



ISSUES FOR  
RESPONSIBLE  
INVESTORS

# WASTE IN ASIA

MAR 2011

**Author**

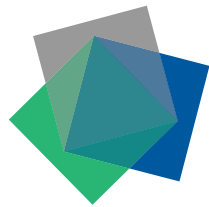
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# RESPONSIBLE RESEARCH

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# EXECUTIVE SUMMARY

This report examines the environmental, social and governance (ESG) issues in the waste sector in Asia. Through a discussion of the current situation and trends in the Asian waste landscape supported by case studies of waste management companies in the region, the report highlights the ESG risks and opportunities that companies face on a strategic and operational level. As a key pillar of the environmental goods and services sector, responsible waste management drives sustainability, a prerequisite for continued economic progress in Asia.

Companies that incorporate ESG considerations in their business strategy and operations are better positioned to minimise secondary pollution from waste, generate social goodwill and gain stakeholder support for their services. Institutional investors can act in their fiduciary capacity on behalf of individual investors to exercise informed ownership through the monitoring and engagement of companies to improve their management of these critical issues.

The report begins with an introduction of the landscape for waste in Asia and a brief overview of waste principles and policies. This is followed by a discussion of the ESG risks and opportunities in three main sections of environment, social aspects and governance. The report concludes with a company benchmarking of ten selected Asian waste companies using the Asian Sustainability Rating™ system (ASR™). The ASR™ is a tool developed by Responsible Research that is used by investors to benchmark portfolios and add a sustainability dimension to investment decision-making and engagement practices. Four global waste companies are benchmarked as well to provide a comparative guide to the performance of the Asian companies.

## Environment

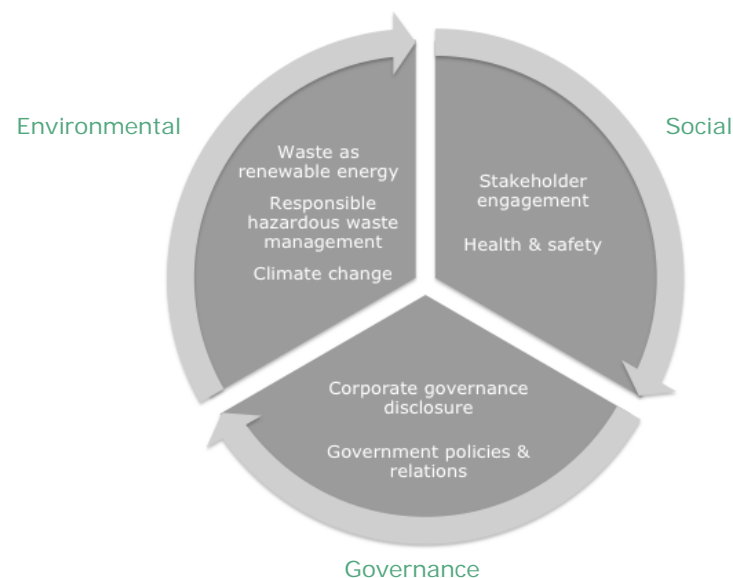
The paradigm shift in Asia's waste sector is the increasing focus on waste as a source of renewable energy rather than a problem to be hidden. Waste management has evolved from simple collect-and-dispose models to technology-driven treatment systems that convert waste into thermal power. While landfill remains the dominant method of waste disposal, energy recovery systems that convert waste to energy and reduce the final amount of waste for landfill disposal are gaining in popularity throughout the region.

Asian waste companies are active in developing energy recovery systems such as landfill gas capture, incineration plants and biogas extraction units. Waste as a renewable energy creates new opportunities through climate change projects, where companies can seek financial assistance via the sale of carbon credits for waste projects that reduce greenhouse gas (GHG) emissions. Many

companies have embarked on such projects, particularly in landfill gas capture, although success has been varied due to technical challenges associated with waste and suitability. However, firms that tap into waste-related energy opportunities need to ensure strict and transparent monitoring of emissions so that no air, water and land pollution results from the treatment process.

Hazardous waste management in Asia requires urgent action to keep up with expanding industrial activity. Deficient environmental regulations and poor enforcement in developing Asia result in the illegal dumping of waste by industrial generators, devastating the environment and reducing business opportunities for hazardous waste treatment companies. Global trade in hazardous waste also cripples environmental and human health in countries that receive a major share of the illegal waste trade for processing. Large-scale exports of electronic waste to China and India from developed countries have led to domestic and international efforts to curb the illegal trade and to channel the waste to regulated recycling companies. The seemingly inevitable rise in bulk hazardous waste is expected to create opportunities for hazardous waste treatment companies as regulations tighten and technological capacity improves.

Figure 1: Key ESG Issues facing the waste sector in Asia



Source: Responsible Research



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## Social aspects

Waste management is a participative and community-driven process, characterised by a myriad of informal stakeholders including residents, community groups, 'rag pickers' and NGOs. Asian waste companies generally understand the importance of stakeholder engagement from project planning and development to implementation stages. The companies generally focus on engaging communities in upstream activities such as waste segregation and recycling. However, they have limited experience in community investment with defined social goals such as establishing long-term partnerships with local populations to improve income levels. Employee welfare is another high-priority area in which Asian waste companies seem to lag. There is limited information disclosed on health and safety standards, welfare benefits and training programmes. With increased social awareness and greater advocacy for labour rights, companies are likely to face increasing pressure from stakeholders to disclose more information and improve human resource management.

## Governance

Corporate governance in Asia's waste sector is generally unimpressive, with key areas of concern being low board independence and limited disclosure on board committees, audit and nomination procedures, and risk management, among others. Such observations are not unique to the waste sector and reforms at the national level will push waste companies to join others to strengthen their corporate governance. With regards to government policy, waste companies can theoretically benefit from favourable policies on preferential electricity tariffs for renewable energy from waste as well as subsidies for capital expenditure on waste infrastructure. To gain maximum benefit from such policies, companies must thoroughly understand the contractual rights and responsibilities in waste projects, which typically take the form of public-private partnerships (PPP). Effective legal, regulatory and policy regimes, timely tariff collection and technical clarity are key enablers of successful PPP arrangements.

This report includes a review of the key ESG issues and solutions that companies are taking to mitigate risks and develop opportunities. Companies that react positively to pressures from environmental regulations, social groups and corporate governance reform or even act as champions of sustainable business practices stand to gain in economies that place increasing emphasis on sustainable growth.

The report also details a benchmarking of ten listed Asian waste companies that are evaluated for their sustainability performance using the ASR™. Four global waste companies are benchmarked

alongside to provide a comparative guide to the performance of the Asian companies. The benchmarking reveals that Asian waste companies lag behind their global counterparts significantly in terms of their sustainability performance. It should be noted that the Asian conglomerates with waste management businesses are not scored in this exercise because the waste business is not a listed entity.



# CONTENTS

## WASTE IN ASIA

PLEASE CLICK TO ACCESS SECTIONS

### 4 EXECUTIVE SUMMARY

### 9 KEY INSIGHTS

### 13 INTRODUCTION

Investing in Waste  
The Basics of Waste  
Waste Management Companies in Asia

### 27 ENVIRONMENT

Overview  
Waste Treatment and Environmental Impact  
Waste and Recycling  
Integrated Treatment Approach  
Hazardous Waste Management  
Waste and Climate Change

### 91 SOCIAL

Overview  
Waste and Society  
Health and Safety  
Capacity Building  
Community Engagement

### 137 GOVERNANCE

Governance in Asia  
Corporate Governance in the Asian Waste Sector  
Corruption  
Government Policies  
Contractual Relationships

### 155 CONCLUSION

### 163 REFERENCES

## KEY INSIGHTS

### 1. Waste infrastructure requires urgent improvements to alleviate the environmental impact of rising waste generation

The pressing need for more and better waste infrastructure is most critical in developing Asia. Poor management of rising waste volume due to population growth, urbanisation and economic development could lead to a 'waste crisis' with long-lasting environmental degradation if there is no corresponding expansion of waste services. Waste treatment facilities such as sanitary landfills and incinerators are most urgently sought, but they demand large capital expenditure and are often inadequately provided by local governments due to financial constraints.

### 2. Waste as renewable energy is emerging as a central focus in Asia's waste sector

Resource recovery from waste is gaining importance in national waste management strategies across Asia, and the generation of renewable energy from waste is a key focus area. Companies are actively pursuing energy from waste projects, which support political, environmental and energy agendas as well as provide steady income via the sale of electricity. Renewable energy from waste takes many forms, such as landfill gas capture, incineration, refuse-derived fuel and biogas from anaerobic digestion. The shift from landfills to waste-to-energy (WTE) plants represents the dominant transformation in waste treatment. China is pursuing an ambitious national policy of converting 30 percent of its total municipal waste into energy by 2030, while Hong Kong is set to implement a new waste management strategy with waste incineration as the main treatment method. Asian companies are finding new and innovative ways of optimising energy recovery from waste, such as the landfill gas project to replace naphtha in town gas production by SITA Hong Kong and the integrated solid waste treatment facility in Qatar by Keppel.

### 3. Sustainable waste management reduces greenhouse gas emissions

With a contribution of three to five percent of total global anthropogenic GHG emissions in 2005, the waste sector can do its part to mitigate climate change through sustainable management. Asian companies are active in a variety of Clean Development Mechanism (CDM) projects in waste management, which are eligible for carbon credits based on the scale of GHG emissions reduced. CDM provides the financial support to launch projects that

would otherwise be economically unfeasible, as well as to develop a system of monitoring and transparency to determine long-term emission savings. Landfill gas to energy and biological treatment of waste are the more common projects in Asia. Companies that reach specific environmental and social goals through long-term commitment and partnership with the local community can achieve international certification standards, such as the Gold Standard Voluntary Emission Reduction status that was accorded to China Everbright's Suzhou methane recovery project. This type of global recognition could theoretically reduce a company's cost of capital for subsequent projects.

#### **4. Stricter environmental health and safety standards and legal enforcement are required for hazardous waste**

Technical resources and legal enforcement of responsible hazardous waste treatment is lacking in Asia. Illegal dumping of toxic waste by industry threatens environmental and human health and reduces business opportunities for hazardous waste companies. Companies such as Shenzhen Dongjiang, Super Dragons Technology and Shenzhen GEM are investing in research and development (R&D) to improve their technological capability in hazardous waste treatment. The electronic waste (e-waste) crisis in Asia, particularly China and India, is of international concern, as these two countries receive the bulk of illegal e-waste exports to Asia.

#### **5. Recycling is largely an informal sector operation in developing Asia**

Recycling in Asia is largely a fragmented 'traders' business made up of informal enterprises. Recyclable materials are perceived as a commodity to be paid for, which makes the business model of large-scale recycling plants financially challenging. Such investments in the developed world usually require a free supply of materials to defray the cost of processing. These market conditions may explain why relatively few Asian waste companies are integrated across recycling and treatment businesses compared to those in the West. One such company is Fook Woo (923:HK), which is integrated across the value chain for paper waste collection, recycling, reprocessing and disposal. Recycling is widely accepted as the preferred option over energy recovery in sustainable waste management and integration of recycling into the formal sector could produce more consistent recycling efforts.

#### **6. Stakeholder engagement and social attitudes must be proactively managed by Asian waste companies**

Stakeholder engagement and social attitudes have an overarching influence on the success of waste management systems. Besides working closely with the government, companies must also engage local residents, NGOs, the informal sector and other active participants of the waste community. Private sector involvement in waste is often faced with negative social perceptions such as not-in-my-backyard (NIMBY) attitudes and resentment from the informal sector, which have to be managed through an iterative process of open dialogue, public audit of treatment facilities and a commitment to community investment.

#### **7. Asian waste companies lack comprehensive disclosure on employee welfare indicators**

The level of disclosure on health and safety standards, welfare benefits and training programmes for employees is generally low among the companies. Health and safety information is especially critical. Statistics from several developed countries show that the waste sector has a higher rate of injuries than the national average. Capacity building programmes for workers are essential as well in order to raise the productivity of the traditionally labour-intensive and low-skills-based industry. Companies such as UEM Environment and Sembcorp Environment (both unlisted subsidiaries) have taken the lead in reporting on employee statistics.

#### **8. Community investment and partnership strengthen long-term sustainability of waste projects**

Asian waste companies are active in seeking community involvement but lack strategic community investment projects which may help drive their revenues and secure their license to operate. Common initiatives include promoting source segregation of waste by households and educational campaigns on recycling. Community investment and partnership is a long-term process full of deliberation that must still be quick to adapt to changing local conditions. Some non-listed waste companies have demonstrated commendable effort through projects that involve the informal sector and provide training and income for local people. Companies can also tap into clean development mechanism (CDM) projects to create social benefits that improve the lives of less advantaged communities.





## 9. Limited disclosure and low board independence are characteristic of corporate governance in the Asian waste sector

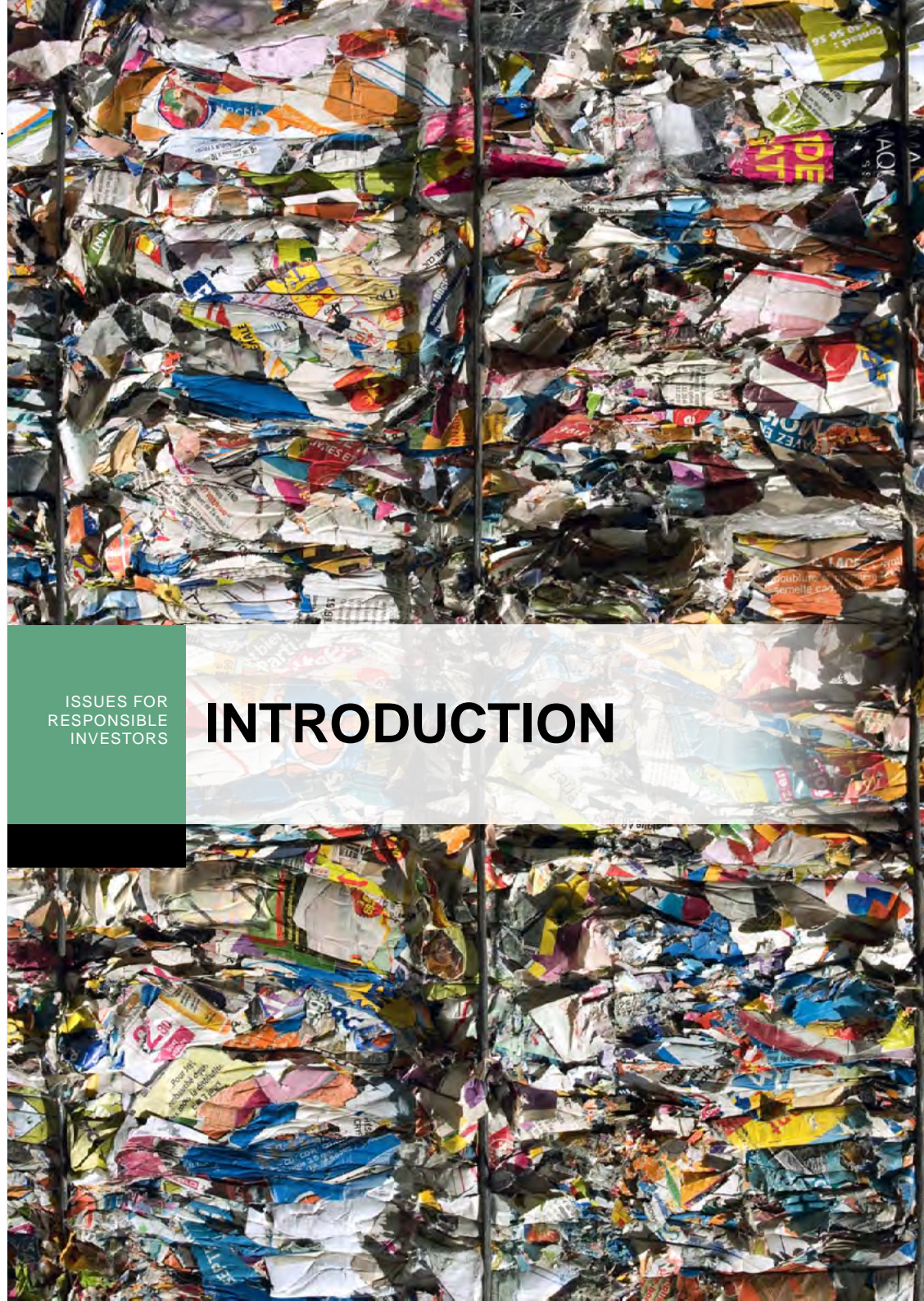
Many of the surveyed Asian waste companies do not provide adequate information on board composition and committees. Low board independence and the non-separation of the roles of Chairman and CEO are common. As corporate governance reform takes place across Asia in the wake of the global financial crisis, the waste sector will benefit from stricter requirements on board quality, financial control and audit procedures.

## 10. Government policies on renewable energy tariffs and infrastructure subsidies support private sector investment

Many preferential feed-in tariff policies for WTE projects exist in Asia to encourage private investment. Additionally, companies can access specially designated funds set up by national environmental ministries and multilateral development agencies to reduce the cost of infrastructure capital. One example is the economic stimulus package by the Chinese government, which allocated up to 40 percent of the US\$586 million budget to green infrastructure. The Asian Development Bank (ADB) made its first private-sector municipal solid waste project through a US\$200 million loan facility agreement with China Everbright for the development of WTE plants in secondary cities in China.

ISSUES FOR  
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# INTRODUCTION



# INVESTING IN WASTE

## A sector of growth and opportunities

While the solid waste industry in developed markets such as Europe, Japan and the United States is fairly mature with a high degree of private participation, it is still an emerging sector in most parts of Asia. Population growth, urbanisation, tighter environmental regulations and privatisation have spurred growth of the regional waste industry. On the whole, the environmental goods and services market in Asia (ex-Japan) is expected to grow rapidly, with a tripling of market size from US\$38 billion in 2005 to US\$116 billion by 2015, as forecasted by the ADB. Solid waste management is the second largest segment in the sector after water and wastewater management, at US\$5.4 billion or 22.5 percent of the Asian environmental market in 2001 (the latest year for which disaggregated data is available from the ADB).<sup>1</sup>

With a vibrant investment landscape of multinational corporations, domestic waste management companies, Asian conglomerates with a solid waste interest and emerging small-cap companies, the waste industry in Asia looks set to present many opportunities for investors looking to incorporate an environmental focus in their portfolio. Sustainability issues and regulatory change are driving the market towards greater technological development as well as bringing the energy and waste sectors ever closer.<sup>2</sup> Energy recovery from waste is a key focus in waste management and the synergy between the two markets is likely to generate more investment interest in Asia.

## Environment, social and governance issues are critical to the waste sector

Waste management companies are faced with a myriad of ESG issues in their daily operations. Often described as 'green' businesses, the waste sector can exert a powerful and positive force on environmental sustainability if companies engage in best practices that protect environmental and public health. On the contrary, companies that ignore sustainability concerns will directly place the community and the environment at risk as a result of actions such as illegal dumping, poor environmental monitoring and lack of health and safety measures. Waste is also intricately linked to the global issues of climate change and renewable energy, which introduce new risks and opportunities that companies and investors must understand and manage with care.

## Report coverage

This report will discuss the solid waste management industry in Asia with a primary focus on the municipal solid waste market.

Wastewater is excluded as the water and wastewater industry experiences very different market forces and ESG issues from the solid waste industry. Municipal solid waste comprises the largest segment of the solid waste market and is usually the main business area for Asian waste companies. The report will also highlight examples from companies that handle other types of waste such as biological and hazardous wastes.

Waste  
in Asia:  
growth and  
opportunities



# THE BASICS OF WASTE

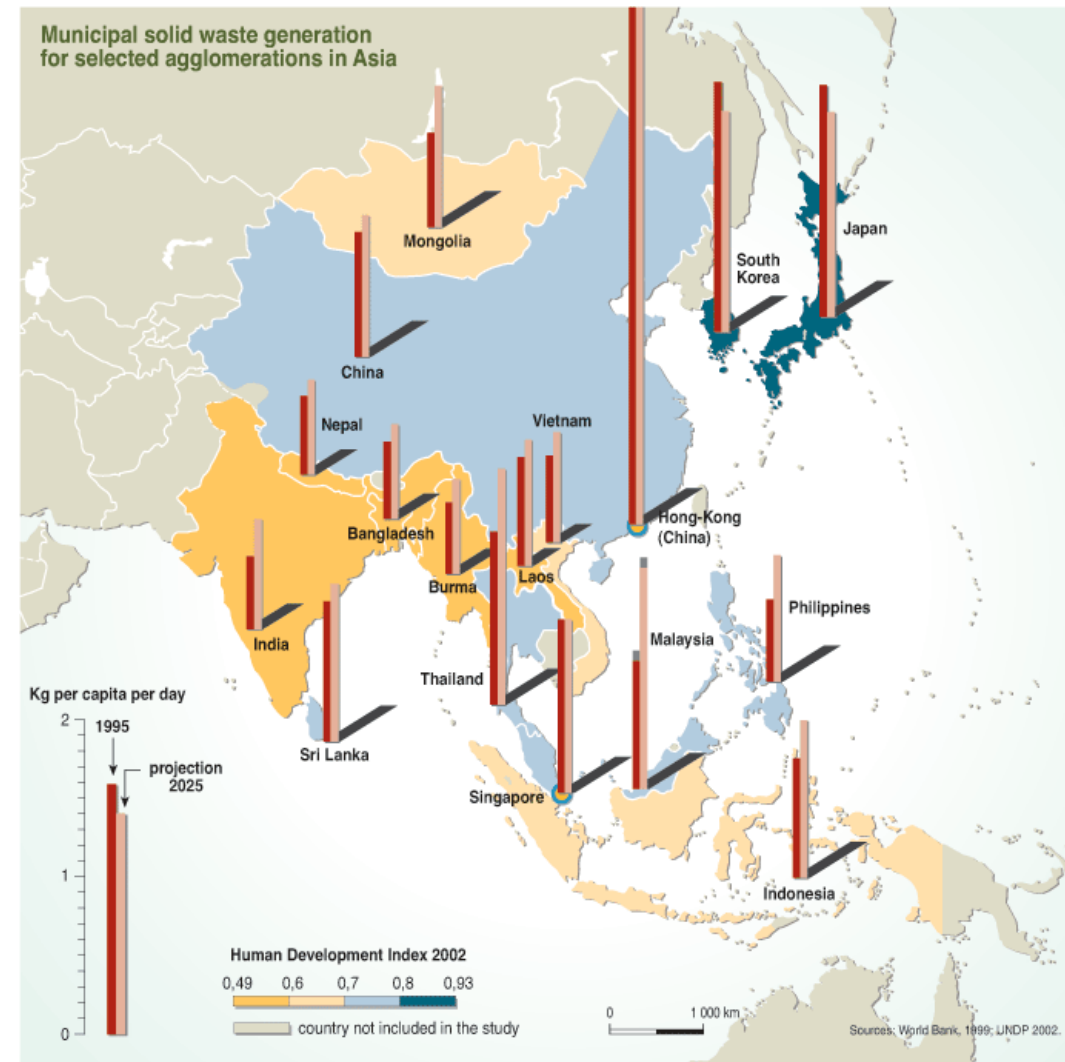
## The waste landscape in Asia

At the broadest level, waste refers to materials that a generator has no further use for and intends to dispose of.<sup>3</sup> However, waste can also be reutilised for its original or different purpose through various processes. As such, waste is often referred to as a 'misplaced resource' in the industry. Waste management companies are moving away from the traditional collect-and-dispose model to an integrated approach that maximises resource recovery and economic value from waste.

Asia is the fastest growing region in the world, with over four billion people making up over 60 percent of the world's population. The urban population in Asia is growing at about 2.3 percent annually. Consequently, waste generation in Asia has increased rapidly over the last decade. The World Bank estimates waste generation in urban areas at between 450,000 to 760,000 tonnes per day; this is expected to reach about 1.8 million tonnes per day by 2025.<sup>4</sup> With waste in Asia rising in tandem with the region's fast economic growth, cities are struggling to handle the burgeoning waste volume. The waste generated per capita is expected to increase in developing countries while remaining constant or slightly decreasing in developed countries, as shown in Figure 2. A similar observation between waste generation and economic development was witnessed as Europe developed over the last few decades.

Asia is struggling to manage the growing waste generation due to population growth and urbanisation

Figure 2: Municipal solid waste generation for selected Asian countries



Source: UN<sup>5</sup>

Figure 3: A comparison of waste management in Asia by income level

Income level	Low	Medium	High
Municipal waste kg/capita/year	150 – 250	250 – 550	350 – 750
Collection rate	< 70%	70% - 95%	> 95%
Waste regulations	No or poorly defined national environmental strategy; regulations are lacking; no statistics	Presence of national environmental agency, strategy and legislations; limited statistics	Presence of national environmental agency and strategy; strict regulations; comprehensive statistics
Overview of waste management	Little organised collection; recycling by informal sector; open dumping or burning of mixed wastes; high exposure to disease	Moderate coverage of collection service; growing capacity for hazardous waste management; mixture of dumpsites and semi-controlled landfills	Increased emphasis on total waste reduction, resource recovery and prevention of hazardous waste; controlled landfills or incineration
Treatment rate	Unauthorised disposal > 50%; informal recycling 5% - 15%	Landfills > 90%; start of selective collection; organised recycling 5%	Landfill and incineration at or close to 100%; organised recycling > 20%

Source: Adapted from UNESCAP <sup>6</sup>

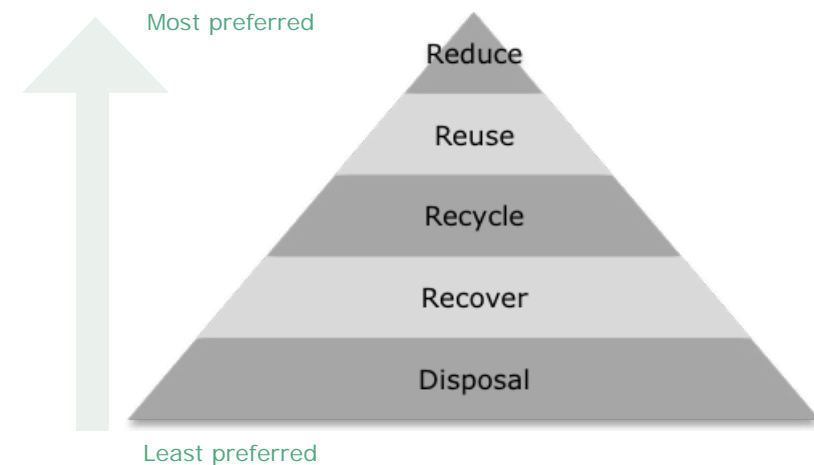
It should be noted that waste statistics in most developing countries tend to be incomplete and inconsistent in terms of waste classification. For example, the comprehensive definition of municipal solid waste includes waste from residential, commercial, industrial, institutional, construction, demolition and municipal activities. It excludes special or technical waste that requires highly specific treatment methods such as radioactive or electronic waste. However, some countries may not follow the comprehensive definition and exclude certain types of waste in their national statistics, such as construction and demolition, depending on their own national classification.<sup>7</sup>

The problems of inadequate infrastructure, limited financial resources and lack of localised technical expertise create opportunities for private sector investment. Market liberalisation in Asia is transforming the waste landscape from a traditionally public service sector to privatised markets with active public private partnerships. Specific opportunities vary according to the economic maturity; developing countries have very different waste generation patterns and existing levels of waste infrastructure.

#### Urbanisation, waste and sustainability

Waste is no longer viewed as an issue of pure material disposal but an integral part of the socioeconomic and environmental discussion on urbanisation and sustainability. Sustainable waste management is a strategic approach that covers all sources and aspects of waste management from generation, segregation and transfer to treatment, recovery and disposal in an integrated system, with an emphasis on stakeholder participation and resource recovery. The sustainable approach adopts the waste hierarchy as a useful framework that ranks the options of waste management based on environmental impact.

Figure 4: The waste hierarchy



### Recommended waste approach:

**Reduce:** waste minimisation initiatives by businesses and households to reduce the amount of waste produced

**Reuse:** reuse waste and avoid energy-consuming reprocessing

**Recycle:** reprocess waste for further use

**Energy recovery:** generate energy from waste using a variety of technologies such as incineration

**Disposal:** put waste in landfill sites

Source: UK DEFRA<sup>8</sup>, Greenfile<sup>9</sup>

### Six key drivers for sustainable waste management in Asia are identified:<sup>10</sup>

1. Rapid population growth
2. Increasing purchasing power making waste management services more affordable
3. Rapid urbanisation and industrialisation leading to environmental degradation
4. More stringent environmental regulations in response to domestic pollution
5. Global response to climate change through adaptation, mitigation and carbon pricing
6. Greater Asian government commitment and investment to improve the quality of waste services
7. Improved capacity of domestic waste management firms and related industries to develop the local market
8. More open economic policies allowing for gaps in domestic supply to be bridged by encouraging private participation and foreign investment

### ESG issues across the waste value chain

As sustainable waste management emerges as a central theme in environmental policies, companies stand to gain by capturing greater market share across the full waste value chain. An integrated approach provides opportunities for greater financial return but also raises many ESG issues that must be managed holistically to avoid 'spillover' costs. The waste value chain can be represented by four key components: collection, sorting and recycling, treatment and disposal. Waste treatment faces the most serious ESG issues due to the increasing number of treatment technologies and systems commercially available for resource recovery.

Figure 5: ESG issues across the waste value chain



Source: Responsible Research

### Legislation shapes the outlook for the industry

Like all environmental services, the waste sector is heavily influenced by government policies and legislation. Governments retain the ultimate responsibility for waste management, which is not diminished in the privatisation process. Waste management regulations in Asia differ in scope, depth and enforcement across different political regimes. The policies in developing countries are usually focused on sanitary disposal by landfill and increasing access to waste services to the poor while developed countries devote more resources to building integrated waste infrastructures with emphasis on WTE systems. A common trend across Asia is the rising importance of waste as a source of renewable energy. Waste



# WASTE MANAGEMENT COMPANIES IN ASIA

In the context of this report, pure plays are defined as companies in the environmental goods and services sector with a solid waste division as the sole or main business area.

Figure 6: Domestic pure plays in the Asian waste sector

	Company	Ticker	Country of operation	Market cap US\$ mil	Revenue US\$ mil	Profit US\$ mil
1	Sound Environmental Co Ltd	000826:CH	China	2,118	99.0	21.3
2	China Everbright International Limited	257:HK	China	1,892	228	48.0
3	Shenzhen Green Eco-manufacture Hi-Tech Co Ltd	002340:CH	China	1,129	53.6	8.3
4	Fook Woo Group Holdings Ltd	923:HK	China, HK	952	183	37.6
5	PT Fajar Surya Wisesa (FajarPaper)	FASW:IJ	Indonesia	795	265	26.8
6	Shenzhen Dongjiang Environmental Co Ltd	8230:HK	China	340	136	17.0
7	KD Holding Corporation	6803:TT	Taiwan	248	81.2	10.3
8	ZhongDe Waste Technology AG	ZEF:GR	China	187	56.1	8.0
9	Super Dragon Technology Co. Ltd	9955:TT	Taiwan	180	152	6.7
10	Insun ENT Co. Ltd	060150:KS	Korea	123	87.0	8.9

Notes: Market capitalisation based on market close of 22 December 2010 unless otherwise stated. Revenue and profit based on latest available full-year financial results.

Source: Responsible Research

can be converted into energy in a variety of ways such as landfill gas capture, incineration, biogas conversion and more. Policies such as renewable energy tariffs encourage private sector investment in capital-intensive energy recovery systems. While most Asian governments are supportive of WTE systems, such policies are usually faced with considerable controversy as opponents view energy recovery as a source of secondary pollution from waste and an inferior option to waste reduction and recycling.

Globally, waste legislation in developed nations has moved towards segregated collection, optimisation of recycling and energy recovery efficiency and landfill minimisation, often with mandatory targets established. The European Commission has one of the most comprehensive and stringent waste legislation frameworks in the world. The EU Landfill Directive mandates minimum diversion targets for each member country. In Asia, a similar trend to reduce waste generation and increase recycling can be witnessed in some more developed economies, such as Korea and Taiwan. Taipei introduced a fee per package system in 2000, which mandated residents to use designated garbage bags for different types of waste. The differential charging system reduced the daily waste production by one-third and increased recyclables collection threefold. In Korea, a similar policy known as the volume-based fee system was introduced in 1995. This levied a waste collection fee based on the volume of waste disposed and imposed fines for non-compliance. It still remains too early to tell whether other developing countries in Asia will adopt a similar framework in the future. There is no single prescribed method of sustainable waste management; rather it must be developed based on local political, social and environmental conditions.

## Zero Waste strategy

The 'Zero Waste' strategy is a concept of waste elimination through the consideration and redesign of the total life cycle of products to reduce, reuse and recycle waste.<sup>11</sup> The strategy is incorporated into the waste management policy of some governments in mainly developed Western countries. While the strategy is encouraging from a sustainability perspective, waste management companies may face a survival crisis without sufficient waste as feedstock for their operations. An analysis of the practical reality of a zero waste society is beyond the scope of this discussion but it is likely to remain a very long-term goal in Asia given the current state of economic development. Companies with an integrated business model and expertise in recycling and recovery are better positioned to manage changing trends in waste generation, as they are not solely dependent on disposal charges as their primary source of revenue.

Waste legislation focuses on sanitary disposal and waste-to-energy

Companies with integrated business models can better manage decreasing waste generation

Figure 7: Asian conglomerates with waste management businesses

	Conglomerate	Ticker	Waste Management Company
1	Swire Pacific Ltd	19:HK	Alex Fraser Pty Ltd
			Multiserv NSW Pty Ltd
			Swire Industrial Services Pty Ltd
			Swire Materials Handling Pty Ltd
2	CITIC Pacific Ltd	267:HK	Green Valley Landfill Ltd
3	Sun Hung Kai Properties	16:HK	South China Transfer Ltd
4	Keppel Corporation Ltd	KEP:SP	Keppel Seghers Engineering Singapore Pte Ltd
5	Cheung Kong Infrastructure Holdings Ltd	1038:HK	Green Island International Ltd
6	Samsung Heavy Industries Co Ltd	010140:KS	Samsung Heavy Industries (Engineering & Construction division)
7	Sembcorp Industries Ltd	SCI:SP	Sembcorp Environment Pte Ltd
8	New World Development Ltd	17:HK	Waihong Environmental Services
9	Shenzhen Energy Group Co Ltd	000027:CH	Shenzhen Energy and Environment Co. Ltd
10	Shanghai Chengtong Holding Co Ltd	600649:CH	Shanghai Environment Group
11	MMC Bhd	MMC:MK	Recycle Energy Sdn Bhd
12	Tianjin Teda Co Ltd	000652:CH	TEDA Environmental Protection Co. Ltd
13	UEM Group Bhd	Private <sup>[1]</sup>	UEM Environment Sdn Bhd
14	DRB Hicom Bhd	DRB:MK	Alam Flora Sdn Bhd
15	Ramky Group	Private <sup>[2]</sup>	Ramky Enviro Engineers Ltd
16	Infrastructure Leasing & Financial Services Ltd	Private <sup>[3]</sup>	IL&FS Ecosmart Ltd IL&FS Waste Management & Urban Services Ltd.
17	Nine Dragons Paper (Holdings) Ltd	2689:HK	Waste paper recycling business
18	Thermax India Ltd	TMX:IN	Incineration business

Source: Responsible Research

Notes:

[1]: Wholly owned subsidiary of government investment body Khazanah Nasional Berhad

[2]: Private company with institutional investors including IFC, Tara India, SAPE

[3]: Private company, promoted by Central Bank of India (CBI), Housing Development Finance Corporation Limited (HDFC) and Unit Trust of India (UTI). Over the years, IL&FS has broad-based its shareholding and inducted Institutional shareholders including State Bank of India, Life Insurance Corporation of India, ORIX Corporation - Japan and Abu Dhabi Investment Authority

A variety of small-cap domestic waste management companies (market capitalisation of less than US\$100 million) co-exist in the marketplace, serving smaller contracts of local municipalities. As the sector develops, consolidation of these small players is likely to occur.

Figure 8: Small-cap Asian waste management companies

	Company	Ticker	Country of operation	Market cap US\$ mil	Revenue US\$ mil	Profit US\$ mil
1	Kobin Environmental Enterprise Co Ltd	1808:TT	Taiwan	132	29.8	7.7
2	EcoWise Holdings Ltd	ECW:SP	Singapore	76.7	21.4	0.1
3	Guanwei Recycling Corporation	GPRC:US	China	68.9	47.3	6.4
4	JiinYeeh Ding Enterprise Co., Ltd	8390:TT	Taiwan	80.1	33.8	3.2
5	Centillion Environment & Recycling Ltd	CENR:SP	Singapore	31.7	21.1	(13.6)
6	Enviro-Hub Holdings Ltd	ENVH:SP	Singapore	69.6	32.5	(16.8)
7	KS Koentec Co Ltd	029960:KS	Korea	60.2	17.4	0.2
8	Progressive Impact Corp Bhd	PICB:MK	Malaysia	55.7	21.2	3.0
9	Yueshou Environmental Holdings Limited	1191:HK	Hong Kong	53.4	13.1	(67.1)

10	Analabs Resources BHD	ALR:MK	Malaysia	30.9	32.9	4.5
11	Y-entec Co Ltd	067900:KS	Korea	32.3	29.8	2.0
12	China Industrial Waste Management, Inc	CIWT:US	China	20.1	10.6	2.0
13	Better World Green PCL	BWG:TB	Thailand	17.1	17.1	(1.3)
14	Tex Cycle Technology Malaysia Bhd	TEXC:MK	Malaysia	14.2	8.0	1.9
15	General Environment Conservation PCL	GCENCO:TB	Thailand	17.0	9.2	(2.1)
16	Colex Holdings Ltd	COLEX:SP	Singapore	11.7	28.0	1.0
17	Professional Waste Technology 1999 PCL	PRO:TB	Thailand	11.6	9.6	(11.1)

Source: Responsible Research

**Notes:** Market capitalisation based on market close of 22 December 2010 unless otherwise stated.

In several Asian markets, global players in waste management have already secured leading positions, such as Veolia in China and Suez in Hong Kong. Multinational corporations highlighted in the report are listed in Figure 9.

Figure 9: Global leaders in waste management

	Company	Ticker	Market cap (US\$ mil)
1	Waste Management Inc.	WM:US	17,362
2	Veolia Environnement	VIE:FP	14,764
3	Suez Environnement Co	SEV:FP	10,183
4	Stericycle Inc	SRCL:US	6,837
5	Sims Metal Management Ltd	SMS:US	4,534

Source: Responsible Research

**Note:** Market capitalisation based on market close of 22 December 2010 unless otherwise stated.



ISSUES FOR  
RESPONSIBLE  
INVESTORS

# ENVIRONMENT





# OVERVIEW

## Can waste be green?

As an integral component of the broad environmental goods and services sector, the waste industry is often generalised as being 'green'. A more critical analysis will yield the observation that the waste sector, just like any other industry, conducts environmentally damaging practices as well as some sustainable initiatives. Companies mindful of their environmental responsibility aim to adopt best practices suited to the local conditions that not only minimise negative impacts but also produce benefits such as greenhouse gas emission reduction, resource recovery and renewable energy.

Across Asia, economic growth coupled with environmental and social pressures has brought about significant improvements in solid waste management over the last two decades. A fundamental shift in waste management philosophy is in progress, whereby the primary goals of public health and sanitation manifested in largely end-of-pipe solutions have developed to encompass the broader environmental concerns of pollution mitigation and resource conservation.

## Key insights

An evaluation of the environmental issues facing the Asian waste sector yields the following key insights:

- **Infrastructure and capacity** building in waste treatment is urgently needed to alleviate serious environmental impacts
- **Waste as a source of alternative energy** is gaining in importance in overall waste management strategy
- **The shift from landfills to waste-to-energy** plants represents the dominant transformation in waste treatment
- **The environmental benefits of recycling** are not fully captured by the market due to the presence of a large, informal sector
- **Hazardous waste management** requires more rigorous environmental health and safety monitoring systems in Asia
- **Sustainable waste management** contributes to GHG emission reduction and should therefore benefit from green fiscal stimulus

As the waste landscape evolves in Asia, a multitude of environmental, economic, social and political factors interact to shape the future of the industry. Companies that understand and capitalise on the environmental opportunities while taking responsible steps to minimise the risks will stand to gain from long-term sustainable returns.

# WASTE TREATMENT & ENVIRONMENTAL IMPACT

## Treatment technologies drive environmental impact

The selection and implementation of waste treatment systems are the most important factors in determining the environmental impact of waste management. Land, air and water pollution differ vastly depending on whether the waste is incinerated, composted or simply dumped. For many developing Asian cities and rural areas, 'treatment' may be absent and only rudimentary disposal is practised. A survey of the disposal methods in ten Asian economies is presented below. Disposing in solid waste disposal sites, which comprise both sanitary landfills and dumpsites, is still the most common practice. The use of incineration varies significantly: Singapore and Taiwan adopted it as the major treatment method but it is not practiced at all in Hong Kong or Malaysia. The outlook is changing as more and more governments in Asia push for incineration, also referred to as waste-to-energy (WTE) systems, as the alternative to landfill.

Figure 10: Municipal solid waste disposal methods in Asia

	Fraction of municipal solid waste disposed by method			
	Solid waste disposal site	Incineration	Composting	Unspecified
China	85%	15%	-	-
Hong Kong	100%	-	-	-
India	75%	5%	10%	10%
Indonesia	70%	2%	15%	13%
Korea	35%	28%	37%	-
Malaysia	93%	-	1%	6%
Philippines	85%	-	10%	5%
Singapore	6%	94%	-	-
Taiwan	4%	96%	-	-
Thailand	70%	5%	10%	15%

Source: Various <sup>12</sup>

Note: Composting may include biogas recovery for some countries.

## Energy from waste gains importance

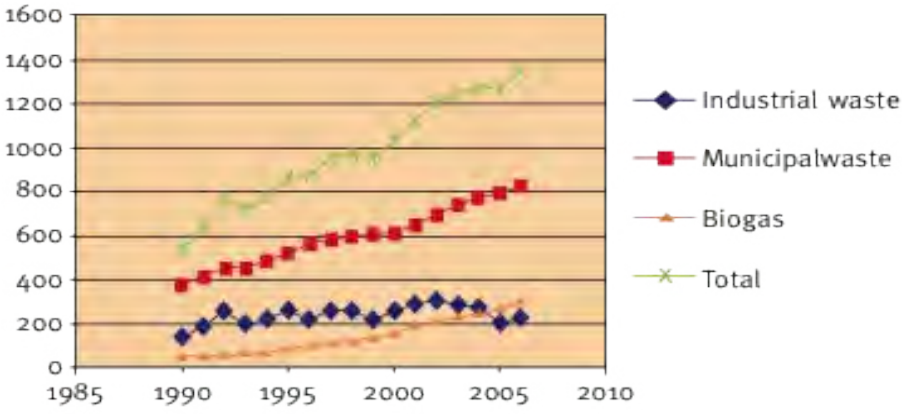
Traditionally Asia has viewed waste management as an essential public health service and the objective is to have safe and proper disposal of waste. As the industry develops and technologies are introduced to harness waste as a form of energy, many

Asia is seeing more energy from waste projects as countries seek to harness the renewable energy potential of waste

governments and companies in Asia recognise the economic and environmental potential of this previously untapped energy source. The global agenda on renewable energy and climate change has also spearheaded developments in this area.

Energy from waste can be considered partially renewable because of the biogenic content of waste that comes from food, gardens, paper and timber, to name a few sources. Other components such as plastics constitute the non-renewable portion of energy. However, it is common in the industry to speak broadly of waste as being renewable energy without strict definitions of the actual composition. Globally, energy from waste has more than doubled since 1990, and further growth is expected with more projects in Asia as well as other developed markets.

Figure 11: Global energy (Petajoules, PJ) from waste, 1990 – 2006 (IEA, 2009)



Source: ISWA <sup>13</sup>

Note: Biogas includes landfill gas and gas from anaerobic digestion. Based on national data reported to the International Energy Agency (IEA) from OECD and non-OECD countries. Data from non-OECD countries is incomplete, thus these are minimum values.

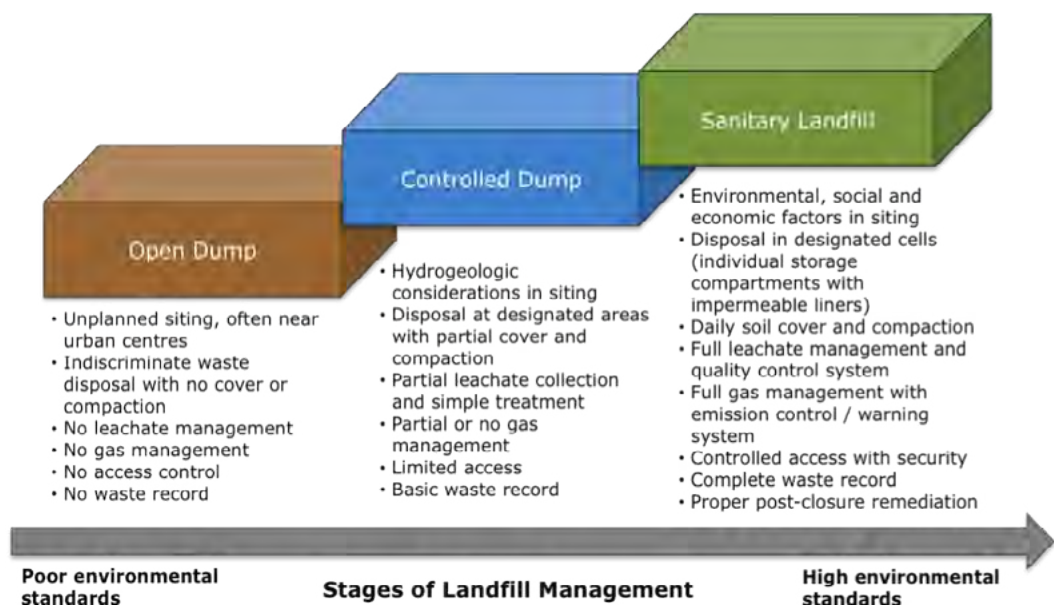
**From dumpsites to sanitary landfills**

Landfill refers to the deposit of waste into or onto land.<sup>14</sup> Landfill that is designed and operated to meet regulatory standards on environmental protection and sanitation is known as sanitary or

engineered landfill. In many parts of developing Asia, dumpsites (unsanitary landfills that simply contain waste in an open land without waste treatment systems) are still common. Some of the well-known dumpsites in Asia that have caught international attention include the Smoky Mountains garbage dump in Manila, Philippines, Stung Meanchey dump site in Phnom Penh, Cambodia and the 'seventh ring' belt of rubbish dumps in Beijing, China.

Dumpsites are an environmental and public health hazard and the governments in Asia recognise the urgent need to close dumping grounds and implement proper landfill infrastructure. Many have set national goals to achieve such a transformation. Malaysia aims to close, rehabilitate or upgrade all of the existing 112 unsanitary landfills by 2015 to 2020.<sup>15</sup> In Taiwan, random disposal at dumps gave way to incinerators and sanitary landfills, a process that is governed by strict enforcement and monitoring systems developed progressively since the mid-1980s.<sup>16</sup> Uncontrolled or poorly managed disposal sites are usually located near high-density population areas that further intensify environmental and health impacts on local communities.

Figure 12: Stages of landfill management



Source: ADB<sup>17</sup>



The most pressing need for developing Asia is the progression from dumpsites to sanitary landfills

The transition from dumpsite to sanitary landfill is most pressing in the less developed countries of Asia and international aid from the World Bank, Asian Development Bank and other multinational organisations is assisting governments in developing proper infrastructure. In more developed economies where sanitary landfill is the norm, the focus tends to be on incineration systems as the next step in the waste management framework.

### Environmental impacts of landfills

Improper landfill management and dumping of waste cause air, land and water pollution. Air pollution results from methane gas and carbon dioxide that are released from the biodegradation of organic waste. Methane gas is a greenhouse gas that has an effect on global warming 21 times stronger than carbon dioxide and it remains in the atmosphere for nine to 15 years.<sup>18</sup> Odour, though less toxic, also contributes to undesirable air quality. Land and water pollution are caused primarily by leachate, the liquid that seeps through decomposing solid waste in landfill and extracts dissolved or suspended materials in the process.<sup>19</sup> Landfill leachate is heavily concentrated in organic compounds and if not properly captured and treated it both contaminates sources of drinking and surface water and damages ecological systems.

The environmental risks of poorly designed and managed landfills are well researched and understood by the global community. Asian companies recognise the opportunities that lie in harnessing environmentally sustainable systems that promote landfill integrity and quality and minimise environmental deterioration. Landfill management systems typically include leachate collection and treatment, methane venting or recovery, surface drainage control, a liner system, surface cover, compaction of waste and an overall environmental monitoring system. Depending on the state of the disposal site and socioeconomic factors such as the local state budget and public health, the progression from dumpsite to landfill can vary from simple operational improvements to fully engineered systems.

### Sustainable landfill management

Companies that successfully capitalise on the environmental opportunities of landfill management are those which go beyond providing technical solutions and introduce global best practices adapted to suit the unique conditions of the local environment. Key criteria for achieving sustainable landfill management are continuous improvement in pollution mitigation processes, adaptability to changing waste conditions and engagement with local stakeholders. These constitute a dynamic and often challenging

process spanning twenty years or more depending on the contract. The Laogang Landfill in Shanghai, China, managed by Veolia Environmental Services Asia and Shanghai Chengtou Holdings, is an example of a successful transformation from an unsanitary disposal ground to a properly managed landfill with environmental control systems that surpass most landfill standards elsewhere in the country. Nevertheless, challenges remain and change over time due to socioeconomic developments. Companies have to work closely with local governments and other waste service providers such as transport companies to ensure continuous improvement in operations.

### Case Study: Veolia led multinational consortium in development of Shanghai Laogang Sanitary Landfill

The Laogang landfill is located 60 kilometres from downtown Shanghai. It receives around a third of the total waste generated in the Shanghai municipality, with a capacity of 6,300 tonnes per day. Laogang was built in the 1980s when environmental standards in landfill construction were less stringent. The site was not lined with impermeable membranes and lacked a leachate collection system. As such, the environmental conditions around the landfill failed to meet air quality and surface water standards. Air pollutants such as hydrogen sulphide and ammonia were about 30 to 90 percent and six to 13 percent higher than their respective standards. Concentrations of phosphorus and Chemical Oxygen Demand (COD) in the water at the unloading berth unacceptably exceeded Class V surface water quality standards.<sup>20</sup> Such alarming signs highlighted the severe state of pollution with far-reaching consequences on the burgeoning urban population of Shanghai.

In 2003, the consortium formed by Veolia Environmental Services Asia, CITIC Pacific and Shanghai Chengtou signed a 20-year concession agreement with the Shanghai government to design, build and operate the Phase IV extension of Laogang Landfill. The total investment of the project is US\$93 million, which includes a World Bank loan of US\$33 million.<sup>21</sup> Veolia designed the landfill to meet international standards and comply with local Chinese regulations. An extensive suite of technologies was deployed in the construction of the landfill, such as groundwater management to minimise leachate migration from the older phases, biological leachate treatment with Class III discharge quality standards and landfill gas collection system to produce power for on-site use. Very importantly, a long-term monitoring programme was developed in conjunction with the Shanghai Environmental Monitoring Center.





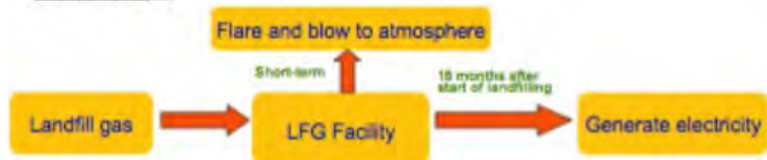
One of the key achievements was the use of ground reinforcing techniques to increase airspace, which extended the service life of the landfill from the original 20 years and capacity of 20 million tonnes to an estimated 45 years and capacity of 80 million tonnes.<sup>22,23</sup>

The 2009 United Nations Environment Programme (UNEP) Environmental Assessment Report on the review of environmental measures in Shanghai in preparation for Expo 2010, states that Phase IV of Laogang Landfill was operating beyond its designed capacity, resulting in leachate also exceeding the design capacity of the treatment plant. This undermined the effectiveness of the pollution mitigation measures of the project. In addition, some excess waste had to be sent to earlier phases of the landfill, which lacked proper containment facilities and were due for closure. To address the problem, the municipal government is now planning to transform the Laogang area into an integrated waste treatment and recycling facility and carry out the overdue closure and rehabilitation of the older phases.<sup>24</sup>

#### Lifespan extension

Facility	Design intake tpd	Original Design Life	VES* Extended Facility Life	Increase as a %
Laogang Phase 4	4900	20 years	45 years	225%

#### Gas capture



#### Leachate treatment

	Raw Leachate	Treated Leachate
COD (mg/L)	50000 ~70000	1500 ~2500
NH3-N (mg/L)	600 ~ 800	close to 0



#### Case Study: UEM Environment - Lifecycle analysis of landfills



UEM Environment, the environment arm of Malaysian conglomerate UEM Group Berhad, provides a variety of waste management services focused largely on hazardous waste treatment as well as domestic waste management. Its key facility for hazardous waste treatment is the Kualiti Alam Waste Management Centre, which houses treatment processes such as physical and chemical treatment, solidification and stabilisation, incineration and secured landfill. Landfilling of post-treated residue of stabilised hazardous waste requires strict compliance to prevent leakage of toxic materials.

UEM Enviro provides detailed environmental data on their landfills as part of their support to the National Life Cycle Assessment (LCA) Project, which is spearheaded by SIRIM Berhad, the national organisation for standards and quality, and promoter of technological excellence in the manufacturing sector. The data include the type of waste treated, air emissions, leachate treatment and wastewater discharge.<sup>25</sup> Through this detailed reporting, UEM Enviro supports the goals of the LCA Project in promoting eco-labelling and increasing awareness among industry and consumer groups on the importance of LCA in manufacturing and procurement practice.<sup>26</sup>

#### Renewable energy from landfill

Progressive improvements in landfill management not only strive to alleviate environmental stress but also harness the hidden potential of landfills: renewable energy from landfill gas. Landfill gas is released from the anaerobic decomposition of biodegradable solid waste and consists of about 50 percent methane. Methane, a primary component of natural gas, is a potent greenhouse gas if released into the environment. An estimated ten percent of total methane emissions comes from landfills. However it can be converted into renewable energy via gas recovery and utilisation systems that remove contaminants and moisture in the gas. The electricity produced is typically used to power on-site facilities and any excess is sold to the local power grid. Harnessing landfill gas as renewable energy reduces the use of fossil fuels, which saves costs and cuts carbon emissions.

While landfill gas projects are generally environmentally appealing, companies must review potential risks extensively before embarking on any such project. The key environmental risk is the availability

Landfill gas-to-energy recovery helps to avoid methane gas emissions but effectiveness of gas capture is a challenge

and life span of landfill gas. The gas production rate typically falls after the first 20 to 30 years of operation. However, the very nature of waste makes such estimation highly variable and companies need a good understanding of past and current waste composition and volume as well as foresight of future changes in regulations that may affect landfill gas production.

### Case Study: NENT Landfill gas-to-energy project in Hong Kong (subsidiary of SITA Waste Services and New World Developments)

The North East New Territories (NENT) Landfill in Hong Kong is operated by Far East Landfill Technologies Ltd, a subsidiary of SITA Waste Services and New World Developments. In 2007, NENT became the first and only landfill in Hong Kong to generate surplus power from landfill gas to replace fossil fuel in town gas production. Prior to the project, landfill gas was used only for on-site electricity generation and as heating fuel for treating leachate. SITA and Towngas, the public gas utility company, saw the potential for greater energy recovery and developed a system that treats raw landfill gas to the quality of synthetic natural gas. The NENT project remains the largest landfill gas utilisation project in Hong Kong. Through this initiative, naphtha consumption in Hong Kong has been reduced by 43,000 tonnes and carbon emissions by 135,000 tonnes annually.

### Landfill and climate change

One of the most significant environmental impacts of landfill is climate change. Methane gas released from the decomposition of organic waste in landfills is the major contributor of total carbon emissions from waste management, which was estimated at three to five percent of total global emissions in 2007.<sup>27</sup> The issues facing landfill gas projects are discussed in the next section on waste and climate change.

### Post-closure rehabilitation

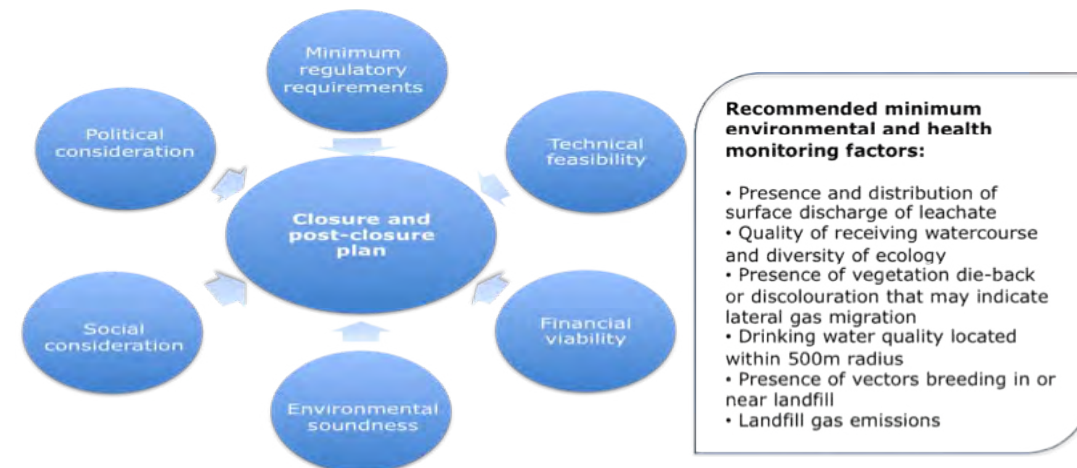
In most developed nations, requirements for post-closure care are extensive, typically covering a period of about 30 years. The objective of landfill rehabilitation after closure is to ensure that the waste is properly capped to minimise residual contamination of the environment. Post-closure activities consist at a minimum of maintaining and monitoring the integrity of the methane gas, leachate and groundwater treatment systems.<sup>28</sup>

There is a lack of detailed information about post-closure rehabilitation of landfill in Asia. Companies disclose limited information on aftercare plans or the financial budget set aside for such activities. This contrasts starkly with practices in Europe and the United States, where landfill rehabilitation is viewed as a serious environmental liability. In public waste management tenders, governments consider the rehabilitation plans of prospective bidders as well as a company's financial ability to fulfil its obligations relating to post-closure events. The EU Directive on Environmental Liability covers all waste management activities and explicitly states that, 'Operators who professionally conduct risky or potentially risky activities will be held liable for any environmental damage.'<sup>29</sup>

As environmental regulations tighten in Asia, more stringent and extensive landfill rehabilitation measures may be prescribed in the future. Companies must be aware of the risks and liabilities and allocate resources accordingly from the start of operations.<sup>30</sup> Such regulations will also motivate companies to invest in more robust environmental control and monitoring systems as upfront costs could be lower than the future costs of clean-up. Beyond financial costs, both governments and companies must consider other factors, such as technical feasibility, environmental soundness and social acceptability.

Landfill rehabilitation, a major environmental and financial liability in developed countries, has yet to become a key priority in Asian waste management

Figure 13: Considerations in post-closure landfill rehabilitation



Source: ADB <sup>31</sup>



### **Case Study: IL&FS Ecosmart provides environmental consultancy and project development to Gorai Landfill closure**

IL&FS Ecosmart specialises in consultancy and project development services for environmental initiatives under the Public-Private Partnership (PPP) framework. Ecosmart is a strategic initiative of Infrastructure Leasing & Financial Services Limited (IL&FS), an infrastructure development and finance conglomerate in India.

Ecosmart was appointed by the Municipal Corporation of Greater Mumbai as the consultant for the first-ever scientific landfill closure in India at the Gorai dumpsite. The 19.6-hectare dumpsite has been in operation since 1972 and contains an estimated 2.3 million tonnes of waste. Untreated disposal and open burning have resulted in pollution of nearby creek waters and worsening air quality, which have severe consequences on environmental and human health. Scientific closure of the dumpsite involved leveling and reforming the existing waste pile and installing rehabilitation systems such as the laying of an impermeable surface cover, sheet piling to secure the site against tidal inundation, landfill gas capture and leachate collection systems. With a final green cover in place, the dumpsite was converted into green landscaped spaces for the city of Mumbai.<sup>32</sup>

The landfill closure was successfully registered as a CDM project for landfill gas capture. The project expects to reduce greenhouse gas emissions by 1.2 million tonnes over a 10-year period.<sup>33</sup>



### **Interview: SITA Waste Services in Asia**

SITA Waste Services Limited (SITA), a wholly owned subsidiary of French environmental services company Suez Environment, is the leading waste services provider in Hong Kong. Jan Boelen, Director of Strategy and Sustainable Development at SITA, shared with Responsible Research how sustainability is integral to SITA's business.

SITA minimises the environmental impact of its operations by implementing energy-efficient initiatives or embarking on projects that reduce the carbon emissions from waste. One example is the introduction of Euro V engines for the fleet of waste collection vehicles, which have lower emissions and higher fuel efficiency. The NENT landfill gas-to-energy project is another landmark project by the company (detailed as a case study on page 36), which converts

landfill gas, a source of greenhouse gas emissions, into a fuel source for the local gas utility company. SITA is currently doing a feasibility study with Towngas to develop a similar system at another landfill, the WENT landfill, which has twice the design capacity of NENT. As the WENT landfill is located much further away from potential users, technical challenges in gas transport will have to be addressed. While technology is important, the success of landfill gas-to-energy projects is ultimately dependent on economics and the commitment of both parties.

SITA is also actively involved in the aftercare of closed landfills to ensure that residual environmental impacts are kept to a minimum. SITA has completed the restoration of 12 closed landfills in Hong Kong. These are old landfills with relatively poor leachate and gas systems located close to urban areas. The restoration works carried out from 1996 to 2006 include an aftercare period of up to 30 years.

The scope of restoration works was extensive and included adopting existing infrastructure and/or constructing new works for the collection and treatment of landfill gas and leachate, minimising surface water infiltration by capping the waste, providing an effective surface water drainage system, building access roads, landscaping the whole restored surface and providing monitoring infrastructure for the aftercare period. The aftercare was equally if not more rigorous, requiring the maintenance of the restoration works (roads, drains, capping, landscaping), monitoring the environment within and around each landfill to ensure that specification requirements are being met, and collecting and treating landfill gas and leachate. Environmental monitoring, both on and off site, includes air, water, gas and leachate quality and migration, water infiltration, slope stability and effects on vegetation. While SITA has extensive experience in landfill remediation in other countries, in Hong Kong some common solutions could not be used due to space constraints. For example, large-scale biological treatment and reed beds for leachate management had to be replaced by a space-saving thermal process, which uses energy from the combustion of landfill gas. Gas estimation also proved challenging, as the estimation models based on dryer and temperate climates are unreliable in Hong Kong's more tropical climate, where gas is produced more quickly after waste is filled and the rate of production is different. SITA adopted global best practices and installed sophisticated environmental protection systems to meet the stringent requirements of the restoration. The closed landfills were successfully converted to recreational green spaces such as golf courses and parks for public enjoyment.<sup>34</sup>





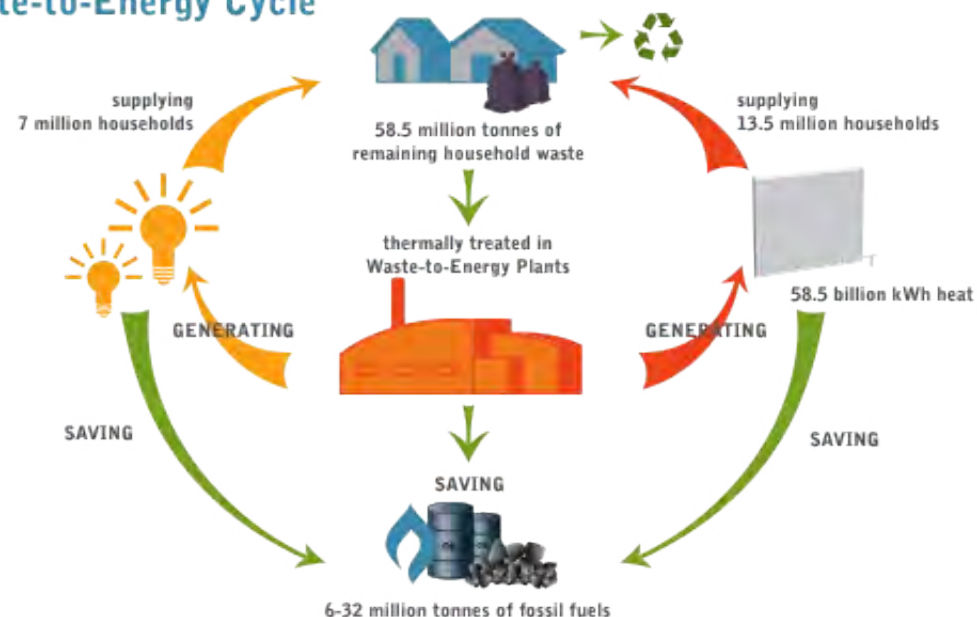
Landfill has been the cornerstone of Hong Kong's waste management system for several decades. In the Policy Framework for the Management of Municipal Solid Waste (2005–2014), the government has identified incineration as a key waste treatment method. In developing the framework, the government sought advice from stakeholders through public consultation. SITA actively supports the government's efforts by providing information on its experiences and knowhow from both its Hong Kong and international operations.

### Incineration: Waste-to-Energy (WTE) gains traction in Asia

Incineration is the thermal treatment of waste with or without recovery of the combustion heat generated.<sup>35</sup> Globally, incineration is widely practised as a key waste treatment method in developed nations, with most installations in Japan, Western Europe and the United States. Studies estimate that the global capacity of waste incineration increased from 160 to 200 million tonnes per year in the last decade, and forecast growth in the next five years to reach 240 million tonnes per year.<sup>36</sup> Increasingly incineration plants are termed as WTE facilities because of their energy recovery capability, although most regulations do not specify minimum requirements for incineration plants to qualify as energy recovery facilities. In Europe, legislative support for WTE is strong, in recognition of WTE's importance in reducing dependence on landfill and fossil fuels.

Figure 14: Illustrative model of energy recovery potential from WTE plant

### Waste-to-Energy Cycle



Source: CEWEP<sup>37</sup>

In Asia, the use of incineration as a key treatment method varies significantly between countries. Among the more developed economies, Japan, Singapore and Taiwan are strong advocates of incineration in their national waste management strategy, while Hong Kong does not have any municipal waste incinerators following the closure of aged-technology incinerators in the 1990s.<sup>38</sup> China identifies waste incineration as a key priority area in the environmental protection industry in the 11<sup>th</sup> Five-Year National Plan and focuses on large-scale urban waste incineration plants.<sup>39</sup> In the developing countries of Thailand, Indonesia and Philippines, landfill is the predominant disposal method and is likely to remain so in the near future. Incineration is concentrated in urban areas while landfills are much more common in rural places. The rationale behind the difference is mainly due to the higher capital and operating cost of incineration, which is usually too expensive for rural communities. At the same time, incineration offers the benefit of a smaller footprint, which is critical in land-stretched urban cities.

Incineration is the key treatment technology adopted in Japan, Singapore and Taiwan. China is pushing ahead with ambitious incineration projects

Incineration in Asia is arguably the most hotly debated waste treatment method and it receives an intense amount of attention from the public, NGOs and research institutions. The key issues of incineration focus on the use of waste to produce energy and the environmental and public health effects that result from the emissions of burning waste. This section takes a closer look at the environmental benefits and risks of incineration, while social reactions to public health issues will be explored in the Social Aspects section.

### Case Study: Defining WTE

The EU Waste Framework Directive contains extensive legislation on the waste management framework and sets binding targets for member countries. One of the issues debated on waste incineration was whether to impose a minimum energy efficiency requirement for incineration to qualify as an energy recovery system. This would distinguish between facilities that are merely for 'disposal' and those with true 'recovery' capabilities. The European Commission on the Waste Framework Directive proposed to specify a minimum efficiency level to qualify as an energy recovery system but the European Parliament, which voted instead for a broad definition of energy recovery, eventually rejected it.

To date there is no clear consensus on the expected energy recovery of incineration and the debate on whether incineration is a disposal or energy recovery system continues. Most companies, understandably, market their plants as recovery systems.

### Key drivers for incineration

Incineration, with its much smaller land requirement, can help solve the problem of having to provide increasing space for landfill. The environmental problems of dumpsites and poorly managed landfills can also be avoided by incineration, which treats waste thermally and reduces its volume in a controlled environment. In addition, technological advancement has improved the efficiency of energy recovery from the combustion of waste, which allows electricity to be produced and sold. The sale of energy provides a revenue stream that partially offsets the operating cost of incineration. The energy is also an alternative to traditional fossil fuels and can be renewable for the portion of waste that is biogenic. Hence incineration not only eliminates the problem of methane gas release from landfill but also generates power from waste. Energy recovery from incineration has a higher efficiency and stability than landfill gas-to-energy.

Supporters of incineration advocate the green energy and positive impact on climate change that the technology can offer.

### Emissions: a case of standards, monitoring and enforcement

The benefits of incineration may make a convincing case for governments to implement incineration as a key strategy in waste management. The high capital and operating costs of incineration, however, are the major economic hurdle to such a policy. Additionally, emissions from incineration are a key issue of concern and debate. All responsible companies must prove they have the necessary technical and operational expertise for full compliance and demonstrate a commitment to engage with government and the local community in performance monitoring and improvement. The most toxic pollutants emitted from incineration are dioxins, organic compounds known to cause severe environmental and human health damage. The severity of health impacts includes impairment of the immune, nervous and hormonal systems and reproductive functions. Dioxins are also suspected to cause cancer.<sup>40</sup> Dioxins are released from burning waste containing chlorine, such as polyvinyl chloride (PVC), a plastic compound used in consumer packaging and a variety of industrial applications. Another pollutant is the residual ash from incineration, which contains highly concentrated levels of heavy metals and other toxins. In most developed countries it is treated as hazardous waste and must be disposed of in a prescribed manner.

Many leading waste management companies in Asia are involved in incineration as a key business and some have adopted global best practices in their environmental monitoring systems that exceed local requirements. In China, the allowable limit for dioxin emission from waste incineration is 1.0 ng I-TEQ Nm<sup>-3</sup> while the standard for the European Union, North America and Japan is 0.1 ng I-TEQ Nm<sup>-3</sup>.<sup>41</sup> Other Asian countries with a significant presence of incineration plants have tightened dioxin limits in recent years, as seen in Figure 15. Companies which voluntarily strive to meet a stricter standard than required will be in a stronger position to manage future changes in environmental laws which are expected to tighten in the Asian regulatory landscape.

Companies must have the right technologies, operation expertise and corporate integrity to control emissions and report the environmental data openly and fairly

Land constraints, methane avoidance and energy recovery are key drivers of incineration

Figure 15: Dioxin emission standards

	Dioxin emission limit (ng I-TEQ Nm <sup>-3</sup> )	Notes
China	1.0	
Taiwan	0.5	For incinerator capacity of less than 4 tonnes/hour
	0.1	For incinerator capacity of more than 4 tonnes/hour
Singapore	0.1	1.0 ng I-TEQ Nm <sup>-3</sup> for incinerators commissioned before 1 January 2001
Korea	0.1	0.5 ng I-TEQ Nm <sup>-3</sup> for incinerators commissioned before 1 July 2003
United States	0.1	
EU	0.1	
Japan	0.1	

Source: Various<sup>42</sup>

### Case Study: China Everbright achieves Euro standards for dioxin emissions in WTE plant

China Everbright International is a major environmental services company in China, with key businesses in solid WTE and wastewater treatment. In the 2009 annual report, the company states that, 'The Group has established environmental and social responsibility management system and environmental protection annual planning. The Group has formulated an accurate, swift and sensitive monitoring system, established comprehensive indicators for monitoring system of environmental management and is equipped with advanced monitoring equipment and set up an information and data system, etc.'

The Suzhou WTE project, the largest WTE project by China Everbright, exemplifies global best practices that the company has chosen to adopt. The emissions from the plant meet the Euro I emission standard, and the dioxin level complies with Euro II standard, both of which are more stringent than Chinese regulations. The online gas emission monitoring system is connected to the monitoring centre of the Suzhou Environmental Monitoring Team, an initiative proposed by the company to the Suzhou government as part of its efforts to improve its operational performance. The facility became the first WTE plant in Jiangsu Province to receive online monitoring from the local government.

The regulatory landscape for waste incineration differs across Asia, and in markets where incineration is established as a mainstay of waste treatment, regulations are generally more stringent and require greater disclosure. In Taiwan, monitoring of incineration plants comes under the national electronic data management system, which provides a comprehensive database for environmental monitoring through up-to-date, public online information. The system enables multi-stakeholder engagement from companies, local regulatory bodies and the community collectively to prevent potential risks and dangers.<sup>43</sup>

Plant performance indicators reported by the company encourage public monitoring and feedback

### Case Study: KD Holding's extensive online environmental monitoring system for waste incineration facility

KD Holding Corporation is an investment holding company in the waste management business in Taiwan. It operates through its subsidiaries, Sino Environmental Services, Leading Energy and HD Resource Management.

A survey of the web portal of KD's Taichung Wujih refuse incineration plant reveals a wealth of operational and environmental data that is made available to the public. Information such as the environmental monitoring system, emissions test results, waste volume, energy production and maintenance plans are published online and updated regularly. In addition there is a feedback forum for the public to post questions or complaints about the plant. Educational tours for residents and students are also organised at the facility.<sup>44</sup>

While such levels of disclosure are not yet common across Asia, companies that choose to engage stakeholders in a proactive and collaborative way will benefit in the long-run through these sustainable environmental practices.

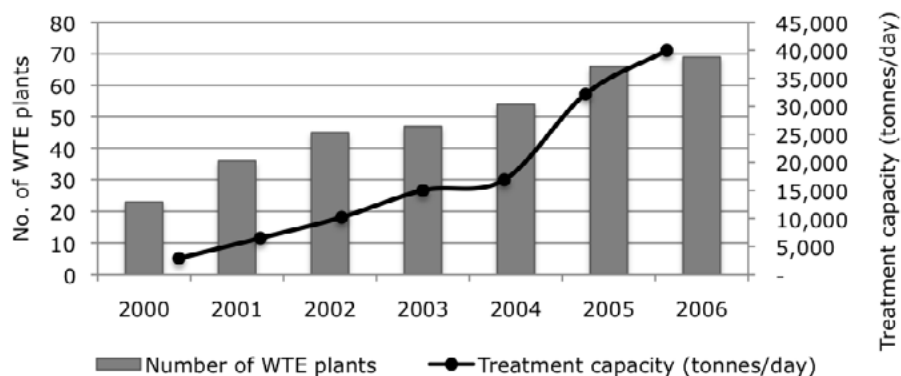




## Technology transfer to Asia

Incineration in most parts of Asia is in the early stages of development and capacity building in technological and operational capabilities is critical in laying the foundation for a self-sustaining domestic market. Partnership with leading global waste players is a common strategy to promote technology transfer to Asia. While this is not unique to incineration and can be seen in other waste treatment projects such as landfill, the technological sophistication and capital investment tend to be higher for incineration projects; this may explain the greater publicity that such projects receive. Besides private sector co-operation, support from international development agencies also helps to accelerate the development. The ADB made its first private-sector municipal solid waste management project through a US\$200 million loan facility agreement with China Everbright International for the development of WTE plants in secondary cities in China. ADB will also support international learning between China and other ADB developing countries to encourage more clean WTE technologies for Asia.<sup>45</sup> With strong support from the government, incineration capacity has increased steadily over the last decade and is forecasted to expand further to support the country's ambitious renewable biomass energy target of 30 gigawatts by 2020.

Figure 16: WTE capacity in China (2000-2006)



Source: Waste Management World<sup>46</sup>, China New Energy<sup>47</sup>

Note: Based on the statistics from the China Ministry of Construction, there were 69 WTE plants as of 2006. According to the 11th Five-Year Plan, about 60 more WTE plants will be built from 2006 to 2010.

Figure 17: China's renewable energy targets for 2020 in 11th Five-Year Plan

Target	2008	2020	
Installed capacity (GW)	Actual	Initial	Revised
Hydro	171	300	-
Wind	12	30	120 – 150
Biomass	<4	30	-
Solar	0.1	1.8	10 – 20

Source: KPMG<sup>48</sup>

Note: The revised targets have not been officially published.

### Case Study: Waste Management Inc. teams up with Shanghai Chengtong Holding to develop WTE in China

Waste Management Inc (WMI), the largest waste services company in North America, made its landmark entry into the China market in August 2009 through a joint-venture partnership with Shanghai Chengtong Holding's subsidiary Shanghai Environment Group. WMI's investment of US\$75 million is the largest overseas capital investment in the Chinese waste sector to date, a significant development in a market traditionally viewed as dominated by state-owned enterprises.<sup>49</sup>

The partnership aims to introduce the advanced technology and operational expertise of WMI's WTE capabilities to China, which Shanghai Chengtong believes will transform and improve operational and management systems, promote more efficient use of resources and strengthen overall profitability. Shanghai Chengtong also envisages that the partnership will spearhead greater progress in meeting its sustainability goal of doubling renewable energy production to provide enough power for the equivalent of two million homes by 2020.<sup>50</sup>

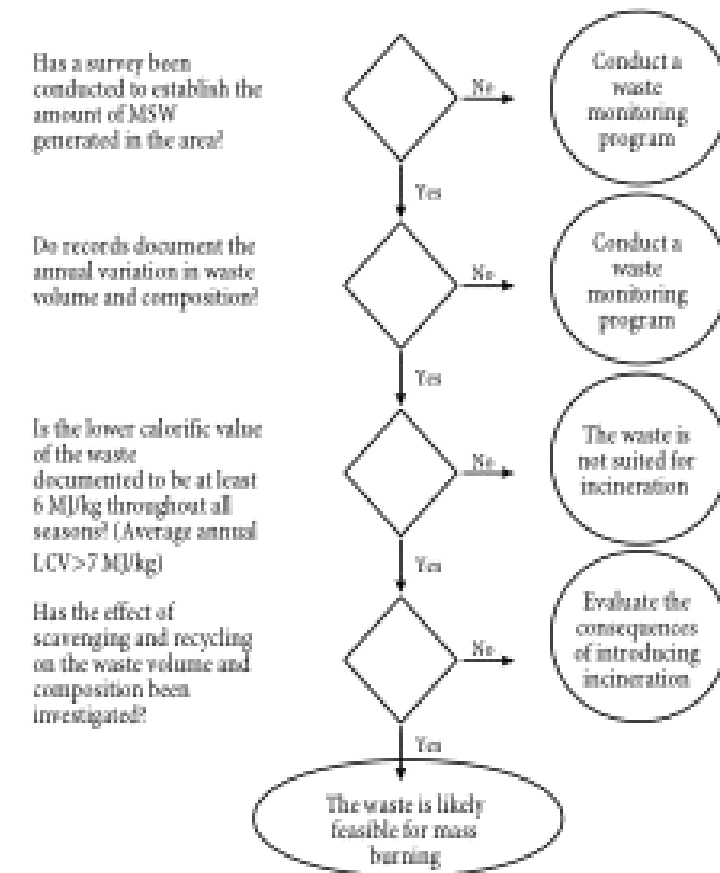
Other Asian companies that are involved in global partnerships for WTE projects include Thermax India, an engineering company providing solutions to the energy and environmental sectors. Thermax signed a technology transfer license agreement with Lambion Energy Solutions, a German engineering company with expertise in converting waste to energy, for high-efficiency combustion systems suitable for biomass high in moisture

content.<sup>51</sup> Foreign technology is instrumental in the development of the Korean waste market, which has one of the highest standards in Asia today due in part to the import of many core technologies and equipment from leading global waste players.<sup>52</sup> A recent partnership is the agreement between Samsung Heavy Industries and Irish company Bedminster International, where the Korean conglomerate is licensed to utilise the Bedminster BioEnergy Technology to build integrated waste treatment facilities in Korea and Southeast Asia.<sup>53</sup> Partnerships within Asian companies are also gaining recognition, such as the joint venture between Tianjin TEDA and Keppel Integrated Engineering to develop the Tianjin Eco-City. This project, which is of national interest to both China and Singapore, will house a suite of environmental infrastructure systems, including WTE and other integrated solid waste treatment facilities.<sup>54</sup>

### Adapting technology to local conditions

For technology transfer to be successful, Asian companies must integrate and adapt best practices to suit local conditions. One of the most commonly cited problems with incineration is that waste in Asia has a higher moisture content than most developed Western countries due to dietary differences. The moisture content directly affects the calorific value of waste, which is the amount of heat released from waste combustion and a key performance indicator of the incineration process. High moisture content reduces calorific value, which in turn diminishes the energy efficiency of incineration and jeopardises the performance of WTE plants in energy production. Another major issue is the non-segregated waste collection in most Asian cities, which makes for a highly heterogeneous waste profile that must be managed by the incinerators. Non-segregation increases the presence of undesirable materials for combustion such as chlorine-containing plastics, batteries and metals, which lowers the overall efficiency of the combustion process and poses potential environmental hazards. The assessment of local waste conditions is a critical step before introducing incineration to communities that are new to the technology. A framework for the assessment of waste as fuel provided by the World Bank recommends specific calorific values for incineration. In practice, there are a number of technologies that claim to be suitable for different waste types and calorific values and there is no universally prescribed standard of minimum value.

Figure 18: A framework for assessment of waste as fuel



Source: World Bank <sup>55</sup>

To overcome the issues of waste incompatibility, some companies in Asia are developing local systems and technologies. For example, IL&FS in India is looking into the integration of global technologies and development of home grown systems to suit local waste characteristics, through its collaboration with the Andhra Pradesh Technology Development & Promotion Centre. With funding support from the government, IL&FS also promotes segregated waste collection from waste generators, which enables more efficient treatment through dedicated waste streams.<sup>56</sup>

Adaptation of foreign technologies to suit local waste profile is critical for all WTE projects

### Local challenges of heterogeneous waste profiles

The challenges posed by local waste composition and collection habits have led the public and NGOs to question the ability of companies to deliver robust solutions effectively. Often the crux of the discussions or protests lies not in specific technology but in the long-term operational capabilities and commitments of companies to ensure environmental compliance. The challenges facing local companies are usually a combination of factors, including operational experience, familiarity with local waste profile, operating budget and above all, integrity towards environmental and public health responsibilities.

#### Case Study: IL&FS - Revival of defunct incineration plant sparks intense debate

IL&FS Waste Management & Urban Services will embark on a waste incineration project in Timarpur, India, which involves the revival of the defunct Timarpur WTE plant that was shut down 16 years ago due to the low calorific value of the waste stream. The waste in Timarpur had low calorific value due to high moisture content from organic material, which meant that the energy recoverable from incineration was low. Poor energy production rendered the plant an uneconomical investment and the failure was attributed to the mismatch of the Danish-imported technology with the type of local waste. The revival project was met with strong protest as community groups cited the poor track record of the plant and a lack of clarity on the technological improvements planned. IL&FS has proposed to use a technology developed locally, which claims to generate six megawatts of electricity and produce 69,000 tonnes of refuse-derived fuel annually from treating 650 tonnes of waste every day. The municipality has also claimed that the calorific value of the waste has increased over the years thereby making the project now viable.<sup>57</sup>

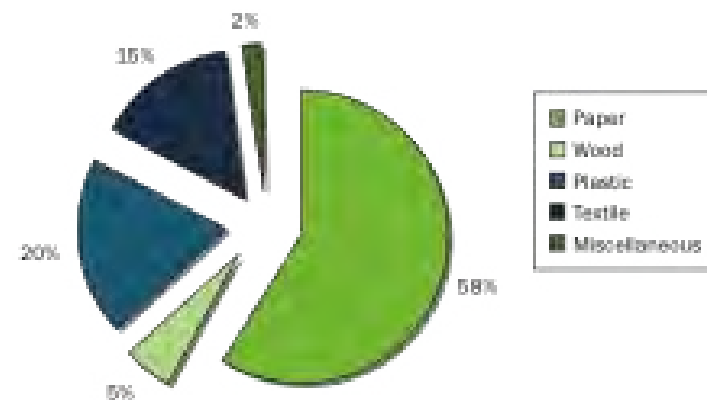
### From mass burning to Refuse Derived Fuel

Most incineration methods in Asia are mass burn combustion systems that receive unsorted waste. Refuse Derived Fuel (RDF) was developed to minimise environmental risks and promote recycling. RDF refers to the segregated high-calorific combustible solid waste that is consumed in energy recovery systems. It consists of paper, card, wood, selected plastics and textiles and has a lower moisture and ash content than untreated waste.<sup>58</sup> RDF is also known as Solid Recovered Fuel (SRF). RDF is most widely adopted in Europe where it is recognised as a more environmentally friendly treatment

option than mass burning, with cleaner emissions and higher energy recovery. Technical specifications have been drafted to aid the commercialisation of RDF as a supplementary fuel to be used in energy-intensive industries such as coalmining. However, RDF has not been widely received in Asia despite its benefits. Obstacles that prevent its large-scale implementation include a higher cost of processing, which cannot be recovered from the low waste tariffs, and a lack of source segregation by households, which creates a harder task for plant operators. RDF is most widely seen in Japan and Korea, which have comprehensive policies that promote private-sector innovation in RDF technologies and long-established waste segregation practices by households. Japan has built 57 RDF production facilities and five exclusive power plants to replace small incinerators. Korea has 35 RDF manufacturing facilities and plans to expand that number through increased government subsidies for WTE projects as well as promote the use of RDF in coal power plants.<sup>59</sup>

Asian companies that have taken the lead in RDF production, such as Malaysia's Recycle Energy, are recognised by governments for their sustainable initiatives. Companies seeking to promote RDF as a sustainable waste management strategy should engage policymakers to promote source segregation, as this practice is a key success factor in RDF production.

Figure 19: Typical composition of RDF



RDF, a cleaner fuel made from source-segregated waste, is not widely produced in Asia as mass incineration remains the preferred method

Source: Shanks<sup>60</sup>, UK DEFRA<sup>61</sup>



### CASE STUDY: Recycle Energy launches RDF production in Malaysia

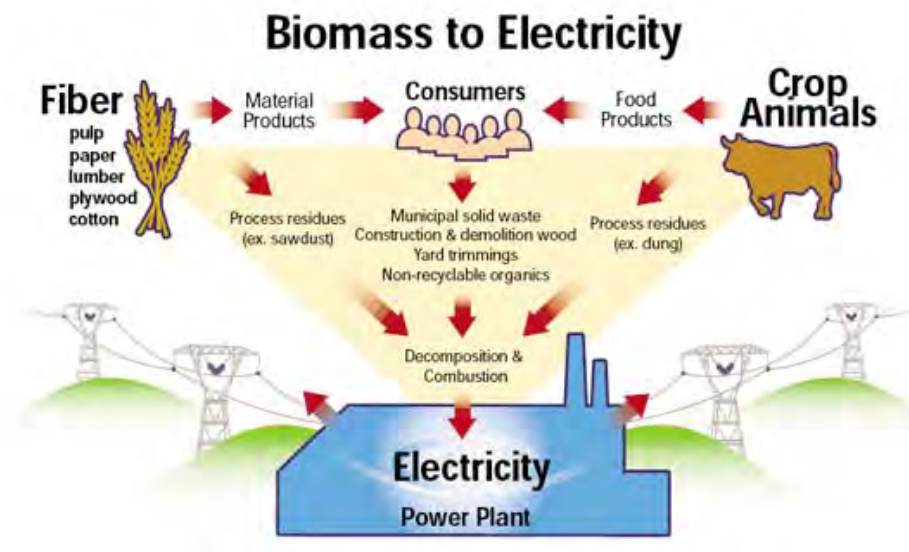
Recycle Energy, a partnership of Malaysian MMC Corporation Bhd (60 percent) and Core Competencies (40 percent) that focuses on renewable energy from waste, has commenced its first RDF facility in Selangor, Malaysia. The Solid Waste Resource Recovery Centre processes unsorted municipal waste to recover recyclables and organics separately and processes the residual stream into RDF. The project aims to achieve a closed-loop and self-sustaining resource recovery system whereby RDF powers the facility and supplies excess power to the grid. While the efforts by Recycle Energy are commendable, there remain challenges to be resolved for the plant to be economically viable. Quality control of RDF is difficult due to the non-homogeneity of waste. High moisture content causes technical problems such as lower sorting efficiency and a large quantity of treatable leachate.<sup>62</sup> Other issues include low electricity tariffs, which the company is campaigning to increase from US\$0.07/kwh to US\$0.16/kwh. The local council also finds the processing fee too high, as the RDF facility charges a gate fee of RM46/tonne, which is higher than the landfill fee of RM36/tonne. Given these challenges, Recycle Energy expects it to take about nine years to break even on the US\$61 million investment.<sup>63</sup>

### Biological treatment of organic waste

Biological treatment in waste management applies specifically to organic waste. This approach differs from landfill and incineration, which are the dominant methods of treatment and disposal for commingled organic and inorganic waste. While generally regarded as a 'greener' solution in waste management, biological treatment displays both environmental risks and opportunities and must be carefully managed to achieve a truly sustainable solution.

Biological treatment refers to the use of bacteria to break down organic materials in the waste.<sup>64</sup> The treatment can be further separated into aerobic (in the presence of oxygen) and anaerobic (in the absence of oxygen) digestion. Aerobic digestion, more commonly referred to as composting, produces outputs that are typically used as a soil enhancer. Anaerobic digestion produces biogas, which goes towards power generation.

Figure 20: Anaerobic digestion of biomass to produce electricity



Source: California Energy Commission <sup>65</sup>

### Biological treatment in Asia

For centuries, rural communities in Asia and other parts of the world have used organic waste, such as agricultural residues and animal manure, to produce compost and generate power. Harnessing the technology for large-scale commercial applications, however, has not received the same degree of national or commercial interest. Economic considerations are a key factor, as the cost of collecting, transporting and processing organic waste tends to be prohibitively high compared with the revenue from sale of electricity or compost. However, perspectives are changing as environmental awareness of the benefits of biological treatment increases. Biological treatment not only reduces the quantity of waste for disposal but also generates renewable biomass energy. Energy derived from organic waste has a higher renewable energy content than incineration, which produces energy by burning both organic and inorganic wastes such as plastics. Biological treatment diverts organic waste for processing at source, and as such is more efficient than landfill gas capture, which tries to recover energy from mixed waste deposited in landfill.

Diverting waste for biological processing at the source is more efficient than trying to recover energy from landfilled waste

Biological treatment is gaining support in Asian countries with large agricultural economies and high agricultural waste outputs. China has set ambitious targets to increase biomass power from two gigawatts in 2005 to 24 gigawatts by 2020. Sources of biomass power identified by the Chinese government include agricultural and forestry waste, municipal solid waste and energy crop plantations.<sup>66</sup> The ADB estimates that China will require investments totalling US\$60.5 billion over the next ten years to harness the biomass potential in rural areas. The transformation is expected to help reduce rural poverty and environmental degradation.<sup>67</sup> In Korea, regulations on food waste recycling require separate collection of food waste from households, restaurants and agriculture and fishery centres, and different treatment methods are prescribed for each stream. The waste is processed to produce livestock feed, compost and power.<sup>68</sup>

### Case Study: ADB supports biogas projects in China

Rural biomass energy development in China is getting international support from the Efficient Utilisation of Agricultural Wastes Project, which is financed by a US\$22.1 million loan from the ADB and a US\$6.4 million loan from the Global Environment Facility. The project aims to develop biogas digesters to close the gap of inefficient and insufficient energy in rural areas, raise farmer incomes and protect the environment. These goals strongly support China's national goals for rural biomass energy development.

### China's strategic goals for rural biomass energy development

Priority Area for Development	Technologies	2010	2015	2020
Priority 1: Household heating and cooking	Household biogas digesters	40 million	60 million	80 million
	Straw biogas plants	100	500	1,000
	Straw briquette/pellet fuel	1 million tons	20 million tons	50 million tons
	Medium-to-large biogas plants (based on animal waste)	4,000	Not Available	10,000
Priority 2: Bioethanol/biodiesel	Energy crop planting area	1.66 million ha	Not Available	3.33 million ha
Priority 3: Biomass-powered electricity	Straw power generation	3 GW	Not Available	6 GW

GW = gigawatt, ha = hectare.

Note: Quantified goals are based on the Ministry of Agriculture's 2015 goals (Development Plan on Agricultural Biomass Industry, 2007–2015) and the central government's overall goals for energy and biomass for 2020.

Many environmental benefits derive from biogas waste utilisation, most notably:

- Renewable energy replaces highly polluting coal
- Ash residue from straw waste is a high-quality potassium fertiliser
- Replaces indiscriminate disposal of biomass waste (such as field-burning of crop waste) which is currently ruining soil, groundwater and water resources
- Reduces carbon emissions

At the same time, project developers must also be mindful of the environmental risks of biomass energy development. These include:

- Over extraction of water supply for processing
- Emissions and wastewater discharge quality
- Underutilisation of fertiliser by-product from biogas plants

The development of medium-to-large biogas plants is a key focus of the government's overall strategy. However difficulties such as high capital costs and operational practices are a limit to progress. China is still developing its capacity, which means that the cost of imported technology can be prohibitive without external financial support. Government support in terms of electricity tariffs and tax breaks are critical in overcoming these financial barriers and realising the potential of the country's vast resources of biomass waste.<sup>69</sup>

Asia's agricultural economy provides large potential for biological treatment of organic waste from agriculture

### Challenges of biological treatment

For biological treatment to be successful, companies must be aware of the environmental challenges that may threaten the sustainability of large-scale facilities. Quality control of incoming organic waste is pertinent, especially for composting. Compost is used in the natural environment as a soil enhancer and fertiliser; the presence of contaminants would result in secondary soil pollution and may even re-enter the food chain. The task of monitoring quality is understandably more difficult for larger plants, which receive hundreds of tonnes of waste a day. Mechanical processes such as size screening, magnetisers and eddy currents (to remove metals) and density separators (to remove heavy inorganic materials) are used to process waste, but even the most sophisticated systems cannot guarantee adequate removal of heavy metals, ash, plastics and glass fragments. The root cause is the source of waste and waste generators must be sure to supply uncontaminated waste.

Companies should engage with their suppliers and conduct regular audits of their waste-handling practices.

In the anaerobic digestion process, the energy content of waste is the key determinant of successful operation. Again, quality control is essential as only with a consistent input can the plant maintain a steady energy output. However companies must recognise that organic waste has a much lower energy content compared with fossil fuels: agricultural waste has an energy content of about 15 MJ/kg while that of coal and natural gas are about 24 MJ/kg and 43 MJ/kg respectively.<sup>70</sup> Some experts argue that the lower energy density of biomass supports smaller-scale production facilities located close to the waste source over large, centralised set-ups. Multiple small power plants also reduce the risk of linked infrastructure that may be vulnerable to external effects.<sup>71</sup> While the environmental benefits of using biomass energy and cost savings from fuel switching are widely mentioned, companies should evaluate carefully the true expected energy recovery and factor in provision for fluctuations and inconsistencies before investing. In China, the government requires biomass power projects to pass an environmental evaluation and demonstrate resource sustainability before project approval is granted.<sup>72</sup> Such regulations further emphasise the importance of a thorough environmental review to ensure that biomass waste projects are indeed viable solutions for the environment and the economy.

### Case Study: China Everbright invests in straw waste cogeneration and biomass power projects

China Everbright has two large-scale biomass waste energy projects in the pipeline, both of which are expected to commence operations in 2012. The Xinyi Straw Cogeneration project, the company's first investment in biomass energy, is expected to supply no less than 130 gigawatt hours of electricity to the power grid per year during the term of operation. The second project, Dangshan Biomass Power Generation Project is expected to yield 220 gigawatt hours per year. China Everbright sees great potential in the biomass energy market in China and expects both projects to play a significant role in its development in the market.<sup>73</sup>

Research shows that biogas digestion of agricultural waste such as straw has a potential energy yield three times higher than municipal waste incineration.<sup>74</sup> With the right infrastructure and economic support, biogas digestion could become a valuable renewable energy in China.

### Case Study: Ramky Enviro Engineers to revive biomethanation facility

Ramky Enviro Engineers, the largest waste management company in India and a subsidiary of Ramky Group, will embark on the revival project of a used biomethanation facility at Koyambedu wholesale market in Chennai. Implemented by the previous local government in 2005, the plant was closed down after technical issues, poor segregation of wastes and a lack of funds troubled business operations. Ramky says it is confident of restoring operations after assessing the plant to be in good working order. Ramky hopes that the waste contractor engaged by the Chennai Metropolitan Development Authority will carry out proper collection and segregation, although specific measures for ensuring and enforcing such performance were not stated.

In an interview with Goutham Reddy, Executive Director of Ramky, Mr Reddy declared that the facility is operating well with a proper waste segregation mechanism now established.<sup>75</sup> On the issue of composting in India, the director expressed the view that the biggest challenge facing large-scale composting is competition from chemical fertilisers. Chemical fertilisers are subsidised by the government, which makes organic fertilisers produced from composting more expensive and less popular with customers.

Due to unavoidable variation in the quality of organic waste, the compost produced is generally only suitable as a soil cover or enhancer and not as fertiliser, as the nutrient values of nitrogen, phosphorus and potassium are too low. However, upstream control of the waste profile and application of best available techniques can increase the nutrient value of compost.

### Case Study: SITA Australia produces BioWise compost

SITA Environmental Solutions, a major waste management company in Australia, is a subsidiary of global leader Suez Environnement (60 percent) and Singapore-based Sembcorp Industries (40 percent). BioWise is a joint development initiative between SITA and the Water Corporation of Western Australia.

BioWise compost is produced from green organics, biosolids and food residues. It complies with the Australian Standard AS 4454 - composts, soil conditioners and mulches, and is regularly tested to ensure consistent quality. The compost quality is controlled by



an analysis of feedstock and an extensive quality management plan. BioWise provides a pathogen-free and organic alternative to conventional chemical fertilisers and is used in the horticultural, landscaping and nursery sectors. The benefits include water saving through moisture retention, increased soil microbiological activity and improved soil texture. In 2002 BioWise received an Award from the Western Australian Nursery and Garden Industry Association for Excellence for Best Environmental Practices within a Nursery Business.<sup>76</sup>

### Case Study: Veolia Foundation supports biogas system for rural community in Sichuan, China

Veolia Foundation, the community investment arm of Veolia Environnement, supports non-profit and community-based projects that contribute to sustainable development. The foundation supported the provision of a biogas system for a rural village in Sichuan, China. The project was carried by NGO Heifer International Hong Kong. The rural community lives in poverty and wood is the only source of energy for heating and cooking. However, the Chinese government places strict restrictions on tree logging in an effort to protect the forests and prevent soil erosion. This has affected the people severely in meeting their energy needs. Heifer saw the potential of biogas as an alternative that would provide energy without deforestation. Each household was provided with four pigs, refurbishment of the existing pigsties, and installation of toilets, as well as a biogas tank, biogas heater, wood stove with heat recovery and pressure cooker. This simple but effective biogas system helped improve the villagers' living conditions by providing a sustainable source of energy for household use.

## WASTE AND RECYCLING

### Understanding recycling

Recycling is the reprocessing and reuse of waste materials for its original purpose or for other uses and it serves to divert waste from disposal.<sup>77</sup> In European Union waste legislation, recycling includes organic recycling such as composting but excludes energy recovery, a common understanding among most countries. Biogas recovery is classified under both recycling and energy recovery in different contexts. For the purpose of sustainability analysis, this report covers composting and biogas recovery in the preceding section together with other energy recovery systems.

Recycling of waste includes a myriad of materials, the most common items being paper, plastic, metals, glass, textiles, timber, concrete and electronic waste. Electronic waste, or e-waste, is a hazardous waste and will be discussed separately in the next section.

The process of recycling begins with the collection of either commingled or source-segregated waste and recyclables, followed by mechanical and manual sorting based on size, density, magnetic and chemical properties, and final delivery of the separated recyclables to dedicated recycling plants for reprocessing into new materials.

It is commonly said that recycling conserves resources and promotes a circular economy of reusing resources and minimising waste. While this is certainly true, it is important to note that ultimately waste is inevitable due to downcycling. Downcycling is the reprocessing of materials into a product of lower quality. An example is the recycling of used office paper into toilet paper. Most recyclables are downcycled, so there is a limit to the number of times an item can be reused before it has to be disposed of. Paper can be recycled five to seven times before the fibres become too short for further use.<sup>78</sup> Steel, on the other hand, can theoretically be recycled infinitely because the properties of steel remain unchanged, and it is the world's most recycled material.<sup>79</sup>

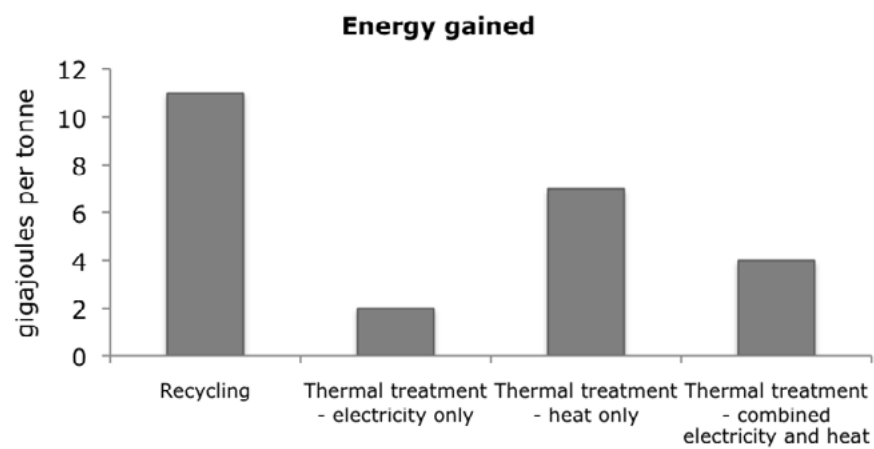
Recycling  
conserves  
resources  
and reduces  
waste

### Socio-environmental perceptions of recycling

Generally, the public has a more positive perception of recycling, both socially and environmentally, than of energy recovery systems. The concept of recycling is closely tied to resource management and waste reduction, both of which are key components of sustainable waste management. Energy recovery is an end-of-life solution, a one-time extraction of energy, after which the material cannot be reused. Studies have quantified the additional energy gained from recycling compared with incineration (see Figure 21). In addition, the environmental health and safety concerns of energy recovery systems, in particular incineration, continue to ignite

intense debate in many communities. One argument is that energy recovery systems discourage recycling and encourage more waste, as capital-intensive incineration plants require a continuous feed of waste for efficient operation and maximum energy production. While it is beyond the scope of this report to delve into the different schools of thought on recycling versus incineration, such debates are likely to surface in communities where governments or companies decide to construct waste treatment facilities.

Figure 21: Energy gained from recycling vs thermal treatment of waste



Source: WTER<sup>80</sup>

### Recycling in Asia: a reality check

The recycling sector in Asia, for the most part, is fragmented and dominated by the informal sector. With the exception of Japan, Korea and Taiwan where formal channels for private-sector investment in recycling are established, recycling in Asia remains largely a trade of small businesses or individual sellers. In Singapore, the recycling community consists of licensed waste management companies, which are mandated to collect recyclables as part of the municipal waste contract, as well as individual recyclers known as 'karung guni', sometimes referred to as modern-day rag-and-bone men. During times of rising commodity prices, the recycling scene gets more competitive and the 'karung guni' offer higher prices to residents for their recyclables or pilfer the recycling bags left outside homes for the waste management company. The perception of recyclables as a paid commodity is stronger in Asia than it is in Europe or the United States, making recycling as a large-scale commercial

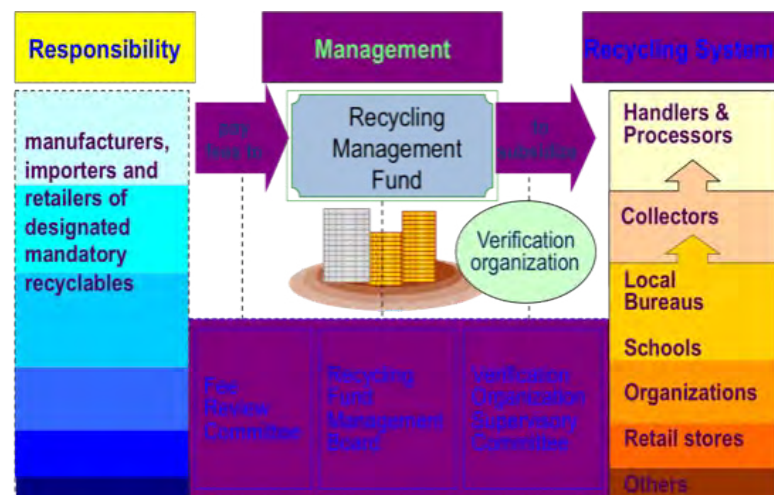
entity financially challenging. The business model of large recycling plants relies on the free supply of materials to defray the cost of processing. The price of recycled goods is usually insufficient to cover both the costs of processing and materials.

Figure 22: Informal waste recycling in Asia



Source: Various<sup>81</sup>

Figure 23: Formal recycling system in Taiwan



#### Captions:

- In Taiwan, manufacturers, importers and retailers of designated mandatory recyclables pay fees to the government-managed Recycling Management Fund, which is used to subsidise the recycling system
- Public recycling bins
- Integrated recycling facility

Source: Various<sup>82</sup>

In Asia as in much of the world, the price of virgin materials in the commodity market is the driving force behind the demand and supply of recycled goods. Unlike other waste management sectors, which are essentially driven by government policies and pricing, recycling is left largely to private market forces. Landfill

tax is usually controlled by the government, which in turns affects incineration fees (which may or may not be directly controlled). Feed-in tariffs for energy produced from waste are another method of government intervention in the waste market. Governments adopt such strategies as part of long-term visions to nurture market growth and promote national environmental and energy policies. Such policies are largely absent in recycling, rendering it vulnerable to volatile market swings. The non-alignment of market drivers explains the inconsistency in the development of recycling versus treatment sectors in Asia. The future may bring stronger regulations to the recycling market, driven by similar waste management principles. One example is the requirement for a minimum recycled content in manufactured goods, which would spur greater and more consistent demand for recycled materials.

#### Sustainable practices in recycling

##### Resource conservation

Resource conservation is often quoted in recycling company sustainability reports. To further their corporate responsibility beyond the commercial activities of recycling, these companies can dedicate resources towards active conservation initiatives, such as paper recycling firms supporting responsible logging practices in the forestry sector.

Greenpeace released a report in 2009 calling for greater disclosure for forestry companies listed on the Hong Kong Stock Exchange. According to Greenpeace, inadequate disclosure requirements on environmental sustainability for forestry companies result in most being environmentally friendly only by default, thus misleading investors.<sup>83</sup> Paper recycling companies such as China-based Nine Dragons Paper were included in the report, reflecting the strong link between the recycling and raw materials sectors.

#### Case Study: Fook Woo achieves FSC and PEPC certification for recycled paper products

Fook Woo Group Holdings Ltd, a leading waste-paper collection and recycling company in Hong Kong and China, supports sustainable forestry through the certification of its recycled paper products by the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). Established by international non-profit and non-governmental organisations, these certification schemes promote responsible forest management and offer consumers the choice of responsible procurement.<sup>84</sup>

Recycling, unlike other waste management activities, is driven by the commodity market and thus subjected to large price fluctuations

Recycling companies have the potential to support resource conservation in the markets that the recycled materials derive from





An interview with Fook Woo's Chief Operating Officer, Boswell Cheung, gave a deeper insight into sustainability initiatives at the paper recycling company. According to Mr Cheung, Fook Woo is the only Hong Kong paper recycling company to obtain FSC certification for recycled tissue paper products. In order to meet the certification requirements, a rigorous internal data management and reporting system was established to ensure proper tracking of the quantities of different types of waste paper being used in the recycling and manufacturing processes. On the market outlook for recycled or 'green' tissue products, Fook Woo sees a steady increase in demand for its products by both overseas customers, such as leading supermarket brands, and domestic retailers. Fook Woo believes that the market outlook for China is strong as consumers are increasing their demand for sustainable products, a view that is supported by the increase in sales volume of recycled tissue products during the recent financial crisis. While signs of future growth are promising, the concept of 'green' in Asia is still relatively new compared with Western countries. Some consumers still associate 'green' with cheap or poorer quality products. Government support helps to push the green agenda forward and create greater public awareness. In 2007, the Hong Kong government mandated all government departments to use recycled tissue paper. Fook Woo secured the first contract and is also the current supplier.

Environmental protection in the production process is also critical to the company. To conserve water, Fook Woo installed the Metso brand Advantage DCT 60 tissue machine, which has a much lower water consumption rate than the machines used by all other Chinese paper producers. From a previous consumption of 180 tonnes of water for one tonne of recycled tissue paper, the process now uses only eight tonnes of water per tonne of paper. Saving water also increased the rate of production and labour productivity.

Fook Woo identifies the key sustainability issues of paper recycling companies to be the need to improve energy efficiency in the recycling process and the social responsibility of recycling companies as waste collectors.

Besides local stakeholders, the push for higher environmental standards in recycling also stems from foreign consumers who practise sustainability screening in their procurement process. Asian companies that respond positively to the more stringent environmental requirements are able to create new market opportunities. For example, Indonesian paper recycler Fajar Paper indicated that it would build a new niche market to supply recycled packaging to companies that export products to United States,

Japan and Europe, where stringent environmental regulations prevail.<sup>85</sup>

### Quality standards are important

Recycled products must meet local and international quality standards of the markets they serve. Product quality plays an important role in recycling but is not of particular concern in other waste management processes apart from RDF production. Sustainable recycling companies not only abide by the specifications but also support or directly conduct research and development to develop new or improved recycled products.

Spearheading innovations in higher-quality recycled products expands business opportunities

### Case Study: Alex Fraser pioneers the alternative use of construction and demolition waste



Alex Fraser Group, a subsidiary of Swire Pacific (51 percent share), is a leading construction and demolition (C&D) waste recycling company in Australia. Alex Fraser is a pioneer of R&D and accreditation schemes for using recycled C&D materials in infrastructure. It took more than a decade for Alex Fraser to gain support from local governments, councils and contractors for the use of crushed concrete products. However resistance from construction companies to using the products remained high even after Alex Fraser obtained formal accreditation. The success of its inaugural project for the Western Ring road marked the start of new business opportunities and growth. Today, Alex Fraser continues to seek new ways of recycling. One initiative is a trial with several local governments to use up to 30 percent crushed glass in road base aggregate.<sup>86</sup>

Government policies that mandate the use of recycled projects are the primary driving force for the recycling market and reduce its vulnerability to commodity trading risks. Insun ENT, a C&D recycling company in Korea, benefits from government regulations that stipulate minimum requirements for the use of recycled aggregates in specified construction projects.<sup>87</sup>

### Global trade in recycling

Driven by commodity prices, recycling often involves trans-boundary shipments of recyclables to markets that supply and demand the raw materials. Global trade in recycling has been and still is under attack for illegal transport of waste or highly



contaminated recyclables. Such activities occur under the guise of recycling by declaring the content of the shipment as recyclables rather than waste. The consequences of illegal trading will almost certainly be poor environmental and safety practices in recycling and uncontrolled disposal of residual material.

A survey of the Chinese market sentiment on paper and plastics recycling by the UK Waste & Resources Action Programme (WRAP) found that import regulations of recycled paper and plastics sent to China for reprocessing tightened in 2009. This was evidenced in higher frequency and intensity of import checks and increased monitoring and enforcement of environmental systems at local recycling facilities.<sup>88</sup> Tighter environmental controls on recycling markets in Asia would benefit the entire industry and support more structured growth.

# INTEGRATED TREATMENT APPROACH

## Global perspectives

Integrated solid waste treatment looks at the total waste value chain and consolidates processes to recycle and recover maximum resources within a single facility. The two major treatment and disposal methods discussed in the preceding sections, landfill and incineration, are single-model approaches to waste management, which ignore recycling. An integrated approach aims to provide a holistic solution based on the waste management hierarchy, which emphasises material recycling, followed by energy recovery and finally landfill disposal as the least favourable option. There are many waste treatment options for recycling and recovery, including metals extraction, plastics and glass recycling, organic waste composting, biogas production, RDF manufacture and incineration.

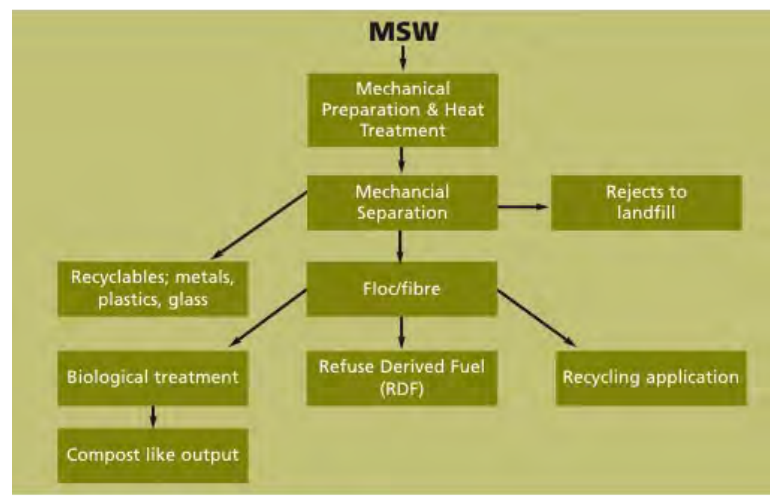
## Integrated treatment is established in Europe

The evolution of integrated solid waste treatment as a core component of waste management strategy is seen most strongly in Europe, where for the last decade the European landfill directive has been the primary driver of the integrated waste treatment market. The landfill directive, which came into force in July 1999, stipulated that the amount of biodegradable waste sent to landfill must be reduced to 35 percent of 1995 levels by 2016. This regulatory environment spurred the development of pre-treatment technologies aimed at reducing the biological content of landfill waste, leading to what are now known as Mechanical Biological Treatment (MBT) systems. MBT are defined as pre-treatment technologies that contribute to the diversion of solid waste from landfill<sup>89</sup> employing a mechanical sorting process to extract recyclables and biological treatment to convert organic waste into compost or energy. MBT may also include a final process to convert the residual waste into RDF for energy recovery.



Integrated solid waste treatment combines recycling, biological treatment, WTE and disposal to optimise resource recovery

Figure 23: A schematic of the MBT process



Source: UK DEFRA<sup>90</sup>

## The Asian setting

An integrated model may not suit the fragmented waste sector

In Asia, the integrated treatment concept may be familiar but the market remains in its infancy. The higher cost of waste processing in a MBT facility is the primary reason for the lack of development but other market forces are also at play. First, recycling in most parts of developing Asia is dominated by the informal sector, individual street recyclers rather than large waste companies. Second, waste collection is usually conducted by the local municipality and not privatised. While some degree of consolidation is taking place, the market is generally fragmented along separated lines of waste collection, recycling and treatment. Many leading Asian waste companies focus on treatment systems and barely, if at all, play an active role in collection and recycling. The integrated solid waste treatment model complements a consolidated industry where one company has expertise across the full value chain and is able to optimise resource efficiency across the entire plant.

Asia's waste management strategy also places significant emphasis on sanitary waste disposal and energy recovery via incineration, with less focus on recycling and total resource management. Japan, which has arguably the most advanced and comprehensive waste

management system in Asia, advocates an integrated approach that is slightly different from MBT. Source separation of waste by households and industries is enforced which allows most recyclables to be retrieved prior to entering the waste stream. Further sorting by waste management companies recovers more recyclables, after which the remaining waste is sent for incineration.<sup>91</sup> There is no recovery of organic waste for compost or biogas production, and incineration remains the key.

One of the largest integrated treatment facilities in Asia is currently being built in Incheon, Korea. The Sudokwon Landfill "Dreampark" project is a fully integrated facility, comprising landfill, WTE plants, biomass treatment, sewage sludge utilisation and even solar and wind energy generation. Samsung Engineering is one of the companies engaged for the construction of waste facilities in this government-driven project.

## Case Study: Sudokwon Landfill "Dreampark" project in Korea<sup>92</sup>

The Sudokwon Landfill project envisages a new concept of waste treatment as part of an 'environmental theme park'. Waste is treated and reutilised in the most environmentally responsible manner and integrated with community activities that take place in the ecological park. Aptly termed the Sudokwon "Dreampark", the many technologically advanced systems include:

- Landfill solidification treatment process with self-sealing function that intercepts leaking water with an impermeable layer seal between two different layers
- Sludge treatment and reutilisation process that turns waste into suitable landfill cover. The sludge is mixed with caustic lime or cement and preserved so that it becomes dry and granulated
- Ongoing studies to reuse treated leachate for landscaping and washing
- Production of refuse-derived fuel from segregated household waste

The ecological park is also expected to generate community benefits by constructing athletic facilities, tourist attractions and other leisure amenities. The park is earmarked as a key venue for the 2014 Incheon Asian Games.

With a staged development process, the project is expected to cost a total of US\$1.27 billion by 2017. The Sudokwon Dreampark could mark the first of many similar projects, as the government plans to build environmental ecological parks at 13 other locations, including Busan, Gwangju, Daegu and Daejeon.<sup>93</sup>



## Asia must find the solution that best meets local needs

The applicability and future of integrated waste treatment systems for Asia remain uncertain and policy makers must determine the most suitable solutions customised to meet local needs

The prospect of integrated solid waste treatment for Asia is uncertain at present, as it is not currently a focus of most national waste management policies and many challenges remain. The recycling culture in Asia views recyclables as traded goods that demand payment, as is the case in the informal recycling sector. MBTs usually work on the principle of dual collection systems, whereby households dispose of their organic waste and recyclables into two separate bins without being paid for them. Co-mingled recyclables are separated into their respective streams at the MBT. This notion of 'voluntary' recycling is not common across Asia and is practised mainly in Japan, Korea and Taiwan. Thus the risk of a low recyclables load may affect the economics of an MBT plant. The higher moisture content of Asian waste can also affect sorting efficiency and cause technical problems in both recycling and composting. Illegal mix of industrial toxic wastes in the municipal stream can result in severe problems in biological processes. Finally, the lack of a mature market for sale of recovered compost and RDF hinders profitability. Perhaps the most meaningful response for governments and companies is not to regard the European model of integrated waste treatment facility as a wholesale solution for Asia, but to consider the most appropriate approach that suits the environmental and social needs of the local community.

### Case Study: Keppel builds integrated solid waste treatment facility in Qatar

Keppel Integrated Engineering, the infrastructure arm of Singapore conglomerate Keppel Corporation, was awarded a US\$1.2 billion contract to build an integrated solid waste management facility in Qatar and undertake its operation and maintenance for 20 years. This is the first integrated waste management facility in the Middle East and has a large treatment capacity of 2,300 tonnes per day of municipal solid waste and 5,000 tonnes per day of construction and demolition waste.

The facility will employ a complete system of sorting, recycling, composting, landfill, sludge treatment and WTE technologies. Keppel will deploy water-cooled grate technology for the WTE plant, the Danodrum system for recycling and pre-treatment of waste, and the Unibrane membrane bioreactor system for wastewater treatment.<sup>94</sup> The plant is expected to commence operations in 2010.

The plant is expected to handle non-homogenous municipal waste, as there will be no source separation by local residents. While it is not known whether specific targets are set for recovery rates of individual treatment processes (a common feature in public-private partnerships for European MBT plants), such contractual requirements would require the operator to have an acute understanding of the waste stream and optimise its processes according to the waste quality and composition.



Source: Keppel Seghers<sup>95</sup>

Integrated solid waste treatment has been promoted in eco-cities and industrial parks in Asia as part of an overall objective of achieving a model sustainable community. Eco-city projects are typically championed by governments and the environmental solutions promulgated often include sophisticated technologies that may or may not be immediately suitable for large-scale commercialisation. Nevertheless they serve as a useful model for potential future market development.

# HAZARDOUS WASTE MANAGEMENT

## Case Study: Integrated solid waste management at Tianjin Economic Development Area

The Tianjin Economic Development Area (TEDA) is a special development zone located at Bohai Bay in China. Solid waste management of industrial and municipal waste is a key priority in TEDA's overall environmental management blueprint for sustainable industrial development. Facilities include a hazardous waste incinerator, medical waste treatment plant, recycling plants and engineered landfill. When the basic facilities were established, challenges remained in fostering proper waste reduction, reuse and recycling. There was little or no co-operation between the facilities, sorting recyclables was difficult and scavengers had to be dealt with.

In response, TEDA management took steps to initiate an integrated solid waste management system. The guiding principle was to optimise resource efficiency through inter-company co-operation and to minimise the amount of waste produced and disposed of. The management established an environmental management information system to promote waste reduction, reuse, recycling and exchange; encouraged tenant enterprises to adopt new environmental management strategies such as cleaner production; constructed new environmental facilities for waste sorting; and implemented capacity building programs to educate the local community about waste management. The main focus was to encourage inter-company recycling, whereby the waste from one company could be reused by another.<sup>96</sup>

The promotion of sustainable waste practices is an ongoing effort and TEDA management continues to encourage co-operation on waste between companies, whilst ensuring that the integrated treatment facilities are properly run and comply with environmental standards.<sup>97</sup>

## Of complexity, change and challenge

Unseen by most people, our daily activities contribute to the ever-increasing generation of hazardous waste that threatens the sustainability of ecosystems and affects the most vulnerable communities in developing nations. Hazardous waste is the unavoidable by-product of economic output as a great many industries produce hazardous waste as a result of direct manufacturing processes or extended resource utilisation.

Broadly defined, hazardous waste is waste that is dangerous and potentially harmful to public health or the environment. It usually has one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Examples include chemical waste from manufacturing processes, contaminated sludge, biomedical waste, ship-breaking waste and electronic waste. Radioactive or nuclear waste is usually classified separately due to its unique treatment requirements. The highly varied and complex nature of hazardous waste demands a comprehensive management system that is largely independent of municipal waste treatment, the key focus of preceding sections. The treatment of hazardous waste can be classified into destruction (usually by incineration) or recovery. Destruction breaks down the properties of hazardous waste to render it harmless while recovery involves the extraction of useful resources, such as precious metals, from the waste. Finally, the residue from hazardous waste treatment must be stabilised before disposal in a secure landfill.

One of the most significant international agreements on hazardous waste is the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, a global agreement ratified by 170 countries. All of the ten Asian economies surveyed (excluding Taiwan and Hong Kong) ratified the agreement. Implementation, however, remains weak, as global trade in hazardous waste shows no signs of abating. The 2006 data reported by Basel Parties indicates that 20 percent of the total volume of hazardous waste exported is for disposal, with the other 80 percent being used for recovery.<sup>98</sup> Figure 16 shows the generation, export and import of hazardous waste of selected Asian economies based on the data submitted by the countries to the Basel Convention Secretariat.<sup>99</sup> The data provides a snapshot of what is likely to be a much larger market of hazardous waste in which data collection and disclosure are very limited. One of the most critical and persistent problems is the export of electronic waste, or e-waste, from developed countries to developing countries, mainly in Asia and Africa. It is worth highlighting that the United States has not ratified the Basel Convention. According to the NGO group Basel Action Network, anti-Basel lobbying of strong industry groups is the main reason for non-ratification by the United States.<sup>100</sup>

A wide spectrum of hazardous waste exists due to industrial activity





The Basel Convention is one of the most important international agreements on the global movement of hazardous waste

Figure 24: Total amount of hazardous wastes generated, exported and imported (in metric tonnes) for selected Asian countries as reported to Basel Convention Secretariat

Country	Generation	Export	Import
China	10,840,000	1,074	-
India	-	-	-
Indonesia	-	2,883	-
Korea	17,828,060	-	138
Malaysia	548,916	5,224	306,646
Philippines		13,666	29,590
Singapore	2,563,600		
Thailand	-	6,225	645

Note:  
2006 data (latest available) for all countries except Philippines and Thailand  
2005 data for Philippines and Thailand  
No data available for India based on 2001–2006 data published online by Basel Convention

Source: Basel Convention<sup>101</sup>

An important characteristic differentiating the hazardous waste market from municipal waste is the concept of producer responsibility. In many high-technology industries, producers treat the hazardous waste produced by the manufacturing process in-house. The technicalities of hazardous waste management require specific expertise that may be best known to the producers themselves. Some companies also choose to outsource the task to third parties, giving rise to the development of a hazardous waste management market.

Producer responsibility goes a step further in some consumer goods markets, where the Extended Producer Responsibility (EPR) principle is adopted. EPR is an environmental policy approach that extends a producer's responsibility for a product to the post-consumer stage of a product lifecycle.<sup>102</sup> By placing the responsibility of end-of-life waste management on the producer instead of the municipality, EPR encourages producers to evaluate the full environmental impacts and costs associated with the product. The implementation of an EPR policy is usually accompanied by economic incentives

to induce the desired outcome. In most developed countries, EPR is practised in the consumer electronic goods markets. It aims to prevent the improper disposal of obsolete goods such as old televisions, cameras, printers and computers that would effectively become e-waste. EPR usually applies only to hazardous waste with recycling potential, so that the take-back policy has some economic benefits for the producer. Hazardous waste management companies therefore seek out producers that choose to outsource their waste treatment. Contractual agreements are established on an individual basis for different producers and contain specific clauses on the type and quality of waste. This is another key difference from municipal waste contracts, that are linked to local government.

Effective hazardous waste management is complex and constantly changing, reflecting increasing sophistication in manufacturing and consumption habits. Challenges to the industry are evolving rapidly and sustainable practices will be key to long-term survival.

### Hazardous waste in Asia

Asia is witnessing rapid developments in the hazardous waste landscape, as economic growth, environmental awareness and the global waste trade are creating a growing hazardous waste industry that needs urgent technology upgrades and capacity building. The issues are most pronounced in the two largest economies of China and India, which not only face burgeoning domestic waste but also inflow of e-waste from overseas. The two countries receive the bulk of e-waste exported to Asia, most of which is recycled illegally causing devastating risks to environmental and human health. In 2005, the United Nations estimated the global volume of e-waste generated at 20 to 50 million tonnes.<sup>103</sup> A recent news release from UNEP in February 2010 estimates global e-waste generation to increase by 40 million tonnes a year. In China and India, the e-waste from old computers alone is estimated to surge by 200 to 400 percent and 500 percent respectively from 2007 to 2020. This is due to the escalating growth in e-waste from both domestic markets and imports.<sup>104</sup>

Producer responsibility, whereby the producer of the waste is held responsible for safe treatment and disposal, is widely practised in hazardous waste management

China and India receive the bulk of global e-waste imports to Asia

Figure 25: Trans-boundary movements of e-waste to Asia



Source: UNEP<sup>105</sup>

The Chinese and Indian governments' attempt to enforce a ban on illegal recycling had limited success due to the practical difficulties of pursuing the dispersed network of illegal recyclers. Over time, the policy has shifted towards encouraging proper recycling through the establishment of industrial recycling parks and a license scheme for approved recyclers.<sup>106</sup> A study by UNEP found that sustainable technologies in e-waste recycling have evolved from individual and

corporate initiatives in both the informal and formal sectors. It specifically identified China and India as having significant potential to introduce processing technologies to support capacity building in the informal sector.<sup>107</sup> Stronger regulations and enforcement are seen in the more developed economies of Japan, Korea and Taiwan, which have incorporated the EPR approach in their hazardous waste management strategies.

As e-waste is a global problem with severe impacts on Asia, this section will focus mainly on the environmental risks of e-waste in Asia, and sustainable practices that can be adopted by e-waste recycling companies.

### Environmental risks

Hazardous waste disposed of without proper or sufficient treatment destroys the environment, often with uncertain, long-lasting effects. A myriad of toxic materials are released into the soil, water and air when hazardous wastes are dumped or not fully stabilised, with the common constituents being lead, cadmium, mercury, chlorinated substances and many more. Lead, for example, accumulates when released into the environment and has a long residence time compared with other pollutants. Soils and dust contaminated with lead are easily spread to humans through hand-to-mouth transfer.<sup>108</sup> The persistent nature of most toxic chemicals makes containment and rehabilitation extremely difficult, and as such, environmental risks from hazardous waste know no boundaries. The impacts on human health can be devastating, causing immediate sickness, long-term health degradation, or even death due to carcinogenic toxins.

Environmental and health risks of hazardous waste are extremely dangerous, often long lasting, and difficult to remedy

### Case Study: Formosa Plastics fined for illegal dumping of mercury-contaminated waste in Cambodia

A highly publicised case that is often quoted as a deciding factor in the formal establishment of hazardous waste management in Taiwan is the illegal dumping of hazardous waste in Cambodia by Taiwan's Formosa Plastics Group. When the mercury-contaminated concrete arrived in Cambodia on 26 December 1998, local residents thought that the materials, which had no warning labels, were some form of international aid and took them home. When news of death and illnesses broke out, Taiwan came under international criticism for alleged dumping. Formosa Plastics, which was fined US\$50,000, acknowledged that there had been deficiencies in its selection of the waste disposal company. Yuntai Waste Disposal Company, which was contracted to dispose of the mercury waste,



had been using its legal status as a cover for illegal practices, dumping wastes at several locations.<sup>109</sup>

The Formosa case brought to light the dire situation of hazardous waste in Taiwan, where insufficient sanitary disposal sites, lax enforcement and corruption had resulted in illegal dumping locally and abroad. Today, Taiwan has tight regulations to govern the collection, treatment and disposal of hazardous wastes.

### Case Study: E-waste crisis in Guiyu, China

Arguably one of the best-known e-waste recycling centres in the world, the town of Guiyu in Guangdong province, China, receives hundreds of thousands of tonnes of e-waste annually from exporters who channel the hazardous waste illegally into China. Using primitive and highly contaminatory methods, the e-waste is mined manually for copper, gold, and other metals. Migrant workers, who form the majority of the labour force, smelt computer parts in the open air to extract metals, use acid baths to separate precious metals from circuit boards and strip wires to recover the copper threads. The e-waste trade has made Guiyu's environment unfit for living. Water has to be bought from a neighbouring town because the streams in Guiyu are choked with acid waste. Reports of lead poisoning, miscarriage, skin damage and other illnesses among workers and children are further proof of the unprecedented damage that e-waste has and continues to inflict on Guiyu.<sup>110</sup>

### Sustainable practices

Sustainable practice in hazardous waste management requires companies to have rigorous and methodical environmental health and management systems that monitor each step of the treatment process. Environmental monitoring and protection should also include regular surveys of the environmental impact on the surrounding ecosystem, such as groundwater contamination and air quality. Responsible companies also seek verification of their operational integrity by inviting client audits and by asking their customers for feedback. International certification by or participation in global best-practice organisations also helps to build a culture of sustainability. An example is the UN-founded StEP organisation, a programme dedicated to developing sustainable solutions for e-waste management. Companies may also declare their commitment to a 'no-export' policy and guarantee that all wastes received will be treated domestically.

Asian hazardous waste management companies do not provide much disclosure on environmental sustainability practices other than stating that they adhere to local regulations and emission standards. One exception is UEM Environment, a wholly owned subsidiary of Khazanah Nasional Berhad, a non-listed investment body in Malaysia. In the sustainability report for 2008, UEM detailed the results of its environmental monitoring and compliance system, which includes quarterly analysis on the ambient air, emission stacks, wastewater, surface water and groundwater analysis. It also carries out biodiversity and bioasset monitoring to track the impact on flora and fauna. UEM has adopted the Dutch Intervention Values for soil and groundwater monitoring as general guidance, as there are currently no legislative requirements in Malaysia.<sup>111</sup>

Technology development is key in raising the environmental standards of hazardous waste treatment. Companies in Asia recognise the importance of R&D investment and seek to differentiate themselves from others through technological knowhow.


### Case Study Shenzhen Dongjiang Environment focuses on R&D for hazardous waste

Shenzhen Dongjiang Environment is a waste management company in China focused on industrial and hazardous waste treatment. It focuses heavily on R&D in order to spearhead new developments in resource utilisation of materials recovered from hazardous waste. At the Dong Jiang Research & Development Centre, research into and production of environmental technologies are underway, such as weight and volume reduction and resource recovery of contaminated waste effluent, sludge, spent organic solvents, greases and mineral oils.

The company also embarks on international co-operation projects with leading global companies. It has established joint-venture companies in China with Heritage Technologies, a subsidiary of the US resource recovery firm, Heritage Group. In 2005, it joined Veolia Environmental Services in the construction of the Guangdong Hazardous Waste Comprehensive Treatment Demonstration Centre (Phase 1), the first integrated hazardous waste facility in Guangdong.<sup>112</sup> Although no guarantee of the waste quantity or quality exists in the contract with the Guangdong local government, there are subsidies for the cost of treatment. Such contractual arrangements require robust and technologically proven systems to deliver a high-quality service.

Disclosure on environmental protection measures against hazardous waste risk is limited among Asian companies





### Case Study: Shenzhen GEM - Green innovations in e-waste recycling

Shenzhen Green Eco-Manufacture (GEM) is an e-waste recycling and resource recovery company in China. Its main products are ultra-fine nickel and cobalt powder extracted and reprocessed from e-waste. As a pilot and demonstration enterprise for a recycle economy, Shenzhen GEM has received many national awards for its technology and products.

One of the innovations of Shenzhen GEM is the development of a new packaging material that is made of electronic waste, sawdust, straw and other materials. It serves as a substitute material for wood and plastic and can be used in construction decking and packing, building and furniture.<sup>113</sup> The innovation demonstrates GEM's venture into sustainable building materials based on alternative uses of recovered e-waste resources.

In the high-risk business of hazardous waste, an industry traditionally viewed as dangerous and polluting, green innovations help to promote resource recovery. Super Dragons Technology, an e-waste recycling company in Taiwan, articulates such a view. The company processes recovered non-metallic wastes like glass and resin casings into construction materials and art pieces. While it acknowledges that such ventures may be unprofitable and earn minimal margins, they do serve to highlight the benefits of resource recovery.<sup>114</sup>

Asian companies can look to leading global firms for best practice in establishing environmental risk and monitoring systems and adapting them to suit local conditions.



### Case Study: Best practice at Sims Recycling

Sims Recycling Solutions is the world's largest recycler of electrical and electronics equipment. Sims provides a detailed tracking system that begins with issuing a tracking number for each consignment received to allow traceability and reporting to the client on the status of processing. A recycling certificate is issued to the client once the product has been disposed of in an environmentally safe manner. Sims also guarantees that all electronic data will be securely wiped and shredded for identity protection.

In its global environmental and social responsibility statement, Sims articulates that, 'No export and no landfill policies for all electronics and electronic components protect your environmental liability.'



### Case Study: Best practice at Stericycle

Stericycle provides comprehensive medical, pharmaceutical and hazardous waste management systems to hospitals and other industries, with a global presence in the Americas and Europe. The Stericycle Medical Waste Disposal Service provides detailed custody documentation to ensure regulatory compliance of biohazardous waste. All containers are scanned at every point in the process and customers have online access to information on their consignments. Information on the amount of waste generated by each department of the facility is also provided for customers to gain a better understanding of their waste generation pattern. Stericycle also conducts training programmes and waste audits to help hospitals identify, handle and segregate their medical waste, which reduces the quantity of medical waste they pay to manage.

Stericycle published the report, 'Best Practices in Selecting a Contracted Regulated Medical Waste Disposal Provider' in 2008. It contains a detailed vendor checklist as well as case studies of best practice. Recommended practices include evidence of emergency preparedness for treatment facilities and transportation, waste tracking and monitoring, analysis of waste minimisation data, and training in regulatory and environmental compliance.



# WASTE AND CLIMATE CHANGE

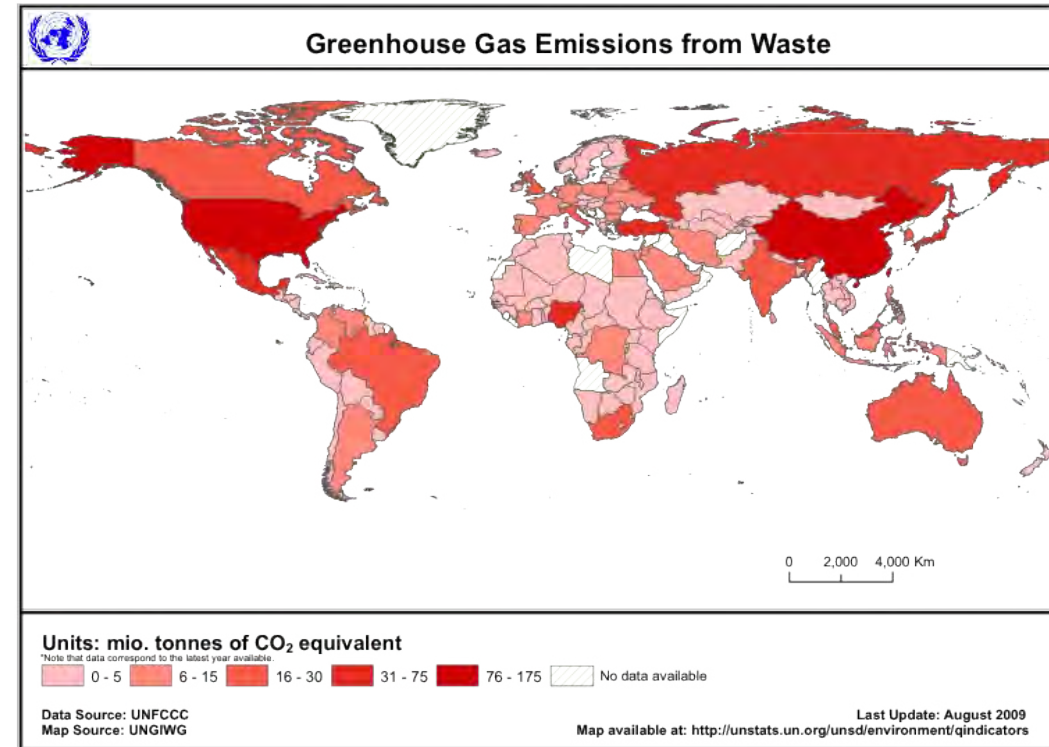
## Asia: vulnerable to climate change

Climate change and its consequences on the environment and economy have gained increasing attention from the global community since the signing of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. As the 2009 United Nations Climate Change Conference in Copenhagen did not achieve the binding targets for GHG emission reduction that many had hoped for, the task of climate change mitigation continues to be the responsibility of countries, corporations and communities. Asia and the Pacific, with the largest population in the world and fast-growing economies, are witnessing the highest growth in GHG emissions globally. With large populations living in poverty, climate change could have devastating effects on many of the most vulnerable communities.

## Waste and GHG emissions

The waste sector contributes about three to five percent of total global anthropogenic GHG emissions in 2005.<sup>115</sup> Landfill is the major constituent of emissions from waste, accounting for more than half of the total. Waste in Asia currently produces about 27 percent of global waste emissions. The Intergovernmental Panel on Climate Change (IPCC) anticipates a 50 percent increase in landfill emissions alone by 2020, due to increasing solid waste in developing countries, based on current waste management practices.<sup>116</sup> This increase is partially offset by stabilising or reducing landfill emissions from developed nations.

Figure 26: Global carbon footprint of the waste sector



Source: UN Statistics<sup>117</sup>

The IPCC recognises that GHG reduction is usually not the key driver but a co-benefit of waste policies and regulations that address a broad spectrum of environmental and social goals, such as alleviating dumpsite problems and improving public health.<sup>118</sup> Sustainable development in waste management across the full value chain will naturally reduce GHG emissions, whether it be switching to renewable fuel for collection trucks, increasing recycling activities, or diverting waste from landfill for composting and WTE processes.

## From GHG emitter to GHG reducer

The waste sector has both the potential and the technology to transform its position as a traditional GHG emitter to a GHG reducer.

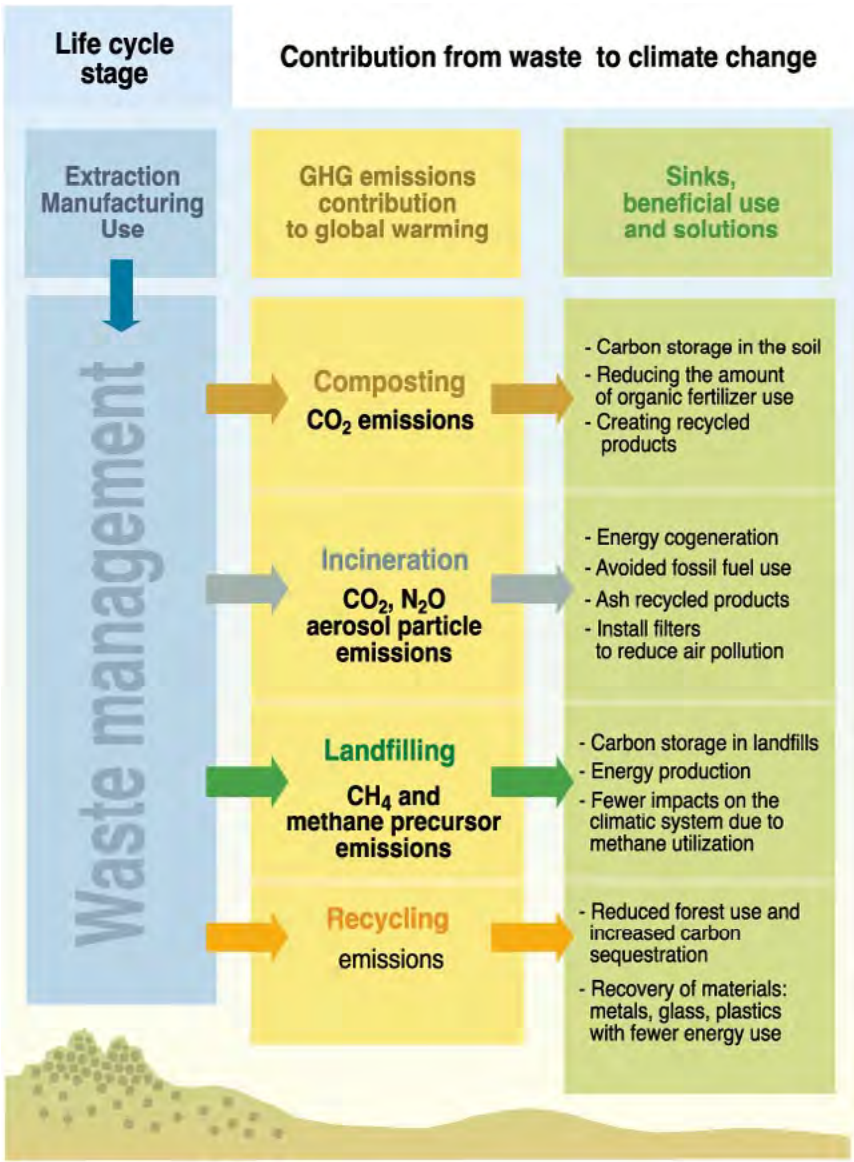
This is possible through the treatment practices discussed in the preceding section, such as landfill gas capture, composting and WTE systems. The paper 'Waste and Climate Change' published by the International Solid Waste Association (ISWA) gives several key insights into the potential of waste management as a GHG reducer.

Figure 27: Re-evaluating waste: ISWA's key messages

1. The waste industry occupies a unique position as a potential reducer of GHG emissions, with opportunities that have yet to be fully exploited.
2. The waste sector offers proven, practical and cost-effective technologies that can contribute to GHG mitigation.
3. Waste prevention, minimisation, reuse and recycling reduce GHG emissions by conserving raw materials and fossil fuels.
4. Organic wastes can be recovered as soil conditioners and fertilisers through aerobic and anaerobic biological treatment. These processes reduce GHG emissions by sequestering biogenic carbon in solids. They also improve soil conditions and add soil nutrients.
5. Waste offers a significant source of renewable energy, via incineration and other WTE processes, landfill gas utilisation and anaerobic biogas digester.
6. The transfer of sustainable technology to developing countries is critical to reducing GHG emissions. The Clean Development Mechanism (CDM) provides opportunities for technology transfer.
7. Waste policies and regulations can be strong national drivers to reduce GHG emissions.
8. Accurate measurement and calculation of GHG emissions is vital in setting and monitoring realistic reduction targets.

Source: ISWA<sup>119</sup>

Figure 28: How waste contributes to climate change: emissions and sinks



Source: UNEP<sup>120</sup>

## Clean Development Mechanism potential

### Opportunities and challenges

The CDM is a market-based mechanism developed under the Kyoto Protocol that allows industrialised countries to meet part of their emission reduction targets by investing in GHG-mitigating projects in developing countries. Industrialised countries benefit from the more cost-effective solution of investing in projects outside of their own countries, whilst developing nations gain in technology transfer, financial aid and sustainable development.

The waste sector features prominently in the list of CDM-registered projects. It is the second-largest group after the energy sector, with 474 projects representing 17 percent of total projects.<sup>121</sup> Indeed, waste projects in the ten Asian economies surveyed make up one-third of these 474 projects.<sup>122</sup> The Asian waste sector is in a strong position to gain from the benefits of CDM while working within the framework of national waste strategies and growing private-sector investment. Besides the immediate benefit of financial support to launch projects that would otherwise be economically unfeasible, CDM helps to nurture a system of monitoring and transparency by introducing an institutional framework with public access and feedback to CDM project documents. The principle of long-term emission savings in CDM also promotes the sustainable operation of projects rather than a single focus on plant construction and start-up, as is sometimes the case for local or international aid channelled through capital investment.<sup>123</sup>

However risks exist in CDM waste projects that call for careful evaluation to minimise any negative effects. One of the most common problems concerns landfill methane gas recovery projects, which make up most CDM waste projects globally and in Asia. The volume of gas that can be recovered is estimated using models based on landfill lifespan, waste volume, site criteria and other factors. The volume that can actually be extracted may deviate from the estimate, and is usually a lower figure. A market study by Pöry (Beijing) Consulting Company reported that the collection, recovery and utilisation ratio of landfill gas in China is unlikely to exceed 20 percent, while the limit for developed countries is 60 percent. A quick survey of projects in China supports these statistics. Companies embarking on CDM projects should take account of possible deviations in carbon emission reductions and their resulting impact on financial returns.

Figure 29: Actual vs estimated CERs\* in typical landfill gas CDM projects in China

Project	Monitored CERs (tCO <sub>2</sub> -eq)	Estimated CERs (tCO <sub>2</sub> -eq)	Ratio
Nanjing Tianjingwa Landfill Gas to Electricity Project	40,518	246,107	16.5%
Meizhou Landfill Gas Recovery and Utilisation as Energy	51,183	234,417	21.8%
Anding Landfill Gas Recovery and Utilisation Project	24,734	72,202	34.3%
Shenzhen Xiaping Landfill Gas Collection and Utilisation Project	80,616	315,781	25.5%
Jinan Landfill Gas to Energy Project	28,237	108,846	25.9%

\*CERs: Certified Emission Reductions, commonly known as carbon credits. Measured in terms of metric tonnes of carbon dioxide or its equivalent (tCO<sub>2</sub>-eq)

Source: Pöry<sup>124</sup>

Other risk factors include technology adaptability to suit local conditions, high transaction costs, local government support and policies, power grid connection and project size. This last factor was rated a strong risk in a survey conducted by the UNEP for Southeast Asian countries in 2009. To justify the cost of registration and long-term monitoring systems, CDM is usually financially viable only for larger-scale projects, which may impede the development of smaller-scale schemes.<sup>125</sup> Smaller projects could yield environmental benefits for the local rural community, but may be rejected due to financial considerations. Another vital consideration for energy recovery projects is the ability to supply power to the local grid company. This is a potentially complicated issue in terms of distance connection costs, negotiations with local grid operators and feed-in tariffs. The problem was highlighted as a key concern for biogas projects in China, due to their typically small plant sizes and long distances to the local grid.<sup>126</sup>

Encouraging signs are seen in some parts of Asia where governments have taken proactive steps to spur the growth of CDM waste projects. Malaysia, which has the highest number of registered waste projects in the ten Asian economies surveyed, has identified biogas and landfill gas as key areas for future CDM projects. Thailand encourages the private sector to reduce carbon

Other risks include technology adaptability, transaction costs, government policy, grid connection and project scale

emissions in energy projects, and this has led to the successful implementation of several biomass waste and biogas projects.

### **Case Study: China Everbright achieves Gold Standard Voluntary Emission Reduction status for methane recovery project**

China Everbright's Suzhou landfill methane recovery project, received the Gold Standard Voluntary Emission Reduction (VER) Project registration from Switzerland's Gold Standard Foundation, the first VER project in China. The Gold Standard is a certification scheme that recognises carbon offset projects with a strong element of long-term sustainable development. The certification is based on a Sustainability Development Matrix, which embodies the principles of UNFCCC criteria for CDM projects, namely:

- Additionality of emissions reduction compared with the norm
- No adverse environmental impact
- Consistency with host country's sustainable development strategy
- Emissions reduction benefits that are real and measurable
- No diversion of overseas development aid to finance carbon offset projects<sup>127</sup>

China Everbright announced in August 2010 that it had received its first revenue generated from the Suzhou VER project. The project achieved a total certified emission reduction of 204,337 tonnes for the period of April 2007 to July 2009. The company called the revenue receipt a 'major breakthrough... in its effort in carbon emission reduction' and aims to further its work in CDM projects.<sup>128</sup>

Reporting of waste-project carbon emissions by Asian companies is generally low. Carbon reporting on the whole is not yet a widespread phenomenon in Asia and is usually limited to the large-cap corporations. One exception is UEM Environment, which reported the carbon emissions from its operations in its sustainability report. However it did not provide information on whether any reductions were achieved through improved waste management systems. Such information would be useful for assessing its sustainability initiatives in carbon mitigation.

Few Asian waste companies report on carbon emissions

### **Case Study: KD Holdings contributes to emission reduction for parent company via WTE operations**

KD Holding's major shareholder is CTCI Corporation, a publicly listed Taiwan engineering and construction company. In CTCI's 2009 corporate social responsibility report, the company reported that the WTE plants operated by KD Holdings contributed to a reduction of 561,532 tCO<sub>2</sub>e in emissions.<sup>129</sup> It would be additionally useful for CTCI to include information on the emission reduction's contribution to the company's overall carbon footprint.

### **Case Study: Shanks Group reports potential carbon avoidance**

Shanks Group, a London-based integrated waste management company with a strong focus on mechanical-biological treatment, reported its potential carbon avoidance from waste treatment activities in its 2009/10 corporate responsibility report. This is a unique departure from traditional carbon reporting which typically focuses on gross emissions. Shanks reported both emission and avoidance figures separately and does not seek to claim all of the avoidance or use it for offsetting its emissions. The company takes the view that such information is important in helping stakeholders to understand the sources and relative importance of carbon emissions and reduction through its operations. The avoidance figures are reported according to the following categories:

- Renewable energy generated
- Waste-derived fuels produced and sold
- Materials separated for reuse/recycling (some are reused directly, others undergo reprocessing by third parties)

In addition, the company has set a target of increasing its potential carbon avoidance to in excess of 800,000 tonnes by the end of March 2015. In 2010, it had achieved a potential avoidance of 742,000 tonnes. Shanks has indicated that it will consider revising the target upwards to ensure that it remains a challenging objective.<sup>130</sup>

### **Recycling and CDM**

Recycling contributes to carbon emission avoidance by reducing the consumption of virgin materials. However, there is currently no approved methodology in CDM for recycling activities, and it is unclear whether a methodology will be established in the near future. If pursued, the quantification of GHG savings will be difficult as a full lifecycle assessment will be required for each recycled

Quantification of carbon emission savings from recycling is not yet established in CDM



item. In the report on 'Waste and Climate Change', ISWA provided estimations of GHG emission reductions of commonly recycled materials.

Figure 30: Estimated savings in GHG emissions for recycled materials

Material	Kg recyclables per 1,000 kg MSW	Kg recovered per 1,000 kg MSW	Kg CO2-eq saved per 1,000 kg material	Kg CO2-eq saved per 1,000 kg MSW
Paper	200	140	600 – 2,500	85 – 350
Aluminium	10	6	10,000	60
Steel	25	15	2,000	30
Glass	50	30	500	15
Plastic	80	50	0 – 1,000	0 – 50
Total	365	241		190 – 505

Source: ISWA<sup>131</sup>



ISSUES FOR  
RESPONSIBLE  
INVESTORS

**SOCIAL**



# OVERVIEW

## Social dynamics of waste

Across cultures, wealth and politics, waste has been and continues to be an integral element of human existence. The interplay of social forces on every aspect of waste from generation and collection to recycling and disposal exerts critical influences on the development and outlook of the waste management industry. Companies that understand and are able to manage the delicate balance between corporate goals and social concerns will not only improve the lives of communities they serve but also successfully become long-term community partners, providing an essential social service.

### Key insights

Four key insights can be drawn from the Asian waste sector:

- Social attitudes and stakeholder engagement have a significant impact on waste management policies and implementation
- Health and safety of workers and local communities are in need of higher standards, monitoring and enforcement
- Capacity building of employees is gaining importance in a traditionally low-skills-based industry
- Community engagement and partnership are vital to the long-term sustainability of waste management companies

Generally, the level of disclosure for listed Asian waste management companies on social issues is low, and public information on their interaction, or lack of, with the broader society is limited. Nevertheless it is possible to draw lessons from smaller or non-listed industry players that have taken a proactive stance in managing social concerns. As the waste industry in most parts of Asia is still under development, Responsible Research believes that over time the market will gain a deeper appreciation of the risks and opportunities and recognise the importance of social responsibility in creating sustainable businesses.

# WASTE AND SOCIETY

## Social matrix of waste management

Waste management systems constitute a key urban infrastructure need for all societies

Waste management systems constitute one of the basic urban infrastructure needs of modern societies. Human activities generate a wide variety of wastes and the challenges of providing sanitary waste management become more pressing with rising population growth and urbanisation. In many Asian countries there is an urgent need for expansion and upgrading of waste infrastructure. Poorly managed systems lead to environmental degradation as well as health and sanitation hazards. Since effective waste management contributes to better public health, it is seen as an essential public service. However, local governments are often aware of the issues but lack the capacity and financial means to implement fully comprehensive and integrated solutions. Solid waste infrastructure is often inadequate despite municipalities spending 20 to 50 percent of their budget on waste services. In low-income countries, the major cost of collection accounts for up to 90 percent of total expenditure.<sup>132</sup>

High-income countries in Asia enjoy relatively efficient waste management systems that make use of technology and both the private and public sectors to collect, treat and dispose of waste. The challenges that these countries face are concerned less with public health than with issues such as increasing recycling rates, building integrated solid waste facilities and pursuing national sustainability goals.

### Stakeholder engagement is critical

The challenges of public waste infrastructure present opportunities for the private sector to enter the market. Privatisation can bring about better-quality services at lower cost due to market competition, access to specialised expertise and the creation of an incentive-based system. Indeed Asia's more developed countries have a longer history and greater degree of privatisation than compared with their less developed counterparts.

Private companies wishing to replace or complement the government in providing waste services must understand the 'social matrix' of interested stakeholders who are affected by the decisions and actions of the waste management industry. In developing countries, non-governmental stakeholders are often instrumental in the development, implementation and effectiveness of overall waste management systems because local municipalities lack the ability to execute the task independently. Waste management

Developing Asia urgently requires upgrading of waste management systems to meet rising population and urbanisation needs



Companies that engage stakeholders in the planning and implementation of waste services are better positioned to succeed

companies must appreciate the intricacies of the social matrix and actively seek feedback and participation from stakeholders from planning to execution. Studies have shown that the success of private sector entry is characterised by an alignment of objectives with those of local institutions and beneficiaries as well as the regular engagement of stakeholders in decision-making during the planning cycle.<sup>133</sup>

Figure 31: Key stakeholders in waste management



Source: World Bank<sup>134</sup>

### Defining stakeholders

Broadly speaking, stakeholders comprise local and national governments, local communities, commercial enterprises, non-government organisations (NGOs), private waste management companies, informal sector workers and external support agencies. Depending on the contractual framework, private companies may not be required or allowed to interact directly with all stakeholders. For example, communication with residents may be restricted to certain permitted channels, and the government alone may manage funding from external support agencies.

Companies should understand the motivations of each stakeholder group and incorporate these considerations into their decision-making processes. Governments are primarily concerned with legal and contractual obligations, while residents demand quality of service at reasonable cost. Likewise, business owners look for best-priced services and waste minimisation to help them manage the costs of disposal. NGOs and local community groups may be most concerned with public health and environmental impacts. Informal sector workers that have traditionally performed the roles of collection and recycling in developing countries may feel threatened by the entry of large corporations.<sup>135</sup>

The consequences of not engaging stakeholders in the market development of waste management in Asia cannot be overstated. They include social protest against waste treatment facilities, poor recycling efficiency, and displacement of waste-pickers from their only means of livelihood. Conversely, successful stakeholder engagement has produced commendable results, such as active and transparent performance monitoring of service providers, source segregation and recycling by householders, and community investment to improve the lives of rural communities through energy recovery projects.

### Across developing and developed societies

Stakeholder engagement is important in the waste management agenda of both low-income and high-income societies. While most of the discussion so far may seem more relevant to developing countries, companies in developed markets also actively engage with governments and local communities. They may work more closely with local authorities than directly with communities on awareness programmes such as recycling initiatives or to implement a volume-based charging system. NGOs in developed countries can still be influential in waste policy but may have a different advocacy focus, such as greater concern with sustainability than basic public health. Another area of difference is the informal sector, which is usually not present or minimal in developed markets.

Stakeholder interest spans a wide spectrum of issues that must be well understood by corporations





## Case Study: Social responsibility at SITA and Veolia

Stakeholder engagement begins with companies identifying their social responsibility goals to determine the principles for developing specific actions targeted at each stakeholder group. While Asian waste management companies are generally active in community development programmes, few choose to communicate their social responsibility aims publicly. Two global leaders in the waste

industry, SITA and Veolia, publish their social responsibility goals specific to their Asian operations. These could serve as a reference point for other Asian companies seeking to increase public disclosure and communication with stakeholders.

### SITA's Social Responsibility<sup>136</sup>

'Environmental protection is becoming more at the heart of our society. This is why we develop our business with a high social awareness, so as to:

- Create long-term jobs, with good working conditions and work environment
- Optimise workers' safety
- Improve the citizens' environment
- Communicate with the public about our activities'

### Veolia's Social Responsibility<sup>137</sup>

"Training employees, promoting safety in the workplace, raising environmental awareness, liaising with social partners... social responsibility is something that affects every aspect of our work:

- Training employees, developing skills
- Protecting the health and safety of our teams
- Liaising with social partners
- Raising the general public's environmental awareness
- Developing socially responsible policies"

## Waste management as a global development goal

### Millennium Development Goals

The critical global importance of sustainable waste management is illustrated by the Millennium Development Goals (MDGs) of the United Nations (UN). The MDGs are a blueprint of development goals aimed at poverty eradication, economic growth and environmental sustainability for the global community.<sup>138</sup> They were adopted by world leaders in 2000 with specific goals covering a wide spectrum

of economic, health, environmental and other issues to be achieved by 2015.<sup>139</sup>

Waste management is an essential component across several goals, especially those related to the eradication of poverty, lack of education, child mortality, disease and environmental degradation.. All of these factors characterise the lives of many informal-sector waste pickers. Slum communities are often the most heavily affected by a lack of waste facilities and the dumping or poor management of waste, resulting in air, land and water pollution and resource destruction. A UN meeting held in Geneva in 2010 recommended a new 10-year vision for the trans-boundary movement of hazardous wastes, stressing the ties between waste management, achieving the MDGs, human health and livelihoods, and further highlighting the importance of waste management on a global platform.<sup>140</sup>

The MDGs are clearly relevant in Asia as the majority of the population lives in developing economies with limited social and environmental infrastructure. While waste management is not a specific objective within the MDG framework, countries like Thailand and Vietnam have explicitly set targets to increase waste collection and recycling services as part of their national MDG strategies. Globally, water and sanitation are developmental priorities that most countries integrate in their MDG country reports, along with climate change and natural hazards.<sup>141</sup>

Governments alone cannot undertake the huge task of implementing and improving waste management systems. Many opportunities are available to the private sector but it would be myopic for companies to view their role as purely commercial agents. Companies have the ability to support social development, which would strengthen their business sustainability and position them as leaders in the field.

### International Solid Waste Association

At industry level, ISWA perhaps best articulates the social goals of waste management. ISWA is an international non-profit organisation working in the public interest that promotes and develops professional waste management worldwide for a sustainable society. ISWA provides a platform for companies to interact and share best practices, challenges and solutions in waste management.

Waste management is critical to the Millennium Development Goals



Figure 32: ISWA's mission

### ISWA's Mission

- Efficiency in terms of environmental practice
- Social acceptability and efficiency in terms of economic viability
- Advancement of waste management through education and training
- Support to developing countries through ISWA Development Programme
- Professionalism through its program on professional qualifications.



Source: ISWA<sup>142</sup>

In Asia, national associations of ISWA are established in India, Malaysia, Singapore, Japan and Korea. This offers a convenient avenue for companies in these countries to gain access to the global network of private and public waste organisations.

### Case Study: First Training, Advisory and Promotion Centre for Environment and Waste Management to be set up in Singapore

ISWA, the Waste Management and Recycling Association of Singapore (WMRAS) and the National Environment Agency of Singapore have signed a Memorandum of Understanding to establish a Training, Advisory and Promotion (TAP) centre for environmental and waste management in Singapore. WMRAS is a country member of ISWA since 2001.

The TAP centre, the first of its kind in Asia, will spearhead sustainable waste management in the region and promote regional collaboration and public-private partnerships. According to the Chairman of the WMRAS 'With this collaboration, WMRAS will be well positioned to develop Singapore into the regional hub for environment and waste management-related innovations, services and technologies. This project will also enable us to service our members, stakeholders and collaborators in the region efficiently.'

### Four key programmes and initiatives will be implemented at the TAP Centre:

1. Outreach  
Increase awareness of waste management and recycling in Asia-Pacific through a variety of networking, research and collaboration platforms
2. Training and education  
Develop seminars and training courses by ISWA and local experts for both local and international audiences
3. Regional data resource program  
Provide a database of information for ISWA members who plan to venture into the Asia market
4. Expert adviser panel  
Convene a panel of experts familiar with environmental and waste management issues to offer advice and consultancy to both ISWA members and governments.<sup>143</sup>

### The role of government

#### Governments hold overall responsibility

A discussion of the social issues facing waste management would be incomplete without acknowledging the pivotal role of government. The key and most commonly discussed functions of government in waste management are national policy setting, local implementation and contract management of outsourced services (where these exist). A constant characteristic across governments in different economic and social settings is that they all retain ultimate responsibility for proper waste management. Governments are responsible for ensuring that the waste service provided is adequate, environmental and public health standards are met and efficiency and reliability targets are achieved. These fundamental responsibilities are not diminished in the privatisation process.<sup>144</sup>

#### Governments influence social attitudes

Governments can shape social behaviour and attitudes to waste management through either a principle-based or a rule-based approach. In Korea, Taiwan and Japan, laws are enacted to mandate waste separation and recycling, and these have helped progressively to develop a culture of responsible waste management at the household level. In Singapore, a more principle-based approach is adopted, whereby residents are not mandated to separate the waste and a flat fee rather than a volume-charging scheme applies to waste collection. The government, together with local waste

management companies, tries to promote voluntary recycling through community events and educational materials.

Figure 33: Recycling campaigns in schools across Asia



Demonstrating recycling in a scrap yard to children in China



Packaging waste awareness education in a Vietnamese school



Recycling programmes for schools in Singapore



Taiwanese children practising waste segregation

Source: Various<sup>145</sup>



Governments can also aid or hinder the progress of community participation through policies on feedback channels and transparency of information. They can choose to pursue or neglect educational initiatives in waste separation and recycling, which are often conducted in schools and local communities. Furthermore, a government's position towards other stakeholders can shape social attitudes. One example is the approach that governments can adopt towards the informal waste sector. The effects of privatisation can be harsh on the informal sector – a marginalised group of low-income waste pickers – if companies decide to forbid them from accessing the waste. Government policies that look after their welfare are usually absent or ineffective, and without formal government intervention, other stakeholders, including the private sector, may simply ignore their problems. However, supportive policies could require or at least encourage the private sector to co-operate with waste pickers or even integrate them into the formal waste and recycling network.

### Social attitudes

Social attitudes towards waste management vary significantly from country to country. In Asia, some societies embrace recycling as a normal way of life, while others struggle to meet national recycling targets due to lacklustre community support. Companies need to be sensitive to local attitudes and engage with the community to understand the motivations behind their reactions to proposed initiatives.

### Not In My Backyard (NIMBY)

The not-in-my-backyard syndrome, known as NIMBY, is used to describe opposition from the public towards the siting of waste treatment facilities near their homes. While most people agree that waste infrastructure is a public necessity, few communities welcome new waste facilities in their vicinity, for fear of pollution, odour, health problems and property devaluation. In such situations, the government negotiates with the community while the waste management company provides technical information to convince the people that it is able to operate the plant responsibly.

NIMBY opposition is most commonly seen in the construction of incinerators. There are numerous NGOs that oppose waste incineration as a treatment method, chiefly because of the threat to human health caused by dioxins. One of the best-known groups is the Global Anti-Incinerator Alliance (GAIA), an alliance of more than 500 grassroots groups, NGOs and individuals in more than 80 countries working against incinerators and promoting safe and sustainable alternatives in waste treatment. In Asia, GAIA

members include local associations in Malaysia, India, Indonesia, the Philippines, Taiwan and Nepal. NIMBY sentiments are growing in Asia due to the rise of incinerators as an emerging key treatment technology. Companies pursuing incineration projects must be fully engaged in public consultation processes so as to manage the risk of projects being postponed or cancelled due to strong public opposition.

### Case Study: NIMBY protest against incineration in Taiwan

Incineration is the mainstay of Taiwan's waste management policy. In the 1980s, policies were endorsed without much public debate, despite local community groups strongly opposing an increasing number of incinerators. In later years, the protest movement emerged with calls for democratisation, and ordinary Taiwanese saw themselves as key stakeholders who deserved to be heard by policymakers. The government tried without success to use financial compensation to ease the protests. As a result, nine out of 36 planned incinerators were cancelled.

The NIMBY opposition in Taiwan arose not only due to fears of environmental and health risks but as a result of the exclusion of public participation in the policy process. The top-down approach made the public suspicious and critical of the government's intentions and capabilities. Problems with dioxin and ash emissions in the early incinerators further eroded public trust. Today, incineration remains a key focus for environmental citizen groups in Taiwan.<sup>146</sup>

### Scepticism

The public may be sceptical towards waste management policies due to doubts about their effectiveness in meeting sustainability goals. Mandatory recycling, while commendable in scale and scope, has led to questions as to whether all the materials are indeed recycled and doubts about the cost-effectiveness of a centrally planned system. Korea has one of the highest recycling rates in Asia due to comprehensive laws that regulate both household and industrial recycling. However, it is reported that most Koreans commonly believe that most separated recyclables still end up in landfills and incinerators.<sup>147</sup> While specific reasons for this belief are not given, it may be due to a lack of public awareness of the recycling process and its outputs. Mistrust could also arise due to corporations misleading the public about recycling rates. Such attitudes may obstruct efforts by governments and the private sector to promote recycling and related initiatives.





# HEALTH AND SAFETY

## Performance, data availability and target groups

### In need of higher standards

Health and safety (H&S) practices in waste management have made significant progress over the last few decades both globally and in Asia. From manual handling of waste and open dumping to mechanised collection systems and enclosed sanitary landfills, progress is most evident in developing countries where the transition to modern waste facilities has been urgent and fast. Even in high-income countries, the upgrading of waste treatment facilities to improve H&S standards occurred relatively recently. In developed countries, open dumps were converted to controlled landfills with daily soil cover and perimeter drainage to curtail vector access just five decades ago. That was followed in the 1970s by the development of sanitary landfill technologies such as leachate treatment and gas collection systems, when people realised that controlled landfill alone could not prevent water pollution.<sup>150</sup>

Today, the waste sector still faces a critical need for improvements in H&S standards. Statistics from several developed countries show that workers in waste and recycling jobs have a higher rate of injuries than the national average. In the United Kingdom, the number of fatal accidents in the waste industry was over ten times the national average in 2001-02.<sup>151</sup> This figure fell to about four times the national average in 2007-08.<sup>152</sup> A similar trend is observed in the United States, where injury statistics in the waste industry are higher than the national average but have made progressive improvements over the years.<sup>153</sup>

### Limited information for the Asian waste sector

In Asia, information released on H&S standards in the waste sector by governments or corporations is very limited. Although multinational corporations do publish H&S data, the information is consolidated at the group level without specific details on regional statistics. While that makes detailed quantification a challenge, local studies in developing countries supported by anecdotal information do provide a broad picture of past and current trends in H&S standards. The statistics of developed countries also serve as a benchmark for middle- and lower-income nations as they continue to make progress in their H&S performance. However, the risks in developing countries are expected to be higher due to less sanitary methods of waste handling as well as poorer enforcement of worker protection measures.<sup>154</sup>

Despite improvements in H&S over the last few decades, the waste industry must continue to push for better standards in both developed and developing markets

## Case Study: Recycling scandal in Japan

In 2008, Oji Paper, Japan's leading market player in the paper industry, admitted to deliberate misrepresentation of the volume of recycled paper used in some of its products. For more than a decade, the company lied about the recycled content of its products, with published figures being as high as 50 percent when actual recycled content was only five to ten percent. The company issued an apology to their clients and customers for having 'betrayed public trust'. Five firms, including Oji Paper and Nippon Paper, were involved in the recycling scandal.<sup>148</sup>

### Resistance to change

The solution to overcoming resistance to change in waste management systems by communities and citizen groups involves active and honest engagement by the government and private sector. When new technologies are introduced to a community that has previously relied on traditional methods, it is natural that there be some backlash. This may be due to misguided information that the companies must quickly seek to correct. In the Philippines, for example, incineration of municipal waste is banned, so foreign investors introduced non-incineration technologies such as biomethanation. However the biomethanation projects were initially opposed by NGOs, which mistakenly thought that the technology carried similar risks to incineration, since both were labelled waste-to-energy systems.<sup>149</sup>

### Social tension and exclusion

Despite waste management being an essential public good for all, developing nations struggle to provide universal services. As a result, poor communities and slums living on the fringes of society are often excluded from waste service provision. While privatisation may bring relief to selected communities, it may also heighten social tensions if disparities between communities become more pronounced. Although the private sector may not be able to control or avoid this situation, it is still pertinent for them to be mindful of and sensitive to these social dynamics. In addition, exclusion from services is a real concern for the informal sector. Informal sector workers are key contributors to collection and recycling efforts in poorly serviced communities but they are rarely included in social welfare networks. Companies should recognise their contribution and work with governments to ensure their livelihoods are not further diminished due to privatisation.

Scepticism and resistance to change often arise due to lack of public awareness, misguided information and poor government track records in managing waste systems

The marginalisation of waste pickers as a result of privatisation could exacerbate social tensions





Figure 34: Basic H&S protective equipment for waste management workers



Source: Various<sup>155</sup>

Most of the information in this report on H&S in the Asian waste sector is drawn from a comprehensive report published by the World Bank in 2006. The report 'Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle- and Lower-Income Countries' contains a wealth of information on the health issues of workers, local communities and the informal sector in Asia as well as other developing regions based on local and regional studies.

Figure 35: 'Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle- and Lower-Income Countries' – A World Bank report



H&S information released by Asian companies and governments is very limited

Source: World Bank<sup>156</sup>

### Case Study: H&S data published by multinational waste management firms

Some of the H&S data released by multinational waste management companies in their sustainability reports include the following:

- Total number of occupational accidents leading to sick leave
- Total number of working days lost through occupational accidents
- Total accident frequency rate
- Total accident severity rate
- Severe accident frequency rate (definition depends on country legislation)
- Vehicle accident rate
- Number of H&S convictions
- Number of employees who received safety training
- Expenses on healthcare benefits
- Details of healthcare plans

Beyond the statistics, some companies, such as Shanks, have taken disclosure one step further by providing details of H&S convictions, a relatively uncommon revelation in the industry.<sup>157</sup>

## Understanding the impact on different social groups

As an integral component of social infrastructure, waste management has far-reaching H&S impacts on different social groups. In addition to the most commonly studied group of employees working directly in the sector, the health conditions of local residents who are in regular contact with waste services are a key focus for research. Furthermore, the informal sector of waste pickers must not be neglected, as they often suffer the most severe H&S problems during the course of collecting and recycling waste. A summary of the types of H&S risks and the causes is presented in Figure 36.

Figure 36: Defining H&S risks

### Types of H&S risks

The H&S risks in the waste sector can be broadly classified into two categories:

#### 1. Occupational health and injury risks

Employees and waste pickers are exposed to these risks arising from material handling, emissions and equipment. Common problems include:

- Back and joint injuries from lifting heavy containers and driving landfill and loading equipment
- Respiratory illnesses from ingesting particulates, bio-aerosols and volatile organics during waste collection, and from working in smoky and dusty conditions at open dumps
- Infections from direct contact with contaminated material
- Puncture wounds leading to tetanus, hepatitis, and HIV infection
- Injuries at dumps due to surface subsidence, underground fires and landslides
- Headaches and nausea from anoxic conditions at disposal sites with high methane, carbon dioxide and carbon monoxide concentrations
- Lead poisoning from burning of materials containing lead, such as batteries, paints and solders

#### 2. Environmental health and accident risks

Communities living and working in the vicinity of waste facilities are exposed to these risks as a result of emissions, water pollution and a lack of adequate pollution control measures at facilities. Common hazards include:

- Contaminated leachate and surface run-off from disposal

- facilities affecting ground and surface water quality
- Volatile organic compounds in air emissions with suggested links to cancer, birth defects and infant mortality
- Animals feeding on solid waste providing a food-chain path for transmitting animal and human diseases
- Uncollected wastes and clogged drains giving rise to stagnant waters in which mosquitoes breed
- Uncollected wastes providing food and breeding sites for insect, bird and rodent disease vectors

### Key Factors of H&S risks in developing countries

Developing countries face higher H&S risks in waste management due to inadequate understanding of the severity of the problems, poor enforcement of protection and strained financial resources. The problems are further exacerbated by the following characteristics of waste infrastructure in developing economies:

- Low collection service level
- Labour-intensive system of waste handling
- Disposal most commonly by open dumping, followed by open burning
- Inadequate training and education on personal hygiene and occupational safety
- Informal-sector workers comprising mainly women and children
- Disposal of hazardous waste together with municipal waste
- Proportionately higher cost of implementing systems that meet high H&S standards due to import costs and currency exchange variations, further inhibiting governments in developing countries from improving current systems

Source: World Bank<sup>158</sup>

### Occupational H&S

In developing countries in Asia, occupational H&S in the waste industry generally lacks clearly prescribed standards and regulations or suffers from inadequate monitoring and enforcement. The H&S risks faced by private sector workers are mainly concentrated in the waste treatment stage as that is the subsector with the highest degree of privatisation. The lack of disclosure by Asian companies as well as foreign players operating in the region is a concern for investors wanting specific data and trends on the H&S track records of these companies. Without such information, investors would have to review local news sources and accounts by NGOs that report on any H&S issues or violations by corporations.

Occupational H&S hazards in the developing waste sector threaten employee wellbeing




### Case Study: Alleged worker exploitation at Nine Dragons

Nine Dragons is one of the largest paper-recycling companies in China. In late 2007, protests by workers and NGOs against labour rights abuses caused much controversy and brought regional and even international attention. The Students and Scholars Against Corporate Misbehavior (SACOM) is one of the main NGOs that reported the company's alleged wrongdoings. SACOM is a Hong Kong-based NGO that monitors corporate behaviour and advocates for workers' rights by collaborating with workers at the workplace level.<sup>159</sup>

Prior to the outbreak, the chairperson of Nine Dragons was criticised for attacking national policies on labour protection and proposing the exemption of labour-intensive companies from signing permanent contracts with employees and the cutting of income tax for the wealthy. Shortly afterwards, worker protests broke out and accusations of the company's mistreatment of workers, its failure to meet minimum safety standards, its severe penalty system and workers' deaths came to light. In the report by SACOM, the alleged adverse working conditions include dusty and badly ventilated paper-sorting facilities, manual soaking of papers which caused infection and inflammation, inadequate or lack of personal protective equipment such as gloves and masks, exposure to chemicals and hot steam and injuries from forklifts and paper-making machines. Furthermore, the company was accused of forcing workers to pay penalty charges for causing work accidents. The report also highlighted other labour violations, including exploitative labour contracts, wages below the legal minimum and underprovision of rest days.<sup>160</sup>

Eventually the All China Federation of Trade Unions (ACFTU) stepped in and acknowledged that there were labour violations at Nine Dragons but denied that the company was a 'sweatshop' as claimed by SACOM.<sup>161</sup> The chairperson of Nine Dragons also countered with claims that SACOM was setting out to damage the reputation of Chinese enterprises during the Olympic Games and that SACOM had received funding from Europe to badmouth Chinese companies.<sup>162</sup>

### Case Study: Alleged violation of Bhopal hazardous waste disposal



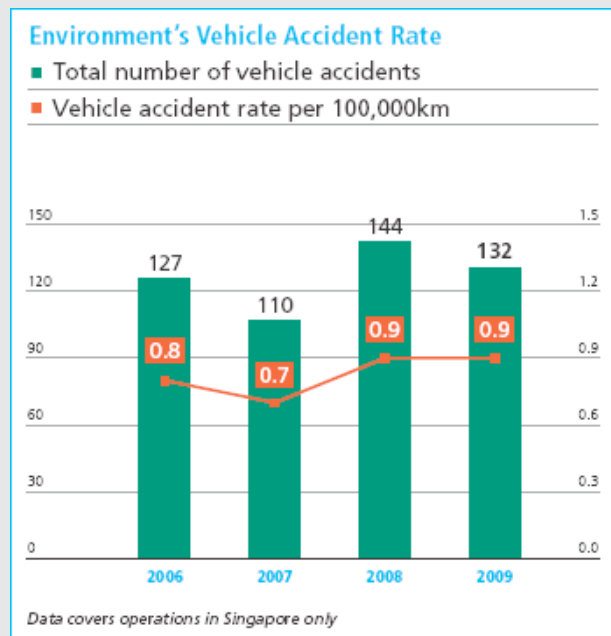
The disposal of hazardous waste from the Union Carbide factory in Bhopal remains from one of the worst industrial disasters in India's history. The incident led to accusations that the local pollution board overlooked violations of the Hazardous Waste Rules by the appointed contractor to dispose of the waste.

Ramky Enviro Engineers was granted consent by the Madhya Pradesh Pollution Control Board to operate the incineration plant for treating the waste. However it was reported that, prior to the award, the Central Pollution Control Board issued a notice to Ramky regarding non-compliance with the Environmental Protection Act. There were also major safety concerns about the incineration plant allegedly not being appropriate for treating the highly toxic waste. This was because the plant was located within only 500 metres of the nearest village and did not have up-to-standard treatment, storage and disposal capabilities.

Despite the concerns, a trial run was conducted. During that time, six workers were taken ill and partially lost their vision. They were admitted to a hospital and reported to be out of danger soon afterwards. Local residents protested against the incineration citing a lack of appropriate pollution-control measures. In response, Ramky explained that the worker incident had nothing to do with the toxic waste from Bhopal.<sup>163</sup> Following the incident, survivors of the Bhopal gas tragedy staged a protest at the local government office demanding an 'immediate explanation for criminal negligence towards the health and safety of workers and residents and complicity with Ramky group of companies.'<sup>164</sup>

One of the few companies to publish information on H&S performance is Sembcorp Environment. While the information is limited to accident frequency and severity rates and vehicle accident rates, it is a commendable effort which other Asian companies can learn from.

### Case Study: Sembcorp Environment reports accident statistics



Sembcorp Environment recognises the accident rates of waste collection vehicles as a key safety indicator in its waste management operations. In 2009, the company achieved a reduction in the total number of vehicle accidents. Ongoing preventive and corrective measures include counselling and internal disciplinary systems with the direct involvement of the labour union. To promote responsible driving, awards are given to drivers who achieve three years of traffic accident-free service with the company.

The company also reports on the accident frequency rate and severity rate. The 2009 report provided an explanation for the increase in accident rates for the previous year as well as details of the preventive measures taken. This included additional toolbox meetings on the importance of H&S, more frequent spot inspections at operational sites and new guidelines relating to the use of safety equipment.<sup>165</sup>

The provision of health benefits is an essential component of a company's overall H&S management system. Employees have the right to understand their health coverage options and companies must ensure that such information is communicated thoroughly.

### Case Study: Personalised health benefits by Veolia

Veolia Environmental Services in Hong Kong provides a customised life and health insurance scheme for its employees so as to address individual needs more effectively. Employees can choose from a range of health coverage options how they wish to spend a specified amount allocated by the company. For example, employees can waive basic medical coverage if they already have better coverage outside of work or opt to have a more comprehensive solution above the basic requirements. If they choose less expensive coverage than that provided by the company, the money saved can be used to reimburse medical expenses while any excess above the amount allocated can be paid in leave days, subject to conditions.

Through this initiative, Veolia hopes to achieve better budget control whilst providing sufficient coverage for all employees. It also believes that the scheme will benefit its staff by giving them greater freedom to use their health insurance more effectively.<sup>166</sup>

### H&S risks to local communities and waste pickers

H&S risks, real or perceived, are the most common reason for community protests against the establishment of waste facilities in neighbourhoods. While most governments, corporations and academic scholars do not deny that such risks exist, there is considerable debate over the severity of health problems that can be quantifiably attributed to waste activities. In almost all debates a range of viewpoints is present, from waste management advocates who argue that the latest technologies have reduced health impacts to a minimum, to community groups who stress that long-term detrimental effects persist and damage environmental and public health.

Anecdotal information provides a glimpse into the state of H&S risks on local communities and the informal sector. National statistics are virtually absent due to the inherent difficulty of data-gathering in the waste environment. Although there may be no perfect solution, companies should endeavour to engage local stakeholders to minimise the environmental and health impacts of their operations and continually seek improvement measures to reduce risks to a minimum.

Considerable debate on the H&S risks of waste facilities to local communities calls for active engagement by companies



### Case Study: Health impacts on communities and waste pickers

A selection of case studies from the World Bank report, 'Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Middle- and Lower-Income Countries,' provides anecdotal information on the H&S risks that local communities face from the waste sector:

- An epidemiological survey of 400 waste pickers in Calcutta, India indicated that waste pickers at open dumps were particularly vulnerable to increased incidence of respiratory diseases. The waste pickers experienced a 71 percent incidence of respiratory disease, compared with just 34 percent in the control group
- In 1995-96 at the Payatas dumpsite in Metro Manila, Philippines, of the 600 families living within 0.5 kilometres of the open dump, the missionary clinic reported three cases of infants born with imperforate anuses and nine or ten cases of children with cerebral palsy
- Pulmonary function tests conducted on residents and waste pickers surrounding a Bangkok dump found 40 percent to be below normal. Total suspended particulate levels at the dump averaged 490 mg/m<sup>3</sup>, far exceeding average Bangkok residential levels of 260 mg/m<sup>3</sup>. Methane levels of 20 mg/m<sup>3</sup> were measured at the dumpsite, whereas nearby city background levels were just 0.3 mg/m<sup>3</sup>.

The extreme poverty of waste pickers coupled with their lack of formal H&S protection results in a disproportionately severe impact on their welfare. Waste pickers in some countries have formed alliances to fight for greater recognition as well as H&S protection from the government. In general, there seems to be a lack of direct communication between corporations and waste pickers, probably because waste pickers tend to view corporations as taking over their means of survival or exploiting them through privatisation. Despite the apparent hostility, companies can still make a positive impact on the lives of waste pickers by supporting government initiatives that upgrade the skills of waste pickers and by providing employment and healthcare benefits to those who are willing to join the formal sector.

Figure 36: Protests by waste pickers



Waste pickers suffer disproportionately from H&S risks due to lack of formal protection

Source: WIEGO<sup>167</sup>

### Case Study: Waste pickers in India demand H&S coverage by government

The Alliance of Indian Wastepickers (AIW) is a national network of 35 organisations comprising waste pickers, informal recyclers and itinerant buyers. The AIW has a presence in 22 cities across India and focuses on peer support, policy advocacy and cross learning.

In its report 'Livelihoods with Dignity', released in March 2010, the AIW called for formal health and safety benefits from the government that have traditionally been denied to waste pickers. Recommendations from the National Labour Commission about Rag Pickers include mandatory provision of medical and life insurance coverage to all authorised waste pickers through the levy of a welfare tax from citizens. In addition, the Commission also recommended restrooms, drinking water, and toilet and crèche facilities to be established at dumping grounds and landfills. The AIW also advocates for government support to organise waste pickers into co-operatives and give them the right to collect recyclable materials at household level. AIW believes that this will provide better working conditions, reduce health hazards and ultimately improve the economic status of waste pickers.<sup>168</sup>

Despite numerous studies conducted in developed countries, statistics are generally inconclusive in showing a clear correlation between incineration and health problems. However, according to a survey by the UK Department for Environment, Food and Rural Affairs (DEFRA), public attitudes towards waste management facilities are strongly negative, with particular attention focused on dioxin emissions from incineration plants. The DEFRA report suggests that attitudes are shaped as a result of controversial and contradictory information from the waste industry and environmental pressure groups. A natural human instinct and survival mechanism to avoid diseases by direct contact with waste, along with low public trust of the government, further cements any negative perceptions.<sup>169</sup>

These factors also apply to Asian countries, where health impacts of incineration are widely feared. The most practical solution is for governments and companies to engage communities in open discussion. Learning points can be drawn from the UK DEFRA report, which found more positive attitudes to waste facilities in Denmark, Sweden and the Netherlands. This was attributed to several key factors, including trust between the developer and local communities, involvement or commitment of local councils, confidence in the regulator, and emphasis on an integrated waste strategy with waste minimisation and recycling.

### CASE STUDY: Protests against incineration in China

Several community protests against incineration projects in China surfaced during 2009, with one of the most prominent cases being the Panyu incineration project in Guangzhou. In November of that year, hundreds of residents broke into a protest following an unsuccessful consultation meeting with local officials. According to a public opinion poll by the Guangdong provincial social research and study centre, nearly 92 percent of residents believed the project would seriously harm their health and the environment, while more than 97 percent opposed the construction of the plant.<sup>170</sup> The Panyu project has since been put on hold as the government seeks to conduct further environmental impact assessments. In a rare move, the Guangdong provincial government urged residents to put forth their views and advice via the internet.<sup>171</sup>

While protests against incineration are unlikely to change the Chinese government's national strategy of pursuing many more such projects in the near future, fears of health hazards and dissatisfaction over the lack of public consultation could mean a difficult process for companies as they embark on long-term contracts to serve these communities. Trust in both governments and incinerator companies must be established before the more strategic goals of integrated waste management can be pursued.



**Protests by local residents in Panyu against the construction of the incinerator.**

Source: China Daily<sup>172</sup>, chinaenvironmentallaw.com<sup>173</sup>

# CAPACITY BUILDING

## Developing human capital

### Skills training improves social perceptions of the waste sector

The waste sector is traditionally viewed as having low-skilled and poorly paid workers. In low-income countries where privatisation has not taken place, members of the disadvantaged or lower classes of society usually manage the waste. Even with the entry of the private sector, in many developing countries the co-existence of the informal sector continues to reinforce the social perception that the waste sector ranks low in skills development and labour quality. Fortunately, this perception is changing, especially in more developed markets. Governments and private companies are making conscious efforts to upgrade the skills and knowledge of employees through a variety of training programmes. Employee welfare services are also being developed and strengthened to enhance staff satisfaction, commitment and professionalism.

As with H&S data disclosure, Asian companies provide very limited information on employee welfare and training. In countries where the government promotes productivity and skills development schemes specifically for the waste industry, companies are more likely to implement formal employee training programmes. For example, the Singapore government launched a multi-agency initiative to improve the standards of the cleaning sector (typically viewed as part of or supporting the waste industry). This includes a new skills training and qualification framework, voluntary accreditation schemes and grant provisions for companies that send their employees for training. The accreditation scheme was developed after consultation with industry partners. The initiative received wide support from the waste industry association WMRAS and reached out to more than 50 companies within the first few months of implementation.<sup>174</sup>

Some employee welfare and training statistics in Asia can be drawn from multinational companies that report on such items on a regular basis. Asian companies that are keen to enhance their reporting can begin by focusing on the more common parameters such as training hours and budget. They can then progressively increase the scope of information as their internal reporting capability improves.

## CASE STUDY: Employee welfare and training data released by multinational waste management firms



A survey of employee welfare and training data released by multinational waste management companies finds the following indicators to be most commonly reported. Note that health and safety data, which was discussed in the preceding section, is excluded from the following list.<sup>175</sup>

### Training

- Percentage of workforce trained
- Average number of training hours per employee
- Average training expenses per employee
- Breakdown of hours by training topic (technical skills, people management, environment, H&S, sustainability, ethics, etc.)

### Working conditions

- Absenteeism rate
- Overtime rate

### Employment and recruitment

- Voluntary employee turnover
- Hiring rate
- Percentage of permanent and temporary contract staff
- Number of women employed

### Employee engagement

- Findings of employee satisfaction survey

### Labour union engagement

- Number of labour-management dialogues
- Number of collective agreements signed

### Diversity

- Gender distribution rate
- International (non-local) employment rate
- Proportion of disabled individuals

## Waste sector: a source of green jobs

The International Labour Organisation (ILO) recognises the waste sector as providing 'green jobs' that promote sustainable development. Green jobs are defined as decent work created in economic sectors which reduce the environmental impact of the sectors, ultimately leading to environmentally, economically and socially sustainable enterprises and economies.<sup>176</sup>

The Green Jobs Initiative is a partnership established between the ILO, the United Nations Environment Programme, the International Trade Union Confederation and the International Organisation of Employers. Waste management serves the cause of environmental and public health, which qualifies it as a key provider of green jobs. However, these jobs must go beyond the image of being green and provide real sustainable benefits to the employee, community and environment. The ILO cautions that many jobs that are green in principle may not be so in reality because of unsustainable business practices that cause more environmental damage than improvement. Such cases are seen in waste and recycling, biomass energy and construction, which tend to have proportionately higher H&S risks and low incomes.<sup>177</sup>

The Green Jobs Initiative serves as a reminder to waste management companies that they are in a good position to create sustainable employment only if they invest in adequate health, safety and welfare systems. When done right, companies can truly be called ambassadors of sustainable employment, by providing green and decent jobs that effectively link the MDG goals of poverty reduction and environmental protection and make them mutually supportive.<sup>178</sup> Companies can tap into the resources provided by ILO for the Asia-Pacific region, which include training programmes, conferences, job events and capacity-building projects that bring together governments, non-profit organisations and the private sector. Waste management is a key focus, as seen in a recent ILO staff training session in India, which identified waste and recycling as a priority cluster for action.<sup>179</sup>

## Employee welfare and training in Asia

### Reporting by Asian companies

Several Asian waste management companies have taken the lead in reporting on employment issues and statistics, which provides a starting platform for investors to engage with them on employment issues.

## CASE STUDY: Comprehensive reporting by UEM Environment



UEM Environment stands out among Asian companies in its depth of sustainability reporting on employee welfare and development. A list of social indicators on employment is published in its sustainability report, which includes average payroll, age distribution, training hours and budget, and gender diversity. Some of the initiatives that are less commonly seen in Asian companies include UEM's focus on gender equality. UEM reported that the proportion of women to men is even in all subsidiaries, except at the hazardous waste centre where the nature of the job is traditionally skewed towards men. UEM states a no-preference policy in job advertisements and does not differentiate the salary between men and women. In addition UEM is committed to increasing the proportion of female to male employees by establishing relationships with a number of colleges as recruiting grounds and seeking to be more aggressive in ensuring a good diversity of applicants and employees.

UEM conducts employee satisfaction surveys and has implemented changes in its healthcare policy in response to employee feedback. This includes increasing the hospitalisation limit coverage for executive positions to US\$15,800 and for non-executive positions to US\$9,500 regardless of their grade. For employee's dependents, the company will cover children until the age of 18 or 23 if they are still studying. Another area of change is to host more orientation programmes, get-together sessions and briefings by heads of department, following comments from staff that there are communication issues between management and employees.

UEM tracks its progress via a self-assessment scorecard of sustainability indicators. This serves as a useful tool for investors to understand and evaluate progressive improvements made over time.<sup>180</sup>







### Case Study: People development and welfare at Sembcorp Environment

Highlights of staff development and welfare initiatives at Sembcorp Environment were presented in the group's 2009 sustainability report.

- Recipient of a commendation award from the National Trades Union Congress, in recognition of the company's strong commitment to growing a constructive partnership between the company and the union, and for its continuing focus on skills upgrading, work safety and employee welfare.
- Close engagement and consultation with labour unions during the divestment process of a subsidiary cleaning business. The entire divestment process was undertaken in parallel with an engagement and consultation exercise with the Building Construction and Timber Industries Employees' Union (BATU). All employees affected by the divestment were offered continued employment under the new business owner based on the same terms and conditions as under Sembcorp. As a result, 99 percent of employees were transferred to the new business. In appreciation of past service, the affected employees were offered an ex-gratia payment payable upon completion of three months' service with the new business owner.

Statistics on employee welfare and training are provided at group level. There is no specific information available on the environment business alone.<sup>182</sup>



### Case study: Veolia China provides training materials customised to the local context

Veolia Environmental Services in China developed the 'Professional Paths' training material, aimed at providing common, knowledge-based training for all new hires, with emphasis on diversity, mutual respect and teamwork. The Professional Paths materials, translated from the French 'Parcours professionnels', cover a wide spectrum of topics, including company background knowledge, relationships and behaviour, hygiene and security, and environmental awareness. Extensive work was done in localising the legal and practical content to enhance the learning process for Chinese employees.

With the training budget earmarked for the next two years, Veolia China aims to train every one of its recently hired workers and to extend the programme to other employee categories.<sup>183</sup>

 Progressing on track  Completed  Not met			
Performance Metric	Status	2008 Progress	2009 Moving Forward
Productivity of Resources		<ul style="list-style-type: none"> <li>• 17% increase in treating waste from 2007</li> <li>• Decrease planned shutdown by 3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Aiming for 20% increase in treating waste</li> </ul>
Expansion and Business Growth		<ul style="list-style-type: none"> <li>• Secured 4 new local contracts</li> </ul>	<ul style="list-style-type: none"> <li>• Secure new overseas contracts and at least one new local contract</li> </ul>
<b>People, Organisation and Development</b>			
<ul style="list-style-type: none"> <li>• Developing excellent leaders across middle management</li> </ul>		<ul style="list-style-type: none"> <li>• 3% out of 32 managers rated excellent by UEM Leadership Centre (ULC)</li> </ul>	<ul style="list-style-type: none"> <li>• Focus on improving Proficiency Level &amp; Competencies Gap Analysis for Finance, Business Development, Managing Information System (MIS), Human Resource and Corporate Communications by 40%</li> </ul>
<ul style="list-style-type: none"> <li>• Retention of top critical position and implementation on Succession Planning Assessment and closing the Competency Gap Programme</li> </ul>		<ul style="list-style-type: none"> <li>• Increased retention rate by 12.65% compared to 2007</li> </ul>	<ul style="list-style-type: none"> <li>• Improve implementation of Succession Planning Assessment and close the Competency Gap by 50%</li> </ul>

### Progress rating of people, organisation and development in UEM Environment's report

Taiwan-based KD Holdings also provides information on employee welfare by charting progress and describing ongoing efforts.<sup>181</sup> A more detailed and quantitative approach such as that of UEM would enhance public understanding of the company's efforts in staff development.



Companies must understand labour regulations and manage contractual labour issues carefully and responsibly

## Responsible management of contractual labour issues

The transfer of public services to the private sector involves critical labour issues such as rehiring and retrenchment. Companies should be mindful of their social and contractual responsibilities to ensure wherever possible a smooth transition and minimal disruption of the existing workforce.

### Case Study and Interview: Social issues and responsibility at Ramky

#### Ramky assures rehiring of municipal workers

The award of the integrated municipal solid waste contract by Greater Hyderabad Municipal Corporation (GHMC) to Ramky Enviro Engineers sparked protests and strikes by municipal workers fearing retrenchment once Ramky takes over waste services in the municipality. Ramky gave assurances and reiterated to the 15,000 sanitation workers that there would be no retrenchment of existing staff and additional employment would be generated in door-to-door collection, transportation, segregation and processing of waste.<sup>184</sup>

Labour laws in India protect the interests of workers and regulate the contracting of services. The Contract Labour Act of 1970 provides that contracting out services can be prohibited if a municipal authority already provides those services departmentally. Indian municipal authorities that are keen to privatise waste management services need to consider their options carefully, as the state government can prohibit private sector entry at the request of labour unions if it believes that such actions will hurt the interests of existing workers.<sup>185</sup>

#### Interview with Goutham Reddy, Executive Director of Ramky

Social issues such as employment, dismissal, NGO engagement and community development are a critical and indispensable aspect of waste management in India. Ramky views the key social challenges in the Indian waste market to be the prevalence of NIMBY attitudes and low acceptance of the polluter-pays principle. For example there are still municipalities that expect to be paid for the disposal of their wastes instead of having to pay for those services, although the number is reducing.

To overcome these challenges, Ramky conducts education programmes and awareness campaigns, and works closely with NGOs and local communities to organise community development programmes aimed at raising the acceptance of waste management as a paid service. In India, a public hearing is a legal requirement for all environmental projects. During the public hearing, Ramky provides information on the benefits and negative effects of the project on the community. NGOs are very involved in this process. However, the process of public engagement is not necessarily formal or organised in India. Communication with NGOs and the community often continues after the public hearing and extends into construction and implementation stages, depending on the specific conditions of each project. The key issues that NGOs are most concerned with are local employment arising from the project and the environmental and health impacts on the community. To promote healthy living, Ramky organises health awareness camps for the people (both residents and waste pickers) who live in the vicinity of the waste facility, usually within a two to three kilometre radius. These camps educate the community about health issues such as eye and dental problems, viral fevers, AIDS and Hepatitis B. They also provide basic health checks that help detect early warning signals of underlying health problems.

Ramky focuses wherever possible on the integration of waste pickers into its operations. There are two stages of waste picking in most communities: the first stage involves retrieving recyclables at communal dustbins, while the second stage refers to activities at the disposal site. Almost all of Ramky's facilities employ waste pickers, but the number varies, as some waste pickers are resistant to joining the company, preferring to preserve their independence and way of livelihood. Engaging waste pickers is a dynamic and sometimes challenging process, as there is no one solution that fits all communities.

## Supporting the informal sector

### Waste pickers protest against privatisation

An estimated one percent of the urban population of Asian, African and Latin American cities makes a living by waste picking. In Mumbai, India, waste pickers contribute an estimated US\$1 billion annually through waste recycling and the manufacture of products from recovered materials. Globally waste pickers produce an economic output through scavenging activities in the region of several billion US dollars a year.<sup>186</sup>

Figure 37: The scavenging activities of waste pickers contribute to the economy



Source: United Nations University<sup>187</sup>

However, in addition to lacking formal H&S protection, the informal sector suffers from both a lack of institutional support and a lack of capacity training. Much of the work done in Asian developing countries to improve the skills of waste pickers is spearheaded by NGOs and the waste pickers themselves. Successful recycler co-operatives in the Philippines, India and Indonesia are testimony to the resilience and tenacity of the waste pickers, who struggle to upgrade their capabilities and increase their earnings.<sup>188</sup> Despite the apparent lack of direct interaction between the private sector and waste pickers, companies that refuse to acknowledge them run the risk of fuelling social unrest and causing self-inflicted reputational risk. On the other hand, companies that take the bold step of trying to engage or integrate waste pickers into the formal workforce with fair employment benefits and training programmes stand to gain as responsible corporate citizens.

### Case Study: Holcim supports waste pickers through a capacity building and integration programme



Holcim, a leading international cement producer, supports a local capacity building and integration initiative of waste pickers in Iloilo, Philippines. The project was led by GTZ, a federally owned organisation from Germany that supports international co-operation for sustainable development. The objective of the Recycling Partnerships project was to demonstrate how informal waste pickers could be successfully integrated into the formal solid waste management system. Holcim played a vital role by partnering with the local municipality to train waste pickers in waste-sorting techniques to produce alternative fuel for the local Holcim cement plant. The GTZ report stated that, 'the partnership with Holcim was and still is the most important element in order to realise the AFR (alternative fuels and raw materials) sorting activities and thus to establish the group as a professional waste sorting enterprise.'

After a successful 100-day trial at the waste separation plant, Holcim signed a memorandum of agreement with the municipality and GTZ. In the agreement, Holcim committed to a fixed payment per kilogramme of AFR produced by the waste pickers for a fixed duration and took responsibility for providing packaging materials and transportation. Holcim also engaged with the relevant authorities to obtain approval for co-processing segregated waste in its cement production, as incineration of mixed waste is illegal in the Philippines.

Following the success of the project, the Holcim-GTZ project team is now looking into increased production and a long-term agreement with Holcim. Holcim is interested in the possibility of registering the project for CDM status, based on the carbon emissions reduction from waste co-processing.<sup>189</sup>



Waste pickers at Iloilo received training to work on the sorting belt and bale press machine



# COMMUNITY ENGAGEMENT

## Understanding the power of community

### Companies engage communities in a variety of ways

Much has been said in this report about the importance of the community as a key stakeholder in the overall waste management framework. Support from local communities is a key ingredient in the success of private sector projects. This is especially true in developing countries where the management of waste is closely tied to the daily lives of residents. The privatisation of waste services often requires changes in the way residents handle waste, from simple adjustments like different collection points to more challenging tasks such as source separation. With co-operation from communities, companies will be able to run their operations more smoothly, receive better sorted wastes and in turn conduct downstream treatment and disposal activities more effectively.

Asian companies recognise the power of communities and adopt a variety of ways to harness that energy. A common observation, however, is that they tend to focus more on community involvement than community investment. Typical activities include community-based waste segregation and recycling projects, resource recovery initiatives, public consultation sessions and public disclosures of plant operating performance. In contrast, community investment focuses on activities that companies undertake beyond their core commercial services to benefit the communities in which they operate.<sup>190</sup> By proactively investing in the communities where they operate, source and distribute products, companies create a positive impact for both the community and the business.<sup>191</sup> For companies that do engage in community investment, the most common avenue is through CDM projects that have a social impact element in addition to the environmental benefits.

### Respecting boundaries

In instances where access and rights to waste is a sensitive issue, companies may find themselves at odds with the local community. Such situations are common in developing Asian economies, where the large informal sector of waste pickers stakes its claim to the waste stream. To avoid income displacement and social unrest, some companies choose the path of co-existence, in which the informal sector maintains some access to the waste and continues its collection and recycling activities alongside the formal system. Other companies have taken a tougher stance by running operations that effectively exclude waste pickers from any access. The issue of identifying and respecting boundaries can become very challenging and companies must decide for themselves the most appropriate and responsible step to take.

The next section presents case studies of Asian companies and their community engagement initiatives. It covers both listed and non-listed companies, as the latter group provides useful insights into the risks and opportunities of community initiatives. Some of the smaller, non-listed companies could be forerunners of a developing market and their experiences offer learning points for larger corporations.

## Asian experiences in community initiatives

From door-to-door collection models and pilot recycling projects to charitable support of dumpsite rehabilitation, Asian companies have found new ways of engaging communities that resonate with local cultures and needs.

### Case Study: IL&FS launched waste segregation project in India

IL&FS launched a door-to-door waste collection initiative to encourage source segregation of waste in a number of Indian cities. A comprehensive and structured approach was taken, beginning with the signing of a memorandum of understanding with local municipalities and NGOs. The initiative started with a pilot project comprising about 2,000 households over six months. The aim was to create a self-sustainable model for citywide replication. IL&FS involved different groups of stakeholders from the conceptual stage of the project, including NGOs, women's groups, waste pickers, ward councillors and resident welfare associations. Awareness programmes were conducted for the different groups to highlight the importance of the project. This was followed by a selection of suitable workers from the waste picker community for specialised training. Continuous supervision and monitoring with help from the local authorities kept progress on track. The project achieved many tangible results, such as overall improved cleanliness, reduction in waste generated, successful segregation and improved working conditions of waste handlers.<sup>192</sup>

Lessons from both listed and non-listed companies are presented





### Case Study: ITC's Wealth out of Waste paper-recycling initiative

ITC Paperboards & Specialty Papers (ITC) began the Wealth of Waste (WoW) programme in 2007 to promote paper recycling and waste segregation by households. The company saw potential in increasing paper recycling, as the level of recycling in India at that time was a poor 14 percent compared with 70 percent in Europe and the United States. However, ITC decided to do things a little differently. Instead of source segregation of each type of recyclable waste, ITC promoted co-mingled recycling, by providing a single recycling bin to households for all their recyclables. This greatly simplified the task for households and encouraged greater participation. ITC also paid the households for the recyclables. The collected materials were transported to a junkyard for sorting, and there the paper waste was recovered and sent to ITC's reprocessing plants.

The pilot project was highly successful in Hyderabad and quickly spread to 15 municipalities in less than two years. To cope with the rising collection volume, ITC partnered with Ramky Enviro Engineers to help. The project caught the national interest and the Ministry of Urban Development urged ITC to replicate it in as many as 52 municipalities across the country. ITC is proud of the environmental, social and economic benefits that the project has generated, through resource recovery and waste minimisation, extra income for households, and the lower cost of raw materials for the company.



WoW workers collecting recyclable waste

Source: ITC<sup>193</sup>

### Case Study: China Everbright held public consultation for new incinerator project

In a large-scale public consultation meeting, a first for solid waste management projects in Zhenjiang, China Everbright fielded many questions from the public on a proposed incinerator for the city. The project had caused widespread community concern, which made the session a very important avenue for people to seek clarification from the company and local government.

In response to concerns over dioxins, the company explained how the flue gas treatment system would control the emissions to within acceptable levels. On the subject of waste segregation, China Everbright gave assurances that it would fully support the government's efforts to promote source segregation. In the meantime, the company would ensure that the system was technically capable of handling mixed waste. It also shared information about how the odour control system and backup firing mechanism would work. In response, residents suggested that there should be real-time monitoring and supervision of environmental standards by both local authorities and the public, as well as a public electronic display of online emissions data outside the facility.<sup>194</sup>

### Challenges of community partnerships

A thought-provoking paper by the London School of Economics (LSE) presented a series of case studies on the successes and failures of companies that attempted to build partnerships with local communities in Asia for waste treatment projects. The report sheds light on the practical challenges that these companies faced when trying to implement new and foreign technologies in communities that resented the intrusion. While some of the company names are not revealed, the paper nonetheless provides useful insights on the struggles of community partnership.

Community partnership is a deliberative and long-term process that must be quick to adapt to changing local conditions

### Case Study: Successes and failures in community partnership

Dr Tim Forsyth's paper, 'Building deliberative public-private partnerships for waste management in Asia', presents case studies of foreign investment in waste projects in the Philippines and India to highlight the effectiveness of community partnerships in creating sustainable waste management models for developing countries.

The paper introduces to the waste sector the concept of co-operative environmental governance, which requires companies to seek a positive negotiating space between investors and citizen groups. It aims to enhance local support and accountability while maintaining business objectives. Projects without careful and deliberative partnerships may result in public resentment and marginalisation of the poor. In developing countries, the process of engagement may involve informal and overlapping channels of communication without a structured government framework. In addition, companies should understand the suitability of technologies for the local environment. WTE projects tend to be more controversial, all the more so when recyclables are removed from the waste stream.

Two of the case studies presented in the paper are summarised below:

**Biomethanation project in the Philippines-** A US-based investor built a WTE plant in Ayala Alabang, a town south of greater Manila. The plant used animal waste from local farms to generate power. The project started off on a positive note with an agreement signed between the investor and a local women's NGO that agreed to provide waste collection services for the plant. However the project ran into problems after a few years of operation. First, the land rent escalated as local landowners falsely believed that the plant would be highly profitable simply because the waste came from a wealthy neighbourhood. Second, the company had counted on the recycling of inorganic materials to provide additional profitability for the project. This meant that it had to control both the organic waste stream used for biomethanation and the recyclables stream. However waste collectors and truck drivers removed the valuable recyclables while delivering the waste to the plant. The project became economically unviable and was eventually closed.

**Biomethanation project in India-** An Asian-based company with several international shareholders launched a biomethanation plant in the town of Lucknow in Uttar Pradesh. From the outset, the company recognised the existing social system of waste pickers and their reliance on waste as a source of income. It partnered with the NGO group Exnora, which specialises in waste management issues. The team established a system of allowing the pickers to segregate the waste and recover the recyclables for their use before sending the remaining organic waste to the plant. The company hoped also to generate social goodwill by sending the message to the community that biomethanation is a clean energy project as it does not burn plastics or deprive people of livelihoods. It was a win-win situation, as the arrangement assured a steady stream of clean organic waste for the plant, a top priority for successful operation.<sup>195</sup>

## Creating social impact through CDM projects

The climate change benefits of the CDM are examined in the Environment section, which looks at companies that have launched successful CDM projects to reduce carbon emissions. An equally important goal of the CDM is to promote sustainable development in developing countries through human, institutional and system-wide capacity development that brings the financial and technological benefits of the CDM to less advantaged participants.<sup>196</sup> Companies can create a positive social impact on the communities they serve by implementing CDM projects and tapping into the resources offered by international agencies. An example is the World Bank Community Development Carbon Fund (CDCF), which extends the benefits of carbon finance to poor communities in developing countries that would otherwise find it difficult to attract carbon finance because of country and financial risk. CDCF projects distinguish themselves from other CDM projects through an exceptional focus on community benefits and participation, providing opportunities for people to obtain clean water, improve better health conditions and gain jobs. The CDCF achieves these goals by linking private investors with community development projects, providing a channel with lower transaction costs and lower risks for all stakeholders.<sup>197</sup>

CDM projects are well established in Asia and several waste management projects have created sustainable development for local communities. Companies that embark on long-term community development initiatives will benefit from the generative impact of social goodwill.



Figure 38: Key elements of a successful waste management programme with a social mission



Source: Responsible Research

### Case Study: Malavalli Power Plant in India

The Malavalli Power Plant project, a Gold Standard CDM project by Indian-based MPPL Renewable Energy, was recognised by the Gold Standard CDM certification board for its contribution to environmental, social and economic development for the local rural community. The plant uses low-density crop residues and other biomass fuels found in the local area. An estimated 21,000 tonnes of CO<sub>2</sub> emissions are avoided each year. Besides the environmental benefits, the social impact from the project is far-reaching. It includes:

- Job creation
- Promoting organic farming practices using organic fertilisers produced locally from waste
- Converting a waste stream into a new source of income; an estimated US\$975,000 has been generated through the biomass supply chain
- Establishment of an NGO to manage power distribution, billing and collection of revenues from the project<sup>198</sup>

While sustainable development objectives are strongly promoted in CDM projects, cases exist where companies allegedly fail to deliver on their promises to the community, causing social benefits to fall through. There are even reports of companies which created negative environmental impacts that threaten livelihoods.<sup>199</sup> This serves as a reminder for constant monitoring of projects to ensure that no irresponsible actions thwart the original intention and result in adverse consequences for the community.

Monitoring is necessary to ensure CDM projects deliver promised social and environmental benefits

### Case Study: AT Biopower rice husk project in Thailand

The rice husk power plant CDM project by AT Biopower in Thailand utilises rice husk from Thailand's rice plantations to generate clean renewable energy. The project aims to promote development and employment in the local community. According to the company website, an estimated US\$2.2 million will be generated through employment for local people during construction. A social contract with the local community is signed to develop jointly the residential areas, temples, schools and health centres. Additionally the people will enjoy additional income through long-term rice husk supply contracts with local rice mills.<sup>200</sup>

However, several reports have highlighted problems allegedly caused by the plant after operation began in 2005. There were accounts of farmers in the vicinity who complained of reduced rice yields after the plant commenced operations and ash started to descend on the rice fields. Health problems were reported which could possibly be linked to the silica content in rice husk ash, known to cause occupational lung disease among unprotected workers. Residents became increasingly concerned about possible negative health and environmental impacts. AT Biopower responded that they were not aware of the alleged health problems and added that the company maintained an environment and health insurance fund earmarked for the community.<sup>201</sup>

Other reports have surfaced which argue that rice husks are not waste and should not be used as fuel. Local farmers use the rice husks to absorb chicken droppings, creating a natural agricultural fertiliser that is essential to the harvesting process. With the rice husks being used by the power plant, farmers can no longer afford the higher price and have to switch to chemical fertilisers, destroying a self-sufficient and organic-based system.<sup>202</sup>

In April 2010, it was reported that AT Biopower had cancelled plans to build more rice husk power plants due to difficulties in securing the feedstock. The company commented that collection was difficult as the agricultural waste was spread out on the fields, which increased costs.<sup>203</sup>

ISSUES FOR  
RESPONSIBLE  
INVESTORS

## GOVERNANCE





# GOVERNANCE IN ASIA

## Understanding good governance

### The foundation of civilisation

Good governance is the foundation of modern society

Governance exists in all facets of modern society, comprising international, national and local governments and corporate practices. The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) describes governance as 'the process of decision making and the process by which decisions are implemented (or not implemented)'.<sup>204</sup> While most discussions focus on formal governance involving governments and corporations, it is important to recognise all of the critical actors of the informal structures. These include local communities, NGOs, academia, religious leaders and many more. The informal actors can be active participants in the governance process and act as watchdogs to alert the public of any unethical or illegal corporate or government practices.

Figure 39: Key elements of good governance



Source: UNESCAP<sup>205</sup>

### Governance indicators for Asia

The Worldwide Governance Indicators project by the World Bank assesses the quality of governance for countries worldwide across six dimensions of governance: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law and corruption. The East Asian region displayed a fairly consistent performance for the time period of 1996 to 2008, faring in the 25<sup>th</sup>

to 50<sup>th</sup> percentile and 50<sup>th</sup> to 75<sup>th</sup> percentile for the six categories. The most improved category is political stability while the most deteriorated is government effectiveness.<sup>206</sup> On the whole, there remains to be significant room for improvement in Asia, where the quality of governance has not kept pace with the much more rapid economic development in the region. Government leadership in good governance leads the way for promoting strong corporate governance in the private sector. In countries where the government suffers from corruption and low transparency, it is likely that the private sector has a poor track record as well.

Asia fares average in worldwide governance indicators, which must be improved in tandem with its rapid economic development

Figure 40: Worldwide Governance Indicators for East Asia and OECD regions

Region	Percentile Ranking for 2008 (0–100)					
	Voice and Accountability	Political stability	Government effectiveness	Regulatory quality	Quality of law	Corruption
East Asia	49.9	59.4	46.5	42.1	52.9	45.1
OECD	90.6	81.9	88.7	91.2	90.2	90.2

Note:  
East Asia comprises the following countries and territories: American Samoa, Brunei, Cambodia, China, Cook Islands, Fiji, Guam, Hong Kong, Indonesia, Kiribati, North Korea, South Korea, Laos, Macao, Malaysia, Marshall Islands, Micronesia, Mongolia, Myanmar, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Philippines, Reunion, Samoa, Singapore Solomon islands, Taiwan, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu and Vietnam.

Source: World Bank<sup>207</sup>

## Corporate governance

### The changing landscape of corporate governance in Asia

Corporate practices that encompass key elements of good governance underpin the integrity and success of the private sector. Specifically, corporate governance is concerned with the key issues of board accountability, transparency, shareholder rights and disclosure. Good corporate governance contributes to improving economic efficiency and growth as well as enhancing

investor confidence.<sup>208</sup> Institutional investors such as mutual funds and pension funds act in a fiduciary capacity on behalf of individual investors and have the potential to exercise informed ownership through monitoring.<sup>209</sup>

In Asia, legal, institutional and regulatory frameworks for corporate governance have seen significant growth and change in the last decade and continue to strengthen in both developed and developing markets. The Asian financial crisis of 1997 is often said to have triggered the first wave of corporate governance reforms across the region, bringing about fundamental policy and regulatory changes and stronger enforcement. The recent global financial crisis once again put corporate governance in the spotlight as stakeholders examined how responsible business practices played a pivotal role in how companies fared in the volatile environment. As the region assesses the progress that has been made, it also needs to review the areas that demand improvement and stronger regulatory enforcement.

Asian leaders draw upon global standards and principles to formulate corporate governance, and represent an important voice in the international community on regulatory development. Five Asian countries – China, India, Japan, South Korea and Indonesia – are members of the Group of Twenty (G-20) Finance Ministers and Central Bank Governors, a forum for international dialogue on national policies, international co-operation and financial institutions.<sup>210</sup> Global regulatory reform such as prudential regulation for the banking sector urged by the G-20 should have a cascading impact on the broader Asian corporate governance landscape.

A summary of the improvements in Asian corporate governance over the past decade and the key areas of expected changes was presented by Jamie Allen, Secretary General of the Asian Corporate Governance Association (ACGA), in his coverage of Asian corporate governance issues in October 2009. ACGA is an independent and non-profit organisation that works with investors, companies and regulators in the implementation of effective corporate governance practices in Asia.<sup>211</sup>

Figure 41: Improvements in corporate governance in Asia over the past decade

Area	Improvements observed
Financial reporting	More detailed disclosure rules; faster reporting; quarterly reporting; disclosure of 'material' events, director pay, director dealings
Board composition and function	Introduction of independent directors, board committees, and director training; higher expectations placed on directors; higher fees paid to directors
Shareholder rights	Formal rights strengthened; retail activist groups formed; institutional investors started voting their shares and taking engagement more seriously
Accounting/auditing	Local accounting and auditing standards brought more into line with international standards; independent regulation of audit profession in some markets
Regulatory enforcement	Financial regulators still underequipped, but greater focus on enforcing listing rules and key securities laws (e.g. insider trading)

Source: ACGA<sup>212</sup>

# CORPORATE GOVERNANCE IN THE ASIAN WASTE SECTOR

Figure 42: Key issues in the second decade of corporate reform in Asia (2009 – 2018)

Area	Improvements required
Strengthen shareholder rights	Proxy voting: earlier release of final agendas and circulars of general shareholders' meetings; full voting by poll; publication of detailed voting results Fairer 'general mandates': tighter rules on dilutive private placements Privatisations/ de-listings: protection for minority shareholders is weak in much of Asia Related-party transactions: ensure that minority interests are protected in connected transactions
Enhance regulatory enforcement	Regulatory backbone: investors would like governments to send a clear and consistent signal on enforcement Securities law: a faster, fairer approach to dealing with insider trading and fraud Listing rules: investors want to see more rigour and efficiency in the enforcement of listing rules by exchanges Corporate governance codes: rarely enforced or promoted; exchanges could be more proactive (e.g. in IPOs) Transparency: regulators could be better at disclosing their enforcement actions and processes
Improve board functioning	Board composition: is it appropriate, given the strategic direction and needs of the company? Board committees: more thought to be given to the choice of committees, how they operate and what they should achieve Independent directors: if implemented well, they can bring considerable value to a board, but controlling shareholders need to allow them to voice their opinions Director expertise: regulations and investors' expectations are continually changing. A good director is an informed director
Merge corporate social responsibility and corporate governance into 'Environment, Social and Governance (ESG)'	Greater focus on the need for investors to incorporate ESG risks into the investment process. For example: United Nations Principles of Responsible Investment (UNPRI) Greater attention on whether newly listed companies meet requisite environmental and labour standards Global pension funds looking for fund managers who can invest along ESG lines Should it be E + S + G, or 'G' as the basis and framework for 'E & S'?

Source: ACGA<sup>213</sup>

## Low board independence and limited disclosure

### Key observations

The ten companies in the Asian waste management sector benchmarked in this report display a low to average level of quality in corporate governance. Using the Asian Sustainability Rating (ASR™) system, the companies were scored on several governance indicators covering corporate governance policy, reporting, financial control, board quality and independence, audit quality and best practices. The full details of the ASR are provided in the Conclusion of this report. All ten companies are listed on Asian stock exchanges, with the exception of ZhongDe Waste Technology AG, which is listed on the Frankfurt Stock Exchange.

Several common characteristics are observed in most of these companies:

- Board independence of less than 50 percent, and in several cases less than 30 percent
- Same personnel serving as Chairman and CEO
- No provision for remuneration and/or nomination committees
- Lack of or limited information on risk management

### Board independence and the Asian culture

None of the companies surveyed has a majority of independent directors. This is typical of Asian listed companies, which have a stronger tradition on family ownership and relationship building compared with Western corporations. For the same reason, Asian companies often have the founder holding the positions of both Chairman and CEO. The common belief is that such a structure will provide strong and consistent leadership for strategy planning and long-term growth. Studies done by the Hong Kong Stock Exchange (HKEX) echo these findings; 36.8 percent of all companies listed in 2007 did not comply with the mandatory provision for separation of Chairman and CEO roles.<sup>214</sup> It is interesting to note that the HKEX prescribes a set of mandatory codes as well as recommended best practices. In accordance with the principle-based 'comply or explain' model, companies may deviate from code provisions but must account for their non-compliance.<sup>215</sup> Such an approach allows investors to have a better understanding of a company's position on governance issues.

The ten Asian companies benchmarked here have low to average scores in corporate governance based on the ASR

Low board independence with less than 50 percent independent directors and non-separation of chairman and CEO roles are common among the companies surveyed

# CORRUPTION

## Absence of remuneration and/or nomination committee

This analysis found no evidence of remuneration and/or nomination committees in several of the benchmarked companies. This observation is based on Responsible Research's best efforts to review annual reports, governance reports and other publicly disclosed information. Some companies did not mention the reason for not having a committee, while those that did briefly stated that the function of such a committee was not required for the current state of operations. In China, at present, there is no mandatory requirement for listed companies to have a remuneration committee.<sup>216</sup> Another observation is that the risk management process, a common feature within the discussion of the audit committee, is not comprehensively addressed by most companies and entirely missing for a few.

The companies benchmarked here are the pure plays in the Asian waste sector. As highlighted in the Introduction, a substantial number of waste management companies in Asia are private subsidiaries of larger listed corporations or conglomerates. Although scoring for these larger companies was not performed for this report, it is expected that both the parent and subsidiary companies would display a higher quality of corporate governance.

## Strengthening of corporate governance is expected

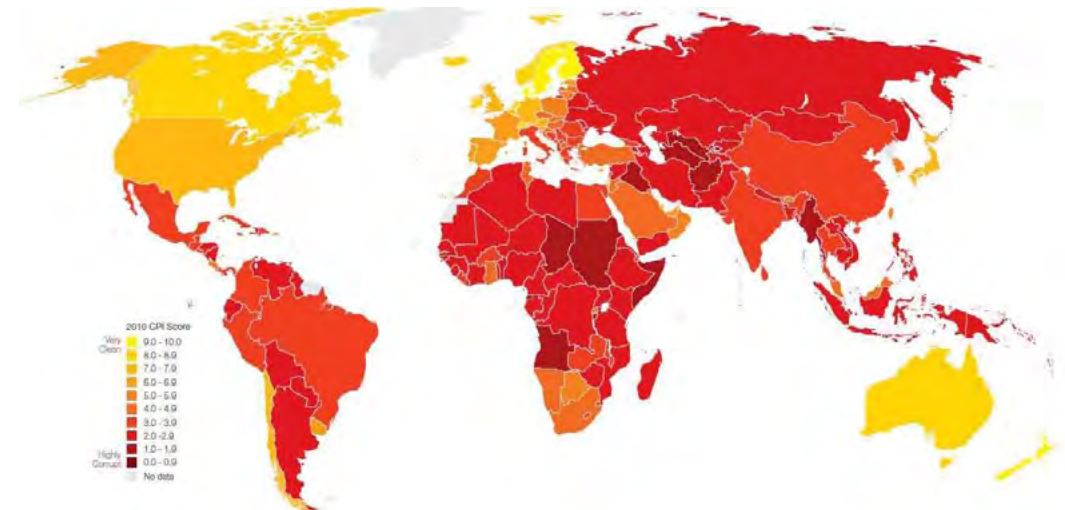
Given that the waste management sector is at an early stage of development, further growth and possible market consolidation may bring about sharing and introduction of best practices among the players. The sector will also benefit from national and regional improvements in corporate governance. Governments in Asia are taking active steps to strengthen corporate governance. The convergence of Thai accounting standards with international standards, the push by the Securities and Exchange Commission of Thailand for more minority shareholder protections, and the reform agenda of the Securities Commission of Malaysia, which introduced new institutional mechanisms for market activism and regulatory enforcement, are all testament to continuous improvements in corporate governance. Multilateral agencies can also play a role in promoting good governance through financing local waste management projects. The ADB prides itself in making a positive impact on corporate governance in the region by insisting on high standards of governance in the administration of private sector projects.<sup>217</sup> Detractors of the ADB, however, argue that the agency has insufficient oversight of funded projects. One ADB investment questioned is its clean energy private equity fund, which reportedly did not have regular internal assessment or focused management but rather a set of 'suggested' and poorly enforced safeguards on environmental and social issues and corporate governance.<sup>218</sup>

## Corruption in urban infrastructure impedes development

### Poor governance and financial strain increase corruption risk

Corruption in Asia across governments and corporations remains one of the most critical impediments to sustainable development. Studies such as the Worldwide Governance Indicators project by the World Bank and the annual Corruption Perceptions Index by Transparency International consistently show that a lot of work remains to be done to reduce and eradicate corruption in Asia. According to the Corruption Perception Index (CPI), the more developed countries in Asia perform better in anti-corruption measures; Singapore leads the region with a CPI score of 9.2, compared with significantly lower scores of between 2 to 4 for the Philippines, Indonesia, India, Thailand and China.<sup>219</sup>

Figure 41: Corruption Perception Index, 2010



Source: Transparency International<sup>220</sup>

Corruption has long been known to be widespread in the infrastructure sector.<sup>221</sup> Corruption in urban infrastructure systems such as water, sanitation and solid waste both threatens environmental and public health and undermines the development of a mature and socially responsible private sector. The institutional framework and financial resources for infrastructure systems have not kept pace with urban growth and the demand for environmental services in developing countries. Studies have shown that many of the weaknesses of infrastructure programmes stem from the corruption that plagues

Governments  
in Asia are  
taking active  
steps to  
strengthen  
corporate  
governance



# GOVERNMENT POLICIES

## Waste is a highly regulated business

The waste sector is governed by a multitude of regulations from the national policy office, state bureaus and local municipalities. As shown in the Social Aspects section, stakeholder engagement with governments and local communities is vital to the success of waste management projects. While regulations may impose strict rules on environmental compliance and performance targets, companies also benefit from government policies that promote sustainable waste treatment methods such as WTE. Renewable energy feed-in tariffs are an important source of revenue for WTE projects, but companies must understand the requirements to qualify for preferential tariffs as well as the terms and conditions on the sale of electricity.

## Companies can benefit from renewable energy tariffs for WTE projects

The renewable energy feed-in tariff (FIT) is a policy instrument used by many countries worldwide to promote renewable energy development. FIT schemes offer long-term purchase agreements on the sale of renewable electricity, ranging typically from ten to 25 years and applicable for every kilowatt-hour (kWh) of electricity produced. FITs are designed specifically based on the type of renewable energy, technology, project size and location. The success of FIT policies rests on three key provisions: guaranteed access to the grid, stable and long-term purchase agreements, and payment levels based on the true costs of renewable energy generation.<sup>227</sup>

As of 2009 FIT programmes are found in over 60 countries<sup>228</sup> and are gaining significance in many developing countries such as China and India. One of the most successful and best-known FIT implementations is in Germany, a pioneer of FIT energy policies. Supportive tariffs and financial incentives spurred the growth of the German renewable energy market and were instrumental in increasing renewable power generation from 6.3 percent in 2000 to more than 15 percent in 2008.<sup>229</sup>

Waste management companies that embark on WTE projects are usually eligible for FIT. They may have to comply with certain requirements, such as a minimum level of renewable content in the waste and energy efficiency. WTE falls under the category of biomass energy within the broad spectrum of renewable energy eligible for FIT. Companies must ensure that they have the necessary monitoring and fuel quality assurance systems required by FIT regulation. FITs are usually implemented on a sliding scale of support by automatically reducing tariff payments annually or in

FIT promotes renewable energy development

WTE projects are usually eligible for FIT schemes

the design, contracting process and execution of a project.<sup>222</sup> As a result, deadlines are not met, safety standards are ignored and resources are misused. Studies have also found that the control of corruption is associated with an increase in infrastructure spending by the government, with the effects being most pronounced in Asia and Africa.<sup>223</sup>

## Illegal trade in waste

One of the areas in waste management that faces a higher risk of corruption is e-waste. As has been seen in the discussion on hazardous waste management, the illegal flow of e-waste to Asia is evidence of widespread corruption that enables the illegal trade to cross borders without prosecution. Unlike other waste with much lower recoverable value, e-waste has the potential to be a very profitable trade, and one which unfortunately is often conducted in illegal and harmful ways. An example of e-waste corruption is the fraud committed by the founders of the now-defunct e-waste recycler, Citiraya Industries, which made millions of dollars by selling used computer chips which should have been destroyed.

## Case Study: Corruption scandal at former Citiraya Industries

Citiraya Industries Ltd was a publicly listed e-waste recycling company in Singapore from 2002 to 2006 with operations in 11 countries. In 2005, news of corruption at the company shook the local waste and recycling industry. The founders, Ng Teck Lee and Raymond Ng, were found guilty of selling used computer chips that should have been destroyed and making profits of US\$51 million from the illegal trade. The company also created 1,554 suspect transactions in 2004, with up to US\$119 million in fictitious sales in an attempt to inflate revenue figures. Investigators received information that certain Citiraya employees gave bribes to its customers' staff to facilitate the diversion of rejected microprocessor chips for resale in illegal markets outside of Singapore. Up to US\$1.3 million in bribes were given to employees and customers. Citiraya also falsely declared the quantity of precious metals recovered from the e-waste it received. The fraud committed was extensive and extended across the whole chain of operations.<sup>224</sup>

The crime was uncovered after Taiwanese authorities were alerted that scrap chips which belonged to one of Citiraya's customers surfaced in Taiwan.<sup>225</sup> Ng Teck Lee was sentenced to eight years in jail while Raymond Ng remained on the run. Citiraya was placed under judicial management and turned around to be re-listed as Centillion Environment and Recycling in 2006.<sup>226</sup>

Corruption in urban infrastructure leads to wasted resources, inefficiency and environmental degradation

Corruption in e-waste continues to perpetuate the lucrative business



stages. A detailed understanding of the financial impact and careful budgeting are necessary for companies to assess the contribution of FIT to overall project viability.

A survey of FIT schemes in Asian economies reveals that most countries are supportive of WTE projects. They differ in the stage of FIT implementation, with countries like Korea having an established system of FIT and others such as Malaysia and Philippines beginning to adopt the policies. The trend looks likely to gain momentum as more countries increase their focus on using renewable energy to reduce dependence on traditional fuel sources. FITs support the waste management agenda too, as governments wishing to promote WTE as the alternative to landfill can employ FITs to provide the necessary financial incentives for companies.

Figure 42: FIT schemes in Asia

	Description of FIT	Regulatory framework governing FIT policy
China	US\$0.037/kWh for all biomass power projects; this was increased to US\$0.051/kWh in 2008	Medium- and Long-Term Development Plan for Renewable Energy, under the 2005 Renewable Energy Law
India	Project-specific tariff for municipal solid-waste projects, based on several fixed-cost components, such as return on equity, interest on loan, depreciation and operation and maintenance expenses	Central Electricity Regulatory Commission Regulations 2009
South Korea	Ranges from US\$0.058-0.073/kWh for landfill gas, biogas and biomass projects  From 2012, the FIT scheme will be replaced with the Renewable Energy Portfolio Standard, which mandates utilities to generate a specific amount of clean and renewable energy	National Basic Energy Plan and Green Energy Industry Development Strategy

Taiwan	All renewable energy is eligible for a guaranteed FIT of US\$0.063/kWh for 15 years under the Taipower Renewable Energy Purchase Scheme (subject to an aggregate maximum capacity of 600 MW)  Landfill gas: additional US\$0.016/kWh above regular tariff. Total maximum capacity has been subscribed	Renewable Energy Development Bill
Philippines	Renewable FIT ranges from US\$0.15-0.55/kWh.	Renewable Energy Act, approved by the Energy Regulatory Commission in July 2010.
Malaysia	Proposed additional US\$0.025/kWh above regular tariff for municipal solid waste projects	National Renewable Energy Policy and Action Plan, expected to take effect in second quarter of 2011

Source: Various<sup>230</sup>

### Economic stimulus programmes support environmental projects

The recent financial crisis forced many governments to implement a variety of economic stimulus programmes to boost the economy. Environmental projects are increasingly viewed as part of a defensive market providing essential services, and therefore less susceptible to economic downturns. An example is the China economic stimulus package, which allocated up to 40 percent of the total US\$586 billion budget to 'green' projects, with a focus on power grids, water infrastructure, environmental improvements and rail communications.<sup>231</sup> Sustainable waste management projects can tap into such government incentives to reduce capital investment costs. With an ambitious target of converting 30 percent of its total municipal waste into energy by 2030, the economic stimulus package will certainly help to support China's national goal by spurring WTE investments across the country.<sup>232</sup>

### Government and privatisation

The privatisation of waste management requires extensive discussion and negotiation between the government and private sector in order to establish the responsibilities of both parties and ensure a smooth transition of services. Delays in the privatisation

Waste management projects can tap into economic stimulus funds to reduce the capital costs

Delays in privatisation by the government hinder private sector development

# CONTRACTUAL RELATIONSHIPS

process cause uncertainty for companies and also hinder their ability to undertake investments to expand or improve services. In Malaysia the privatisation process has been ongoing since 2008 and is scheduled to be finalised by the end of 2010 or during 2011.

## Case Study: Privatisation in the Malaysian solid waste management industry

In 1985, the Malaysian government decided that private sector participation in solid waste management would improve the overall sector through providing more cost-efficient services. Three companies were given letters of intent authorising their services as private waste management providers. However more than 20 years later, privatisation of the solid waste market is not yet complete. This is due to disagreements between government bodies on the delegation of responsibilities for waste management. As a result, the private companies were issued yearly contract renewals instead of long-term concessions. Alam Flora, one of the three private operators, has seen its concession renewed annually on an interim basis since it began operations in 1996. Such delays in legislative reform and implementation place severe constraint on private sector development, as companies find it difficult to commit large investments or secure loans without a long-term contract.<sup>233</sup>

## Public-private partnerships for solid waste infrastructure

### Global investment flow in infrastructure

Public-private partnership (PPP) has been the cornerstone of urban infrastructure privatisation in the last two decades. PPP describes a contractual arrangement whereby the private sector provides infrastructure assets and services that traditionally are provided by the government, such as railways, water and sanitation, and hospitals. It involves a transfer of financial, technical and operational risks to the private party, depending on the specific model of PPP employed.<sup>234</sup> Private participation in infrastructure and government reforms accelerated in the 1990s and global investment flows peaked at US\$114 billion in 1997. PPP financing fell in the late 1990s, precipitated largely by a social backlash against the perceived preference for the private sector over the public sector in delivering infrastructure services in developing countries.<sup>235</sup> The new millennium saw a recovery in PPP, with Asia leading the way as demand for infrastructure services grew rapidly alongside population growth and urbanisation. East Asia and the Pacific raised twice as much in privatisation proceeds from 2000 to 2003 as in the 1990s, with China being the main contributor. An estimated US\$300 billion a year of infrastructure finance is needed to meet expected demand in Asia.<sup>236</sup>

The demand for PPP in infrastructure development in Asia is expected to grow

### PPP for the solid waste sector

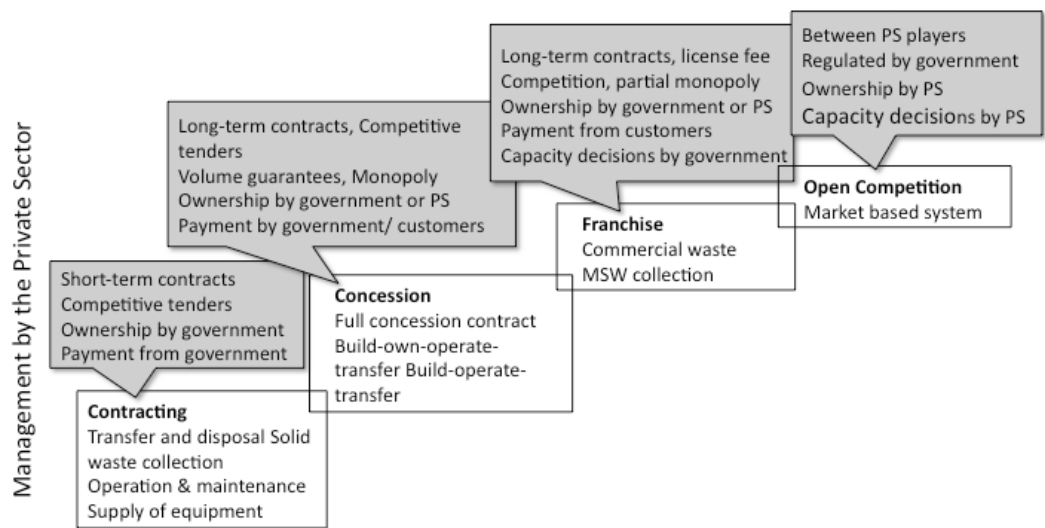
The PPP model for solid waste infrastructure has been widely adopted by governments in both developed and developing countries. In Asia, governments are actively pursuing PPPs as a means of improving service quality and reducing the financial burden on local municipalities. PPPs offer several advantages over full privatisation for public goods as they allow the government to retain some control over service provision and combine social and environmental responsibilities within a commercial arrangement. Most of the case studies presented in this report are examples of PPP in waste projects, such as the WTE plants in China, landfill management in Hong Kong, and biomethanation projects in India. The motivation for engaging in PPP is summarised by the ADB:<sup>237</sup>

- To attract private capital investment (often to either supplement public resources or release them for other public needs)
- To increase efficiency and use available resources more effectively
- To reform sectors through a reallocation of roles, incentives, and accountability

The PPP model applies to most waste management projects in Asia, with varying degrees of privatisation

A wide spectrum of PPP models exists, varying in the degree of ownership and management by the private sector. Different risks and opportunities exist across the range of schemes. Companies in short-term contracts for waste collection have much lower financial commitments than those in long-term concession agreements where the private sector undertakes the construction, operation and maintenance of large waste treatment facilities.

Figure 43: Management and ownership in different models of private sector participation



Source: UNESCAP<sup>238</sup>

### Risks and opportunities in PPP

Successful PPPs are characterised by a 'win-win' situation where both parties co-operate to yield the maximum overall benefit, which translates into profits for companies and effective outsourcing at lower cost and higher efficiency for governments. The experiences of the developed markets in Asia highlight the success of PPP in waste management, as seen in Singapore, Hong Kong, South Korea and Taiwan. Singapore embarked on a privatisation process a decade ago, beginning with waste collection and recycling. More recently, the government proceeded to privatise the incineration plants. Keppel was successful in the privatisation bids and subsequently set up the Keppel Green Trust to offer investment opportunities in its 'green' infrastructure assets.<sup>239</sup> In Hong Kong, the leading waste

management player, SITA, works closely with the Environmental Protection Department to manage the landfills, ensure proper post-closure remediation and conduct recycling trials. By distributing the risk to the parties that manage it most effectively, PPPs can bring commercial discipline and sound financial due diligence to waste management, both of which are usually weak in publicly funded infrastructure in developing markets. PPPs are also more flexible to market signals and can mobilise human and technological capabilities to design, innovate and create more productive systems that meet the needs of the population.<sup>240</sup>

Nevertheless, companies must be fully aware of the risks that exist in PPP arrangements. Poor governance and ill-defined contractual terms can create new avenues of inefficiency and corruption that worsen instead of improve the current system. A non-supportive regulatory regime is also detrimental to PPPs. Relevant laws and frameworks for assigning authority and setting performance standards, regulatory bodies and oversight arrangements, tariff and subsidy policies, legally mandated service quality standards and labour laws must all be in place.<sup>241</sup> The quality of governance is a problem that plagues many developing countries and these issues must be overcome for PPP to work successfully.

Tried-and-tested models of PPP from developed markets should be adapted to meet the needs of developing markets. A common difference in developing countries is the presence of a large and vibrant informal sector. A practical PPP scheme will incorporate the efforts of the public, private and informal sectors to produce the most appropriate suite of waste management solutions for the community.<sup>242</sup> The method and enforcement of tariff payments is another key concern for companies. The government's ability and willingness to pay can make or break a contract, as most companies will not hesitate to exit a contract if there are persistent delays or shortfalls in payment. The conditions for tariff adjustment must be carefully scrutinised to ensure transparency and reasonableness in the pricing mechanism.

On the technical side, provisions on waste specifications can affect a private operator's ability to treat the waste. An example is the PPP contract between Shenzhen Dongjiang Environment and the local government for the Guangdong integrated hazardous waste demonstration plant. The contract does not provide a guarantee for hazardous waste specifications, which is the norm for the industry. However, the government does provide a subsidy for the treatment cost.<sup>243</sup> According to Shenzhen Dongjiang, the Guangdong facility contains the full array of treatment processes, including physical-chemical treatment, high temperature incineration, a stabilisation and solidification unit and secure landfill. Such a contract demands



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a sophisticated treatment capability and confidence in the plant operator to manage any unexpected fluctuations in waste quality. Effective legal, regulatory and policy regimes, timely tariff collection and technical clarity are key enablers of a successful PPP arrangement.

The following case studies highlight examples of PPP problems faced by Asian waste management companies.



### Case Study: Alam Flora pulls out of Bahrain market

Malaysian waste company Alam Flora pulled out of Bahrain in 2008 following multiple disputes over contractual issues with the local government. The company blamed the government for incompetence, unjust price negotiations and failure to pay the amount due for its services. Alam Flora alleged that the government owed a total of US\$5 million which it refused to pay. The company was also unhappy with the continual short-term contract renewals, having undergone five six-month temporary contract renewals. In retaliation, the local government accused Alam Flora of overcharging and poor service. Veolia Environmental Services subsequently took over the contract.<sup>244</sup>



### Case Study: Veolia Onyx in Chennai

In 2000, Onyx, a subsidiary of Veolia, was awarded a seven-year waste management contract by the Municipal Corporation of Chennai in India. After two years of operation, the company was served a notice by the Tamil Nadu State Pollution Control Board for dumping wastes 'indiscriminately on wetlands' of Perungudi. The dumpsite had no liner protection and was located in an environmentally sensitive zone adjacent to a rainwater harvesting area. As a result the dumped waste directly contaminated freshwater resources. The Board stated that Onyx had failed to demarcate the area allotted for dumping and that the uncontrolled dumping harmed the wetlands. Onyx maintained that the dumping area in the wetlands followed the contract terms with the Chennai municipality.

The case highlighted the problem of a piecemeal privatisation approach to waste management, in which collection and disposal was privatised but the treatment of collected waste was excluded. Without a comprehensive and integrated approach, companies may not look beyond the contract clauses and may engage in environmentally undesirable practices that are difficult for the government to control.<sup>245</sup>

ISSUES FOR  
RESPONSIBLE  
INVESTORS

## CONCLUSION



# COMPANY BENCHMARKING

The ten pure play companies in Asia's waste sector surveyed in this report are evaluated for their sustainability performance using the Asian Sustainability Rating system (ASR™). The ASR™ is a benchmarking tool developed by Responsible Research and used by investors to benchmark portfolios and add a sustainability dimension to investment decision-making and engagement practices. Companies are scored across four main categories and 100 indicators covering general sustainability, environment, social and governance. In addition, sector-specific questions are developed to address specific sustainability issues of the industry. The scores of each category are converted to a percentage score, with 100 percent representing the highest possible score for a category. One of the features of the ASR™ is that it requires information to be provided in English, otherwise a half-point discount is imposed. In such cases, the original score before adjustment is given in brackets.

The benchmarking was done based on publicly disclosed information by the companies, such as annual reports, corporate social responsibility reports and company websites available from 1 July 2010 to 30 September 2010.

Four global waste companies are also benchmarked to provide a comparative guide to the performance of the Asian companies. It should be noted that the Asian conglomerates with waste management businesses are not scored in this exercise because the waste business is not a listed entity. Benchmarking of the parent company will not provide scores comparable with the domestic pure plays.

Several observations are made from the benchmarking results. A significant gap exists between the performance of global players and domestic companies across most of the categories. In general, disclosure by the Asian companies is quite limited, especially in the areas of customers and suppliers. Most of the information contained in annual reports was limited to corporate governance. Some companies discussed their corporate social responsibility within the annual report while others entirely omitted it. As such, the latter group scored poorly in general sustainability. While most companies provided some information on environmental sustainability and community initiatives, the information usually lacked depth and quantification on targets and results. The scores on these sections are therefore also rather low.

The ASR™ scoring serves as a proxy of the company's sustainability performance based on publicly disclosed information. It may not necessarily reflect the full scope of sustainable practices that a company undertakes as the company may not have communicated all the information externally. This is a challenge of any benchmarking exercise based on publicly available information. Investors should consider all available information from the company, news sources and shareholder meetings to arrive at a comprehensive assessment of the company's sustainability performance.

# COMPANY BENCHMARKING - GLOBAL

Company	Country	General sustainability	Environment	Social	Governance	Sector-specific	Total
Veolia Environnement	France	89	100	89	92	88	92
Suez Environnement	France	94	81	74	81	100	82
Waste Management Inc	USA	61	48	60	85	100	67
Shanks Group	UK	67	48	51	85	75	63

Company	Country	General sustainability	Environment	Governance	Employees	Consumers	Suppliers	Community	Sector-specific	Total
Veolia Environnement	France	89	100	92	88	60	100	100	88	92
Suez Environnement	France	94	81	81	81	60	43	100	100	82
Shanks Group	UK	67	48	85	81	20	29	29	75	63
Waste Management Inc	USA	61	48	85	69	40	14	100	100	67



# COMPANY BENCHMARKING - ASIA

Company	Country	General sustainability	Environment	Social	Governance	Sector-specific	Total
China Everbright	China	17	29	20	65	63	35
Sound Environmental	China	0	5	7 (9)	35 (65)	25	13 (21)
Fook Woo Group	Hong Kong	6	17 (19)	17	69	13	25 (26)
Shenzhen Dongjiang Environment	China	0	5	6	52 (54)	25	17 (18)
ZhongDe Waste Technology	China	0	5	6	50	25	17
Fajar Paper	Indonesia	17	24	20	56 (58)	0	27 (28)
KD Holding	Taiwan	11 (22)	7 (14)	17 (34)	31 (62)	25 (50)	18 (36)
Super Dragon Technology	Taiwan	0	10 (14)	6	33 (54)	13	13 (19)
Shenzhen GEM	China	17 (22)	21 (24)	21 (34)	35 (50)	38	25 (34)
Insun ENT	Korea	14 (28)	7 (10)	9 (17)	21 (42)	25	13 (24)

# SECTOR-SPECIFIC QUESTIONS

Category	Question
Environment	Does the company invest in technologies for renewable energy from waste?
	Does the company report on the energy produced from waste-derived renewable energy projects?
	Does the company operate any integrated waste treatment facility that consists of, at the minimum, sorting and separation of incoming waste and either a biological treatment process or WTE process?
	Does the company set targets on any of the following activities: Energy produced from waste-derived renewable energy projects Recycling rate of incoming co-mingled waste Conversion rate for composting plants Waste collection efficiency Any other activity that relates to environmental sustainability
	Does the company adhere to international best practices or standards that are more stringent than local requirements?
Social aspects	Does the company engage in community education initiatives to raise public awareness about responsible waste management?
	Does the company hold public consultation sessions before commencing construction of new waste infrastructure?
	Does the company provide any services that allow customers to actively manage their waste or engage customers to work together to improve waste generation habits?



# CONCLUSION

The Asian waste landscape continues to experience changing market drivers and socio-environmental priorities as the sector shifts from public to private participation. Sustainability drivers such as environmental protection and community engagement are gaining significance among policymakers and private companies seeking to push the waste agenda beyond end-of-pipe solutions. The ESG issues facing Asian waste management companies present risks and opportunities that must be managed at both strategic and operational levels.

Generally, the Asian companies surveyed in this report demonstrate a growing awareness of the sustainability issues in waste management and are starting to take active steps to mitigate the risks of environmental degradation and social discontent. In the environmental sphere, many companies are engaged in some form of sustainable practice, such as the public monitoring of air emissions quality based on EU standards by China Everbright, R&D on hazardous waste treatment by Shenzhen Dongjiang and certification of responsible forest management for recycled-paper products by Fook Woo. In particular, CDM projects to reduce carbon emissions from waste are undertaken by many Asian companies, driven by environmental pressures, financial rewards and support from multilateral agencies. While the efforts are encouraging, more remains to be done. Most companies do not have a clearly outlined strategic approach to environmental sustainability, which may explain the segmented rather than integrated focus of their sustainability initiatives. An integrated approach would address sustainability issues across the full value chain from waste generation and recycling to treatment and disposal.

On social issues, Asian waste companies appear to fall short in disclosing information on health and safety standards as well as employee welfare and training programmes. Companies like UEM Environment and Sembcorp Environment have taken the lead in providing some statistics on employee matters, which are very important in the labour-intensive waste sector. While Responsible Research believes that most companies practise stakeholder engagement to varying degrees, publicly available information is limited. Community investment with defined social goals is another area that could be strengthened as more companies recognise the importance and benefits of social responsibility. Limited disclosure is also observed in corporate governance, with several companies failing to provide adequate information on board composition and committees. Low board independence is another common issue. In terms of government policies and contractual relationships, Asian waste companies can gain from favourable policies on renewable energy from waste and are engaged in a wide variety of public-private partnerships with the local governments.

Figure 43: ESG Issues and solutions in the Asian waste management sector

Environment	<ul style="list-style-type: none"> <li>• <b>Treatment:</b> convert dumpsite to sanitary landfill; implement landfill gas capture system with careful assessment and monitoring of gas quality; employ strict and transparent monitoring of emission quality from WTE system; promote source segregation of waste to yield quality feedstock for biological treatment and refuse derived fuel</li> <li>• <b>Recycling:</b> encourage recycling as preferred option to energy recovery based on environmental, economic and policy considerations; emphasise consistent quality of recycled products</li> <li>• <b>Hazardous waste:</b> promote responsible management of hazardous waste and reject all forms of illegal trade</li> <li>• <b>Climate change:</b> incorporate climate change assessment for all waste projects; redesign systems and processes to become net greenhouse gas reducer</li> </ul>
Social	<ul style="list-style-type: none"> <li>• <b>Stakeholder engagement:</b> identify, engage and incorporate the needs of various stakeholders in developing sustainable waste management system; address negative social attitudes towards waste systems through open dialogue</li> <li>• <b>Health &amp; safety (H&amp;S):</b> improve H&amp;S standards for employees and those affected by the waste system such as slum communities and rag pickers; provide healthcare benefits and personal protective equipment for workers; practise greater disclosure of H&amp;S data</li> <li>• <b>Capacity building:</b> strengthen employee welfare and training programmes; manage contractual labour issues responsibly; engage and support informal sector</li> <li>• <b>Community investment:</b> launch community initiatives that educate the public on waste minimisation, recycling and separation, establish partnerships with community to co-manage the waste; create social impact on communities through CDM projects with clearly identified social, environmental and financial benefits for the people</li> </ul>
Governance	<ul style="list-style-type: none"> <li>• <b>Corporate governance:</b> strengthen governance with greater board independence; increase public disclosure on governance matters; incorporate best practices that may not necessarily be mandated by the local stock exchange</li> <li>• <b>Corruption:</b> enforce zero tolerance policy for corruption in all aspects from construction matters to export of waste</li> <li>• <b>Government policies:</b> capitalise on beneficial government policies that provide grants or tax breaks for sustainable waste infrastructure and preferential tariffs for renewable energy from waste</li> <li>• <b>Public private partnership (PPP):</b> select the appropriate PPP arrangement based on risks and responsibilities involved; work closely with the government to ensure clarity of duties, timely payments and fair monitoring and enforcement as far as possible</li> </ul>

Source: Responsible Research



As Asia continues to pursue rapid economic growth, mounting pressure on the environment will increase the demand for environmental goods and services. Companies that provide services such as waste management, water and waste-water treatment and sanitation systems are increasingly expected to incorporate sustainability issues of resource conservation, carbon footprint, energy usage and more. Challenges are undoubtedly present but there is reason to believe that positive changes are happening at the government, community and corporate levels. The strengthening of urban environmental governance, public dialogue with social groups and corporate governance reform will push companies towards more sustainable business practices. Initiatives within the private sector such as partnerships between foreign and domestic players introduce global best practices through technology transfer and capacity building. Examples such as the partnerships of Veolia and Suez with local waste companies have brought in best available techniques adapted to the Asian context.

In a 2007 waste management conference hosted by the ADB, participants spoke of the 'enormous business opportunities [that] will be created in Asia once the region has in place better policies promoting resource conservation and management', and how 'more systematic attention to waste management and resource use efficiency translates into new jobs and new business opportunities'.<sup>246</sup> In the three years since then, the waste sector has grown and evolved with domestic players gaining a larger market share, more government policies that encourage private sector participation, and increased public awareness of environmental issues. Companies wishing to capitalise on the business opportunities will be better positioned to do so by proactively managing the ESG risks and opportunities facing the sector.

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13