



**Asia-Pacific Centre for Environmental Law**

**WORKSHOP**

**on**

**URBAN AND INDUSTRIAL ENVIRONMENTAL MANAGEMENT  
(CUM FIELD TRIPS): THE SINGAPORE MODEL**

**Seminar Room 4-3  
Blk B, Level 4  
Faculty of Law  
National University of Singapore**

**5 -11 December 2007**

Organised by

**ASIA-PACIFIC CENTRE FOR ENVIRONMENTAL LAW (APCEL)**

***PROGRAMME***

**Emeritus Prof Koh Kheng Lian: Workshop Director  
Director, Asia-Pacific Centre for Environmental Law  
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**The programme is accurate at the time of printing, but APCEL reserves the right to amend  
the programme as it deems fit**

**Theme: Urban and Industrial Environmental Management  
(Cum Field Trips): The Singapore Model**

**Purpose**

To build capacity in urban and industrial environmental management

**Objectives**

- To enable administrators and managers of urban and industrial environmental management to learn and exchange experiences and techniques in urban and industrial management with participants from some twenty countries all over the world
- To promote awareness and understanding of the issues in urban-industrial environmental management and to initiate a policy dialogue, strategies on urban industrial environmental management, including issues in compliance and enforcement
- To enhance the capacity of participants to meet the challenges of continued growth and environment pressures, taking the experience of Singapore as a model in some areas such as wastewater and pollution management, and control of freshwater quality in an urban setting
- To develop networks and partnerships among participants
- To examine the ASEAN strategies and plans of action relating to urban and industrial environmental management as an example of subregional efforts

## **Day 1, Wednesday, 5 December 2007**

0815 hrs – 0830 hrs

**Registration**

0830 hrs – 0900 hrs

**Opening Ceremony –APCEL**

Welcome Address by APCEL: Prof Koh Kheng Lian

0900 hrs – 0930 hrs

Tea Break and Participants' Introduction

0930 hrs – 1245 hrs

**Session 1: Singapore Model for Urbanization and Industrialization:**

**(a) Environmental Governance**

**(b) 'Brown' Planning and the Ecological Footprint**

**(c) City in a Garden – an Aspect of Sustainable Development?**

While Southeast Asia as a region has one of the lowest percentages of people living in urban areas (39% in 2006) in the world, the current rapid urban growth rate in the region is likely to see urban populations reaching 65% by 2050. In Southeast Asia, Singapore is the only fully urbanised country by virtue of its city-state status. While this poses a 'unique' example of urban development, the manner in which the Singapore government has tackled urban issues and challenges over the decades can be with cultural modification, social sensitivity and political accommodation translated to other cities in the region. The pillars of Singapore's urban success story lies in urban planning, pragmatic policies, legal enforcements and the tackling of brown issues. My contention is that cities are human engineered, built environments that should not be governed by ecological laws but rather the laws of human society. Singapore's Garden City or City in the Garden planning mandate is testimony to a human contrived, constructed and manicured landscape. Secondly, my thesis is that we need accept the reality of dual urban systems: the firm centre or formal economy and the bazaar and informal economy that have environmental implications. The secret of Singapore's urban success story lies in its public housing programme that houses 86% of Singapore's population and hence provides clean water, efficient garbage disposal and modern sewerage systems that ensures a clean, hygienic and liveable environment. When Singapore's Ministry of the Environment was established in 1972 there were barely five countries in the world that had similar ministries, which demonstrates the far sighted vision of the government. However, unlike other environmental ministries that deal with green issues, Singapore's Ministry of the Environment effectively deals with the "clean and brown issues" of Singapore. It is quite another story if we were to measure Singapore's environmental success by looking at its green issues (preservation of biodiversity) and the ecological

footprint. Given that the City-state has no natural resources and produces barely 10% of its food, it is understandable that the sustainability of Singapore's 4.3 million population requires an ecological footprint possibly 40 to 50 times larger than its current 700 sq km of land area to maintain its current standards of living and quality of life.

Resource Persons: Assoc Prof Victor SAVAGE

Chairperson: Prof KOH Kheng Lian

1245 hrs – 1345 hrs

**Lunch**

1345 hrs – 1500 hrs

**Session 2: International Protection of the Atmosphere and Climate Change**

Fossil fuels (coal, oil and gas) have been a source of energy to power machines since the beginning of the industrial age. As these fuels burn they emit a variety of gases which form a blanket of gases acting like greenhouse trapping the sun's heat and warming the planet earth.

Global warming is a great threat to the atmosphere and consequently to human life. Scientists warned the Kyoto global climate change conference in 1997 that if no actions are taken to curb greenhouse gas emissions, global temperatures and sea levels will rise, causing havoc to earth, particularly in developing countries which would be most susceptible to the effects of climate change in terms of human health, ecological systems, and socio-economic sectors.

Even though the international community has been concerned with global warming for over a century it was only in 1992, 154 countries signed the United Nations Framework Convention on Climate Change (FCCC) at the UN Conference on Environment and Development at Rio de Janeiro. In ratifying the FCCC the developed countries agreed to reduce greenhouse gas emissions to the 1990 levels by year 2000. Developing countries do not bear the same obligations. The FCCC, without setting any set specific emissions limitations, required the developing countries to report on their emissions. The Convention came into force in 1994.

In December 1997, 160 nations agreed on the Kyoto Protocol calling for emissions reductions relative to the 1990 levels, for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>). At the end of Kyoto meetings, industrial countries had agreed to cut their CO<sub>2</sub> emissions by 5% below levels by 2012.

The Protocol is now in force.

This presentation examines the international efforts in saving the atmosphere by mitigating global warming.

Resource Person: Penna LAKSHMIKANTH R

Chairperson: Emeritus Prof KOH Kheng Lian

1500 hrs – 1515 hrs

**Tea Break**

1515 hrs – 1615 hrs

**Session 3: Environmental Planning in Singapore**

Urban Planning, as an activity of purposeful anticipation of and provision for the future undertaken by public sector organizations to regulate land and water use on behalf of society, presents the opportunity to address environmental concerns at the early stages of development programming. This presentation examines how environmental concerns are addressed in land use planning in Singapore. It traces the principles and philosophies governing the key planning instruments, such as the strategic Concept Plan, as well as the statutory Master Plan, and considers how environmental concerns are addressed, in conjunction with other societal concerns such as economic growth and social development. Apart from key spatial strategies, the presentation will include a discussion of major regulatory requirements as well as market-related mechanisms that support plan implementation.

Resource Person: Dr MALONE-LEE Lai Choo

Chairperson: Prof KOH Kheng Lian

1615hrs – 1730 hrs

**Session 4: Environmental Impact Assessment**

- (a) The Potential for Strategic Environmental Assessment in Asia
- (b) The Effectiveness of EIA in Asia

Any major new development, infrastructure, or facility has the potential to impact the surrounding environment and community. EIA is the planning tool that allows the identification, quantification, evaluation, and mitigation of impacts on the environment. Other related project planning tools include Social Impact Assessment (SIA) and Quantitative Risk Assessment (QRA). Strategic Environmental Assessment (SEA) meanwhile allows for evaluation of new programs and policies, before any specific physical projects are planned.

EIA is requirement in most Asian countries. However, EIA scope, methodology, and effectiveness varies dramatically across the region. Singapore, Malaysia, and Hong Kong are good examples of very different approaches to EIA. World Bank standard EIA is the

most accepted approach internationally. The basic methodology generally includes: defining the baseline environment; describing the project; regulatory review; project alternatives; identifying emissions and releases; evaluating impacts; mitigation measures; and environmental management plan. Scope of such assessments usually include: air; water, ecology; cultural resources; waste management; contaminated land; chemical management; noise; landscape and aesthetic impact.

Resource Person: Assoc Prof Jeff OBBARD

Chairperson: Prof KOH Kheng Lian

## **Day 2, Thursday, 6 December 2007**

0900 hrs – 1045 hrs

### **Session 5: Waste Management**

- Integrated waste management planning
- Waste management infrastructure
- Waste management policy, institutional aspects, and regulations

This session provides an overview of the solid waste management system in Singapore. Principles of sustainable urban waste management planning are defined, including the waste management hierarchy, integration of institutional matters and infrastructure, costs, and the importance of systems that are appropriate to the unique local situations. The key waste management facilities and infrastructure in Singapore are presented, including collection systems, incinerators, landfills, and recycling facilities, including issues such as capacity and cost. The latter half of the presentation is devoted to the institutional issues that are essential for a workable, cost effective waste management system. These include methods of private sector participation, regulations and enforcement, tariffs and charging, arrangements between the regulator and operator, and other issues.

Resource Person: Mr Richard C. REIDINGER

### **Participants' Presentation on Waste Management**

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

1045 hrs – 1115 hrs

### **Tea Break**

1115 hrs – 1300 hrs

### **Session 6: Hazardous Waste Management (including**

## **Bio-Hazardous Waste)**

Hazardous waste is a by-product of industrial processes (solvents, wastewater sludge, etchants, etc), commercial activities (vehicle oil changes), institutions (medical waste, R&D waste), and even households. A comprehensive regulatory, institutional, and infrastructure framework is required to strictly manage these diverse and dangerous materials. Improper management of hazardous waste has resulted in serious environmental pollution, land contamination, and population health problems in many countries around Asia.

Singapore has one of the most advanced hazardous waste management systems in Asia. The government controls hazardous waste through a combination of regulation (Toxic Industrial Waste Regulations), administrative control, and strict enforcement. The entire value chain, including generation, transport, treatment, and final disposal, is managed. All hazardous waste infrastructure in the country is privately owned and operated, and a private market for hazardous waste services prevails which ensures efficient prices and services. Hazardous waste methods used in Singapore include incineration, solvent recycling, stabilization, oil recycling, and physical-chemical treatment.

Resource Person: Mr Richard C. REIDINGER

### **Participants' Presentation on Hazardous Waste Management**

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

1300 hrs – 1400 hrs

#### **Lunch**

1400 hrs – 1530 hrs

#### **Session 7: Basel Convention on the Transboundary Movement of Toxic Wastes**

We will examine how the international community has addressed the problem of the transboundary movement of hazardous waste through and examination of the 1989 Basel Convention on the Transboundary Movement of Hazardous Waste. We will examine why the Convention was necessary and how it attempts to regulate the transboundary movement of hazardous waste through principles such as “prior informed consent”. We will also examine the mechanisms and provisions in the Convention which are designed to encourage developing countries to ratify and implement the convention, and the mechanisms established in the Convention to keep it updated and to encourage states to effectively implement its provisions. We will also examine the steps taken by Singapore to implement the Convention and make it part of Singapore national law. Finally, we will examine the role played by international NGOs such as Greenpeace and the Basel Action Network in promoting the international regulation of hazardous wastes.

Our study of the Basel Convention provides an example of the major provisions and schemes that are found in many of the major international treaties on the environment, which are often referred to as Multilateral Environmental Agreements (MEAs).

Resource Person: Mr Richard C. REIDINGER

### **Participants' Presentation on Basel Convention**

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

1530 hrs – 1600 hrs

#### **Tea Break**

1600 hrs – 1730 hrs

### **Briefing on Singapore's Overall Environmental Strategy**

- (a) Overview of MEWR
- (b) Singapore Green Plan 2012

Mr Jason HO  
Sr Marketing Communications Executive  
3P Network Division, MEWR

Corporate Video on MEWR

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

## **Day 3, Friday, 7 December 2007**

0900 hrs – 1000 hrs

### **Session 8: Air Pollution Management – The Singapore Experience**

- (a) Control of Air Pollution from Industrial Sources
- (b) Control of Air Pollution from Mobile Sources

Air pollution management – the Singapore Experience  
This session discusses Singapore's management of air pollution – it gives an overview of the control of air pollution from industrial sources and mobile sources.

Resource Person: Assoc Prof LYE Lin Heng

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

1000 hrs – 1015 hrs

**Tea Break**

1015 hrs – 1115 hrs

**Session 9: Transport-Based Air Pollution Management**

- (a) Singapore's Experience – Traffic Planning
- (b) Experience of other Countries  
(Participants' Inputs)

This session elaborates on Singapore's management of air pollution control via controls on vehicular traffic. It looks at the implementation of the "polluter pays" principle in the system of control of car sales via the certificate of entitlement (COE); in the imposition of charges for entry into the central business area, and for use of certain expressways during peak hours; and the imposition of taxation for use of the roads.

Resource Person: Assoc Prof LYE Lin Heng

**Participants' Presentation on Air Pollution Management**

**Q & A**

Chairperson: Prof KOH Kheng Lian

1115 hrs – 1245 hrs

**Deep Tunnel Sewerage System**

Guest Speaker: Mr YONG Wei Hin  
Assistant Director  
Deep Tunnel Sewerage System  
Public Utilities Board

1245 hrs – 1330 hrs

**Lunch**

1330 hrs – 1500 hrs

**Session 10: Waste Minimisation and Recycling Programme in Singapore**

Waste minimization is the first preference within the waste management hierarchy, closely followed by material recovery and recycling. Achieving significant levels of waste minimization and recycling usually requires substantial intervention from government, in order to correct the market failures and externalities which have traditionally resulted in landfill being the dominant waste management method. Waste reduction methods may include economic instruments (recycling credits, disposal taxes, innovation grants), regulatory measures (producer responsibility, mandatory source separation, building codes), and technology measures (cleaner production technology, material recovery facility, etc).

Singapore has put in place several measures to promote waste minimization and recycling. These have included education, charging for solid waste disposal, and integration of recycling requirements into residential waste collection concessions. However, Singapore's primary method of waste reduction has been incineration, which results in reduction of waste to landfill by more than 80%. The private sector has also been active in developing facilities to recover and recycle various types of waste material, inc

Resource Person: Mr Richard C. REIDINGER

### **Participants' Presentation on Waste Minimisation**

Chairperson: Prof KOH Kheng Lian

1500 hrs – 1515 hrs

Tea break

1515 hrs – 1730 hrs

Topic (to be determined later)

Guest Speaker: Mr Edwin KHEW (to be confirmed)

## **Day 4, Monday, 10 December 2007**

0900 hrs – 0945 hrs

### **Session 11: Wastewater Management in South-East Asia**

#### **“An Overview”**

This presentation will provide an overview of the status of wastewater management in Southeast Asian countries on a comparative basis using data from international development agencies -- UNEP, UNESCAP, ADB and the World Bank. The presentation discusses the significant achievements of countries within the region, including Singapore, the different approaches adopted by national governments in managing wastewater, and reasons for difficulties encountered in providing satisfactory facilities and services to meet the needs of the communities they serve. The review will also cover a number of cases of wastewater treatment facilities being funded by international aid agencies. The contribution of private enterprise in building and operating wastewater facilities will be assessed. Difficulties encountered by this approach will be considered. Based on experiences of countries within the region, the feasibility of community-based operated wastewater treatment facilities will be discussed.

Resource Person: Dr OOI Giok Ling

### **Participants' Presentation on Wastewater Management**

#### **Q & A**

Chairperson: Prof KOH Kheng Lian

0945 hrs – 1045 hrs

**Session 12: Water Pollution Control in Urban Catchments:  
A Case Study in Singapore**

Resource Person: Dr A APPAN

The quality of runoff in any water resources project is largely influenced by the activities within the catchment areas and the direct pollution load the reservoir is being subjected to. As catchment areas tend to get progressively more urbanized in terms of industrialisation, the runoff quality is affected and so the quality of water to be abstracted tends to deteriorate. When such raw water is treated, there will be additional costs incurred for infrastructure development for anti-pollution measures to be taken within both the catchment area and the reservoir and also the water treatment plant. These additional expenditures will lead to an increase in the production cost of treated water. The main objectives of this paper are to define the impact of urbanization and industrialization on water catchments leading to poorer runoff quality and higher treatment costs. These concepts are illustrated in a real-life case study in Singapore where the sources of pollution in an urbanizing catchment were identified and quantified.

The pollution problem was analysed thoroughly and well-defined anti pollution measures were taken over a period of time and the results monitored. It has thus shown that it is possible to accommodate industrialisation and urbanization in large tracts of land provided an appropriate infrastructure is set up to identify the pollution problems and carry out extensive analysis. The recommended anti-pollution measures were taken on sound basis of the analyses along with appropriate administrative support from all the relevant contributing sectors. Legislation should be promulgated or amended, if necessary and, most important of all, there should be the right political will to back the technical decision makers.

**Participants' Presentation on Water Quality Management**

**Q & A**

1045 hrs – 1100 hrs

**Tea Break**

1100 hrs – 1130 hrs

**Participants' Presentation on Wastewater Management/  
Management of Freshwater Resources**

Freshwater resources are becoming increasingly scarce across the region. Pollution, overuse and harmful methods of exploitation of freshwater resources are rapidly reducing their provenance. Participants have been asked to prepare short presentations on how

individual countries/regions/ municipalities identify, protect, and utilize available freshwater resources. They will be required to describe their system of administration and how they interface with various interest groups (stakeholders) including the question of level of treatment of freshwater, costs involved, technologies utilized, method of delivery and pricing. Participants will be encouraged to be share their concerns and difficulties encountered and how they have been able to overcome the problems. The presentations will be followed by a Q&A session and the facilitator will guide the discussion with the view to identify and highlight lessons learnt and good practices relevant to other countries/situations.

Resource Person: Dr OOI Giok Ling

Chairperson: Prof KOH Kheng Lian

1215 hrs – 1330 hrs

**Departure for Tuas South Incineration Plant**

1330 hrs – 1530 hrs

**Tuas South Incineration Plant**

- (a) Overview of Waste Management in Singapore and TSIP
- (b) Plant Tour
- (c) Q&A

Mr Ivan YAP (to be confirmed)  
Tuas South Incineration Plant  
National Environment Agency

1530 hrs – 1630 hrs

**Departure for NEWater Visitor Centre**

1630 hrs – 1730 hrs

**NEWater Vistor Centre**

Plant Tour

Ms Adeline Niah  
Manager  
NEWater Visitor Centre  
Public Utilities Board

**Day 5, Tuesday, 11 December 2007**

0900 hrs – 1015 hrs

**Session 13: Compliance and Enforcement**

Resource Person: Assoc Prof LYE Lin Heng

## **Participants' Presentation on Compliance and Enforcement**

### **Q & A**

Chairperson: Prof KOH Kheng Lian

1015 hrs – 1045 hrs

Tea Break

1045 hrs – 1215 hrs

### **Session 14: The Role of ASEAN in Urban and Industrial Environmental Management and Governance: Focus on Freshwater Resources**

ASEAN, the Association of South East Asian Nations, was established in 1967. Its five founder members are Indonesia, Malaysia, Philippines, Singapore and Thailand, subsequently joined by Brunei, Cambodia, Laos, Myanmar and Vietnam. This workshop will consider some ASEAN environmental instruments relating to urban and industrial environmental management and governance. It will also focus on the work of the ASEAN Working Group on Environmentally Sustainable Cities (AWGESC) and the ASEAN Working Group on Water Resource Management (AWGWRM) – in this context, it will showcase Singapore's management of water resources.

Resource Person: Prof KOH Kheng Lian

### **Q & A**

Chairperson: Prof KOH Kheng Lian

1215 hrs – 1245 hrs

### **Closing Ceremony**

Closing Remarks

Presentation of Certificates

*~End of Workshop~*

Koh Kheng Lian

Director, APCEL Workshop on Urban and Industrial Environmental Management