MUNICIPAL WASTE MANAGEMENT REPORT:

Status-quo and Issues in Southeast and East Asian Countries

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FOREWORD

This report presents and discusses the status-quo and issues of Municipal Waste in 14 countries in Southeast and East Asia. Aspects of Municipal Solid Waste (MSW) included herein are generation and composition, policies and regulations, economic instruments, current practices of MSW and other management strategies. The report also presents some propositions and policy recommendations in order to determine regional collective actions on the status-quo and issues regarding Municipal Waste.

The Thematic Working Group on Solid and Hazardous Waste (Waste TWG) secretariat compiled this report from 14 countries in Southeast and East Asia. The report has been reviewed and discussed during the Second Waste TWG meeting in Siem Reap, Cambodia on December 2008 and the Fourth High-Level Officials' meeting in Beijing, PR China on March 2009. Additional data and information from member countries has been updated and incorporated in the report.

The compilation of municipal waste management report was made possible through the funding support of the Ministry of the Environment, Japan whom the Thematic Working Group (TWG) on Solid and Hazardous Waste secretariat located at AIT/UNEP RRC.AP gratefully acknowledge.

The Waste TWG Secretariat would also like to acknowledge, with much appreciation, the support and cooperation of the following organizations and individuals due to them the compilation of this report cannot be completed.

- The 14 Waste TWG member countries for accomplishing the municipal waste questionnaire and providing latest additional data and information.
- The Waste TWG Chairman and TWG member countries for painstakingly contributing comments and/or additional inputs in the compilation of this report.
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LIST OF ABBREVIATIONS AND ACRONYMS

3R	Reduce, Reuse and Recycle
ADB	Asian Development Bank
AIT	Asian Institute of Technology
COMPED	Cambodia Education and Waste Management Organization
COPEH	Code of Practice on Environmental Health
CRAES	Chinese Research Academy of Environmental Sciences
DENR	Department of Environment and Natural Resources
EPHA	Environmental Public Health Act
EPR	Extended Producer Responsibility
GDP	Gross Domestic product
GEF	Global Environment Fund
IETC	International Environmental Technology Centre
IGES	Institute for Global Environmental Strategies
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicators
LFG	Landfill Gas
LGU	Local Government Unit
MCDC	Mandalay City Development Committee
METI	Ministry of Economy Trade and Industry
MNET	Ministry of Nature, Environment and Tourism
MOE	Ministry of Environment
MOEJ	Ministry of Environment of Japan
MRF	Material Recovery Facility
MRI	Mitsubishi Research Institute
MSW	Municipal Solid Waste
MT	Mechanical Treatment
NEA	National Environmental Agency
NEC	National Ecology Center
NIER	National Institute of Environmental Research
NIMBY	Not in my backyard
NSRS	National Skills Recognition System
NSWMC	National Solid Waste Management Commission
NSWMD	National Solid Waste Management Department
ODA	Official Development Assistance
OECC	Overseas Environmental Cooperation Center
PCCD	Pollution Control and Cleansing Department
PFI	Private Finance Initiatives
PWC	Public waste collectors
REC	Regional Ecology Center
RMB	Renminbi
SEA	South East Asia
SWM	Solid Waste Management
TC	Town Councils
TEI	Thailand Environment Institute
TWG	Thematic Working Group
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
URENCOs	Urban Environment Companies
VEPA	Vietnam Environment Protection Administration
WB	World Bank
WEEE	Waste Electrical and Electronic Equipment
WHO	World Health Organization
WJEMP	Western Java Environmental Management Project
YCDC	Yangon City Development Committee

I INTRODUCTION

I. Introduction

Solid waste management is one of the major environmental burdens particularly in megacities of many developed and developing Asian countries. An alarming rate of solid waste generation trends can be seen parallel to urbanization, industrialization and economic development. This environmental burden continues to be a major pressing issue threatening the environment and health of the people. Unless environmental measures are introduced and effectively enforced, continuing burdens of solid waste management will be inevitable.

This section highlights the background and rationale of the report which is comprised of the definition and current situation of Municipal Waste in 14 South East and East Asian Countries, developments in 3R and waste management, objectives and scope, and the approach used for the compilation and analysis of the report.

1.1 Background

Human activities create waste, and the way these wastes are handled, stored and collected may pose risks to the environment and to public health.

The main problems of municipalities in solid waste management include the sharp increase in the accumulation of waste and its management, use of open dumps that create and spread health problems, contamination of underground water resources and the decreasing capacity of sanitary landfills along with the difficulties in establishing new dumpsites and the rising costs of wastes disposal.

According to the World Bank (2004), urban authorities in Asia spend an estimated 50-70% of their revenues on waste management. The effect of neglecting the environment is said to cost an average 5% of the GDP.

It is in this context that solid and hazardous waste was selected as one of the priority areas of the Regional Ministerial Forum on Environment and Health. At the same time, solid and hazardous waste issues were addressed by many Asian countries using such principles as the 3R - reduce, reuse and recycle. These countries agreed to further promote these through regional cooperation under the 3R Initiative. The Asia 3R (Reduce, Reuse and Recycle) Conference held on October 30 - November 1, 2006 in Tokyo, Japan discussed four topics including Partnership and International Cooperation for the promotion of the 3Rs, Medical Waste management, Municipal Organic Waste Management and E-Waste Management. The conference gave the primary avenue to comprehensively discuss and address the aforementioned topics. It concluded with identifying the 3R Knowledge Hub and the Regional Initiative on Environment and Health in Southeast and East Asian Countries as potential mechanisms in the conduct of a follow-up to the said conference.

The Waste Thematic Working Group (TWG) was initially formulated with 13 member countries from Brunei Darussalam, Cambodia, Peoples Republic of China, Indonesia, Japan, Lao PDR, Malaysia, Mongolia, Myanmar, The Philippines, Singapore, Thailand and Vietnam as well as 9 partner organizations and experts from regional and international organizations. The Waste TWG secretariat is located at UNEP RRC.AP, Thailand. The secretariat developed and circulated the municipal waste questionnaire. Answers from this survey questionnaire were compiled, analyzed and incorporated in this status report.

This report aims to present the status-quo and issues of Municipal Waste Management, particularly separation, collection and treatment as well as disposal of Municipal waste in 14 Southeast and East Asian countries.

The specific objectives are:

- to identify status-quo and issues of Municipal Waste Management;
- to exhibit the current practices of Municipal Waste in SEA and East Asian Countries in terms of collection, segregation, treatment and disposal in the region;
- to study the current policies and regulations in SWM relative to 3Rs; and
- to present proposed recommendations in relation to the status-quo and issues of municipal waste management.

The purpose of the compilation of the status-quo and issues of Municipal Waste Management is to provide a proposed regional collective recommendation on the current status and problems regarding municipal waste management in the member countries.

1.2 Scope of the Report

The report covers the current municipal waste management activities in Waste TWG member countries. The 14 South East and East Asia countries include Brunei Darussalam, Cambodia, PR China, Indonesia, Japan, South Korea, Lao PDR, Malaysia, Mongolia, Myanmar, Philippines, Thailand, Singapore and Vietnam. Discussion and presentation on the current practices of municipal waste management particularly the identification and review of status-quo and issues of municipal waste management are made. Current good practices relative to 3R principles in municipal waste management which include activities in terms of collection, segregation, treatment and disposal are also highlighted. Finally, an analysis is done on the current situation, challenges and issues of municipal waste management in member countries in the aspects of legal/policy, economic, institutional, technological and socio-cultural at the national and/or local level.

Findings shall help identify and propose recommendation for regional collective action on the status-quo and issues of municipal waste management.

1.3 Approach

The approach consisted of analyzing information collected through the accomplished municipal waste questionnaire from member countries and existing data and information available. The status-quo and issues on municipal waste are identified and assessed with the active participation of member countries (e.g. of experts and officers in National Agencies).

The methodology and/or approach (see Figure 1 for illustration) includes the following activities:

- Review of the draft Municipal Waste questionnaire by soliciting comments/additional inputs from member countries and member partners.
- Incorporation of primary data and information collected through the accomplished municipal waste questionnaire from member countries.
- Review and incorporation of additional documents obtained, (e.g., publications, country/national agency reports and other reports from relevant international organizations such as AIT, UNEP IETC, World Bank, ADB, WHO and others;
- Gathering of existing information and data, especially those collected by 3RKH, to supplement the analysis of the status-quo and issues on municipal waste management.

- Compilation and analysis of available data and information through the solicited views of responsible authorities/waste management units at the national/local level.
- Drawing recommendations in the development of the draft status report.
- Soliciting additional contributions and comments from all Waste TWG member countries and regional partners for the draft final Municipal Waste Status report in the Second Waste TWG meeting.

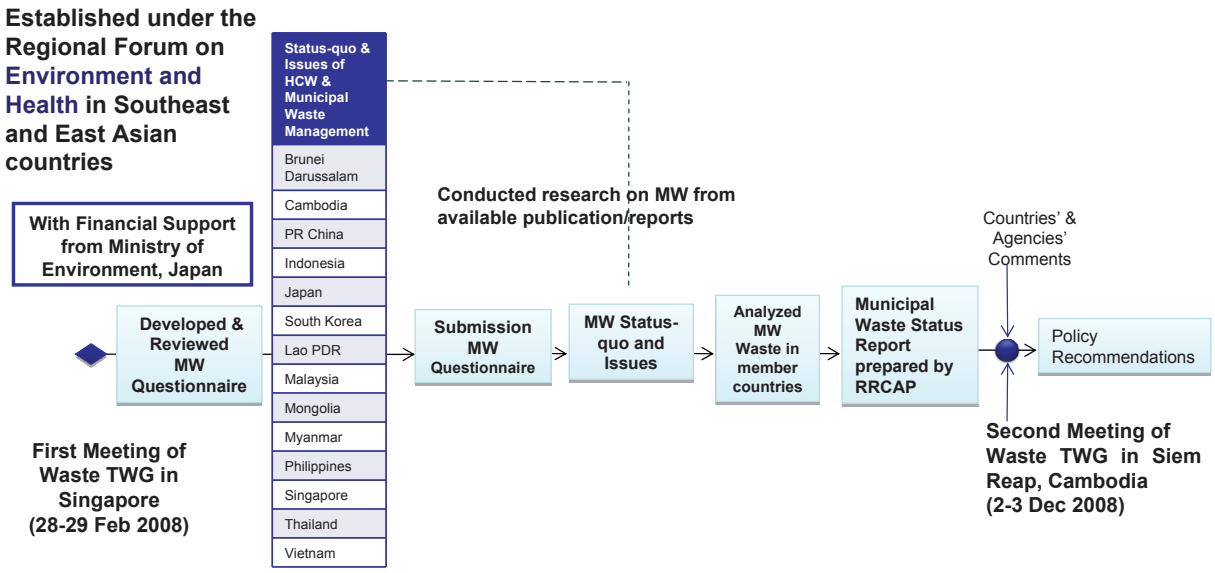

Figure 1: Municipal Waste Report compilation approach

II CURRENT PRACTICES OF MUNICIPAL WASTE IN SEA AND EAST ASIAN COUNTRIES

II. Current Practices of Municipal Waste in SEA and East Asian Countries

2.1 Overview of Municipal Waste in SEA and East Asian Countries

According to Imura, et. al. (2005), high population growth and urbanization coupled with rapid economic growth greatly accelerates consumption rates in Asian developing cities. These consumption patterns have contributed to the increase in municipal solid waste generation and to changes in waste composition. For instance, the urban areas of China generated about 190 million tons of MSW in 2004, creating significant potential for MSW projects in the country. The recent Environment Monitor report prepared as part of the study estimated that Shanghai alone has 10% organic waste diversion through composting, and the remaining 90% land filled (World Bank, 2005).

Cities and/or municipalities in high-income member countries are increasingly becoming comparable to that of western countries in terms of quality and quantity of waste generation. Developed countries generate more that 1 kilogram of solid waste per capita per day while developing countries is about half of that generation (see Table 1).

Table 1: Typical characteristics of municipal solid waste management in Asian cities by level of development

MSW characteristics	Level of development		
	Less-developed cities (Less than 2,000)	Rapidly developing cities (2,000-15,000)	Developed cities (16,000-30,000)
MSW generation (kg/capita-day)	0.3-0.7	0.5-1.5	>1.0
MSW collection rate	<70%	80-95%	95-100%
Recycling	Informal	Formal and informal	Formal
Expenditure from Municipal budget (%)	15-40	5-25	1-5

Source: Imura et al., 2005

In some Asian cities, expenditures on Municipal Waste (MW) can reach 40% of the municipality's operating budget and out of this, 70-90% is spent on waste collection. For instance, Metro Manila in the Philippines annually spends $ 64 million on garbage collection and disposal (ADB, 2004).

These and many other status-quo and issues on Municipal Waste and Municipal Waste Management are some of what most countries in Southeast Asia (SEA) and East Asia are encountering. In order to draw recommendations for a regional collective action on MW, this report looks into the characteristics and composition of Municipal Waste in member countries beginning with a definition of MW.

2.2 Definition of Municipal Waste

Municipal Solid Waste (MSW) can be defined using Chapter 21.3 of Agenda 21 (United Nations Conference on Environment and Development, Rio de Janeiro, June 14, 1992). Solid wastes."include all domestic refuse and non-hazardous wastes such as commercial and institutional wastes, street sweepings and construction debris". MSW primarily comes from households, but also includes wastes from offices, hotels, shopping complexes/shops, schools, institutions, and from municipal services such as street cleaning and maintenance of recreational areas (cited from UNEP IETC).

The 14 member countries in Southeast and East Asia were asked to provide their own definitions of Municipal waste. These answers are summarized in Table 2.

Table 2: Definitions of Municipal Waste in Waste TWG member countries

Country	Definition of Municipal Waste
Brunei Darussalam	Municipal waste is classified under four major categories, including; residential, commercial, institutional and industrial. Other wastes included in MW are soil wastes, construction wastes, toxic and hazardous wastes, and waste/ used oil (AIT, 2008).
Cambodia	Cambodia does not have a definition of Municipal Waste. But, a definition of solid and household waste is provided under Article 3 of the Sub-Decree on Solid Waste Management: • Solid waste refers to hard objects, hard substances, products or refuse which are useless, disposed of, are intended or required to be disposed of; • Household waste is that part of solid waste which does not contain toxins or hazardous substances, and is discarded from dwellings, public buildings, factory, market, hotel, business building, restaurant, transport facilities, recreation site, etc.
PR China	Municipal waste (also known as Urban House Refuse in China) is the solid waste discharged from urban daily life activities (Chinese Law on the "Prevention and Control of Environmental Pollution"). MSW also includes solid and hazardous wastes (HW) such as waste fluorescent tube, mercurial thermometer, paint, cleanser, etc., which are generated from urban daily life activities.
Indonesia	Municipal Solid Waste is the remnant of human daily activities and/or natural processes in the solid form, (Article 1 Law No.18 Year 2008). The Scope of Municipal Solid Waste in Indonesia includes (Article 2 Law No. 18 Year 2008) household waste derived from household daily activities, excluding feces and specific waste; household-like waste derived from commercial areas, industrial area, special areas, social facilities, public facilities and/or other facilities; specific waste includes waste containing hazardous and toxic materials, waste derived from disaster, construction and demolition waste, waste that cannot be processed due to the unavailability of technology; and waste which does not periodically occur. (MoE, 2008)
Japan	Municipal Waste is defined as waste other than 'Industrial Waste' in accordance with the 'Waste Management and Public Cleansing Law", where 19 kinds of wastes generated through industrial and other business activities are defined as 'Industrial Waste'. Around two-thirds of Municipal Waste is household waste while the rest includes various wastes generated from business establishments such as offices, restaurants, shops, etc. (MoE, 2008)
Republic of Korea	Municipal waste is household, industrial, construction, and hazardous waste. Household waste may be generated from the house, office, and/or industry.
Malaysia	Municipal waste is part of solid waste, including the following; a) any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; b) any substance required to be disposed of as being broken, worn out, contaminated or oterwise spoiled; or any other material that, according to Solid Waste and Public Cleansing Management Act 2007 [Act 672] or c) other written law, is required by the authority to be disposed of. This includes public solid waste, imported solid waste, household solid waste, institutional solid waste and special solid waste such as waste from commercial, construction, industrial and controlled activities.
Mongolia	Municipal Solid waste is domestic and industrial solid waste from materials produced during the process of consumption, production and services, including unwanted waste.
Myanmar	Municipal Waste is that which comes from human and animal activities and are normally solid, discarded as useless and unwanted. It is all-inclusive encompassing the heterogeneous mass disposed from urban community as well as the more homogeneous accumulation of agricultural, industrial and mineral waste.
Philippines	Municipal waste is produced from activities within the local government units including a combination of domestic, commercial, institutional and industrial wastes and street litters (ESWMA 2000). It refers to all discarded household, commercial waste, non-hazardous institutional waste, ports/harbour and industrial waste, street sweepings, construction debris, agricultural waste, and other non-hazardous/non-toxic solid waste.
Singapore	Municipal Waste comprises household waste and waste from offices, hotels, shopping complexes/shops, schools, institutions, trade premises, hawker centres, markets and municipal services such as street cleaning and maintenance of recreational areas.
Vietnam	There is no official definition of municipal solid waste in Vietnamese laws. But the Law on Environmental Protection, 2005 defines Wastes as materials that take solid, liquid, gaseous, or other forms, are discharged from production, service, daily life or other activities." With reference to Decree No. 59/2007/ND-CP on Solid Waste Management, solid waste is the waste in solid form, discharged from production, service, daily life or other activities. This includes non-hazardous and hazardous solid waste. Because there is no official definition of municipal solid waste, it is not clear whether MSW is includes domestic waste only or both domestic and industrial waste, and non-hazardous only or both non-hazardous and hazardous waste.

Many member countries do not have an official definition of municipal waste. However, they provided useful classifications that account for the differences in the type of waste composition found in each country. While most member countries define municipal waste as waste from domestic, commercial and institutional sources, some include industrial wastes in their definition. Others also define MW as part of construction and demolition as well as special wastes.

2.3 Municipal Waste Generation & Composition

IGES (2005) reported that Municipal solid waste generation per capita in Asia increased together with the increase in income. In cities of advanced Asian countries, the quantity of waste generated is in excess of 1 kg/person/day compared to developing countries in Asia with roughly half that amount (e.g. about 0.5 kg/person/day). The composition of MW in advanced countries is highly inorganic and non-recyclable while cities of developing Asian countries, MW is generally organic and recyclable. This can be illustrated in Table 3.

Table 3: Municipal Waste Generation in South East and East Asian Countries

Country	Annual Municipal Waste Generated in Tons (by Weight)	% MW in Total Solid Waste	% MW Recycled	Data Source &Date	Note
Brunei Muara, Brunei Darussalam	189,000	100%	-	JASTRE, 2005	
Cambodia					
Phnom Penh	324,159			MoE, 2006	Domestic waste generation at disposal site in Phnom Penh
PR China	148,041,000	8.9%		CRAES,2006	Quantity of municipal waste transported in 2006 (There was no statistical data of the generation)
Indonesia	40,150,000		5%	MoE	The data is the computed generation per year with average 0.5 kg/l/d
Japan	52,000,000		19.6%	MoEJ, 2006	Waste generated in 2003
Republic of Korea	17,829,484	68.3%	60.1%	NIER, 2006	This MW does not include Hazardous Waste
Lao PDR	1,204,400				25% of the total population of 5.8 million live in the city (Country Report, 2005 June)
Malaysia	5,781,600		4% (average in Kuala Lumpur)	NSWMD-MHLG,2005	0.90 kg/capita/day (average) in 2005 for Peninsular Malaysia multiply with the 2000 Census of 17.6 million people in Peninsular Malaysia.
Mongolia Ulaan Baatar	552.8				MNET, 2008
Myanmar					
Mandalay	109,500		10%	MCDC, 2007	Data from one Municipality in Myanmar
Philippines	10,539,375		28%	NSWMC,2007	projected for 2010
Singapore	1,490,000	58%	54%	NEA, 2007	
Thailand	14,640,000			TEI, 2004	
Vietnam	12,800,000	50%	18-22%	VEPA, 2004	

Table 3 illustrates the annual Municipal waste generation in tons by weight in South East and East Asian Countries. PR China has the highest waste generation in the region, followed by South Korea, Japan and Indonesia. Currently, there is no data on municipal waste generation at the national level for Cambodia and Mongolia. But in Phnom Penh, the capital of Cambodia, the amount of municipal waste is observed. Actual statistics of municipal waste generation is illustrated in countries like Brunei Darussalam, Phnom Penh - Cambodia, PR China, Indonesia, Republic of Korea, Lao PDR, Mandalay in Myanmar, Singapore, Thailand and Vietnam.

Most member countries do not have data and information on the actual municipal waste generation so that estimated and/or projected amount of municipal waste generation can be noticed. This is so in countries like Malaysia and Philippines' Metro Manila. The MW recycled is highest in South Korea, followed by Singapore while other member countries do not have sufficient data on recycled MW.

World Bank (2007) reported that Solid waste in Lao PDR is comprised mainly of organic material, plastic, paper and glass, cans and other metals (see Table 2.4). The comparatively low content of organic material in municipal solid waste is mainly due to the fact that a large proportion of food waste is recycled as animal feed even in urban areas. In Phnom Penh, Cambodia, domestic waste is composed of plastic carried bags, boxes/ bottles, cardboards, irons, glasses, rags, and other organic wastes. Domestic wastes in Phnom Penh amount to approximately 5,987 tons in 2005 and increased nearly two times in 2006 to 10,028 tons.

Additional components of municipal waste include ceramic and stone, leather and rubber, wood, textiles, bone/ash, construction debris. It can be noticed that some of the municipal waste components fused food and organic waste (leaves and other organic waste that are biodegradable).

Table 4: Type of Municipal Waste Composition in 14 SEA and East Asian Countries

Country	Type of Municipal Waste Composition (in %)						GDP/Cap
	Food wastes	Paper	Plastic	Metal	Glass	Others	
1. Brunei-Muara District, Brunei Darussalam	36	18	16	4	3	23	30,342
2. Phnom Penh, Cambodia	63.3	6.4	15.5	0.6	1.2	13	513
3. PR China	49	16	16	2	1	16	2,022
4. Indonesia	63	11	10	1	1.5	13.5	1,641
5. Japan	15	50	20	2	1	4	34,264
6. Republic of Korea	26.3	21.4	8.9	8	4.7	30.7	18,395
7. Lao PDR	30	15	30	25	25		581
8. Malaysia	47	15	14	4	3	17	5,943
9. Mongolia	16.8	25.2	12.1	2.5	4.4	39	1,224
10. Myanmar	73.27	2.24	17.75	0.20	0.45	6.09	232
11. Philippines	32.7	12.5	24.7	5	3.1	22	1,352
12. Singapore	19.8	22.8	22.8	3.36	2.32	28.92	31,028
13. Thailand	43	12.1	10.9	3.5	6.6	23.9	3,166
14. Hanoi, Vietnam	41.9	1.9	15.6	6	7.2	27.4	723

Sources: 1) Brunei-Muara District, 2005 JASTRE, Ministry of Development , others consists of yard waste, wood, rubber, textiles, inert and others) PPM Cambodia, 2003 , 3)POPs Research Center of Tsinghua University, 2007 4)DKI- Jakarta Province, Indonesia, 2007, 5) Ministry of the Environment, Japan, 2006; 6) Korea – 2006, 7) *Lao PDR: ADB, 2001, Environments in Transition: Cambodia, Lao PDR, Thailand and Vietnam cited from Environment monitor 2007*; 8) Malaysia, 2005, others consists of textile, wood, rubber/leather, 9) Mongolia, others consists of bone, ash, tin, cloth and other materials, 10) Yangon, Myanmar 2007, others consists of textile & wood 11) Philippines, others consists of inorganic wastes & special waste 12) Singapore, – 2007, others consists of scrap tires, textiles/leathers, wood/timber, construction debris, ceramics, stones and rubber, 13) Thailand Environment Monitor 2003 cited in AIT (2008) 14) Vietnam Environment Monitor (2003) at municipal level, others may include textiles, wood, inert and hair.
Note: Some of the countries categorized food wastes into organic wastes, and other term as kitchen waste & organic waste.
Source data for GDP: World Economic Outlook Database, October 2008 (Gross domestic product per capita, current prices, U.S. dollars)

Table 4 describes the type of MW composition in 14 SEA and East Asian Countries. Member countries with a high percentage composition of food waste include Indonesia, Malaysia, Thailand, PR China and cities like Phnom Penh in Cambodia and Mandalay in Myanmar. It must be noted that some countries categorized food wastes into organic wastes and/or kitchen wastes. Member countries with high percentage composition of plastic waste include Lao PDR, Philippines, Singapore, Japan, Mandalay in Myanmar. Food waste accounts for the highest percentage of MW composition for most countries, excluding Japan, where paper is the major source of MW, accounting for as much as 50% of the total MW in Japan, and Lao PDR, where plastic accounts for one third of total MW in the country. Both Mongolia and South Korea have the highest MW composition of other type of MW, other wastes identified by member countries include textile, wood/timber, rubber/leather, construction debris, ceramics and inert wastes, this type of waste accounts for almost all the MW composition in Japan with as much as 96%. Advanced member countries such as Japan and Singapore have a high percentage of paper and plastic composition in MW.

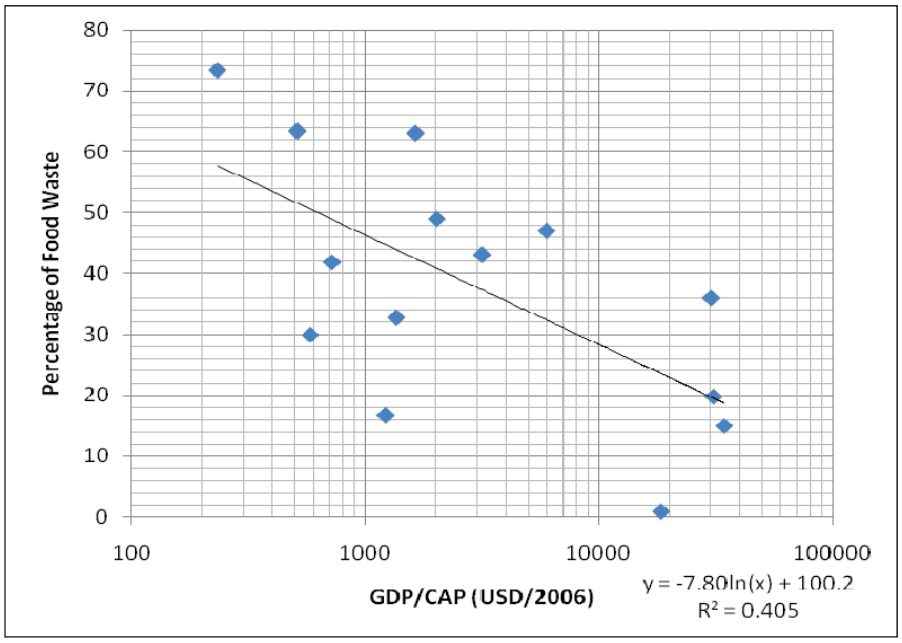

Figure 2: Relationship between GDP per capita and percentage of food waste generated

Figure 2 depicts the correlation between GDP per capita and the percentage of food waste generated in SEA and East Asian countries. The correlation figure indicates a moderate positive linear relationship between the GDP per capita and food waste generation. Even though the relationship is moderate, a relationship does exist, indicating that as GDP per capita increases, the food waste generated is moderately increased, this analysis also suggests the opposite effect of Food waste moderately decreasing with a lower GDP per capita.

2.4 Policies and Regulations

In Mongolia, guidelines and reports are developed to introduce the principle of polluters payments; a draft of law on payment imposed on packet of import products and a rule of state waste registration. Local administrations are obliged to organize policy and action on household solid waste treatment and disposal. The Mongolian Ministry of Nature and Environment promotes these through a policy and provides professional guidance, coordination as well as finance for some projects and programs.

Table 5: Policies, laws and regulations on Municipal Waste

Country	Policies/regulations on Municipal Waste
Brunei Darussalam	Recommended Procedures for Disposal of Waste Batteries Measures to reduce the use of plastics
Cambodia	- The Law on Environmental Protection and Natural Resources Management (1996) - Law towards any kind of wastes, including hazardous waste management - The Sub-Decree on Solid Waste Management (SSWM) prepared by MoE (1999) - Sub-Decree on Water Pollution Control: stipulates the restriction of inappropriate disposal of solid waste/garbage, which contributes toward the deterioration of the water environment and of human health, including the ecosystem. - Sub-Decree on EIA Process: aimed on restricting improper waste management during and after project operations Agencies: Local Authority, MoE and other concerned national and local agencies
PR China	- Law on the Prevention and Control of Environmental Pollution by Solid Wastes, the revised edition adopted by the 13th Meeting of the Standing Committee of the Tenth National People's Congress on December 29, 2004, effective as of April 1, 2005 - Standard for Pollution Control on the Landfill Site for Municipal Solid Waste(GB16889-2008), the revised edition issued by the Ministry of Environmental Protection on April 2, 2008, effective as of July 1, 2008 - Standard for Pollution Control for Municipal Solid Waste Incineration(GB18485-2001), issued by the Ministry of State Environmental Protection Administration on November 12, 2001, effective as of January 1, 2002 - Technical code for municipal solid waste sanitary landfill (CJJ17-2004), issued by the Ministry of Construction on February 19, 2004, effective as of June 1, 2004 - Technical Standard for Solid Waste Cleaning of Reservoir Bed of The Three Gorges on Yangtze River (HJ85-2005), revised edition issued by the Ministry of State Environmental Protection Administration and the State Council Three Gorges Project Construction Committee Executive Office, effective as of June 13, 2005 - Control Standards for Urban Wastes for Agricultural Use (GB8172-87), issued by the Ministry of State Environmental Protection Administration on October 5, 1987, effective as of February 1, 1998 - Regulations for the Administration of Prevention of Pollution of the Yangtze River water area by ship's garbage and littoral solid wastes, issued by the Ministry of Communications, the Ministry of Construction and State Environmental Protection Administration on December 24, 1997, effective as of March 1, 1998 - Regulations of the City's Appearance and Environmental Sanitation, issued by the State Council on June 28, 1992, effective as of August 1, 1992 - Notice of Limitation of Production, Distribution and Use of Plastic Shopping Bag, issued by the State Council on December 31, 2007, effective as of June 1, 2008
Indonesia	- Act of the Republic of Indonesia Number 18 Year 2008 regarding Waste Management - Law Number 38 year 2007 regarding Responsibility of Central Government, Provincial Government and Local Government - Act of the Republic of Indonesia Number 23 Year 1997 regarding Environmental Management - law Number 26 year 2007 regarding Spatial Planning - Government Regulation Number 21 year 2006 regarding Policy and Strategy of MSW - Government Regulation Number 16 year 2005 regarding Water Supply (Raw Water Protection) - Law Number 32 year 2004 regarding Local Government - Law Number 7 year 2004 regarding Water Resources - Law Number 23 year 1992 regarding Health Ministry of Environment is responsible for providing national policy Ministry of Public Work together with MOE, MOT, MOI, BPPT and Ministry of Home Affair are responsible for preparing guidelines of MSW Local Government is responsible for local operations of MSW management Indonesia is implementing a program on municipal waste management called "Clean City Program/ADIPURA AWARD".

Country	Policies/regulations on Municipal Waste
Japan	''Waste Management and Public Cleansing Law'(enacted in December 1970) stipulates that each municipality shall collect, transport and dispose of municipal wastes generated within its area. The National government develops the fundamental policy for waste reduction, the development plan of waste treatment facilities, and gives technical and financial assistance to municipalities. The Ministry of the Environment (MOE) is responsible for MSW management administration at the national level. Recycling of some types of municipal wastes is implemented in accordance with specific separate recycling laws, namely: Container and Packaging Recycling Law (enacted in June 1995, administered by MOE and Ministry of Economy, Trade and Industry (METI)), - Home Appliances Recycling Law (enacted in June 1998, administered by MOE and METI), - Food Waste Recycling Law(enacted in June 2000, administered by MOE and Ministry of Agriculture, Forestry and Fishery), and - End-of-life Vehicle Recycling Law (enacted in July 2002, administered by MOE and METI). 2. Agencies - Local Governments - Ministry of Environment
South Korea	1. Regulations - Waste Control Act, 8 Mar, 1991. - Act on the Promotion of Saving and Reutilization of Resources, 8 Dec, 1992. - Act on the Promotion of Construction Waste Recycling, 21 Dec, 2003. 2. Agencies - Local Governments - Ministry of Environment
Lao PDR	Law on Environmental protection, No. 2/99/NA dated 3 April 1999 Regulation No. 521/MCTPC dated 23 February 2007 Regulation No. 1770/STEA dated 3 October 2000 on environment assessment in Laos
Malaysia	Solid Waste and Public Cleansing Management Act 2007 [Act 672]; Gazetted on 30 August 2007. Imposed by the end of 2008. Give executive power to the Federal Government (Department of National Solid Waste Management) to manage solid waste instead of the Local Authorities. Solid Waste and Public Cleansing Management Corporation Act 2007 [Act 673]; Gazetted on 30 August 2007. Responsible agency: Solid Waste and Public Cleansing Management Corporation. National Solid Waste Management Policy; Approved on 13 September 2006. Need to be updated – in line with Act 672. National Strategic Plan on Solid Waste Management. Approved on 20 July 2005. Need to be updated – in line with Act 672. Agencies: LGUs, NSWMD/MHLG, MoE & other concerned national agencies
Mongolia	Law on household and industrial solid waste on 2003, draft of which is developed by the Government of Mongolia to improve the management of household and industrial solid waste, creating a economic mechanism for reuse and reduction of waste, and managing solid waste to keep environmental balance. The law has been followed since 2004. All the rights and obligations of stakeholders, on waste collection, segregation, treatment and disposal procedure, database, economic regulations and control mechanisms are reflected entirely in the law. Provisions for the implementation of the Law on household and industrial solid waste include the following: - "Rule on hazardous waste certification" - "Methods of waste payment evaluation and norm setting" - "Hazardous waste classification and rate" - "Solid waste disposal construction, sort of dumps and their requirements, responsible persons and organization's acitivities Agencies: MNET

Country	Policies/regulations on Municipal Waste
Myanmar	Policies/laws: Proclamation No. 11/90 by SLORC (State law and order restoration council) for Yangon City Development Committee (YCDC) Rules and regulations: Yangon City Development Committee Act 33 (A), (B) (1990), Yangon City Municipality Act – 1922 Development Committee is using the Yangon City Municipal Act 1922 and drafting a new suitable regulation for Nay Pyi Taw The City of Mandalay Development Law
Philippines	RA 9003- Ecological Solid Waste Management Act of 2000 RA 7160- Local Government Code Executive Order 226 – Omnibus Investment Code Department Administrative Order 2001-34 – Implementing rules and Regulations of RA 9003 Department Administrative Order 2006-9 – Guidelines on the closure and rehabilitation of open and controlled dumpsites Department Administrative Order 2006-10 Guidelines on the categorization of sanitary landfill Agencies: LGUs, NSWMC/EMB-DENR and other concerned national agencies
Singapore	Environmental Public Health Act (EPHA), developments are required to provide the necessary refuse storage and collection system which would include refuse bin centre in the premises for the proper management of refuse. The EPHA also provides the legislative framework for the licensing and regulation of waste collection and the establishment of approved waste disposal and recycling facilities. There are also provisions in the EPHA for enforcement of offences on illegal dumping of waste. The following Regulations and Code of Practice related to solid waste management supplement the EPHA: - Environmental Public Health (General Waste Collection) Regulations, - Environmental Public Health (Public Cleansing) Regulations - Code of Practice on Environmental Health (COPEH) - Code of Practice for General Waste Collectors
Thailand	- Rules on waste separation at source - Criteria, standards and procedure for managing infected waste - The Enhancement and Conservation of National Environmental Quality Act, 1992 on requirements over the procedures for collection and transportation of community hazardous waste - Registration of operators in the business of waste management and setting operational guidelines - The Town Planning Act, 1975 for mandatory requirement of areas used as site for integrated waste disposal centre - The Public Health Act, 1992 and The Enhancement and Conservation of National Environmental Quality Act, 1992
Vietnam	Law on Environmental Protection 2005 Decree No. 80/2006/ND-CP dated 09 Aug 2006 of the Government on the implementation of Law on Environmental Protection 2005 Decree No. 59/2007/ND-CP dated 09 Apr 2007 of the Government on Solid Waste Management Decision No. 23/2006/QD-BTNMT dated 26 Dec 2006 of the Minister of Natural Resources and Environment on the issuance of Hazardous Waste List Circular No. 12/2006/TT-BTNMT dated Dec 2006 of the Ministry of Natural Resources and Environment on the Professional Capacity and Procedure for Application, Registration, Permit and Code of Hazardous Waste Management.

Source: 1) JASRE, 2005; 2) AWMAP report, 2008; 13) PCD, Thailand "Drafting the Law to Support the Implementation of the National Waste Management Plan(NWMP) ". Most of the policy, laws and regulations reflected in the table is solicited from the member countries through the municipal

On the other hand, Japan exhibits good practices on Sound Material Cycle Society through the 3R (reduce, reuse and recycle) principles. Keeping the mottainai spirit [Mottainai is a long-established Japanese concept meaning that it is a shame for something to go to waste without having made use of its potential in full. This expression incorporates a respect for the environment that has been handed down from ages past.] and taking account of the environmental burdens, Japan is promoting its practices to other countries in the region (Ministry of the Environment Japan, 2008).

The National 3R Strategies, action plans and/or framework on SWM already exist in most member countries like Malaysia, Philippines, Japan, Singapore and South Korea while in other countries such as Indonesia and Vietnam the development of National 3R Strategy is on-going.

The policies, law(s) and regulation(s), explicit or implicit, national or local, and their enactment along with the corresponding responsible agency related to Municipal Waste Management are summarized in Table 5. Laws, regulations and policies in terms of collection, transportation, treatment and disposal of municipal waste are discussed herein including the framework, programmes and guidelines on waste minimization and/or 3R principles. Their corresponding implementing agencies and concerned line agencies are also identified.

Box 1:

MSW collection, segregation, treatment and disposal in Japan
Percentages of municipalities that are implementing the separate collection in FY2007 in Japan can be found in the following Table:

Container and packaging materials	% of Municipalities implementing separation
Glass containers	96%
Paper containers	38%
PET bottles	97%
Other plastics containers	72%
Iron containers	99%
Aluminium containers	99%
Cardboard	90%

> 1,767 municipalities of 1,827 have their own waste segregation/ sorting facilities.
> 1,826 municipalities of 1,827 are practicing waste collection.
> 1,825 municipalities of 1,827 have waste treatment facilities such as incinerators and other types of intermediate treatment for recycling.

Source: Ministry of the Environment, Japan (2008)

2.5 Collection, segregation, treatment and disposal in the region

The collection, transportation, treatment and disposal of municipal waste are normally administered by the local government in most member countries like the Philippines, Thailand, Indonesia and Mongolia. However, in PR China the collection, transportation, treatment and disposal of municipal waste are managed by a special department in the local government known as corporation. The corporation is autonomous from the local government in most of the local areas thereby creating challenges including the lack of coordination between national authorities and the local government.

On the other hand, the private sector is playing an increasing role in the construction and operation of MSW-disposal facilities under lease and concession contracts in SEA and East Asian countries. These include the construction and operation of waste collection and disposal facilities signifying the role of private sector being mainly limited to collection and transfer of waste (IGES, 2005). Noticeably, there are still a number of member countries where MSW collection, transportation and disposal facilities has been the responsibility of the local government.

In the **Philippines**, different levels of compliance to the implementation of RA 9003 among local government units can be noticed. While some LGUs are already becoming a model site in the implementation of the Ecological Solid Waste Management Act, others are gathering lessons to improve in their compliance with: segregation at source, segregated collection, establishment of materials recovery facilities/system, and management of residual wastes.

Collection of solid wastes is mostly being managed by the local government unit. Highly urbanized cities, on the other hand, hire private contractors through a tendering process with accredited contractor/s participating per requirement of the Philippine laws. The collection service covers a range of 80% to 100% of the area, with some barangays and subdivisions having their own collection. In municipalities, collection covers the poblacion area only. Collection efficiency in Metro Manila is 83% and at the national level, collection efficiency ranges from 40% - 70%. Treatment facilities for toxic and hazardous wastes are privately run. These are mostly located in regions adjacent to the National Capital Region.

As reported in the Environment Monitor 2007, the generation of solid waste in urban areas in **Lao PDR** is on the rise and is already degrading the quality of surface and groundwater. Expanding urban populations, poor collection, and largely inadequate disposal facilities are compounding the level of pollution.

Municipalities in the capital city of Lao PDR and secondary towns have existing landfill sites while small town areas have open and uncontrolled dumping sites. It was reported that solid waste collection efficiency of urban households in the five larger urban areas is about 45% while there are only five existing sanitary landfills as of 2003.

Sorting practices of municipal waste in **PR China** is different from other countries. Normally, waste recycling is a tradition in China, where people always sort out waste recyclables then sell them to itinerant buyers. Majority of the municipal waste is sorted out prior to treatment and disposal. Even though many municipalities have waste segregation/sorting facilities, the efficiency of those facilities is quite low. According to the Law, the collection of municipal waste is managed by the competent administrative department of construction under the State Council and the competent administrative department of environmental sanitation of the local people's governments. Furthermore, collection of municipal waste is under the direction of corresponding local departments known as the Environmental Sanitation Bureau, City Appearance and Environmental Sanitation Bureau, Municipal Administration Commission, etc. The appointed organization which does the collection work is often named Environmental Sanitation Group. China's municipal waste collection system is manifested in every municipality, excluding the countryside. While there may be few rural areas seen to have existing municipal waste collection systems, every municipality has its own treatment facility for municipal waste.

Table 6: Municipal Waste Facilities

Country	Treatment Factories	Incineration Facility	MRF	Open dumpsites	Controlled landfill	Sanitary Landfill
Brunei Darussalam				6		
Cambodia						
PR China	419	69			324	20
Indonesia	20	-	80	400	70	10
Japan						
South Korea	4,955	2,028	-	325	1,348 (this includes not only landfills, but also other ways of treatment such as solidification, gasification, etc.)	
Lao PDR						5
Malaysia					261	10
Mongolia				8		1
Myanmar				2		
Philippines			2361	826	273	19
Singapore		4				1
Thailand		3			20	91
Vietnam				49	91	17

Sources: 3) Data in 2006, CRAES (2008); 6) Waste treatment report 2006, published in 2007, Ministry of Environment; 7) 261 landfills throughout Malaysia, 111 are not operating, 3R in Malaysia, Ministry of Housing and Local Government, 2009 11) 2nd Quarter of 2008, 7) Date indicated on 2003, Environment Monitor 2007 Report, World Bank; 12) NEA, 2008; 11) NSWMC/EMB-DENR, 2008

In **Indonesia**, segregation is part of the 3R progam; 16% of MSW reduction at Surabaya City and reduction of MSW in other areas in the country are evident. A survey showed that in Bandung City, 19% of domestic waste from Hospital is reduced. Almost all municipalities in Indonesia carry out waste collection in their respective areas. However, big cities in the country authorize the private sector to carry out waste collection activities. One very common waste treatment facility in Indonesia is composting, which are managed either by the local government, the private sector and/or the community.

All municipalities in **South Korea** know and practice the 3R principles. The ultimate goals of waste management in Korea are to provide clean environment for the people and the natural ecosystem by minimizing waste generation, optimizing waste recycling and treating waste generated in an environmentally-sound manner. A strategic approach to promote "3Rs" is the core measure to achieve those goals in the country. Hence, all municipalities understand and try to practice this plan despite their limited facilities for waste segregation/sorting, collection and treatment in their respective areas.

In **Malaysia**, a comprehensive environmental programme is being practiced in the Methodist Girls' School in Penang since 2002. The program includes recycling, electrical and electronic equipment (WEEE) waste collection, energy saving practices, solar energy programme, used spectacles collection, plant labeling, environmental talks and jumble sale as well as use handkerchiefs and reduce plastic bags campaigns.

Segregation/sorting facilities exist and are practiced in Malaysia (e.g. in Kota Kinabalu City Hall, where 500 tpd Material Recovery Facility (MRF) exists and is managed by a private company; and in Kajang Municipal Councilwherein a 1,000 tpd Resource Recovery Centre/Refuse Derived Fuel-Waste to Energy (RRC/RDF-Wte) plant is administered by a private company). Examples of existing solid waste collection, transportation and transfer practice in Malaysia include those in regional interim companies and the private sector which are autonomous but is engaged by the Local Authorities (Good Practices on Solid Waste Management in Malaysia, June 2008).

In **Mongolia**, limited solid waste segregation facilities exist and waste separation is managed manually although, the waste segregation in local areas has been organized more recently. In all provinces, solid waste collection and transportation are carried out by licensed companies assigned by the local administration. There are no waste paper treatment industries. Paper is bought from central dumps, entities, waste collectors and second raw material points and exported to China. About 3-4 toilet paper factories treat them incompletely and use them as raw materials for the production of toilet paper. For instance, Agar Taij LLC treats 6.5 tons of paper/day.

Municipalities in **Myanmar** know about 3R principles or its equivalent. Most municipalities and/or cities in the country have waste collection services for Municipal waste. This is managed by authorities such as Yangon City Development Committee (YCDC), Mandalay City Development Committee (MCDC), Nay Pyi Taw City Development Committee and Township Development Committee and Department of Development Affairs. A number of private sectors have waste segregation facilities for municipal Waste in small scale. The YCDC practices composting of organic waste and reusing of waste plastic bags into waste collection bins. A pilot scale on composting of organic waste is also carried out in MCDC, as much as the Ministry of Agriculture is engaged in composting activities.

On the other hand, **Singapore** has put in place an integrated solid waste management system that ensures all non-recycled wastes are collected and disposed of safely at waste-to-energy plants or at the offshore sanitary landfill in the case of non-incinerable waste.

In a national survey, 80% of the respondents showed awareness in waste minimization and recycling. From actual statistics collected, 63% of residents participate in recycling. Except for condominiums and private apartment estates, all households are provided with recycling bags or bins to store their recyclables for door-to-door fortnightly collections.

Collections are done by the appointed PWCs selected through public tenders. The recyclables are brought to sorting facilities and then sent to recycling plants. There are four existing public waste collectors appointed by the National Environment Agency (NEA) for the provision of waste collection services for domestic and trade premises and about 340 licensed waste collectors in the country (NEA, 2008).

All incinerable waste is incinerated in any of the four waste-to-energy plants (IPs). The non-incinerable waste and ash from the IPs are disposed of at the Semakau Landfill. The IPs and the landfill are owned by the Government and managed by the NEA.

Thailand: MSW collection and disposal in Bangkok has reached 99% of the total waste volume managed by private companies. Local governments play a key role for municipal areas in terms of collection and disposal but the significant problem is well beyond the ability of the municipal government.

The sanitary facilities have been increased to 117 locations in municipal areas. In 2005, MSW collection and disposal in municipal areas reached 43% of the total waste volume and increased by 8% from the year 2003. For non-municipal areas, proper collection and disposal of MSW is rarely found.

Under the support of JICA, Hanoi Urban Environment Company did a pilot 3R in some residential areas in Hanoi **Vietnam** in 2007, starting with waste segregation at source at the household level. The waste was segregated for recycling, particularly bio-waste for composting at Cau Dien Composting Plant.

Ho Chi Minh City and other cities piloted 3Rs and source segregation in the past. Their sorting facilities include Cau Dien Composting Plant of Hanoi Urban Environment Company and Ho Chi Minh City Environment Company.

Box 2:
Public Recycling Bins

In Singapore, about 3,800 recycling bins have been placed at public places with high human traffic to supplement the National Recycling Programme. Such places include locations outside several mass rapid transit stations, food courts and food centres, bus interchanges, airport, pedestrian malls, etc.

Source: NEA, 2008

The national average collection rate of municipal waste in urban areas rose from 65 percent to 71 percent between 2000 and 2003. Collection rates are typically higher in larger cities (76 percent) compared to smaller cities (70 percent), while in rural areas collection rates are typically less than 20 percent. The poor are largely not served by collection services; nine out of ten of the poorest urban households do not receive solid waste collection service. New initiatives are being promoted to fill the gaps in municipal waste collection service. For example, community-based and private sector organizations are collecting waste in rural villages and in urban areas without municipal coverage.

Like other countries in Southeast and South Asia, open and controlled dumps are the dominant form of waste disposal in Vietnam. Only 12 of 61 cities and provincial capitals have engineered or sanitary landfills; most were constructed in the past four years. Of the 91 landfills across the country, only 17 are sanitary landfills. The development of waste treatment and disposal systems including landfills is a government priority but due to the lack of financial resources, the government is constructing most sanitary landfills with ODA funding.

III ASPECTS OF MUNICIPAL WASTE MANAGEMENT IN SOUTHEAST AND EAST ASIAN COUNTRIES

III. Aspects of Municipal Waste Management

The succeeding sections discuss and present the status-quo of the different aspects of Municipal Waste Management in 14 SEA and East Asian countries. These include economic instruments, technologies, partnerships, informative measures and awareness raising efforts, informal sector, stakeholder participation and capacity building.

3.1 Economic Instruments

This section presents and briefly describes economic instruments related to Municipal waste e.g. incentive – subsidies, low-interest finance, tax exemption; disincentive – fees, charges/fines at the national/local level in SEA and East Asian countries.

PR China

The treatment of MSW is a main area of the treasury bonds investment in China. From 1990s, the treasury bonds were the main source of capital to the treatment facilities of municipal waste. From 1998 to 2005, the national central government had invested 40.0884 billion RMB on the treatment facilities of municipal waste, with 5.84 billion RMB from the treasury bonds and 12.477 billion RMB invested by the local government. From 2005 to 2010, the investment on infrastructures of the municipal environment would be 660 billion RMB, including the treatment facilities for municipal waste. World Bank and other international financial organizations as well as developed countries like Japan, Germany and Canada supported the construction of treatment facilities for municipal waste from 1980s to 1990s. For example, the Datun transfer station and the Asuwei landfill site in Beijing put into use in 1991 were constructed by loan from the World Bank.

In December 27, 2002, the Ministry of Construction delivered the Suggestion on Accelerating Public Trade Market Process of Municipal Public Utilities where social capital and foreign capital to participate in the construction of municipal public utilities by sole, joint or cooperative means was encouraged. From then on, a lot of private enterprises and foreign investors played an active role in the area of municipal waste treatment.

Indonesia

Existing economic instruments on municipal waste in Indonesia are as follows:

- Incentive and disincentive for Clean City Program/"ADIPURA" (award system).
- Subsidies (DAK: Special Allocation Budget and others); National/Provincial/ District Government Budget.
- Service fee.
- Tax exemption for importation of MSW technology.

Japan

The national government provides municipalities with subsidies and low interest loans for constructing waste treatment facilities. Low interest finance and tax incentives are being given to private companies, which build municipal waste disposal facilities by using PFI. Two-thirds of all municipalities introduced waste collection fee systems for household waste. Recently, a fee is imposed for plastic shopping bags as encouraged by the Government, some markets, shops and stores.

South Korea

Existing economic instruments in Municipalities in the Republic of Korea include:

1. Volume-Based Waste Fee System (or Unit Pricing System): The main objective of this system is to impose waste disposal cost on individual waste generators to reduce the amount of waste generated and to promote separate discharge of waste.
2. Extended Producer Responsibility (EPR) System: This system holds producers accountable for the entire life cycle of their products in order to incite innovation in product design, material use and business management through economic incentives.

Malaysia

With the SWM Act, it is currently a transition period for Malaysia to transform from translating waste economic instruments in terms of subsidies (incentive) and assessment tax (disincentive) to public-private sector partnership, tax breaks for the industries/operators, cross-concession trading (incentive) as well as direct billing, proper calculated tipping fees, license to the operators and penalties in terms of fines and temporary suspension of services to a household (disincentive).

Box 3: Philippine Zero-Basura Olympics

The Philippines launched "Zero Basura Olympics: Fasttrack RA 9003, also called the "KM 300 Garbology Marathon." The contest, the first of its kind in the country, aims to prioritize, operationalize, institutionalize and fast-track the LGU-wide implementation of Republic Act (RA) 9003 or the Ecological Solid Waste Management (ESWM) Act of 2001. The top LGUs with the best practices in segregation, recycling, composting, closure and rehabilitation of open dumpsites, use of alternative technologies and categorized disposal facility receive recognition and citations.

Photo source: NSWMC, 2008

Payments to service providers for collection, transportation, transfer, recovery, treatment or disposal are based on Key Performance Indicators (KPIs) which emphasize quality of services.

Mongolia

Ministry of Nature and Environment adheres to the policy to import facility for solid waste indemnifying; recycle and reuse. Imported facilities are either free of, or rebated from, customs tax. Comments for reflecting the policy on related laws are also given.

According to the Law on household and industrial solid waste, local governors have the right to organize Service fund for solid waste in order to support independent financial source for solid waste collection, transportation and disposal and reduction of solid waste. That service fund will be spent not only for solid waste collection, transportation, disposal and reduction of solid waste, but also for central dumps reformation and public education.

Myanmar

In Yangon, Myanmar, local level economic instruments exist in the form of fees, charges and fines.

Philippines

Incentives are provided for the purpose of encouraging LGUs, enterprises, private sector and civil society to develop or undertake socially acceptable, effective and efficient solid waste management, and/or to actively participate in any program for its promotion as provided for in RA 9003. The incentives may be fiscal

including duties, taxes, interest rates or non-fiscal such as simplified bureaucratic procedures and reduced paper requirements.

Rewards are provided to LGUs, individuals, private organizations and entities, including non-government organizations that have undertaken outstanding and innovative projects, technologies, processes and techniques or activities in re-use, recycling and reduction. Subsidies also exist. In fact, a department of finance guideline on cost sharing scheme for brown environment projects is currently being revised to accommodate LGUs belonging to first-third income class.

Singapore

In Singapore, the cost of waste disposal is fully recovered through the disposal gate fee charged at the disposal facilities. The full cost recovery approach is part of the government's long-term strategy to cut down waste generation and promote waste recycling by making waste generators pay the full cost of disposing their waste. The current disposal gate fee levied at the disposal facilities is $77 per ton of waste.

To control illegal dumping of waste, punitive measures such as hefty fines and forfeiture of vehicles used for illegal dumping activities were put in place to deter illegal dumping offenders.

The waste collection services in Singapore have been fully privatized since 2001. Residential and trade premises pay a refuse removal fee to the NEA-appointed public waste collectors (PWC) for the refuse collection service. The refuse fees levied on the premises are based on the successful tender rates submitted by the PWCs in an open tender.

Vietnam

Economic instruments relating to Municipal waste include incentives such as subsidies, low-interest finance, tax exemption, and disincentives like fees, charges/fines.

- Decree No. 174/2007/ND-CP dated 29 Nov. 2007 on Environmental Protection Fee for Solid Waste and Circular No. 39/2008/TT-BTC dated 19 May 2008 of the Ministry of Finance on implementing Decree No. 174/2007/ND-CP.
- Law on Environmental Protection 2005 outlines the incentives for environmental projects but there is no specific guidance on how to do this.
- Decree No. 81/2006/ND-CP dated 09 Aug. 2006 on the Administrative Punishment of Violation in Environmental Protection; it has a Chapter on Violation in Solid Waste Management.

3.2 Technologies

The following section presents the existing technologies in Municipalities in the 14 member countries. It further illustrates the type of technologies used for municipal waste collection, segregation, treatment and disposal, and briefly discuss the level of technology: Imported, Local, Capacity (rate), etc. the municipalities have. The number of technologies and/or facilities is outlined in Table 6 in the preceding section.

PR China: The collection and segregation of municipal waste in China is mostly carried out manually. Efficiency of segregation/sorting facilities is quite low. Municipal waste is transported via a vehicle truck, more than half in air-tight conditions. The number of motor vehicles designated for municipal environmental sanitation was 66,020.

Indonesia: Existing technologies on Municipal Waste include:

- Collection technologies: trucks, motorcycles, carts (local and imported).
- Segregation technologies: conveyor, gravitational sorter machine (local).
- Treatment technologies; composting (local and imported).
- Disposal technologies; sanitary landfill, controlled landfill, gas capture or LFG extraction.

Japan: Available technologies on Municipal Waste in Japan include:

- Collection: Mechanical waste collection vehicle.
- Segregation.
- Treatment: Incineration (stoker furnace, shaft furnace, fluid bed furnace) and high efficiency power generation; gasification and melting furnace; gasification and reforming; carbonization; methane fermentation and power generation; RPF/RDF production and power generation; metal collection and recycling; biodiesel production from waste oil.
- Disposal: Semi-aerobic landfilling.

South Korea: Existing technologies used for Municipal Waste in the country include incineration and landfill disposal.

Box 4:
MW Volume Reduction

To overcome the constraint of limited land, Singapore has adopted waste-to-energy incineration as a waste disposal method. Incineration reduces waste volume by 90% thereby reducing drastically the need for landfill waste. Municipal and other combustible waste are sent to these incineration plants so that only the ash from incineration and non-incinerable waste are allowed to be disposed of at the landfill.

Singapore has 4 waste-to-energy incineration plants and 90% of the waste collected is sent to these plants for incineration. The remaining 10% non-incinerable waste is sent to the landfill. There is only one landfill in Singapore and it is an offshore landfill, constructed at a cost of S$610 million by joining 2 small islands with earth/rock bunds lined with impermeable membrane. The 4 incineration plants and the offshore landfill were constructed by the government and operated by the National Environment Agency.

The incineration plants are fitted with advanced pollution control equipment. At these plants, energy is recovered to generate electricity. Scrap iron is also recovered.

Although incineration offers the advantage of high volume reduction and helps to conserve landfill space, it is not adequate if more waste is generated each year. This would then put additional demand to build more incineration plants and landfills.

Source: NEA, 2008

Lao PDR: Capital city and secondary town in Lao PDR have collection and treatment facility by landfill system while small town cities have open dumping and burning systems.

Malaysia: Municipal wastes in Malaysia are mostly disposed off to the landfill.

Mongolia: Recently, the Ministry of Nature and Environment started to introduce landfill approaches for solid waste dumping sites in nine provinces. The dumping is about five square hectares with a lifespan of 10 years. Every waste point has 3 facilities, a balance and a small plastic bag treatment factory. All of these facilities are imported.

Myanmar: Yangon, Nay Pyi Taw collection and segregation are carried out manually, truck & heavy machines also exist. Mandalay municipal waste is collected using available technology e.g. bell ringing system, communal, block and Karb sides. There is no treatment system in the municipality. But, a semi-landfill system is utilized for disposal.

Philippines: Local government units are currently adopting low cost and local technology for collecting and segregating wastes. Sanitary landfills are currently being used by some LGUs as a mode of disposal. Some LGUs are currently in the process of rehabilitating/closing their open and controlled dumps while others continue to use open and controlled dump sites (see Table 6).

Singapore: Waste collection is mechanised using rear end loaders and compactors. Some private developers adopted the pneumatic refuse conveyance system for the collection of refuse.

Singapore adopted waste-to-energy incineration for the disposal of its waste with the belief that incineration is the most cost effective method of waste disposal reducing the volume of waste by 90%. Heat from the combustion of refuse is used to generate electricity while ferrous metal is recovered for recycling.

3.3 Partnerships

This section describes joint projects with partnerships between Municipalities and other stakeholders including national government and key players on Municipal waste management in South East Asia and East Asian member countries.

PR China

After the admittance of different kinds of capital, many countries and organizations begin to participate in the construction of treatment facilities for municipal waste. For example, the treatment facility in Wuzhou, Guangxi province, the first CDM project of refuse compost put into production in the world in 2007, was a collaborative effort between China and Germany. The compost facility in Fuling, Chongqing City and the landfill facility in Pengzhou, Sichuan province were made by China and Holand. The treatment facility in Handan, Hebei province on electricity generation by marsh gas produced from municipal waste constructed in 2007 was between China and a company from Italy. The separation facilities for municipal waste in Hengxian, Guangxi province obtained financial and technical support from England and U.S.A. China has obtained much help both in finance and technology from many international organizations such as GEF, UNEP, UNDP, UNIDO and UNCRD. Moreover, China has worked together with research institutes and colleges of foreign countries on recycle and pollution control technology, creating a stable technical foundation for the management of municipal waste in the country.

Indonesia

Joint projects related to Municipal waste in Indonesia include:

- Pilot/demo project on implementing 3R of municipal waste between Central and local Government and the community.
- Western Java Environmental Management Project (WJEMP) on composting implemented by executing agencies such as the Ministry of Public Works and MOE.
- Pilot project for developping sanitary landfill (Ministry of Public Works, BPPT and Districts).
- Debt for nature swap (Cooperation program with Germany) on municipal waste management for gas).
- CDM progam at Bantar Gebang landfill site in cooperation with Japan, Suwung Bali and Balikpapan (East Kalimantan).

Box 5:
Composting in Phnom Penh, Cambodia

A small number of NGOs in Cambodia play important roles in disseminating, educating and raising awareness on solid management problems among local communities, for the protection of the environment and of public health. The application of bio-fertilizer is successfully undertaken at target areas in Phnom Penh by a local NGO – the Cambodia Education and Waste Management Organisation (COMPED). COMPED is a big bio-fertilizer producer, which uses urban organic wastes that are collected from Stung Meanchey dumpsite and Phsar Demkor market. Regular production through composting in PPM is carried out by COMPED. A compost price is mainly cheap compared to prices of agrochemicals. Furthermore, composting is doable at the household and/or community level. The government is promoting and disseminating the beneficial use of compost fertilizer through several projects and government programmes.

Source: MoE Cambodia, 2008

Japan

Some local governments are involved in voluntary agreements for reducing plastic shopping bags with citizens' organizations and retailers such as supermarkets. Also, local residents groups (e.g. residents' associations) are very active in collecting recyclables such as waste papers, clothes, metals, etc. In 2006 for example, the total amount of collected recyclables reached 3 million tons.

South Korea

Municipalities in the Republic of Korea have initiated a food waste reduction campaign. On-going nationwide campaign is made in partnership with local authorities, citizen groups, civil society organizations, and the food industry.

Lao PDR

A number of municipalities are involved in SWM project in Lao PDR together with the private sector, other stakeholders, and the community.

Cambodia

In the area of environmental education and awareness, Siem Reap Province has initiated a School Recycling Program which is focused on the dissemination of the garbage management scheme. The schools' major activities include waste recycling, school gardening and distribution of environmental brochure/leaflet to stakeholders. Outputs of the program include: education and awareness on garbage management within primary schools and others; increased efficiency of primary schools in managing solid wastes/ garbage; improved performance of other schools in the area of waste management; and dissemination of environmentally-sound management practices in solid wastes/garbage from pupils to parents and communities. The programme was implemented by staffs from the Environmental Department of Siem Reap Province, JICA study team, JICA volunteers and Directors of primary schools. Program participants include school teachers, primary school pupils and parents.

Malaysia

Malaysia joint projects between Municipalities and other stakeholders including national government include:

1. Bukit Tagar Sanitary Landfill in Selangor: a partnership between the Federal Government and a private operator.
2. Seelong Sanitary Landfill and Taruka Transfer Station in Johor: a partnership between the Federal Government and an interim company.
3. Pulau Burong Sanitary Landfill and Ampang Jajar Transfer Station: a partnership between Local Authorities and a private operator.
4. Resource Recovery Centre/Refuse Derived Fuel - Waste to Energy (RRC/RDF-WtE) Plant in Selangor: a partnership between a Local Authority and a private operator.

Mongolia

With the cooperation of the governments of Mongolia and Japan, a Master plan on solid waste in Ulaanbaatar City Project was implemented in 2004-2007. Organized activities are at implementation phase since 2008. Foreign and domestic financiers invest in small and medium projects and programs. Currently, Japan, Korea, USA and Czech are helping toward the improvement of solid waste management in the country.

Yangon, Myanmar

YCDC is the sole governmental body for municipal waste management in Yangon City. A partnership related to municipal waste management exists. Information resources are available to the municipal practitioner to aid their participation in planning and decision-making.

Philippines

The National Solid Waste management Commission (NSWMC), an inter-agency office, was created under the Office of the President to oversee the implementation of plans and programs under RA 9003 and to prescribe policies to support its implementation.

National/Regional Ecology Centers maintain a multi-sectoral, multi-disciplinary pool of experts that provide consulting, information, training and networking services for the implementation of RA 9003 in collaboration with Provincial/City/Municipal Boards and Barangay Solid Waste Management Committees.

Singapore

The so-called 3P (people, private, public) partners are very relevant in organizing and running programmes in the community especially since education and awareness-building are important to the sustainability of the integrated solid waste management system of the country. Some of their events include:

The *Annual Recycling Day* aimed to raise awareness and educate the public on the need to recycle and minimize waste is a joint effort by NEA, People's Association (PA), Singapore Environment Council (SEC), and Waste Management and Recycling Association of Singapore (WMRAS), the four Public Waste Collectors (PWCs), Grassroots organizations and schools.

Grassroots and community events initiated by grassroots organizations often integrate recycling activities such as recyclables exchange.

School Recycling Corner Programme: NEA, together with the PWCs, introduced School Recycling Corner Programme to the schools in 2002. This serves as a platform to reach out to students, inculcating the good habits of 3R in them since at a young age. As of Dec 2007, 95% of schools have joined the School Recycling Corner Programme.

Vietnam

There are various projects but Municipalities do not report to VEPA.

3.4 Informative Measures

This section presents information-related measures on Municipal Waste Management in terms of collection, segregation, treatment and disposal in countries in SEA and East Asia.

Indonesia

In Indonesia, information-related measures on the technical aspects and on the volume of MSW generated/handled/disposed at landfill sites, including MSW composition (limited to a few cities), amount and condition of MSW handling facilities and all other activities are implemented by the local government.

Japan

Information on newly introduced or amended laws and national regulations for waste management and recycling are given to waste management practitioners through various training programs mainly organized by municipalities and to a wide range of stakeholders through web sites. Proposals on new policies and

measures, and the review of existing laws and national regulations are discussed at the MOE's advisory committee, the Central Environment Council. The Council's discussion is open to the public; all the citizens and other stakeholders are given opportunities to submit comments to draft reports of the Council. Municipal waste is managed based on the annual waste management plan of each municipality. The plan is subject to the decision of the assembly of the municipality.

South Korea

Provision of information to Municipal waste practitioner and other relevant stakeholders about Municipal waste related matters, particularly in decision making and Municipal waste management, include:

- Separative Discharge Labeling System for packaging materials: this system has been in place since January 2003 in order to provide guidance to consumers in discharging items in separately marked recycling bins and to assist recycling and recovery industries to easily identify the waste product and/or packaging material.
- Korea Eco-labeling Program: this is a voluntary certification program to choose eco-products from products of the same purpose. these products display the designated logo (Eco-Label) and brief description, in order to reduce consumption of energy and resources and to minimize generation of polluting substances in each production step.

Malaysia

Most current information is accessible to the public. With the newly developed legal and institutional framework on SWM, the Federal Government is in the process of enhancing the supporting infrastructure particularly the waste management database.

Mongolia

Companies licensed by the local administration do the solid waste collection, transportation and disposal. At present, reuse of solid waste is insufficient although some plastic bags, papers, bones; glasses and food wastes are reused. Raw materials from waste are used for producing some plastic bags, chairs, and fence stakes by about 5-6 companies while some half-treated wastes are exported to China.
Recently, the government is developing a policy to improve the database of household solid waste, with information open to the public.

Myanmar

In Mandalay City, Myanmar use information-related measures through the media such as through publishing in a newspaper to disseminate information on SWM, particularly on awareness-raising and other campaigns.

Philippines

Offices/organizations, NSWMC and its secretariat, NEC and REC were created to provide, among others, technical assistance on such areas as basic policy and other supporting guidelines to facilitate the implementation of RA 9003. Aside from NSWMC, NEC and REC, the field offices of the Department of Environment and Natural Resources (DENR) provide related information on SWM to the stakeholders.

Singapore

The NEA works with various stakeholders like schools, private organisations and the community to organise environment-champion workshops to raise awareness on environmental-related issues. NEA also partners with the PWCs to educate the stakeholders on 3R-related issues.

Vietnam

Information is limited although there are trainings provided to provinces by VEPA. The information is available in the VEPA website. However, it is not comprehensive.

3.5 Informal Sector

This section presents the status and contribution of informal sector to SWM and 3R principles in the 14 member countries in SEA and East Asia.

Informal sector contribution on recycling activities in many municipalities of developing member countries is evident. The sector includes waste pickers at the dump site, itinerant buyers and junkshops. There has been little effort towards addressing the associated health risks, faced by the informal sector. For instance, most waste pickers remain unprotected and therefore vulnerable while sorting wastes at open dump sites.

In **PR China**, most collection for the reuse and recycle of municipal wastes are carried out by the informal sector such as the supply and marketing cooperatives, private corporations and the floating population.

According to the World Bank (2005), waste pickers need to be better integrated into waste management programs. By 2010, all large landfills in China should be free of waste pickers (at the tipping face). Overall, waste pickers contribute to China's waste management system; secondary materials are diverted and some 2,500,000 jobs are created. Nevertheless, a more integrated approach is needed and operating standards need to be defined for waste pickers (both in terms of working procedures, occupational health and safety requirements and types of materials diverted at various points without interfering with collection and disposal operations).

In **Indonesia**, waste picking by scavengers is a very evident element of waste management. There are about 6,000 scavengers in the Province of Jakarta including those at the dump site. Itinerant buyers and junkshops also abound.

The informal waste sector, as defined and agreed by stakeholders during the four consultations workshops in the **Philippines** for the development of the draft National Framework Plan, are individuals, families, groups or small enterprises engaged in the recovery of waste materials, with revenue generation as the motivation, either on a full- or part-time basis. Most work without any formal recognition from government accreditation, licensing or regulating agencies. While some work for licensed waste-related enterprises, their employment with the enterprise owners are neither binding nor legal. They have no social and economic security and work under substandard and unhealthy work conditions with limited access to basic services (NSWMC, 2009).

Although there had been no accreditation, licensing or regulating agency looking after the welfare of the informal sector in the Philippines, the latter plays a significant role in the recovery of recyclable materials. . At present, the report on the national framework for the informal sector in SWM developed by the National Solid Waste Management Commission of the Philippines is being circulated and disseminated to local authorities in the country. The report serves as a framework for Government Units that are developing policies for the informal sector at the local level. Other developing Asian countries could replicate this practice of information dissemination and awareness-raising in the integration and recognition of the informal sector as a partner of public and private institutions, organisations and corporations in the promotion and implementation of the 3Rs in solid waste management (IGES, 2009).

In Singapore, the informal sector is called the 'rag and bone' - men who have been collecting recyclables such as newspapers, clothes, used electronic products, etc. for recycling and/or reuse.

The informal sector in Vietnam collects majority of the recyclable and reusable waste in urban areas. In 1995, the value of recyclable materials traded by the informal sector in Ho Chi Minh City was estimated to be VND 135 billion, which amounted to VND 15 billion less than the city's total budget for waste management that year. In Hai Phong, the value of plastics, paper, metal and glass traded was estimated to be VND 33 billion in 2000. The most significant recyclable materials were plastics (valued at VND 11 billion), followed by paper (VND 10 billion) and metals (VND 8.5 billion). A 1996 survey of the informal sector in Hanoi estimated that 18 to 22 percent of all waste is being diverted from the landfill by the informal recyclers. Given that roughly 1.4 million tons of waste is produced in Hanoi every year, savings on disposal costs from recycling currently range from VND 38 to 47 billion.

3.6 Stakeholder Participation

Cambodia

Cooperation with NGOs (Stakeholders): The MoE in collaboration with COMPED and the International Experts established the Environmental Guideline on Solid Waste Management in the Kingdom of Cambodia, in order to implement the existing environmental regulations as well as to increase awareness and knowledge of stakeholders including private partners.

Japan

Municipalities are managing municipal waste generated in their areas either by themselves or by commissioning to specialized companies. Local resident groups (e.g. residents' associations) are often very active in collecting recyclables such as waste papers, cloths, metals, etc. The total amount of collected recyclables reached 3 million tons in 2006.

Indonesia

Key stakeholders involved in the collection, segregation, treatment and disposal in municipalities in Indonesia include the local authorities, private sector and the community.

South Korea

Municipalities and companies are participative in the aspect of waste disposal.

Lao PDR

Lao PDR has a project and structure that outlines the participation of all stakeholders, particularly in 3R-related information.

Malaysia

Stakeholders include:

- The Ministry of Housing and Local Government through the Department of National Solid Wast.
- Management and Solid Waste and Public Cleansing Management Corporation.
- The Prime Minister Department for privatisation of solid waste management facilities and services;
- The Ministry of Finance for budget allocation.

Mongolia: Licensed companies contribute to household solid waste management through waste collection, segregation, treatment and disposal.

Myanmar

In the cities of Yangon and Mandalay, all key stakeholders like the YCDC, PCCD (Pollution Control and Cleansing Department) and the Local Authority are involved in SWM.

Singapore

NEA, together with the PWCs and Town Councils (TC), implemented a system for residents to segregate recyclable waste under the National Recycling Programme. Residents can recycle via a fortnightly door-to-door collection programme or make use of the centralised recycling depositories located within the housing estates. NEA works closely with Citizen Consultative Committees, TCs and the PWCs for public education and awareness on waste recycling. NEA also holds regular dialogues and consultations with the Waste Management and Recycling Association on waste management issues.

Vietnam

Key stakeholders involved in Municipal Solid Waste Management include:

- Urban environment companies (URENCOs) as key players in MSW collection, treatment and disposal.
- Ministry of Construction responsible for planning and construction of treatment and disposal facilities.
- Ministry and provincial Department of Natural Resources and Environment responsible for environmental issues in general.

3.7 Capacity Building for Municipal waste management

Table 7: Capacity Building through Training on Municipal Waste Management

Country	Capacity Building through Training on Municipal Waste Management			Information Sector function on 3Rs
	Public/private Sector	Local communities /citizens	Firms and industries	
Brunei Darussalam	Y	Y	Y	Y
Cambodia	Y	NS	NS	Y
PR China	Y	Y	Y	Y
Indonesia	Y	Y	NS	Y
Japan	Y	Y	Y	N
South Korea	Y	Y	Y	Y
Lao PDR	Y	Y	Y	-
Malaysia	Y	Y	Y	Y
Mongolia	Y	Y	Y	Y
Myanmar*	Y	Y	N	N
Philippines	Y	Y	Y	Y
Singapore	Y	Y	Y	Y
Thailand	Y	Y	Y	Y
Vietnam	Y	NS	NS	Y

Notes: Y = Yes, N = No & NS = Not sure

Table 7 Capacity Building through Training on Municipal Waste Management shows that most member countries conduct capacity building through training the public/private sector, local communities and firms and industries regarding MWM.

In **China**, both the national and local authorities conduct trainings for municipal waste management to local communities and citizens through proactive ways such as exhibitions, ambulatory advertisements and throwaways. Trainings for municipal waste management to firms and industries are also conducted mainly to identify the content of waste generated in the firms and industries, and to categorize which can or cannot be treated along with municipal waste.

In **Japan**, when a standard or a regulation is changed, local authorities hold a briefing/training for the public/private sector dealing with municipal waste management. A local authority often holds a briefing for citizens and local communities informing them how to treat, manage and separate municipal wastes in their houses. On the other hand, industries and firms are briefed with regards to the wastes they discharge.

In **Mongolia**, officials of the household solid waste department conduct training in their area of responsibility once a year. Suasive measures like educating the public about solid waste are also evident; this issue is also mainstreamed in the curriculum of secondary schools. Moreover, some TV programs are made and broadcasted to educate the public on the topic of SWM.

In Yangon City, **Myanmar**, the local authority enhances its own capacity through seminars concerning solid waste management in or outside the country. Meetings and discussions with schools and NGOs are also often held.

In the **Philippines**, capacity building is part of the mandate of the DENR and the national and ecology center.

In **Singapore**, all refuse collection workers involved in the collection of garbage from domestic and trade premises under the Public Waste Collection Scheme are certified under the National Skills Recognition System (NSRS).

NEA conducts waste management trainings to communities at the Community Development Councils' (CDCs) level in its annual workshops. There are also ad-hoc trainings for small groups of residents in line with the activities of Residents' Communities (RCs) held throughout the year.

The **Singapore** Environment Institute (SEI), which is the training arm of NEA, conducts a course on "Introduction to Waste Management in Singapore" for companies.

In **Vietnam**, MONRE sometimes organizes trainings related to waste management for provincial officials and other stakeholders.

IV STATUS-QUO AND PROBLEMS OF MUNICIPAL WASTE IN SEA AND EAST ASIAN COUNTRIES

IV. Status quo and Problems of Municipal Waste in SEA and East Asian Countries

Municipal waste management problems currently faced by most member countries include illegal dumping, limited knowledge on technological solutions and processes, limited resources (e.g. recycling facilities, landfill plan and landfill area), lack of coordination among national and local authorities and other sectors in the formulation of policy measures, too little revenue from waste collection fees and lack of knowledge and experience of waste management workers. Table 9 provides a summary of the management aspects.

A statistical computation of information gathered from the member countries show a moderate correlation between the GDP per capita and the municipal waste generated. This means that an increase in GDP may likely see some corresponding increase in the volume of waste generated. Table 8 and Figure 3 depict the correlation between GDP per capita (USD) and the percentage of municipal waste generated in SEA and East Asian countries, with the exception of some countries like Cambodia, Myanmar and the Philippines. The correlation figure indicates a moderate positive linear relationship between the GDP per capita and municipal waste generation. Even though the relationship is moderate, a relationship does exist, indicating that as GDP per capita increases, the municipal waste generated is moderately increased, this analysis also suggests the opposite effect of municipal waste moderately decreasing with a lower GDP per capita.

Table 8: MW generation rate in Kg/capita /day

Country	Population (thousands) Mediumvariant 2005	kg/capita/day	GDP/Cap (USD/2006)	Note
1.Brunei Darussalam	374	1.4	30,342	
2. Cambodia				
Phnom Penh	1,326	0.67	513	Domestic waste generation at disposal site in Phnom Penh
3. PR China	1,312,979	0.31	2,022	Quantity of municipal waste transported in 2006 (There is no statistical data on waste generation)
4. Indonesia	226,063	0.49	1,641	This is the computed generation per year
5. Japan	127,897	1.11	34,264	Waste generated in 2003
6. Republic of Korea	48,607	1.02	19,114	
7. Lao PDR	5,664	0.64	581	Average of 4-5 kg/capita/week
8. Malaysia	25,653	0.90	5,943	
9. Mongolia	2,641	0.22	1,990	
10. Myanmar				
Mandalay	650	0.46	232	MCDC, 2007
11. Philippines	84,566	0.34	1,352	projected for 2010 0.34kg/cap/day in Valenzuela to 0.67 kg/cap/day in Quezon City (ADB, Metro Manila Solid Waste Management Final Report, 2002)
12. Singapore	4,327	0.94	31,028	
13. Thailand	63,003	0.64	3,166	
14. Vietnam	85,029	0.41	723	

Source: [Population] Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2006 Revision and World Urbanization Prospects (except, Phnom Penh, Mandalay), Population Census of Cambodia 2008 (Phnom Penh), Ministry of Hotels & Tourism, Myanmar (Mandalay). [GDP/Cap] World Economic Outlook Database, October 2008 (Gross domestic product per capita, current prices, U.S. dollars)

YCDC: Yangon City Development Committee

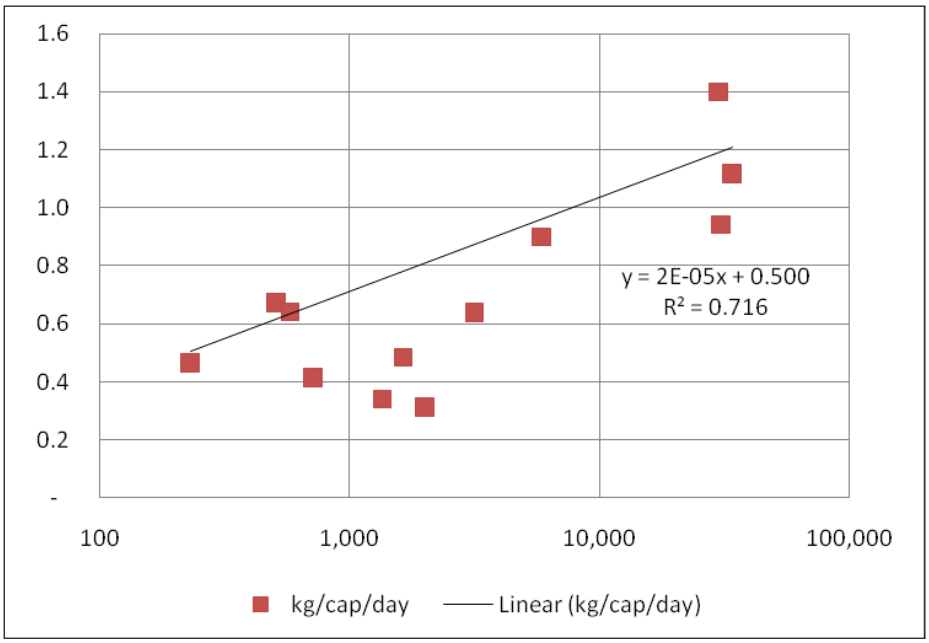

Figure 3: Relationship between the GDP/capita in USD (2006) and MW generation rate

Note: Varies on the waste type and composition e.g. C&D waste

Table 9: Summary of the status-quo and issues of MW in SEA and East Asian countries.

Country	National/Local Management Instruments			
	Policy Instrument	Economic Instrument	Partnerships	Informative measures
Brunei Darussalam	▲	■	▲	▲
Cambodia	▲	▬	▲	▬
PR China	●	▲	▲	●
Indonesia	▲	●	▲	▲
Japan	●	●	●	●
South Korea	●	●	●	●
Lao PDR	■	■	■	▲
Malaysia	▲	▲	▲	▲
Mongolia	▲	■	■	▬
Myanmar*	▲	▲	▬	■
Philippines	▲	▲	●	▲
Singapore	●	●	●	●
Thailand	▲	▲	●	▲
Vietnam	■	▲	▲	■

Legend :
● =Exist fully, ▲ =Exist partially, ■ =Exist but ineffective, ▬ =None

NOTE: The table above presents a simple summary of the status-quo and issues of MW based on the information gathered. However, these do not necessarily represent the actual status of MSW in the member countries. There should be some criteria to comprehensively assess various elements of MSW and therefore identify the status.

It must be noted that the information gathered for the latter countries include only one locality unlike the others, which provide data for the entire country. There is a need to close this gap in information so that a more plausible result with respect to GDP and waste generation will be reached.

Cambodia has the following constraints and issues on municipal waste management:

- no available data and information at most of the local and national levels e.g. annual increase in waste generated.
- weak enforcement of laws on solid waste management.
- no separation at source for solid waste from households, business centers.
- limited markets for recyclables.
- practice of 3R principles is not carried out by most waste generators.
- municipal waste is mixed altogether with other harmful wastes and recyclables at the dumpsite.

In **PR China**, collection, transportation, treatment and disposal of municipal waste is carried out by a special department in the local government known as corporation. Since the corporation is autonomous from the local government in most of the local areas, lack of coordination between the national authorities and the local government can be a problem.

Indonesia's Municipal Waste Management problems include poor site selection process, limited infrastructure and equipment in the landfill site (e.g. leachate treatment facilities, gas collection system, soil recovery and heavy equipment, etc), poor maintenance and operation of landfill (i.e., as open dumps), limited budget, lack of awareness on the 3R program, lenience to law enforcement and lack of political support.

On the other hand, the remaining capacity of final landfill sites for MSW in Japan is decreasing annually despite continued reduction in the amount of wastes disposed. 19% of all municipalities in Japan do not have their own final landfill sites; these municipalities transfer their wastes to landfill sites in other municipalities, which can be very far. Although, the total amount of MSW generated in Japan and per capita waste generations in the country have been decreasing continuously since year 2000, it is still necessary to strengthen the efforts to reduce MSW.

Waste/used containers and packaging such as PET bottles and papers are collected by municipalities in accordance with the Waste Container and Packaging Recycling Law. In recent years, however, considerable amount of these recyclables are sold and transported to other Asian countries. That sometimes makes it difficult for domestic recycling businesses to secure sufficient amount of recyclable resources, potentially causing instability of the domestic recycling systems.

South Korea's municipal waste management problems include the enduring Not In My Backyard (NIMBY) phenomenon, and the establishing and efficient managing of "Waste to Energy" technologies.

Lao PDR has the same problems as most of the municipal waste management problems mentioned in the preceding discussion.

Malaysia's municipal waste management problems include increase of waste generation rate, high operational cost to treat and dispose solid waste, irresponsible solid waste disposal methods and practices along with the absence of an integrated solid waste planning and management scheme.

Mongolia's increasing population in cities parallel to economic growth contribute to an increase in solid waste that impacts the environment and consequently affect public health.

At present, solid waste management is limited and illegal dumping is high. Financial challenges related to waste collection, transportation and disposal are evident in Ulaanbaatar and other cities. Mongolia recognizes the importance of the cooperation and participation of residents and organiza organizations besides finding solutions to the technical and financial challenges in solving the solid waste problem. Recycling activities are limited due to the lack of industries for solid waste segregation, treatment and reuse.

Municipal waste management in **Myanmar** has been the responsibility of the local municipal authority formed by the Government. With limited revenues and insufficient facilities, the conventional way of managing solid wastes being the sole responsibility of a single body is facing constraints.

In the case of Mandalay, the Municipal Waste Management problems include lack of resources – equipment (e.g., vehicles) and personnel, improper collection and management of disposal sites, which are mostly run as semi-landfill systems, lack of awareness and cooperation from the public, and lack of awareness in solid waste management. Nay Pyi Taw has limited facilities, human resources and revenues.

In the **Philippines**, different levels of compliance to the RA 9003 among local government units are evident. Compliance of some LGUs is comparatively low while others were already successful in the implementation of the Ecological Solid Waste Management Act. The comparatively low compliance in the implementation of the said regulation is due, but not limited, to the following: information gap, limited resources, limited market for recyclable materials in other areas and lack of determination among local leaders in implementing the law.

The Philippine government implements the principle of reduce, reuse and recycle, to be practiced in all sectors (schools/academe and other institutions, business and industrial establishments, malls and markets, non-government organizations and the national and local government agencies). Several local government units and establishments are already practicing the said principle.

Vietnam sees its larger cities collecting a larger percentage of their waste (76 percent) than smaller cities (70 percent), while rural areas have typically less than 20% collection rates. The poor are mostly not served by collection services although new initiatives are being promoted to fill the gaps in municipal waste collection service. For example, community-based and private sector organizations are collecting waste in rural villages and in urban areas without municipal coverage. MW problems in Vietnam are as follows:

- Most hazardous healthcare and industrial waste is mixed with general waste at collection.
- Municipal waste disposal practices are improving but still represent a threat to health and the environment.
- Local institutions are limited by staff skills.
- Regulations are not effectively enforced.
- Lack of financing for operations threatens the sustainability of investments.
- Civil society plays a limited role in waste management.

Singapore has established an integrated solid waste management system that ensures all wastes that are not recycled, are collected and disposed of safely at waste-to-energy plants or at the offshore sanitary landfill in the case of non-incinerable waste. The amount of solid waste disposed has, however, increased 6-folds between 1970 and 2000, and if this growth is not curtailed, Singapore will need to build a new

incineration plant every 5-7 years and a new landfill every 25-30 years to cope with the waste generated. This is not sustainable for Singapore being a small city-state with limited land. The sustainable solution is to reduce waste through waste minimization and recycling. In the Singapore Green Plan 2012 (SGP 2012), an environment master plan to meet the goal of environmental sustainability, the country set a target of increasing recycling rate to 60% by 2012 and to strive towards zero landfill. With the policy in place, the recycling rate has gone up from 40% in 2000 to 54% in 2007.

In summary, some developing member countries like Cambodia, Lao PDR, Thailand and the Philippines have shown good practices in terms of composting municipal waste. On the other hand, municipal waste separation at source is successfully practiced among the developed member countries - South Korea, Japan and Singapore. These same countries have effectively enforced their established policies, laws and regulations as these were coupled with available capacity and resources.

The promotion of 3R principles and its practices in the region is progressing very well, particularly in middle-income Asian member countries. While the management of municipal waste is decentralized in most member countries, many elements of MSW like collection, transportation, treatment and disposal are administered by private concessionaires.

The contribution of the informal sector toward recycling is highly noticeable. However, occupational health and safety requirements are still largely neglected.

The problems associated with municipal waste management in many Asian developing member countries are categorized as follows:

- *Municipal Waste Generation & Composition*
  - Rapid increase in volume of municipal waste
  - Increase and emergence of a variety of municipal waste
  - Increase in difficulty of processing of emerging type of municipal waste
  - Shortage of landfill space
  - Increase in municipal waste management cost
  - *Lack of basic data and information e.g. statistics of waste generation and composition*
- *Policies and Regulations including institutional arrangements*
  - Lack of and/or unclear policy on MW
  - Weak enforcement of existing laws and regulations
  - Lack of policy to promote 3R
  - Inadequate planning
  - Inadequate proactive action
  - Ineffective regulations
  - Lack of good governance
- *Suasive measures (Education, Promotion of 3Rs through awareness campaign & awareness raising)*
  - Lack of awareness to promote 3Rs
  - Lack of awareness on health risks of the informal sector
  - Lack of participation and coordination among stakeholders e.g. inter-agency collaboration at national/ local level
- *Economic measures*
  - Revenue in the collection of MW is very low and lax, so that it cannot cope with the SWM expenditures
  - Penalties are not strictly enforced

- *Technological Aspects*
  - Unsuitable technology
  - Limited resources including finance and expertise to manage technology
- *Partnerships*
  - Limited linkages with and among MW stakeholders

Aside from the presented status-quo and issues on MSW, a number of constraints encountered in the compilation of the status report are observed. These include the following:

- undefined terms or phrases in the solicited data and information from the submitted accomplished questionnaire.
- lack of dates in the data and information provided.
- incomplete data in most of the accomplished surveys.
- inconsistent values between the solicited MW generation and composition and the existing and available publications in SWM.

Furthermore, according to the survey, most of the SEA and East Asia members highlighted that the measures to minimize the amount of municipal waste going to landfill include:

- The practice of 3Rs, particularly recycling activities to minimize municipal waste (PR China)(Myanmar).
- MSW reduction from the sources, increase 3R program at sources and interim places and utilize waste as source of energy (Indonesia).
- Reduction of land filled wastes using mixed measures and technologies. Organic wastes can/should be composted, incinerated, or fed into methane fermentation process to recover energy. Recycling can/should be promoted for metals, glasses, plastics and papers. Mixed plastics can/should be incinerated, or put into industrial processes as 'fuels'. More importantly, reduction in the generation of waste should be pursued through public awareness raising together with the introduction of appropriate waste separation and collection systems in cooperation with retailers and/or other businesses to minimize container and packaging materials (regulations can/should also be as effective as appropriate) (Japan).
- Introduction of Volume-Based Waste Fee System or Mechanical Treatment (MT) technology (South Korea).
- Public participation on the promotion of 3R (Lao PDR).
- Improvement of solid waste segregation and awareness of waste management practices - reduction at source, particularly in household, entity and industry; introduction of tax fees on imported products due to increasing imported products (Mongolia).
- Creation and adoption of a waste management hierarchy comprised of a broad ranking of preferred solutions for solid waste handling with the overall consideration of care for the environment. The prioritization of options for waste management includes the following: i) Reduce – reducing the waste generated; ii) Reuse – reusing products and materials; iii) Recycle – recovering value from waste via recycling, composting and material/energy recovery; and iv) Treatment and disposal – resorting to disposal when no appropriate further solutions are available (Philippines).
- Singapore already implemented various measures to minimize waste disposed to landfills.. The country's Solid Waste Management program adopts four strategies in managing waste, as follows: i) Reduce the volume of combustible waste by incineration, which highly reduces the volume thereby conserving landfill space ii) Recycling of waste in order to reduce the amount of waste to

be incinerated. The waste recycling industry in Singapore includes companies with the capability and capacity to recycle and process electronic waste, food waste, wood waste, horticultural waste, used copper slag, construction and demolition wastes, ferrous waste and plastic waste. iii) Reduce waste to landfill to extend the life of the existing landfill; and iv) Waste minimization to reduce waste at source.

- Reduction and segregation at source should be enhanced. It helps take out food waste for composting (41.9%). Vietnam, for example, is an agricultural country, thereby a big market for compost.

V RECOMMENDATIONS

V. Recommendations

Data and information on Municipal waste generation and municipal waste management in Asian countries should be studied and explored further since many, particularly the developing member countries, have poor data and information. Awareness raising and capacity building in municipal waste and municipal waste management should be developed and effectively enforced. Partnerships and cooperation of various stakeholders in municipal waste and municipal waste management should be enhanced in the provision of resources for the effective implementation of the 3Rs and of waste management.

Implementing an effective and efficient municipal waste management relative to 3Rs can be achieved with the following recommendations to the Waste TWG:

- Establish data and information management systems for municipal waste management at the National/ local level with consideration to a bottom-up approach in reporting e.g. Information and data from LA to MoE.

- Develop guidelines and/or policies at the national/local level addressing municipal waste management and governing Sound Material Cycle Society through 3R principles, therefore looking into the effects on public health and impacts on the environment.

- Strengthen capacity building and technical support activities to enhance partnerships among municipal waste and other concerned stakeholders.

- Promote dialogue, consultation and consensus building among municipal waste management stakeholders.

- Disseminate information on the importance of and good practices in municipal waste management with 3R.

- Establish a network for capacity-building for urban waste management governing 3R.

- Mobilize funding and resources from institutions and/or donor agencies for the implementation of effective Municipal Waste Management practices at the national/local level.

- Form an effective network or organization from among the informal sector in order to provide information and tangible support in terms of occupational safety and health (e.g., proper equipments like carts and masks may be given along with information on waste handling for waste pickers).

- Recognize the role and importance of the informal sector and provide long-term support in the form of health insurance or other forms of savings, with which the informal sector can access.

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reduce
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Webpage: http://www.environment-health.asia/twg.cfm?themeid=3

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