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Management of Hazardous Industrial Wastes – Lessons From Singapore

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Management of Hazardous Industrial Waste – Lessons from Singapore

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I. INTRODUCTION

In the past thirty years, Asia has experienced a rapid industrial growth and many developing countries in Asia have emerged as economic powers to be reckoned with. With the positive economic and social results of industrialisation, however, also comes the negative impact to the environment, as well as increasing threats to health from occupational hazards. The fast pace of industrialisation makes hazardous industrial wastes a serious issue for a lot of Asian countries, as hazardous industrial wastes often discarded on uncultivated or public lands, in rivers, or in sewers not intended to carry hazardous industrial wastes.

In Singapore, the issue of hazardous industrial wastes is taken very seriously, as Singapore has very limited land and yet most of it is used extensively for housing and industries, such as pharmaceuticals, oil refining, shipping and electronics production. Singapore is an island nation of about 712 square kilometres in area with average population density of 7,126 people per square kilometre.¹ Such high population densities make it vital for hazardous waste to be managed as to minimise, if not to avoid, public exposure to accidental release of hazardous substance.² Currently, there are more than 2,000 companies in Singapore that handle or use hazardous substances, which generate a wide variety of hazardous wastes.³ Additionally, two-thirds of Singapore land area is used as water catchment areas,⁴ making it critical to ensure that hazardous waste facilities are not located in the vicinity of such areas, so as not to pollute the water sources and contaminate the drinking water.

Despite a recent study that found that Singapore's impetuous rush into developing a modern metropolis over the last thirty years had caused serious problems on its natural environment,⁵ Singapore has been quite successful in managing hazardous wastes produced by its industries and in maintaining the city as one of the most liveable cities in Asia.⁶

¹ Data from Department of Statistics Singapore, available at <http://www.singstat.gov.sg/stats/keyind.html#popnarea>, accessed on 18 March 2011.

² See National Environmental Agency ('NEA') website, available at http://app2.nea.gov.sg/mgmt_hazsub.aspx, accessed on 18 March 2011.

³ In 2006, about 413,000 metric tons of hazardous industrial wastes were generated in Singapore. See *Basel Convention Country Fact Sheets: Singapore*, published in May 2008 at Basel Convention website at <http://www.basel.int/natreporting/cfs.html>, accessed on 1 April 2011.

⁴ See Public Utilities Board ('PUB') website, available at <http://www.pub.gov.sg/water/Pages/LocalCatchment.aspx>, accessed on 21 March 2011.

⁵ See Bradshaw CJA, Giam X, Sodhi NS (2010), *Evaluating the Relative Environmental Impact of Countries*, PLoS ONE 5(5): e10440. Doi:10.1371/journal.pone.0010440.

⁶ Mercer LLC, *Quality of Living Report – 2010 Edition*, available at http://www.mercer.com/press-releases/quality-of-living-report-2010#Ranking_Eco_Cities, accessed on 1 April 2010. See also *Singapore Beats Hong Kong as*

The premise of this Paper is to look into Singapore's regulatory regime in hazardous industrial wastes management and to consider whether or not other countries in Asia can adopt similar approach. Part II will examine various regulatory requirements implemented in Singapore to control hazardous industrial wastes. Part III will focus on Singapore's measures in minimising the production of hazardous industrial wastes, either by way of screening new industrial developments or by way of waste reuse, recovery and recycling. Procedures for treatment and disposal of hazardous industrial wastes will also be discussed, as well as the post-disposal monitoring and audit conducted by the National Environmental Agency of Singapore ('NEA'). Each aspect of the regulatory framework will be examined to see if it is successful in its enforcement or if it does not achieve its objective in practice. This Part will then focus on the challenges in enforcing these regulatory requirements, including limited space for disposal and the balance between enforcing a strict environmental regulations and attracting new industries to come into the country. Other areas of concern will also be identified, such as the issue of export of hazardous industrial wastes and whether or not it meets the requirements under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal ('Basel Convention').⁷

Part IV will discuss if Singapore's strategy for control of hazardous industrial wastes can be adopted by other developing countries in Asia, taking into account Singapore's unique attributes as a city state with limited natural resources and high population density. This Part will conclude on what lessons can be learned from Singapore, even if Singapore's strategy for control of hazardous industrial wastes is not directly suitable to other developing countries in Asia.

II. REGULATIONS ON HAZARDOUS INDUSTRIAL WASTE IN SINGAPORE

Singapore, a former British colony, has a system of governance and a legal system largely inherited from the United Kingdom, although since independence in 1965, 'there has been a gradual – and increasing – movement towards developing an autochthonous legal system'.⁸ Since the centre of Singapore's economy is trade and the manufacturing industry, most of the environmental issues in Singapore are related to industrial and urban pollution.⁹

The NEA, established in July 2002, is the primary environmental regulatory agency in Singapore, which focus on the implementation of environmental policies in Singapore and to increase the effectiveness and responsiveness of Singapore's environmental protection effort.¹⁰ Waste management and pollution control generally fall under the purview of the Environmental Protection Division of the NEA. The Division implements programmes to monitor, reduce and

Asia's Most Livable City, Bloomberg 26 May 2010, available at <http://www.businessweek.com/news/2010-05-26/singapore-beats-hong-kong-as-asia-s-most-livable-city-update1-.html>, accessed on 1 April 2011.

⁷ United Nations Environment Programme, *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*, 22 March 1989, available at: <http://www.basel.int/text/documents.html>, accessed 23 March 2011.

⁸ Eugene Chan and Gary Tan, 'The Singapore Legal System,' in Singapore Academy of Law, *Laws of Singapore*, available at <http://www.singaporelaw.sg/content/LegalSys.html>, accessed on 17 March 2011.

⁹ Gunawan Tanuwidjaja, *The Integration of Environmental Law and Its Implementation in Singapore*, available at <http://greenimpactindo.wordpress.com/2010/03/29/the-integration-of-environmental-law-and-it%E2%80%99s-implementation-in-singapore/>, accessed on 22 March 2011.

¹⁰ Alan Khee-Jin Tan, 'Recent Institutional Developments on the Environment in South East Asia – A Report Card on the Region' (2002) 6 *Singapore Journal of International & Comparative Law* 891 at 904.

prevent environmental pollution. Additionally, in order to conserve energy resources and landfill space, this Division implements programmes to minimise waste generation, and maximise recycling and energy conservation. This Division oversees the Pollution Control Department ('PCD'), which controls toxic and environmentally hazardous chemicals under the Environmental Protection and Management Act ('EPMA') and the Environmental Protection and Management (Hazardous Substances) Regulations.¹¹ Another division in the NEA that plays an important role in waste management is the Environmental Public Health Division, which ensures a high standard of public health through comprehensive ground surveillance and appropriate preventive measures.

A. The Singapore Legal System And Legislation Procedure

Singapore has a comprehensive environmental legislative system. Before proposing a new environmental policy by way of enactment of a new Act or an amendment to an existing Act, the Ministry of Environment and Water Resources ('MEWR') or the NEA will have to seek in-principle approval from the Cabinet before preparing a draft Bill or a detailed statement of its proposed contents,¹² and then refer it to the Attorney General's Chamber ('AGC').¹³ The Legislative and Law Reform Division ('LLRD') of the AGC handles the vetting and drafting of all Government Bills in Singapore, to ensure that all Bills are consistent with the Singapore Constitution and with other Acts of Parliament, and any parent legislation.¹⁴

In some cases, the MEWR or NEA will consult with experts and relevant stakeholders when preparing the draft environmental legislation. The procedure, formality and degree of transparency when engaging in such consultations will vary according to the 'level of public interest or concern that is likely to be generated by the proposed legislation, the sectors of the economy that are likely to be affected by the proposed legislation and the importance of the proposed legislation to Singapore's economic development'.¹⁵ The MEWR or NEA may also have 'public consultations' on issues which potentially have a wider impact on the Singapore public.¹⁶ Recent examples include the Public Consultation undertaken by the NEA on the draft Singapore Green Plan 2012.¹⁷

The Minister of the MEWR or NEA will then on the First Reading introduce the Bill setting out implementing environmental legislation or amendments to existing legislation;¹⁸ and a date will

¹¹ See NEA website, supra note 2.

¹² See AGC website available at http://www.agc.gov.sg/llrd/legislative_process.htm, accessed on 17 March 2011.

¹³ Kevin Tan, *An Introduction to Singapore's Constitution*, Revised Edition (Singapore, Talisman Publishing Pte Ltd, 2011) at 47.

¹⁴ Robert Beckman, *The Role of Scientists, Experts and Stakeholders in the Law-Making Process in Singapore*, March 2005, CIL Website available at <http://cil.nus.edu.sg/wp/wp-content/uploads/2010/10/Beckman-Role-of-Scientists-Experts-and-Stakeholders-in-Law-Making-Process-in-Singapore.pdf>, accessed on 17 March 2011.

¹⁵ *Ibid.*

¹⁶ See REACH Website available at <http://app.reach.gov.sg/olcp/asp/ocp/ocp01a.asp>, accessed on 17 March 2011.

¹⁷ See NEA website available at http://app2.nea.gov.sg/news_detail_2001.aspx?news_sid=20081016832308707966, accessed on 17 March 2011.

¹⁸ Bills can also be introduced by Private Members but Notice of Introduction must be given at least four days before the introduction of the Bill. See AGC Website, supra note 12.

be fixed for the Second Reading of the Bill.¹⁹ During the Second Reading, the members of the Parliament will debate the Bill;²⁰ and then committed the Bill to a Committee of the whole Parliament or to a Select Committee.²¹ After the Bill has been considered by the Committee, the Parliament will either adopt the findings of the Committee in full, in part or reject them outright.²² In the Third Reading of the Bill, amendments may again be proposed but these will usually be of a minor character and the Bill will not be debated as vigorously as in the Second Reading.²³ At the end of the Third Reading, the Bill is put to a vote and once accepted, will have been passed by Parliament, and then presented to the President for his assent.²⁴

B. Statutory Environmental Laws On Hazardous Industrial Wastes

Hazardous industrial wastes are wastes which by their nature and quality are potentially detrimental to the human health or the environment, and which require special treatment or disposal.²⁵ The key environmental legislation in Singapore in relation to hazardous industrial wastes is the EPMA, which covers the environmental policy of Singapore and its control. Other legislations in relation to industrial hazardous wastes issues in Singapore are the Hazardous Waste (Control of Export, Import and Transit) Act ('HWA'), the Environmental Public Health Act ('EPA') and to a certain extent, the Workplace Safety and Health Act ('WSHA').

1. Environmental Protection and Management Act

The EPMA came into force on 31 January 2008, replacing the old Environmental Pollution Control Act, which was enacted to replace the Clean Air Act, the Water Pollution Control and Drainage Act and the Poisons Act. Consequently, the Environmental Pollution Control (Hazardous Substances) Regulations has also been renamed the 'Environmental Protection and Management (Hazardous Substances) Regulations'. The EPMA provides for environmental pollution control measures with regard to air pollution, water pollution, land pollution, noise control and hazardous substance control in Singapore.

¹⁹ Kevin Tan, *supra* note 13 at 48.

²⁰ Kevin Tan, *ibid.*

²¹ See AGC website, *supra* note 11. The Committee of the whole Parliament 'will deliberate bills that are uncomplicated, are of a regulatory measure or are minor amendments.' Select Committees are appointed usually to examine a particular piece of legislation only if the Bill is 'complex, controversial or has wide-ranging impact'. The public is invited to make written representations to the Select Committee on the Bill and may be invited to give evidence before the Select Committee. See Kevin Tan, *supra* note 13 at 45.

²² Kevin Tan, *supra* note 13 at 49.

²³ Kevin Tan, *ibid.*

²⁴ Before presented to the President, the Bill must be forwarded to the Presidential Council for Minority Rights to ensure that they do not discriminate against any racial or religious community. See Articles 69 and 76, *Constitution of the Republic of Singapore* (1999 Revised Edition), Singapore Statutes Online, available at <http://statutes.agc.gov.sg/>. The exception are money Bills, urgent Bills and Bills affecting defence, security, public safety, peace or good order in Singapore. See Article 78 (7), Constitution of the Republic of Singapore. The Presidential Council for Minority Rights was established in 1969 following the recommendations of the Wee Chong Jin Constitutional Commission. See Kevin Tan, *supra* note 13 at 50.

²⁵ Hazardous wastes do not include household waste or residues arising from the incineration of household waste. See Section 4 of the Hazardous Waste (Control of Export, Import and Transit) Act ('HWA').

For air pollution control, the EPMA prohibits any emission of dark smoke from any industry, as well as the use of open fire to dispose of waste wood, timber and other combustible.²⁶ The EPMA also obliges industries to maintain and operate air pollution control equipment²⁷ and to control air impurities according to the best practicable means available to prevent or minimise air pollution.²⁸ The standards for air impurities allowed to be emitted by industries are provided in the Environmental Protection and Management (Air Impurities) Regulations, which include the emission standards allowed for special waste incinerators for hazardous industrial wastes.²⁹

For water and land pollution control, the EPMA requires all industries to treat any trade effluent they generated to the allowable limits before discharging them into any drain or land.³⁰ Discharging any hazardous substance into any inland water so as to be likely to cause pollution is strictly prohibited.³¹ Industries that discharge trade effluent into any watercourse or land are required to install sampling test points, inspection chambers, flow-meters and recording to ensure that the trade effluent they discharging are within the allowable limits provided by the PCD.³²

Part VII of the EPMA regulates the importation and sale of hazardous substances. The EPMA prohibits the import, possess for sale, sell or offer for sale any hazardous substance without a license.³³ Additionally, the EPMA obliges industries that store or transport toxic substance to use a method of storage, operation or process to prevent water pollution; to install and operate pollution monitoring equipment to prevent and detect any leakage or discharge; to carry out specific tests on equipment, tanks or any other related facilities and to submit the results of these tests; and to prepare and submit contingency plan for events of accidental discharge or spillage of oil, chemicals, trade effluent or other polluting matters.³⁴

Part X of the EPMA enables the NEA to require industries to conduct study on pollution control, self-monitoring and take mandatory insurance.³⁵ While Part XI grants the NEA with the powers of arrest, to enter any premises for investigation and to search any premises and seize any records or substance if the NEA has reasons to believe that any hazardous substance is being discharged without any license.³⁶

There are several subsidiary regulations that support the EPMA, which control boundary noise limits for factory premises,³⁷ noise at construction sites,³⁸ hazardous substances,³⁹ trade

²⁶ Section 11 of the Environmental Protection and Management Act ('EPMA').

²⁷ Section 10, *ibid.*

²⁸ Section 12, *ibid.*

²⁹ See Section 5(8), Singapore Environmental Protection and Management (Air Impurities) Regulations.

³⁰ Section 16 of the EPMA.

³¹ Section 17, *ibid.*

³² See Section 5, Environmental Protection and Management (Trade Effluent) Regulations.

³³ Section 22 of the EPMA.

³⁴ Section 19, *ibid.*

³⁵ See Section 36 – 38, *ibid.*

³⁶ See Sections 45, 47 and 50, *ibid.*

³⁷ See Environmental Protection and Management (Boundary Noise Limits for Factory Premises) Regulations.

³⁸ See Environmental Protection and Management (Control of Noise at Construction Sites) Regulations.

effluent,⁴⁰ air impurities,⁴¹ and ozone depleting substances,⁴² as well as prohibit the use of open fires.⁴³

2. *Hazardous Waste (Control of Export, Import and Transit) Act*

Singapore became a party to the Basel Convention in the control of export, import and transit of hazardous wastes on 2 January 1996.⁴⁴ On 16 March 1998, Singapore enacted the HWA and its Regulations to regulate the control of export, import and transit of hazardous wastes in accordance with the principles and provisions of the Basel Convention.⁴⁵ Under the HWA and its Regulations, the export, import or transit of hazardous wastes from or into Singapore can only be done with a permit from the NEA.⁴⁶ In granting any permit for the export, import or transit of hazardous wastes, the NEA adopts the Prior Informed Consent ('PIC') procedure of the Basel Convention, which prohibits parties from exporting hazardous wastes to another party unless the competent authority in the importing party has been properly informed and has consented to the trade.⁴⁷

3. *Environmental Public Health Act*

The collection, handling, transportation, treatment and disposal of hazardous industrial waste in Singapore are controlled under the EPHA and Environmental Public Health (Toxic Industrial Waste) Regulations. Under the EPHA, all hazardous industrial waste collectors must be licensed.⁴⁸ The transport of hazardous industrial waste in quantities exceeding those stipulated in the Environmental Public Health (Toxic Industrial Waste) Regulations requires a transport approval.⁴⁹ Hazardous industrial wastes controlled under the Environmental Public Health (Toxic Industrial Wastes) Regulations are listed in the Schedule of the Regulations as waste streams from specific industrial activities, wastes with specified toxic components and specific categories of wastes, which includes spent acids, alkalis, wastes containing gallium arsenide and spent etching solutions containing copper from printed circuit board manufacturing.⁵⁰

4. *Workplace Safety and Health Act*

The Workplace Safety and Health Act ('WSHA') aims to cultivate good safety habits in all individuals so as to engender a strong safety culture in all factories and workplaces in

³⁹ See Environmental Protection and Management (Hazardous Substances) Regulations.

⁴⁰ See Environmental Protection and Management (Trade Effluent) Regulations.

⁴¹ See Environmental Protection and Management (Air Impurities) Regulations.

⁴² See Environmental Protection and Management (Ozone Depleting Substances) Regulations.

⁴³ See Environmental Protection and Management (Prohibition on the Use of Open Fires) Regulations.

⁴⁴ Supra note 7.

⁴⁵ See *Management of Hazardous Wastes in Singapore*, available at NEA website at <http://app2.nea.gov.sg/data/cmsresource/20090316748986342293.pdf>, accessed on 23 March 2011.

⁴⁶ See Part IV of the HWA.

⁴⁷ See *Management of Hazardous Wastes in Singapore*, supra note 45.

⁴⁸ Section 31, Environmental Public Health Act ('EPHA').

⁴⁹ Section 20, Environmental Public Health (Toxic Industrial Waste) Regulations.

⁵⁰ See *Management of Hazardous Wastes in Singapore*, supra note 45.

Singapore.⁵¹ It requires the owner, occupier, employer and other stakeholders of a factory or workplace to take reasonably practicable measures to ensure the safety and health of workers and other people that are affected by the work being carried out.⁵² The WSHA also regulates the permissible exposure levels, control and disposal of any toxic or noxious materials, whether solid, liquid, gaseous or vaporous from any factories or workplaces.⁵³

C. 'Soft' laws

For industries in Singapore, soft laws consist of notices, codes of practice, guidelines, directives, and circulars as well as notices as prescribed by the NEA or other relevant statutory bodies. These notices, codes and guidelines are issued under the EPMA, HWA, EPHA or other relevant legislation such as the Fire Safety Act. These codes, guidelines, directives, circulars and notices consist of rules which industries, trades and businesses, must comply with. The relevancy of any of the laws or the directives would depend on the particular project undertaken.

These codes of practice, guidelines, directives, circulars and notices provide certainty to users and streamline the NEA's licensing process. Codes are intended to have a results-based focus where possible. The NEA has issued codes and guidelines for pollution control and waste management in Singapore, such as Code of Practice on Environmental Health, which contains information on the essential design criteria which should be met to satisfy environmental health requirements in the design of refuse storage and collection systems;⁵⁴ Code of Practice on Pollution Control, which provide information for industrialists, architects, professional engineers and consultants on pollution control requirements for the submission of development proposals and building plans;⁵⁵ and Guidebook on Waste Minimisation for Industries, which aims to assist companies to reduce waste at source and to maximise recovery of recyclable waste for reuse or recycling.⁵⁶ The Singapore Civil Defence Force has also issued a circular under the Fire Safety Act on requirements for safe transport of flammable materials, including hazardous industrial wastes, on Singapore roads.⁵⁷

III. PRACTICE AND CHALLENGES TO CONTROL HAZARDOUS INDUSTRIAL WASTES

The enforcement of environmental legislative requirements for the control of hazardous industrial wastes generally operates at three levels. First, depending on the type of activity in question and the type of waste it generates, the NEA at the approval stage determines if all anti-pollution and waste minimisation measures mandated by legislation have been complied with

⁵¹ Section 2, Workplace Safety and Health Act ('WSHA').

⁵² See Part IV of the WSHA.

⁵³ Section 61(2)(f) of the WSHA.

⁵⁴ *Code of Practice on Environmental Health*, available at NEA website at http://app2.nea.gov.sg/Copeh_%202005_with%20Addendum%204.aspx, accessed on 23 March 2011.

⁵⁵ *Code of Practice on Pollution Control*, available at NEA website at <http://app2.nea.gov.sg/data/cmsresource/20090312534898283541.pdf>, accessed on 23 March 2011.

⁵⁶ *Guidebook on Waste Minimisation for Industries*, available at NEA website at <http://app2.nea.gov.sg/data/cmsresource/20100901745753499568.pdf>, accessed on 23 March 2011.

⁵⁷ SCDF Circular on Requirements of Road Transportation of Petroleum & Flammable Materials, updated August 2010.

before granting approval for the commencement of such activity. Secondly, the NEA through its departments issues licences and monitors ongoing industrial activities to ensure that compliance with environmental legislation on hazardous waste management continues to be observed. Finally, the NEA enforces environmental requirements by conducting regular inspections and prosecuting offenders in court.

A. The Approval Stage

In Singapore, the Government has implemented measures to control and minimise the risks from industrial developments handling large quantities of hazardous wastes not only to protect the general public and the environment but also workers within the hazardous plants.⁵⁸ Pollution control is implemented from the planning stages, by proper land use planning and the incorporation of environmental infrastructures. Industries are required to submit an application for written permission, licence and permits from the Building and Construction Authority ('BCA') and from the PCD before they can start construction or development and commence operation.⁵⁹ Before the BCA approves any application of Building Plans, it will consult other relevant authorities such as the Fire Safety Bureau ('FSB'), National Parks Board and the PCD.⁶⁰

The PCD, aside for being responsible for hazardous substances and hazardous industrial wastes control, is also responsible for ensuring that environmental factors are incorporated into land use planning, development and building control of new developments. The PCD will verify that industrial developments are appropriately sited and are compatible with designated land use of their surroundings.⁶¹ As guidance for industries in their land use planning, industries are categorised into clean, light, general and special industries. Only clean and light industrial estates are allowed to be located close to water catchments or residential areas. Special industries that generate hazardous industrial wastes and can cause accidental discharge of polluting and toxic chemicals, such as oil refineries, petrochemical plants and hazardous industrial wastes treatment facilities, will not be allowed to be sited within water catchments and must be sited at least one kilometre from the nearest residential areas.⁶² Land zoned for industrial use will be allocated to the industrial land developing agencies, such as the Jurong Town Corporation ('JTC') and the Housing Development Board ('HDB') or tendered out for development by private sectors. These developing agencies must consult PCD on the allocation of industrial premises.⁶³ The process of getting an approval is described in more detail below.

1. Clearance on the use of Industrial Premises/ Development Control

At this early stage of industrial development, the Central Building Plan Unit ('CBPU') under the PCD screens industrial development plans to ensure that they are sited in proper designated

⁵⁸ See NEA website, supra note 2.

⁵⁹ Industries can now apply for a single licence to carry out their environmental related activities. See Section 31 of the EPMA.

⁶⁰ Section 5, Building Control Act; see *Code of Practice on Pollution Control*, supra note 55, at 4.

⁶¹ See NEA website, supra note 2.

⁶² See *Code of Practice on Pollution Control*, supra note 55, at 9.

⁶³ See NEA website, supra note 2.

industrial estates which are compatible with the surrounding land use.⁶⁴ The CBPU will check the layouts of the proposed developments to ensure that the proposed buildings or other structures do not encroach into public sewers, pumping mains, drainage reserves or common drain. The CBPU will also ensure that the proposed development will not disturb any residential buildings or existing underground links, train stations and tracks, as well as ensuring that there is adequate land set aside for future drainage schemes.⁶⁵

2. Approval on the Building Plan

After a proposed industrial development plan has been granted planning approval, industries are required to submit Building Plans and Detailed Plans of buildings works, as well as related building services, such as solid waste disposal, sewerage, surface water drainage and pollution control systems, to the CBPU.⁶⁶ The CBPU will ensure that the industries use clean technology to minimise the use of hazardous chemicals and the generation of hazardous industrial wastes, as well as adopt processes which facilitate the recycling, reuse and recovery of such wastes. The CBPU may also impose environmental pollution control requirements to be incorporated into the designs of such developments to minimise pollution and mitigate pollution impact on its surrounding.⁶⁷

The PCD will then assess and evaluate the environmental effect of the proposed industries to ensure that they do not cause environmental security hazards and pollution problems.⁶⁸ Industries are required to install in-house facilities to control, recycle and reuse their hazardous industrial wastes or to treat them for safe disposal;⁶⁹ or to engage licensed hazardous industrial waste collectors to collect their wastes for recycling or treatment for safe disposal.⁷⁰ Clearance will be granted only if the PCD is satisfied that emissions of pollutants from such industries can comply with the prescribed standards; pollution impact could be mitigated to acceptable levels; hazardous wastes can be safely managed and properly disposed of; and that the industry is sited in a suitable industrial area.⁷¹ This screening process is necessary to avoid the generation of any intractable hazardous industrial wastes that cannot be safely dispose of in Singapore.

3. Quantitative Risk Assessment and Pollution Control Study

The PCD may require developers of special industries⁷² to carry out a Quantitative Risk Assessment ('QRA') in order to identify and quantify hazards and risks related to the transport,

⁶⁴ See NEA website available at http://app2.nea.gov.sg/app_clearance_use_industrial_premise.aspx, accessed on 30 March 2011.

⁶⁵ See NEA website available at http://app2.nea.gov.sg/app_sewage_drain_info.aspx, accessed on 30 March 2011.

⁶⁶ Note that industries can only operate in scheduled premises as defined in the First Schedule of the EPMA. Licence to occupy and use any of these scheduled premises will only be granted if the industry undertakes measures to manage, treat and safely dispose hazardous industrial wastes originating from or stored within the premises. See Section 6(3)(c) of the EPMA.

⁶⁷ See NEA website, supra note 2.

⁶⁸ *Ibid.*

⁶⁹ Section 16 of the EPMA.

⁷⁰ Section 8 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

⁷¹ See NEA website, supra note 2.

⁷² For a list of special industries see Appendix 4 of the *Code of Practice on Pollution Control*, supra note 54.

use and storage of hazardous materials.⁷³ The QRA must identify all possible accident scenarios and provide recommendation of measures to be incorporated in the design and operation of the premises to keep hazards / risks to as low a level as practical.⁷⁴

The PCD may also require a pollution control study from developers of special industries to assess all pollution impact on the environment and recommendation of measures to mitigate such impact.⁷⁵ The pollution control study report must contain the inventory and storage of hazardous industrial wastes, including waste oil, solvent and other solid wastes; measures for safe storage and handling of hazardous industrial wastes to ensure compliance with requirements in the Code of Practice on Pollution Control; and system of checks on the safe storage and handling of hazardous industrial wastes.⁷⁶

4. Emergency Response Plan

Once the QRA is cleared, the industries are required to develop an emergency response plan ('ERP') to mitigate all accident scenarios identified in the QRA study. The NEA provides that the ERP must be comprehensive and should contain the following key elements:⁷⁷

- a) notification procedures (who are the persons and authorities to contact and how to contact);
- b) emergency procedures to contain and decontaminate spills in the event of a chemical fire / release, (immediate actions to be taken by driver/ground staff and actions to be taken by the company upon being informed);
- c) emergency equipment to be carried on the vehicle and at base, such as personal protection equipment, absorbents, neutralising solutions and salvage drums;
- d) Material Safety Data Sheets of the hazardous substances transported.

The ERP must be submitted to the PCD for information and to Singapore Civil Defence Force ('SCDF') (HazMat Branch) for clearance.

B. Licensing Control And Monitoring Stage

Singapore's strategy to control and monitor hazardous industrial wastes are by two folds. First, the NEA issues licences and monitors the hazardous industrial wastes generators. Second, the NEA controls the collection, treatment and disposal of these hazardous industrial wastes. These licensing controls are implemented under the EPMA and its Regulations, as well as under the Environmental Public Health (Toxic Industrial Waste) Regulations. The licensing controls prevent unauthorised persons from handling hazardous substances and ensure proper safeguards are taken at all times in the handling of hazardous substances to prevent accidental releases and

⁷³ Section 26 of the EPMA.

⁷⁴ See *Pollution Control Department (PCD) Guidelines For Quantitative Risk Assessment (QRA) Study*, available at NEA website at http://app2.nea.gov.sg/env_plan_cbpu.aspx, accessed on 25 March 2011.

⁷⁵ Section 36 of the EPMA.

⁷⁶ See *Central Building Plan Unit Planning & Development Department Guidelines For Pollution Control (PC) Study*, available at NEA website at http://app2.nea.gov.sg/env_plan_cbpu.aspx, accessed on 25 March 2011.

⁷⁷ Section 22 of the Environmental Protection and Management (Hazardous Substances) Regulations; see also NEA website, *supra* note 2.

mitigate the adverse effects of polluting materials being released from industries at any stage of the hazardous industrial wastes disposal.⁷⁸ The EPMA prescribes licences for discharge of trade effluent, oil, chemical, sewage or other polluting matters;⁷⁹ while the Environmental Public Health (Toxic Industrial Waste) Regulations prescribes licences for the collection, recycling, treatment and disposal of hazardous industrial wastes.⁸⁰

1. Licences for Hazardous Industrial Waste Generators

Under the EPMA and its regulations, industries are required to obtain licences to import, transport, store or use hazardous substances. As conditions to the grant of these licences, the EPMA and its Regulations impose technical requirements to be complied with to ensure the safe management and handling of hazardous substances and to prevent an accident from occurring.⁸¹

a) Licence to import, export or sell hazardous substances

This Licence is required for any industry who wishes to import or export hazardous substances that are controlled under the EPMA. The import stage is the most effective stage to ensure that all chemicals that enter Singapore can be and will be safely managed and handled at all times by approved competent licence holders.⁸² Industries must provide proof that the location for the storage of such hazardous substances is in compliance with PCD's requirements, and to ensure that containers and storage tanks for the hazardous substances are designed, manufactured and tested in accordance to internationally-acceptable standards.⁸³

b) Licence to store or use hazardous substances

Likewise, industries that are planning to purchase, store or use any hazardous substances controlled under the Environmental Protection and Management (Hazardous Substances) Regulations must possess a valid permit.⁸⁴ Such industries must have been cleared by the PCD to use hazardous substances at his factory, and able to show that the hazardous substances will be stored safely in an approved location and in compliance with the storage requirements, which include sheltered; fenced-up; under lock and key; provided with kerb / hump all round the storage area; provided with fire protection and safety facilities; equipped with leak detection and warning devices and emergency scrubbing systems for storage of toxic gases.⁸⁵ Industries must follow PCD's labelling requirements as well as restricting entry to the storage area only to authorised personnel.⁸⁶ Permit holders must not store hazardous substances for any purpose

⁷⁸ See NEA website, *supra* note 2.

⁷⁹ Section 15 of the EPMA.

⁸⁰ Section 9 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

⁸¹ See NEA website, *supra* note 2.

⁸² *Ibid.*

⁸³ See Section 22 of the EPMA; see also NEA website, *ibid.*

⁸⁴ See Section 17 of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁸⁵ See NEA website, *supra* note 2.

⁸⁶ See Section 19 of the Environmental Protection and Management (Hazardous Substances) Regulations.

other than those stated in the permit, and to keep a record of the quantity and stock movements of such hazardous substances that they stored.⁸⁷ Another condition of obtaining a permit is to have an adequate emergency action plan for dealing with any accidental release of hazardous substances, including response actions to mitigate the impact of the release, procedures for decontamination, and having an adequate stock of emergency equipment such as neutralising agent, adsorbents, oversized drums, and protective gears.⁸⁸ The PCD may also require implementation of a safety audit to test, identify and rectify weaknesses in the management system and practices of handling hazardous chemicals on a regular basis.⁸⁹

c) Transport approval control

Approval from the PCD is required for companies to transport any hazardous substances in quantities exceeding those specified in the Environmental Protection and Management (Hazardous Substances) Regulations.⁹⁰ The limits vary from 0 kg for highly toxic chemicals such as mercury compounds, to 5,000 kg for corrosives such as boric acid.⁹¹ The transport approval will be issued to a company that could show proof that the hazardous substances will be transported safely in compliance with the transportation requirements and that the containers and the tankers used for such transport are designed, manufactured and tested in accordance to the code of practice accepted by the PCD,⁹² and are properly labelled and carry appropriate hazard warning panels in accordance to the Singapore Standards 286, 'Cautionary Labelling for Hazardous Substances'.⁹³ The same requirement applies to the vehicle to be used for the transportation of hazardous or flammable materials, which requires a transport licence to be displayed in the driver's cabin at all times.⁹⁴ All transportation of controlled hazardous substances can only be done along NEA's approved routes and must be

⁸⁷ Section 18 of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁸⁸ Section 22 of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁸⁹ See Section 22(4) & (5) of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁹⁰ Sections 3 & 4 of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁹¹ See Schedule of the Environmental Protection and Management (Hazardous Substances) Regulations.

⁹² Section 4 of the Environmental Protection and Management (Hazardous Substances) Regulations. Under the approved standards, the tank and tank container must undergo periodic inspections. The following standards are acceptable to the NEA: (i) European Agreement of Road Transport of Dangerous Goods ('ADR Standards'); (ii) United Nations Recommendations on the Transport of Dangerous Goods ('UN Standard'); (iii) International Maritime Dangerous Goods Code ('IMDG Code'); or (iv) United States Code of Federal Regulations ('US-DOT Standards'). See NEA website, supra note 2.

⁹³ Section 10 of the Environmental Protection and Management (Hazardous Substances) Regulations; see NEA website, supra note 2.

⁹⁴ Prior to the approval of the transport licence, the vehicle is to undergo a third party inspection to meet the required safety standards, and any bulk tank carried on the vehicle must be tested and certified by a professional engineer. See SCDF Circular on Requirements of Road Transportation of Petroleum & Flammable Materials, updated August 2010.

between 9.00 am and 5.00 pm (Monday to Saturday excluding Sundays and Public Holidays).⁹⁵

Under the current legislation of the Fire Safety (Petroleum and Flammable Materials) Regulations, all drivers who are assigned to transport hazardous substances on the roads in Singapore are required to carry a valid Hazardous Materials Transportation Driver Permit, which is valid for no more than three years.⁹⁶ To obtain or renew the permit, drivers must be trained in the prevention and handling of accidental spills and have attended the Hazardous Materials Drivers Course conducted by SCDF's Civil Defence Academy.⁹⁷ The Hazardous Materials Transport Driver Permit comes in the form of a smart card containing individual biometrics (ie, fingerprints) and relevant information of the drivers, which will be used in conjunction with the Driver's Identity Verification system to verify the identity of the driver at checkpoints or any roadside inspections conducted by the relevant authorities.⁹⁸ All drivers must obtain from the consignor or owner of the hazardous substance all documents pertaining to the chemicals transported (such as transport approval, all emergency response and spill control as well as first aid equipment) and familiarise themselves with the information contained therein before proceeding to transport the consignment of the hazardous substance.⁹⁹ The consignor or owner of the hazardous substances must ensure that the instructions given to the driver are accurate and sufficient to enable the driver to carry out the transportation safely, and to be present on-site to personally deal with any chemical release during transportation.¹⁰⁰ The consignor, owner or transporter of hazardous substances must also establish an adequate transportation emergency response plan to deal with any accidental release of the hazardous substances.¹⁰¹ Additionally, this emergency information should be put on the hazard warning panels on road tankers and vehicles carrying hazardous substances in tank containers.¹⁰²

⁹⁵ Section 9 of the Environmental Protection and Management (Hazardous Substances) Regulations. For complete approved timings for the transport of hazardous materials, see SCDF Circular on Requirements of Road Transportation of Petroleum & Flammable Materials, *ibid*.

⁹⁶ Sections 6 & 7 of the Fire Safety (Petroleum and Flammable Materials) Regulations; see also Section 7(b) of the Environmental Protection and management (Hazardous Substances) Regulations.

⁹⁷ Section 6(2) of the Fire Safety (Petroleum and Flammable Materials) Regulations.

⁹⁸ See SCDF website available at http://www.scdf.gov.sg/content/scdf_internet/en/building-professionals/fire-safety-licensing-and-enforcement/Petroleum-Storage-Tpt.html#Transport_licensing_submission, accessed on 30 March 2011.

⁹⁹ Drivers must also obtain the supplementary operational requirements for loading, transport, storage, unloading, handling and stowage; restrictions on the mode of transport and any necessary routing instructions; emergency action plan; and general nature of risk and safety precautions when handling the hazardous substances. See sections 6 & 8 of the Environmental Protection and Management (Hazardous Substances) Regulations.

¹⁰⁰ Section 7 of the Environmental Protection and Management (Hazardous Substances) Regulations.

¹⁰¹ See Section 22 of the EPMA; see also NEA website, *supra* note 2.

¹⁰² The hazard warning panels should contain the following emergency information: (i) the appropriate class label and subsidiary risk label, if any; (ii) the correct technical name of the substance; (iii) the UN number of the

In addition to the licenses to import, use, store and transport hazardous substances, industries are required to notify the NEA of the type or nature of hazardous industrial wastes that are being produced or generated in their premises, or if the quantity, volume, concentration or level of any hazardous industrial wastes they generate exceed the permitted level.¹⁰³ Industries are also required to keep a register of the hazardous industrial wastes they produce, which should contain the type and quantity generated, manner of disposal, date and quantity supplied or sold to a hazardous industrial wastes collector, the name and address of the hazardous industrial wastes collector and the quantity of hazardous industrial wastes they held in stock.¹⁰⁴

2. Licences for Hazardous Industrial Waste Collectors

As mentioned above, during the approval stage, industries are required to install in-house treatment facilities to recycle and reuse their hazardous industrial wastes or to treat their hazardous industrial wastes for safe disposal.¹⁰⁵ For those industries that are too small or find it impractical or uneconomical to have their own in-house treatment facilities, either due to cost, lack of expertise or space constraint, they can apply for clearance from the PCD to engage a licensed hazardous wastes collector to collect their hazardous industrial wastes for recycling or treatment for safe disposal.¹⁰⁶ Industries are required to segregate their hazardous industrial wastes according to their characteristics and to store them in special containers for collection by licensed hazardous industrial waste collectors for disposal.¹⁰⁷ Industries that engage a hazardous industrial waste collector must provide all necessary information to enable the waste collector to carry out the storage, treatment, reprocessing or disposal of the hazardous industrial waste properly and safely.¹⁰⁸ These waste generators must also ensure that information they provided are accurate and that the hazardous industrial wastes collector that they engage is a licensed one.¹⁰⁹

Operators of specialised hazardous waste recycling, treatment and disposal plants are required to obtain licences from the PCD to collect, store, use, reprocess, treat and dispose of hazardous industrial wastes from industries.¹¹⁰ A hazardous industrial wastes collector can only collect specific hazardous industrial wastes that are listed in their licences and confine their hazardous industrial wastes storage and treatment activities to approved premises and facilities.¹¹¹ These licence and control requirements are implemented to ensure that all hazardous industrial wastes

substance; (iv) the Hazchem code number; and (v) contact numbers and names of company and emergency response authority. See NEA website, *supra* note 2.

¹⁰³ Section 4 of the Environmental Public Health (Toxic Industrial Waste) Regulations. See the Schedule for the prescribed limit of hazardous industrial wastes that can be generated.

¹⁰⁴ Section 6 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

¹⁰⁵ See Sections 6 & 16 of the EPMA.

¹⁰⁶ *Supra* note 69.

¹⁰⁷ See *Code of Practice on Pollution Control*, *supra* note 55, at 19.

¹⁰⁸ Section 5(1) of the Environmental Public Health (Toxic Industrial Waste) Regulations.

¹⁰⁹ Section 5(2), *ibid.*

¹¹⁰ Section 9, *ibid.* Note that this licence does not cover for the carrier engaged by the hazardous industrial waste collector to transport the hazardous industrial wastes.

¹¹¹ Section 13 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

are collected, treated and disposed of in compliance with the stipulated standards.¹¹² As of 29 March 2011, there are more than 180 of such hazardous industrial wastes collectors listed with the NEA in Singapore.¹¹³ A large amount of industrial wastes generated and collected in Singapore by the licensed collectors, such as spent solvents, spent etchants and photographic wastes, are either recycled, reused or have valuable components extracted and recovered before disposal.

A collector licence does not include an approval to transport, which is issued to those who undertakes the transport of the controlled hazardous industrial wastes, who can either be the generator, the licensed collector or the transport company engaged by one of them. The consignor, who can be either the generator or the licensed collector, must obtain transport approval from the PCD to transport the hazardous industrial wastes. Note that approval from the NEA is required only if the hazardous industrial wastes collector, or a carrier or transport company engaged by such collector, intends to transport hazardous industrial wastes in quantities which exceed those specified in the Environmental Public Health (Toxic Industrial Wastes) Regulations.¹¹⁴

Carriers of hazardous industrial wastes are subjected to the same requirements imposed by the SCDF to those who transport hazardous materials; including obtaining licences for both the driver and vehicle to be used to transport the hazardous industrial wastes.¹¹⁵ The hazardous industrial wastes collectors are required to maintain a proper record on collection, treatment and disposal of hazardous industrial wastes.¹¹⁶ To prevent illegal dumping and disposal of hazardous industrial wastes, the movement of such wastes is tracked by the HazMat Transport Vehicles Tracking System ('HTVTS').¹¹⁷ All SCDF-licensed vehicles carrying (or having the capacity to carry) hazardous materials or hazardous industrial wastes are required to be fitted with tracking devices and immobilizers.¹¹⁸ This immobilizer feature was introduced to prevent such vehicles from being hijacked and used to compromise the security of key installations in Singapore. The vehicle's horn-hazard warning lights-immobilizer feature will be activated once an alarm is detected by the system, and SCDF will then dispatch enforcement officers to investigate the cause of the violation¹¹⁹ and will contact the owner or consignor concerned.

¹¹² See *Code of Practice on Pollution Control*, supra note 55, at 19.

¹¹³ See List Of Toxic Industrial Waste Collectors / PVC Waste Collectors Licensed Under The Environmental Public Health (Toxic Industrial Waste) Regulations 1988, available at <http://app2.nea.gov.sg/data/cmsresource/20090316562565217318.pdf>, accessed on 30 March 2011

¹¹⁴ See the Schedule of the Environmental Public Health (Toxic Industrial Waste) Regulations for the prescribed limit of hazardous industrial wastes that can be transported without a licence.

¹¹⁵ See SCDF website available at http://www.scdf.gov.sg/content/scdf_internet/en/building-professionals/fire-safety-licensing-and-enforcement/Guidebook-App-Petroleum-Flammable.html, accessed on 30 March 2011.

¹¹⁶ Section 12 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

¹¹⁷ See SCDF Circular on Requirements of Road Transportation of Petroleum & Flammable Materials, updated August 2010.

¹¹⁸ Section 44 of the Fire Safety (Petroleum and Flammable Materials) Regulations; see also *ibid*.

¹¹⁹ Security violation includes unauthorised transport delivery outside approved routes and timings, unauthorised entry into restricted areas, vehicle does not stop despite instructions being given, and company lost contact of vehicle, see *ibid*.

C. Enforcement of Hazardous Industrial Wastes Regulations

Even if the environmental regulations in one country were comprehensive and well crafted, these regulations would not have been effective without rigorous enforcement to ensure that anyone who violates these requirements is penalised and would not gain unfairly from their violations. Although in principle environmental regulations in Singapore emphasize that compliance is identified from the reports periodically submitted by industries to the NEA,¹²⁰ and that the NEA and its departments are not obliged to inspect any building or site to ascertain the compliance to any environmental requirements, the NEA still regularly monitors the industries' compliance with the regulations and requirements to ensure that they do not become complacent and pay less attention and effort to safely manage their operations. Monthly checks are conducted on premises of hazardous industrial wastes generators and collectors, and their records are audited to ensure that requirements on collection, storage, treatment and disposal of hazardous industrial wastes are complied with.¹²¹

Under the EPMA, HWA and EPHA, the NEA and its officers are authorised to carry out regular inspection to check into the following aspects of controls:

- a) Import, purchase and sale of hazardous substances and hazardous industrial wastes;¹²²
- b) Storage, transportation and labelling of hazardous industrial wastes;¹²³
- c) Maintaining and updating of records and sales documents;¹²⁴ and
- d) Ensure that all hazardous industrial wastes are safely disposed of.¹²⁵

In carrying out its functions, the NEA and its officers or other relevant regulatory bodies, such as the SCDF, are empowered to check and search premises;¹²⁶ extracts records and documents for investigations;¹²⁷ and conduct surprise checks on road tankers used for transportation on the road.¹²⁸ The contravention of any provision under the EPMA authorises the NEA to exercise these enforcement provisions. Any act of obstructing the NEA and its officers in the execution of their duties under the EPMA is viewed as an offence and can lead to the imposition of penalties amounting to a fine of up to S\$20,000 or to imprisonment for a term of up to three months or both for first conviction.¹²⁹

¹²⁰ See Section 37 of the EPMA; Section 17 of the Hazardous Waste (Control of Export, Import and Transit) Regulations; Section 27 of the EPHA.

¹²¹ See *Management of Hazardous Wastes in Singapore*, supra note 45 at 6.

¹²² Section 29 of the EPHA.

¹²³ Section 17 of the Environmental Public Health (Toxic Industrial Waste) Regulations.

¹²⁴ Section 6, *ibid.*

¹²⁵ Section 37(2), *ibid.*

¹²⁶ Section 47 of the EPMA; Section 31 of the HWA; Section 81 of the EPHA.

¹²⁷ Section 50 of the EPMA; Section 32 of the HWA.

¹²⁸ Section 49(b) of the Fire Safety (Petroleum and Flammable Materials) Regulations.

¹²⁹ See Section 49 of the EPMA.

In relation to the transport of hazardous industrial wastes, if the driver was detained by the Singapore Police Force for sizable offences or if the vehicle was found without the driver, SCDF will contact the owner or consignor, who must ensure that they drive or tow away the vehicle within one hour of the arrest. The owner or consignor must also provide SCDF with the particulars of the company personnel who will be towing back the vehicle. Both the licensee of the owner or consignor and the driver will be subject to enforcement actions and penalties meted out for the violations committed.¹³⁰

D. Transboundary Movements of Hazardous Industrial Wastes

As mentioned above, Singapore acceded to the Basel Convention on 2 January 1996,¹³¹ which is the broadest and most significant international treaty on hazardous wastes presently in effect. The Basel Convention provides a set of principles and requirements for states to control the trade of hazardous industrial wastes which might otherwise constitute serious health and environmental threats. The Basel Convention is the first and foremost global legal instrument regulating the transboundary movement of hazardous wastes and their disposal, as well as providing a platform for states to cooperate at the global level for effective management and disposal of hazardous wastes.

Prior to acceding to the Basel Convention, Singapore had already established its own national system in controlling the export, import and transit of hazardous industrial wastes, which are set out in the Environmental Public Health (Toxic Industrial Waste) Regulations, subsidiary legislation under the EPHA. When Singapore accede to the Basel Convention, this system was already in place, making Singapore as one of the few countries back then in Asia-Pacific that has the institutional, scientific and legal infrastructure to fulfil its obligations under the Basel Convention not only in regard to internal storage, handling, use and transport, but also in the import, export and disposal of hazardous industrial wastes.¹³²

The key objectives of the Basel Convention are: (i) to reduce transboundary movements of hazardous wastes and other wastes listed in the Basel Convention to a minimum;¹³³ (ii) to dispose the hazardous wastes generated, as close as possible to their source of generation;¹³⁴ (iii) to minimize the generation of hazardous wastes in terms of quantity and hazardous level;¹³⁵ (iv) to ensure strict control over the movements of hazardous wastes across borders as well as the prevention of illegal traffic;¹³⁶ (v) to prohibit shipments of hazardous wastes to countries lacking the legal, administrative and technical capacity to manage and dispose of them in an environmentally sound manner;¹³⁷ and (vi) to assist developing countries in establishing an

¹³⁰ See SCDF Circular on Requirements of Road Transportation of Petroleum & Flammable Materials, updated August 2010.

¹³¹ *Supra* note 44.

¹³² *Prevention of Illegal Traffic in Hazardous Waste*, Proceedings of the ESCAP/UNEP Expert-level workshop, Tokyo 1-4 March 1994, at 31, see Simon SC Tay, 'The Singapore Legal System and International Law: Influence or Interference' in Kevin YL Tan (ed), *The Singapore Legal System* (Singapore University Press 2nd, 2003) 476.

¹³³ Article 4(2)(d) of the Basel Convention.

¹³⁴ Article 4(2)(b), *ibid.*

¹³⁵ Article 4(2)(a), *ibid.*

¹³⁶ Article 4(7), *ibid.*

¹³⁷ Article 4(2)(e), *ibid.*

environmentally sound management for the hazardous wastes they generate.¹³⁸ These measures to reduce waste generation, to reduce transboundary waste movements and to provide a standard set of controls for hazardous waste movements are similar to the Environmental Public Health (Toxic Industrial Waste) Regulation's regulatory controls for imports and exports of hazardous wastes in Singapore.

In addition to the Environmental Public Health (Toxic Industrial Waste) Regulations that are already enforced, to give effect to the Basel Convention, Singapore enacted the HWA and its Regulations to strengthen the control on export, import and transit of hazardous wastes in Singapore. The HWA enhanced the existing system to administer and regulate the transport of hazardous wastes in and out of Singapore under the Environmental Public Health (Toxic Industrial Waste) Regulations. The HWA establishes an administrative authority,¹³⁹ outlines the system of permits,¹⁴⁰ granted enforcement powers to the NEA,¹⁴¹ and sets penalties with criminal sanctions for both individual and corporation.¹⁴² The HWA also defines the term 'hazardous waste' for the purpose of transboundary movements of waste as waste controlled as hazardous waste under the Basel Convention. The list of hazardous wastes for the purpose of transboundary movements are specified in the HWA, which follows the list of hazardous wastes under the Basel Convention.¹⁴³

The Basel Convention requires the exporting country to notify the importing country or any transit countries of the proposed shipment of hazardous industrial wastes.¹⁴⁴ The hazardous industrial wastes shipment can only happen after the transit or importing countries have given their consent for such shipment.¹⁴⁵ Such shipments of hazardous industrial wastes must be packaged, labelled, and transported in accordance with international rules,¹⁴⁶ and a tracking or movement document must accompany the hazardous industrial wastes shipment from its point of origin until its ultimate disposal.¹⁴⁷ The Basel Convention also requires each party to inform the potentially affected countries of any accident that occurs during the shipment of hazardous industrial wastes,¹⁴⁸ and to submit an annual report to the Basel Secretariat summarising the amounts and types of hazardous industrial wastes exported and the destination and disposal methods.¹⁴⁹

¹³⁸ Article 6(2)(d), *ibid.*

¹³⁹ Section 15 of the HWA authorised the appointment of a Director of Hazardous Wastes.

¹⁴⁰ Parts III and IV of the HWA.

¹⁴¹ Part V of the HWA.

¹⁴² Sections 25 – 27 of the HWA prohibit import, export and transit respectively, imposing maximum penalties of S\$300,000 for a body corporate and a fine of S\$100,000 or imprisonment up to two years for individuals. There are also subsidiary offences which are also punishable by fine.

¹⁴³ Section 4 of the HWA.

¹⁴⁴ Article 6(1) of the Basel Convention.

¹⁴⁵ Article 6(3), *ibid.*

¹⁴⁶ Article 4(7)(b), *ibid.*

¹⁴⁷ Article 6(9), *ibid.*

¹⁴⁸ Article 13(1), *ibid.*

¹⁴⁹ Article 13(2), *ibid.*

The Basel Convention contains two major restrictions on hazardous industrial wastes movements. The first restriction requires that exports of hazardous industrial wastes occur only if the exporting country does not have sufficient disposal capacity or sites that can dispose of such wastes in an environmentally sound manner or if such wastes are required as a raw material for recycling or recovery industries in the importing country.¹⁵⁰ The second restriction prohibits movement of hazardous industrial wastes between parties to the Basel Convention and non-parties,¹⁵¹ except when these movements occur under an equivalent bilateral or multilateral agreement that provide an equally sound management structure for transboundary movements of hazardous industrial wastes.¹⁵²

Singapore restricts the export, import and transit of hazardous industrial wastes. Under the HWA, any person who wishes to export, import or transit hazardous industrial wastes must obtain a Basel Permit from the PCD.¹⁵³ In granting the Basel Permit for the export, import or transit of hazardous industrial wastes, the PCD adopts the Prior Informed Consent ('PIC') procedure of the Basel Convention, which provides that the importing state must be informed of the nature of the materials and give consent in advance to receive the same.¹⁵⁴

The HWA, however, is not without any shortcomings. Some argues that the drafting of the legislation is 'inelegant and borrows disparate clauses from Australian counterpart legislation without a full appreciation of their context'.¹⁵⁵ Moreover, although the Basel Convention is attached in the HWA as a schedule, the legislation does not make clear what effect his is intended to have.¹⁵⁶ Additionally, neither the HWA nor its regulations seem to cover the duty to re-import under the Basel Convention, where the transit state is under an obligation not to allow impediments where the state of export has a duty to re-import due to the illegal conduct of the exporter.¹⁵⁷ This, however, does not mean that Singapore did not recognise this principle, as this is apparent from Singapore's practice in relation to export of hazardous industrial wastes to Indonesia. On 27 July 2004, Singapore exported waste to Indonesia that was not considered as hazardous waste either under the Basel Convention or under Singapore's domestic legislation. Under Indonesia's domestic laws, however, such waste was considered as hazardous waste in which the import of such waste into Indonesia was prohibited under Indonesia's domestic laws. Indonesia then transmitted to Singapore a list of hazardous industrial wastes contained in its

¹⁵⁰ Article 4(9), *ibid.*

¹⁵¹ Article 4(5), *ibid.*

¹⁵² Article 11, *ibid.*

¹⁵³ *Supra* note 139.

¹⁵⁴ Article 6 of the Basel Convention. Note that the PIC procedure is not contained in the HWA, but it is incorporated in the Hazardous Waste (Control of Export, Import and Transit) Regulations. See Singapore Parliamentary Reports Official Reports, Vol 67 No 18, Cols 1851-9.

¹⁵⁵ Simon SC Tay, *supra* note 132, at 475.

¹⁵⁶ Simon Tay argued that it is not clear whether the Court may make primary reference to the Basel Convention to supplement an omission in the HWA, or whether the Court may use the Basel Convention to guide its interpretation only if there is ambiguity. See Simon SC Tay, *ibid.*

¹⁵⁷ Article 9(2) of the Basel Convention provides that where waste has not been exported in conformity with the procedures of the Basel Convention, the government of the exporting state is under a duty to re-import it. As similar duty arises if the exporting state has a reason to believe that the importing state will not manage the hazardous industrial wastes in an environmentally sound manner.

Government Regulation 85/1999, which was received by Singapore on 27 August 2004. Although Singapore has acted in accordance with its domestic law, and the export of material in question from Singapore to Indonesia on 27 July 2004 did not breach the Basel Convention, Singapore agreed to allow the return of the waste in question from Indonesia to Singapore.¹⁵⁸

IV. SUSTAINABLE CITY: LESSONS FROM SINGAPORE

The success of these environmental protection programmes is evident today, as Singapore air quality and inland waters are generally comparable with the best cities in the world; and Singapore managed to maintain its position as the most liveable city in Asia.¹⁵⁹ Singapore's success in implementing a hazardous industrial wastes management system was a result of co-operation between the government, who enforce strict environmental requirements, and the industries, who manage their hazardous chemicals properly, as well as with the support of the general public. The main challenge for Singapore was how to balance environmental consideration with economic consideration, seeing that most of Singapore's economic sources in Industry and trade. Singapore, thus, adopted a system that does not discourage investors to put their money in Singapore, for example, by not providing Mandatory Environmental Impact Assessment requirement. Monitoring instead is implemented through excellent land use planning and development control, pollution prevention, control of hazardous substances and waste disposal. This can be seen on the excellent space quality and cleanliness of the city.

The question remains: can other Asian countries follow similar approach as Singapore's? Developing a hazardous industrial wastes management strategy largely depends on the topography, population density, transportation, infrastructure, socioeconomic and environmental regulations of one country.¹⁶⁰ Singapore's unique geographical feature and its relatively small size may make it difficult for other Asian countries to adopt such a 'hands-on' management system like Singapore. It is actually better and far more plausible for other cities in Asia to take on similar approach, instead of countries. Cities such as Jakarta, Bangkok and Manila are in a better position to enact and adopt a localised hazardous industrial wastes management system, rather than having Indonesia, Thailand and the Philippines to adopt a national hazardous industrial wastes management system that might not suitable to be applied uniformly in all of their territories.

The main challenges, of course, are the political willingness of each city regulator to make this issue as their priority, battling corrupt practices in order to enforce this system and to a lesser extent, technology and skill to adopt a sound hazardous industrial wastes management system. Some issue will be equally challenging to Singapore and other cities in Asia, such as how to handle hazardous wastes that are generated from domestic household, such as batteries, and automobile scraps.¹⁶¹ On the other hand, challenges that were specific to Singapore, such as land limitation, might not be an issue for countries such as Indonesia or Thailand.

¹⁵⁸ *Press Release of the Secretariat of the Basel Convention*, jointly adopted by the Republic of Indonesia and the Republic of Singapore, released at Geneva on Friday 13 May 2005.

¹⁵⁹ *Supra* note 6.

¹⁶⁰ Shinichi Sakai, 'Municipal Solid Waste Management in Japan' (1996) *Waste Management* 16 at 395.

¹⁶¹ Renbi Bai and Mardina Sutanto 'The Practice and Challenges of Solid Waste Management in Singapore' (2002) *Waste Management* 22 at 566.