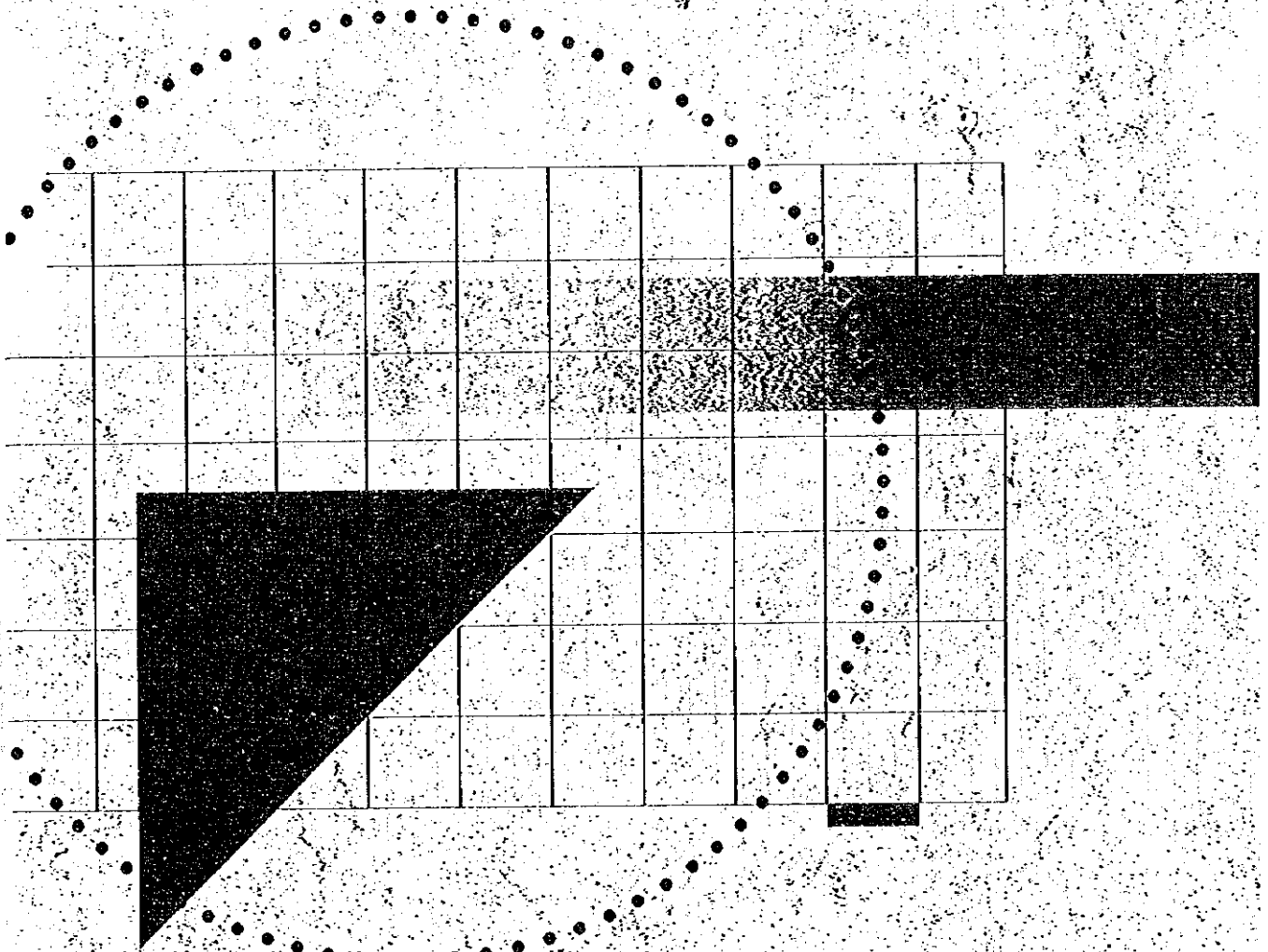


9.2 シンガポール環境管理技術会社 (SEMES) 案内

Singapore
Environmental
Management and
Engineering
Services Pte Ltd



S E M E S

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The synergistic contribution of the Ministry of the Environment and Singapore Technologies Industrial Corporation supports SEMES with a wealth of expertise, experience and commercial standing in the environmental and technological arenas.

Through SEMES, foreign government agencies and private companies now have access to more than 25 years of experience in environmental management and engineering.

Drawing on the proven success of Singapore's development into an internationally acclaimed clean and green city, SEMES offers the following:

- **Relevant Expertise**

Within a space of 25 years, Singapore has successfully established a quality environment while making the transition through various stages of economic development and urban growth. With the experience of more than 20 major environmental projects, SEMES has the capability to find appropriate solutions to environmental problems concomitant with economic development and urban growth.

- **Complete Solutions**

Environmental problems are often not only technical but also social and political in nature. SEMES offers complete solutions to environmental problems, combining regulatory and legislative considerations with technological applications.

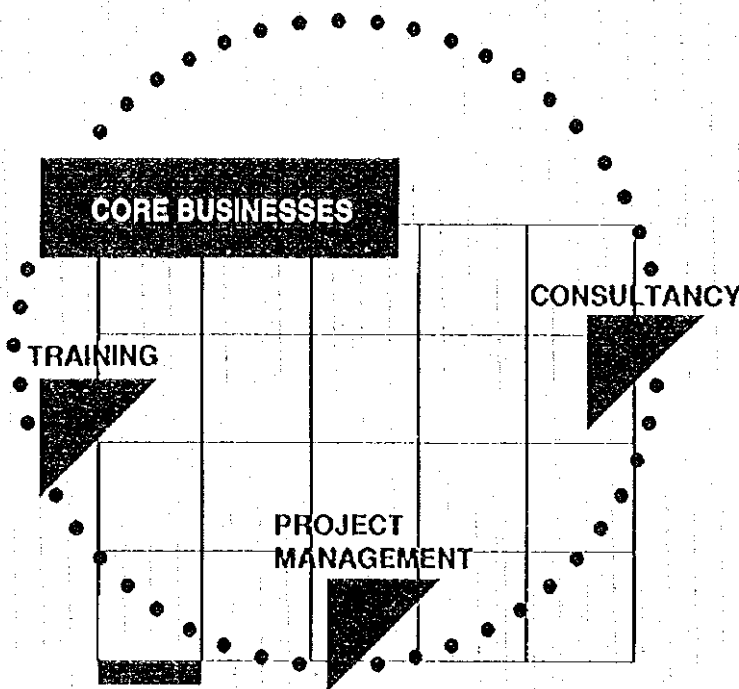
- **Experienced Specialists**

SEMES' vast pool of specialists consists of well-trained professionals who have comprehensive experience in all aspects of environmental planning, management and control.

- **Comprehensive Facilities**

The comprehensive facilities of the Ministry of the Environment allow SEMES to offer hands-on training and a full spectrum of environmental management services.

OVERVIEW



Singapore Environmental Management and Engineering Services Pte Ltd (SEMES) is a specialist company offering consultancy, project management and training, in the various fields of environmental management and environmental engineering. These include solid waste management, sewerage, sewage treatment and disposal, management of land drainage, flood control and pollution control.

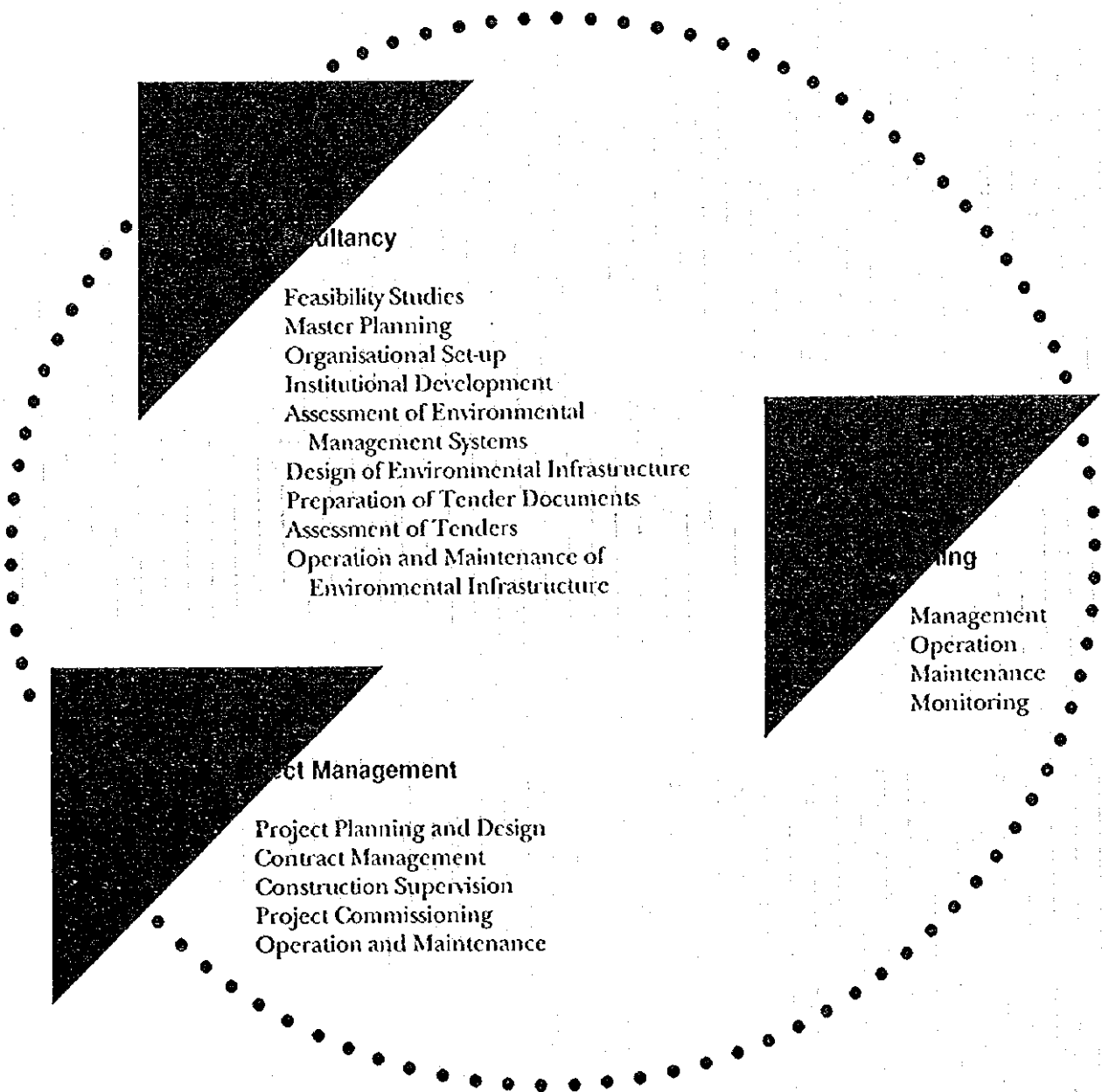
Set up as a joint venture between ENV Corporation and Singapore Technologies Industrial Corporation, SEMES provides high-quality services through a committed team of professionals.

ENV Corporation, a private company set up by Singapore's Ministry of the Environment, has majority ownership of SEMES. Through this affiliation, SEMES is fully backed by the resources and expertise of the Ministry.

SEMES' relationship with Singapore Technologies Industrial Corporation - Singapore's leading technology-related multinational with established international networks - adds a solid commercial foundation supported by achievements in advanced technology.

SCOPE OF SERVICES

Singapore has attained sustainable development by ensuring a good balance between economic development and environmental quality. This pragmatic approach is solidly behind SEMES' drive to provide the best in environmental management services including:



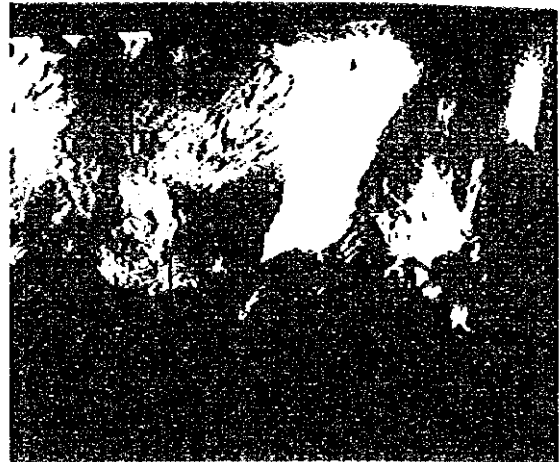
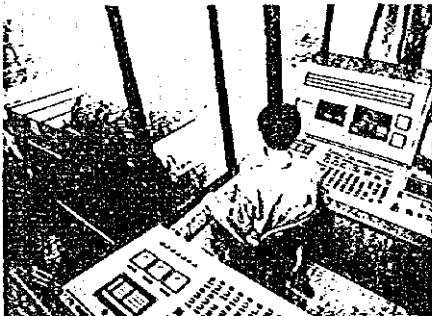
SOLID WASTE MANAGEMENT

Proper refuse collection and disposal is one of the most immediate challenges in environmental management a country encounters.

Singapore's effective management of solid waste is an exemplary demonstration of SEMES' expertise in this area of environmental management.

Known for its efficient daily refuse removal and disposal, Singapore has a comprehensive solid waste management infrastructure. This comprises a fleet of collection and transfer vehicles, vehicle maintenance workshop, transfer station, sanitary landfills and three refuse incineration plants.

There is also a computerised "waste management system" which provides on-line monitoring of status performance of each refuse collection vehicle.



Tuas Incineration Plant

Completed in 1986 at a total cost of S\$200 million, this plant comprises five incinerators with a daily capacity of 2,000 tonnes. It offers energy conversion and scrap metal recovery capabilities.

Senoko Incineration Plant

To be completed in 1992, this latest incineration plant will cost S\$580 million and comprise six incinerators with a capacity of 2,400 tonnes per day. It will also offer energy conversion and scrap metal recovery capabilities.

Kim Chuan Transfer Station

Built in 1986 at a total cost of S\$30 million, this transfer station consists of six high-pressure compactors, capable of handling up to 1,500 tonnes of refuse daily.

AREAS OF EXPERTISE

Feasibility studies

Master planning

Institutional development

Refuse collection and conveyance system

Operation and maintenance of transfer stations

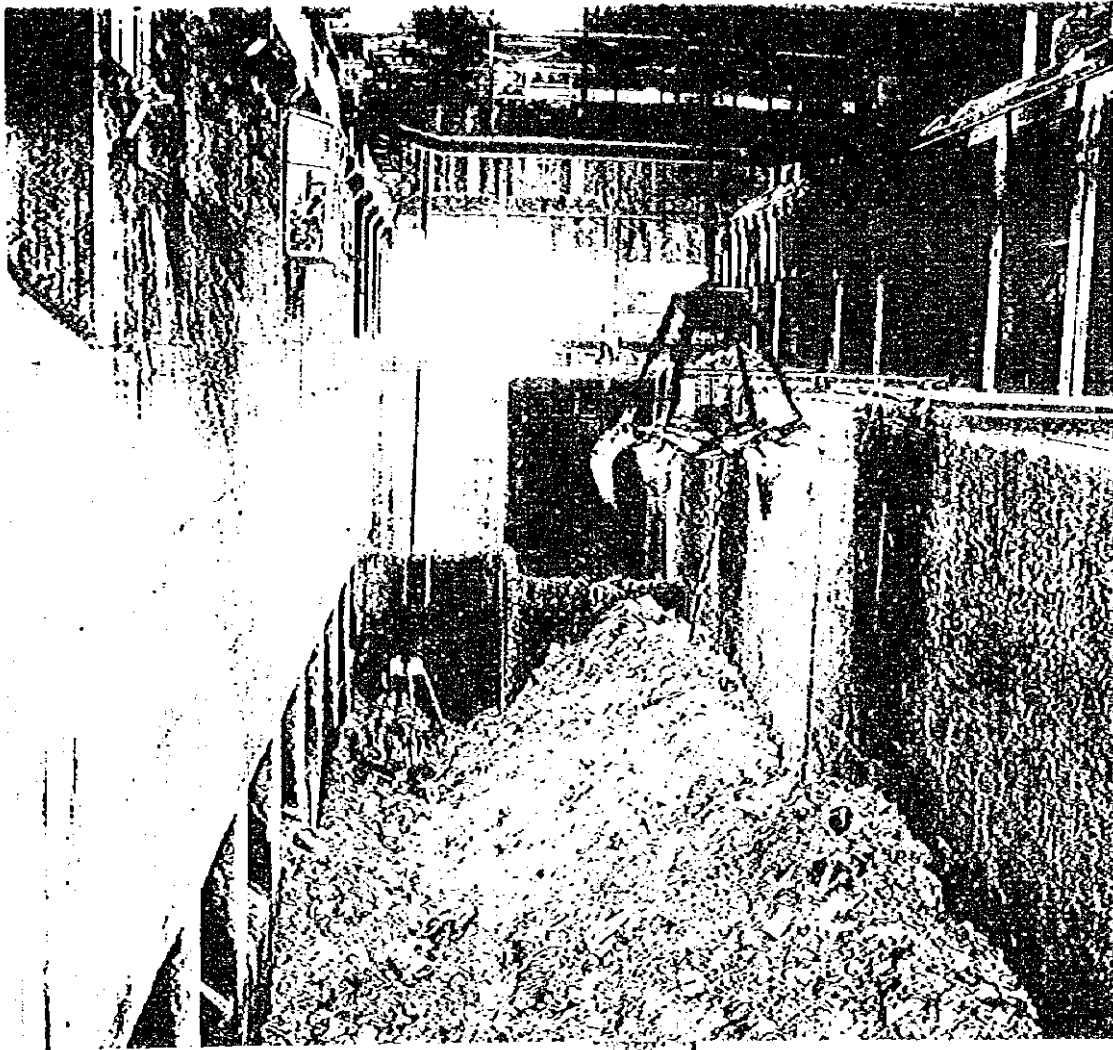
- refuse reception
- computerised weighbridge system
- refuse compactors
- refuse transfer vehicles
- vehicle washing system
- electrical, monitoring and control system

Operation of incineration plants

- refuse handling system
- incinerators
- scrap recovery system
- power generation
- process control (analogue and digital system)

Maintenance of incineration plants

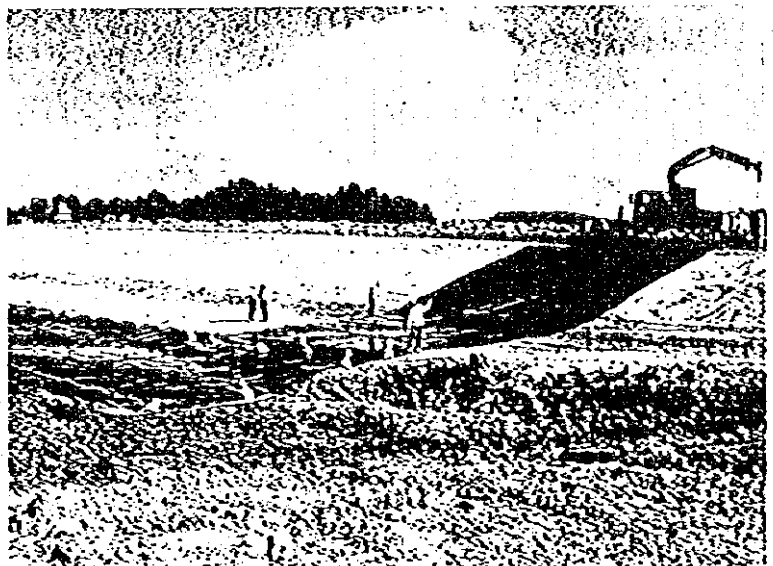
- preventive maintenance
- repair and fault rectification
- overhaul of incinerators/ turbo-generators
- computerised inventory control
- plant upgrading



Above Left & Above:
Singapore's highly efficient incineration plants illustrate SEMES' expertise and experience in managing solid waste

Extreme Left:
Our team of specialists has in-depth experience in the design and installation of high-tech control systems for effective refuse management

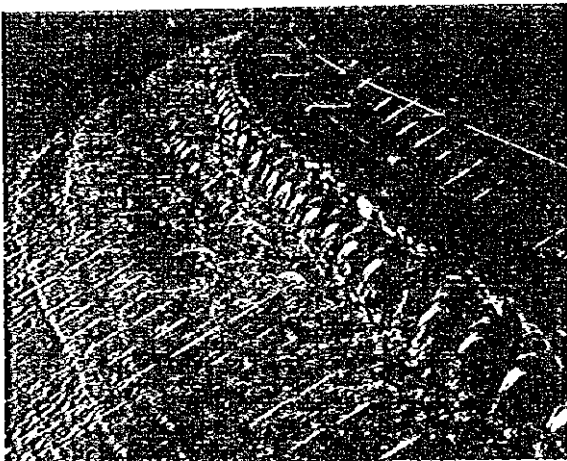
Right:
Laying of liner to prepare landfill for refuse disposal - a vital process in the proper management of sanitary landfills



SEWERAGE AND SEWAGE TREATMENT

Adequate sanitation and efficient sewerage management are fundamental in ensuring a good standard of hygiene in the daily lives of people.

With the backing of more than 25 years experience in intensive sewerage development - resulting in some 2,300 km of sewers, six large and sophisticated sewage treatment works and an industrial water works; at a capital outlay of S\$1.85 billion - SEMES offers a comprehensive range of expertise in the collection, treatment and disposal of sewage.



Seletar Sewage Treatment Works Phase 2 Extension

Completed in 1991 at a cost of S\$56 million, this plant has a treatment capacity of 57,000 cubic metres per day.

Nee Soon New Town Sewerage Scheme

Carried out in 1990, this project provided sewerage facilities for public residential and industrial development in Nee Soon New Town. Total project cost is S\$62 million.

Central Monitoring System for Sewage Pumping Stations

The expanded system started operation in 1990, linking 124 pumping stations and allowing for remote and central monitoring of all sewage pumping stations in Singapore. Total project cost is S\$6.5 million.

AREAS OF EXPERTISE

Feasibility studies and master planning

- flow projections
- sewer routing
- siting and sizing of installations

Planning and design

- preparation of tender
- tender evaluation and recommendation

Engineering design of sewage treatment works

- preliminary, primary and secondary treatment
- sludge treatment and disposal
- plant electrical network and distribution
- process control, metering and instrumentation

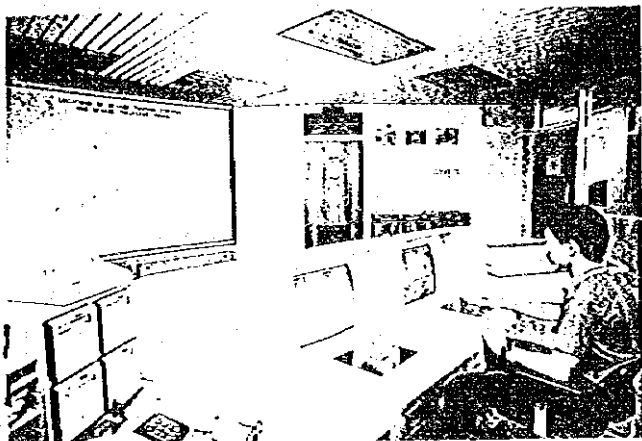
Construction and project management

Design of industrial waterworks

Organisation and management of sewerage systems

Operation and maintenance of sewerage facilities

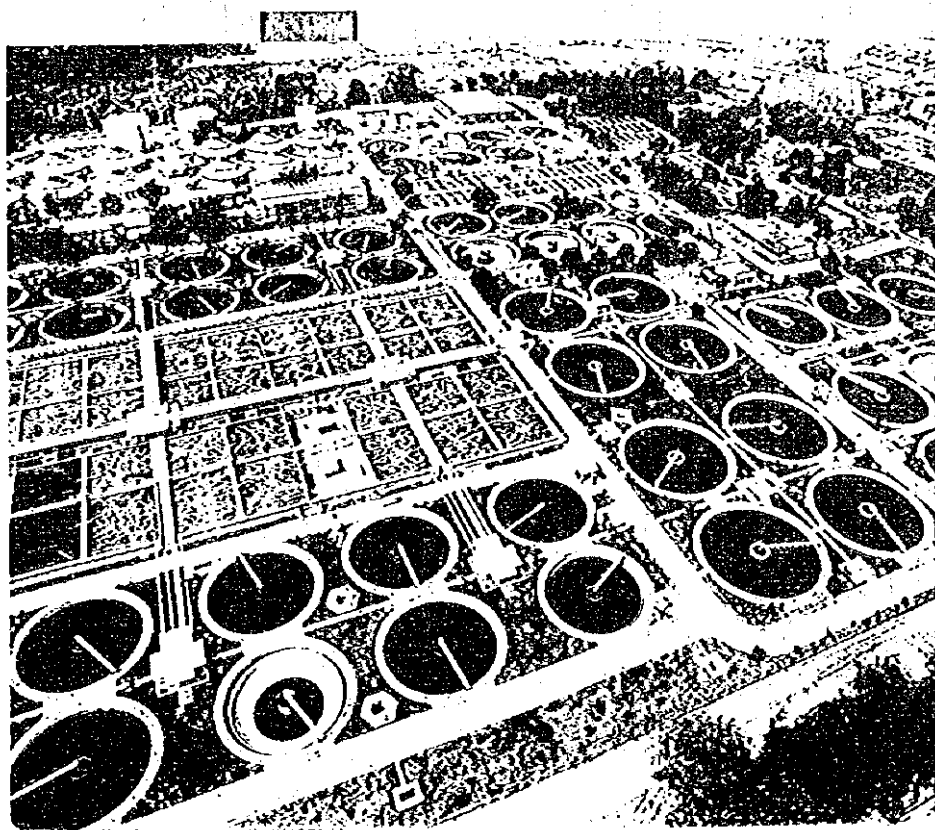
- computerised telemetry system for sewage pumping stations
- computerised automation system for sewage treatment works



Above:
Computerisation allows for central monitoring of sewage pumping stations for more effective control in the conveyance of sewage

Extreme Left:
SEMES can provide efficient solutions to treat and rechannel waste water for industrial use

Right:
SEMES is backed by specialists who have built six major sewage treatment works and a comprehensive sewerage network which today serve the whole of Singapore



LAND DRAINAGE AND FLOOD CONTROL

The development of Singapore into a relatively flood-free city today, speaks of more than 25 years of experience in effectual drainage for flood control. Drainage projects undertaken helped to reduce the extent of flood-prone areas by more than 90 percent. Furthermore, these projects catered for sharp increases in storm runoffs arising from rapid and intensive land development and industrialisation of Singapore.

Singapore has also implemented a tele-monitoring system which enables continuous, remote real-time monitoring of flood-prone areas. The system provides early warning against flooding and allows for contingency planning.

Drawing on the experience and expertise built up through the years, SEMES can provide consultancy and project management services in massive land drainage projects.



Widening and Covering Up of Stamford Canal

This project, carried out in 1988, alleviated floods in the area. Costing S\$48 million, the project included the construction of a pedestrian mall over the canal.

Bukit Timah Flood Alleviation Scheme

Costing S\$240 million, the scheme involved diversion of a stormwater catchment of 1,270 hectares, construction of a triple-cell culvert and canal, and reconstruction of part of the Bukit Timah Canal. The project was completed in 1990.

Realignment of Sungei Serangoon

Completed in 1991 at a cost of S\$12 million, this project involved realigning the major river through extensive mangrove swamp reclamation site. It also included dredging of marine clay and organic silt, and lining of the upper tributaries of the river.

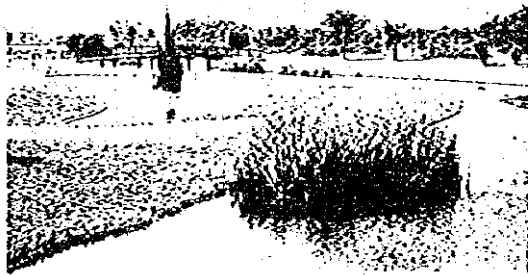
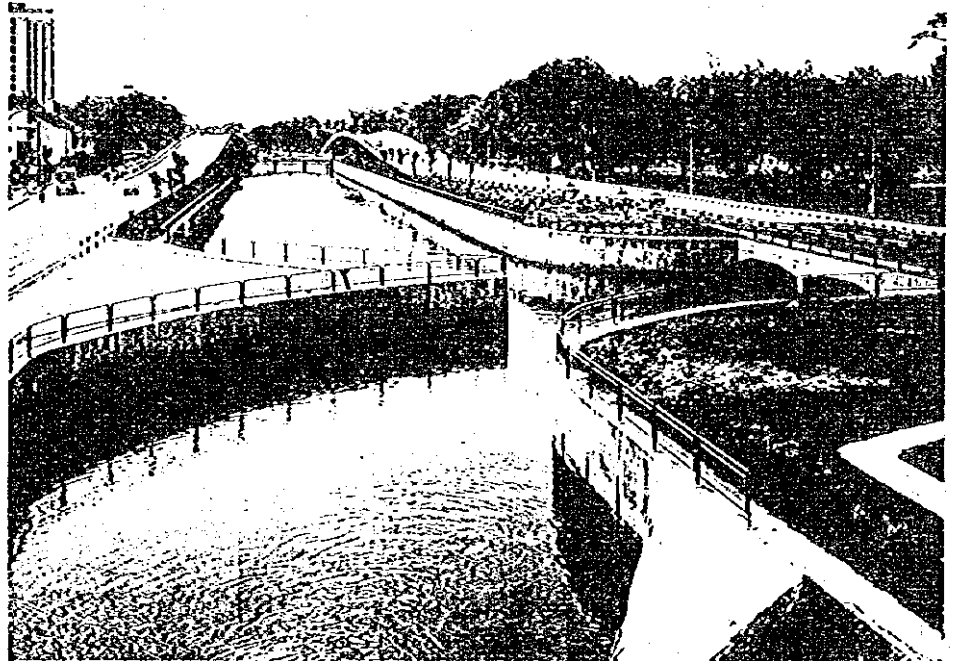
AREAS OF EXPERTISE

- Feasibility studies and master planning
- Planning and design
- Construction and project management
- Maintenance
- Tele-monitoring system for flood-prone areas

Above Left:
The use of flexi-slabs speeds up installation and stabilises river banks - an improved technique for the construction of river banks in drainage projects

Right:
Bukit Timah Canal - its success in alleviating floods in Singapore's prime urban district reflects SEMES' capability in land drainage and flood control

Below:
Drainage pond in Singapore's Marina South City Park - part of the careful planning involved in land drainage projects to enhance the beauty of the surrounding



POLLUTION CONTROL.

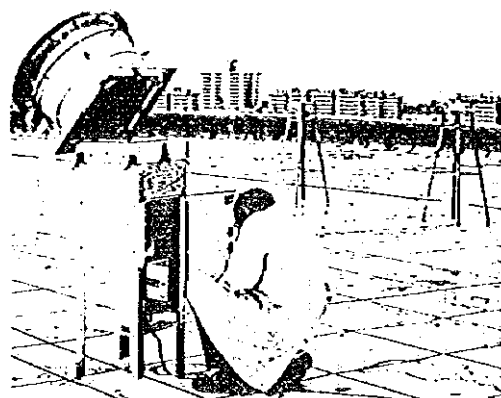
Rapid industrial development and urbanisation inevitably bring with them the need to control air and water pollution. Over the years, strategies and control measures have been developed to regulate, protect and improve the quality of air and water in Singapore; whilst facilitating progressive industrialisation and urbanisation. The impact of new developments on the environment is also continuously assessed and factored into land use planning.

Backed by the rich experience in developing Singapore into a clean and green city state of world renown, SEMES offers consultancy and operational services in the specialised area of pollution control.

Monitoring Programmes for Air and Water Quality Control

Monitoring programmes are required to assess the effectiveness of environmental control.

Companies can tap SEMES' experience and expertise in setting up comprehensive monitoring programmes for air and water quality control. The well-equipped and sophisticated laboratory of the Ministry of the Environment supports the analytical aspects of the monitoring programmes.



Management of Hazardous Substances and Toxic Wastes

SEMES, tapping on the Ministry's legislative, enforcement and operational experience in the management of hazardous substances and toxic wastes, provides consultancy and operational services in the various aspects of this highly complex field.

Clean-up of the Singapore River and Kallang Basin

Completed in 1987, Singapore's showcase project took 10 years to complete. The estimated direct cost amounted to more than S\$200 million and involved the identification and removal of sources of pollution, and beautification of the Singapore River and Kallang Basin.

Improvement to Kallang Basin

Costing S\$35 million and completed in 1987, this project involved dredging 660,000 cubic metres of organic silt, creating sandy beaches with sandfill and constructing river walls.

AREAS OF EXPERTISE

Environmental impact assessment

Environmental planning

Land use planning

Institutional development

Legislation and enforcement

Identification of sources of pollution

Formulation of action plan

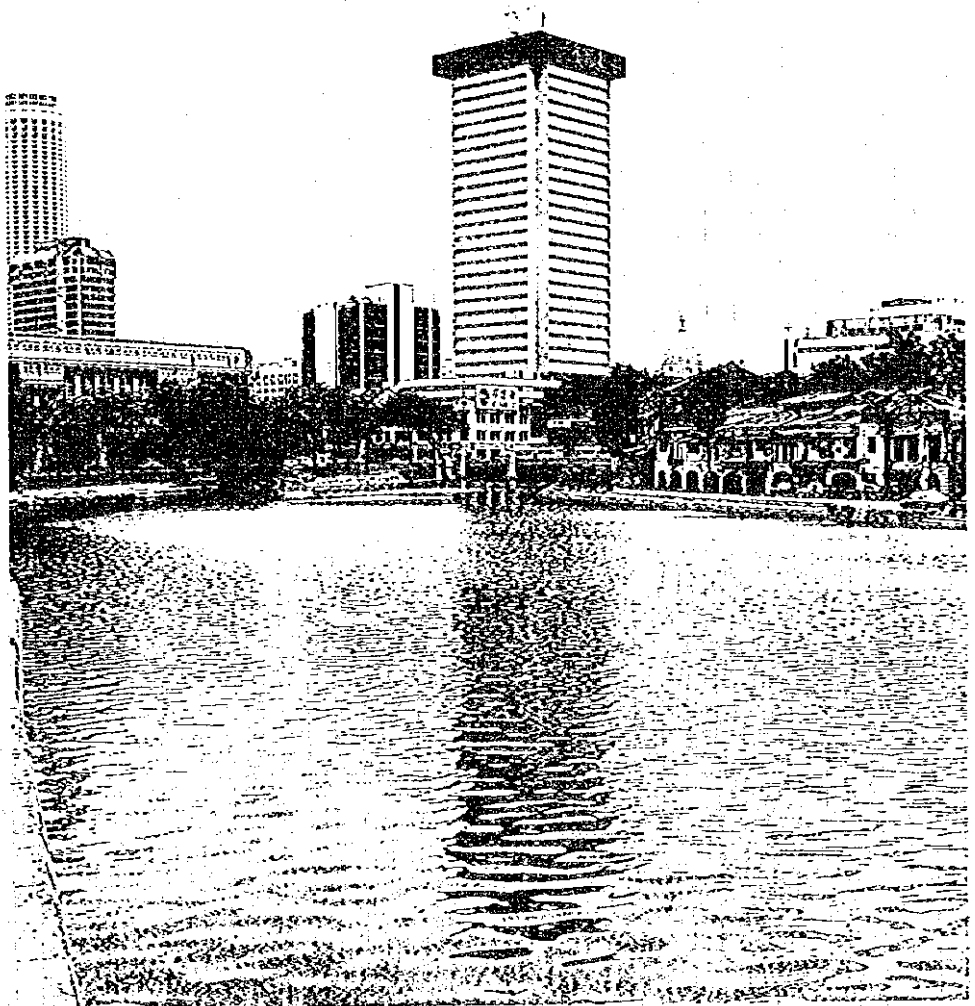
Clean-up operations of polluted water courses

Ambient air quality monitoring

Water quality monitoring

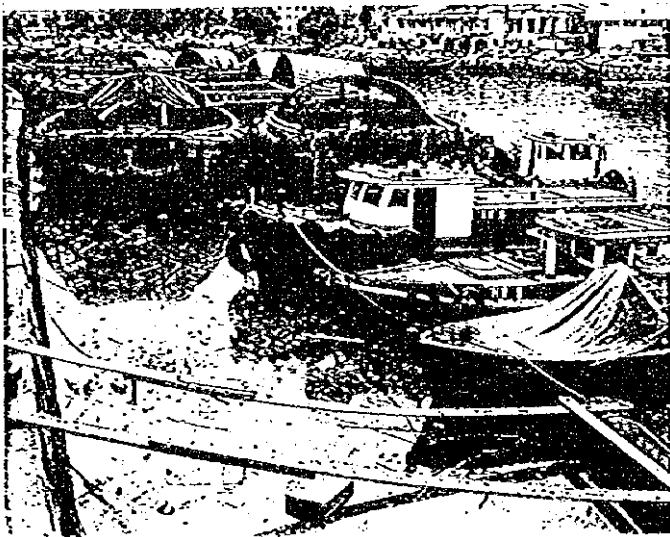
Management of hazardous substances

Management of toxic wastes



Above Left:
The planning and design of environmental monitoring networks, comprising air monitoring stations such as this, form part of the work routinely carried out by specialists in SEMES

Right & Below:
From polluted, murky water to its present day "clean river" status where aquatic life thrives again - the Singapore River before (*below*) and now (*right*) after a major pollution control and clean-up project



TRAINING AND INSTITUTIONAL DEVELOPMENT

The quality of design and construction alone is not sufficient to ensure the effectiveness of any environmental management project. Success of the project also depends on the standard of subsequent management, operation and maintenance.

Hence, the development of the institution, responsible for the running of the facility, and the training of its staff at all levels are important factors. Institutional development involves examination and continuous improvement of the organisational structure, internal procedures and transfer of know-how to management and staff.

With vast experience in training, which includes the training of participants under the Colombo Plan Technical Co-operation Scheme and the Asean Training Awards Programme, coupled with the comprehensive facilities of the Ministry, SEMES' team of experts provides specialised hands-on training and assistance in institutional development, for efficient operation and maintenance of major environmental facilities.

AREAS OF EXPERTISE	Institutional strengthening
Management training	Management and organisation
Operation and maintenance training	Administrative systems and procedures
Identification of manpower needs	



CORPORATE PHILOSOPHY

“ SEMES is dedicated

to providing high quality,

efficient environmental

management and

engineering services,

for a cleaner and

greener environment.”







JICA