SCHEDULED WASTES IN MALAYSIA ON A JOURNEY

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Dato' Hajah Rosnani Ibarahim

Director General
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Malaysia

"The past three decades have been a period of rapid growth for Malaysia and our manufacturing sector...However, a consequence of this impressive growth is the generation of toxic and hazardous wastes... To address the environmental and health problems associated with waste, strong and effective policies and strategies are needed."

Foreword

The past three decades have been a period of rapid growth for Malaysia and our manufacturing sector. With the emphasis on industrialisation, Malaysia has been producing large quantities of a wide variety of materials and products. However, a consequence of this impressive growth is the generation of toxic and hazardous wastes, or "scheduled wastes", which comprise one component of the complex waste issue facing the country. To address the environmental and health problems associated with waste, strong and effective policies and strategies are needed.

Hazardous wastes became an emerging issue in Malaysia 10 years after the Environmental Quality Act (EQA) was introduced in 1974. The waste crisis faced by the developed countries at that time showed that **uncontrolled disposal of hazardous wastes** was not only detrimental to public health and the environment but also demanded costly clean-up measures.

Malaysia's hazardous wastes management programme was formally launched in 1989. Since then, great strides have been made in implementing the programme and remarkable achievements have been chalked up. Today, Malaysia is proud to be ranked among the few developing countries that have a well-established waste management programme complete with a **fully integrated treatment and disposal facility for toxic and hazardous wastes.**

The management of scheduled wastes in Malaysia has been greatly strengthened by the enactment of legislation, namely **the Scheduled Wastes Regulations 1989** which were subsequently repealed and replaced by the Scheduled Wastes Regulations 2005. The enactment of these regulations has laid down a solid foundation for the Government to manage scheduled wastes based on **the "cradle-to-grave" principle**. It has also inspired confidence in both local and foreign investors to establish treatment, disposal and recovery facilities to support the implementation of a proper scheduled wastes management system in Malaysia.

This book provides an overview of the scheduled wastes management programme being carried out in Malaysia. Some of the legislation and international agreements related to the control of toxic and hazardous wastes that are already in place in Malaysia are also included.

Therefore, although intended primarily for officers of the Department of the Environment (DOE) to assist them in their professional work, this book will undoubtedly also interest the various players in the scheduled wastes management system: **the generators of scheduled wastes, transporters, facility operators and investors.** For members of the public who wish to gain insight into scheduled wastes management in our country, this book should prove useful.

Waste becomes a Menace

In the 1960s, as a young nation, Malaysia placed great emphasis on industrial growth to spur development of the country. As industrial growth began to take off, so did environmental awareness of the **wastes** generated by industrial production. The waste situation then was exacerbated by the lack of suitable and efficient facilities for handling and treating waste. The result was uncontrolled and indiscriminate waste disposal which very soon became a **serious threat** to **the ecosystem**.

Petaling Jaya dumping ground (1982)

Toxic and hazardous wastes may cause or significantly contribute to serious illness or death, and they can pose a substantial threat the environment when improperly managed. Some examples of scheduled wastes are **contaminated solvents, waste pesticides, heavy metal sludges, waste oils and inks, and waste residues from industrial operations** such as electroplating, battery manufacturing, smelting and refining of metals, and chemical production.

Top: At the Ulu Klang Dumping Ground, cardboard containers holding toxic sludges from the treatment of semiconductor effluent lie exposed. Sludge can be seen spilling out of several broken containers

Bottom: Spent mercury containing sludge and brine sludge chemically fixed in concrete are left exposed at the generator's premises while awaiting proper disposal

Such wastes are also by-products of industrial processes in the manufacture of consumer goods, for example, plastics, fabrics, paint, glues, electronic equipment, household appliances and toys. Hospitals, laboratories, clinics, offices and households also produce scheduled wastes like pathogenic and clinical wastes, discarded and expired drugs, chemicals, household cleaners and pesticides.

Untreated acids together with caustic and waste effluents from an aluminium anodising factory in Seberang Prai are discharged directly into a nearby creek, thus polluting it

These wastes usually have one or more of the following characteristics:

- Inflammable
- Corrosive
- Reactive
- Poisonous
- Infectious

As the waste created in the 1960s continued to increase, environmental concerns about the generation of toxic and hazardous wastes as well as the concomitant issues of waste collection, disposal and sound management quickly became matters of vital importance.

It was the United Nations Conference on Human Environment in 1972 that provided the impetus for the formulation of waste management legislation in Malaysia. On 14 March 1974, **the Environmental Quality Act 1974 (Act 127) was gazetted and it came into force on 15 April 1974**. With this act, environmental governance in Malaysia took on a structured form.

A federal enforcement agency known as Environment Division was established in 1975 under the Ministry of Housing and Local Government. The agency came under the Ministry of Science, Technology and the Environment in March 1976 and it was renamed Department of the Environment (DOE) in 1983. Today, DOE is part of the Ministry of Natural Resources and the Environment.

The main role of DOE is to prevent, control and abate pollution through the enforcement of legislation provided. The Department carries out its work through 15 State Offices and 25 Branch Offices.

Cement slurry being discharged into a watercourse at the edge of the Petaling Jaya Dumping Ground

(DOE) Headquarters 1975-1986
Mui Plaza, Kuala Lumpur

(DOE) Headquarters 1986-2001
Wisma Sime Darby, Kuala Lumpur

(DOE) Headquarters
2001-2006
Presint 1, Putrajaya

Department of the Environment (DOE) Headquarters in Presint 4 Putrajaya, 2010

A Quantum Leap

In 1979, faced with severe uncontrolled and indiscriminate waste disposal arising from more than a decade of industrial growth, DOE initiated the formulation of guidelines for the handling and disposal of toxic and hazardous wastes in the country.

One of the preliminary activities carried out by DOE was a survey of industrial premises to assess the extent and magnitude of toxic and hazardous wastes generated in Malaysia. A total of 900 questionnaires were sent out but the response rate was only 25 per cent. Even with this disappointing response, DOE was still able to draw up an initial inventory of the sources of toxic and hazardous wastes.

DOE staff carrying out sampling of oil spill at a coastal area

Another survey was conducted in 1981, this time with the co-operation of the Federation of Malaysian Manufacturers (FMM) and industry associations linked to it. FMM sent out questionnaires to its members requesting data on the type and quantity of waste generated by them. Again, the response was not encouraging with only 13 per cent (89) of FMM members responding.

However, by combining the information from these two surveys with factory inspections, discussions with waste disposal contractors and other information sources, for the first time ever, a national estimate of the quantity of toxic and hazardous wastes generated was derived.

With this data in hand, DOE was in a good position to begin preparing Policy Guidelines for the Collection, Treatment and Disposal of Toxic and Hazardous Wastes in Malaysia. The key tasks included:

- An assessment of the quantities and types of hazardous waste streams generated in the study areas at that time, and a review of the existing methods of treatment, collection and disposal;

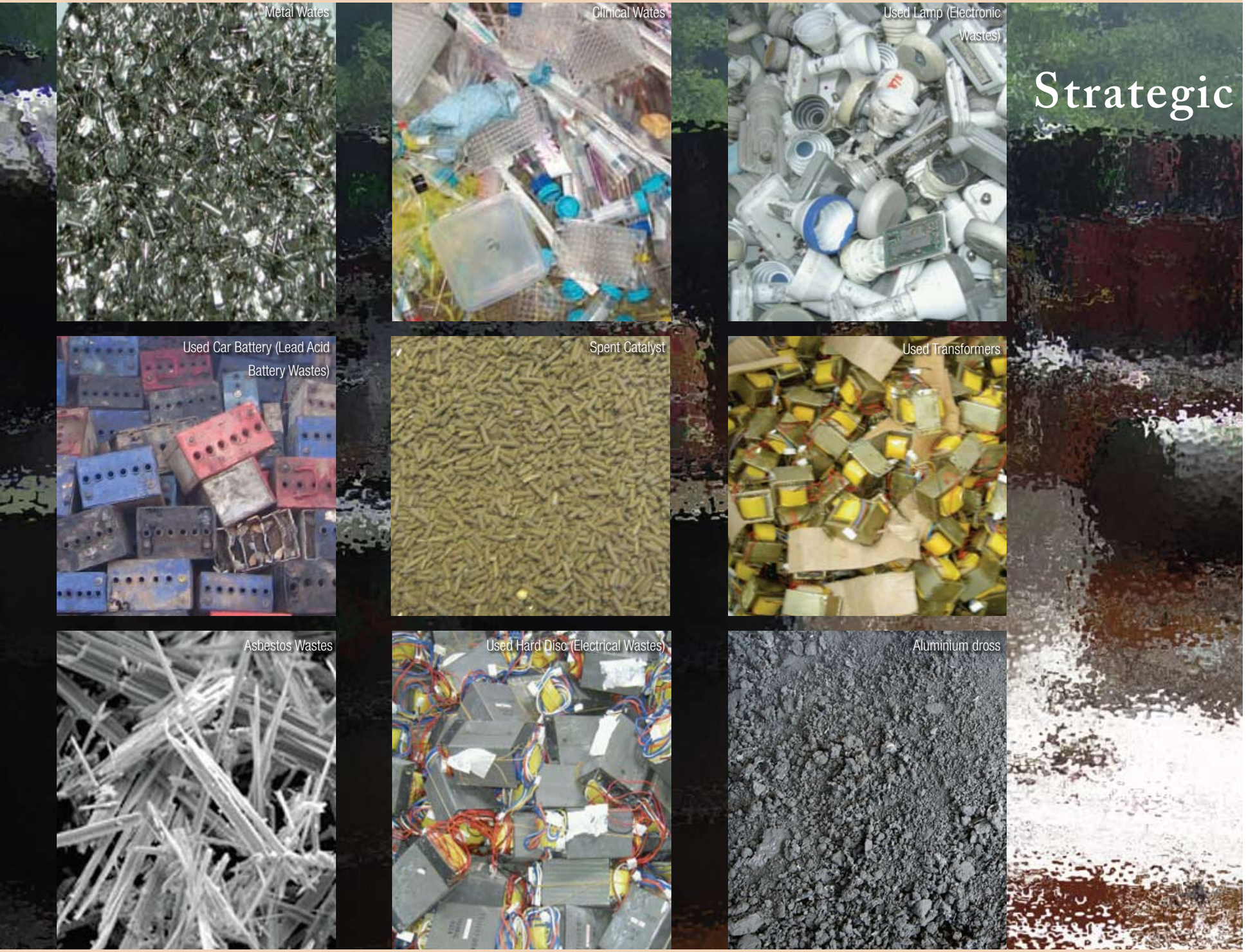
- Development of a national strategy for the treatment and disposal facilities in relation to major industrial centres, taking into account available local technology, regional economics and environmental impact; and

- A comprehensive study of standards, legislation, control and enforcement procedures, and management infrastructure that would be required to deal with the generation, storage, treatment and final disposal of wastes, based on the "cradle-to-grave" concept.

Top: Sampling of air emission

Bottom: Inspecting toxic and hazardous wastes stored at a generator's premises

The tasks were completed in March 1982. In April 1983, a national committee was set up to finalise the drafting of **the Policy Guidelines on the Handling, Storage, Transport and Disposal of Toxic and Hazardous Wastes**. These Policy Guidelines subsequently formed the basis for the formulation of specific regulations on toxic and hazardous wastes management.



Several types of hazardous wastes

Strategic Moves

In April 1984, DOE initiated yet another industrial survey using questionnaires seeking more specific information on wastes, but again the response was unsatisfactory. To complement this survey, DOE officers conducted site visits to verify the data obtained and to solicit essential information from the manufacturers that did not respond. From this survey, it was estimated that the total quantity of various types of toxic and hazardous wastes generated in the country was **280,000 cubic metres per annum**. The major waste generators identified were the metal finishing, electroplating, chemical, electronics, electrical, printing and packaging industries.

Construction of the incineration plant at the Integrated Toxic and Hazardous Wastes Facility at Bukit Nanas, Port Dickson, Negeri Sembilan, which was officially opened on 7 November 1998

Based on the information collated, DOE proposed a National Strategy for the Management of Toxic and Hazardous Wastes which included the following components:

(a) Disposal facilities consisting of the following:

- Secured landfill sites to receive toxic sludge produced by wastewater treatment plants installed within individual industrial premises and slag/ash residue from incineration plants;
- Incineration plants equipped with gas scrubbing facilities for certain categories of waste that require thermal destruction such as halogenated hydrocarbon solvents and pesticides;
- Physical-chemical treatment plants for liquid wastes containing heavy metals such as the wastes from the metal finishing industry; and
- Special storage compartments/areas for the temporary containment of toxic and hazardous wastes such as mercury, arsenic and polychlorinated biphenyl/triphenyl wastes.

(b) Collection and transportation of wastes from waste generating areas to disposal facilities, transfer stations and pre-treatment facilities.

The survey also highlighted that the facilities for toxic and hazardous wastes disposal existing in Malaysia at that time were not suitable for handling the type of waste identified as potentially hazardous or toxic. The disposal practices in use then were also unsatisfactory and posed long-term environmental hazards.

Toxic and hazardous wastes being transported safely in a prescribed conveyance

A related survey of domestic dumping sites showed that leachate controls were non-existent and it would have been impracticable to use them. Hence the disposal of toxic and hazardous wastes at these domestic dumping grounds was not recommended.

It was therefore proposed that environmentally-acceptable secured landfill sites be immediately established as disposal facilities. Subsequently, facilities to serve as centralised physical-chemical treatment plants for the treatment of inorganic wastes from small and medium-sized industries and incineration plants would also be established.

Legislative Provision

1984

In October 1984, DOE began drafting regulations for the management of toxic and hazardous wastes in Malaysia. Assisting DOE was a Danish consulting firm appointed under the ASEAN/EEC Scientific and Technological Co-operation Programme. The proposed regulations, which would apply to waste generators, waste contractors and waste disposal site operators, incorporated the following components:

- 'Notification' system to register all generators of toxic and hazardous wastes;
- 'Licensing' of contractors to handle, treat, store and transport toxic and hazardous wastes; and
- 'Licensing' of waste disposal site operators to carry out works relating to final disposal of toxic and hazardous wastes.

The toxic and hazardous wastes to be prescribed were broadly classified into three main categories, namely, "Waste Oil", "Chemical Wastes" and "Biological Wastes".

1985

Improvements to the draft regulations were made in 1985 and 1986 in response to comments received and detailed deliberations at various public and interagency forums.

The final draft of the proposed scheduled wastes regulations to control the generation, storage, treatment, transportation and disposal of toxic and hazardous wastes was completed in 1989. The regulations were as follows:

- **Environmental Quality (Scheduled Wastes) Regulations 1989**
- **Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations 1989**
- **Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989**

After they had been signed by the then Minister of Science, Technology and the Environment on 31 March 1989, the two Regulations and the Order were gazetted on 27 April 1989 and came into force on **1 May 1989**.

A sample of waste labels to be affixed to toxic and hazardous wastes containers

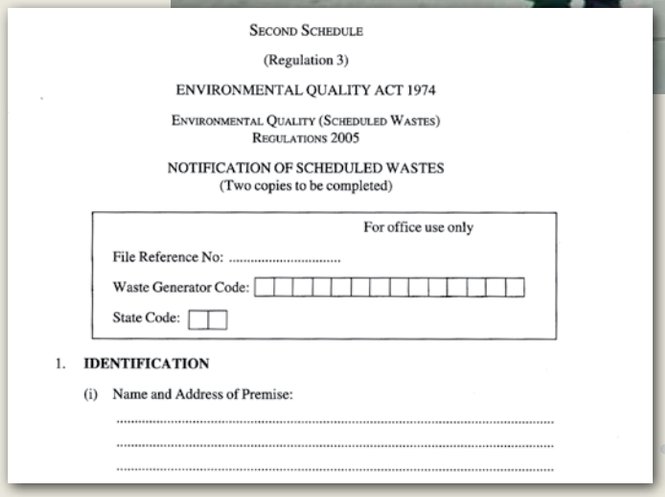
Top from left: explosive substances, oxidising substances and infectious substances

Bottom from left: spontaneously combustible substances, toxic substances and miscellaneous dangerous substances

In essence, the Environmental Quality (Scheduled Wastes) Regulations 1989 require waste generators to notify the Director General of the types and quantities of waste generated. The Regulations also allow disposal of wastes only at prescribed premises. Waste generators are responsible for the proper management of their own wastes as detailed in the Regulations. The scheduled wastes are listed in the First Schedule of the Regulations.

The Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations 1989 deal with operational procedures and licensing of facilities used for the recovery, treatment, storage and disposal of scheduled wastes. The facilities prescribed in this Order are as follows:

- Off-site storage facilities
- Off-site treatment facilities
- Off-site recovery facilities
- Scheduled wastes incinerators
- Land treatment facilities and
- Secured landfills



SECOND SCHEDULE

(Regulation 3)

ENVIRONMENTAL QUALITY ACT 1974

ENVIRONMENTAL QUALITY (SCHEDULED WASTES) REGULATIONS 2005

NOTIFICATION OF SCHEDULED WASTES
(Two copies to be completed)

For office use only

File Reference No: .....

Waste Generator Code: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

State Code: ☐☐

1. **IDENTIFICATION**

(i) Name and Address of Premise:

.....

.....

.....

However, it was envisaged that the enforcement of these regulations would not be effective without establishing a comprehensive facility for toxic and hazardous wastes management in Malaysia. Furthermore, the operational viability and design of this comprehensive facility required accurate and adequate information on waste types and quantities, which was then not available. Thus, in 1985, DOE conducted a more detailed survey with the following objectives:

- Identify generators or potential generators of toxic and hazardous wastes;
- Determine current methods of treatment and final disposal practices generally adopted by waste generators;
- Prepare a comprehensive inventory on the types and quantities of waste generated as an update on the information obtained in the 1981 survey; and
- Develop a preliminary plan and strategy for the treatment and disposal of toxic and hazardous wastes.

Top: A DOE officer inspecting a disposal facility to ensure the operator complies with all relevant regulations

Left: Notification form for generated scheduled wastes

Concurrently, DOE began the search for suitable sites for the disposal of toxic and hazardous wastes in the three major industrialised states of Selangor, Johor and Pulau Pinang. In each of these states, a state-level Site Selection Committee was established to identify suitable sites. The Committee comprised representatives from relevant government departments such as DOE, Land Office, Town and Country Planning Department, Geological Survey Department, State Water Authority, Health Department, Public Works Department and State Economic Planning Agency.

Construction work begins at the Integrated Toxic and Hazardous Wastes Facility

Between 1985 and 1991, DOE investigated a total of 91 sites. The work, which involved identification and evaluation of potential sites followed by negotiation with relevant parties, was complicated by **the "Not-Behind-My-Backyard" (Nimby) syndrome**. Finally on 15 March 1991, after several years of laborious work, DOE was able to obtain consent from the Negeri Sembilan State Government for the acquisition of a piece of land to construct the final disposal facility for toxic and hazardous wastes. This site is in Tanah Merah Estate in the Port Dickson District of Negeri Sembilan.

Feasibility Study on Infrastructure Development

1987

In 1987, with assistance from the U.S. Technical Assistance Program (TDP), DOE conducted a feasibility study on the proposed physical management of toxic and hazardous wastes in Malaysia. The study estimated that **380,000 cubic metres of toxic and hazardous wastes were generated annually** in Malaysia by industrial, commercial and research activities. This estimate included the large volume of untreated wastewater. In addition, it was estimated that 600,000 containers of various sizes containing residues of toxic and hazardous wastes had to be disposed of annually.

These new estimates indicated a substantial increase in the total volume of wastes generated in the two years between 1985 and 1987.

Based on the projected quantities of wastes that would be generated, the study recommended the establishment and operation of the following facilities:

- An incinerator with sufficient capacity to incinerate about 13,500 cubic metres per year of incinerable wastes;
- A physical-chemical system consisting of oxidation/ reduction reactors, pH adjustment units, precipitation and separation units to treat about 50,000 cubic metres per year of inorganic liquids; and
- Secured landfills to cater for about 200,000 cubic metres of landfillable wastes per year.

Based on the types, quantities and distribution of waste generators, two possible options were examined. They were:

Option 1

A centralised treatment and disposal facility in Selangor consisting of an incineration plant, a physical-chemical treatment system, a stabilisation plant and a secured landfill to cater for all types of waste in Peninsular Malaysia.

Aerial view of storage facility at the Integrated Toxic and Hazardous Wastes Facility

Installation of liners at a secured landfill

Option 2

A regional treatment and disposal facility consisting of an incineration plant, a physical-chemical treatment system, a stabilisation plant and a secured landfill in Selangor as well as stabilisation facilities and secured landfills in Penang and Terengganu.

The Selangor facility would cater for all incinerable wastes and liquid inorganic wastes in Peninsular Malaysia, while the landfills in Selangor, Penang and Terengganu would cater for their own landfillable wastes as well as that from neighbouring states.

In November 1988, the Government of Malaysia decided that private equity investment would be invited for the construction of centralised facilities for the collection, storage, treatment and disposal of toxic and hazardous wastes in the country. The decision was based on the findings and recommendations of the DOE feasibility study and information from the surveys conducted.

Aerial view of the Integrated Toxic and Hazardous Wastes Facility at Bukit Nanas, Port Dickson, Negeri Sembilan

Milestones

1992 - 1998

On 8 January 1992, the Government awarded a consortium led by I. Kruger Engineering NS, Denmark the right to proceed with the proposal to design, finance, build and operate a fully integrated system in Malaysia for the collection, transport, treatment and disposal of scheduled wastes. Members of the consortium included United Engineers Malaysia Berhad and Arab-Malaysian Development Berhad. The consortium registered a company called **Kualiti Alam Sdn Bhd (KASB)** and was awarded the exclusive right to implement and operate the integrated facility for 15 years.

The concession agreement between KASB and the Government of Malaysia was signed on 18 December 1995. This marked a major milestone in the quest to promote systematic and environmentally sound management of wastes in Malaysia.

The agreement specified that the Integrated Scheduled Wastes Treatment and Disposal Facility would be located at Bukit Nanas, Port Dickson, Negeri Sembilan. The facility would be designed to cope with all categories of toxic and hazardous wastes except radioactive, explosive and clinical wastes.

A section of the Integrated Scheduled Wastes Treatment and Disposal Facility

The Integrated Scheduled Wastes Treatment and Disposal Facility to be operated by KASB (which named the facility Waste Management Centre) would consist of the following facilities:

• Solidification	120,000 tons per year
• Physical-Chemical Treatment	10,000 tons per year
• Secured Landfill	177,000 tons per year
• Incinerator	30,000 tons per year

Notwithstanding the establishment of these facilities, the Government would continue to allow the operation of the following:

- On-site facilities for environmentally sound treatment of scheduled wastes by physical and chemical treatment, solidification, pre-treatment, recovery and recycling, incineration and other thermal processes;
- Existing on-site and off-site secured landfills already licensed by DOE before the date of this Agreement;
- Centralised wastewater treatment plants situated in industrial parks and approved by the Government for the purpose of treating wastewater from premises located within that particular industrial park;

Wastewater treatment plant

- Off-site facilities for the pre-treatment, recovery or recycling of scheduled wastes; and
- Collection and transportation of wastes for the purposes of treatment on-site or at centralised wastewater treatment plants within industrial parks, disposal at existing licensed secured landfills and recovery.

A detailed environmental impact assessment (EIA) of the site where the Integrated Scheduled Wastes Treatment and Disposal Facility was to be located had commenced in May 1991. While the EIA was underway, dialogue sessions with the relevant Negeri Sembilan State Authorities were held to clarify various issues associated with the project and to secure support for it. The detailed EIA report of the project was finally approved by DOE on 26 August 1993 and on 29 October 1993 the Negeri Sembilan State Government gave its final consent to the project. Construction of the facility started in mid-1994 and it was due to be completed by the end of 1997. The facility was expected to collect and store wastes by the middle of 1995 so as to alleviate the then increasing problem of storage space at the premises of the waste generators.

Construction of the Integrated Scheduled Wastes Treatment and Disposal Facility at Bukit Nanas, Negeri Sembilan progressed satisfactorily. The newly established waste stabilisation plant started its test-run in the third quarter of 1997 and was licensed to operate by the end of that year. By 31 December 1997, 52,000 tonnes of scheduled wastes had been sent to the Integrated Scheduled Wastes Treatment and Disposal Facility.

The assessment, review, approval and supervision of implementation of the facility were carried out by DOE with support and technical assistance from the Danish Commission on Environment & Development (DANCED).

Construction of the physical-chemical treatment plant and the scheduled wastes incinerator at the Integrated Scheduled Wastes Treatment and Disposal Facility began in 1997.

The Integrated Scheduled Wastes Treatment and Disposal Facility at Bukit Nanas, Port Dickson, Negeri Sembilan was officially opened on 7 November 1998 by Tun Dr. Mahathir Mohamad, then Prime Minister of Malaysia. After his official address, Tun (first row, centre) proceeds to an inspection of the facility (left) and is invited to sign the Visitors Book (top)

Historical Event

The Scheduled Wastes Integrated Treatment and Disposal Facility was finally completed in June 1998 and ready to accept all types of scheduled wastes generated by Malaysian industries, except for explosives, and radioactive and clinical wastes. **On 7 November 1998, Tun Dr. Mahathir Mohamad, then the Prime Minister of Malaysia, officiated at the opening of this state-of-the-art facility for the management of toxic and hazardous wastes – the first in the region.**

In his official address, Tun Dr. Mahathir advised industries and businesses to properly manage their wastes in order to protect their workers, the public and the environment from undue harm and pollution. He also reminded KASB, the operator of the facility, to maintain professionalism when providing services to its clients and to place great emphasis on running an efficient and competent operation.

The Scheduled Wastes Integrated Treatment and Disposal Facility is an important achievement in the Malaysian hazardous wastes management programme. With the facility in operation, the management of scheduled wastes has entered a new phase, one where there is assurance that such wastes will be collected, treated and disposed of in a proper and safe manner.

Transboundary Agreement

Implementation of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989

In the 1970s, as developed countries began to introduce more stringent environmental laws, transboundary movement of hazardous wastes began to grow.

There was ample evidence to show that developing countries were the targets for illegal dumping of hazardous wastes by a few waste generators in industrialised countries. This practice enabled the waste generators to avoid paying the higher cost of managing such wastes in their own countries where environmental standards are higher and disposal sites have become scarce.

Bags of oil tanker sludges from tanker cleaning activities awaiting proper disposal

The Basel Convention was born out of the need to protect countries, especially the developing ones, against the adverse impact of **uncontrolled transboundary movements of hazardous wastes.**

Realising the benefits that could be gained, **Malaysia on 8 October 1993 acceded** to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, 1989. This was facilitated by amending the Customs (Prohibition of Import) Order 1988 and Customs (Prohibition of Export) Order 1988 under the Customs Act 1967 to include a list of wastes to be controlled as stipulated in the Basel Convention. The Convention came into force in Malaysia on 6 January 1994.

Malaysian delegates at the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

The Basel Convention prescribes that

(i) All exports of hazardous wastes from Organisation for Economic Co-operation Development (OECD) to non-OECD countries for final disposal would be banned immediately;

(ii) All exports of hazardous wastes from OECD to non-OECD countries for recovery operations would be gradually reduced and totally stopped by 31 December 1997;

(iii) Non-OECD countries which allow the import of hazardous waste from OECD countries for recovery purposes until 31 December 1997 should inform the Convention Secretariat on the categories, quantities, recovery process and final disposal methods of the residues arising from such operations;

(iv) A signatory State cannot send hazardous wastes to another signatory State that bans import of such wastes;

(v) A signatory State cannot ship hazardous wastes to any non-signatory country;

(vi) Every country has the sovereign right to refuse a shipment of toxic and hazardous wastes;

(vii) Before an exporting country can start shipment of its wastes, it must obtain the importing country's consent in writing. The exporting country must first provide detailed information on the intended export to the importing country to allow the latter to assess the risks involved;

(viii) No signatory State may ship hazardous wastes to another signatory State if the importing country does not have the facilities to dispose of the wastes in an environmentally sound manner;

(ix) When an importing country proves unable to dispose of legally imported wastes in an environmentally acceptable way, then the exporting State has a duty to either take back the wastes or find some other ways of disposing of them in an environmentally sound manner;

(x) The Convention states that illegal traffic in hazardous wastes is criminal;

(xi) Shipments of hazardous wastes must be packaged, labelled and transported in conformity with generally accepted and recognised international rules and standards;

(xii) Bilateral agreements may be made by signatory States with each other and with a non-signatory country, but these agreements must conform to the terms of the Basel Convention and be no less environmentally sound;

The Fourth Meeting of the Conference of the Parties (COP4) to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989 was held in Kuching, Sarawak

Top: Dato Law Hieng Ding, then Minister of Science, Technology and Environment officiating at the conference

(xiii) Since the authorities of many countries especially developing ones frequently do not have trained specialists and the technical know-how to assess information concerning hazardous wastes and to handle them efficiently, the Convention calls for international co-operation involving, inter alia, the training of technicians, the exchange of information and the transfer of technology;

(xiv) The Convention sets up a Secretariat to supervise and facilitate the implementation of the Basel Convention; and

(xv) The Convention stipulates that less hazardous waste be generated and what is generated to be disposed of as close to its source as possible.

In February 1998, Malaysia hosted the Fourth Meeting of the Conference of Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989, in Kuching, Sarawak. Malaysia also became the President of the Parties for the duration of two years. **This was regarded as an international recognition of the many years of effort by Malaysia to manage hazardous wastes efficiently and effectively.**

Proactive Approach

Environmental Quality (Scheduled Wastes) Regulations 2005

Over the 15 years that the Scheduled Wastes Regulations, 1989 were enforced, several shortcomings in the legislation were noted. Consequently, a comprehensive review of the regulations was carried out. The revised regulations known as **the Environmental Quality (Scheduled Wastes) Regulations 2005 were enacted and came into force on 15 August 2005.** With the enforcement of the 2005 Regulations, the Environmental Quality (Scheduled Wastes) Regulations 1989 were revoked.

Some of the major changes incorporated into the 2005 Regulations are waste categorisation based on waste type and not the source or origin of waste as was required by the 1989 Regulations; new provisions for special wastes management; limiting the amount and duration of storage of wastes; recovery of hazardous wastes; the requirement of

Partial recovery of toxic and hazardous wastes at a facility in Malaysia

conducting training for persons handling hazardous waste; and improvement in labelling requirements.

Under the 2005 Regulations, scheduled wastes are categorised into five groups:

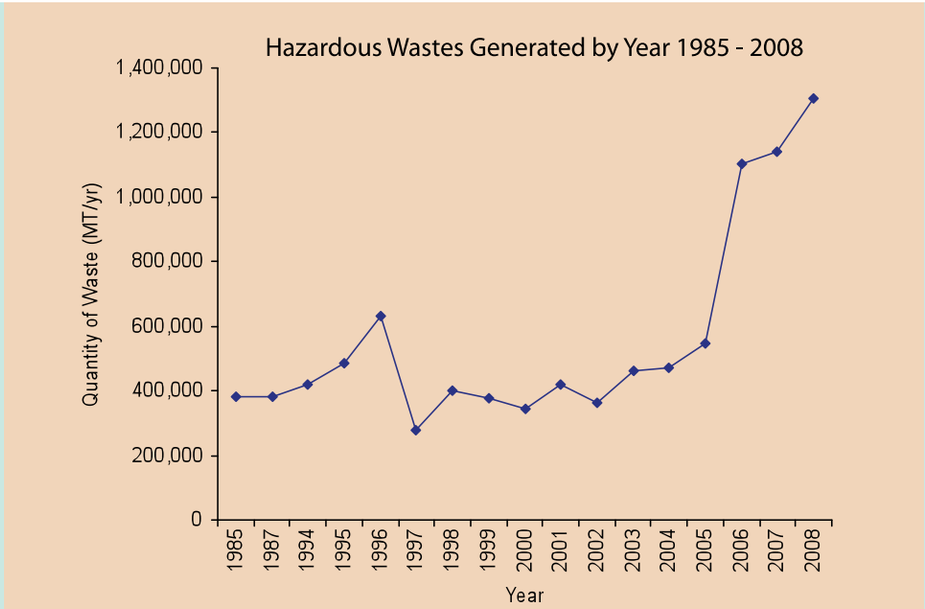
- Metal and metal-bearing wastes;
- Wastes containing principally inorganic constituents which may contain metals or organic materials;
- Wastes containing principally organic constituents which may contain metals and inorganic materials;
- Wastes which may contain either inorganic or organic constituents; and
- Other wastes.

The 2005 Regulations prescribe a list of 77 categories of toxic and hazardous wastes. This list was finalised after reviewing hazardous waste categories from other countries as well as those prescribed under the Basel Convention on the Transboundary Movements of Hazardous Wastes and their Disposal, 1989. Four categories of waste that were in the 1989 Regulations have been excluded from the new list. They are effluents from rubber factory, effluents from textile industry, leachate from landfills and slag from the iron and steel industry.

The 2005 Regulations include 10 new waste categories. They are **galvanic sludge, leaching residue from zinc processing, electrical and electronic waste, waste gypsum, waste of organic phosphorus compound, wastes containing dioxin or furans, discarded chemicals, obsolete laboratory chemicals, wastes containing peroxides, and residues from treatment of scheduled wastes.**

Also, under the 2005 Regulations, scheduled waste generators may store wastes for up to **180 days after generation** provided that the quantity of scheduled wastes accumulated on site shall not exceed **20 tonnes**.

Regulation 7 of the 2005 Regulations states that waste generators may apply in writing to have the scheduled wastes generated from their facilities or processes excluded from treatment, disposal or recovery at the prescribed premises. The application shall include submission of documentary evidence that the wastes do not exhibit any hazardous characteristics in terms of corrosiveness, ignitability, reactivity and toxicity and do not have hazardous effects on human or other life forms.



Hazardous Wastes Generated by Year 1985 – 2008

FACILITY	TONNES/YEAR	PERCENTAGE (%)
On-site Storage	24,618.23	1.90
Local Off-site Recovery Facilities	624,361.12	48.07
On-site Treatment	484,747.54	37.32
Kualiti Alam Sdn. Bhd.	137,371.50	10.58
Off-site Clinical Waste Incinerators	14,140.05	1.09
Trinekens (Sarawak) Sdn. Bhd.	13,490.33	1.04
TOTAL	**1,298,728.77**	**100**

Environmental Quality

(Scheduled Wastes) Regulations 2005

First Schedule
(Regulation 2)

SW 1	**Metal and metal-bearing wastes**
SW 101	Waste containing arsenic or its compound
SW 102	Waste of lead acid batteries in whole or crushed form
SW 103	Waste of batteries containing cadmium and nickel or mercury or lithium
SW 104	Dust, slag, dross or ash containing arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory
SW 105	Galvanic sludges
SW 106	Residues from recovery of acid pickling liquor
SW 107	Slags from copper processing for further processing or refining containing arsenic, lead or cadmium
SW 108	Leaching residues from zinc processing in dust and sludge form
SW 109	Waste containing mercury or its compound
SW 110	Waste from electrical and electronic assembly containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl

SW 2 Wastes containing principally inorganic constituents which may contain metals and organic materials

SW 201	Asbestos wastes in sludges, dust or fibre forms
SW 202	Waste catalysts
SW 203	Immobilized scheduled wastes including chemically fixed, encapsulated, solidified or stabilized sludges
SW 204	Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium
SW 205	Waste gypsum arising from chemical industry or power plant
SW 206	Spent inorganic acids
SW 207	Sludges containing fluoride

SW 3 Wastes containing principally organic constituents which may contain metals and inorganic materials

SW 301	Spent organic acids with pH less or equal to 2 which are corrosive or hazardous
SW 302	Flux waste containing mixture of organic acids, solvents or compounds of ammonium chloride
SW 303	Adhesive or glue waste containing organic solvents excluding solid polymeric materials
SW 304	Press cake from pre-treatment of glycerol soap lye
SW 305	Spent lubricating oil
SW 306	Spent hydraulic oil
SW 307	Spent mineral oil-water emulsion
SW 308	Oil tanker sludges
SW 309	Oil-water mixture such as ballast water
SW 310	Sludge from mineral oil storage tank
SW 311	Waste oil or oily sludge
SW 312	Oily residue from automotive workshop, service station oil or grease interceptor
SW 313	Oil contaminated earth from re-refining of used lubricating oil

SW 314	Oil or sludge from oil refinery plant maintenance operation
SW 315	Tar or tarry residues from oil refinery or petrochemical plant
SW 316	Acid sludge
SW 317	Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds
SW 318	Waste, substances and articles containing or contaminated with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT)
SW 319	Waste of phenols or phenol compounds including chlorophenol in the form of liquids or sludges
SW 320	Waste containing formaldehyde
SW 321	Rubber or latex wastes or sludge containing organic solvents or heavy metals
SW 322	Waste of non-halogenated organic solvents
SW 323	Waste of halogenated organic solvents
SW 324	Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process
SW 325	Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin
SW 326	Waste of organic phosphorus compound
SW 327	Waste of thermal fluids (heat transfer) such as ethylene glycol

SW 4 Wastes which may contain either inorganic or organic constituents

SW 401	Spent alkalis containing heavy metals
SW 402	Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous
SW 403	Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic
SW 404	Pathogenic wastes, clinical wastes or quarantined materials
SW 405	Waste arising from the preparation and production of pharmaceutical product
SW 406	Clinker, slag and ashes from scheduled wastes incinerator
SW 407	Waste containing dioxins or furans
SW 408	Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes
SW 409	Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes
SW 410	Rags, plastics, papers or filters contaminated with scheduled wastes

SW 411 Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production

SW 412 Sludges containing cyanide

SW 413 Spent salt containing cyanide

SW 414 Spent aqueous alkaline solution containing cyanide

SW 415 Spent quenching oils containing cyanides

SW 416 Sludges of inks, paints, pigments, lacquer, dye or varnish

SW 417 Wastes of inks, paints, pigments, lacquer, dye or varnish

SW 418 Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent

SW 419 Spent di-isocyanates and residues of isocyanate compounds excluding solid polymeric material from foam manufacturing process

SW 420 Leachate from scheduled waste landfill

SW 421 A mixture of scheduled wastes

SW 422 A mixture of scheduled and non-scheduled wastes

SW 423 Spent processing solution, discarded photographic chemicals or discarded photographic wastes

SW 424 Spent oxidizing agent

SW 425 Wastes from the production, formulation, trade or use of pesticides, herbicides or biocides

SW 426 Off-specification products from the production, formulation, trade or use of pesticides, herbicides or biocides

SW 427 Mineral sludges including calcium hydroxide sludges, phosphating sludges, calcium sulphite sludges and carbonates sludges

SW 428 Wastes from wood preserving operation using inorganic salts containing copper, chromium or arsenic of fluoride compounds or using compound containing chlorinated phenol or creosote

SW 429 Chemicals that are discarded or off-specification

SW 430 Obsolete laboratory chemicals

SW 431 Waste from manufacturing or processing or use of explosives

SW 432 Waste containing, consisting of or contaminated with, peroxides

SW 5 Other wastes

SW 501 Any residues from treatment or recovery of scheduled wastes

The Journey Continues: Challenges to Face

Discarded mobile phones and batteries contribute to e-waste

Over a span of 30 years, Malaysia has made significant achievements in scheduled wastes management among which are the establishment of the Scheduled Wastes Integrated Treatment and Disposal Facility – the first in the region – in 1998 and becoming a party to the Basel Convention in 1993. However, the journey continues. Technological developments, changing lifestyles, consumerism, industrialisation, urbanisation, scarcity of land and other factors continue to pose new challenges to DOE in the management of scheduled wastes.

E-waste

One of the biggest challenges is the management of electronic waste or e-waste. **E-waste refers to electronic and electrical components and equipment discarded at the end of their usefulness**. This is a relatively recent addition to the waste stream. E-waste is attracting increasing

attention globally as the quantity generated is rising rapidly. Fuelled by rapid technological advances and consumer demand for new and advanced equipment, the electronics and information technology industry is the world's largest and fastest growing manufacturing industry today. Consequently, proper management of e-waste is of serious concern and significant importance.

This new waste stream requires environmentally sound management so that hazardous substances are not released into the environment. Many of the materials contained in electrical and electronic components and equipment can be potentially hazardous if improperly handled throughout their life cycles. Among the heavy metals and hazardous substances found in electrical and electronic equipment are antimony, nickel, cadmium, mercury, chromium, zinc, lead, silver, copper and polychlorinated biphenyl. The challenge is to manage e-waste properly so that valuable resources such as precious metals can be recovered and in the process, contribute towards sustainable development.

In 2008, DOE with the co-operation of a private company carried out a preliminary study on the e-waste inventory in Malaysia. It was estimated that about **700,000 tonnes of e-waste were generated annually. This amount of e-waste comprised televisions, personal computers, washing machines, mobile phones and batteries, refrigerators and air-conditioning units.**

Inset: Manual retrieval of valuable components in e-waste during partial recovery process

Wastes of Printed Circuit Board (PCB)

As recovery and disposal costs for e-waste in developed countries continue to rise, developing countries that lack regulatory control become the destinations for the recycling and disposal of such waste. In view of the increasing production and usage of electrical and electronics equipment worldwide as well as the potential environmental problems posed by e-waste generation and disposal, DOE has taken vital steps to introduce legislation to control and manage e-waste in Malaysia. Thus, e-waste is listed as one of the scheduled wastes to be controlled in the Environmental Quality (Scheduled Wastes) Regulations 2005. This new category of e-waste corresponds to codes A1180, A1150 and A2010 in Annex VIII of the Basel Convention hazardous wastes list.

Under the 2005 Regulations, all e-waste generators are required to notify DOE of the generation of e-waste and all recycling or recovery facilities need to be licensed by DOE. Generators of e-waste are required to keep an up-to-date inventory of the categories and quantities of waste generated, treated and disposed of. E-waste must be treated or disposed of in an environmentally sound manner at licensed premises or at on-site treatment facilities only.

To facilitate the management of e-waste, DOE has published Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia. These guidelines spell out the requirements for the importation of used electronic and electrical equipment for refurbishment or reuse. It is to be noted that the import of e-waste for recovery and disposal is not allowed.

Examples of contaminated sites
Anti-clockwise from top left: oil terminal, agricultural land, workshop and former mining area

Contaminated Land

Another issue relevant to waste management is contaminated land. Contaminated land is defined as "land containing substances that when present in sufficient concentrations, may cause harm to humans, animals and the environment." Unfortunately, many contaminated sites including abandoned municipal open dump sites remain undetected.

Land contamination may arise when industrial operations dispose of waste by tipping it on land at their premises and from unintentional leaks and spills. Contaminants can range from solvents, oil, petrol and heavy metals to radioactive substances. The sources of contaminants are not just restricted to industrial processes. Other sources may include agricultural activities, inadequate waste disposal measures, deposition from the atmosphere and everyday activities such as petrol distribution and dry cleaning.

It is pertinent to note that increasing population especially in urbanised areas has put heavy pressure on land resources and it is inevitable that eventually it will be necessary to use or redevelop contaminated land. Unfortunately, the absence of legislation coupled with low public awareness has diverted attention away from the problem of contaminated sites.

Specific legislation governing contaminated land is non-existent in most countries. As such, many of the developed countries are beginning to promulgate legislation to govern contaminated land. In Malaysia, there is no specific legislation addressing quality standards or contamination of soil and groundwater. However Section 24 of the Environmental Quality Act 1974 states:

(1) No person shall, unless licensed, pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable conditions specified under section 21.

(2) Notwithstanding the generality of subsection (1), a person shall be deemed to pollute any soil or surface of any land if

(a) he places in or on any soil or in any place where it may gain access to any soil any matter whether liquid, solid, or gaseous; or

(b) he establishes on any land a refuse dump, garbage pit, soil and rock disposal site, sludge deposit site, waste injection well or otherwise use land for the disposal of or as a repository for solid or liquid wastes so as to be obnoxious or offensive to human beings or interfere with underground water or be detrimental to any beneficial use of the soil or the surface of the land.

Indiscriminate dumping of waste oil can cause land to become contaminated when the oil mixes with water

(3) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable to a fine not exceeding one hundred thousand ringgit or to imprisonment for a period not exceeding five years or both and to a further

fine not exceeding one thousand ringgit a day for every day that the offence is continued after a notice by the Director General requiring him to cease the act specified therein has been served upon him.

Several other sections of the Environmental Quality Act 1974 address soil contamination indirectly. Section 31 gives the Director General the power to require the owner or occupier of the premises to install pollution control equipment, conduct a study on environmental risk and maintain a monitoring programme. Section 33A allows the Director General to request an environmental audit for premises perceived to be polluting. Section 34B prohibits the placing of any type of waste on land or surface water. In the Environmental Quality (Scheduled Wastes) Regulations 2005 contaminated soil is listed as a scheduled waste requiring specific ways for its treatment and disposal.

DOE recognises the environmental implication of contaminated land as a potential problem. **Therefore, in 2008 and 2009 under the Ninth Malaysia Plan, it initiated a study of the criteria and standards for managing and restoring contaminated land in Malaysia**. The purpose of this study is to provide a framework for the proper assessment and management of contaminated sites. This would ensure a consistent standard for site assessment and subsequent clean-up and restoration. The framework would also provide guidance to those responsible for the management of contaminated sites. At the same time it would give assurance to the community that public health and environmental concerns on contaminated sites are being addressed.

Sampling and analysis activity to determine the quality of land

Clockwise from above: Undisturbed soil sample collected using split spoon

Collection of soil samples for laboratory analysis

Well installation

Soil Boring Activities

The proposed criteria and standards from the study will be used in formulating appropriate regulations, if so required, for the control of land pollution. The outcome of this study would also provide useful information to the Government for formulating policy and guidelines for future development on contaminated sites.

Complementary Role of Industries

The initial focus of scheduled wastes management in Malaysia was on command and control regulations and "end-of-pipe" controls that required wastes to be managed by incinerating and landfilling. As the cost of this strategy rose, focus shifted to pollution prevention where industries were encouraged to implement waste minimisation programmes, clean technologies and the like. Today, environmental control is no longer limited to waste but extends to products. Industries would need to adjust to this development so that they can meet both current and future environmental requirements that focus on zero waste production and recycling of end-of-life products.

Industries have a complementary role to play in successful waste management. In the area of industry compliance with proper scheduled wastes management, for instance, there are still many aspects that can be improved. **One aspect is that of industries conducting audits on their manufacturing processes to find out how much has been achieved and to take the necessary action for further improvement**.

Community Awareness Programme

Besides reaching out to industrial waste generators, DOE has an active programme to heighten awareness of scheduled wastes in the community. The DOE carries out awareness seminars, participate in events related to protection of the environment and place recycling boxes in office buildings, universities and public places for the disposal of mobile phones and batteries. The e-waste is then sent to licensed recovery and disposal facilities.

The Journey Continues

The management of scheduled wastes is an ongoing journey. DOE is not resting on its laurels as there is only one Earth. As society continues to evolve, new challenges will present themselves. **DOE's responsibility is to stay alert and ahead of the challenges.**

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