papers Submitted to the Environmental Quality Council, 1977 - 1991

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 Effluent	2	
Waste, Toxic and Hazardous	3	
1.2 Standards		
Palm Oil	2	
Rubber	1	
Water Quality	1	
1.3 Legislation		
Amendments	2	
	Sub Total 23	21.7
2. Programme Matters		
2.1 Planning		
Environmental Award	1	
Environmental Education	6	
Impact Assessment (EIA)	4	
Environmental Perspective/Report	8	
Erosion Protection	1	
Guidelines	6	
Klang Valley	1	
Seminar	4	
World Environment Day	6	

Subject	Number of Working Papers	Percentage
2.2 Operations		
Air Quality Monitoring	2	
Clean Air	1	
Contingency Plan	4	
Enforcement	2	
EQA	2	
EQC	1	
Marine, Oil Spills	1	
Motor Vehicle	2	
Palm Oil	1	
Rubber	1	
Sewage and Industrial Effluents	1	
Water Quality Monitoring	1	
2.3 Coordination	6	
	Sub Total 62	58.5
3. Issues		
Air Pollution	1	
Annual Report	2	
Environmental Issues	4	
Marine Pollution	2	
Noise	1	
Ozone Layer	2	
Piggery Waste	2	
Pollution Complaints	2	
Sewage	2	
Waste, Toxic and Hazardous	2	
Water Pollution	1	
	Sub Total 21	19.8
	Total 106	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. Prior to 1991, the Department was structured into 3 functional divisions and 8 regional offices. Since 1 January 1991, the Department has undergone a few changes in the structure both at the headquarters as well as regional offices as shown in **Figure 3.1**.

There are 4 functional divisions at the headquarters namely Administration, Control, Prevention and Development. Besides that the 8 regional offices have been renamed as state offices and the number has increased to 10 offices namely Selangor and Federal Territory (KL), Penang, Pahang, Sarawak, Sabah and Federal Territory (Labuan), Terengganu and Kelantan, Kedah and Perlis, Perak, Melaka and Negeri Sembilan, and Johor.

Administration Division

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

- general administration and coordination
- personnel administration
- finance
- training
- manpower planning
- registration of fees collected and licences issued
- support services

Staffing

The total staff of Department of Environment, numbering 490 as of 1 January 1991, comprises 110 category A officers, 180 category B, 122 category C and 78 category D. Most of the officers in category A and B are with professional and subprofessional qualifications as shown in **Figure 3.2**. It is the objective of the Department to be staffed with professional and subprofessional personnel of balanced and diverse educational background.

Finance

Operational Expenditure

The Department's total operating expenditure for 1991 was M$9,739,920.87. About 57.7 per cent of the operating expenditure was for staff emolument and related expenditures, 38.5 per cent for services and supplies and 3.8 per cent for assets. **Figure 3.3** shows the Department's operating expenditure for the period 1980-1991.

Development Expenditure

The total allocation for development in 1991 was M$2.0730 million, and a sum of M$1.371,723.19 or 66.17 per cent of the allocation was spent for the purchases of equipment. The Department's expenditure for the period 1980-1991 is shown in **Figure 3.3**.

Revenue

The total revenue collected in 1991 amounted to M$1,533,696.09. Effluent-related fees accounted for 49.37 per cent of the total revenue, while compounds and fines collected under the Environmental Quality (Clean Air) Regulations 1978 amounted to 24.40 per cent. Amount received in respect of trust accounts was 21.93 per cent and refund of salaries, allowances and car loans by the staff accounted for 2.33 per cent. Other sources of revenue, including the sale of environmental regulations, booklets and documents, accounted for another 1.97 per cent of the revenue.

Training

As in the past years and in line with the Department's policy of upgrading the skills of its staff, training programmes in various fields of environmental management were continued in 1991.

Long-Term Training

Long-Term training courses offered to the Department were mainly those ranging from three to four months. In 1991, there were three long-term overseas courses offered and attended by the officers (one each) from the Department.

These courses were subject-specific aimed at improving the skills and expertise of officers. The courses covered various aspects of environmental management including resources and industrial pollution and were made possible mainly through foreign sponsorship ie Colombo Plan U.K, Colombo Plan Japan and Institute of Development, Policy and Management (IDPM), London. These courses are listed in **Appendix 6** in cross-reference to **Chapter 6** (International Affairs).

Short-Term Training

Short-Term training programmes offered to the Department were mainly those of less than three months duration. These included courses, seminars, workshops and conferences offered both within the country and abroad. Attendance for short-term training programmes abroad was made possible largely through foreign sponsorship.

Training Courses

In 1991, the Department was represented at several local training courses organized by government, semi-government and private agencies.

On the international level, the Department was represented at 18 short-term courses organized by mainly international organisations eg. UNEP, JICA, UNEP/IRPTC/IPCS, IMO and foreign governments.

In terms of body count, during the year, 21 officers attended 14 short-term training courses and 18 officers attended 18 short-term/training courses abroad.

The courses offered cover various fields of environmental management including personnel management, as per **Appendices 3.1** and **6.1** (Overseas).

Workshops

The Department in 1991 was represented in 7 workshops organised locally involving a total of 8 officers (**Appendix 3.2**) while 5 others participated in 6 workshops overseas (**Appendix 6.2**).

Conferences and Seminars

In order to upgrade knowledge and to expose officers especially to new issues related to global environmental management, the Department took advantage of several invitations received to send officers to participate in conferences and seminars either locally or abroad. In 1991, 28 local seminars pooled a total of 74 officers, as per **Appendix 3.3** while 11 conferences and 4 seminars overseas were attended by 5 & 4 officers respectively (**Appendices 6.3** and **6.4**).

Productivity and Quality Management

In line with the Government's efforts to improve and upgrade the quality of the civil service, DOE played an active part in implementing the nationwide Productivity or 'Q' Campaign, whereby the Department chalked a first by being nominated, along with 25 other departments for the year's national 'Anugerah Khidmat Cekap' (Efficient Service Award).

The Department's first Q Day was launched on 31 October 1991, to include departmental conferment of the Excellent Service Award to deserving employees (previously selected by Productivity Committees at various levels) and proclamation of the Departmental Q Pledge, which was incidentally highlighted in a 1991 government publication "Pembaharuan dan Kemajuan dalam Perkhidmatan Awam (Innovations and Progress in the Civil Service)", and translated as follows:

We, the employees of the Department of Environment, Ministry of Science, Technology and the Environment hereby solemnly declare that we shall continue to-

- *perform (our duties) with sincerity, honesty, justice, trust and wisdom;*

- *perform (our duties) with utmost discipline, dedication and responsibility through the spirit of teamwork to achieve the Organisation's objectives;*
- *strive to put aside self-gains and favouritism over clients;*
- *strive in ernest to upgrade the quality of our service towards Vision 2020;*
- *serve, for the benefit of the people, the nation and religion, based on the National Code of Ethics (Rukun Negara).*

Prior to the Q Day launching, the Department had already on its own initiative, embarked on an 'Employee of the Month' nomination scheme, whereby those whose work for that particular month had shown remarkable talent and/or high degree of innovation were suitably honoured with a permanent-display plaque. The objective of such a scheme was to not only give recognition where it was due, but also to provide incentive for would-be achievers, and ultimately raise the standard of service in the Department in a more sustained manner than would an occasional award.

Control Division

The function of the Control Division is to plan, review and coordinate the enforcement and monitoring programmes conducted by the state offices. The Division has 2 main sections, namely Enforcement and Monitoring. Activities of these sections include:-

Enforcement Section

- o enforcement and licensing of toxic and hazardous waste facilities;
- o enforcement and licensing of prescribed premises;
- o enforcement and licensing of non-prescribed premises; and
- o enforcement of mobile sources;

Monitoring Section

- o air quality monitoring programme
- o instrument services
- o noise monitoring programme
- o marine quality
- o river quality
- o ground water quality

Launching of the Department of Environment's 'Q' Day
(inset: The Director General of the Environment, Dr Abu Bakar Jaafar, delivering his Address)

Prevention Division

The main function of the Prevention Division is to ensure that environmental factors are taken into consideration at all stages of development or project planning with a view to prevent environmental degradation. The Division consists of 3 sections namely Evaluation, Environmental Input to Development and Centre of Investment (COI) the last section facilitated by placement of an officer in the Malaysian Industrial Development Authority (MIDA) headquarters. Activities of these sections are as follows:-

Assessment Section

- o environmental impact assessment (EIA)
- o EIA monitoring and compliance

Environmental Input to Development Section

- o environmental inputs to development planning
- o resource development
- o pre-siting evaluation
- o GIS/Aerial Survey

Centre of Investment at MIDA

- o environmental input for industrial applications
- o cooperation with MIDA and potential investors on environmental matters.

Development Division

The function of the Development Division is to plan, formulate and review environmental guidelines and regulations, to document pollution control technologies, to increase public awareness and to promote regional and international cooperation in the field of environmental management. The Division consists of three sections namely New Programme Formulation, Environmental Education, Information and International Affairs, and Electronic Data Processing. Activities of these sections are as follows:-

New Programme Formulation Section

- o development of criteria and standards
- o formulation and review of regulations and guidelines
- o chemicals management
- o research and inventory

Environmental Education, Information and International Affairs Section

- o environmental education
- o regional and international affairs
- o technology documentation, environmental information, procurement and dissemination

Electronic Data Processing Section

- o computerisation
- o environmental data management

State Offices

The main functions of State 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 state authorities regarding environmental input to development planning. Activities for the State Offices include:-

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

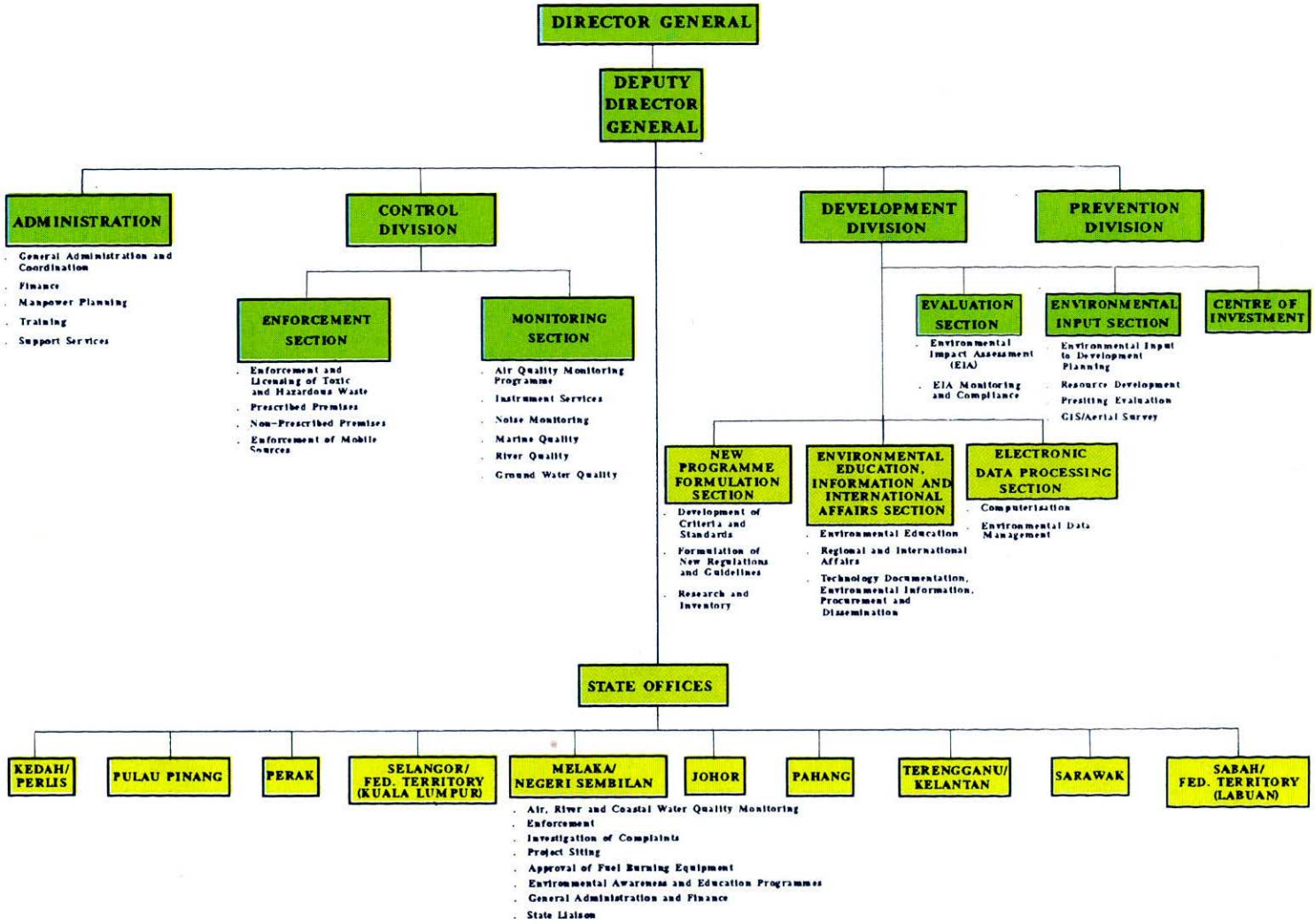


Figure 3.1 Department of Environment: Organisational Structure 1991

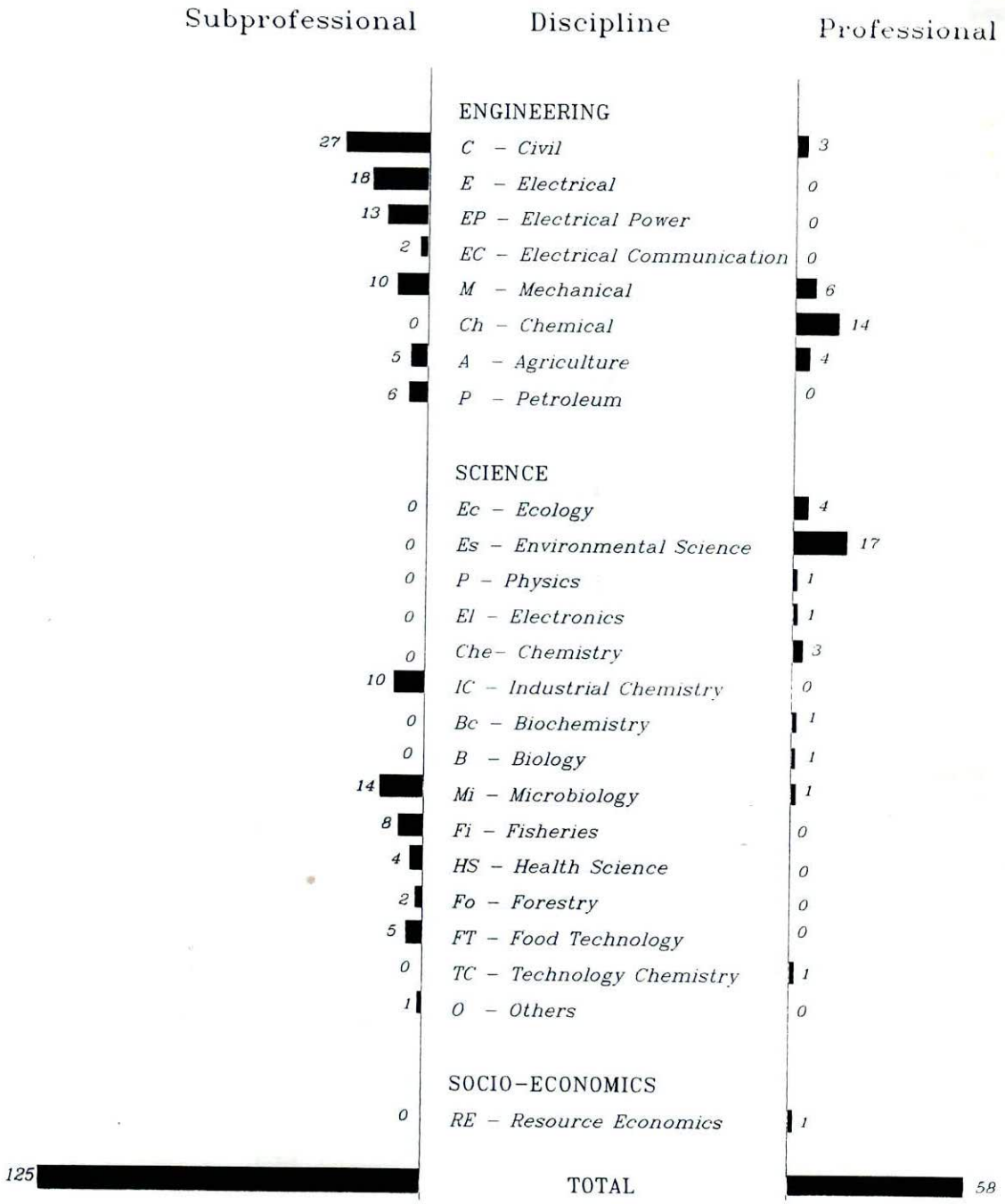


Figure 3.2 Malaysia: Department of Environment Professional and Subprofessional Staff by Discipline, 1991

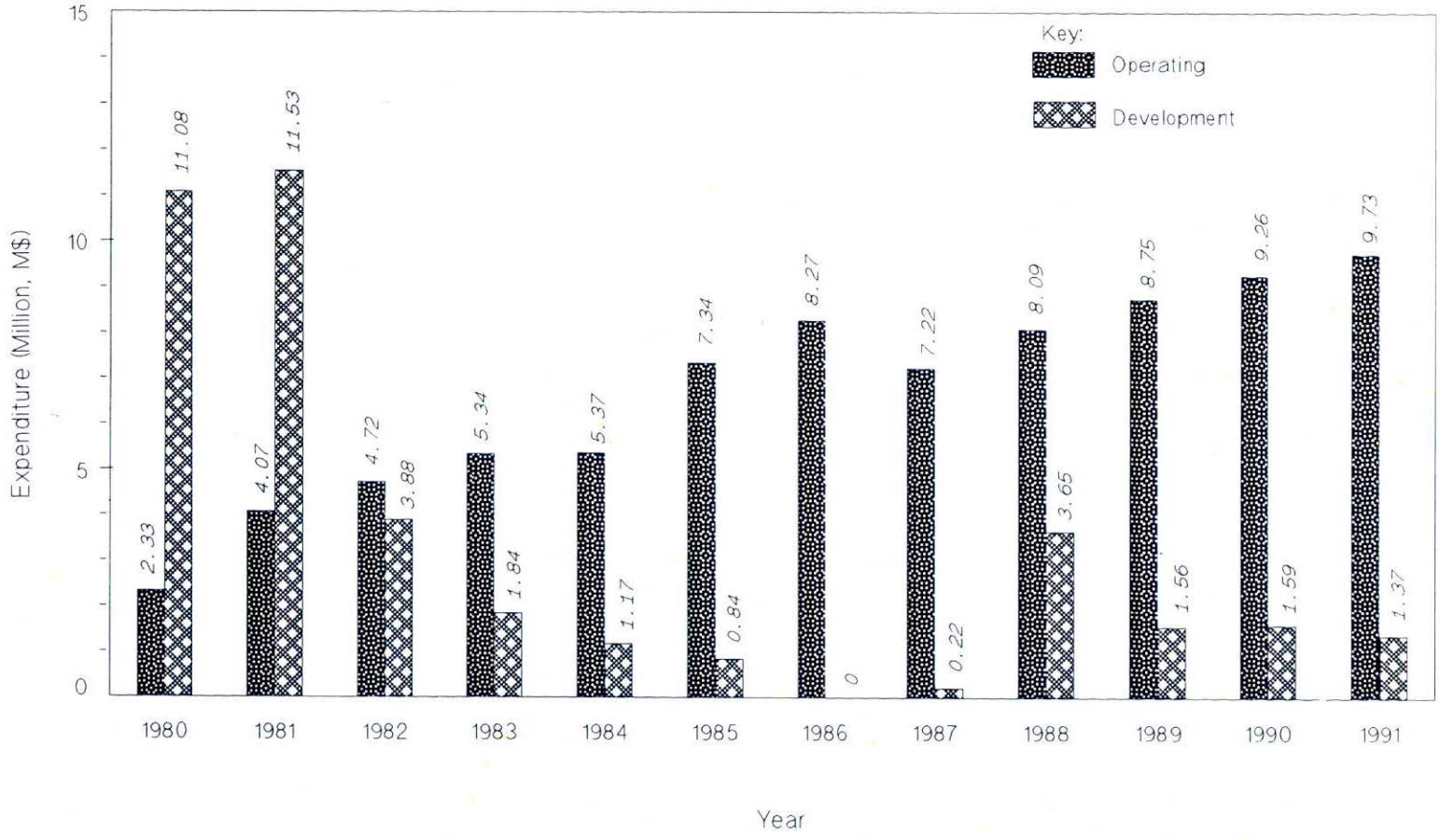


Figure 3.3 Department of Environment: Operating and Development Expenditure, 1980–1991

CHAPTER 4

ENVIRONMENTAL CONTROL

POLLUTION CONTROL

Preamble

The pollution control strategy is implemented through the two principal tasks of the Department, ie. Environmental Quality Monitoring and Enforcement. The two, collectively the Operations arm of the previous organisational structure, have long been the foremost and oldest of DOE's routine duties, having been in operation since the Department, then Division, was formed in the mid seventies. To date, they remain the traditional stronghold of DOE's functions.

ENVIRONMENTAL MONITORING

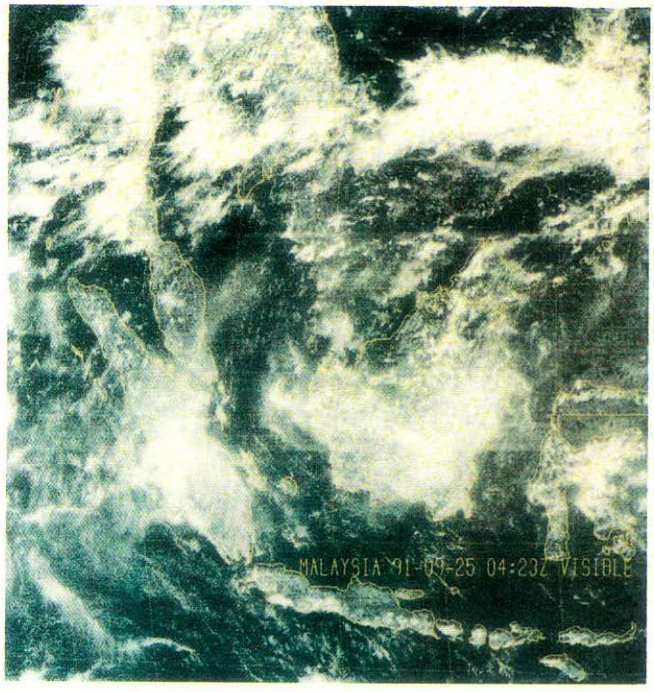
Introduction

Programmes for environmental quality monitoring and surveillance were continued in 1991. These comprise air quality, noise, river water quality and coastal water quality monitoring and surveillance programmes.

Air Quality

In 1991, the measurements of total suspended particulates (TSP), atmospheric lead, heavy metals and dust fallout were continued at 217 monitoring stations under the Air Quality Monitoring Programme. Measurement of fine particulate fractions of less than 10 micrometre (respirable particles) are of most significance for the estimation of effects of particulate on human health as compared to TSP. In this respect, respirable particles were measured at 7 monitoring sites in the same year.

Forests burning - An unwitting harbinger of the Haze



◀ ...25 September 1991 - Hovering 'whiteness' about to conceal Peninsular Malaysia

...8 October 1991 - Malaysia completely shrouded at the peak of the Haze ▶

◀ ...16 October 1991 - Haze Receding.

Progress of the Haze - A Satellite Imagery (Courtesy of the Malaysian Meteorological Services)

Kuala Lumpur Before the Haze

Kuala Lumpur at the Peak of the Haze, October 1991

A list of all the monitoring stations as per **Appendices 4.1-4.6** show the distribution of the air quality monitoring stations throughout Malaysia for both the measurements of TSP and dust fallout.

In 1991, the total number of samples planned for TSP measurements were 2598 as compared to 2921 in 1990. The actual number of samples collected was 2283 as compared to 1807 in 1990, an increase of 26.3 per cent. The percentage of achievement, however, has increased from 62 per cent in 1990 to 88 per cent in 1991.

The expected number of samples for dust fallout in 1991 was 2058 as compared to 1224 in 1990. The actual number of samples collected was 1859 as compared to 1913 in 1990. The percentage of achievement in 1991 was 91 per cent.

Evaluation of air quality in 1991 was inevitably dominated by the Haze that returned around the third quarter of the year. Measurements in October, the peak of the Haze period, showed a three-fold increase in suspended solids and correspondingly, particulate matter. Dust fallout was high over most parts of the country, although atmospheric lead in traffic hubs and industries areas experienced a promising downward trend.

Lead Content

Generally the lead levels in the air has improved, especially in the traffic and industrial areas. The level of lead in traffic areas was 0.43 ug/m^3 in 1991 compared to 1.45 ug/m^3 in 1989 and 0.48 ug/m^3 in 1990. In the industrial areas the level of lead was 0.09 ug/m^3 in 1991, whereas in 1989 and 1990 the levels recorded were 0.23 ug/m^3 and 0.89 ug/m^3, respectively. (**Table 4.1**)

Table 4.2 and **Figure 4.1** indicate most of the places measured for lead pollution in Kuala Lumpur and Selangor show an improvement over the last 4 years.

Total Suspended Particulates

In 1991 the levels of total suspended particulates has increased up to three times above the normal levels during the last haze episode reportedly caused by the forest fire in Indonesia. Between 8 to 11 October 1991 the TSP levels were recorded to be between 300-490 ug/m^3 at Petaling Jaya, compared to the normal TSP levels recorded during non-haze period, ie. in the range of 90 to 150 ug/m^3 (**Figure 4.2**). The visibility of the highly affected areas dropped to less than 1 km.

The Annual mean of TSP in the traffic and industrial areas in most states were higher compared to commercial or residential areas. States that recorded high levels of TSP were Federal Territory (Kuala Lumpur), Pulau Pinang, Johor, Selangor, Perak, Negeri Sembilan and Kedah (**Figures 4.3a** to **4.3d**).

Particulate Matter (PM-10)

Particulate matter (PM-10) is highly correlated with total suspended particulates. During the last haze episode, it was found that in Kuala Lumpur, the levels of PM-10 increased steadily from 90 ug/m^3 on 3 October to 340 ug/m^3 on 10 October. The levels of PM-10 returned to normal after 12 October 1991 (**Figure 4.4**).

In the residential areas particularly at Taman Melawati, the level of respirable particulate matter (PM-10) was very high, reaching a maximum of 175 ug/m^3 on 9 October 1991. The maximum level once again reached 190 ug/m^3 on 20 October 1991, but returned to normal in early November 1991 (**Figure 4.5**).

Other than Kuala Lumpur, Pulau Pinang also recorded high level of PM-10. The annual mean for Pulau Pinang was 106 ug/m^3. In the other states the reading of PM-10 were found to be low or marginal compared to the recommended limit of the Guidelines for Malaysia.

Gaseous Pollutants

At Kuala Lumpur the levels of gaseous pollutant were relatively low , below those recommended by Guidelines for Malaysia (**Table 4.3a**).

During the last haze episode there was no distinct variation in the nitrogen oxide and nitrogen dioxide (NO2) levels (**Figure 4.6**), and similarly for sulphur dioxide and carbon monoxide (CO) (**Figure 4.7**).

Figure 4.8 shows the hourly variation of gaseous pollutants on the peak day of the haze episode. The peak hours were between 8 to 11 in the morning and 10 to midnight. During these hours NO2 and CO levels were the highest at 330 pbb and 250 pbb, respectively, whereas sulphur dioxide remained constantly low within 5-10 pbb throughout the day.

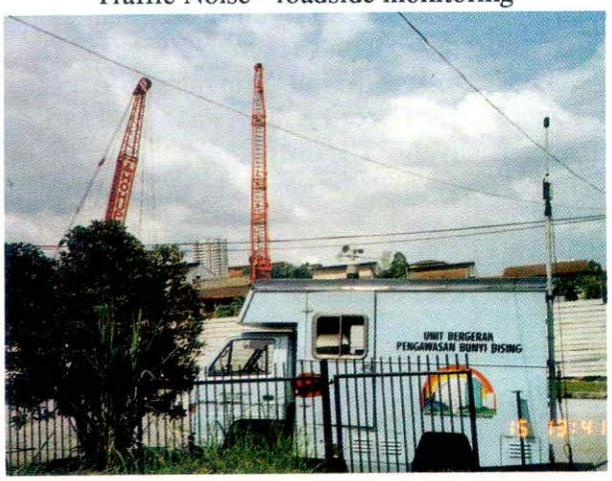
Dust Fallout

The levels of dust fallout measured in most states except for Pahang were considerably high when compared to the Recommended Secondary Guidelines (**Table 4.3b**). The highest mean levels were recorded in industrial areas of Perlis (277 mg/m^2/day), followed by Sabah (257 mg/m^2/day), Kelantan (243 mg/m^2/day), Johor (223 mg/m^2/day) and Sarawak (218 mg/m^2/day). As for the other states, dust fallout was between 141-179 mg/m^2/day whereas in residential areas, the highest level of 388 mg/m^2/day was recorded in Pulau Pinang, followed by Sabah 284 mg/m^2/day, Johor 200 mg/m^2/day and other states between 101-153 mg/m^2/day (**Table 4.4**).

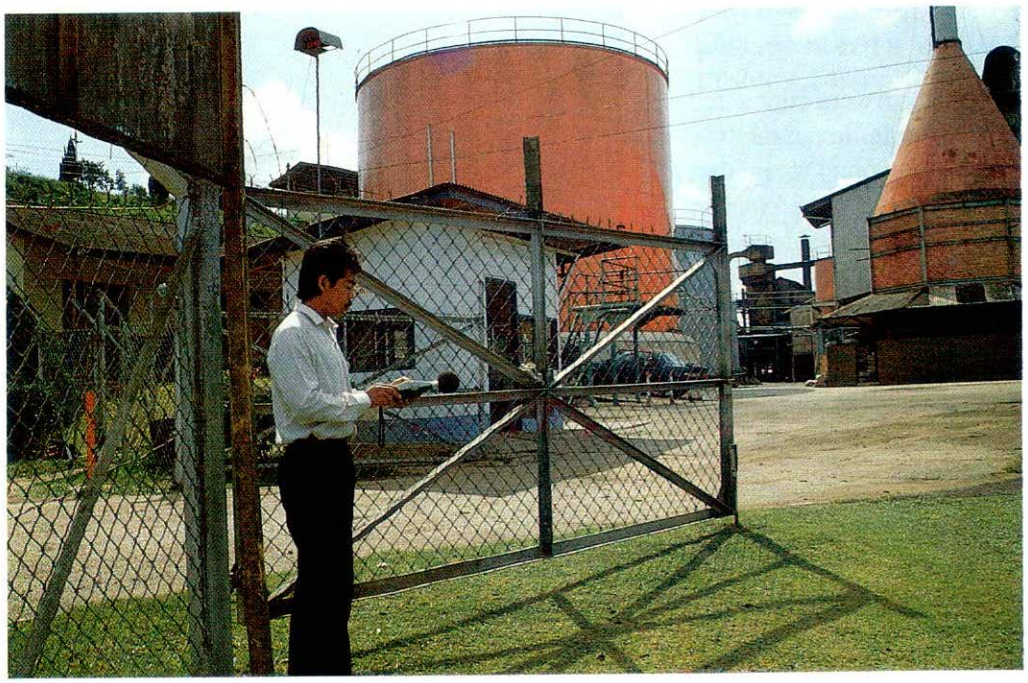
Noise Monitoring

Noise is closely related with everyday life and its sources are obviously diversified. As shown later

Traffic Noise - roadside monitoring



Construction Noise - monitoring by Mobile Unit



Industrial Noise - monitoring at factory periphery

under 'Enforcement', noise complaints constitute about 13 per cent of the total pollution complaints received in 1991. The biggest portion of the total noise complaints was industrial noise (83 per cent), followed by construction noise 9 per cent, traffic noise 5 per cent and community noise 3 per cent. (**Figure 4.9**).

Traffic Noise

In 1991 the measurements of traffic noise were conducted in 3 major towns, namely Ipoh, Taiping and Kuantan. As seen in **Figure 4.10**, the range of noise levels in the town of Ipoh was slightly higher compared to readings in Taiping or Kuantan. Noise levels measured in Ipoh were in the range of 71.3-77.5 Leq dBA, whereas in Taiping and Kuantan, the range was 69.1-76.4 Leq dBA and 66.9-77.1 Leq dBA, respectively. The distribution of these measurements is given in **Figures 4.11a** and **4.11b**).

Figure 4.12 shows the continuous measurements of traffic noise conducted at several locations in these towns. It can be seen that during late night hours, the noise levels were relatively low , within 40-60 Leq dBA, indicating little human activity taking place during these hours. However during the day, the hourly average levels were higher, between 65-70 Leq dBA, arising from the wide range of human activities.

Construction Noise

Measurements of construction noise were conducted mainly based on public complaints. Invariably the public was annoyed by the heavy sound emanating from the hammer piling operation that took place in construction sites. The noise levels measured from this activity, especially in the Klang Valley area were in the range from 60.5 to 73.4 Leq dBA.

Aircraft Noise

Aircraft noise was measured near Kuala Lumpur International Airport, Subang. Residents living within the range of noise exposure contour (**Figure 4.13**) were annoyed by the frequent sound produced by aircrafts especially during landings. The noise levels measured near the airport area were in the range of 63.8-94.0 Leq dBA.

Water Quality

River Quality

Under the 1991 Annual River Water Quality Monitoring Programme, 87 major rivers were monitored and a total of 2967 samples from 555 monitoring sites were collected (**Tables 4.5**, **4.6** and **Figures 4.14** to **4.17**).

Assessment of water quality was carried out in terms of the physical, biological and chemical characteristics of the water body. In-situ water quality measurements include parameters such as turbidity, dissolved oxygen, salinity, temperature, pH and electrical conductivity while laboratory analyses were performed for as many as 30 other chemical and biological parameters (**Appendix 4.7**). These also include bacteriological indicators, pesticides and detergents.

In 1991, the river water quality in general was found to be in a deteriorating state compared with 1990. Although the number of very polluted rivers had decreased from 7 in 1990 to 6 in 1991, a number of the previously clean rivers had become slightly polluted. Monitoring of 87 rivers in Peninsular Malaysia has revealed six very polluted rivers i.e. Sg. Sepang, Sg. Duyung, Sg. Buloh, Sg. Kelang, Sg. Ibai and Sg. Juru. (**Table 4.7**). Out of the six, Sg. Juru and Sg. Ibai have shown a slight improvement. Of the remaining 81, 44 rivers were found to be slightly polluted and 37 rivers clean.

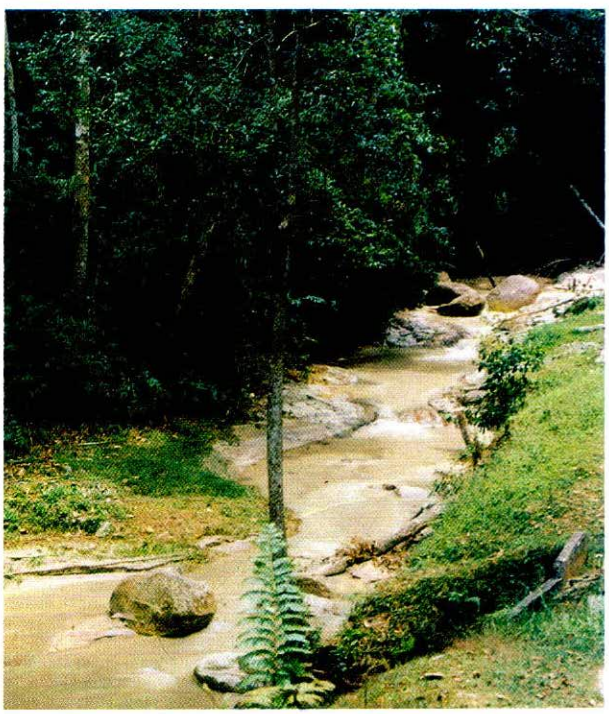
All polluted rivers were found to be in Peninsular Malaysia whereas the majority of rivers in Sabah were clean with the exception of 2 being slightly polluted. Rivers in Sarawak had shown a gradual decline towards 'slightly polluted' ie. from 5 out of 20 rivers in 1990 to 8 in 1991 (**Tables 4.8** and **4.9**).

Appraisal of the water quality is based on the Water Quality Index (WQI) for five parameters namely Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD), Ammoniacal Nitrogen (NH3-N), Suspended Solids (SS) and pH. The water quality data was also compared to the Malaysian Interim National Water Quality Standards for Class III, water use ie. fishery, water supply with extensive treatment and livestock drinking (**Appendices 4.8** to **4.10**).

The deterioration of water quality had also been observed in a 5-year trend (1986-1991) as per **Tables 4.10** (**a** and **b**) and **4.11**. Ammoniacal Nitrogen had shown a deterioration rate of 1.95 per cent in 1991, which had increased from 1.23 per cent in 1990. Suspended Solids had also increased its deterioration rate from 0.69 per cent in 1990 to 1.72 per cent in 1991. However Biochemical Oxygen Demand (BOD5) had improved slightly from 0.21 per cent in 1990 to 0.11 per cent in 1991.

The water quality assessment was greatly emphasized on three main parameters due to its relative significance to the types of pollution. Ammoniacal Nitrogen is a good indicator of pollution from animal wastes and sewage whereas Suspended Solids (SS) is an indicator for soil erosion and sedimentation, and finally Biochemical Oxygen Demand (BOD5) is an indicator for organic pollution, the major part of which arises from industrial and domestic effluents.

From this it can be inferred that the major contributors to river pollution in Malaysia in 1991 were sewage and animal wastes, with silt ranking a close second. **Appendices 4.11** to **4.21** show the status of river water quality for every state.



Stream badly polluted by silt (courtesy of Sahabat Alam Malaysia)

Ammoniacal Nitrogen (NH_3N)

Indicator of Sewage and Animal Waste Pollution

Pollution by sewage and animal waste is indicated by the presence of Ammoniacal Nitrogen in river water. As shown in **Table 4.12** the index of NH_3N showed that 47 per cent ie. 25 out of 53 rivers in Peninsular Malaysia were found to be very polluted leaving only 9 clean rivers (16 per cent). In comparison, 1990 revealed 41 per cent ie. 22 out of 53 rivers in Peninsular Malaysia, as very polluted and 24 per cent or 13 out of 53 rivers as clean.

Out of the 25 very polluted rivers none had showed any improvement or maintained its pollution level. For a total of 9 clean rivers, 3 rivers had shown a slight deterioration, whereas out of 19 rivers which were slightly polluted, 12 had deteriorated and 7 had improved.

In Peninsular Malaysia, very polluted rivers based on the NH_3N index, were Sg. Juru, Sg. Duyung, Sg. Melaka, Sg. Tebrau, Sg. Sepang, Sg. Skudai, Sg. Kelang, Sg. Jejawi, Sg. Merbok, Sg. Perlis, Sg. Prai, Sg. Endau, Sg. Muar, Sg. Batu Pahat, Sg. Kedah, Sg. Linggi , Sg. Ibai, Sg. Buloh, Sg. Kerian, Sg. Benut, Sg. Kesang, Sg. Pontian Kecil, Sg. Johor, Sg. Pontian Besar and Sg. Langat. While the majority of rivers in Sarawak are NH_3N-free as shown by **Table 4.13**, the only river in Sabah which was considered to be very polluted in terms of NH_3N index was Sg. Papar. (**Table 4.14**).

Suspended Solids (SS)

Indicator of Pollution from Soil Erosion and Sedimentation

Suspended Solids, an indicator of soil erosion that resulted in sedimentation and siltation, posed major environmental problems in Malaysian waters throughout 1991. This can be associated with intensive land clearing, uncontrolled development, mining and logging activities.

Out of 53 rivers monitored in Peninsular Malaysia as shown in **Table 4.15**, 29 rivers (54 per cent) were classified as very polluted, 11 rivers (20 per cent) slightly polluted and 13 rivers (24 per cent) were clean.

The worst affected areas in terms of Suspended Solids in Peninsular Malaysia were Sg. Tengi, Sg. Ibai and Sg. Balok. Rivers in Sarawak and Sabah as per **Tables 4.16** and **4.17**, were badly affected by pollution from Suspended Solids : 14 out of 20 rivers (70 per cent) of the rivers in Sarawak were in the category of very polluted whereas in Sabah 9 out of 14 or 60 per cent were very polluted leaving only 2 'sediment-free' clean rivers.

Biochemical Oxygen Demand (BOD_5)

Indicator of Organic Pollution

Generally in 1991, the river water quality in terms of organic pollution remained relatively unchanged. Industrial and domestic discharges accounted for the bulk of the organic load.

Table 4.18 shows that in Peninsular Malaysia, in terms of organic content, 5 rivers (10 per cent) out of 53 rivers monitored were seriously polluted, 15 (28 per cent) slightly polluted and 33 (62 per cent) clean. The worst affected rivers were Sungai Juru, Sepang, Jejawi, Kelang and Melaka. 18 out of 20 rivers monitored in Sarawak were considered organically clean leaving 2 which were slightly polluted (**Table 4.19**). In Sabah, all 14 rivers monitored were found to be virtually BOD-free. (**Table 4.20**)

Heavy Metals

In 1991 heavy metals continued to be monitored at selected sites. Some of the heavy metals monitored were arsenic, cadmium, copper, mercury, lead and zinc. Selection of the sampled 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 basin. 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.

Being a state undergoing rapid industrialisation, Pulau Pinang experienced the worst of mercury pollution, namely in Sg. Prai, Sg. Kerian and Sg. Jejawi. As shown in **Table 4.21**, these were the rivers from which samples were found to contain mercury exceeding the standard value of 0.004 mg/l. Lead was found the most in Johor as per **Table 4.22**, detected in certain rivers and ranging in concentration from a minimum of 0.03 mg/l to a maximum of 0.320 mg/l. All rivers in Johor exceeded the limit of 0.02 mg/l. Other rivers such as Sg. Bernam in Perak; Sg. Juru and Sg. Jejawi in Pulau Pinang; Sg. Muda in Kedah; Sg. Langat, Tengi, Buloh and Sepang in Selangor; Sg. Duyung in Melaka; Sg. Kuantan in Pahang; Sg. Golok in Kelantan; and Sg. Dungun, Setiu, Besut and Sg. Terengganu in Terengganu were also found to contain levels exceeding the limits. As evident in **Table 4.23**, lead levels in Sabah and Sarawak were minimal. **Table 4.24** shows that zinc is not of major concern, being for the most part, below the set limit.

Nutrients

Phosphate and nitrate parameters were monitored for nutrient levels so as to indicate washout of fertilisers from agricultural practices. Malaysian rivers are found to be more polluted by phosphate than nitrate. As per **Table 4.25** the rivers that recorded samples exceeding the set limits of 0.1 mg/l for phosphate were Sg. Sepang in Melaka, Sg. Setiu, Ibai, Terengganu, Dungun and Paka in Terengganu, Sg. Air Baloi, Pontian Kecil Endau and Skudai of Johor. Sabah and Sarawak rivers fully complied with the phosphate standard, as indicated in **Table 4.26**, while nitrate levels are by and large well within the permissible limits.

Marine Quality

In 1991, monitoring was carried out for 152 stations based on the 1989 site selection review, thereby adding no new station to the 1991 programme. **Tables 4.27** and **4.28** list all coastal water and river estuary monitoring stations in the country. A minimum of six samples per year were collected at all sites except for Sarawak where the minimum was four per year.

Based on analytical findings as per **Appendices 4.22** to **4.33**, **Table 4.29** and **Figure 4.18**, Oil and Grease, Suspended Solids and Escherichia Coliform prevailed as the main contaminants, attributed to activities such as land development, agriculture and increasing population.

Oil and Grease (O&G)

Malaysian waters off the coasts were found to contain very high levels of Oil and Grease. Most of the samples contained levels exceeding the Interim Standards for Marine Water Quality (**Appendix 4.34**). Coasts of Pahang, Kelantan, Terengganu, Sarawak, Sabah, Melaka, Perak, Selangor and Negeri Sembilan were the most affected by Oil and Grease.

Escherichia Coliform (E.Coli)

(Escherichia Coliform) is an indicator for sewage contamination arising from domestic as well as animal wastes. The quality of coastal waters in Malaysia contained substantial amounts of *E.Coli*. Pulau Pinang, Kedah, Pahang, Negeri Sembilan, Sarawak, Melaka, Johor and Perak recorded high levels of *E.Coli* in their samples.

Total Suspended Solids

Total Suspended Solids (TSS) is another parameter which prevails abundantly in Malaysian coastal waters mainly along the coasts of Kelantan, Terengganu, Pahang and Perak, being another land-originated product that results from earth-disrupting activities upstream such as large-scale land clearing for agricultural development.

Heavy Metals

Heavy metals monitored in the marine waters included cadmium, chromium, copper, lead, mercury and arsenic. The States of Perak, Pulau Pinang, Kedah, Selangor and Negeri Sembilan recorded the highest number of samples containing mercury levels exceeding the Interim Standards for Marine Water Quality. Although levels of lead, copper and cadmium were found to be low, their distribution is more widespread compared with other heavy metals monitored. Significant levels of lead were found along the coasts of Sabah, Johor, Perak, Pulau Pinang and Kelantan.

Beach Tar

Beach tar sampling was carried out on selected beaches especially those designated for tourist and recreational purposes. Beach tar was found mostly along the coasts of Kelantan and Terengganu, as evident in **Table 4.30**.

Oil Spill Response Planning

Progress

In 1991, 11 cases of oil spill incidents were reported; three of which occurred in the South China Sea and

Scene at Oil Spill Simulation Exercise,Port Klang,July 1991

eight in the Straits of Malacca. **Tables 4.31** and **4.32** show the total number of incidents according to location and source respectively for the past 12 years. No oil spill from rigs or platforms occurred presumably due to the stricter control of late in offshore operations.

Updating of the National Oil Spill Contingency Plan for Malaysia and associated plans continued in 1991 to ensure the availability of important information if and when needed in any emergency.

Regionally, cooperation with Indonesia and Singapore under the Standard Operation Procedures (SOP) for Joint Oil Spill Combat (JOSC) in the Straits of Malacca and Singapore progressed in the normal spirit of brotherhood within ASEAN.

As was the routine in preceding years, in order to upgrade the capability of the Contingency Plan, several oil spill simulation exercises were conducted by individual oil companies, with participation by officials from the Department of Environment.

An Oil Spill Simulation Exercise was conducted by ESSO Oil Company on 8-9 October 1991 at Batu Buruk, Kuala Terengganu. Equipment from all over the country and also by courtesy of the Tiered Area Response Capability (TARC), based in Singapore, was used in this exercise. Prior to this, the ESSO Blending Plant at Port Klang had conducted a similar exercise on 6 July 1991. Later in the year, another oil spill simulation exercise was conducted on 1-4 December 1991 by Caltex Oil Malaysia Ltd. at Port Klang. This last exercise was part of an on-going training under the auspices of the Regional Oil Spill Response Team (ROSRT), and pooled participants from the Department of Environment as well as Caltex ASEAN affiliates.

The findings of these exercises were to reinforce the importance of the following:

(a) Full cooperation between oil companies, the government agencies and ROSRT members to strenghten the effectiveness on oil spill control in Malaysia.
(b) Identification of weaknesses in communication procedures among the relevant agencies.
(c) Response to emergency situations in a timely and coordinated manner to serve the public's interest, minimum loss of life and injury and minimum effect on the environment and the oil company's operation.

Communication Centre

The Communication Centre at the Department of Environment is in full operation after the launching in 1990. Oil spill reporting and clean-up procedures are being communicated through this centre to the other agencies such as the Marine Department, Fisheries Department, Maritime Enforcement Co-ordination Centre, Petronas, Royal Malaysian Police (Air Unit), Royal Malaysian Air Force and Royal Malaysian Navy. The centre is now equipped with HF radio sets, VHF radio, telephone, recording equipment, computer, Barco projector, Patching Telephone Unit, telefax and boardfax.

ENFORCEMENT

Introduction

This section will highlight the achievements and progress in the works of pollution abatement and control via the enforcement of pollution control regulations under the Environmental Quality Act, 1974 carried out by the Department of Environment (DOE). The enforcement of the existing environmental laws and legislation is essential and has been stepped up so as to ensure the capability of the industrial sector, in particular to control the production of environmental pollutants and to practise effective storage and disposal systems.

Progress

Some technological progress has been noted in treating and controlling pollution resulting from the agro-based industries i.e. the crude palm oil and raw natural rubber processing industries. However, on the whole, performance records show that the status of compliance of these industries is still far from satisfactory. The problems are attributed to improper management of treatment systems, the use of under-sized system as well as increased milling capacity, malodour and black smoke emission.

More concerted efforts are needed to curb down pollution problems resulting from the manufacturing industries. With stricter enforcement of Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 and Environmental Quality (Clean Air) Regulations 1978, it is envisaged that the pollution problems can be minimised. Strict revision on the issuance of contravention licences made under the Section 22(1) and Section 25(1) of the Environmental Quality Act, 1974 will help to facilitate further the compliance to these regulations. In addition, factors that aggravate or increase non-compliance, such as the incompetence of some waste management consultants in designing effective treatment systems, have been recognised, and efforts initiated to address and resolve these problems.

Enforcement on mobile sources is continued on a regular basis to monitor compliance on black smoke emission from diesel engines vehicles and also on the lead level in petrol, the latter being given a boost in 1991 by the introduction of incentives for production of unleaded petroleum.

The enforcement of regulations for the management of scheduled wastes has been intensified and the number of waste generators complying with the requirements of the regulations increased significantly through the notification and assessment scheme and licensing mechanism. However, activities in illegal dumping of toxic wastes still persist throughout the country, warranting serious enforcement action.

The implementation and enforcement of the mandatory environmental impact assessment (EIA) procedure and requirements under the Environmental Quality (Prescribed Activities)(Environmental Impact Assessment) Order 1987 have been stepped up in tandem with the country's increasing rate of development and inclination to industrialise.

New Approaches

In an effort to improve current enforcement programmes, work has resumed to review various environmental laws and regulations within and outside the jurisdiction of the Department of Environment and also on the formulation of new regulations. The establishment of a telephone hotline in the Selangor Department of Environment, judging by great response from the general public has given extra 'bite' to routine enforcement activities. The feedback received has helped the Department in combating environmental pollution in a more efficient manner. Cooperation from the Air Police Traffic Unit has been sought to carry out aerial surveillance on environmental pollution pertaining to open burning, black smoke emission from chimneys and illegal dumping of toxic wastes.

Prescribed Premises

Crude Palm Oil Mills

In 1991, a total of 265 mills processing crude palm oil were licensed under Section 18(1) of the Environmental Quality Act 1974, to comply with the standards of discharge specified under the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 (Amendment 1982). For the licensing period 1 July 1991 to 30 June 1992, there were 10 cases of late application after the stipulated period ending 31 March 1991. Late application penalty fees imposed amounted to $4,731.38, marking a 63 per cent decrease in the charges collected the previous year and a reduction of 72 per cent from the charges collected in 1989. This is a good indication that the mills are giving more attention to the licensing requirement and therefore delaying less.

Figure 4.19 illustrates the growth of the crude palm oil industry in the country 1978 to 1990. Compared to the first year of enforcement of the Regulations, the crude palm oil industry has grown as much as 102 per cent from 131 in 1978 to 265 in 1991. The total revenue collected in licensing the industry amounted to $376,349.06 (**Figure 4.20**) decreasing slightly by about 3.7 per cent as compared to the previous year.

Out of the 265 palm oil mills licensed 112 mills were monitored in 1991, and 85 per cent found to be complying with the discharge standards for BOD.

4 Mills had their licences suspended while 5 other mills had been given more stringent conditions for all the parameters. 5 transfers of licences were processed and the fees collected amounted to $150.00. Altogether 30 mills were given stringent conditions in the licences issued.

A few complaints of black smoke emission through chimneys and open burning of empty fruit bunches were received from nearby residents.

Raw Natural Rubber Factories

207 licences were issued under the Environmental Quality (Prescribed Premises)(Raw Natural Rubber) Regulations 1978 in 1991, compared to 211 licences in 1990.

Figure 4.19 shows the total number of raw natural rubber factories licensed from 1978 to 1991. There was no case of late application for renewal after expiry of licence. However, 26 late applications were received after the stipulated period ending 31 December, 1990 and the penalty imposed amounted to $9,950.00. This shows an increase of 56 per cent from the penalty imposed the year before.

Assessment of the total revenue collected in licensing the raw natural rubber factories since 1979 shows a reduction of 57 per cent in fees collected in 1991. (**Figure 4.20**).

90 factories were monitored for the year 1991 and 81 per cent of the factories complied with the licensing conditions.

9 complaint cases were received in 1991, mainly concerned with malodour, even though efforts were taken by the Department to ensure that factories practise good-housekeeping and install proper control equipment.

Three factories were taken to court under Section 16(1) of the Environmental Quality Act 1974 for not complying with the licensing conditions. On the whole, the status of compliance of the raw natural rubber factories looks very promising towards achieving the 100 per cent compliance (**Figure 4.21**).

Non-Prescribed Premises

Premises other than those prescribed (crude palm oil and raw natural rubber mills) ie. largely manufacturing industries, are subjected to the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979, the Environmental Quality (Clean Air) Regulations 1978 and the Environmental Quality (Scheduled Wastes) Regulations 1989.

Rubber-based Industry

The rubber-based industry continued to pose problems with regard to disposal of vulcanised rubber wastes. In 1991, only 3 of such industries were given contravention licences under Section 22(1) of the Environmental Quality Act, 1974 to carry out open burning of their wastes. The industries however have been repeatedly informed that this is only an interim measure, and were urged to find a long-term solution. From 1 July 1991, the Department of Environment ceased issuing contravention licences to the industries and recommended various alternative methods of disposal such as burying the wastes at the approved sites by local authorities, reuse of the wastes, etc. For the industries that have to resort to burning, it is stipulated that the activity must be carried out in an approved and efficient incinerator which is equipped with pollution control equipment and heat recovery system.

Food Manufacturing

The food manufacturing industries also contribute significantly to water pollution in the country. Their non-compliance is largely due to the absence of a proper wastewater treatment system, undercapacity of the existing treatment system to cater for the increased production capacity of the industry and lack of maintenance of the wastewater treatment system. For the year 1991, about 32 industries have applied for the contravention licence under Section 25(1) of the Environmental Quality Act. This constitutes about 39.5 per cent of the total contravention licences issued under Section 25(1) of the Environmental Quality Act for that year.

Wood-based Industry

Indiscriminate disposal of wood wastes from the wood-based industries is of great concern to the environment, causing not only the pollution of air, water and land but also affecting the people and properties around the milling operations. The Department of Environment has encouraged the reutilization of wood wastes generated in the wood

processing mills as fuel for kiln drying operation (KD), steam boiler, brick manufacturing, charcoal making, manufacturing of particle board etc. In spite of this, the problem still prevails and is added to by the burning of wood wastes in inefficient and unapproved incinerators; causing serious air pollution in the form of smoke, dust and flyash.

Textile Industry

Many of the textile industries in the country are still operating without proper effluent treatment systems. As a result, a few places in the states of Perak, Johor, Selangor, Kelantan and Terengganu face serious river water pollution. For industries that have wastewater treatment systems, however, compliance to the stipulated discharge standards of the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 remains a problem especially with respect to the parameter Chemical Oxygen Demand (COD).

Contravention Licence

The Environmental Quality Act (EQA) 1974 allows for contravention licences to be issued for cases of non-compliance, to meet acceptable conditions of discharge of waste into the atmosphere and inland waters. The respective provisions are contained under Sections 22(1) and 25(1) of the Environmental Quality Act, 1974.

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

Through the year there were 81 applications for licence under Section 25(1) of the Environmental Quality Act 1974 (**Figure 4.22**). 72 per cent of the licences issued were to enable the industries to construct or upgrade effluent treatment plants. In a number of cases licences were issued to industries due to lack of treatment technology system capable of meeting the discharge standards especially for the parameter Chemical Oxygen Demand (COD). These licences were given with strict imposition of effluent-related fees as provided for under Regulation 22(1), Environmental Quality (Sewage and Industrial Effluents) Regulations 1979.

In 1991 effluent-related fees collected thus amounted to $138,454.40. The breakdown of the contravention licences issued under Section 25(1) by type of industry and justification are given in **Tables 4.33** and **4.34**. During the licensing period, these industries were monitored regularly to ensure compliance with the conditions of the licences to minimise the load of pollutants discharged.

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

In 1991, 72 applications were received to conduct open burning of wastes and 6 applications for operation of incinerator not of approved design. **Table 4.35** shows the total number of applications for contravention licences received since 1988. Licences were issued where the aforementioned mode of disposal was the only economically practicable means at the time and that the burning would not or would least likely cause adverse impact to nearby residents or surroundings. Both **Tables 4.35** and **4.36** give the detailed breakdown on the number of licences issued under Section 22(1) according to type of industry and type of contravention.

Towards the end of the year in view of the haze situation in Malaysia during the months of October and November, the Department had to cease the issuance of contravention licences on open burning in the Klang Valley. It was in this period that the Department of Environment issued notices to suspend all open burning contravention licences.

Scheduled Wastes

Scheduled Waste Management

The Environmental Quality (Scheduled Wastes) Regulations, Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order and the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations enforced since 1989 have set out the requirements for storage, collection, packaging, labeling, treatment and disposal of scheduled wastes. Although discharges of toxic industrial wastewater into surface water drains and

combined disposal with municipal wastes still occur, the Regulations have to a certain extent succeeded in controlling indiscriminate disposal of such wastes.

In 1991, the Department of Environment received 64 applications to establish prescribed premises for handling of scheduled wastes, of which only 23 were approved. Detailed description on the type of applications received is shown in **Table 4.37**. Meanwhile, a total of 134 applications were received for handling wastes in premises not categorised as prescribed, as per **Table 4.38**.

Establishment of An Integrated Facility for Scheduled Wastes

The year 1991 witnessed a remarkable progress in the establishment of an integrated treatment and disposal facility for scheduled wastes in the country. On 15 March 1991 the Negeri Sembilan Director of Lands and Mines informed the Department of Environment (DOE) that the Negeri Sembilan State Executive Council had agreed to the DOE's proposal of acquiring a piece of land which is part of the Tanah Merah Estate, Port Dickson District, Negeri Sembilan, for the site of the proposed facility. The application letter for the acquisition of the site at Bukit Nanas under Section 4 of the Land Acquisition Act, 1960 was made on 30 March 1991. The site was gazetted for further investigations on 23 May 1991.

The EIA consultants for the consortium led by I. Kruger Engineering A/S began their evaluation of the site on 10 May 1991, whereupon the Environmental Impact Assessment Interim Report was submitted to the DOE on 22 October 1991. Subsequently, the consultants proceeded to carry out a detailed EIA study of the proposed project. An Ad-hoc Panel was formed to study the Detailed EIA Report to be submitted in March 1992. Dialogue sessions with the relevant Negeri Sembilan state authorities were also held to clarify various issues surrounding the project and to secure support.

In addition, the DOE has initiated the groundwork towards the establishment of transfer stations for scheduled wastes in the states of Pulau Pinang, Johor and Terengganu. Meetings were held and Communiques were sent to the relevant State Authorities for further action.

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 continued in 1991. The Department of Environment with the cooperation of the Traffic Police and the Road Transport Department conducted 465 enforcement campaigns in 1991 throughout the country.

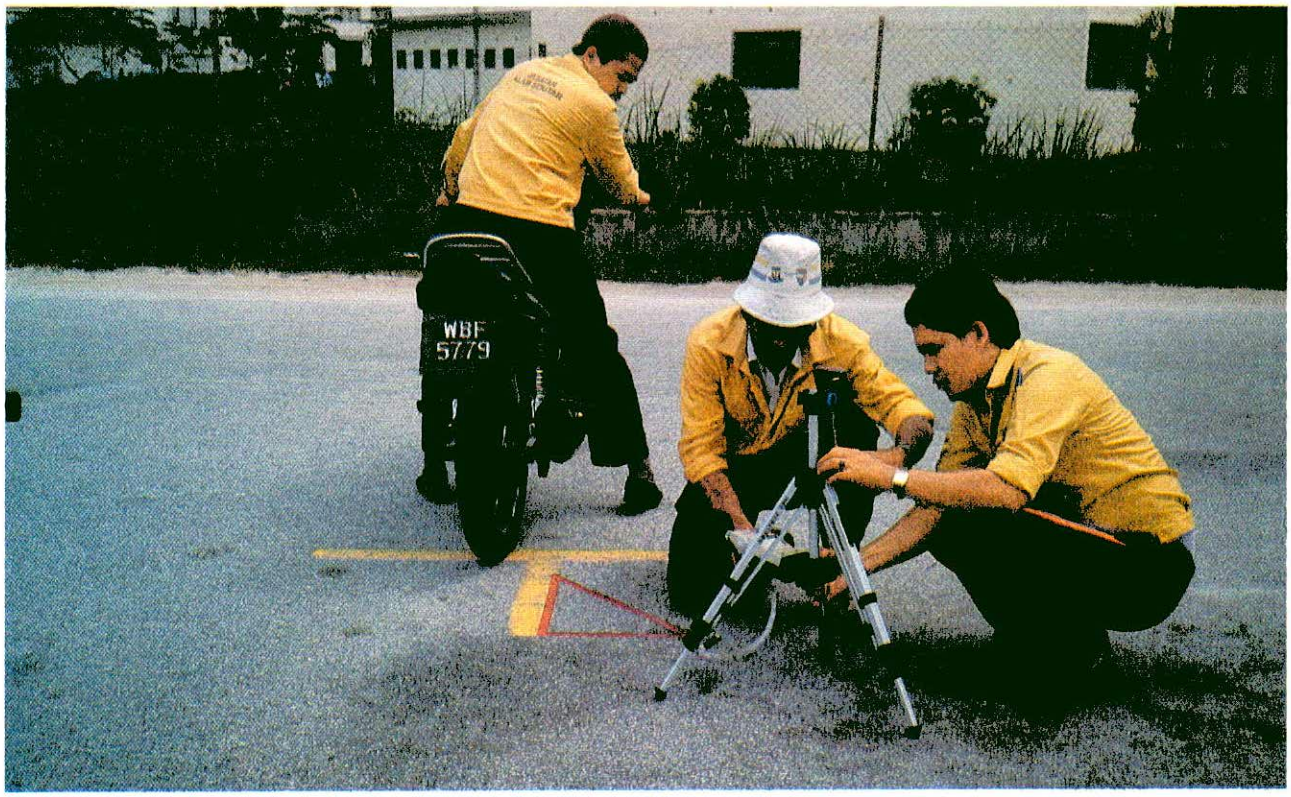
From these campaigns 40,487 vehicles were tested using the Hartridge Smokemeter. 9,444drivers/ vehicle owners were served with summonses for violating the limit of 50 Hartridge Smoke Units (HSU). The overall percentage of compliance was found to be 77 per cent (**Figure 4.23**). **Figure 4.24** shows the breakdown for the types and number of vehicles summoned and the compliance percentage in 1991. The highest percentage of compliance was by lorries (81 per cent); followed by buses (73 per cent); others, ie. vans and pick-ups (73 per cent); taxis (70 per cent); and private cars (65 per cent).

Beside enforcement on in-use vehicles, the Department also carries out smoke checks on new vehicle models at local assembly plants. 48 vehicles were checked in 1991 at random from which 5 (3 buses, 1 lorry and 2 trucks) were found not complying with the smoke stipulated limit.

Table 4.39 shows the enforcement statistics for 1989, 1990 and 1991. The past result of the above enforcement in terms of vehicles summoned according to states is given in **Table 4.40** and **Figure 4.25**.

Lead in Petrol

Under the Environmental Quality (Control of Lead Concentration in Motor Gasoline) Regulations 1985, the permissible lead level in motor gasoline as from January 1990 was0.15 g/l. Compliance to this limit was monitored through sampling programmes. In 1991, a total of 105 samples of both Premium and Regular grades of petrol were taken for analyses from all petrol manufacturers and suppliers in Malaysia. 24 were taken from oil refineries and storage depots, while the remaining 81 samples were from petrol



Testing of Motorcycle Noise

Regular grades of petrol were taken for analyses from all petrol manufacturers and suppliers in Malaysia. 24 were taken from oil refineries and storage depots, while the remaining 81 samples were from petrol kiosks selected at random. All the samples met the new level as required.

Motor Vehicle Noise

In 1991, a total of 40 campaigns were conducted under the Environmental Quality (Motor Vehicles Noise) Regulations 1987. From these campaigns, 4,421 motorcycles were tested and 3,984 (90 per cent) complied with the specified emission standard.

Legal Action

The Environmental Quality Act, 1974 provides penalties for cases of omission or neglect to comply with the Act or Regulations made under the Act. Besides the Act, the Department of Environment is enforcing 15 Regulations, Rules and Orders as listed in **Appendix 4.34**.

Prosecutions

Since 1980, the number of prosecution cases in the year 1991, is noted to be the third highest. Fines collected from 45 prosecution cases amounted to $87,000.00. Allocation of funds to facilitate enforcement visits to the polluted premises, which contributes to the increase of prosecution cases, had also been increased for the year. **Figure 4.26** shows the annual number of cases prosecuted, between 1980-1991.

The distribution of offences prosecuted by each state during the same period is illustrated in **Figure 4.27**. For the states of Kedah, Kelantan, Sarawak and Terengganu no cases were prosecuted in 1991. The state of Selangor recorded the highest number of 16 prosecution cases amounting to 36 per cent of the total cases for the year.

Offences charged under the Environmental Quality Act 1974 had increased by 60 per cent from the previous year to a total of 24 cases. **Table 4.41** illustrates the distribution of offences committed under the Act. 1991 recorded an absence of cases of

Open Burning at Rubbish Disposal Site - common Eyesore and source of Complaint

failure to comply with written notice and failure to furnish information charged in court. 2 cases were prosecuted for emission of wastes into the atmosphere without licence.

In 1991, 18 cases were charged in court under Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 compared to 3 cases in 1990.

Only 3 cases or 7 per cent of the total cases charged in court were offences that involved breaching of provisions under the Environmental Quality (Clean Air) Regulations 1978, where 2 cases were prosecuted for carrying out open burning of wastes and one for emission of acid gases exceeding the standard. **Table 4.42** illustrates prosecuted cases under these Regulations.

Compounds

A total of 1063 cases were compounded with fines amounting to $409,200.00. This shows an increase of about 3 times the total amount collected from prosecution cases in 1991. **Table 4.43** illustrates the offences compounded under the Environmental Quality (Clean Air) Regulations 1978. Offences compounded under these Regulations made up 92 per cent of the total compound cases, 46 per cent of which was for open burning of wastes. The occurrence of haze in mid-1991 had also activated aggressive enforcement activities over open burning throughout the country.

Table 4.44 shows the offences compounded under the new Environmental Quality (Scheduled Wastes)

Table 4.44 shows the offences compounded under the new Environmental Quality (Scheduled Wastes) Regulations 1989. The offences under these regulations contributed only 8 per cent of the total compound cases for 1991.

Public Complaints

The Department of Environment places great priority on complaints received from the public, mass-media, relevant agencies, non-governmental bodies as well as individuals. In response to complaints, received in written form or through the phone, investigations are carried out by the State Offices of the Department and appropriate follow-up action are taken.

Since 31 December 1990, in the wake of increasing frequency of complaints, the state office of Selangor had acquired a "hotline" to accommodate complaints and ensure quick enforcement actions.

Complaints in 1991

In 1991, a total of 811[1] complaints were received by the Department of Environment excluding complaints received through the "Hotline". Compared to 1990, the number of complaints received had increased by 24 per cent as shown in **Figure 4.28**.

As shown in **Figure 4.29**, similar to 1990, Selangor had the most number of complaints (33 per cent) followed by Federal Territory Kuala Lumpur (20 per cent). In contrast to the other states, Perlis and Sabah received the least number of complaints, (2 per cent).

Most of the complaints were on air pollution (71 per cent) followed by noise (13 per cent), water (10 per cent), and others (7 per cent) as illustrated in **Figure 4.30**.

Air-Related Complaints

The total number of complaints on air pollution from non-industrial sources were the highest (40 per cent) compared to the mobile sources (14 per cent), wood based (20 per cent) and rubber based (5 per cent) industries as indicated in **Figure 4.31**.

The nature of complaints on industrial pollution received were mostly on particulate (36 per cent), smoke and fumes (28 per cent), other (19 per cent) and odour (16 per cent) as shown in **Table 4.45**.

Water-Related Complaints

The highest number of complaints received on water pollution came from non-industrial sources (28 per cent) followed by other industries (22 percent), and rubber and palm oil mills (11 per cent) as illustrated in **Figure 4.32**. The non-industrial sources of complaint included land development, logging practices, sand mining, fish kills, lorry or tanker spillages.

Table 4.46 shows the number of complaints on occurrence of open burning of waste at waste disposal sites. The total number of such complaints had increased about 33 per cent compared to 1990.

Complaints Through 'Hotline'

Public response in terms of lodging complaints through the Hotline, Department of Environment, Selangor had been overwhelming and very encouraging. As indicated in **Table 4.47**, the total number of complaints received through the Hotline, quadrupled the total number of complaints (811 from **Figure 4.28**) received through the usual channels. In the future, the use of Hotline may be extended to the other State Offices.

According to analysis carried out on complaints received through the Selangor Hotline, about 24 per cent were on open burning, 13 per cent on dumping of rubbish, 11 per cent on unpleasant smell, while the remaining were other kinds of complaints.

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

Table 4.1

Malaysia: Status of Air Quality.
Annual Mean Values of Lead
by Area Type, 1988-1991

Area \ Year	Annual Mean Values of Lead in ug/m3			
	1988	1989	1990	1991
Traffic	0.80	1.45	0.48	0.43
Industrial	0.14	0.23	0.89	0.09
Commercial	0.08	0.10	0.18	0.37
Residential	0.20	0.36	0.14	0.24
Rural	0.02	-	-	-

Table 4.2

Kuala Lumpur and Selangor: Trend of Annual Mean of Lead (ug/m3) in the Air, 1988 - 1991

Monitoring Site	Year			
	1988	1989	1990	1991
1. SIRIM, Shah Alam	0.34	0.46	0.28	0.21
2. Johnson & Johnson, P.Jaya	0.66	0.98	0.39	0.30
3. Klinik Pergigian Bangsar, K.Lumpur	0.26	2.17	0.87	0.13
4. Dewan Bandaraya Kuala Lumpur	0.85	1.33	0.47	0.37
5. Balai Bomba, K.Lumpur	1.49	1.20	0.82	0.60

Table 4.3a.

Malaysia: Recommended Guidelines for Gaseous Pollutant (at 25 Celcius and 101.13 kPa)

POLLUTANT AND METHOD	AVERAGING TIME	MALAYSIA GUIDELINES		TARGET YEAR FOR COMPLIANCE
		(ppm)	(ug/m3	
OZONE AS 2524	1 Hour 8 Hour	0.10 0.06	200 120	1995
CARBON # MONOXIDE AS 2695	1 Hour 8 Hour	30 9	35 10	1995
NITROGEN DIOXIDE AS 2447	1 Hour	0.17	320	1990
SULFUR DIOXIDE AS 2523	10 Minute 1 Hour 24 Hour	0.19 0.13 0.04	500 350 105	1990
PARTICLES TSP AS 2724.3	24 Hour 1 Year		260 90	1995
PM10 AS 2724.6	24 Hour 1 Year		150 50	1995
LEAD AS 2800	3 Month		1.5	1991

Table 4.3b

Malaysia: Recommended Secondary Guidelines for Dustfall

POLLUTANT AND METHOD	AVERAGING TIME	MALAYSIA GUIDELINES (mg/m2/day)	TARGET YEAR FOR COMPLIANCE
DUSTFALL AS 2724.1	1 Year	133	1995

mg/m3

Table 4.4

Malaysia: Status of Air Quality. Annual Mean Concentration of Dust Fallout by State, 1991

LOCATION	LANDUSE				
	TRAFFIC	INDUSTRIAL	COMMERCIAL	RESIDENTIAL	RURAL
PERLIS	-	277 (3)	210 (1)	-	-
KEDAH	-	167 (6)	88 (1)	-	-
PULAU PINANG	-	168 (8)	204 (3)	388 (1)	-
PERAK	-	179 (23)	242 (1)	-	-
SELANGOR	-	147 (15)	-	116 (3)	172 (1)
FED. TERRITORY	-	141 (1)	143 (1)	-	-
MELAKA	-	124 (6)	-	105 (2)	-
NEGERI SEMBILAN	-	160 (5)	-	101 (2)	-
JOHOR	-	223 (6)	307 (1)	200 (5)	-
PAHANG	-	74 (15)	35 (1)	53 (5)	-
TERENGGANU	-	164 (10)	178 (2)	119 (3)	-
KELANTAN	-	243 (6)	-	-	-
SABAH	-	257 (23)	-	284 (3)	-
SARAWAK	-	218 (6)	-	153 (5)	98 (1)

Key:

( ) Number of Sampling Sites
\- No Data Available

Note: All units are expressed in mg/m3/day

Table 4.5

Malaysia: Water Quality Monitoring Stations, by State 1991

STATE	WQR	RIVER BASIN	NUMBER OF STATIONS	SAMPLING FREQUENCY
PERLIS	1	Perlis	5	6
	2	Kuar	0	0
KEDAH	3	Kedah	12	6
	4	Merbok	7	6
	5	Muda	8	12
PULAU PINANG	6P	Prai	8	12
	6J	Juru	5	6
	7	Jejawi	4	6
	8	Kerian	3	6
PERAK	9	Kurau	4	6
	10	Sepetang	8	6
	11	Bruas	2	6
	12	Raja Hitam	3	6
	13	Perak	28	6
	14	Bernam	6	2
SELANGOR	15	Tengi	1	6
	16	Selangor	6	6
	17	Buloh	5	6
FEDERAL TERRITORY	18	Kelang	22	12
(KL)	19	Langat	11	6
SELANGOR	20	Sepang	4	6
NEGERI SEMBILAN	21	Linggi	15	12
MELAKA	22	Melaka	8	6
	23	Duyong	2	6
	24	Kesang	3	6
JOHOR	25	Muar	16	6
	26	Batu Pahat	12	6
	27A	Air Baloi	3	4
	27B	Benut	6	6
	28A	Pontian Besar	5	4
	28B	Pontian Kecil	2	4
	28C	Skudai	10	12
	28D	Tebrau	4	4
	29	Johor	16	6
	30A	Sedili Besar	9	4
	30B	Sedili Kecil	4	6
	31	Mersing	2	4
	32	Endau	10	6
PAHANG	32	Anak Endau	2	5
	32/33	Pontian	2	5
	33	Rompin	18	5
	34	Bebar/Merchong	3	5
	35P	Pahang	25	5
	35B	Bera/Serting	9	5
	35M	Mentiga	3	5
	35L	Lepar/Bekapor	9	5
	35CH	Bertam	10	5
	36	Kuantan	12	5
	37	Balok	5	5

Table 4.6

Malaysia: Water Quality Monitoring Stations, by State, 1991 (Continuation)

STATE	WQR	RIVER BASIN	NUMBER OF STATIONS	SAMPLING FREQUENCY
TERENGGANU	38	Kemaman	8	6
	39	Chukai/Kertih	5	4
	40	Paka	3	4
	41	Dungun	4	6
	42	Ibai/Marang	3	4
	43	Terengganu	6	6
	44	Setiu	2	4
	45	Keluang	0	0
	46	Besut	3	6
KELANTAN	47	Kemasin/Semerak	4	4
	48	Kelantan	13	6
	49	Golok	3	4
SARAWAK	50	Batang Kayan	4	4
	51	Sarawak/Samarahan	10	12
	52	Batang Sadong	6	4
	53	Batang Lupar	6	4
	54	Batang Saribas	2	4
	55	Kerian	3	4
	56	Batang Rajang	13	4
	57	Batang Oya	3	4
	58	Batang Mukah	4	4
	59	Batang Balingian	2	4
	60	Batang Tatau	1	4
	61	Batang Kemena	3	4
	62	Similajau	1	4
	63	Suai	1	4
	64	Niah	3	4
	65	Sibuti	4	4
	66	Miri/Lutong	4	4
	67	Baram	4	4
	68	Limbang	6	4
	69	Trusan	1	4
	70	Lawas	2	4
SABAH	71	Mengalong	3	6
	72	Padas	7	6
	73	Membakut	1	6
	74	Kimanis	0	0
	75	Papar	1	6
	76	Putatan/Moyog	5	6
	77	Damit/Tuaran	4	6
	78	Kadamaian	1	6
	79	Bingkongan	2	6
	80	Rakit	0	0
	81	Bengkoka	0	0
	82	Paitan	0	0
	83	Sugut	8	6
	84	Labok	4	6
	85	Kaya	0	0
	86	Kinabatangan	1	1
	87	Segama	1	6
	88	Silabukan	1	6
	89	Tingkayu	0	0
	90	Kalumpang	1	6
	91	Tawau/Apas	2	6
	92	Merotai Besar	0	0
	93	Umas-Umas	1	6
	94	Brantian	1	6
	95	Kalabakan	1	6

Table 4.7

Peninsular Malaysia: Status and Trend of River Water Quality in terms of Water Quality Index, 1991

State	WQR	River Name	WQI	Rate of Change	Status
Peninsular Malaysia	20	Sepang	52	-4.39	Very Polluted
	23	Duyong	53	-4.31	
	17	Buloh	59	-1.68	Total = 6
	18	Kelang	56	-1.21	(-ve) = 4
	42	Ibai	50	0.04	(+ve) = 2
	06J	Juru	54	0.99	
	07	Jejawi	61	-4.21	Slightly Polluted
	22	Melaka	62	-4.08	
	34	Bebar	73	-3.18	
	01	Perlis	70	-2.75	Total = 34
	25	Muar	75	-2.45	
	47	Kemasin	74	-2.17	(-ve) = 26
	46	Besut	77	-2.11	
	28D	Tebrau	77	-2.02	(0) = 1
	24	Kesang	75	-1.69	
	04	Merbok	63	-1.66	(+ve) = 7
	08	Kerian	74	-1.63	
	16	Selangor	80	-1.52	
	05	Muda	80	-1.48	
	32	Endau	73	-1.42	
	19	Langat	68	-1.39	
	26	Batu Pahat	73	-1.38	
	48	Kelantan	78	-1.19	
	27B	Benut	70	-1.17	
	29	Johor	73	-1.14	
	28C	Skudai	72	-1.13	
	15	Tengi	62	-1.03	
	03	Kedah	76	-0.87	
	06P	Prai	70	-0.70	
	37	Balok	69	-0.62	
	14	Bernam	75	-0.47	
	21	Linggi	66	-0.39	
	38	Kemaman	80	0.00	
	13	Perak	79	0.33	
	49	Golok	73	0.67	
	27A	Air Baloi	61	1.30	
	28B	Pontian Besar	79	1.68	
	12	Raja Hitam	79	2.45	
	28A	Pontian Kechil	61	2.79	
	11	Bruas	77	4.41	
	44	Setiu	86	-1.28	Clean
	30A	Sedili Besar	82	-1.16	
	31	Mersing	81	-0.94	Total = 13
	40	Paka	81	-0.42	
	35	Pahang	85	-0.30	(-ve) = 6
	30B	Sedili Kechil	81	-0.15	
	33	Rompin	90	0.18	(0) = 0
	09	Kurau	85	0.26	
	36	Kuantan	87	0.68	(+ve) = 7
	39	Chukai	83	0.71	
	43	Terengganu	86	1.03	
	41	Dungun	88	1.27	
	10	Sepetang	87	2.40	

Table 4.8

Sarawak: Status and Trend of River Water Quality in terms of Water Quality Index, 1991

State	WQR	River Name	WQI	Rate of Change	Status
Sarawak	70	Batang Lawas	66	-4.97	Slightly Polluted
	62	Similajau	73	-4.13	
	60	Batang Tatau	75	-1.75	Total = 8
	58	Batang Mukah	69	-1.43	(-ve) = 7
	69	Batang Trusan	79	-0.81	(0) = 0
	61	Batang Kemena	76	-0.77	(+ve) = 1
	57	Batang Oya	78	-0.25	
	63	Suai	79	1.87	
	55	Kerian	81	-1.46	Clean
	59	Batang Balingian	81	-0.99	
	56	Batang Rajang	85	-0.71	Total = 12
	51	Sarawak	86	-0.59	(-ve) = 8
	68	Limbang	81	-0.58	(0) = 0
	52	Batang Sadong	82	-0.57	(+ve) = 4
	50	Batang Kayan	85	-0.53	
	54	Batang Saribas	88	-0.05	
	65	Sibuti	82	0.22	
	64	Niah	86	0.71	
	67	Batang Baram	82	1.58	
	53	Batang Lupar	95	2.29	

Table 4.9

Sabah: Status and Trend of River Water Quality in terms of Water Quality Index, 1991

State	WQR	River Name	WQI	Rate of Change	Status
Sabah	88	Silabukan	69	-4.74	Slightly Polluted
	78	Kadamaian	80	-3.26	
					Total = 2
					(-ve) = 2
					(0) = 0
					(+ve) = 0
	83	Sugut	83	-2.77	Clean
	75	Papar	82	-2.34	
	79	Bingkongan	85	-2.09	Total = 12
	76	Putatan	77	-1.47	(-ve) = 6
	87	Segama	84	-0.47	(0) = 0
	72	Padas	86	-0.09	(+ve) = 6
	77	Tuaran	86	0.35	
	84	Labok	84	0.71	
	91	Tawau	87	0.95	
	71	Mengalong	87	1.07	
	90	Kalumpang	86	1.83	
	73	Membakut	91	6.20	

Table 4.10a

Malaysia : Status and Trend of River Water Quality, Rates of Change from 1986

Area	Status	Number of Rivers												Total			
		Water Quality Index			Ammoniacal Nitrogen			Biochemical Oxygen Demand			Suspended Solids						
		+	0	-	+	0	-	+	0	-	+	0	-	WQI	AN	BOD	SS
Peninsular Malaysia	clean	7	0	6	6	0	3	8	1	24	7	0	6	13	9	33	13
	slightly polluted	7	1	26	7	0	12	2	1	12	2	0	9	34	19	15	11
	very polluted	2	0	4	0	0	25	3	0	2	8	0	21	6	25	5	29
Sarawak	clean	4	0	8	8	0	10	10	0	8	3	0	0	12	18	18	3
	slightly polluted	1	0	7	1	0	1	1	0	1	2	0	1	8	2	2	3
	very polluted	0	0	0	0	0	0	0	0	0	1	0	13	0	0	0	14
Sabah	clean	6	0	6	0	0	8	7	0	7	1	0	1	12	8	14	2
	slightly polluted	0	0	2	0	0	5	0	0	0	3	0	0	2	5	0	3
	very polluted	0	0	0	0	0	1	0	0	0	2	0	7	0	1	0	9

Key :

+ - improved
- - deteriorated
0 - not changing

Table 4.10b

Malaysia: Status and Trend of River Water Quality, 1986-1991

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	37	17	0	19	-0.66	10	1	40	44	6
BOD-5 days	65	25	1	39	-0.11	6	1	15	17	5
Ammoniacal Nitrogen	35	14	0	21	-1.95	8	0	44	26	26
Suspended Solids	18	11	0	7	-1.72	18	0	51	17	52

Table 4.11

Malaysia: Status of River Water Quality, 1987 - 1991

Area	Status	Number of River																			
		1987				1988				1989				1990				1991			
		WQI	NH3-N	BOD	SS	WQI	NH3-N	BOD	SS	WQI	NH3-N	BOD	SS	WQI	NH3-N	BOD	SS	WQI	NH3-N	BOD	SS
Peninsular Malaysia	clean	11	8	39	19	21	11	39	24	17	7	31	22	19	13	35	20	13	9	33	13
	slightly polluted	39	20	10	14	29	25	11	11	33	27	18	10	27	18	13	6	34	19	15	11
	very polluted	3	25	4	20	3	17	3	18	3	19	4	21	7	22	5	27	6	25	5	29
Sarawak	clean	17	20	20	7	13	21	21	3	17	21	21	9	15	18	20	6	12	18	18	3
	slightly polluted	4	1	1	3	8	0	0	6	4	0	0	2	5	2	0	4	8	2	2	3
	very polluted	0	0	0	11	0	0	0	12	0	0	0	10	0	0	0	10	0	0	0	14
Sabah	clean	15	17	16	6	14	17	16	6	11	15	12	2	14	12	12	6	12	8	14	2
	slightly polluted	2	0	1	1	3	0	1	0	6	2	5	1	3	5	5	5	2	5	0	3
	very polluted	0	0	0	10	0	0	0	11	0	0	0	14	0	0	0	6	0	1	0	9

Note :

NH3-N - Ammoniacal Nitrogen
BOD - Biochemical Oxygen Demand
SS - Suspended Solids

The Sub-Indexes for NH3-N, Suspended Solids and Biochemical Oxygen Demand are derived by using Mathematical Formula

* Source: Water Quality Criteria and Standards for Malaysia, July 1986

Table 4.12

Peninsular Malaysia: Status and Trend of River Water Quality, 1991

Area	WQR	River Name	NH3-N Index	Rate of Change	Status
Peninsular Malaysia	06J	Juru	0	-72.54	Very Polluted
	23	Duyong	18	-20.25	
	22	Melaka	28	-13.75	
	28D	Tebrau	41	-11.30	Total = 25
	20	Sepang	10	-11.01	
	28C	Skudai	32	-10.68	(-ve) = 25
	18	Kelang	9	-9.92	
	07	Jejawi	39	-9.79	(0) = 0
	04	Merbok	23	-9.46	
	01	Perlis	47	-9.24	(+ve) = 0
	06P	Prai	38	-7.15	
	32	Endau	53	-6.76	
	25	Muar	60	-6.20	
	26	Batu Pahat	55	-6.12	
	03	Kedah	52	-6.07	
	21	Linggi	36	-6.02	
	42	Ibai	51	-5.55	
	17	Buloh	25	-5.33	
	08	Kerian	67	-4.42	
	27B	Benut	48	-4.40	
	24	Kesang	62	-4.32	
	28A	Pontian Kechil	53	-3.45	
	29	Johor	50	-3.33	
	28B	Pontian Besar	64	-2.26	
	19	Langat	65	-1.84	
	31	Mersing	72	-5.05	Slightly Polluted
	30A	Sedili Besar	73	-4.55	
	05	Muda	72	-4.15	
	30B	Sedili Kechil	72	-3.54	Total = 19
	44	Setiu	85	-2.60	
	48	Kelantan	80	-1.81	(-ve) = 12
	16	Selangor	84	-1.50	
	43	Terengganu	75	-1.47	(0) = 0
	40	Paka	71	-1.29	
	39	Chukai	75	-0.81	(+ve) = 7
	46	Besut	80	-0.64	
	47	Kemasin	83	-0.22	
	41	Dungun	82	0.54	
	38	Kemaman	71	0.75	
	35	Pahang	90	1.18	
	49	Golok	74	1.39	
	27A	Air Baloi	72	1.83	
	13	Perak	82	2.60	
	15	Tengi	74	3.70	
	33	Rompin	93	-1.01	Clean
	34	Bebar	93	-0.96	Total = 9
	14	Bernam	94	-0.91	
	09	Kurau	96	0.71	(-ve) = 3
	37	Balok	94	2.13	
	36	Kuantan	94	3.21	(0) = 0
	11	Bruas	96	7.23	
	12	Raja Hitam	93	8.97	(+ve) = 6
	10	Sepetang	93	12.63	

Table 4.13

Sarawak: Status and trend of River Water Quality, 1991

Area	WQR	River Name	NH3-N Index	Rate of Change	Status
Sarawak	51	Sarawak	87	-0.89	Slightly Polluted
	52	Batang Sadong	77	2.12	Total = 2 (-ve) = 1 (0) = 0 (+ve) = 1
	50	Batang Kayan	94	-0.91	Clean
	53	Batang Lupar	94	-0.66	
	62	Similajau	98	-0.46	
	69	Batang Trusan	98	-0.32	Total = 18
	68	Limbang	98	-0.32	
	70	Batang Lawas	98	-0.32	(-ve) = 10
	56	Batang Rajang	97	-0.23	
	60	Batang Tatau	98	-0.12	(0) = 0
	57	Batang Oya	98	-0.08	
	55	Kerian	98	-0.02	(+ve) = 8
	58	Batang Mukah	98	0.04	
	61	Batang Kemena	98	0.06	
	54	Batang Saribas	96	0.19	
	59	Batang Balingian	98	2.20	
	67	Batang Baram	98	5.47	
	64	Niah	98	5.76	
	65	Sibuti	98	12.87	
	63	Suai	98	71.42	

Table 4.14

Sabah: Status and trend of River Water Quality, 1991

State	WQR	River Name	NH3-N Index	Rate of Change	Status
Sabah	75	Papar	60	-9.00	Very Polluted Total = 1 (-ve) = 1 (0) = 0 (+ve) = 0
	76	Putatan	80	-3.90	Slightly Polluted
	77	Tuaran	85	-3.20	Total = 5
	71	Mengalong	87	-2.68	(-ve) = 5
	72	Padas	89	-2.28	(0) = 0
	73	Membakut	91	-1.87	(+ve) = 0
	88	Silabukan	92	-1.63	Clean
	83	Sugut	95	-1.08	Total = 8
	87	Segama	95	-0.98	
	90	Kalumpang	95	-0.98	(-ve) = 8
	78	Kadamaian	95	-0.98	
	91	Tawau	93	-0.86	(0) = 0
	79	Bingkongan	96	-0.75	
	84	Labok	97	-0.57	(+ve) = 0

Table 4.15

Peninsular Malaysia: Status and Trend of River Water Quality in terms of Suspended Solids, 1991

Area	WQR	River Name	SS Index	Rate of Change	Status
Peninsular Malaysia	15	Tengi	30	-12.56	Very Polluted
	42	Ibai	19	-10.58	
	37	Balok	32	-10.36	
	46	Besut	58	-6.24	Total = 29
	07	Jejawi	54	-6.05	
	12	Raja Hitam	61	-5.34	(-ve) = 21
	11	Bruas	55	-4.64	
	17	Buloh	48	-4.01	(0) = 0
	16	Selangor	64	-3.93	
	19	Langat	41	-3.34	(+ve) = 8
	04	Merbok	60	-3.20	
	47	Kemasin	56	-2.96	
	01	Perlis	61	-2.89	
	32	Endau	68	-2.52	
	28C	Skudai	67	-2.32	
	35	Pahang	69	-2.29	
	23	Duyong	56	-1.79	
	06P	Prai	69	-1.04	
	18	Kelang	51	-0.81	
	06J	Juru	68	-0.75	
	28B	Pontian Besar	46	-0.68	
	48	Kelantan	66	0.06	
	49	Golok	60	0.41	
	34	Bebar	69	0.92	
	13	Perak	63	1.35	
	14	Bernam	51	3.56	
	21	Linggi	56	4.47	
	27A	Air Baloi	66	4.84	
	28A	Pontian Kechil	46	12.20	
	36	Kuantan	70	-3.97	Slightly Polluted
	20	Sepang	72	-2.71	
	28D	Tebrau	71	-2.52	Total = 11
	10	Sepetang	73	-1.40	
	38	Kemaman	70	-0.97	(-ve) = 9
	25	Muar	73	-0.94	
	29	Johor	72	-0.82	(0) = 0
	05	Muda	72	-0.36	
	27B	Benut	70	-0.31	(+ve) = 2
	03	Kedah	72	0.42	
	22	Melaka	73	2.66	
	31	Mersing	76	-3.08	Clean
	30B	Sedili Kechil	80	-1.86	
	30A	Sedili Besar	81	-1.56	
	44	Setiu	85	-1.19	Total = 13
	08	Kerian	77	-0.41	
	33	Rompin	85	-0.26	(-ve) = 6
	09	Kurau	85	0.24	
	26	Batu Pahat	78	0.28	(0) = 0
	40	Paka	77	0.85	
	41	Dungun	88	2.33	(+ve) = 7
	24	Kesang	83	2.62	
	39	Chukai	79	3.13	
	43	Terengganu	88	3.21	

Table 4.16

Sarawak: Status and Trend of River Water Quality in terms of Suspended Solids, 1991

State	WQR	River Name	SS Index	Rate of Change	Status
Sarawak	69	Batang Trusan	29	-16.99	Very Polluted
	60	Batang Tatau	32	-14.08	
	70	Batang Lawas	41	-11.24	Total = 14
	62	Similajau	49	-9.65	
	63	Suai	64	-6.60	(-ve) = 13
	56	Batang Rajang	48	-5.70	
	58	Batang Mukah	30	-4.83	(0) = 0
	55	Kerian	31	-3.98	
	54	Batang Saribas	55	-3.30	(+ve) = 1
	50	Batang Kayan	67	-3.13	
	52	Batang Sadong	69	-2.56	
	57	Batang Oya	49	-2.34	
	68	Limbang	48	-1.88	
	67	Batang Baram	41	3.45	
					Slightly Polluted
	65	Sibuti	72	-1.79	
	64	Niah	71	1.19	Total = 3
	59	Batang Balingian	70	4.90	(-ve) = 1
					(0) = 0
					(+ve) = 2
					Clean
	51	Sarawak	76	0.48	
	61	Batang Kemena	76	2.69	Total = 3
	53	Batang Lupar	87	5.51	(-ve) = 0
					(0) = 0
					(+ve) = 3

Table 4.17

Sabah: Status and Trend of River Water Quality in terms of Suspended Solids, 1991

State	WQR	River Name	SS Index	Rate of Change	Status
Sabah	88	Silabukan	29	12.07	Very Polluted
	78	Kadamaian	57	-6.21	
	79	Bingkongan	60	-5.06	Total = 9
	91	Tawau	64	-3.59	(-ve) = 7
	76	Putatan	62	-1.03	(0) = 0
	83	Sugut	69	-0.79	(+ve) = 2
	84	Labok	67	-0.15	
	87	Segama	55	4.76	
	90	Kalumpang	63	5.90	
	72	Padas	73	0.25	Slightly Polluted
	77	Tuaran	73	0.39	
	71	Mengalong	70	3.79	Total = 3
					(-ve) = 0
					(0) = 0
					(+ve) = 3
	75	Papar	81	-2.02	Clean
	73	Membakut	77	2.73	Total = 2
					(-ve_) = 1
					(0) = 0
					(+ve) = 1

Table 4.18

Peninsular Malaysia: Status and Trend of River Water Qulility in terms of Biochemical Oxygen Demand, 1991

Area	WQR	River Name	BOD Index	Rate of BOD	Status
Peninsular Malaysia	22	Melaka	72	-4.88	Very Polluted
	07	Jejawi	79	-1.36	Total = 5
	20	Sepang	71	0.34	(-ve) = 2
	18	Kelang	79	0.89	(0) = 0
	06J	Juru	69	4.17	(+ve) = 3
	08	Kerian	81	-2.97	Slightly Polluted
	31	Mersing	88	-1.58	
	38	Kemaman	88	-1.39	
	40	Paka	89	-1.35	Total = 15
	28B	Pontian Besar	86	-1.23	
	29	Johor	85	-1.05	(-ve) = 12
	32	Endau	88	-0.89	
	17	Buloh	84	-0.84	(0) = 1
	28D	Tebrau	90	-0.76	
	27B	Benut	89	-0.73	(+ve) = 2
	28A	Pontian Kechil	88	-0.22	
	28C	Skudai	89	-0.09	
	06P	Prai	90	0.00	
	21	Linggi	89	0.02	
	42	Ibai	89	1.66	
	30B	Sedili Kechil	92	-1.01	Clean
	47	Kemasin	91	-1.00	
	26	Batu Pahat	91	-0.96	
	48	Kelantan	92	-0.93	Total = 33
	49	Golok	91	-0.85	
	25	Muar	92	-0.68	(-ve) = 24
	30A	Sedili Besar	92	-0.68	
	24	Kesang	94	-0.65	(0) = 1
	16	Selangor	95	-0.64	
	41	Dungun	94	-0.61	(+ve) = 8
	14	Bernam	93	-0.53	
	03	Kedah	92	-0.49	
	27A	Air Baloi	93	-0.40	
	05	Muda	94	-0.34	
	10	Sepetang	92	-0.32	
	39	Chukai	93	-0.32	
	43	Terengganu	94	-0.32	
	44	Setiu	95	-0.31	
	46	Besut	94	-0.25	
	19	Langat	91	-0.18	
	15	Tengi	95	-0.13	
	23	Duyong	95	-0.11	
	01	Perlis	94	-0.02	
	04	Merbok	92	-0.02	
	13	Perak	92	0.00	
	11	Bruas	96	0.17	
	09	Kurau	95	0.21	
	35	Pahang	95	0.32	
	34	Bebar	99	0.41	
	33	Rompin	98	0.44	
	37	Balok	98	0.52	
	36	Kuantan	97	0.63	
	12	Raja Hitam	98	2.05	

Table 4.19

Sarawak: Status and Trend of River Water Quality in terms of Biochemical Oxygen Demand, 1991

Area	WRR	River Name	BOD Index	Rate of Change	Status
Sarawak	52	Batang Sadong	88	-1.64	Slightly Polluted
	58	Batang Mukah	88	1.35	Total = 2
					(-ve) = 1
					(0) = 0
					(+ve) = 1
	51	Sarawak	94	-0.67	Clean
	70	Batang Lawas	97	-0.47	
	63	Suai	98	-0.30	
	68	Limbang	98	-0.26	Total = 18
	59	Batang Balingian	98	-0.20	
	64	Niah	98	-0.14	(-ve) = 8
	69	Batang Trusan	98	-0.10	
	67	Batang Baram	99	-0.06	(0) = 0
	54	Batang Saribas	98	0.06	
	65	Sibuti	98	0.19	(+ve) = 10
	61	Batang Kemena	99	0.29	
	55	Kerian	99	0.33	
	62	Similajau	98	0.33	
	56	Batang Rajang	98	0.63	
	53	Batang Lupar	99	0.68	
	60	Batang Tatau	98	0.84	
	57	Batang Oya	99	1.09	
	50	Batang Kayan	98	3.50	

Table 4.20

Sabah: Status and Trend of River Water Quality in terms of Biochemical Oxygen Demand, 1991

State	WQR	River Name	BOD Index	Rate of Change	Status
Sabah	76	Putatan	92	-1.15	Clean
	72	Padas	95	-0.80	
	79	Bingkongan	97	-0.51	
	75	Papar	96	-0.47	Total = 14
	77	Tuaran	96	-0.45	
	87	Segama	96	-0.37	(-ve) = 7
	71	Mengalong	97	-0.12	
	88	Silabukan	97	0.23	(0) = 0
	83	Sugut	94	0.26	
	73	Membakut	96	0.29	(+ve) = 7
	90	Kalumpang	100	0.57	
	91	Tawau	95	1.13	
	78	Kadamaian	97	1.30	
	84	Labok	98	3.86	

Table 4.21

Malaysia: Level and Non-Compliance of Mercury in River Water, 1991

State	River Name	Mercury (mg/l)			
		Minimum	Maximum	Median	Sampels Exceeding Limit (Per cent) (0.004 mg/l)
Perlis	PERLIS	0.010	0.010	0.010	100
Kedah	KEDAH	0.001	0.010	0.001	20
	MUDA	0.001	0.010	0.004	40
	MERBOK	0.020	0.020	0.020	100
P.Pinang	JURU	0.004	0.010	0.007	50
	PRAI	0.006	0.015	0.010	100
	KERIAN	0.010	0.010	0.010	100
	JEJAWI	0.020	0.020	0.010	100
Perak	PERAK	0.001	0.050	0.001	46
	SEPETANG	0.010	0.010	0.010	100
	BERNAM	0.001	0.010	0.010	67
Selangor	BULOH	0.001	0.001	0.001	0
	LANGAT	0.001	0.002	0.001	0
	SELANGOR	0.001	0.011	0.002	17
	TENGI	0.002	0.007	0.003	33
	KELANG	0.001	0.007	0.003	12
	SEPANG	0.004	0.009	0.005	67
N. Sembilan	LINGGI	0.001	0.063	0.002	13
Melaka	MELAKA	0.001	0.030	0.004	25
	KESANG	0.001	0.010	0.006	50
	DUYONG	0.012	0.012	0.012	100
Johor	JOHOR	0.000	0.002	0.000	0
	BENUT	0.000	0.001	0.000	0
	MUAR	0.000	0.004	0.001	0
	BATU PAHAT	0.000	0.001	0.001	0
	SKUDAI	0.001	0.003	0.002	0
Pahang	PAHANG	0.001	0.010	0.003	20
Terenggnau	KEMAMAN	0.001	0.001	0.001	0
	CHUKAI	0.001	0.001	0.001	0
	PAKA	0.001	0.001	0.001	0
	DUNGUN	0.001	0.001	0.001	0
	IBAI	0.001	0.001	0.001	0
	TERENGGANU	0.001	0.001	0.001	0
	SETIU	0.001	0.001	0.001	0
	BESUT	0.001	0.001	0.001	0
Kelantan	KEMASIN	0.001	0.001	0.001	0
	KELANTAN	0.001	0.001	0.001	0
	GOLOK	0.001	0.001	0.001	0
Sarawak	RAJANG	0.001	0.001	0.001	0

Table 4.22

Peninsular Malaysia: Level and Non-Compliance of Lead in River Water, 1991

State	River Name	Lead (mg/l)					
		Number of Samples	Minimum	Maximum	Median	Samples Exceeding Standard (Per cent) (0.02 mg/l)	
Perlis	PERLIS	3	0.050	0.060	0.050	(3/3)	100
Kedah	KEDAH	3	0.010	0.010	0.010	(0/3)	0
	MERBOK	8	0.010	0.500	0.020	(3/8)	37
	MUDA	12	0.010	0.800	0.025	(6/12)	50
Pulau Pinang	KERIAN	1	0.010	0.010	0.010	(0/1)	0
	PRAI	21	0.010	0.600	0.020	(10/21)	47
	JEJAWI	2	0.010	0.050	0.030	(1/2)	50
	JURU	2	0.030	0.200	0.115	(2/2)	100
Perak	PERAK	31	0.003	0.150	0.003	(6/31)	19
	SEPETANG	2	0.010	0.030	0.020	(1/2)	50
	BERNAM	3	0.003	0.730	0.600	(2/3)	67
Selangor	SELANGOR	7	0.010	0.080	0.020	(1/7)	14
	KELANG	67	0.003	0.300	0.020	(21/67)	31
	LANGAT	13	0.003	0.160	0.030	(7/13)	53
	TENGI	4	0.010	0.090	0.050	(3/4)	75
	BULOH	6	0.010	0.150	0.070	(4/6)	67
	SEPANG	11	0.010	0.110	0.070	(8/11)	73
Negeri Sembilan	LINGGI	64	0.003	0.200	0.010	(12/64)	19
Melaka	KESANG	2	0.003	0.010	0.006	(0/2)	0
	MELAKA	10	0.010	0.100	0.010	(3/10)	30
	DUYONG	4	0.050	0.130	0.105	(4/4)	100
Johor	MERSING	3	0.030	0.040	0.030	(3/3)	100
	PONTIAN KECHIL	3	0.010	0.190	0.030	(2/3)	67
	JOHOR	25	0.010	0.210	0.040	(17/25)	68
	PONTIAN BESAR	8	0.020	0.240	0.085	(6/8)	75
	SEDILI BESAR	2	0.050	0.130	0.090	(2/2)	100
	SEDILI KECHIL	2	0.030	0.170	0.100	(2/2)	100
	TEBRAU	4	0.020	0.320	0.105	(3/4)	75
	MUAR	15	0.010	0.270	0.110	(12/15)	80
	ENDAU	12	0.030	0.230	0.120	(12/12)	100
	BATU PAHAT	29	0.020	0.200	0.130	(27/29)	93
	BENUT	4	0.010	0.200	0.135	(3/4)	75
	SKUDAI	22	0.020	0.250	0.135	(20/22	91
Pahang	ROMPIN	2	0.003	0.003	0.003	(0/2)	0
	PAHANG	41	0.003	0.070	0.010	(13/41)	32
	KUANTAN	13	0.003	0.300	0.030	(9/13)	69
Terengganu	KEMAMAN	4	0.003	0.050	0.003	(1/4)	25
	CHUKAI	3	0.003	0.010	0.003	(0/3)	0
	PAKA	1	0.003	0.003	0.003	(0/1)	0
	IBAI	4	0.003	0.190	0.006	(1/4)	25
	DUNGUN	9	0.003	0.210	0.020	(4/9)	44
	SETIU	2	0.003	0.040	0.021	(1/2)	50
	BESUT	5	0.003	0.090	0.050	(3/5)	60
	TERENGGANU	5	0.003	0.200	0.090	(3/5)	60
Kelantan	KELANTAN	25	0.003	2.400	0.010	(9/25)	36
	KEMASIN	2	0.003	0.020	0.011	(0/2)	0
	GOLOK	4	0.020	0.060	0.045	(3/4)	75

Table 4.23

Sarawak and Sabah: Levels of Lead, 1991

State	River Name	Lead (mg/l)					
		Number of Samples	Minimum	Maximum	Median	Samples Exceeding Standard (Per cent) (0.02 mg/l)	
Sarawak	RAJANG	2	0.003	0.003	0.003	(0/2)	0
	BATANG KEMENA	2	0.003	0.010	0.006	(0/2)	0
Sabah	MENGALONG	3	0.003	0.003	0.003	(0/3)	0
	PADAS	7	0.003	0.003	0.003	(0/7)	0
	MEMBAKUT	1	0.003	0.003	-	(0/1)	0
	PAPAR	1	0.003	0.003	-	(0/1)	0
	PUTATAN	6	0.003	0.040	0.003	(1/6)	17
	TUARAN	3	0.003	0.003	0.003	(0/3)	0
	KADAMAIAN	1	0.003	0.003	-	(0/1)	0
	BINGKONGAN	2	0.003	0.003	0.003	(0/2)	0
	SUGUT	8	0.003	0.003	0.003	(0/8)	0
	LABOK	4	0.003	0.003	0.003	(0/4)	0
	SEGAMA	1	0.003	0.003	-	(0/1)	0
	SILABUKAN	1	0.003	0.003	-	(0/1)	0

Table 4.24

Malaysia: Level and Non-Compliance of Zinc in River Water, 1991

State	River Name	Zinc (mg/l)					
		Number of Samples	Minimum	Maximum	Median	Samples Exceeding Standard (Per cent) (0.4 mg/l)	
Perak	SEPETANG	3	0.04	0.04	0.04	(0/3)	0
	PERAK	11	0.01	0.17	0.05	(0/11)	0
	KURAU	1	0.07	0.07	-	(0/1)	0
Selangor	SEPANG	11	0.01	2.44	0.02	(1/11)	9
	TENGI	3	0.01	0.19	0.03	(0/6)	0
	SELANGOR	6	0.01	0.08	0.03	(0/6)	0
	BULOH	7	0.01	0.42	0.03	(1/7)	14
	LANGAT	13	0.01	0.10	0.04	(0/13)	0
	KELANG	69	0.01	2.03	0.05	(6/69)	17
Negeri Sembilan	LINGGI	62	0.01	1.00	0.02	(1/62)	2
Melaka	KESANG	4	0.01	0.12	0.04	(0/4)	0
	MELAKA	11	0.01	0.10	0.05	(0/11)	0
	DUYONG	4	0.02	0.90	0.25	(1/4)	0
Johor	BENUT	7	0.02	0.12	0.07	(0/7)	0
	SKUDAI	25	0.01	0.20	0.08	(0/25)	0
	PONTIAN BESAR	12	0.01	0.29	0.08	(0/12)	0
	SEDILI KECHIL	2	0.07	0.10	0.09	(0/2)	0
	JOHOR	24	0.02	6.10	0.09	(1/24)	0
	ENDAU	16	0.01	0.27	0.12	(0/16)	0
	PONTIAN KECHIL	4	0.09	0.24	0.12	(0/4)	0
	MUAR	24	0.02	0.58	0.12	(2/24)	0
	TEBRAU	5	0.12	0.19	0.16	(0/5)	0
	SEDILI BESAR	2	0.11	0.22	0.17	(0/2)	0
	BATU PAHAT	30	0.02	0.40	0.18	(0/30)	0
	MERSING	3	0.06	0.20	0.20	(0/3)	0

Continuation...

State	River Name	Zinc (mg/l)					
		Number of Samples	Minimum	Maximum	Median	Samples Exceeding Standard (Per cent) (0.4 mg/l)	
Pahang	ROMPIN	3	0.01	0.03	0.01	(0/3)	0
	PAHANG	44	0.01	0.36	0.02	(0/44)	0
	KUANTAN	13	0.00	0.72	0.02	(1/13)	8
Terengganu	KEMAMAN	3	0.01	0.01	0.01	(0/3)	0
	CHUKAI	2	0.01	0.01	0.01	(0/2)	0
	PAKA	1	0.01	0.01	-	(0/1)	0
	DUNGUN	3	0.01	0.01	0.01	(0/3)	0
	IBAI	1	0.01	0.01	-	(0/1)	0
	TERENGGANU	2	0.01	0.01	0.01	(0/2)	0
	SETIU	2	0.01	0.01	0.01	(0/2)	0
	BESUT	2	0.01	0.01	0.01	(0/2)	0
Kelantan	KELANTAN	16	0.01	0.04	0.01	(0/2)	0
	GOLOK	3	0.01	0.02	0.01	(0/2)	0
Sabah	MEMBAKUT	3	0.01	0.05	0.02	(0/3)	0
	PAPAR	2	0.02	0.02	0.02	(0/2)	0
	PADAS	16	0.01	0.08	0.03	(0/16)	0
	TAWAU	3	0.02	0.03	0.03	(0/3)	0
	KALUMPANG	1	0.03	0.03	-	(0/1)	0
	MENGALONG	9	0.01	0.07	0.03	(0/9)	0
	TUARAN	8	0.02	0.05	0.03	(0/8)	0
	SUGUT	20	0.01	0.79	0.04	(1/20)	5
	LABOK	13	0.01	0.23	0.04	(0/13)	0
	SEGAMA	1	0.04	0.04	-	(0/1)	0
	PUTATAN	15	0.01	0.16	0.04	(0/15)	0
	KADAMAIAN	1	0.04	0.04	-	(0/1)	0
	BINGKONGAN	3	0.01	0.08	0.05	(0/3)	0
	SILABUKAN	1	0.17	0.17		(0/1)	0

Table 4.25

Peninsular Malaysia: Level and Non-Compliance of Phosphate in River Water, 1991

State	River Name	Phosphate (mg/l)			
		Minimum	Maximum	Median	Samples Exceeding Standard (Per cent) (0.2 mg/l)
Perlis	PERLIS	0.03	1.60	0.08	33
Kedah	MUDA	0.01	1.00	0.10	23
	MERBOK	0.04	2.70	0.16	42
	KEDAH	0.01	2.00	1.10	95
Pulau Pinang	KERIAN	0.03	0.65	0.06	17
	JEJAWI	0.03	0.66	0.07	28
	JURU	0.01	1.00	0.08	35
	PRAI	0.02	45.00	0.12	41
Perak	BERNAM	0.01	0.22	0.07	4
	RAJA HITAM	0.02	0.36	0.08	25
	KURAU	0.07	11.00	0.12	18
	SEPETANG	0.05	0.46	0.15	21
	BRUAS	0.03	24.00	0.15	38
	PERAK	0.03	1.20	0.16	39
Selangor	TENGI	0.03	0.23	0.11	25
	SELANGOR	0.01	0.36	0.13	17
	LANGAT	0.01	0.43	0.14	25
	KELANG	0.03	1.43	0.33	89
	SEPANG	0.16	6.07	1.33	95
Melaka	DUYONG	0.01	0.13	0.07	0
	KESANG	0.01	0.24	0.11	18
	MELAKA	0.01	2.29	0.21	53
Johor	SEDILI BESAR	0.01	10.00	0.01	4
	MERSING	0.01	0.07	0.02	0
	BATU PAHAT	0.01	0.86	0.04	10
	SEDILI KECHIL	0.01	0.16	0.04	0
	BENUT	0.01	6.05	0.06	30
	JOHOR	0.01	3.40	0.06	15
	TEBRAU	0.04	0.20	0.08	0
	PONTIAN BESAR	0.02	0.54	0.09	18
	MUAR	0.01	34.00	0.10	22
	AIR BALOI	0.01	0.26	0.11	22
	PONTIAN KECHIL	0.04	0.22	0.12	33
	ENDAU	0.01	1.87	0.13	30
	SKUDAI	0.01	1.20	0.15	33
Pahang	PAHANG	0.01	2.10	0.10	25
Terengganu	CHUKAI	0.03	0.28	0.09	33
	BESUT	0.03	0.77	0.10	29
	KEMAMAN	0.03	16.00	0.11	39
	IBAI	0.03	0.40	0.12	25
	TERENGGANU	0.03	0.20	0.12	0
	DUNGUN	0.03	0.35	0.18	45
	SETIU	0.03	0.33	0.23	67
	PAKA	0.03	1.50	0.25	50
Kelantan	GOLOK	0.03	0.13	0.05	0
	KELANTAN	0.03	1.50	0.08	22
	KEMASIN	0.05	0.23	0.10	20

Table 4.26

Sabah and Sarawak: Level and Non-Compliance of Phosphate in River Water, 1991

State	River Name	Phosphate (mg/l)			
		Minimum	Maximum	Median	Samples Exceeding Standard (Per cent)
Sarawak	SIBUTI	0.01	0.08	0.02	0
	BATANG BARAM	0.01	0.12	0.03	0
	BATANG KEMENA	0.03	0.06	0.03	0
	BTG MUKAH	0.03	0.05	0.04	0
	BATANG TATAU	0.04	0.04	-	0
	NIAH	0.02	0.07	0.04	0
	BTG SADONG	0.03	0.05	0.04	0
	BTG BALINGIAN	0.03	0.06	0.05	0
	BATANG TRUSAN	0.05	0.05	-	0
	LIMBANG	0.01	0.07	0.05	0
	BTG KAYAN	0.05	0.05	-	0
	SARAWAK	0.03	0.10	0.05	0
	BTG OYA	0.04	0.06	0.05	0
	SIMILAJAU	0.06	0.06	0.06	0
	BATANG LAWAS	0.02	0.14	0.06	0
	BATANG SUAI	0.04	0.08	0.08	0
	RAJANG	0.08	0.08	-	0
Sabah	TAWAU	0.01	0.01	0.01	0
	KALUMPANG	0.01	0.01	-	0
	SUGUT	0.01	0.2	0.01	0
	BINGKONGAN	0.01	0.05	0.02	0
	KADAMAIAN	0.01	0.04	0.02	0
	PADAS	0.01	0.05	0.02	0
	TUARAN	0.01	0.1	0.02	0
	PUTATAN	0.01	0.13	0.02	0
	PAPAR	0.02	0.03	0.02	0
	MEMBAKUT	0.01	0.03	0.02	0
	LABOK	0.01	0.09	0.03	0
	MENGALONG	0.01	0.06	0.03	0

Table: 4.27

Malaysia : Coastal Water Monitoring Stations, 1991

	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 Telok 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,P.Langkawi
	6498916	Pantai Tanjung Rhu,P.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
NEGERI 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
	2418906	Pantai Port Dickson Batu 5
	2517907	Port Dickson-Bandar
	2517909	Port Dickson-LLN
PAHANG	3833909	Pantai Telok 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 Kampong Teluk Salang
	2841923	Pantai Kampung Tekek

Continution...

	Coastal Monitoring Stations	
	Station Number	Location
PERAK	4205923	Pantai Teluk Batik
	4305924	Pantai Pasir Panjang
	4205908	Pantai Pasir Bogak
PULAU PINANG	5303906	Kawasan Perusahaan Prai 1
	5303907	Kawasan Perusahaan Prai 2
	5303926	Kawasan Perindusrtian 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 Tlk 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 Tjg.Aru (Restoran Lido)
	5656908	Pantai Tjg.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	1604910	Pantai Pasir Putih
	1704906	Pantai Bako, National Park
	1702904	Pantai Damai (Damai Beach)
	1706908	Pantai Telok Penyu
	1824918	Pantai Pasir Pandan
	1898902	Pantai Sematan
	2212916	Pantai Belawai
	3230913	Pantai Tg. Batu, Bintulu
	3230914	Pantai Tg. Kidurung,Bintulu
	4449917	Pantai Brighton, Miri
	4640918	Pantai Piasau, Miri
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 4.28

Malaysia : River Estuary Monitoring Stations, 1991

	River Estuary Monitoring Stations	
	Station Number	Location
JOHOR	2024932	Kuala Sungai Muar
	1729930	Kuala Sungai Batu Bahat
	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
NEGERI 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
PULAU PINANG	5104901	Kuala Sungai Kerian
	5204901	Kuala Sungai Jejawi
	5304904	Kuala Sungai Juru
	5303908	Kuala Sungai Prai
SARAWAK	1898901	Kuala Sungai Semantan
	1702903	Kuala Sungai Santubong
	1704905	Kuala Bako
	1604907	Kuala Sungai Sarawak
	2112909	Kuala Batang Rajang
	3130911	Kuala Batang Kemena
	4349915	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 4.29

Malaysia: Status of Marine Water Quality, 1991

State	Parameters Exceeding Interim Standard (%)								
	E_coli (100 MPN/ml)	Oil and Grease (0 mg/l)	Total Suspended Solids (50 mg/l)	Cadmium (0.005 mg/l)	Chromium (0.1 mg/l)	Mercury (0.0005 mg/l)	Lead (0.09 mg/l)	Arsenic (0.05 mg/l)	Copper (0.01 mg/l)
Pahang	50.9	NA	100.0	7.1	0.0	NA	0.0	0.0	0.0
Kelantan	NA	100.0	100.0	NA	NA	NA	30.0	NA	0.0
Terengganu	NA	100.0	98.0	NA	NA	NA	9.5	0.0	5.9
Sarawak	42.9	100.0	32.0	NA	NA	NA	0.0	0.0	NA
Johor	28.8	22.4	9.0	10.6	0.0	0.0	7.0	0.0	0.0
Sabah	1.8	100.0	37.0	100.0	0.0	NA	91.5	NA	1.7
Melaka	45.8	100.0	71.0	4.2	0.0	72.2	0.0	0.0	4.2
Perak	53.3	96.4	97.0	88.0	61.3	94.7	82.1	NA	52.0
Pulau Pinang	84.8	0.0	67.0	NA	0.0	79.5	45.2	NA	51.2
Kedah	42.2	0.0	67.0	0.0	0.0	100.0	0.0	NA	0.0
Selangor	29.4	79.4	68.0	0.0	0.0	90.9	2.9	0.0	0.0
Negeri Sembilan	36.8	85.3	46.0	1.5	0.0	66.7	1.5	0.0	1.5
Median (mg/l)	42.55	96.80	67.50	5.65	0.00	79.50	7.00	0.00	1.60

Table 4.30

Malaysia : Tar Ball Survey, 1991

State	Beach	Max. value recorded gm per meter strip
Johor	Kuala Sungai Johor	1.5
Negri Sembilan	Port Dickson, Bt.5	1.0
	Port Dickson, Bt.7	3.7
	Port Dickson, Bt.8	4.3
	Kuala Sungai Lukut	0.8
Perak	Pantai Pasir Panjang	16.0
Selangor	Pantai Morib	3.8
Kelantan	Pantai Irama Bachok	320.0
Terengganu	Pantai Kijal	195.5
Kedah	Tanjung Rhu	13.58

Table 4.31

Malaysia : Number of Oil Spill Incidents by Location, 1980-1991

Location	Year											
	80	81	82	83	84	85	86	87	88	89	90	91
Port	13	10	11	5	6	6	9	5	10	1	4	-
South China Sea	-	1	2	-	-	-	10	6	12	12	4	3
Straits of Malacca	-	2	1	-	-	-	6	4	5	8	2	8
Straits of Singapore	-	-	-	-	-	-	-	-	2	1	-	-
Total	13	13	14	5	6	6	25	15	29	22	10	11

Table 4.32

Malaysia : Number of Oil Spill Incidents by Source, 1980-1991

Location	Year											
	80	81	82	83	84	85	86	87	88	89	90	91
Bilge/Bunkering	8	7	8	3	3	3	7	4	1	1	4	-
Colliding/Stranding	1	-	1	-	2	-	3	2	2	-	1	1
Loading/Unloading	1	3	2	2	1	3	6	3	1	3	1	3
Cleaning/Ballasting	-	-	-	-	-	-	3	2	5	1	1	3
Oil Platform	-	-	-	-	-	-	-	1	3	8	1	-
Rupture	-	-	-	-	-	-	-	-	-	1	1	1
Unknown	3	3	3	-	-	-	6	3	17	8	1	3
Total	13	13	14	5	6	6	25	15	29	22	10	11

Table 4.33

Malaysia : Contravention Licence Issued under Section 25 (1), Environmental Quality Act, 1974. Number by Type of Industry, 1988 - 1991.

Type of Industry	Year			
	1988	1989	1990	1991
Chemical	9	3	6	9
Food	20	12	7	7
Textile	6	6	5	6
Paper	2	3	4	6
Beverage	10	5	8	5
Electrical Goods	2	1	3	3
Palm Oil Refinery	6	6	4	3
Rubber-based	-	19	9	3
Metal	-	-	-	2
Others	12	18	10	3
Total	75	73	56	47

Table 4.34

Malaysia : Contravention Licence Issued under Section 25 (1), Environmental Quality Act, 1974. Number by Justification, 1988 - 1991.

Justification	Year			
	1988	1989	1990	1991
Construction of Treatment Plant	34	28	28	19
Upgrading of Treatment Plant	8	11	17	15
Lack of Treatment Technology	4	4	2	3
Discharge into Central Sewerage Plant	9	6	4	2
Lack of Land	10	5	1	-
Others	5	7	4	8
Total	75	73	56	47

Table 4.35

Malaysia: Contravention Licence issued Under Section 22 (1), Environmental Quality Act, 1974. Number by Type Of Industry, 1988 - 1991

Type Of Industry	Year			
	1988	1989	1990	1991
Rubber-based Industry	2	79	6	3
Wood-based Industry	55	46	11	39
Palm Oil Mill	3	2	-	-
Rice Mill	4	3	1	-
Others	10	6	3	10
Total	74	136	21	52

Table 4.36

Malaysia: Contravention Licence issued Under Section 22 (1), Environmental Quality Act, 1974. Number by Justification, 1988 - 1991

Type Of Contravention	Year			
	1988	1989	1990	1991
Open Burning Of Waste	51	123	21	43
Operation of Incinerator not of Approved Design	16	1	-	6
Emission of Dark Smoke	2	3	-	1
Emission of Particulates	3	7	-	1
Others	2	2	-	1
Total	74	136	21	52

Table 4.37

Malaysia : Application for Licences to Operate Precscribed Premises for Scheduled Waste Treatment and Disposal. Number by Type of Premises, 1991

Type of Premises	Number of Application
Off-Site Storage Facility	32
Off-Site Treatment Facility	2
Off-Site Recovery Facility	11
Incinerator for Scheduled Wastes	10
Land Treatment Facility	9
Secure Landfill Facility	-
Total	64

Table 4.38

Malaysia : Applications for Handling Scheduled Wastes other than Prescribed Premises. Number by Type of Application, 1991

Type of Application	Number of Application
Enquiries/Request for information on Waste Disposal	82
Disposal of Pharmaceutical Waste	19
Disposal of Innocuous Scheduled Waste	23
Import of Waste	2
Export of Waste	8
Total	134

Table 4.39

Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977, 1989-1991

Subject	Year														
	1989					1990					1991				
Total Number of Diesel Vehicles Registered [1]	298,913					332,080					367,895				
Number of Enforcement Campaigns	448					439					465				
Total Number of Vehicles Stopped for Inspection	42,284					38,322					40,487				
Type of Vehicles	L	B	T	O	PC	L	B	T	O	PC	L	B	T	O	PC
Number of Summons Issued	2470	1726	1205	1165	519	2506	1900	1160	1175	458	4344	2085	1259	1350	406
Total Number of Summons Issued	7,085					7,199					9,444				
Type of Vehicles	L	B	T	O	PC	L	B	T	O	PC	L	B	T	O	PC
Percentage of Compliance	89	78	75	78	74	87	76	71	76	66	81	73	70	73	65
Overall Percentage of Compliance	83							81					77		

[1] Source: Road Transport Department, Malaysia.

Note:

Type of Vehicles

L - Lorry
B - Bus
T - Taxi
O - Others
PC - Private Car

Table 4.40

Malaysia: Offences under the Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977, 1990 - 1991.

State	Number of Vehicles				Compliance (percent)	
	Stopped for Inspection		Summoned			
	1990	1991	1990	1991	1990	1991
Pahang	10,093	6,568	964	436	90	93
Perlis	611	738	77	85	87	89
Sarawak	1,335	791	89	103	93	87
Sabah	23	922	11	126	52	86
Kedah	3,425	3,202	397	493	88	85
Pulau Pinang	5,315	5,116	641	855	88	83
Terengganu	677	1,014	161	171	75	83
Perak	4,728	2,990	690	709	86	76
Kelantan	915	1,094	204	261	77	76
Selangor	1,725	5,920	630	1,560	64	74
Negri Sembilan	1,501	1,637	538	600	64	63
Johor	3,713	4,843	652	1,799	82	63
Wilayah Persekutuan (Kuala Lumpur)	2,851	4,314	1,576	1,671	47	61
Melaka	1,340	1,338	569	575	58	57
Total	38,252	40,487	7,199	9,444	81	77

Table 4.41

Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974. Number by Type, 1988 - 1991.

Section	Type of Offence	Year			
		1988	1989	1990	1991
16	Failure to comply with conditions of licence	4	8	4	8
18	Operation and use of prescribed premises without licence.	-	2	-	4
22	Emission of wastes into the atmosphere without licence.	-	-	-	2
25	Emission of wastes into any inland water without licence.	13	6	9	10
31	Failure to comply with written notice.	-	-	1	-
37	Failure to furnish information.	1	1	1	-
	TOTAL	18	17	15	24

Table 4.42

Malaysia: Offences Prosecuted under the Environmental Quality (Clean Air) Regulations, 1978. Number by Type, 1988 - 1991

Regulation	Type of Offence	Year			
		1988	1989	1990	1991
8	Installation of incinerator without approval.	-	1	-	-
11	Open burning of wastes.	6	1	-	2
15	Emission of dark smoke.	2	1	1	-
27(a)	Emission of acid gases.	-	-	-	1
36	Installation of fuel burning equipment without approval.	1	1	-	-
38	Erection of chimney without approval.	1	1	-	-
	TOTAL	10	5	1	3

Table 4.43

Malaysia: Offences Compounded under the Environmental Quality (Clean Air) Regulations, 1978. Number by Type, 1988 - 1991.

Provision	Type of offence	Year			
		1988	1989	1990	1991
4	New installations as described in the First Schedule installed without approval	-	-	5	7
7	Using incinerator not of approved design	-	-	20	36
8	Installation of incinerator without approval	-	15	40	32
11	Open burning of wastes	46	112	165	445
15	Emission of dark smoke	9	17	38	52
19	Failure to maintain smoke density equipments and recorders	-	-	1	3
35	Emission of unburnt waste/ash particles from incinerator	-	-	7	1
36	Installation of fuel burning equipment without approval.	15	62	61	190
38	Erection of chimney without approval.	13	58	37	116
40	Operation of facilities without control equipment	4	14	31	84
42	Failure to install any equipment or device that carry out air impurities emission test	-	-	-	11
45	Failure to render assistance by owner/ occupier.	-	-	1	-
TOTAL		87	279	405	977

Table 4.44

Malaysia: Offences Compounded under the Environmental (Scheduled Wastes) Regulations, 1979. Number by Type, 1988 - 1991

Provision	Type of offence	Year			
		1988	1989	1990	1991
3	Failure to notify the generation of scheduled wastes	-	-	-	13
4 (1)	Scheduled waste not disposed at prescribed premises	-	-	1	4
8 (1)	Failure to ensure proper storage of the schedule waste	-	-	4	) 32)))
8 (2)	Failure to label scheduled waste containers	-	-	2	)
9	Failure to keep an inventory of scheduled waste.	-	-	1	25
10	Failure to submit the information in the Sixth Schedule.	-	-	-	12
TOTAL		-	-	8	86

Table 4.45

Malaysia: Industrial Air Pollution Complaints. Number by Type, 1980 - 1991

Nature of Complaints	1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991	
	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%	Num.	%
Particulate	99	35	154	44	91	34	98	41	101	38	132	46	135	43	155	41	154	42	154	42	173	43	207	36
Smoke & Fumes	51	18	62	18	50	19	37	15	61	23	56	20	72	23	108	28	97	26	87	23	134	33	162	28
Odour	58	21	51	15	50	19	55	23	59	22	55	19	51	16	73	19	75	20	89	24	81	20	90	16
Gas	7	3	14	4	5	2	5	2	6	2	12	4	8	2	39	10	23	6	13	4	2	1	6	1
Others	66	23	68	19	70	26	46	19	39	15	30	11	50	16	6	2	21	6	24	7	11	3	111	19
Total	281	100	349	100	266	100	241	100	266	100	285	100	316	100	381	100	370	100	367	100	401	100	576	100

Table 4.46

Malaysia: Open Burning at Municipal Waste Disposal Sites, 1985 - 1991

Local Authorities	1985	1986	1987	1988	1989	1990	1991	Total
1. MD Hulu Langat			1	2	1	15	4	23
2. MP Petaling Jaya	3	1			5		1	10
3. MP Shah Alam	1	2			2	2	3	10
4. DBKL	1	1	1	1	1		3	8
5. MD Petaling	1		1	2		1		5
6. MD Kuala Muda			2				3	5
7. MD Seberang Perai		1	2				1	4
8. DP Ipoh				1	1		2	4
9. MD Kulim		1	1			1		3
10. MP Kinta Selatan				1			2	3
11. MD Bentong	1					1		2
12. MD Gombak			2					2
13. MD Perak Tengah							2	2
14. MD Johor Bahru	1				1			2
15. MD Kuala Kangsar			1		1			2
16. MP Hulu Selangor						1		1
17. MP Johor Bahru						1		1
18. MP Klang						1		1
19. MD Labuan						1		1
20. MD Lahat Datu						1		1
21. MD Manjung					1			1
22. MD Selama dan Larut						1		1
23. MD Teluk Intan		1						1
24. Temerloh	1							1
25. MD Triang						1		1
26. MD Muar Selatan							1	1
27. MD Batu Pahat							1	1
28. MD Pendang							1	1
29. MP Seremban							1	1
Total	9	7	11	7	13	27	25	99

Source: Department of Environment, 1991

Table 4.47

Klang Valley/Negeri Sembilan/Melaka: Hotline Complaints

District/Area	Number of Complaints											
	Particulate/Smoke				Effluent Discharge/ Sewage	Noise	Odour			Disposal of Solid Waste	Others	Total
	Open Burning	Factory	Vehicles	Road/ Construction			Oxidation Pond	Factory	Solid Waste			
City Hall, KL	414	134	88	113	33	109	20	86	216	254	187	1654
Hulu Langat	161	57	8	16	13	12	5	38	60	70	28	468
PJ Municipality Council	101	24	21	26	9	28	8	16	46	52	56	387
Petaling	70	32	10	23	10	36	2	32	44	48	48	355
Kelang	50	62	17	13	23	29	5	37	25	23	40	324
Gombak	60	37	7	19	13	9	3	21	26	40	32	267
Shah Alam	42	14	4	9	5	7	2	8	16	18	18	143
Negeri Sembilan	20	28	7	4	11	3	2	12	3	4	8	108
Melaka	4	9	0	0	7	2	0	2	1	0	9	34
Others	5	5	4	0	0	2	0	2	0	0	5	23
Kuala Selangor	4	3	0	0	3	1	0	3	1	2	4	21
Ulu Selangor	1	1	0	0	2	2	0	1	3	3	4	17
Kuala Langat	0	3	2	2	2	1	0	3	1	0	1	15
Sabak Bernam	2	1	0	0	1	0	0	1	1	0	1	7
Sepang	0	2	0	0	0	0	0	0	0	1	1	4
Total	934	412	168	255	132	241	47	262	443	515	448	3827

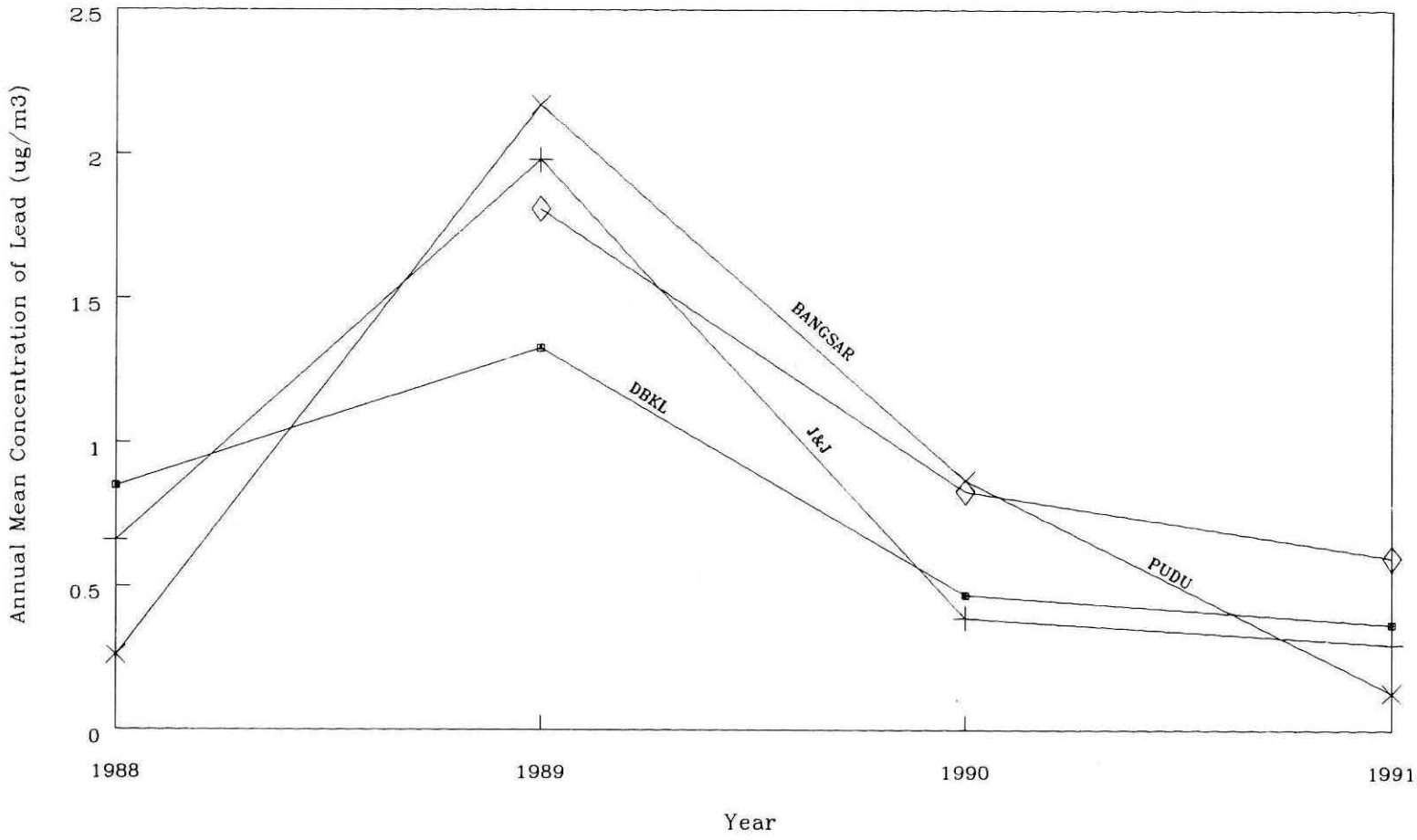

Figure 4.1. Kuala Lumpur & Selangor: Trend of Annual Mean Concentration of Lead (ug/m3), 1988 -1991

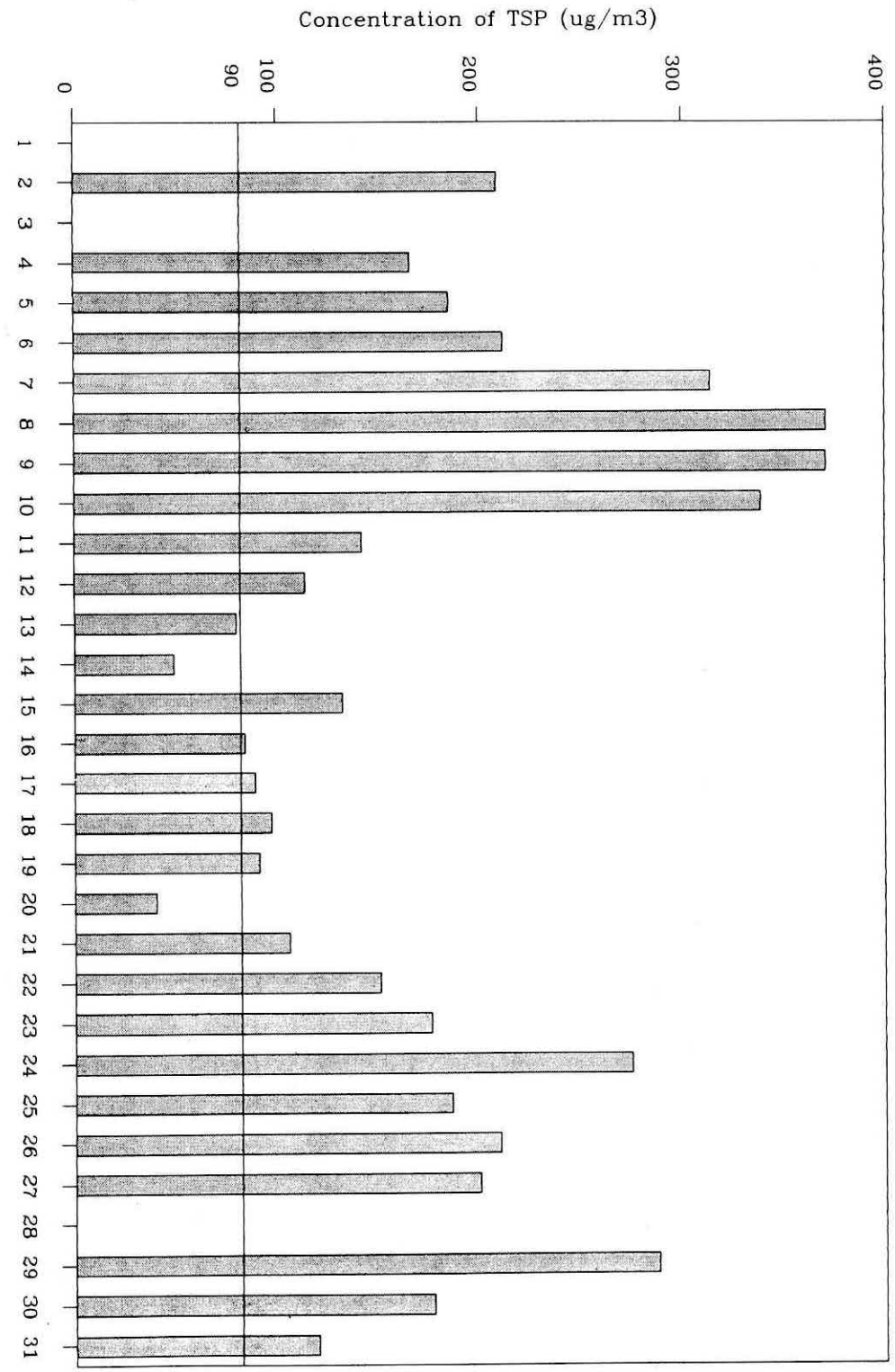

Figure 4.2. Petaling Jaya: Concentration of Total Suspended Particulates, October 1991

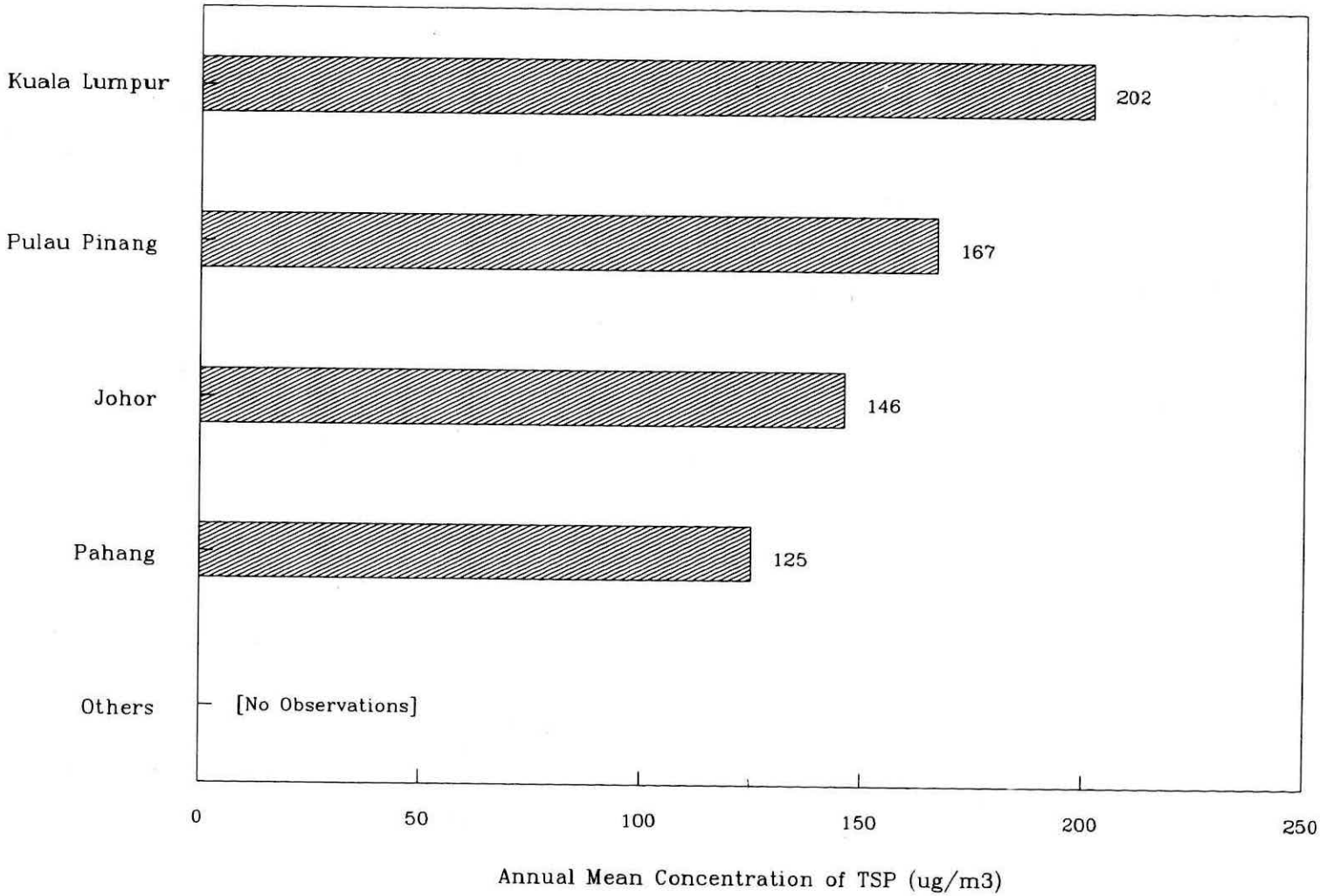

Figure 4.3a. Malaysia: Annual Mean Concentration of TSP in Traffic Areas, 1991

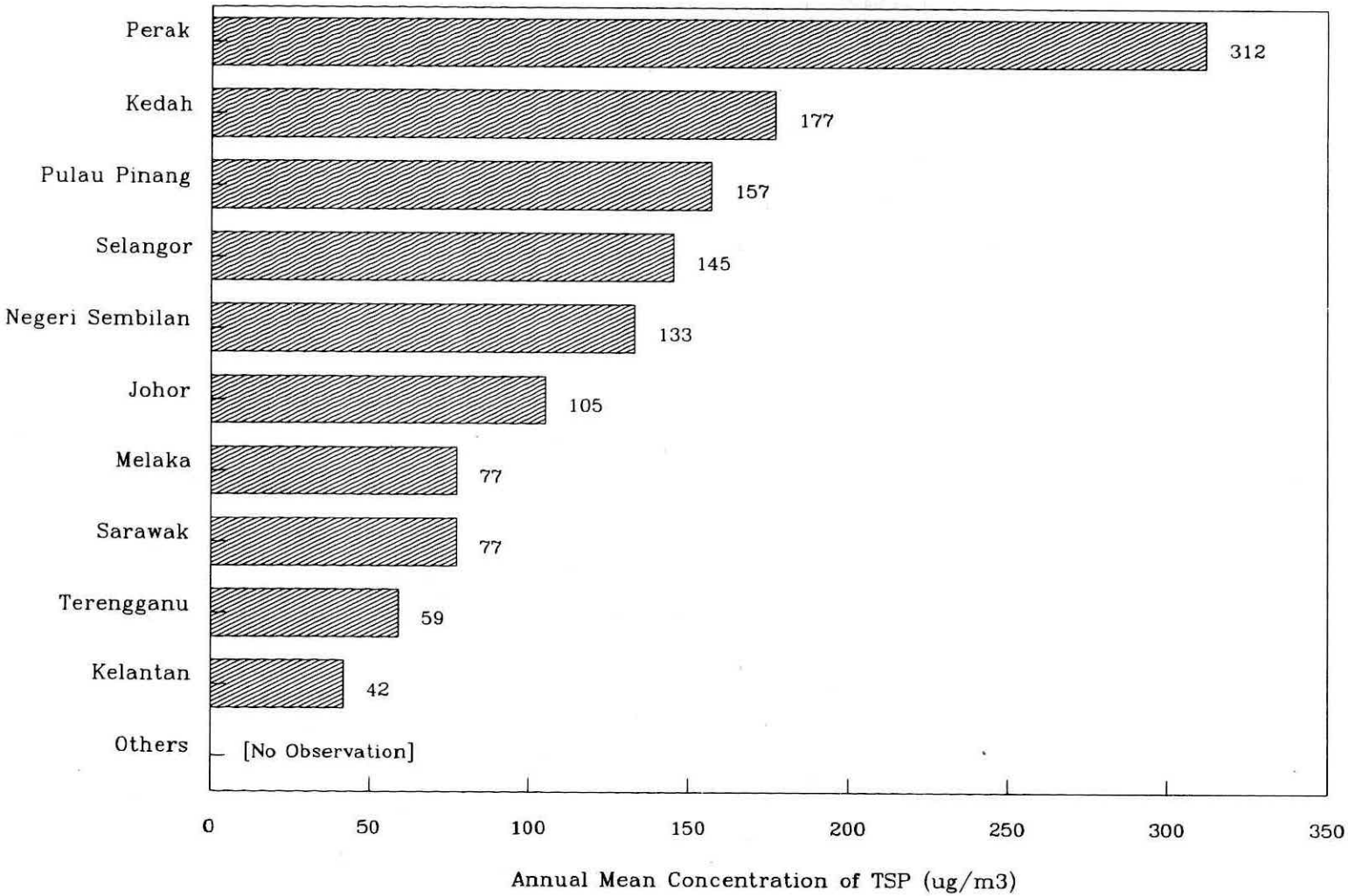

Figure 4.3b. Malaysia: Annual Mean Concentration of TSP in Industrial Areas, 1991

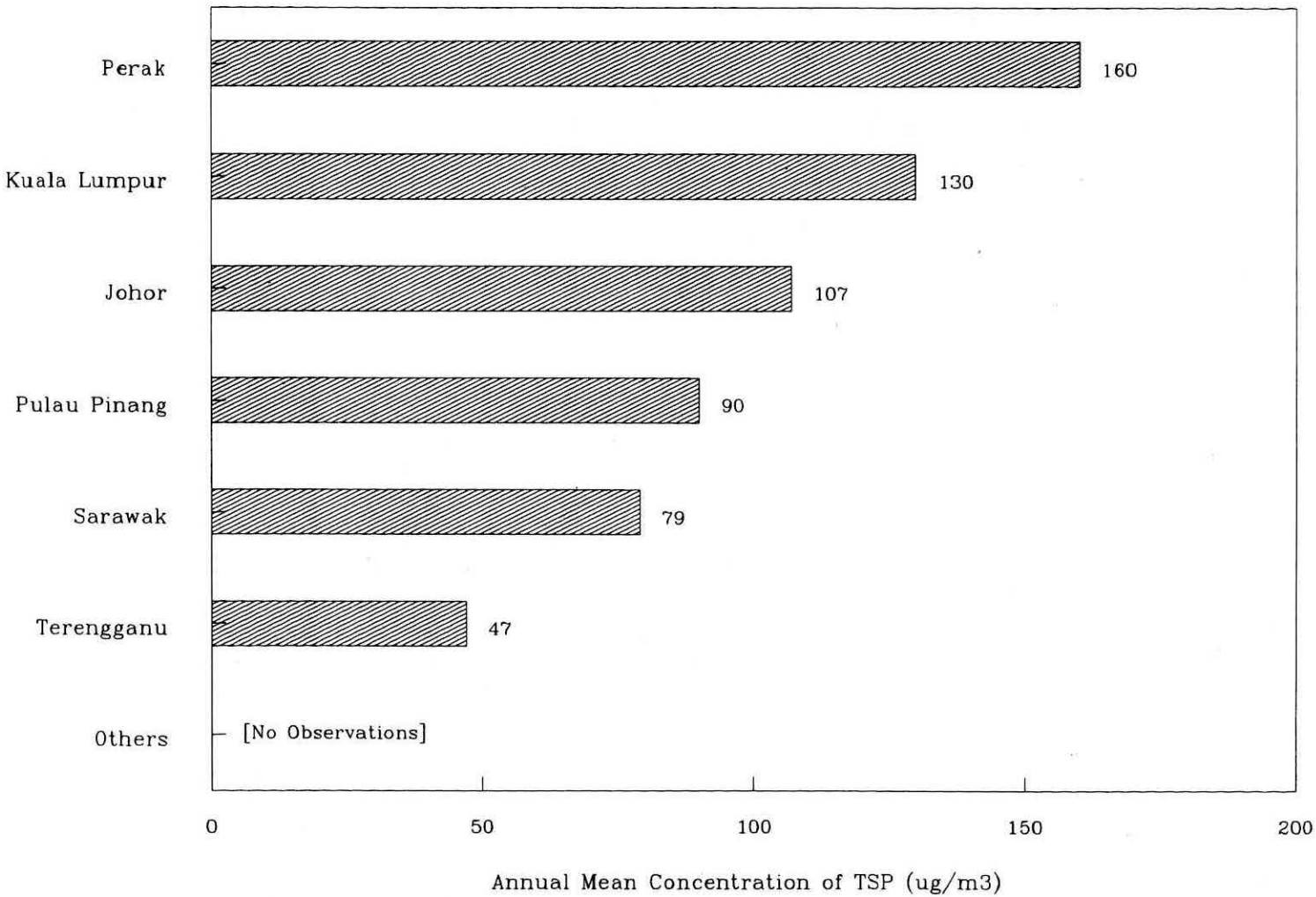

Figure 4.3c. Malaysia: Annual Mean Concentration of TSP in Commercial Areas, 1991

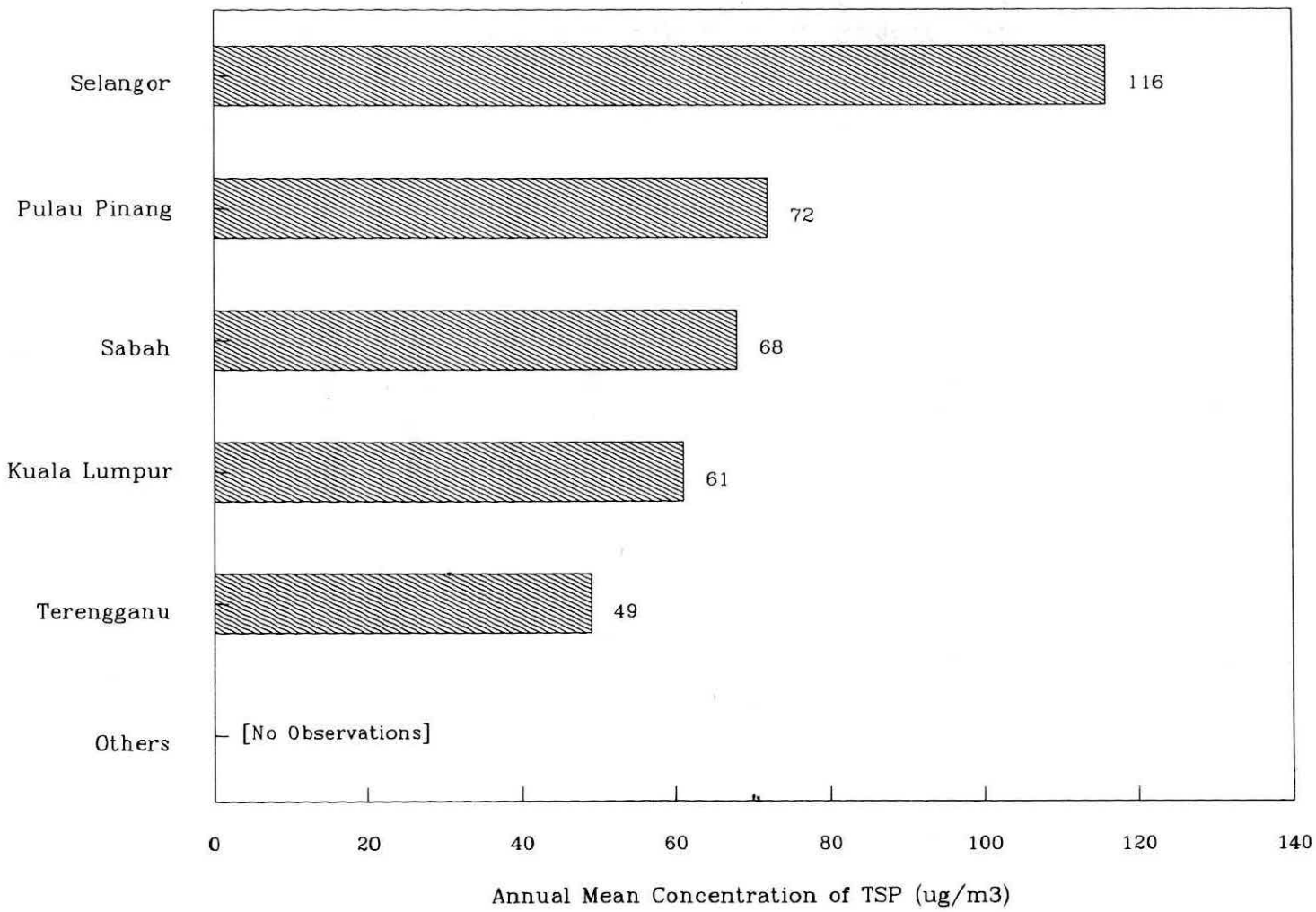

Figure 4.3d. Malaysia: Annual Mean Concentration of TSP in Residential Areas, 1991.

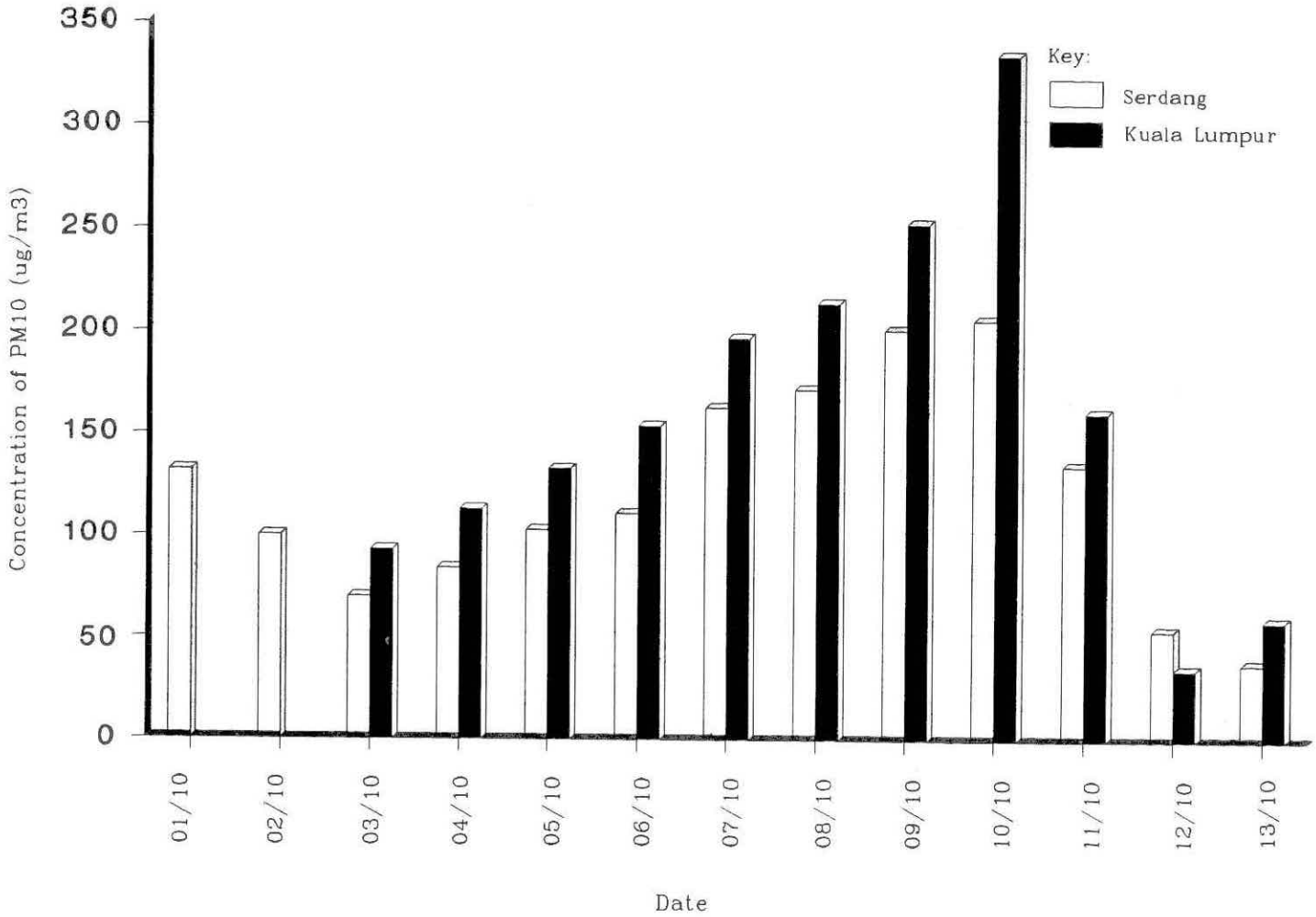

Figure 4.4. Malaysia : Concentration of Respirable Particulate Matter (PM10), October 1991

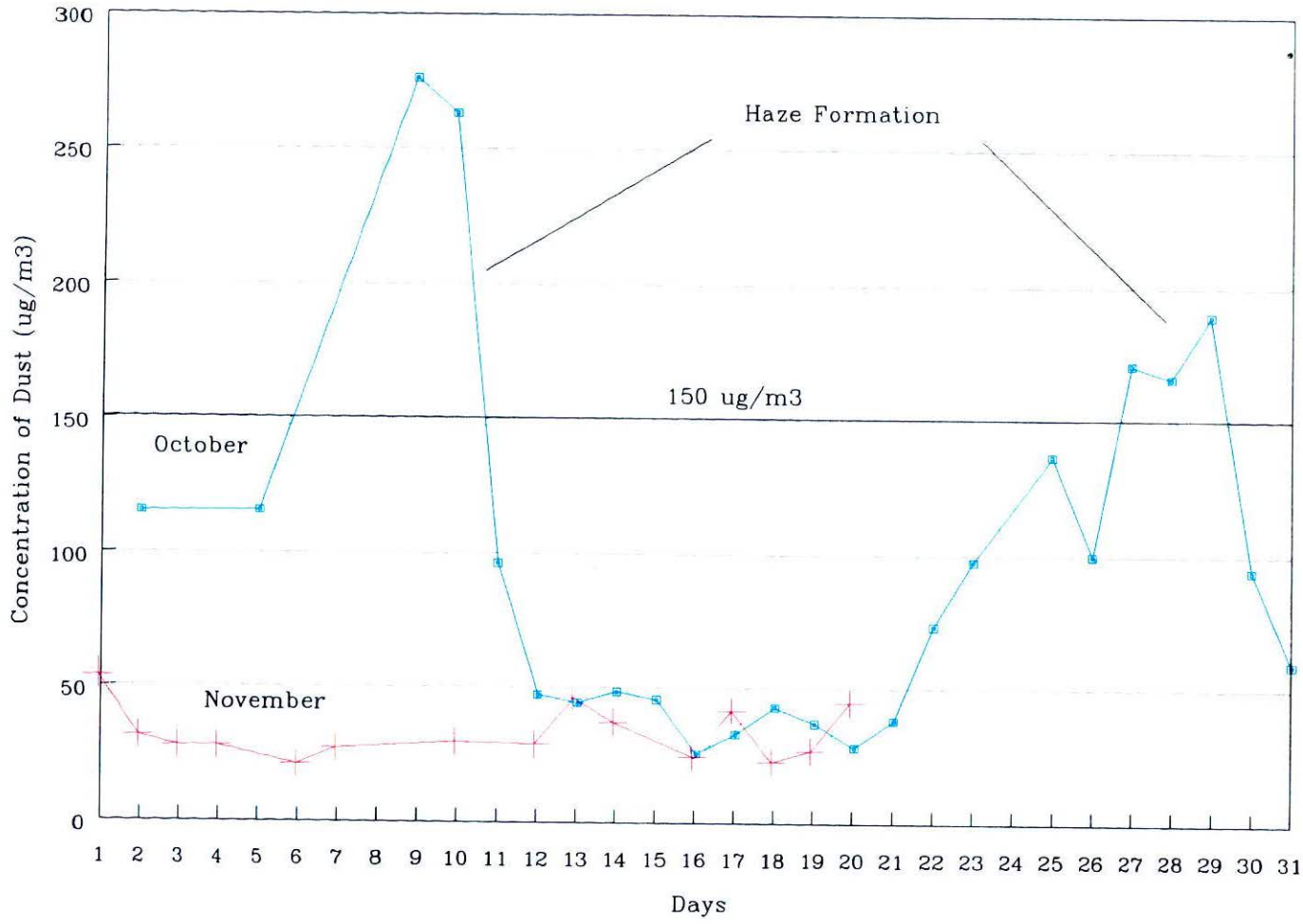

Figure 4.5 : Taman Melawati. Dust Concentration Patterns, During Haze and After Haze, 1991

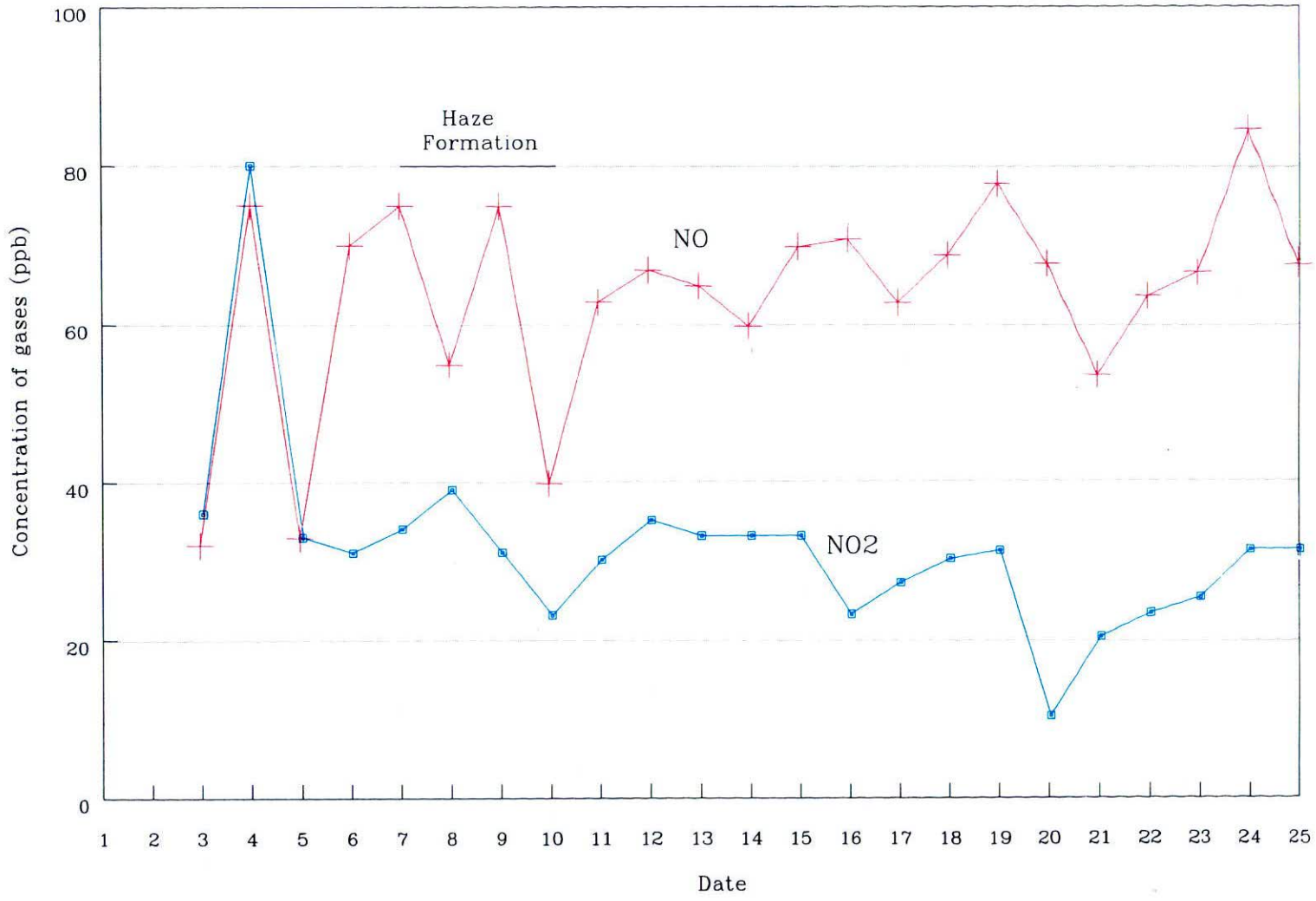

Figure 4.6. Kuala Lumpur: Levels of NO and NO2 in the Air, October 1991

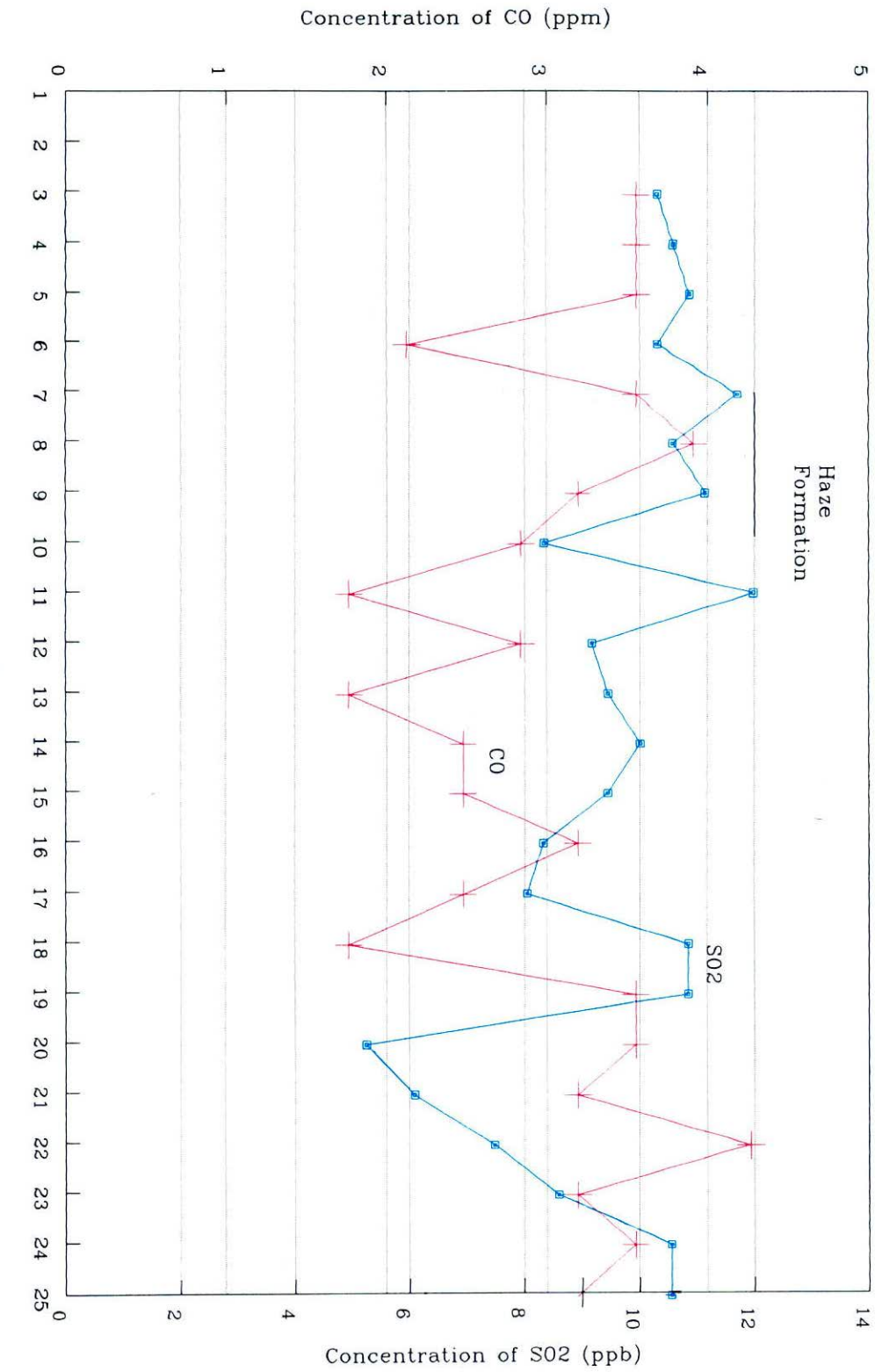

Figure 4.7. Kuala Lumpur: Levels of CO and SO2 in the Air, October 1991

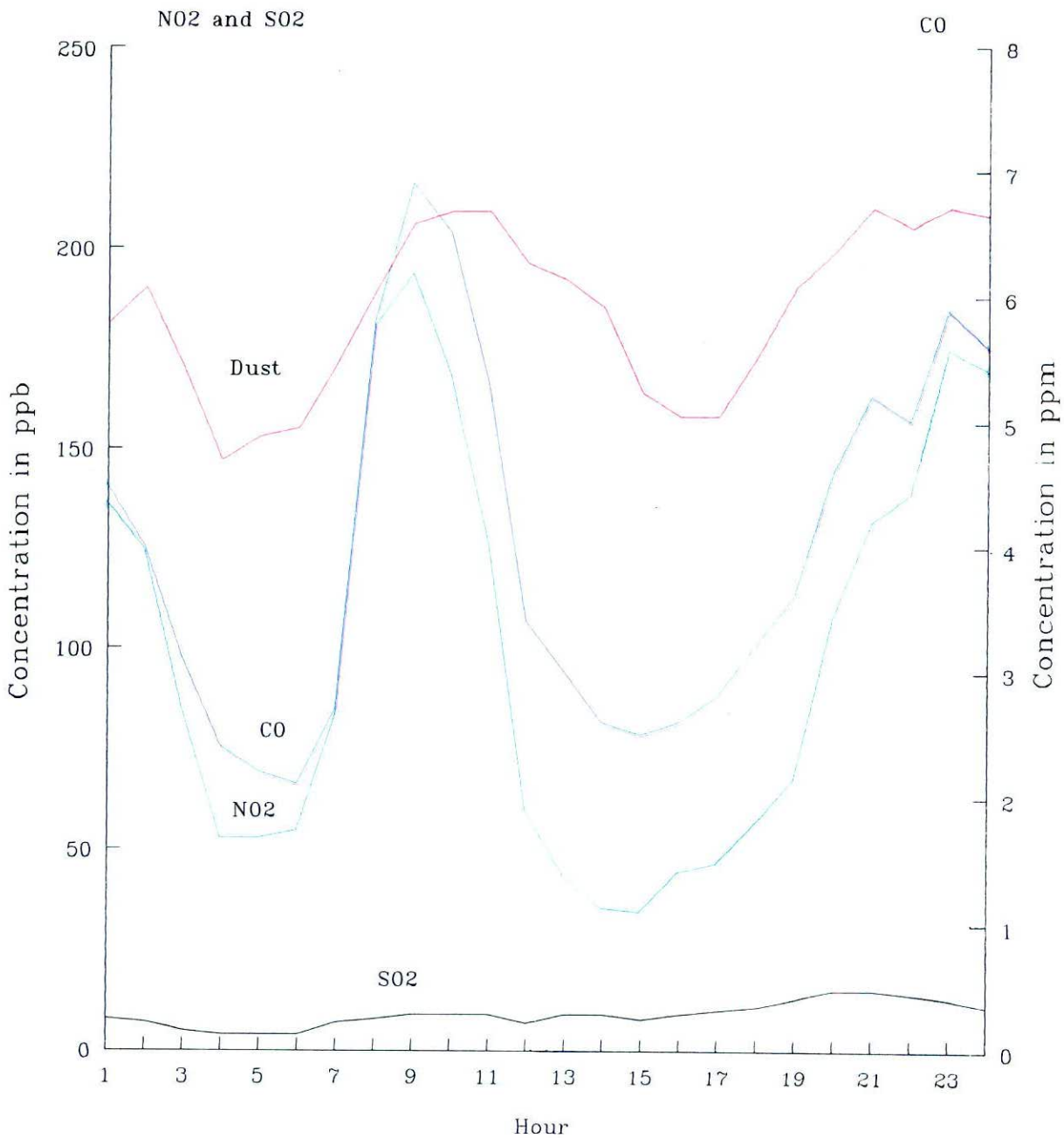

Figure 4.8 . Kuala Lumpur: Hourly Variation of Dust and Gaseous Pollutants, 9 October 1991

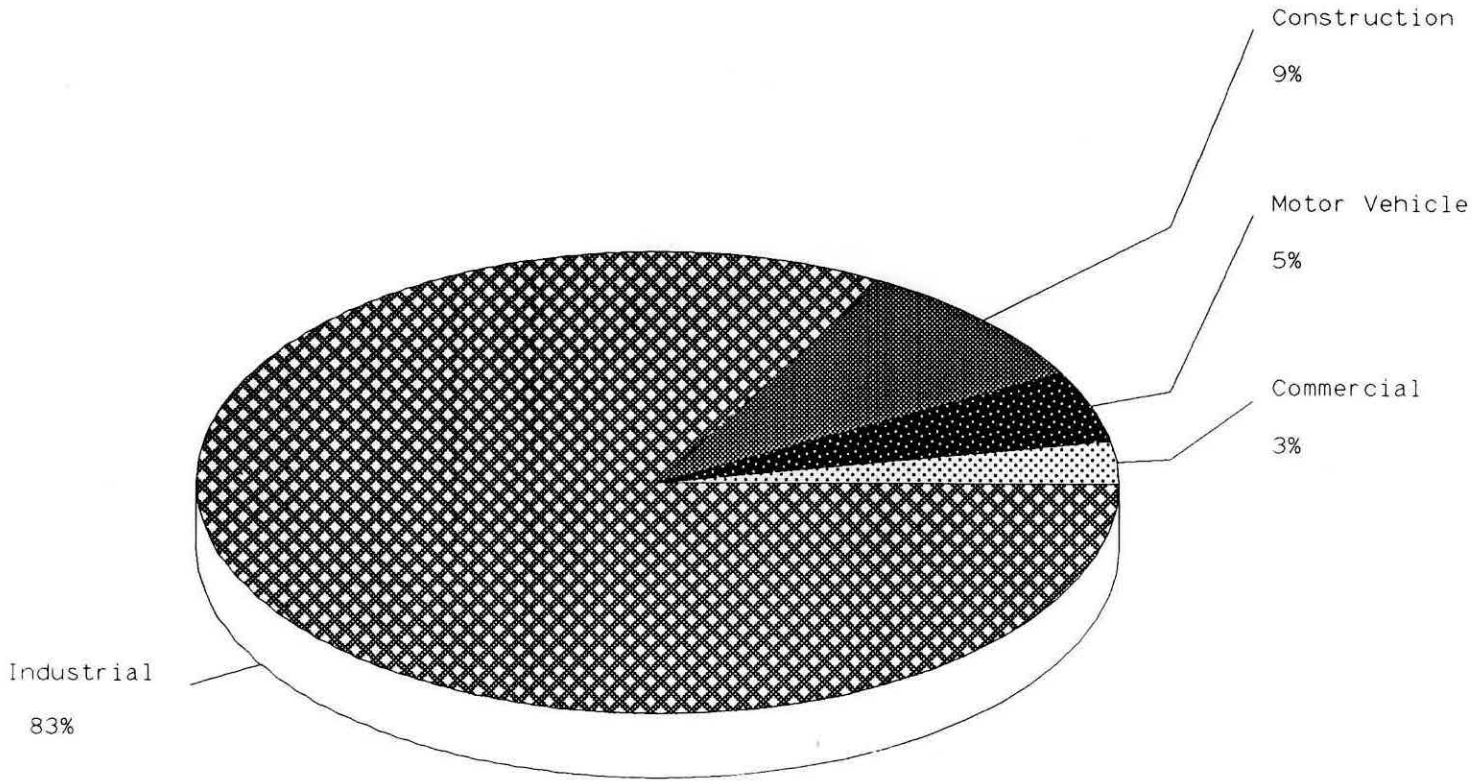

Figure 4.9 Malaysia: Complaints against Noise by Source, 1991

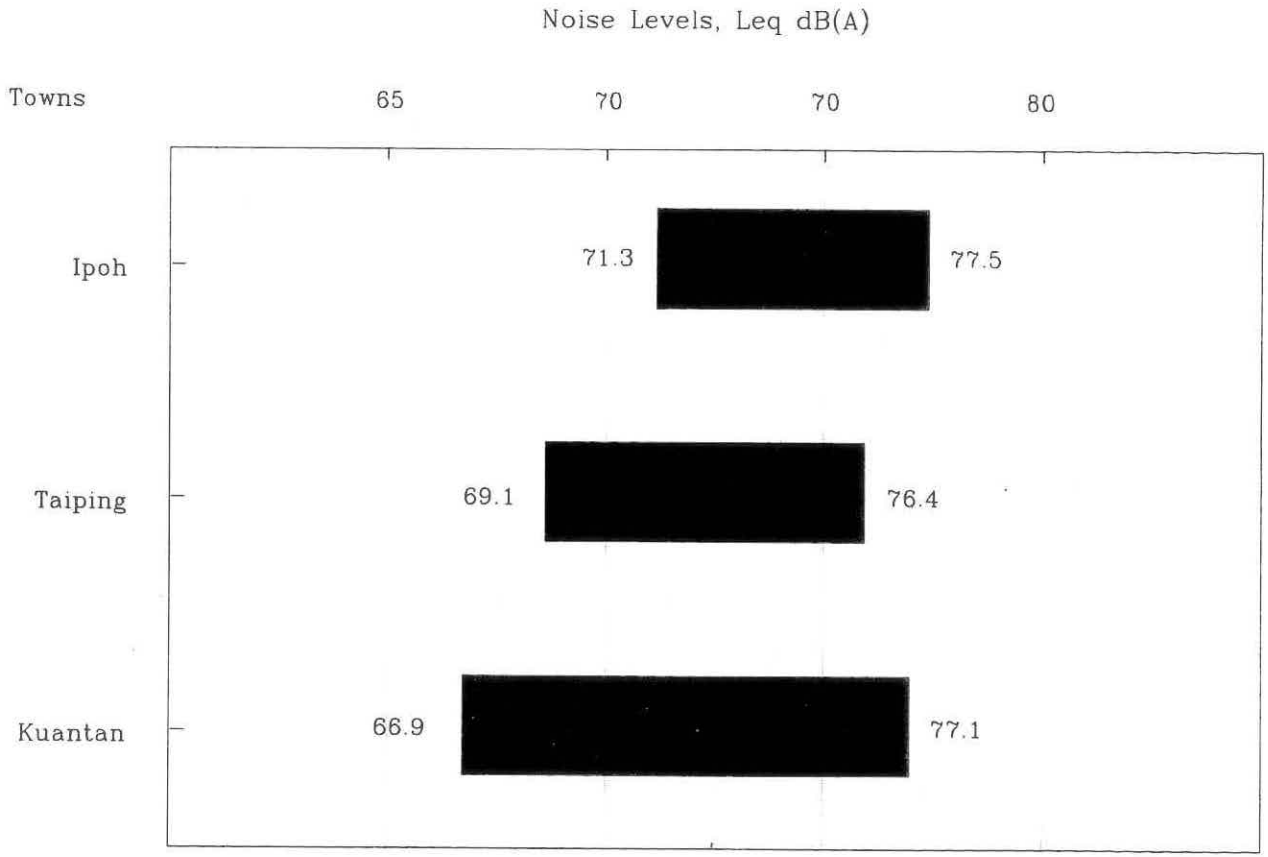

Figure 4.10. Malaysia: Trafffic Noise Levels in Selected Urban Areas, 1991

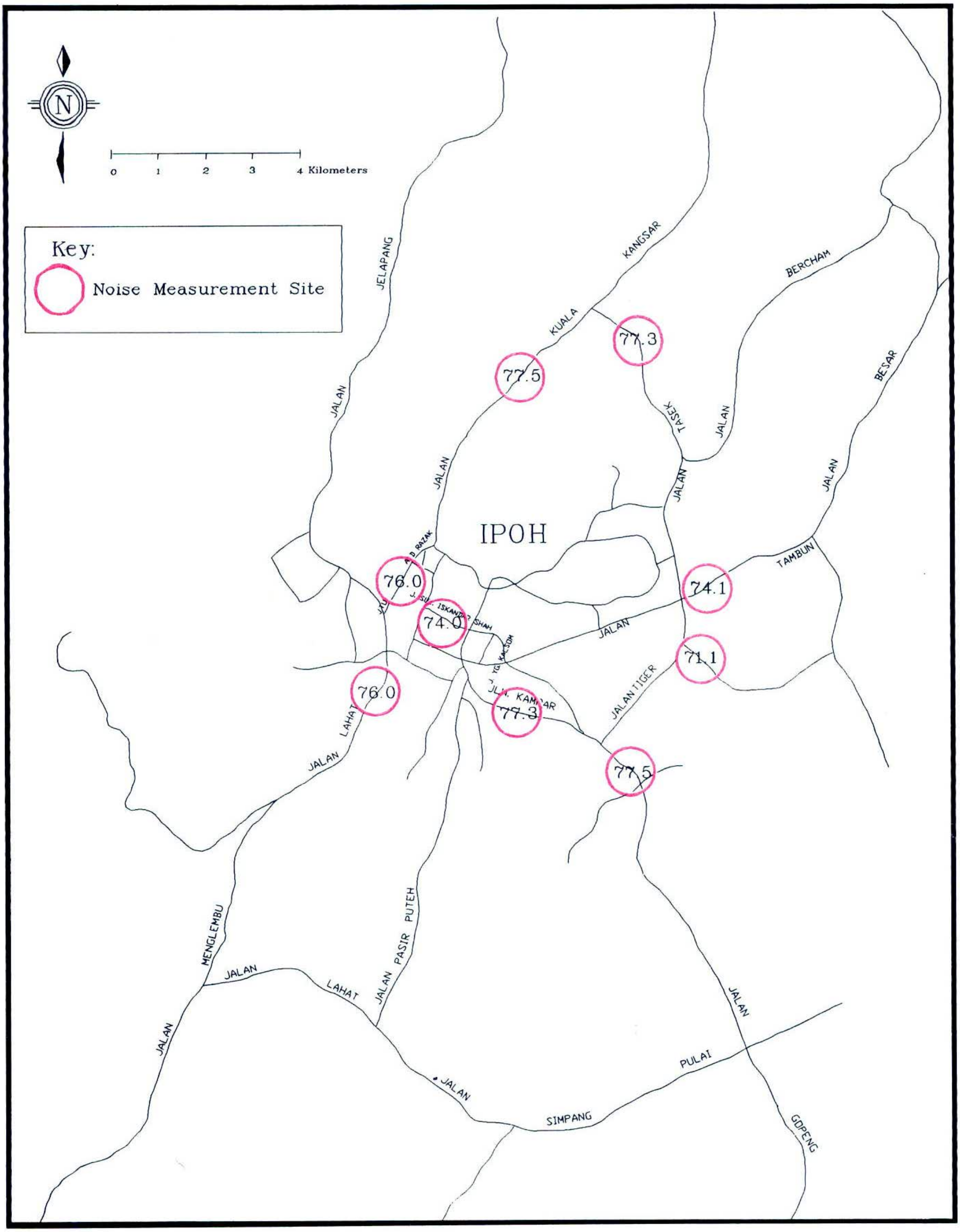

Figure 4.11a. Perak, Ipoh: Distribution of Traffic Noise Levels, 1991

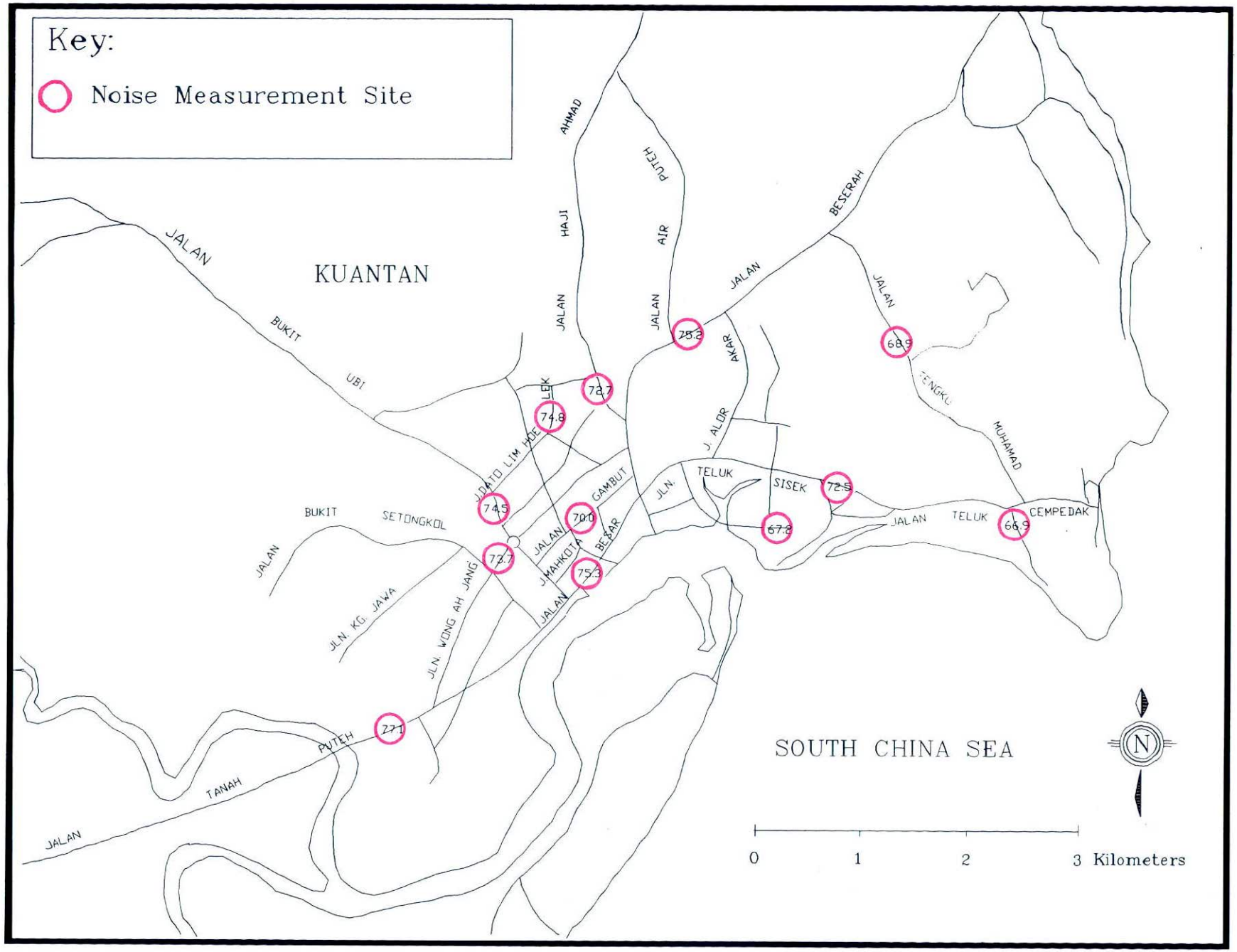

Figure 4.11b. Pahang, Kuantan: Distribution of Traffic Noise Levels, 1991

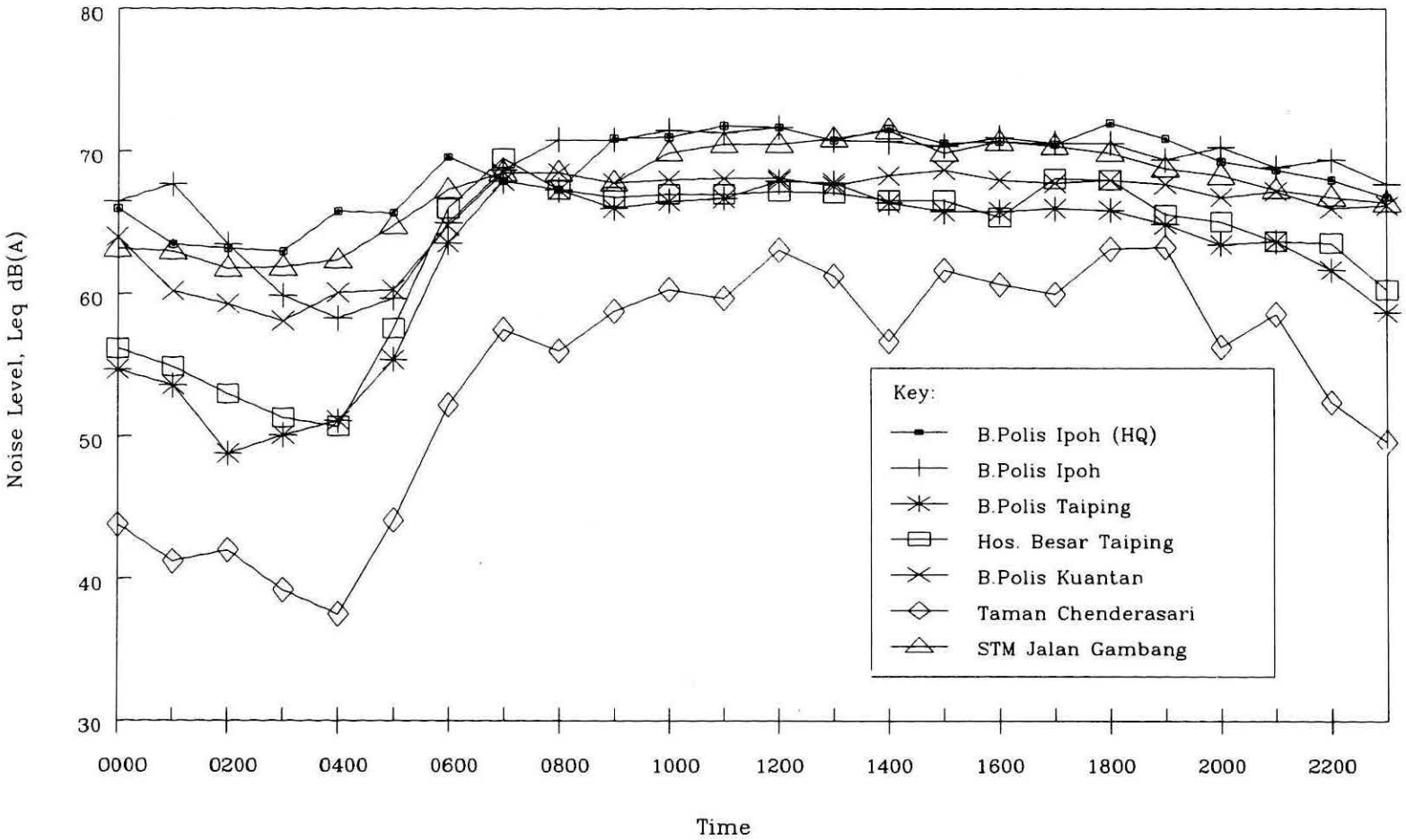

Figure 4.12 Malaysia: Traffic Noise Patterns at Selected Sites in Three Urban Areas, 1991

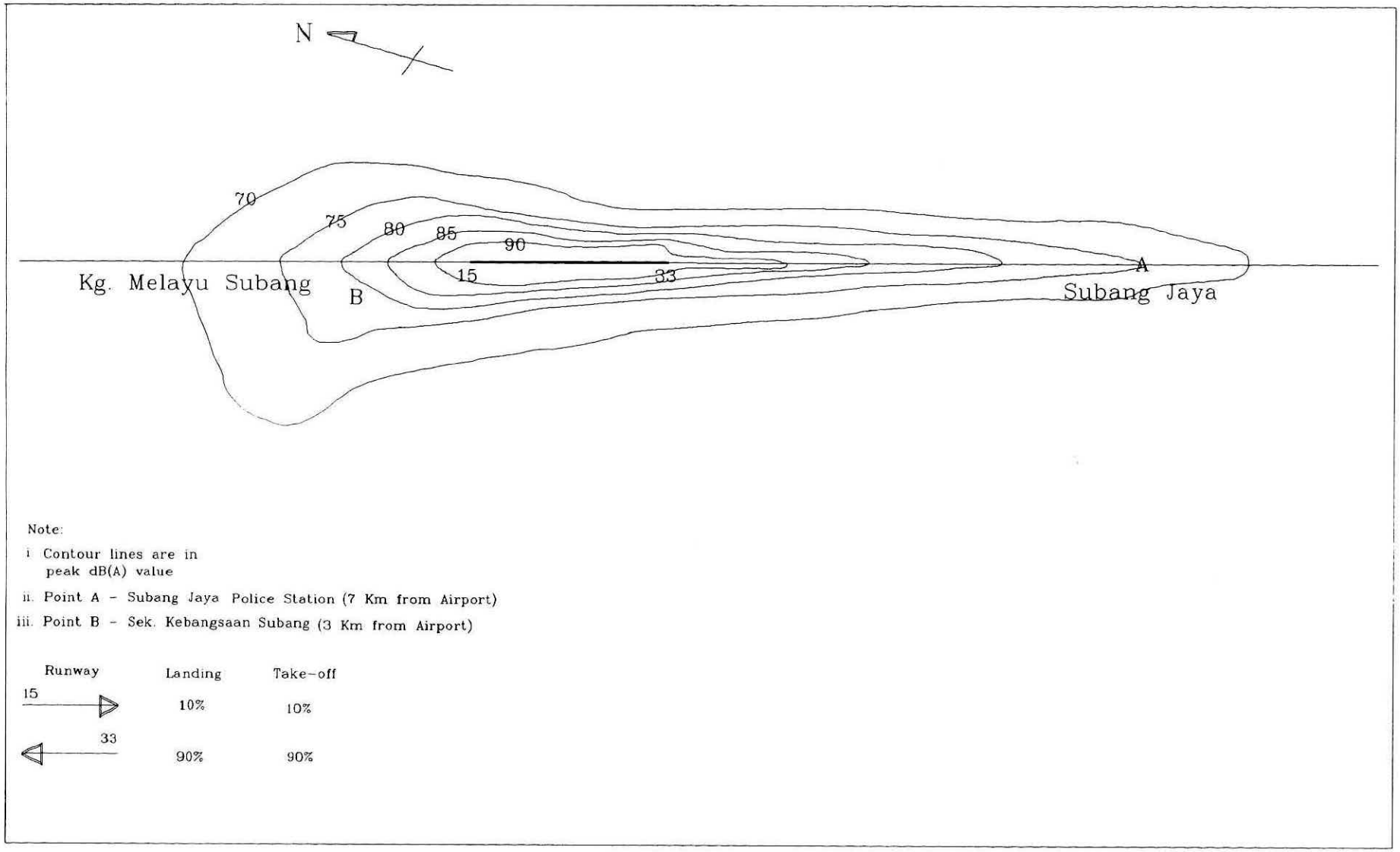

Figure 4.13. Malaysia, Subang: Noise Exposure Contour at Kuala Lumpur International Airport, 1991

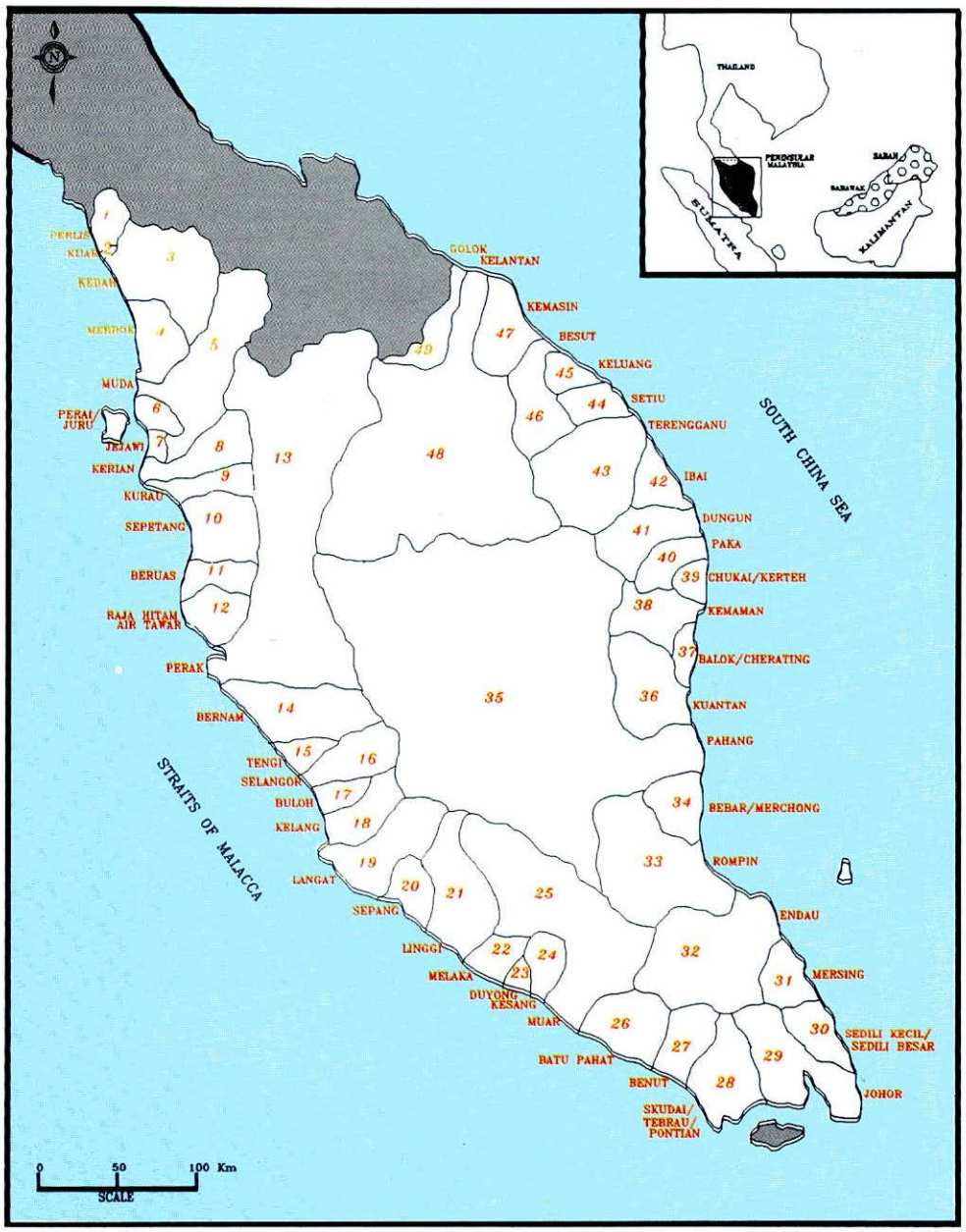

Figure 4.14. Peninsular Malaysia: Water Quality Regions

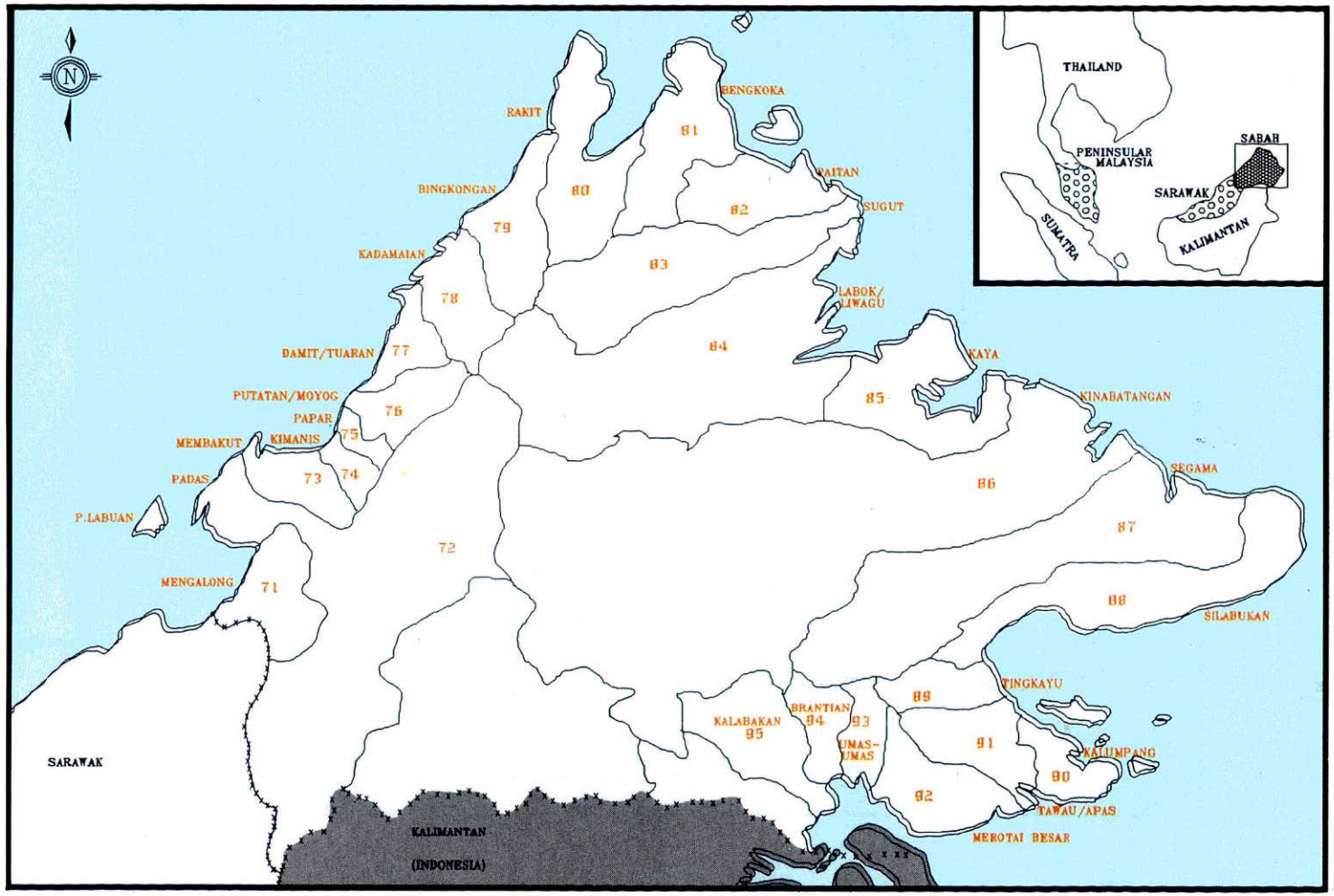

Figure 4.15. Sabah: Water Quality Regions

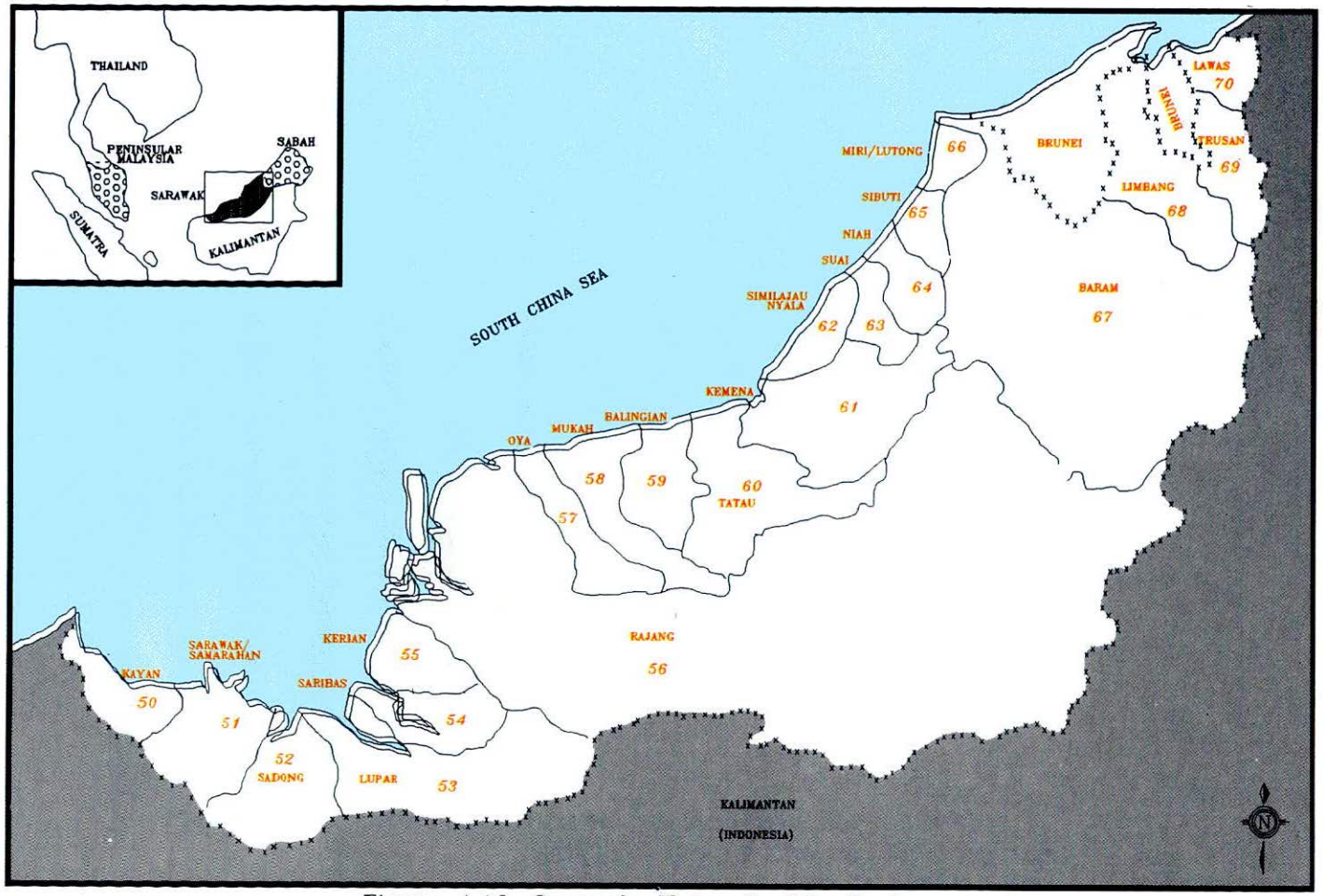

Figure 4.16. Sarawak: Water Quality Regions

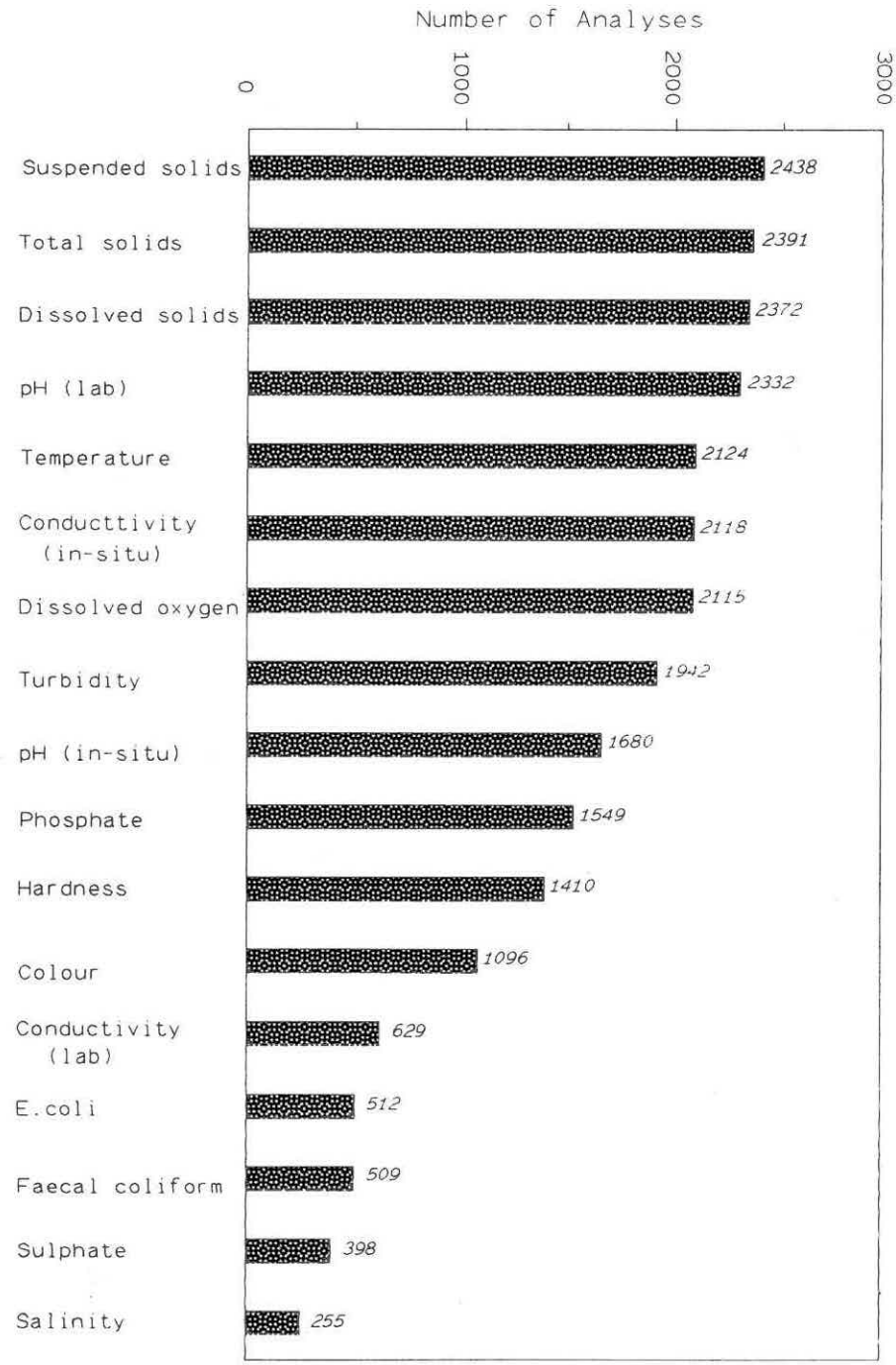

Figure 4.17a Malaysia: Number of Analyses for Physical, Biological and Chemical Parameters of the Monitored River Water, 1991.

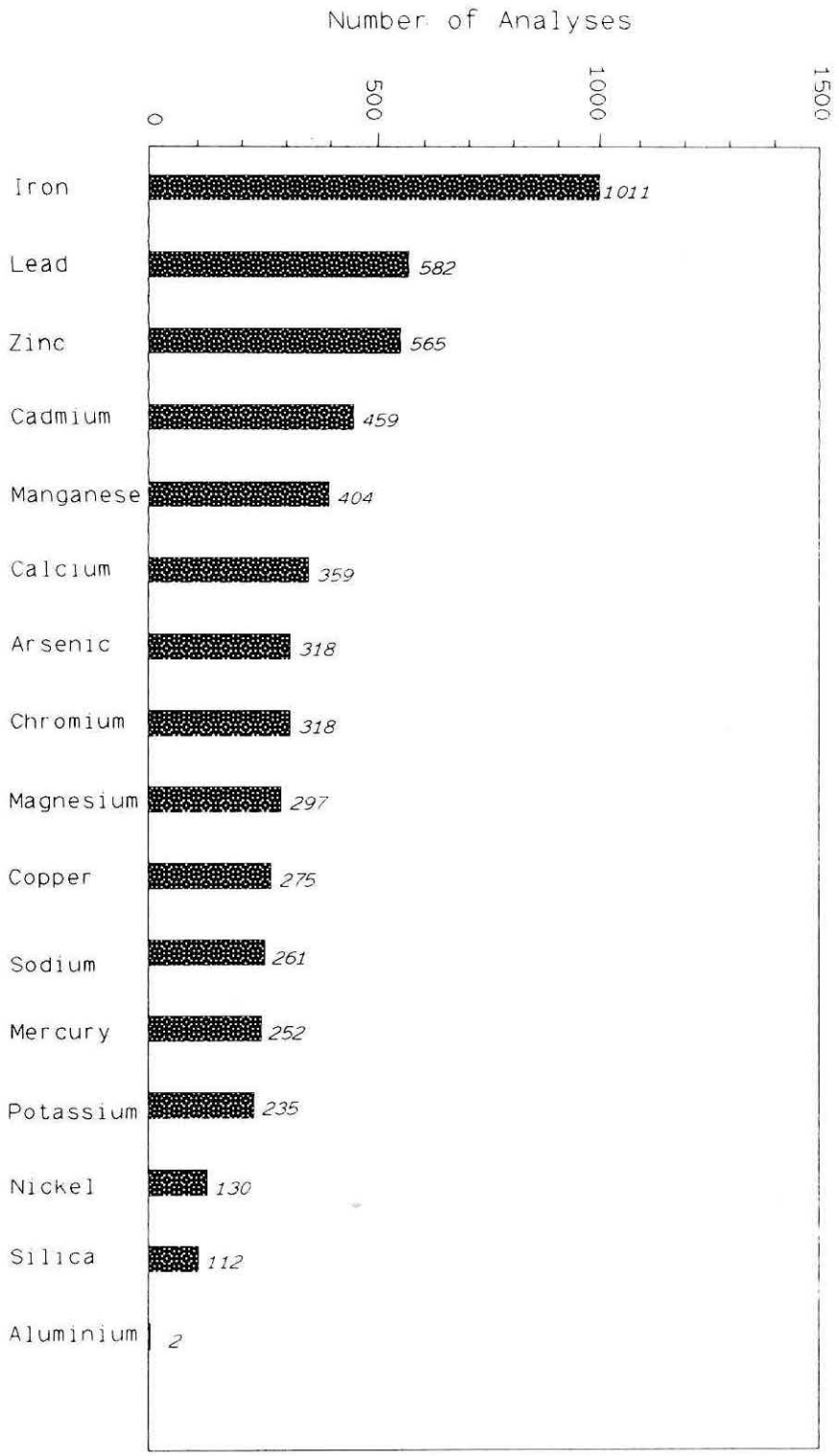

Figure 4.17b Malaysia: Number of Analyses for Physical, Biological and Chemical Parameters of the Monitored River Water, 1991.

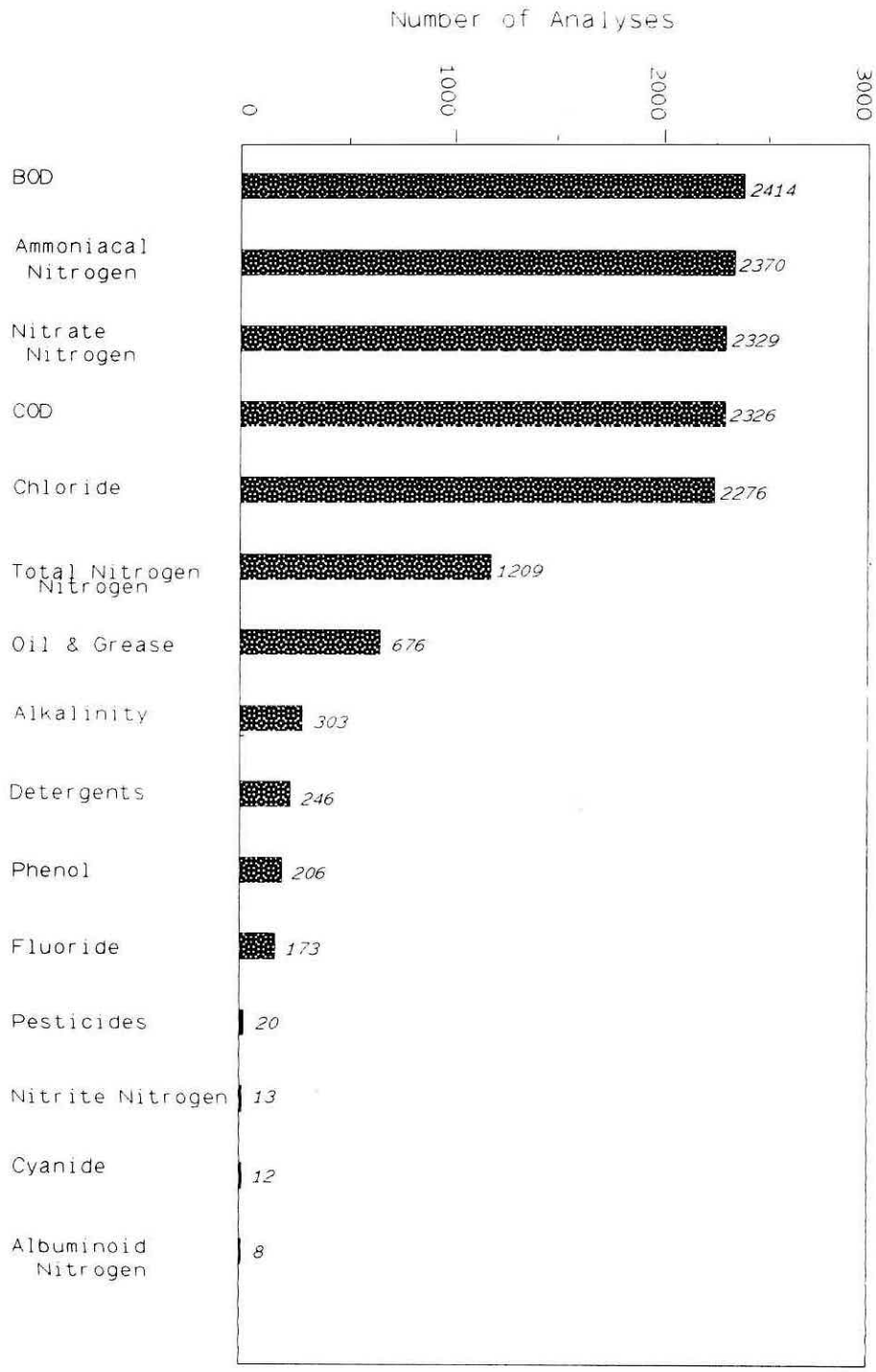

Figure 4.17c Malaysia: Number of Analyses for Physical, Biological and Chemical Parameters of the Monitored River Water, 1991.

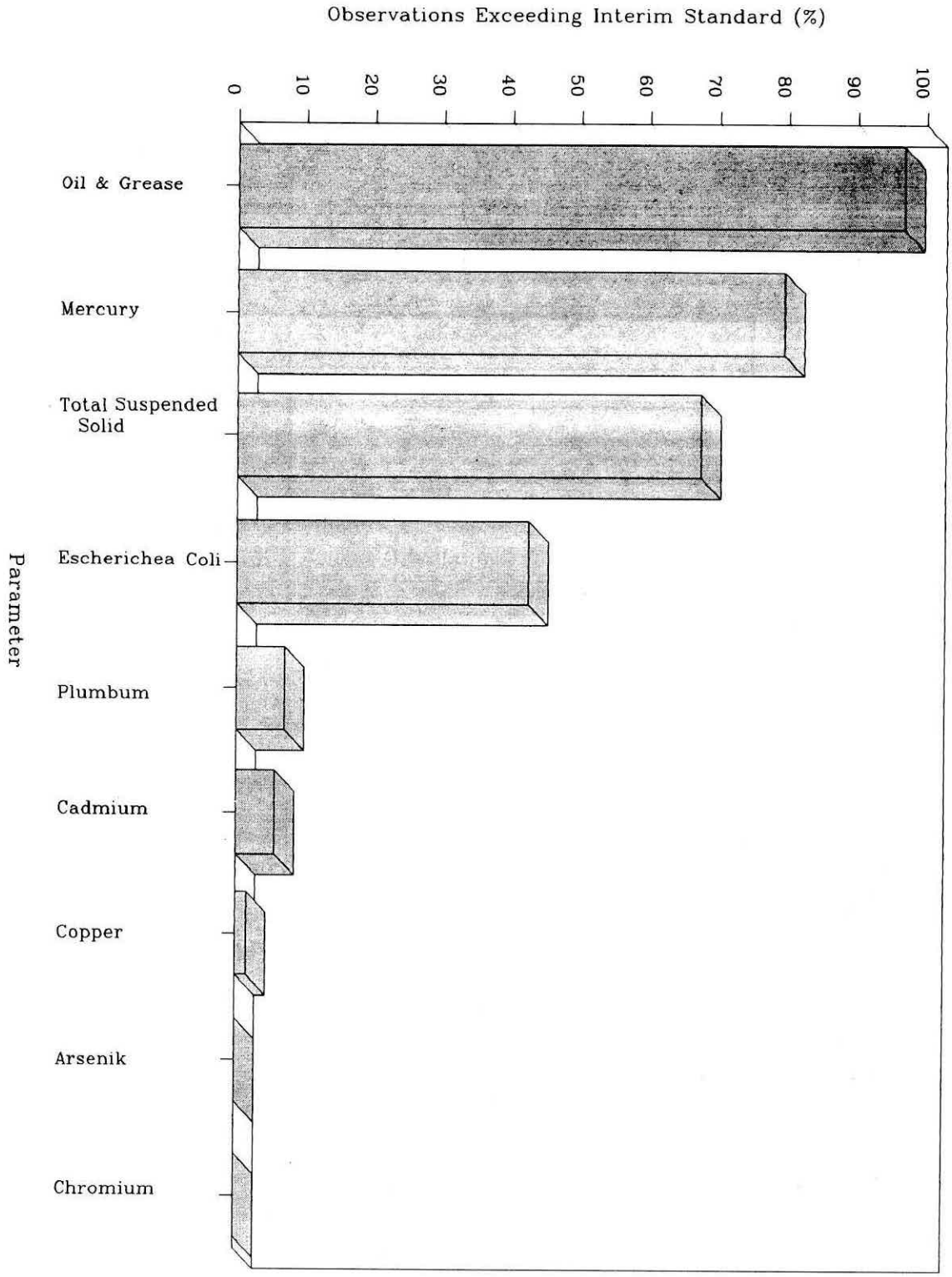

Figure 4.18 Malaysia: Status of Marine Water Quality, 199

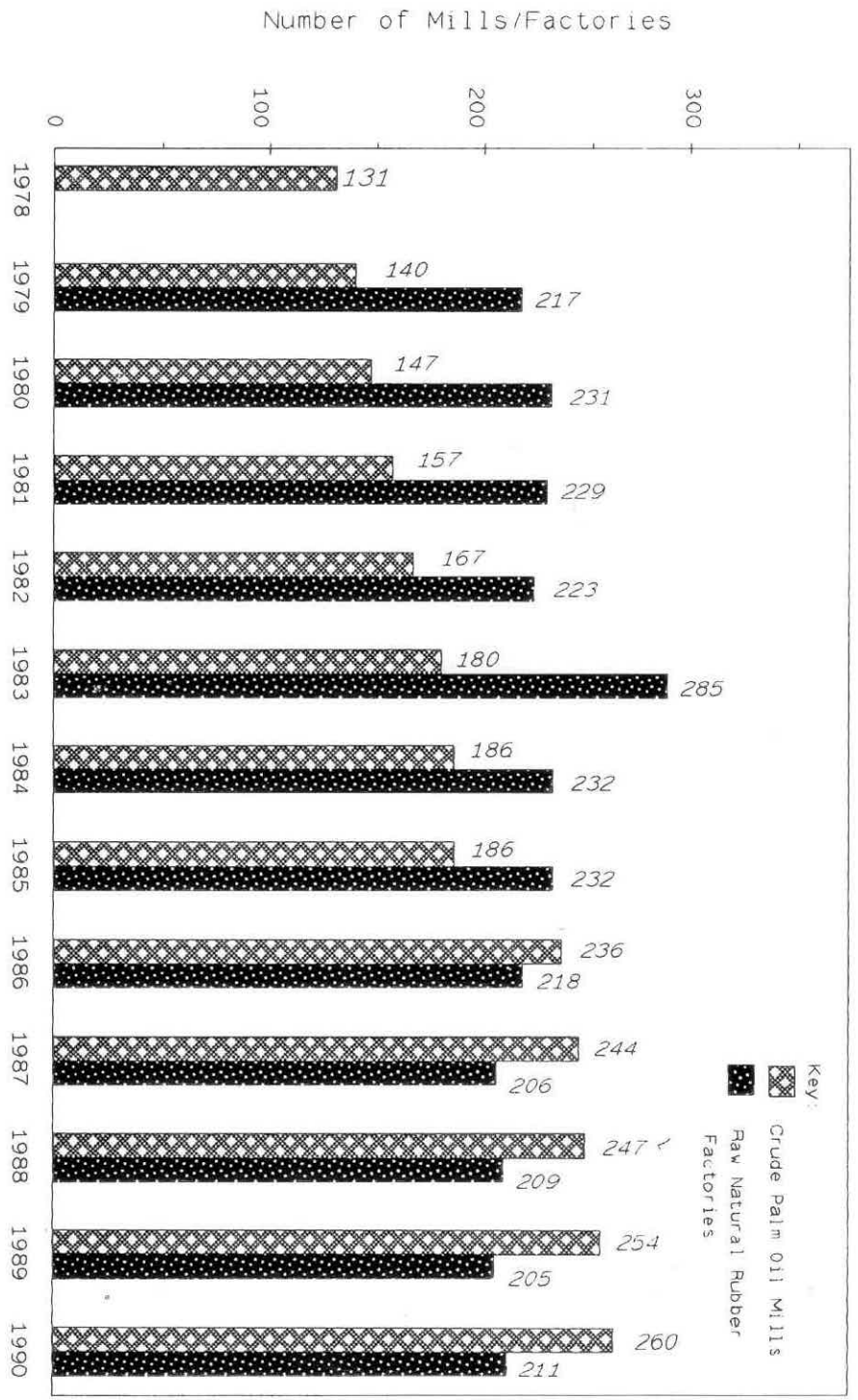

Figure 4.19 Malaysia: Total Number of Crude Palm Oil Mills and Raw Natural Rubber Factories, 1978–1990

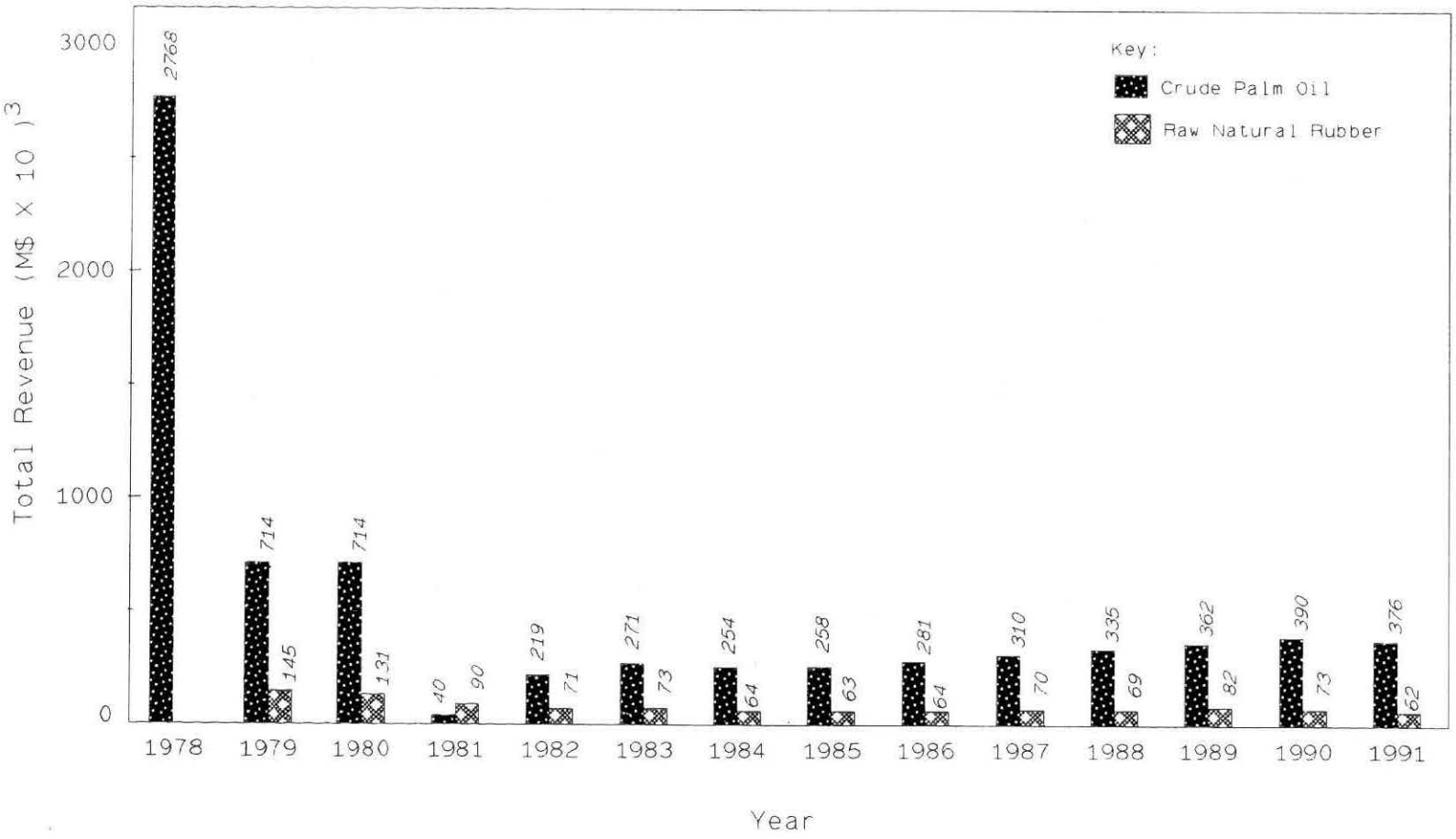

Figure 4.20 Malaysia: Total Revenue Collected in Licensing Crude Palm Oil and Raw Natural Rubber Industries, 1978–1991

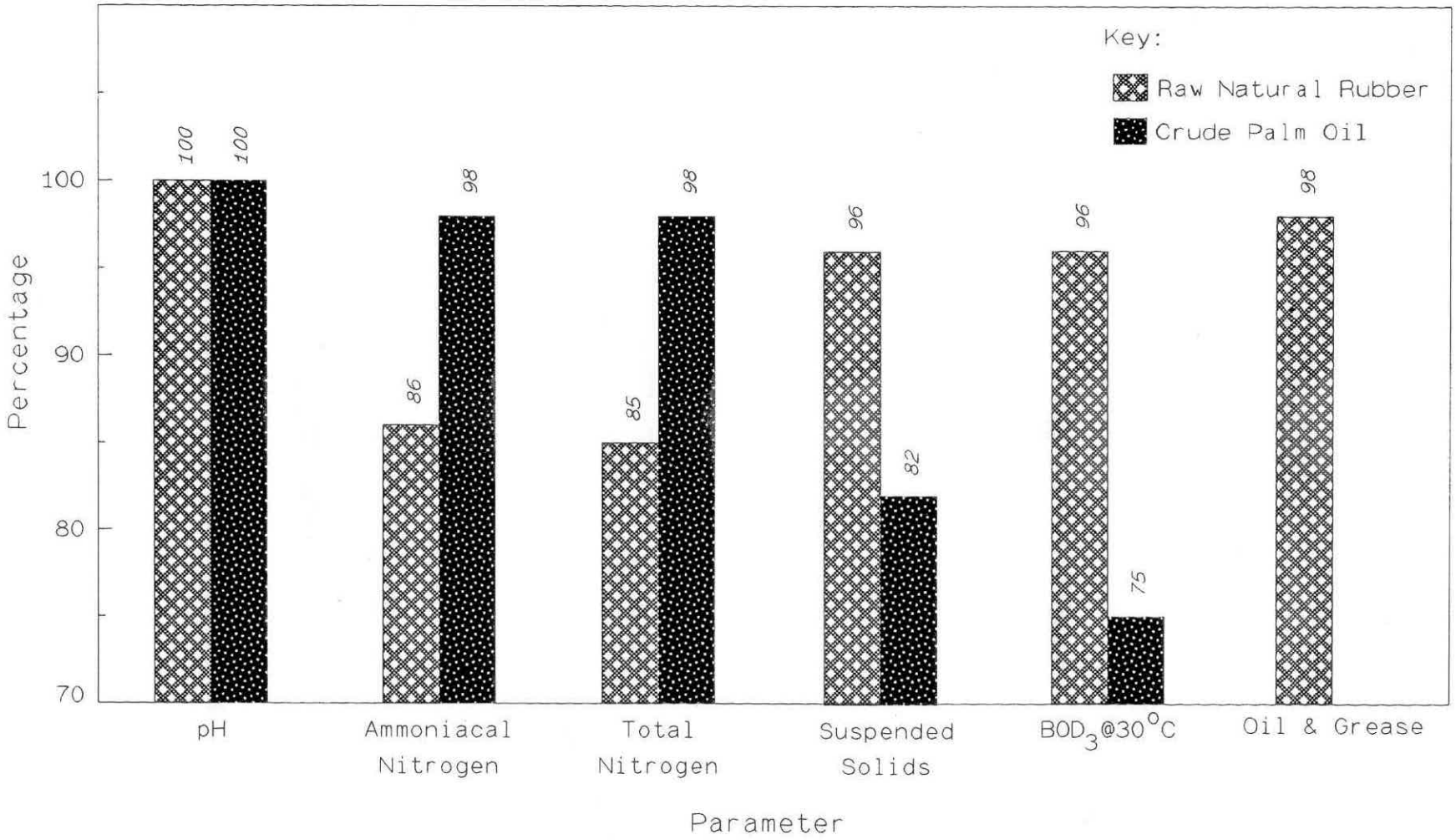

Figure 4.21 Malaysia: Status of Compliance of Palm Oil Mills and Raw Natural Rubber Factories by Parameter, 1991

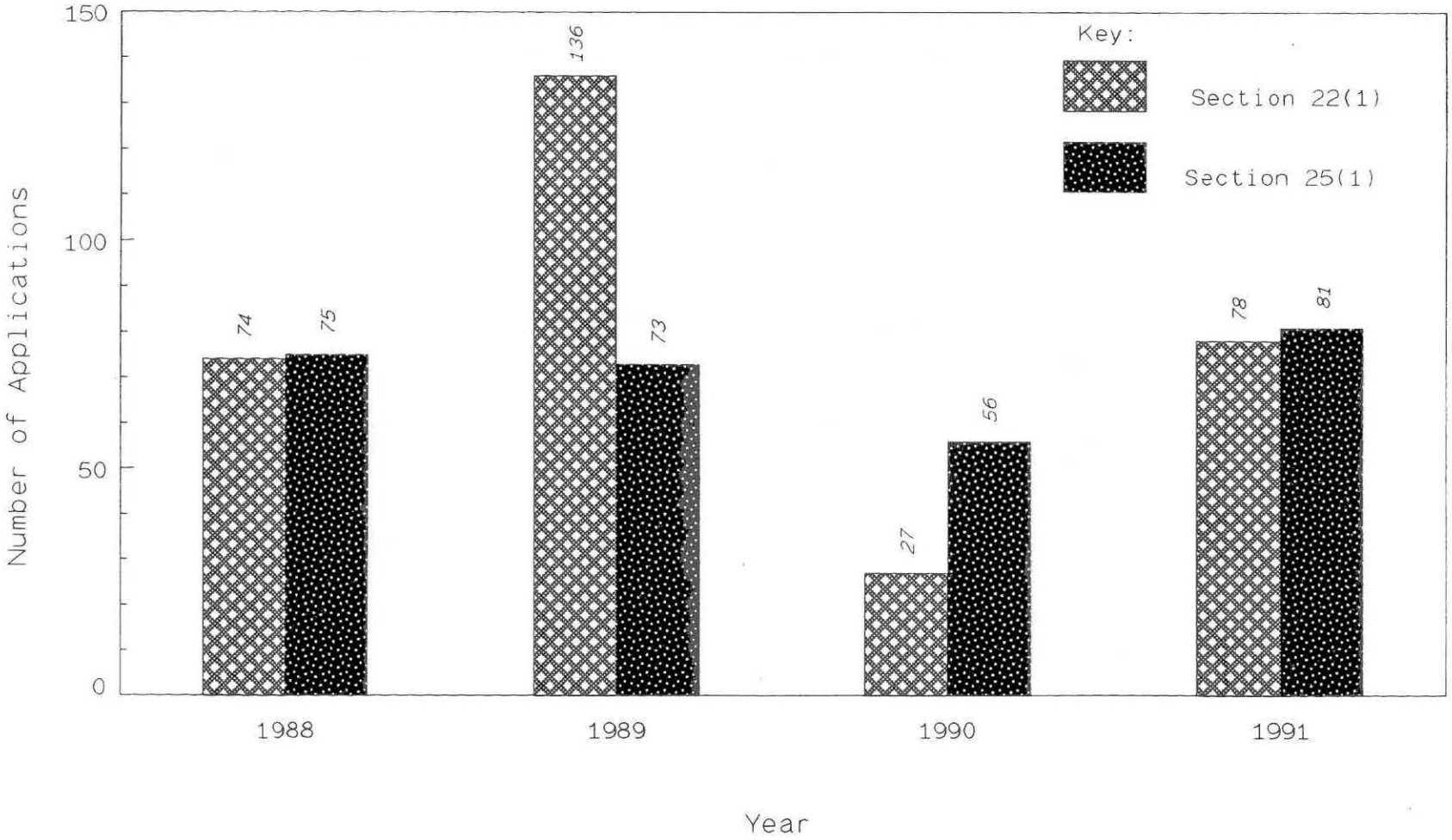

Figure 4.22 Malaysia: Number of Applications for Contravention Licences under Sections 22(1) and 25(1), Environmental Quality Act, 1974, 1988–1991

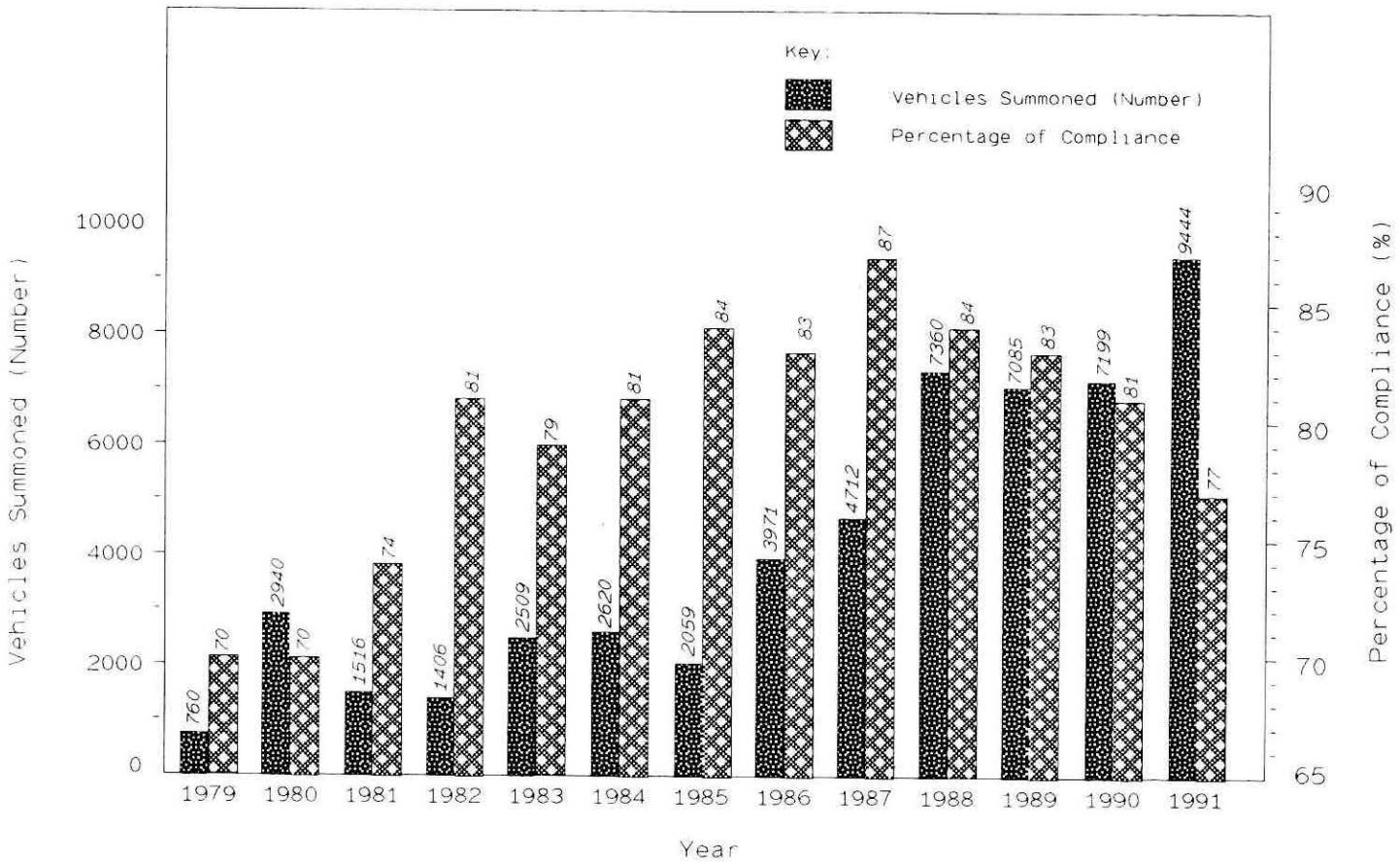

Figure 4.23 Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977. Vehicles Summoned and Percentage of Compliance, 1979 – 1991.

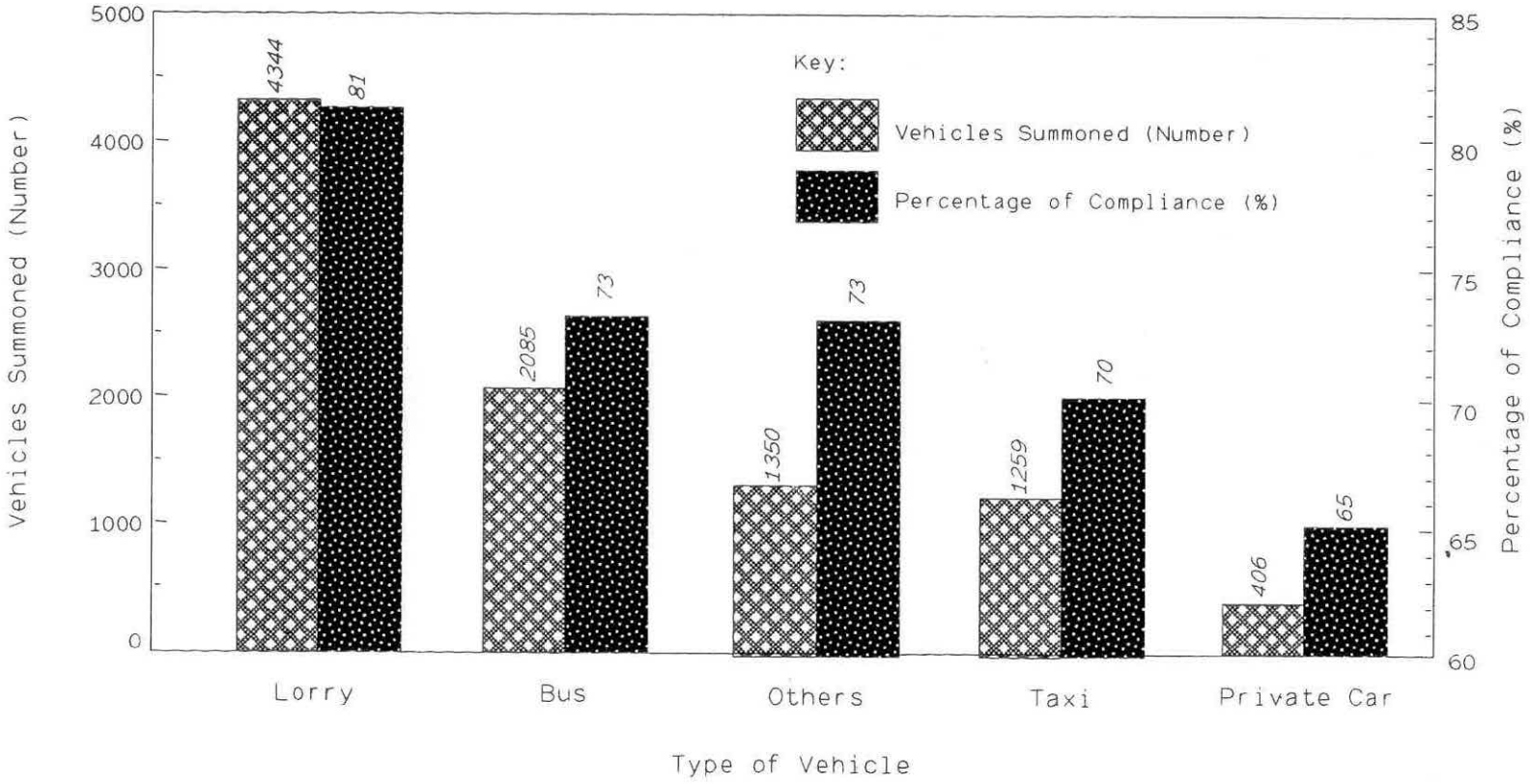

Figure 4.24 Malaysia: Enforcement of Motor Vehicles (Control of Smoke and Gas Emission) Rules 1977. Vehicles Summoned and Percentage of Compliance According to Type of Vehicle, 1991

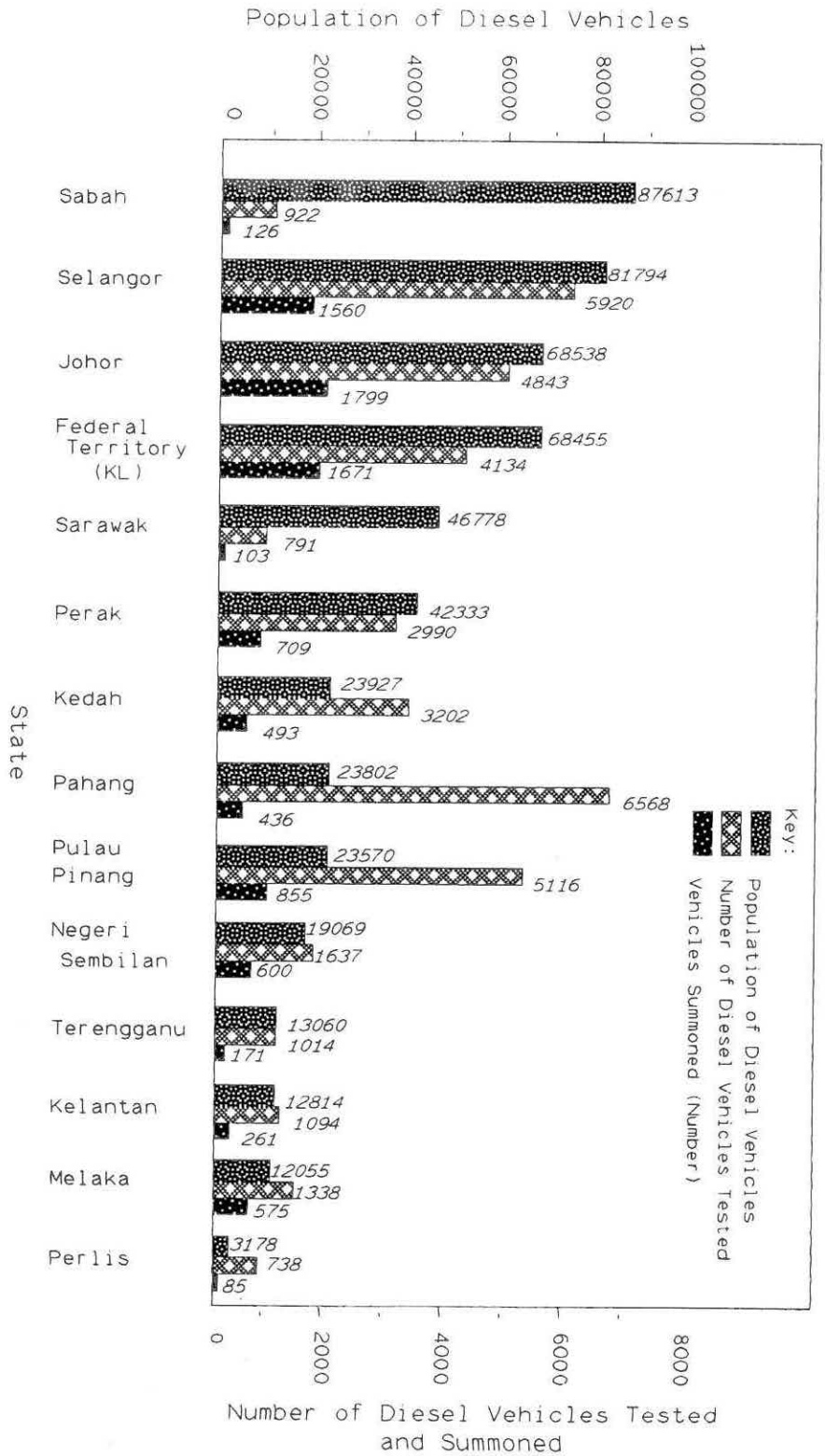

Figure 4.25 Malaysia: Diesel Powered Vehicles Inspected and Summoned For Excessive Smoke Emission by State, 1991.

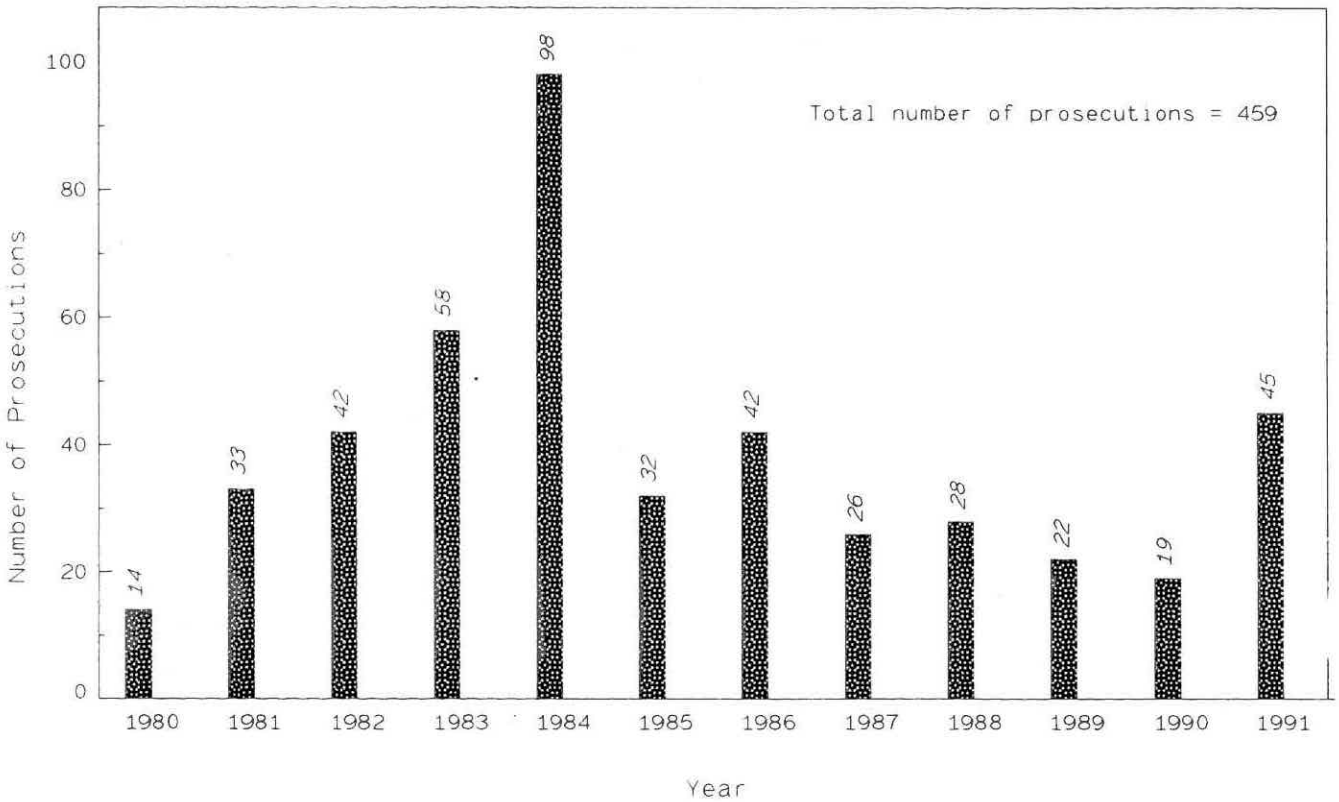

Figure 4.26 Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974 and the Environmental Quality (Clean Air) Regulations 1978 Number by Year, 1980–1991

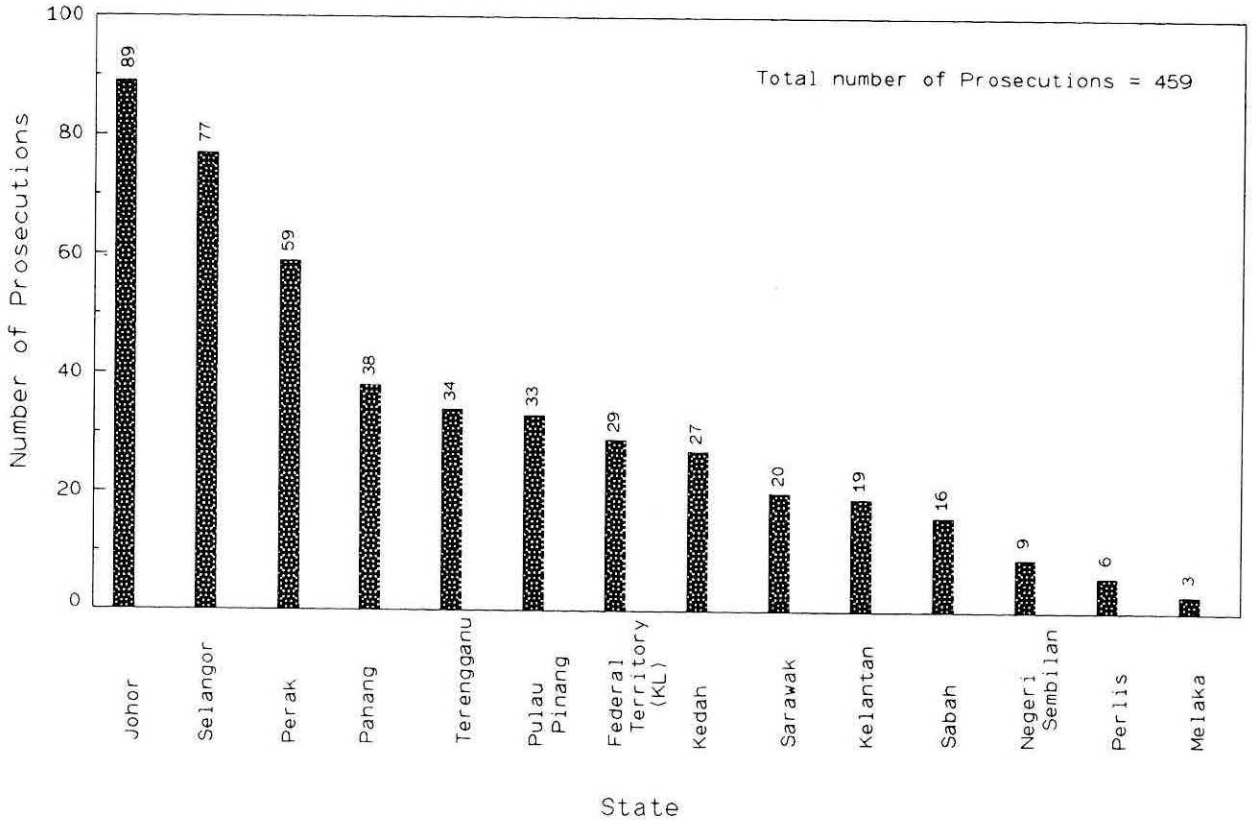

Figure 4.27 Malaysia: Offences Prosecuted under the Environmental Quality Act, 1974 and the Environmental Quality (Clean Air) Regulations, 1978. Number by State, 1980–1991

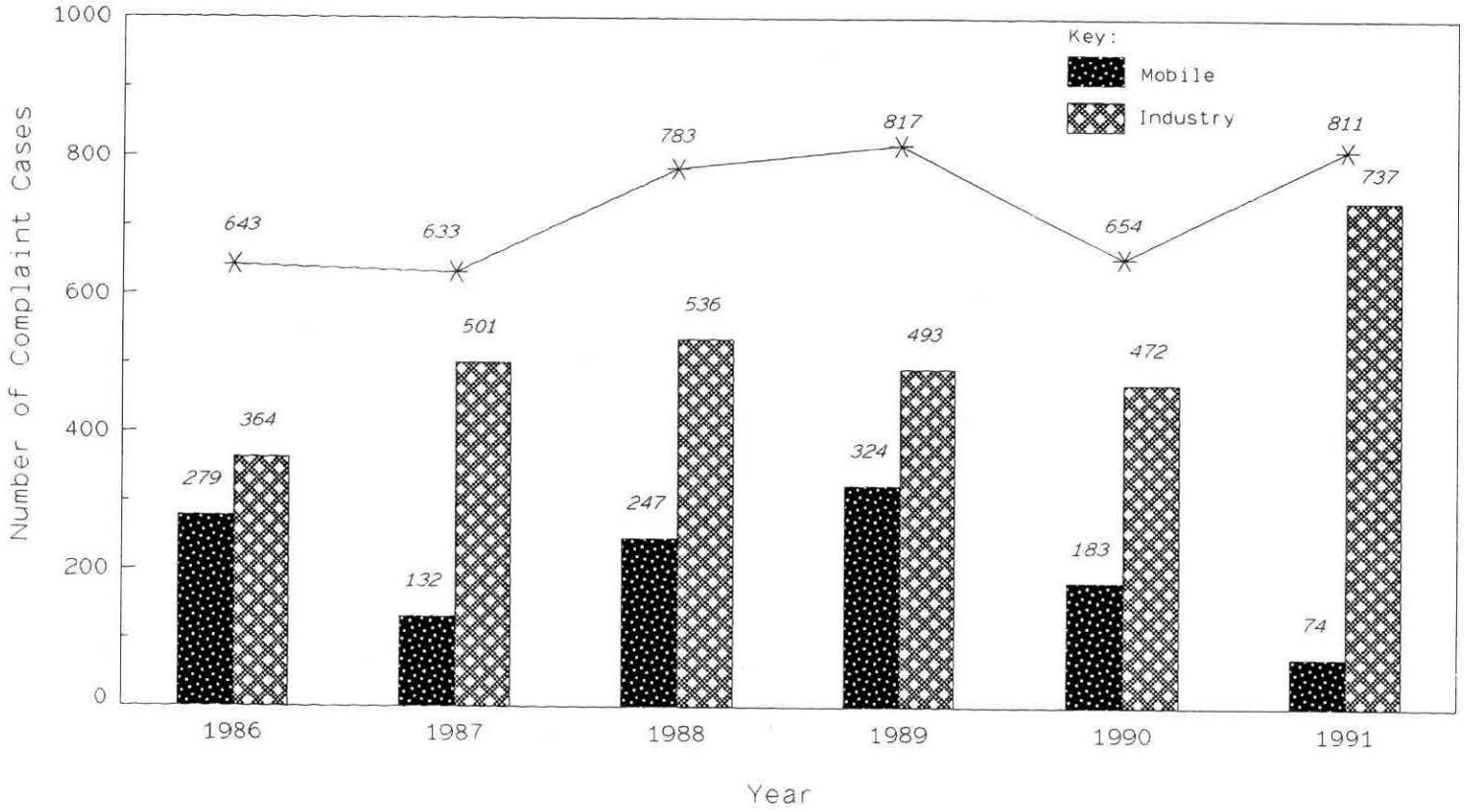

Figure 4.28 Malaysia: Trend in the Number of Complaint Cases Received by the Department of Environment, 1986–1991

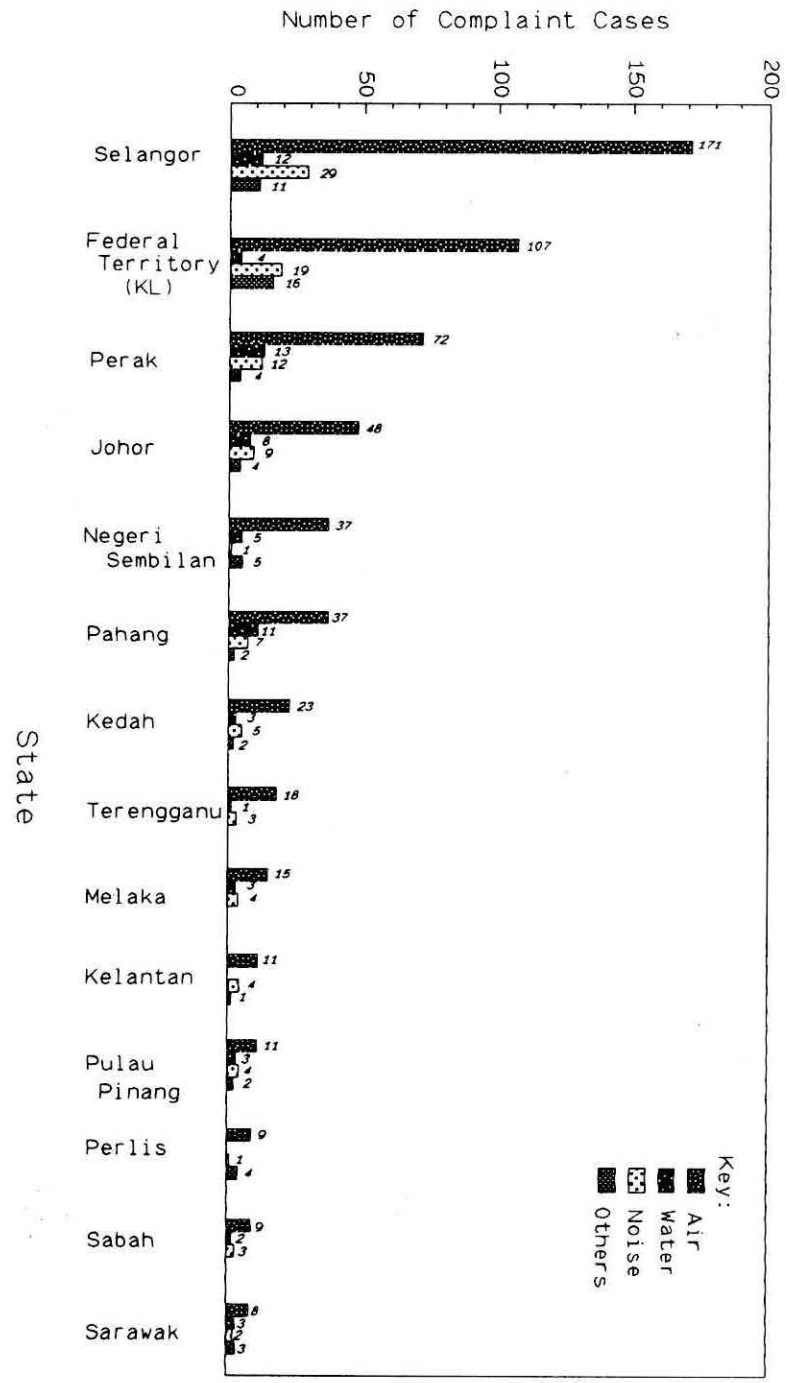

Figure 4.29 Malaysia: Nature of Pollution Complaints by State, 1991

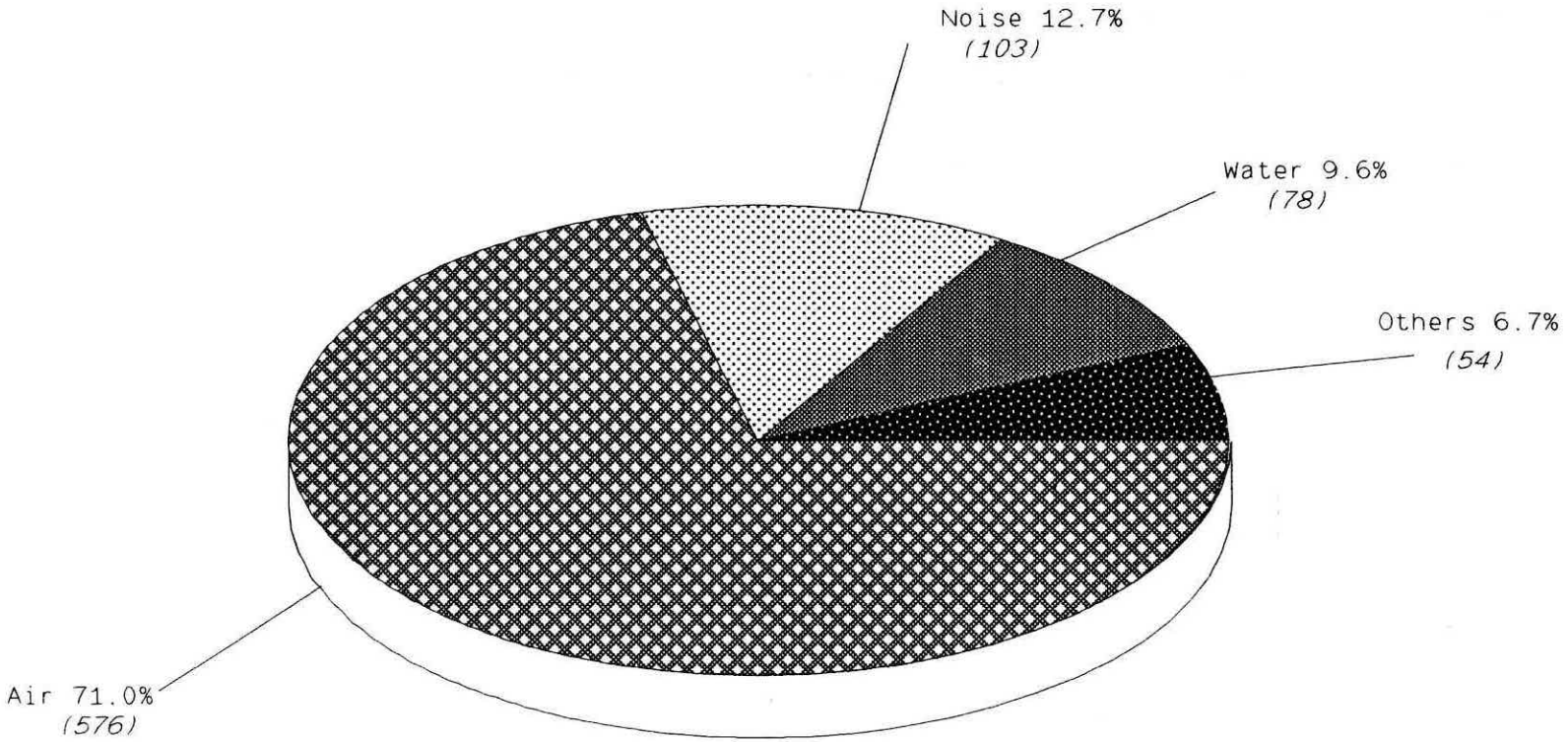

Figure 4.30 Malaysia: Nature of Complaints Received by Department of Environment, 1991

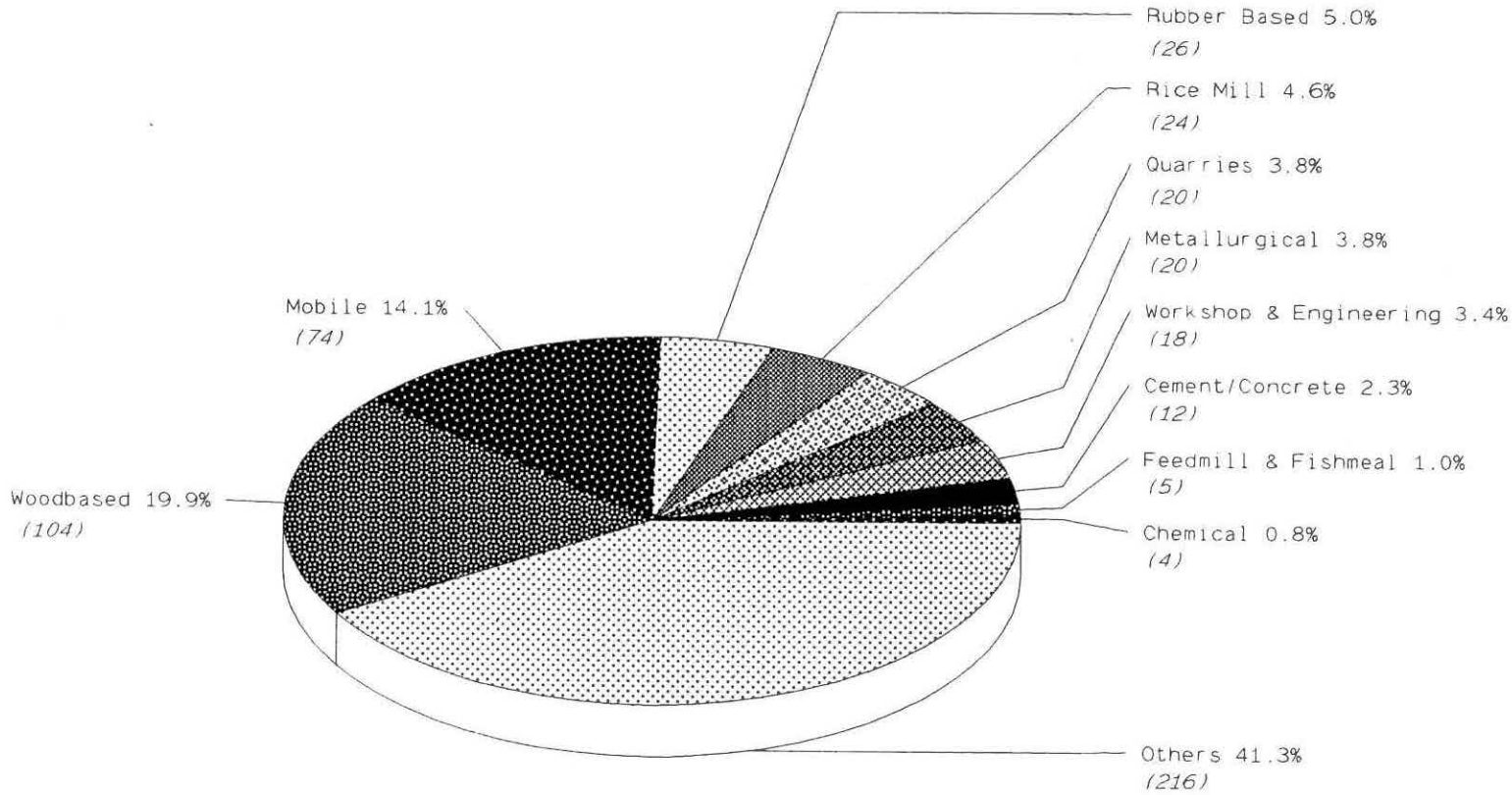

Figure 4.31 Malaysia: Sources of Air Pollution Complaints, 1991

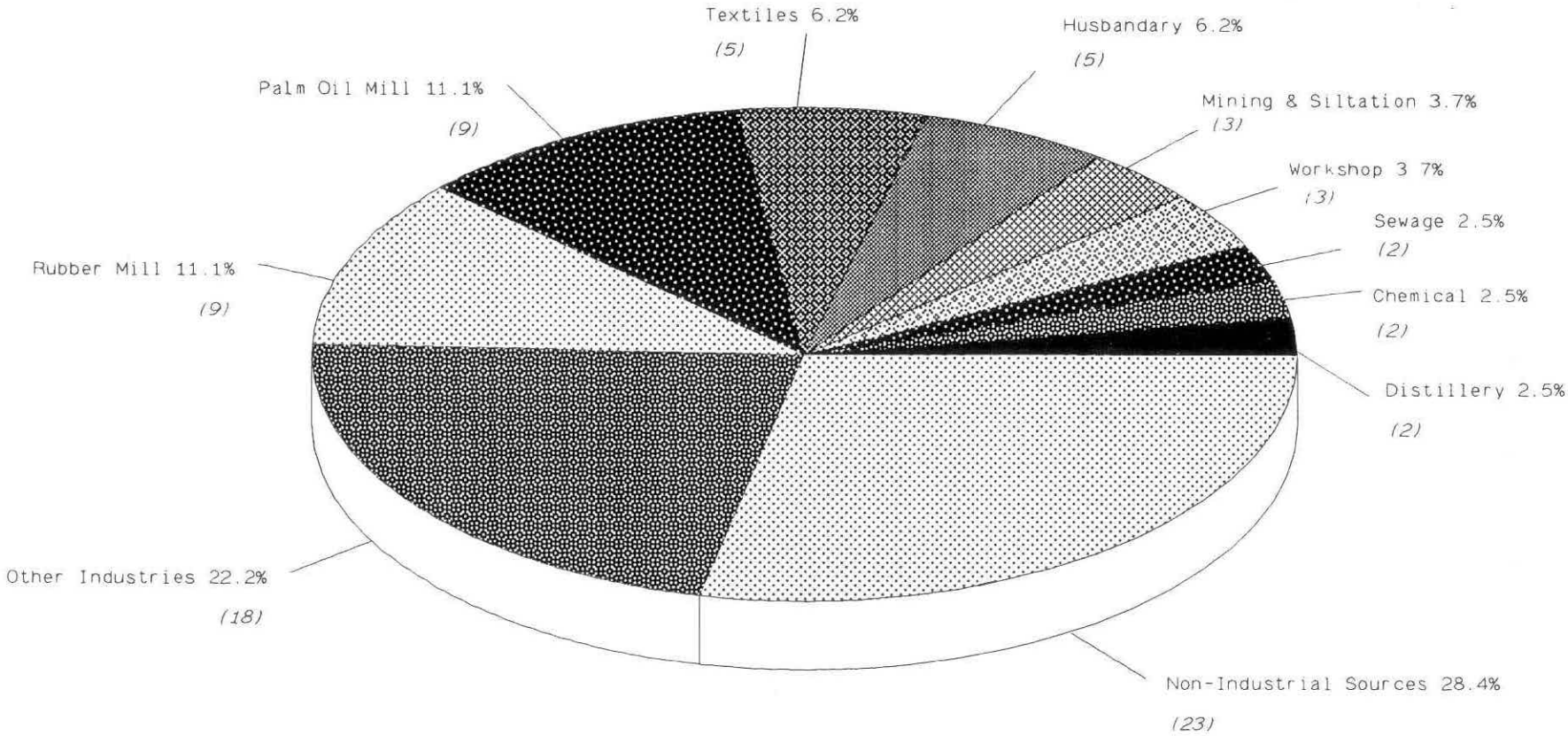

Figure 4.32 Malaysia: Sources of Water Pollution Complaints, 1991