Environmental Protection and Water Pollution Control in Singapore

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Order of Presentation

Introduction

Strategy of Environmental Protection and Water Pollution Control in Singapore

- Prevention
- Legislation & Enforcement
- Monitoring
- Education & Engagement

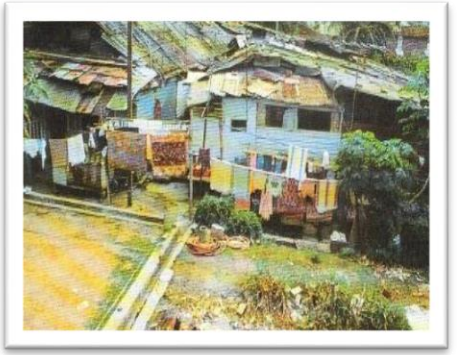
In Summary

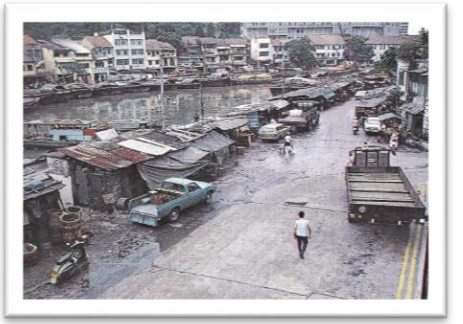
Introduction

- Singapore is an island city-State
- Land area – 722.5 sq. km
- Population – 5.79 million
- Population Density – 8,000 per sq. km

Introduction

- **In the 1950s and 60s, poverty and unemployment were serious concerns.**
- **In order to provide employment after Singapore's independence in 1965, intensive industrialisation programme was implemented.**
- **In the process of industrialisation, there were also parallel developments in the housing, commercial and service sectors.**
- **All these developments generated pollution, wastewater and solid waste.**





Introduction

- Proper planning and implementation of pollution control measures have been carried out.

- With continual efforts to prevent and control pollution, present generation enjoys an environment that is
  - clean,
  - green, and with a
  - high standard of public health

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Strategy of Environmental Protection and Water Pollution Control in Singapore

i **Prevention**

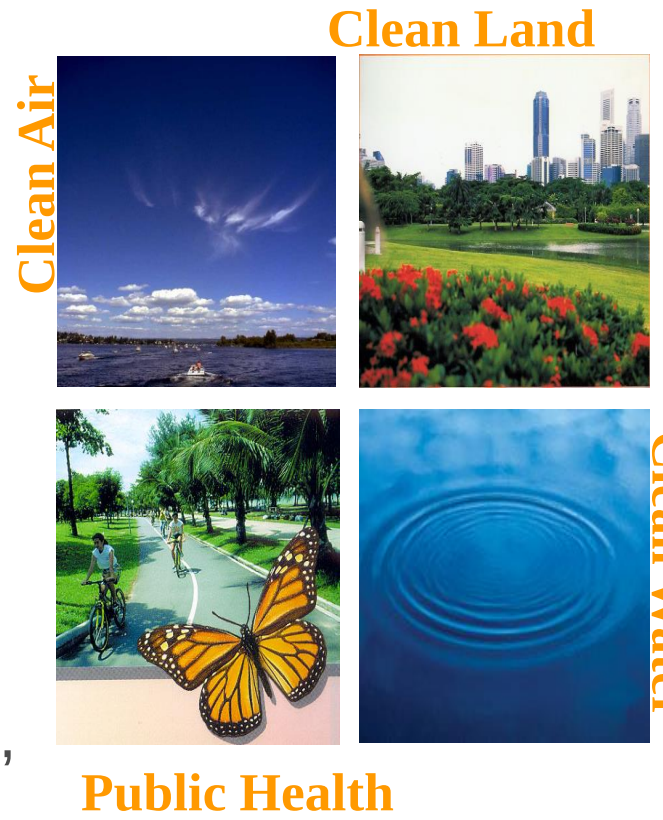
ii **Legislation and Enforcement**

iii **Monitoring**

iv **Education and Engagement**

Prevention

- Environmental Planning Controls
  - Land use planning
  - Judicious siting of industries
  - Building plan control
- Environmental Infrastructure
  - Comprehensive sewerage system
  - Efficient solid waste system
- Regulatory Controls
  - Controls on air and water pollution, vehicular emissions control, Construction noise, hazardous substances and industrial toxic wastes



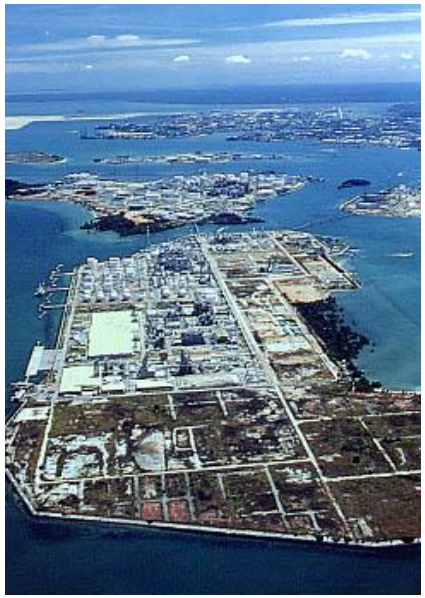
Prevention - Environmental Planning Controls

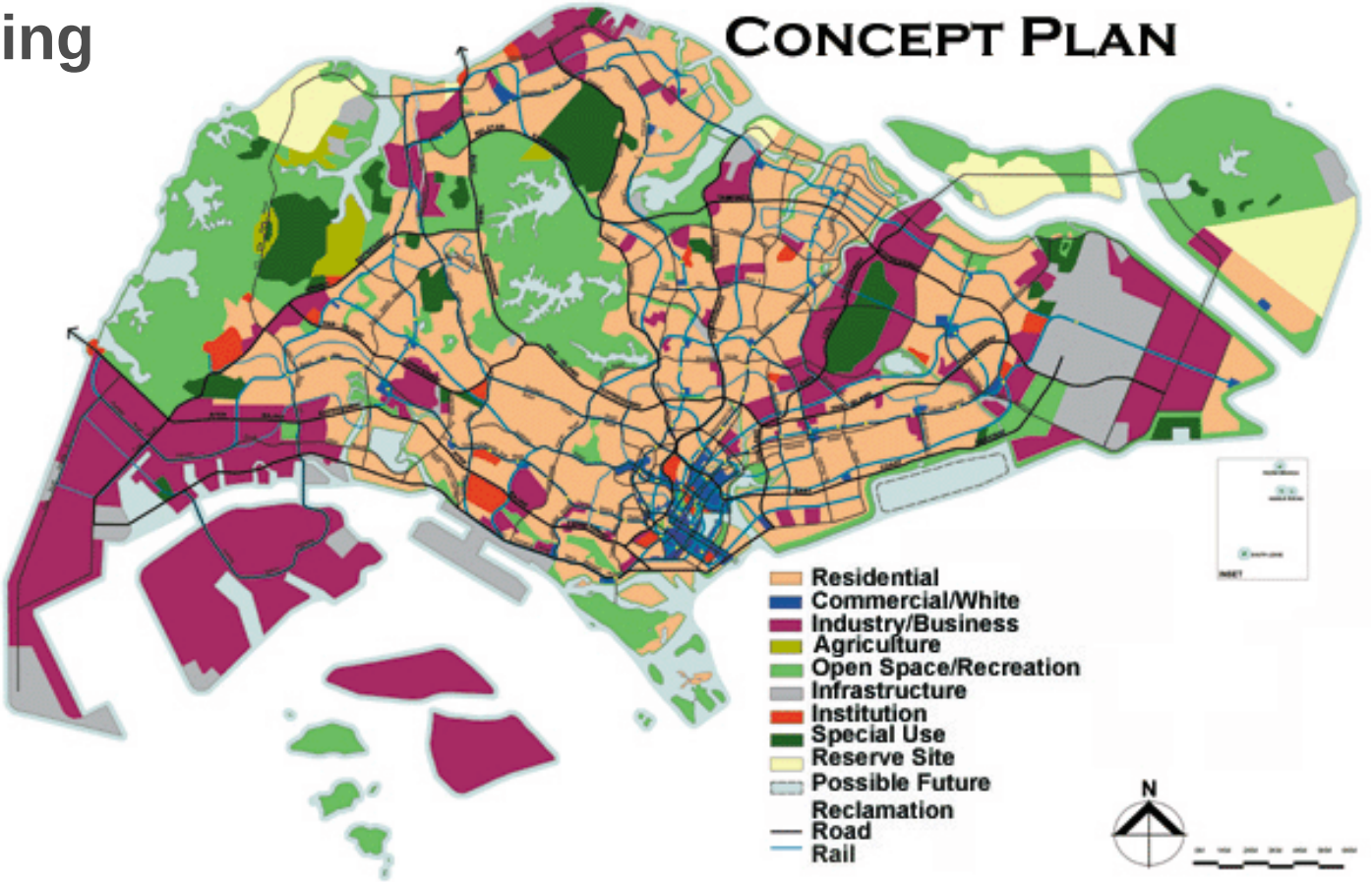
Land Use Planning

Urban Redevelopment Authority (URA)

- National Authority for land use planning
- Prepares Concept Plan and Land Use Master Plans
- Land is zoned for specific uses such as residential, commercial, industrial, etc
- Environmental requirements are factored into the plans

Land Use Zoning





Prevention - Environmental Planning Controls

Judicious Siting of Industries

Screen applications for industrial premises

- Site industries in industrial estates
- Use clean technology - minimise use of hazardous chemicals and generation of wastes
- Use hazardous chemicals that will not pose unmanageable health and safety hazards
- Comply with standards for emission and discharge of pollutants
- Ensure that wastes can be properly and safely disposed of

Prevention - Environmental Planning Controls

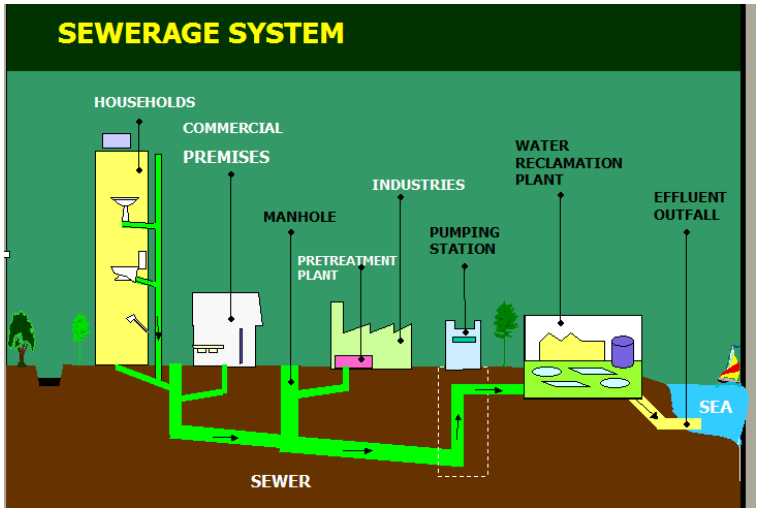
Building Plan Control

- Check building plans of new developments
- Check pollution control facilities of industrial developments
- Check completed developments for compliance with pollution control requirements before occupation and use of developments

Prevention - Environmental Infrastructure

Sewerage Infrastructure

- 4 water reclamation plants
- 3,340 km sewers
- 78 pumping stations
- serve all industrial estates and almost all residential premises except for isolated pockets of residential premises with on-site sewage treatment plants



Prevention - Environmental Infrastructure

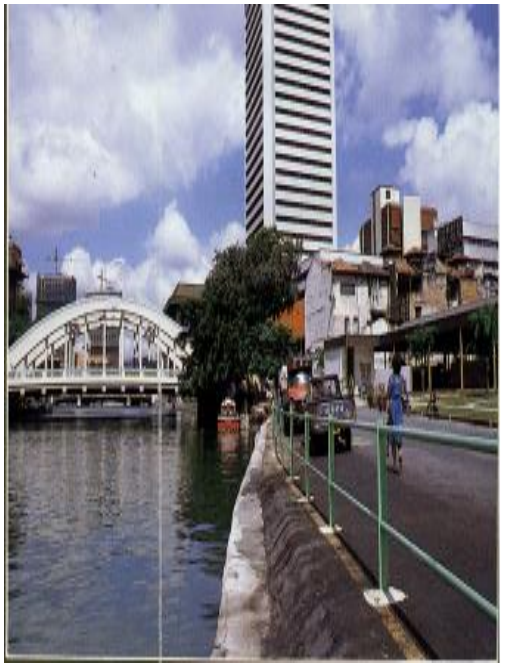
Solid Waste Management

- Daily refuse collection service
- 95% of wastes incinerated at 4 incineration plants
- 5% of wastes (non-incinerable disposed of at the off-shore Semakau sanitary landfill

Prevention

Regulatory Controls

- Air Pollution Control
- Water pollution Control
- Vehicular Emissions Control
- Construction Noise
- Hazardous substances and industrial toxic wastes



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Legislation and Enforcement

The Environmental Protection and Management Act (EPMA)

Part I Preliminary

Part II Administration

Part III Use of Scheduled Premises

Part IV Air Pollution Control

Part V Water Pollution Control

Part VI Land Pollution Control

Part VII Hazardous Substances Control

ii

Legislation and Enforcement

Part V WATER POLLUTION CONTROL

15 – Written permission for discharge of trade effluent, oil, chemical, sewage or other polluting matters

16 – Plant for treatment of trade effluent

17 – Penalties for discharging toxic substances or hazardous substances into inland waters

18 – Power of Director-General to require the removal and cleaning up of toxic substance or trade effluent, oil, chemical, sewage, hazardous substance or other polluting matters

19 – Power of Director-General to require measures to be taken to prevent water pollution due to storage or transportation of toxic substances or any other polluting matters

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Legislation and Enforcement

Water Pollution Control

- Trade effluent discharge to meet limits stipulated in EPM (Trade Effluent) Regulations
- Trade effluent pre-treated to allowable discharge limits for discharge into a public sewer or watercourse
- Containment facilities provided for storage tanks of oil and chemicals

ii

Legislation and Enforcement

Regular inspections

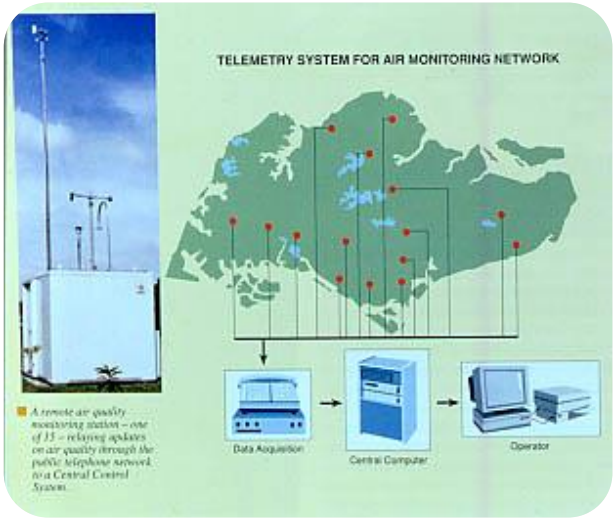
- Industrial effluent treatment plants are regularly checked
- Emphasis is placed on self monitoring by industries
  - regular sampling of post-treated effluent water quality
- Public feedback on water pollution is an important source of information

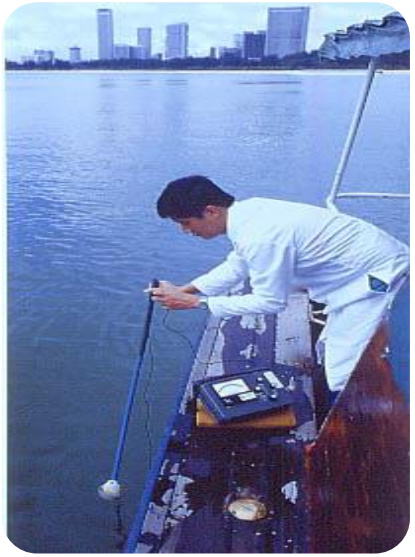
iii

Monitoring

Environmental Monitoring

- Regular monitoring of inland and coastal waters via
  - Sampling of water qualities of rivers, reservoirs, beaches, etc
- Monitoring data provides feedback on adequacy and effectiveness of control programmes





iii

Monitoring

Monitoring Programme	Frequency
Non-Catchment Rivers/Streams	Quarterly
Catchment Streams	Fortnightly to Quarterly
Reservoirs	Quarterly
Straits of Johor	Monthly to Fortnightly
Straits of Singapore	Bi-monthly to quarterly
Toxic Trace Contaminants (Water and sediment samples)	Annual
Recreational Beaches	Weekly

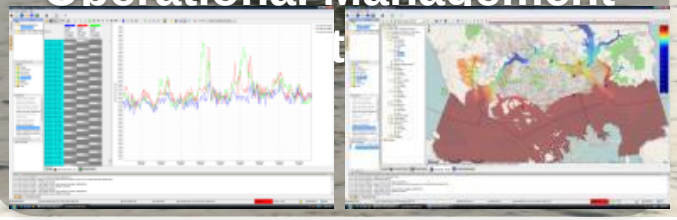
iii

Monitoring

- 8 Monitoring stations along Straits of Johor and Straits of Singapore with sensors, data loggers for automatic transmission of water quality data to base station
- Customised water quality models for modeling studies

Buoy-based monitoring stations

Operational Management



Actively monitor coastal water quality

Analyse water quality trends

Provide early warning of water pollution problems

- Tracing sources of pollution
- Predicting algal blooms
- Study impact of new foreshore developments
- Water quality forecasting

Neptune Monitoring Stations

iii

Monitoring

- Monitor trends in the water quality, enabling the government to make policy decisions to prevent water pollution problems
- Formulate policies based on data gathered from the monitoring programmes
- Assess the nature and magnitude of any water pollution problems
- Assess effectiveness of pollution control measures implemented to improve water quality

iv

Education and Engagement

- Work with industries as partners to move towards self-monitoring and co-regulation
- Regular dialogues with industries, professional institutions
- Training courses for professionals, industries
- Seminars, workshops for industries, businesses, etc
- Public campaigns, e.g. Clean and Green Singapore

iv

Education and Engagement

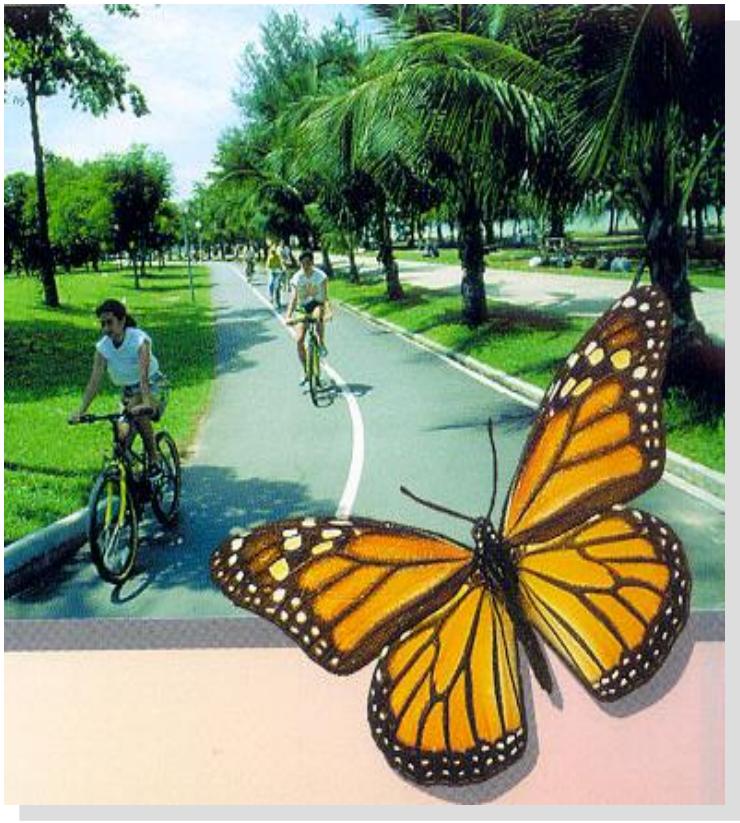
- An educated and well informed public will lend strong support to the protection of the environment
- Cultivate a nation which is proactive in the pursuit of environmentally friendly lifestyles, habits, and technologies
- Inculcate a high level of public awareness and concern for the environment in our people.

In Summary

- Proper planning, enforcement, monitoring and education are keys factors in environmental protection and management in Singapore

- This integrated approach has helped Singapore to continue with its industrial developments and at the same time maintain a clean and healthy environment.

Thank you



Our Environment

Safeguard • Nurture • Cherish

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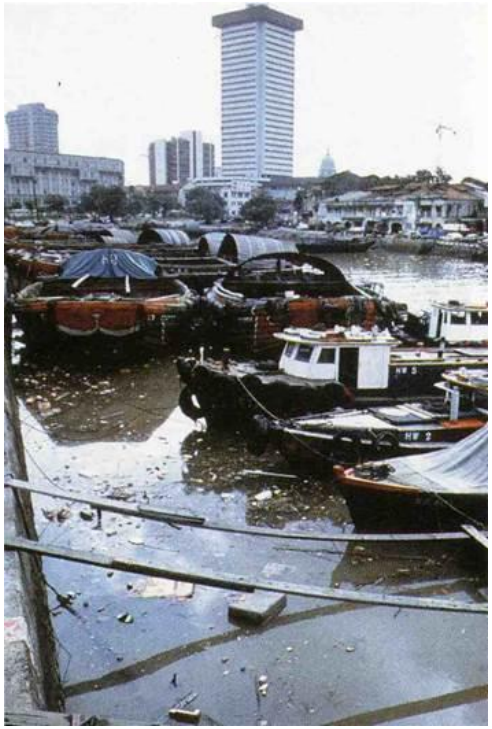
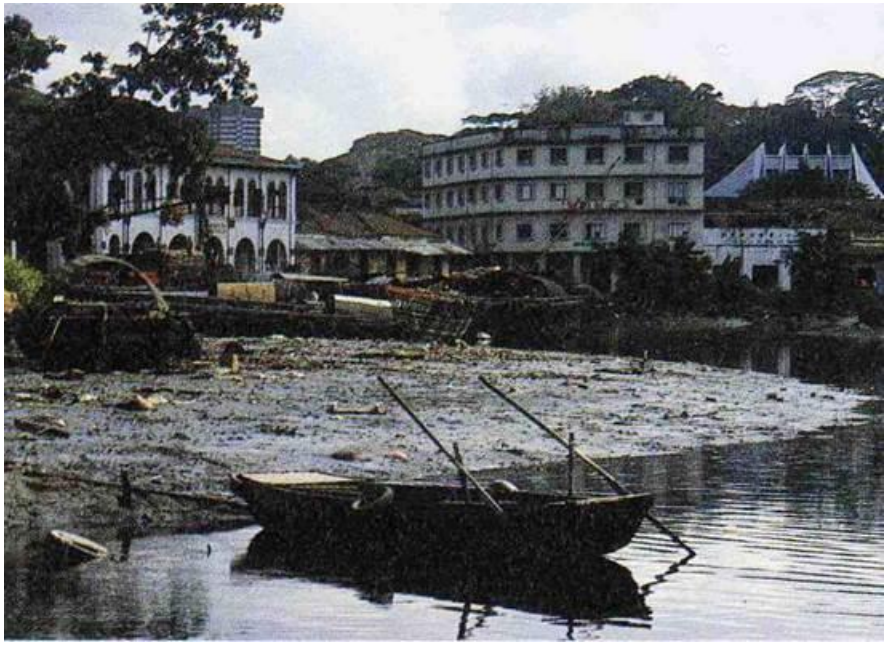
Safeguard · Nurture · Cherish

Singapore River in 1960s – 1970s





Singapore River Clean-Up (1977-1987)