



Investing in Resources & Waste Management: Policy Context & Challenges

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This background paper was prepared with inputs from Mr. Andrew Whiteman, Wasteaware, and Ms. Reka Soos, Green Partners Ltd., for the CSD Intersessional Conference on Building Partnerships for Moving towards Zero Waste ahead of the nineteenth session of the Commission on Sustainable Development. The views expressed herein are those of the author only and do not necessarily reflect the views of the United Nations.

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1. Introduction

This Background Paper is prepared as a contribution to the CSD Intersessional Conference on Building Partnerships for Moving towards Zero Waste, held during 16-18 February 2011 in Tokyo, Japan.

The objective of this Paper is to present some of the issues which relate to financing of the resources and waste management sector globally. The specific goal is to raise some topics for debate amongst the participants during the event.

As a society we have created a set of environmental and safety policies that globally create investment demand for waste management. We also know that the waste management sector suffers from a chronic lack of money, be it operations financing or investment financing. In the first part of this paper we will introduce and show the results of a simple model that estimates what that investment demand may be, and how it is structured. Once the demand is identified, the challenge is to find ways to raise the investment funds needed. To this end we will introduce three strategic questions that have the potential to play an essential role in expanding waste management services:

1. What forms of partnership are necessary to meet the financing demand, and where are the major gaps?
2. What role may there be for specialised agencies for, amongst other things, investment coordination & promotion within national, regional and/or city authorities?
3. How can we make investment more mobile and responsive to the rapidly changing situation in the World's cities?

There has not been a lot written on the subject of investment in the resources & waste management sector. There are no centrally collected data on investment flows, and coupled with this, the sector is plagued by poor reporting of data throughout. Therefore, the authors rely on the materials at hand, and on first-hand experience of the authors (and their close colleagues).

One of the notable things about the industry is that it exists in all countries. Regardless of where you are, waste is a cause of concern across society. The recent UN Habitat Publication 'Solid Waste in the World's Cities', paints a picture of the huge diversity in the ways in which we manage our waste, and turn it into a secondary resource when it makes business sense.

People continue to innovate, countries continue to develop, consumption behaviour changes, and as a result the boundaries of the waste management profession are always in flux. The embedded knowledge of field of work has increased a lot over the last 10-20 years. It is still relatively unrecognised as a field of its own outside the professional networks; however, little-by-little the issue is gaining the serious attention of policy makers.

2. Economic and Policy Context

The resources and waste management system is very similar to the postal system **in reverse**. Rather than receiving, transporting, sorting and delivering letters, the waste service collects, transports, sorts and delivers materials. Each service is extremely logistically complex, involving regular person-to-property visits.

In fact, providing required waste management service is more challenging because it involves a large range of stakeholders/interest groups, suffers from low public interest/participation and is typically organised at the local rather than national level. Would your post arrive at its destination if you threw it on the street.

The daily removal, transport, treatment and disposal of waste is an intensely practical activity. Every day we see bins and vehicles on the streets, and that's all that most people really know about, 'getting waste out from underfoot'. However, what goes on after this, and what goes on behind the scenes to make this seemingly simple service function properly, is difficult to picture.

Why is waste governance complex?

- **Waste management involves everyone.** Including different levels of government, institutions, industries, hospitals, schools, businesses, NGOs and citizens. There are lots of interest groups surrounding the sector.
- **Waste management needs a lot of money.** Absorbing anywhere between 3 and 15% of a municipal budget¹, a functioning waste management system relies heavily on budget allocations and taxation, and on well functioning public procurement processes.
- **Everybody knows something about waste but nobody knows everything.** There is a constant pressure to comply with the wishes and instructions of non-experts. It's a very difficult sector to govern, and when programs and projects are formulated, there are always forces trying to stop them being implemented.
- **People are never satisfied with the services they receive.** Whatever the quality of service provided, it is human nature to get quickly used to it, and want more. This means we are continually challenged to improve services.
- **Waste management is both policy and demand driven.** Waste management is a set of different activities of which some are business-like and others are driven by policy or by a mixture of policy and demand. Each needs a different financial management approach.
- **Waste management is different at different economies of scale.** Approaches to what is feasible for waste management will be very different in large cities compared to small size cities and towns and rural areas, and these need different technical and financial solutions.

¹ Scheinberg A, Wilson DC, Rodic L (editors). Solid Waste in the World's Cities. Prepared for UN Habitat, published by Earthscan, 2010.

Policy drivers for waste governance

So why does waste management need policy intervention?

- **Waste management is a public health and environmental issue.** Poor waste management is not only unsightly, de-motivating and annoying; it can also cause disease outbreaks and pollution incidents.
- **Waste management is a highly visible public service.** Good governance in waste management is noticeable.
- **Waste management can help solve conflicts.** There is plenty of evidence that focusing on a local environmental issue such as waste management can help bridge community divides.
- **Waste is not simply a waste.** We have a common interest to improving the efficiency of resource use, the quality of our environment, our economy, and the quality of our lives.

Decisions on waste management, and in particular the financing of waste management, are made on the same basis as other public investment decisions. The perceived need for investment is weighed against the available resources, and desire to see this investment made sometimes transforms a project concept into reality.

Every now and then decisions are made based on analysis of what is the most efficient resource allocation across society. However, this is the exception rather than the rule, as resources and waste management is an emotive subject which is affected by the actions and reactions of many different stakeholders.

Plainly put, decisions which are made are often compromises between different vested interests. This is one of the reasons why waste facilities are almost always located in or adjacent to poorer neighbourhoods, and so often found on borders between nation states, regions, municipalities and communities.

Economics of waste management activities

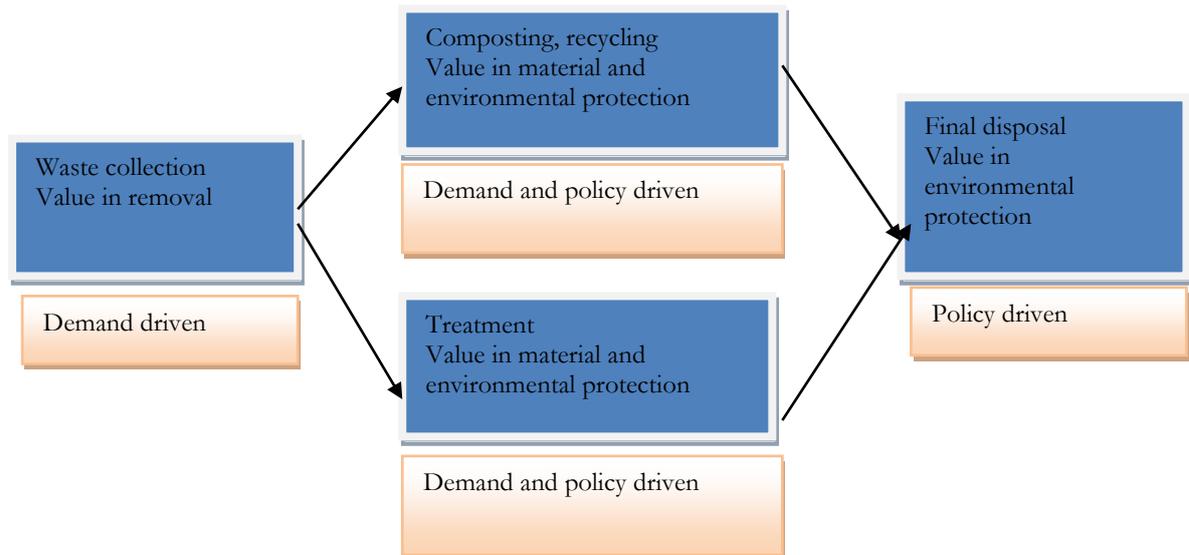
Financial management starts with understanding the economics, the cost, the revenue and the profit of a certain activity. There is however very little reliable and comparable information available. The waste management industry operates within a relative vacuum of auditable data, and this makes economic management of the sector extremely difficult, and vulnerable to corruption and malpractice.

There are a wide range of waste management activities, and their costs, revenues and profit margins are very different. These include primary collection, secondary collection, transfer stations and haulage services, recycling (sorting and further processing into marketable products), composting, waste to energy, incineration, landfill, and others.

To further complicate matters, the result of a waste management service is a public good, a clean city. It is in the nature of public goods that access to them is difficult and expensive to control which prompts so-called ‘free riding’ behaviour.

A simplified way to picture the economics of the different activities in waste management is presented below.

Figure 1: Demand influencing factors



Explaining this figure:

- Collection is driven by demand and the value of the activity is in removal. Most people are willing to pay for, or to put effort into, getting rid of their waste.
- Composting and recycling is driven by a combination of the demand for the intrinsic value of the waste materials, and the money flows generated by various policy instruments.
- Treatment of waste is driven by a combination of the calorific value of waste streams and policy for environmental protection.
- Final disposal is a policy driven activity and the value is in environmental protection.

It is easy to see from the diagram above that waste management systems involve subsidy in one form or another. The more advanced the waste management system is, the more policy driven it is, and the more market interventions and subsidies are needed to sustain it.

This is not to say that intensive policy attention to the subject is always the right or wrong approach. Just that, policy makers should be careful to weigh up the full costs and benefits before making decisions.

3. Investment Demand

Estimating demand for financing

What is the global investment demand for resources and waste management over the next 10-years?

There is no published source of information which gives a global estimate of the size of the resources/waste management industry, the level of investment made, the sources of this investment, the annual costs of operation & maintenance and/or the level of investment demand.

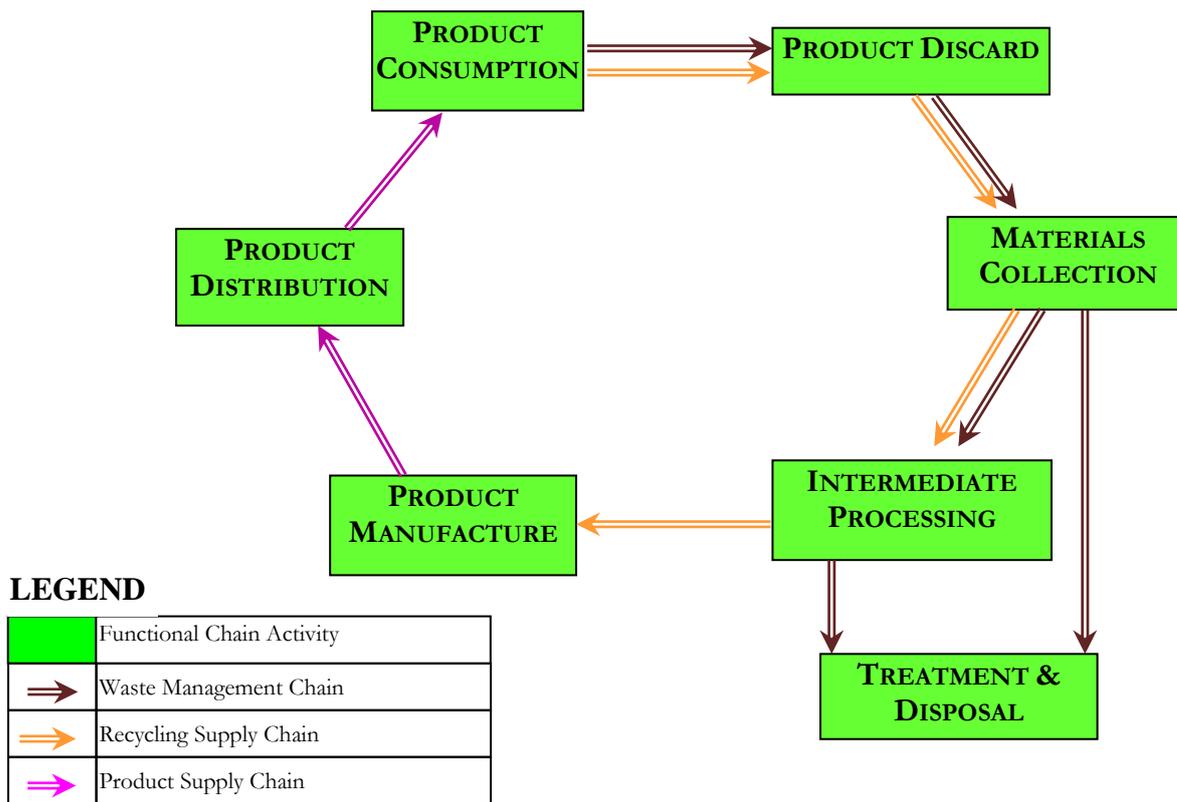
The waste management industry is the opposite of the automotive industry. It is one of those industries with the fewest pieces of available hard data to allow the modelling of market needs and investment requirements. However, the few pieces of data that do exist, for a few countries, can be extrapolated reflecting external indicators such as population and GDP data to assess the indicative investment needs of other countries.

In order to place the potential level of investment demand into some sort of context we have developed a simple model which has allowed us to forecast the level of demand for the waste management services sector over the next 10-years. The forecast is representative of the level of investment demand that may be realised if there is a concerted effort. The analysis is not meant to give a fair result, eg. equality of service for all. Nor does it represent a levelling out or replication of the same standards of waste management to all regions of the world. It does, however, represent a possible trend in the level of investment that would provide a natural step-change in performance in all countries.

It is important to note that in addition to the investments required for the materials collection, intermediate processing, treatment and disposal; there are in addition to this recycling and product supply chains which we cannot hope to capture in the level of the present analysis².

² Further information on investing in Recycling Supply Chains can be gained from Hickman D, Whiteman A, Soos R and Doychinov N. Model for Global Development of Recycling Linkages. International Finance Corporation. February 2009. Available through www.wasteaware.org

Figure 2: Simplified product, materials and waste flow in the resources & waste management economy



The Model deals only with the municipal waste management chain: that is the storage, collection, transfer, recycling, composting, treatment and disposal of household waste, and other similar waste from institutions, commerce and industry.

Key features of the Model

- Analysis is based on the potential infrastructure requirements and investment expenditures of a notional unit urban population of about 3.5 million urban inhabitants.
- Waste management bands are assigned to each country in the world using a matrix of input factors. These provide a range of different investment projection scenarios for different countries, at different stages of developing their resource & waste management economy.
- The per capita investment spend over the next 10-years is calculated for each scenario. Investment demand by region, sub-region and country is calculated by multiplying the urban population 2010-2020 with the per capita investment figure for the assigned waste management band.
- A multiplier factor has been weighted into the estimates small countries, eg. island and gulf states, in order to reflect the specific issues for small units of population. A multiplier factor has been weighted into the estimate for high income countries, in order to reflect the higher wage rates, social and service sector costs in these countries;
- The inputs and outcomes of the Model are cross checked against personal experience, are peer reviewed by experts in the field, and adjusted accordingly.

Limitations of the model

- Demand estimates are only provided for Municipal solid waste management services and infrastructure. Investments are also required for other (special) waste streams including hazardous waste, healthcare waste, waste electronics and electronic equipment (WEEE), tyres, batteries, oils, end of life vehicles etc.
- Investments in downstream processing of collected recyclable materials (ie investments in the recycling economy) are not included. The model focuses on the direct infrastructure and service needs.
- There is no reliable published data to base the estimates on. As such, the estimates are made on the basis of extrapolation from available cost data, using professional judgement to iron out obvious inconsistencies.
- For every country situation, there is an exception. At every level of development, there are examples of high and low performing countries, drastically differing investment climates, and policy environments.
- This is a rough estimate, which does not sufficiently take into account the country specific situations.

The analysis gives us an indicative investment demand estimate within a very broad accuracy range of say +/- 50%. Whilst cross checking certain countries we mostly found a close correlation between the model outcome and the actual situation (+/- 20%). However, in some other cases, we found that the model's estimate was out by over 100%. Adjustments have been made to try to improve accuracy, but it is important to note that the analysis is meant to give a broad strategic picture of investment demand; it is not a definitive estimate which takes into account all local variables.

Model outcomes

Global 10-year investment demand for **municipal** solid waste management infrastructure is estimated at Euro 255 Billion. Given the limitations of the modeling on which this analysis is based is it perhaps better to consider the investment demand to lie within a range of Euro 150-350 Billion. It should be noted that this analysis does not include investment demand for other (non-municipal) waste management infrastructure, which will add considerably to the total investment demand.

Figure 3: Estimated 10-year Global Investment Demand by Continent (Million Euro)

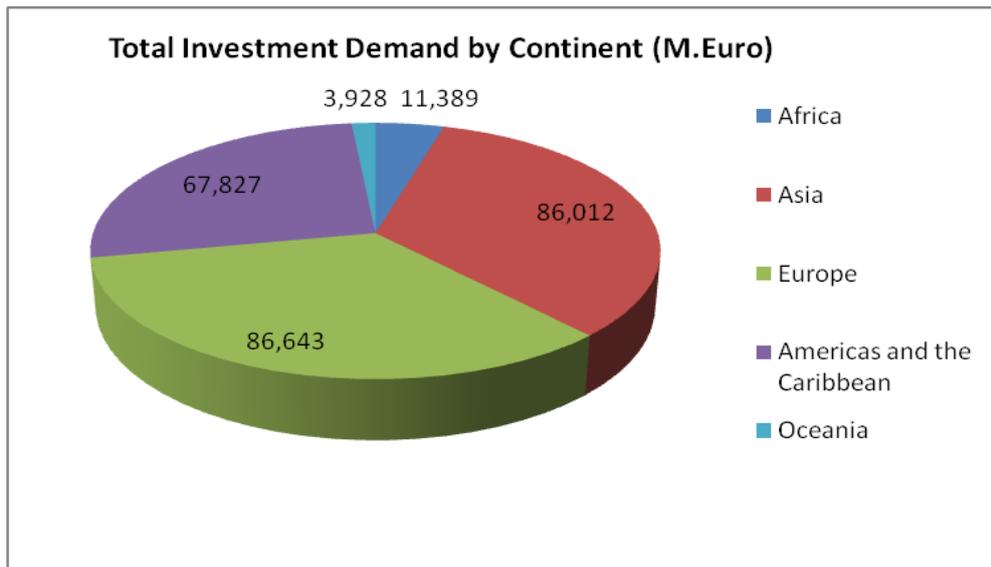


Figure 4: Estimated 10-Year Global Investment Demand by Component

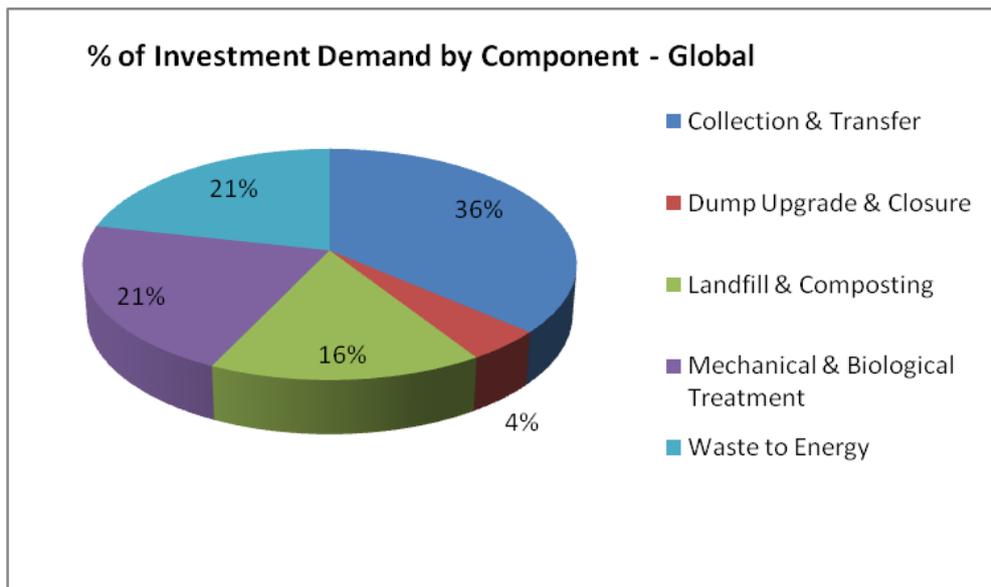


Table 1: Estimated 10-Year Global Investment Demand by Region (Thousand '000 Euro)

Investment Demand by Region						
Region	10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
Africa	11,383,445	6,528,037	1,114,146	2,345,555	967,056	428,651
Asia	85,948,038	37,032,040	4,856,612	10,229,397	14,038,544	19,791,446
Europe	86,490,716	21,357,277	3,260,193	8,799,791	24,984,377	28,089,079
Americas and the Caribbean	67,826,834	27,056,324	2,207,806	18,748,310	11,199,440	8,614,954
Oceania	3,928,450	1,376,197	36,403	954,291	882,620	678,938
Total	255,577,483	93,349,874	11,475,160	41,077,345	52,072,036	57,603,068
SIDS	2,925,389	1,386,426	202,968	706,748	315,548	313,700

Note: Estimates for Small Island Developing States (SIDS) have been isolated from the continental estimates but not included in the total in order to avoid double-counting.

Table 2: Estimated 10-Year Global Investment Demand by Sub-Region (Thousand '000 Euro)

Investment Demand by Sub-Region						
Region	10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
Eastern Africa	1,319,319	1,055,107	147,204	109,021	5,396	2,590
Middle Africa	905,743	733,988	101,446	70,310	-	-
Northern Africa	4,090,219	1,959,461	417,657	1,066,792	460,705	185,603
Southern Africa	1,005,110	498,590	90,517	238,187	120,146	57,670
Western Africa	4,063,055	2,280,890	357,322	861,245	380,809	182,788
Eastern Asia	53,240,386	19,277,152	1,554,707	3,710,077	10,396,735	18,301,715
South-Central Asia	12,791,712	9,423,833	1,052,403	1,852,790	312,626	150,060
South-Eastern Asia	8,672,815	4,317,595,196	817,652,944	1,644,104,949	1,238,607,925	654,853,767
Western Asia	11,243,125	4,013,460	1,431,848	3,022,425	2,090,575	684,817
Eastern Europe	20,052,863	5,166,844	2,989,578	4,724,828	5,484,175	1,687,438
Northern Europe	18,078,516	3,942,566	-	908,652	5,358,337	7,868,962
Southern Europe	23,218,805	4,770,773	270,615	1,443,049	6,818,001	9,916,368
Western Europe	25,140,532	7,477,094	-	1,723,262	7,323,865	8,616,311
Caribbean	1,519,591	868,771	136,356	484,393	16,997	13,075
Central America	5,372,235	2,843,371	523,156	2,005,708	-	-
South America	15,899,293	8,415,043	1,548,295	5,935,955	-	-
Northern America	45,035,715	14,929,139	-	10,322,255	11,182,443	8,601,879
Australia/New Zealand	3,554,628	1,178,343	-	814,726	882,620	678,938
Melanesia	209,894	111,091	20,440	78,363	-	-
Micronesia	47,590	25,188	4,634	17,768	-	-
Polynesia	34,374	18,193	3,347	12,833	-	-
Total	255,496	4,406,584	828,302	1,683,508	1,289,441	711,802

Sub-Regions	Countries
Eastern Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi Mauritius, Mayotte, Mozambique, Réunion, Rwanda, Seychelles, Somalia, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.
Middle Africa	Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Sao Tome and Principe.
Northern Africa	Algeria, Egypt, Libyan Arab Jamahiriya, Morocco, Sudan, Tunisia, Western Sahara.
Southern Africa	Botswana, Lesotho, Namibia, South Africa, Swaziland.
Western Africa	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Saint Helena, Senegal, Sierra Leone, Togo.
Eastern Asia	China, Hong Kong SAR China, Macao SAR, Dem. People's Republic of Korea, Japan, Mongolia, Republic of Korea.
South-Central Asia	Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Kazakhstan, Kyrgyzstan, Maldives, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan.
South-Eastern Asia	Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, Viet Nam.
Western Asia	Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen.
Eastern Europe	Belarus, Bulgaria, Czech Republic, Hungary, Republic of Moldova, Poland, Romania, Russian Federation, Slovakia, Ukraine.
Northern Europe	Channel Islands, Denmark, Estonia, Faeroe Islands, Finland, Iceland, Ireland, Isle of Man, Latvia, Lithuania, Norway, Sweden, United Kingdom.
Southern Europe	Albania Andorra Bosnia and Herzegovina Croatia Gibraltar Greece Holy See Italy Malta Montenegro Portugal.
Western Europe	Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands.
Caribbean	Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands.
Central America	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama.
South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands (Malvinas), French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela (Bolivarian Republic of).
Northern America	Bermuda, Canada, Greenland, Saint Pierre and Miquelon, United States of America.
Australia/New Zealand	Australia, New Zealand.
Melanesia	Fiji, New Caledonia, Papua New Guinea, Solomon Islands, Vanuatu.
Micronesia	Guam, Kiribati, Marshall Islands, Micronesia (Fed. States of), Nauru, Northern Mariana Islands, Palau.
Polynesia	American Samoa, Cook Islands, French Polynesia, Niue, Pitcairn, Samoa, Tokelau, Tonga, Tuvalu, Wallis and Futuna Islands.
Small Island Developing States (SIDS)	Africa: Cape Verde, Comoros, Guinea-Bissau, Mauritius, Seychelles, Sao Tome and Principe. Asia: Bahrain, Maldives, Singapore, Timor-Leste. Americas and the Caribbean: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize British Virgin Islands, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands, Suriname. Oceania: American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Micronesia (Fed. States of), Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.

4. Partnerships for Investment

What forms of partnership are necessary to meet global investment demand, and where are the major gaps?

Generic forms of partnership

Partnerships or business models can do a lot for raising investment and for improving the delivery of waste management systems. Different partnerships or business models will be applicable to different cities and regions. These can range from a single player model, where the municipality takes care of everything to a very flexible, inclusive model, where many different contractors and players find their role in waste management.

A Public Private Partnership is in principal a transaction which transfers the general responsibility for a public service to a private company. Meanwhile, the public authority retains the political responsibility, becoming a partner in profit and losses. This may take the form of anything between traditional procurement and service/operation contracts through some sort of joint venture between the public and the private party, to a complete private investment. The private sector has the potential to improve the cost-efficiency and the level of services; it may have better access to private capital and better access to knowledge. On the other hand if there is no competition and no appropriate monitoring of the private sector, then the private sector may well be inefficient and expensive. (S. Cointreau-Levine, A. Coad, Private Sector Participation in Municipal Solid Waste Management)

Joint ventures are especially welcome in circumstances when the business is very knowledge and information intensive. Such is the case of CDM projects in the waste management sector. CDM projects are revenue generating projects, where for each avoided or mitigated ton of GHG emissions a carbon credit may be earned and sold on the emission trading markets. These projects and markets are very knowledge intensive and they involve knowledge of UN rules and regulations, procedures imposed by host countries and third party project verification procedures. In addition the revenues depend on the running price of the carbon credits which depend on multiple factors, such as the status of the global climate change negotiations, the price of oil and the status of the global economy. Therefore in CDM projects it is worthwhile to set up joint ventures that increase the transparency between the partners, that helps avoid unreasonable expectations.

It is a fact that in most parts of the world and especially in low and middle income countries informal sector, community based organizations or some form of micro-enterprises or private people are involved in various waste management activities, especially recycling, collection services and street sweeping. Increasingly authorities recognize the existence and cooperate with this sector forming some form of a partnership with them. Such partnerships usually eases the

work of the informal sector, decreasing harassment, increasing health and safety practices, often increasing income security for them. The up-side for the authorities is that these partnerships can bring about advantages to the city such as to have a broad-based and resource-efficient waste management system and at the same time secure the income for a group of citizens that are usually marginalized, poor, and have little alternative sources of income.

In some countries producer responsibility arrangements are in place to shift the burden of responsibility away from municipalities towards the producers of packaging and other products which give rise to waste. There are a wide variety of producer responsibility models available, each placing a different degree of financial and operational responsibility on the producers and the municipalities respectively. However, in general producer responsibility schemes typically have the following main objectives:

- To guarantee achievement of the recycling and recovery targets defined in national policy/legislation.
- To provide additional financial stream and incentives for separate collection, sorting and recycling.
- To avoid temporary interruptions in the collection processes in case of negative trends in recyclable waste prices.
- To incorporate waste prevention, reuse and recycling issues into product design.

Table 3: Examples of successful partnerships

Type of partnership	Case study
PPP, traditional procurement with EU financing, EBRD loan Arges County, Romania	<p>Integrated Waste Management in Arges County, Romania</p> <p>Arges County with a population of 650 000 inhabitants, consist of six urban centres. The waste management of the county has, until recently, consisted of five municipal landfills and a number of dumpsites for the rural areas. Leakage and self-ignition was common at these landfills, with resulting air pollution and health risks. The collection and transport of waste has been carried out by specialized companies or services of local city halls. The largest landfill is Albota landfill, located nearby Pitesti.</p> <ul style="list-style-type: none"> • Objective of the project <p>Due to Romania’s EU membership the county was obliged to close or upgrade non-complain landfills. In July 2007, a project started that aims to set up an integrated waste management in Arges County in order to comply with the requirements of EU Directives. The project was divided into two phases, with the most urgent need being met in the first phase. This first phase was completed at the end of 2010 and the second phase will begin in 2010.</p> <p>The objectives of the first phase were to rehabilitate three major landfills and to build up a collection system for waste from the rural areas. The first step in Albota was to build one cell with a designed life expectancy of 5 years. Eventually, there will be three cells operating for waste disposal. Collection of waste from the rural areas will consist of 956 platforms. From there the waste will be transported to Albota landfill.</p> <p>The total cost of the Phase 1 investment was be € 35.432.315. From this, an amount of €18.375.000 was financed by EU Grant- ISPA, € 6.1250.000 by Arges County through EBRD loan and € 10.932.315 from Government of Romania contributions.</p> <ul style="list-style-type: none"> • Contractual arrangements <p>The Project Management Unit that is implementing the investments and is managing the project on behalf of the Municipal Association is organizing separate bids for construction of facilities, operation of the landfills and provision of waste collection services. There is one landfill operator selected for the major landfill. The services provided by the landfill operator are: sorting, composting and disposal. Five private contractors will be responsible for waste collection and transport to the landfill. In the urban areas one construction company is selected</p>

	for construction of the platforms for the hazardous waste collection.
<p>PPP, Build Operate and Transfer with private investment</p> <p>Wenzhou, China</p>	<p>MSW-to-Energy Plant in Wenzhou, China</p> <p>The refuse incinerator power generation plant in Wenzhou, Zhejiang Province is an example of PPP in the MSW sector in the People's Republic of China (PRC). Although the proportion of MSW incinerated in the PRC is still relatively low, such MSW-to-energy plants are a growing segment. In Zhejiang Province alone, more than 30 such plants exist in cities such as Wenzhou, Jiaxing, Shaoxing, Hangzhou, Ningbo, Jinhua, and Taizhou.</p> <ul style="list-style-type: none"> • Structure of PPP <p>The city of Wenzhou generates about 400,000 tons in household waste each year, a figure that is growing at a rate of 8%–10% annually. The household waste was disposed into two existing landfills that were nearing capacity while no other suitable sites had been identified for additional landfills.</p> <p>In 2002, the local government decided to form a BOT partnership with a local private contractor, Wei Ming Environmental Protection Engineering, to build and operate a new MSW-to-energy incinerator plant. The company would invest a total of CNY90 million in phases to build the plant and would operate, manage, and maintain it for a period of 25 years (excluding a 2-year construction period) under the BOT agreement. At the end of the period, the plant would revert to government ownership without any additional compensation to the company. The plant has been operational since 2003.</p> <p>The incinerator plant has a design capacity of 320 tons of MSW per day and electricity generation of up to 25 million kilowatts (kWh) annually. The first phase of the plant would be able to treat 160 tons per day. This would allow the plant to generate 9 million kWh a year, of which 7 million kWh would be available for sale. The plant would also receive a service fee from the Wenzhou city government for the disposal of MSW at a rate of CNY73.8 per ton. The BOT project is expected to break even after 12 years (Chang et al. 2003).</p> <ul style="list-style-type: none"> • Incentive Structure <p>The implementation of MSW-to-energy plant in Wenzhou is closely aligned with the objectives of the PRC's Renewable Energy Law passed in 2005 and is supported by a host of incentives and preferential policies. This includes the requirement that electricity network operators purchase electricity generated by qualified energy producers using renewable energy sources. Moreover, the PRC's Regulation of the Price of Electricity from Renewable Energy and Fee Sharing raised the electricity tariff for electricity generated by MSW-to-energy facilities in Zhejiang Province from CNY0.54 per kWh to CNY0.66 per kWh. Waste to- energy incineration facilities are also exempted from corporate income tax for the first 5 years of operation and are eligible for the immediate refund of value-added tax (Nie 2008).</p> <p>Source: www.adb.org/urbandev, November 2010</p>
<p>PPP, informal sector</p> <p>Belo Horizonte, Brazil</p>	<p>Integrated Solid Waste Management involving the Informal Sector, Belo Horizonte, Brazil</p> <p>The adoption of integrated solid waste management in 1993 made the recovery of recyclables a key feature of waste management in Belo Horizonte. Recovery of construction and demolition waste is the most significant recovery programme of the municipality and is operated through a mix of informal waste collectors, and municipal secondary collection service and recycling plants. Recyclable non-paper, plastic, glass and metals are collected as follows:</p> <ul style="list-style-type: none"> • since 1993, a drop-off system consisting of 150 delivery sites with 450 containers, which are emptied weekly by the Superintendency for Urban Cleansing SLU staff; • since 2003, a kerbside collection system by the SLU, currently targeting almost 354,000 residents; • door-to-door collection of recyclables by co-operatives of waste-pickers from commercial establishments and offices in the downtown area, using hand-drawn push carts. <p>In addition, recyclables are collected from big generators such as industries and in public offices using vehicles owned by the co-operatives. This channel resulted in over 50 per cent of all recyclables collected. The collected material is taken to warehouses run by co-operatives of semiformal waste-pickers where the materials are sorted, processed and stored for sale to industry in Belo Horizonte.</p> <p>Since 1990, the city has been at the centre of solid waste management development in Brazil, leading the movement for inclusion of the informal recycling sector. In 1990, the city included a clause in its Organic Law stating that the collection of recyclables would preferably be the work of co-operatives – the organized informal sector – and that they should be the beneficiary of all collected recyclables. In 1993 the city partnered with this first waste-pickers' co-operative in the</p>

	<p>implementation of its municipal recycling scheme. Since 2003 waste-pickers' co-operatives and informal collectors of debris have joined forces in the Belo Horizonte Waste and Citizenship Forum, which has been an important institutional medium in which to discuss guidelines for the integration of all these organizations within solid waste management (SWM).</p> <p>Source: Jeroen Ijgosse, Sonia Maria Dias, Raphael T V Barros, Solid Waste in the World's Cities. Prepared for UN Habitat, published by Earthscan, 2010.</p>
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Discussion

The investment Model provides a basis for discussion on where are the gaps in meeting investment demand. Depending on the specific needs and gaps in the region, different partnership options will work best to meet investment demand.

The following summarises the Authors expectations of investment demand and sources of investment. Discussions at the CSD Intersessional Conference will enrich this analysis.

Africa

Summary (Billion Euro – rounded)

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
11.4	6.5	1.1	2.3	1	0.4

Key Challenges

The major challenge is to implement basic collection and disposal services, which represent close to 60% of total investment demand.

For collection, the 5P's (pro-poor-public-private-partnership) arrangement seems to be the key issue. For disposal a mixture of public financed and CDM projects, as well as PPP projects will be necessary.

Producer responsibility will play some, although more limited, role in meeting demand. IFT's role will be to assist in developing the policy and legal framework as well as successful project cases.

Asia

Summary (Billion Euro – rounded)

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
85.9	37	4.9	10.2	14	19.8

Key Challenges

Investment demand profile dominated by China and India, however significant investment demand in other countries. Challenges vary between countries, and investment gaps are evident across all system components.

Collection and transfer represents the major demand issue, especially given the rapid pace of urbanisation. 5P's and PPPs will need to fill these gaps alongside what is possible from local and state budgets. Asian waste collection systems are characterised by a two-stage collection system, primary collection and secondary collection. Primary collection systems are often carried out by micro-enterprises, and secondary collection services by the municipality. Each of these has their own investment demand characteristics, issues and constraints. Investing in collection points/small transfer stations to improve the efficiency of the interface between primary and secondary collection is a key component to consider.

Landfill and composting is a key sector, and a combination of public financed and CDM projects will need to meet this demand. MBT and WtE are key sectors of investment demand growth, especially in China where it is anticipated that there will be a major drive towards construction of waste treatment plants. Producer responsibility still has had limited application in Asia.

Europe

Summary (Billion Euro – rounded)

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
86.5	21.4	3.2	8.8	25	28

Key Challenges

Waste treatment represents the major component of investment demand, due to the strong policy drives to reduce dependency on landfill. However, the situation varies across countries, with some countries still at the stage of implementing full coverage of collection services, and sanitary landfills.

Demand is likely to be met by the well developed private sector under PPP contract arrangements with public authorities. In addition the EU, IFIs, and producer responsibility organisations represent major sources of financing. Major challenges are the rate of uptake of committed EU funds.

Specific differences exist between EU and EU-candidate countries, and the Russian Federation. In the Russian Federation a combination of PPP projects potentially accompanied by state financing and investment guarantees may play a key role in meeting demand.

Americas and the Caribbean

Summary

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
67.8	27	2.2	18.7	11.2	8.6

Key Challenges

The major issues relate to implementing collection and landfill/composting in Central and South America. The pace of regionalisation (inter-municipal cooperation) will be a key issue in some countries.

Relative to Europe, there is less of a policy drive in the USA and Canada towards implementing waste treatment technologies (MBT and WtE), however, still these sectors are likely to require major investment considering the societal pressures for reduction in landfill dependency.

Major sources of investment will be from the private sector working under PPP contracts, accompanied by IFI and CDM project financing.

Oceania

Summary

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
3.9	1.3	0.4	1	0.9	0.7

Key Challenges

Collection and transfer, as well as landfill and MBT represent the major investment components of investment demand.

Regionally, the investment demand is dominated by the specific policy environments in Australian States, and the extent to which they move away from landfill towards waste treatment. Investing in MBT (referred to as Alternative Waste Technology in Australia) is a major upcoming sector of demand.

In general the private sector working under PPP contracts will be the dominant source of investment. Whether or not Australian States and New Zealand establish producer responsibility legislation, and the specific form of this legislation, will influence the sources of finance for the sector.

Small Island Developing States

Summary

10 Year Investment Estimate	Collection & Transfer	Dump Upgrade & Closure	Landfill & Composting	Mechanical & Biological Treatment	Waste to Energy
2.9	1.4	0.2	0.7	0.3	0.3

Key Challenges

Small Island Developing States have varied situations, however, in general there are common features of access difficulties to international recyclables markets, very limited land availability, limited competition between local contractors.

With the exception of one or two countries (eg Singapore) the investment demand is expected to be dominated by collection, landfill and to a lesser extent composting. Major sources of finance are expected to be IFI and CDM initiatives, although there are specific countries where PPPs and state finance may be dominant.

5. Attracting Investment

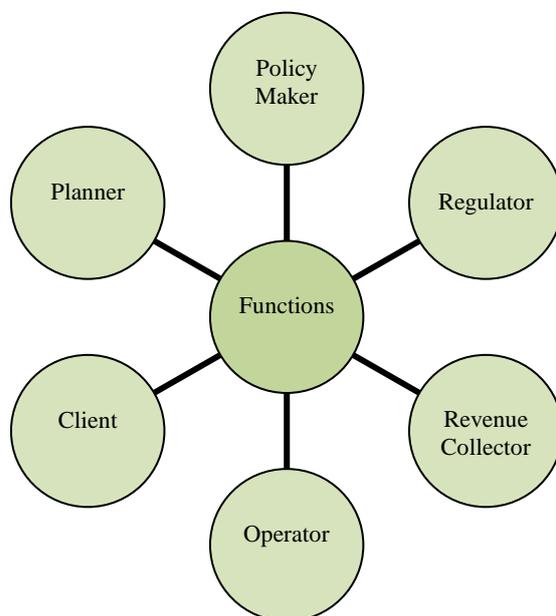
What role may there be for specialised investment coordination & promotion agencies within national, regional and/ or city authorities?

Institutional functions

Institutional issues surrounding waste management are quite complicated, and this is one of the key factors influencing the ability of countries to attract investment into the sector. Before we return to this point, we will first illustrate the range of institutional functions which lay behind providing a waste management service.

The World Bank's Strategic Planning Guide (SPG) for Municipal Solid Waste Management³ is one of the source-books where this complexity has been presented and described, and a theoretical framework offered to help understand and compare different waste management systems. The SPG presented the following six (simplified) institutional functions inherent in a waste management system.

Figure 5: The Six Institutional Functions



Recognition, strengthening and (where appropriate) separation of these functions is one of the most important precursors to improving waste governance.

³ Wilson D.C, Whiteman A and Tormin A. Strategic Planning Guide for Municipal Solid Waste Management. The World Bank, 2001. The SPG can be accessed online through www.wasteaware.org.

The missing 7th function

However, when you look at places where the resources and waste management sector has developed rapidly (or profoundly) in a short period of time, for example:

- Where a rapid increase in the level of investment in waste management infrastructure and services has been attracted and sustained; or
- Where there has been a major increase in the collection and sanitary disposal service coverage; or
- Where there has been a dramatic increase in the level of reduction, recycling and reuse.

And if we look for the reasons behind this, an important factor emerges. Where a step change in practices has been experienced, there is often a leading person, movement or organisation that has been a driving force behind this development, or a key event that has galvanised different stakeholders toward the same course of action.

In some places this is a charismatic Mayor, talented at getting the best out of their team; in others it is a well organised non-government or community group capable of getting the attention of high level officials; and in others it is an institution, organisation or facilitator which has driven the change.

Reflecting back to the ‘institutional functions’, there appears to be a missing function which does not fully capture this reality. We refer to this missing 7th Function as the Change Agent or Catalyst. Or in other words, the institutions, people and their networks capable and responsible for making change happen.

Change agents can come in many different forms, as government departments/agencies, NGO’s and limited companies. Here’s one example of each of these:

- *Government agency change agents (National):* ANGED Tunisia. ANGED (which in English stands for the National Waste Management Agency), is institutionally located under the Tunisian Ministry of Environment. It works to develop implement policy, strategy and infrastructure, but is institutionally separate from the environmental regulator (the ANPE). ANGED has been instrumental in attracting finance to establish a national network of waste recycling, treatment and disposal facilities.
- *Government agency change agents (Regional/State):* Zero Waste SA was established in South Australia as a public authority in 2004. Amongst others, the functions of Zero Waste SA are to develop, coordinate and contribute to the implementation of government policy, develop, adopt and administer the waste strategy for the state, contribute to the development of waste management infrastructure, technologies and systems, and commission, support and collaborate on research into waste management practices and issues. Zero Waste SA has been instrumental in implementing regional waste

management infrastructure, and financing/supporting a wide range of zero-waste initiatives.

- *NGO change agents:* WRAP UK. The Waste and Resources Action Program was set up in 2000 as an independent not for profit company. Its aim is to ‘to create the case for change, support change and deliver change’ in waste and resources management across the UK. It runs a wide range of programs to help businesses and individuals reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way.
- *Limited Company change agents:* WasteServ Malta. WasteServ Malta Ltd was established in November 2002. Wholly owned by Government WasteServ, the company is responsible for organizing, managing and operating (as an ‘operator of last resort’) integrated systems for waste management. WasteServ Malta has been instrumental in implementing waste management infrastructure and associated initiatives.

Discussion

Catalysing investment into the resources/waste management sector through establishment of dedicated agencies, departments or units, with a focus on implementation of strategy and coordination of investments is an issue which deserves attention and debate.

The private sector must be confident that the conditions and parameters on which a decision is made are realistic and must be able to defray as much of the unmanageable risk back to the project sponsors (e.g., the local government). However, local government often does not have the capacity (in house) to effectively discuss and negotiate with the private sector, thus it is equally important to build capacity of the local governments or the designated change agents who negotiate with the private investor. Some of the key factors which influence investor confidence are outlined in the Table below.

Table 4: Factors affecting investor confidence

Policy and Legal Framework

Is there a comprehensive enough policy and legal framework for investment waste management investments? Is there a framework Waste Management Law, and supporting regulations, and does this provides a level playing field for investors? Is the institutional framework well established? Are there many different Ministries and Departments involved in the waste sector, do investors know who to be speak to?

Strategy and Budget

Does the contracting party have a waste strategy in place and do they have sufficient understanding of what is needed to deliver it and the prioritise order in which equipment, services and infrastructure should be procured and operated? Is this strategy politically supported, is the program of investments stable? Does the Government regularly change its

mind about what infrastructure it wants? Is the strategy realistic enough? Is the budget for waste management realistic to deliver the strategic waste management needs? Are there clearly identifiable revenue streams from waste collection/processing/disposal fees and taxes, or from other sources of income, that make the repayment of any borrowing sustainable?

Procurement and Corruption

Is the contracting authority capable of running a fair and professional procurement process? And are they independent from the contractors, investment assessors and specifiers? Does the authority understand the costs, including their existing costs? Is the authority able to define a service level? Does the contracting party have the ability to supervise performance by rigorous, fair and independent means?

Does the contracting party possess the knowledge to write a quality technical specification for the purchase of equipment and services to be provided by the tender, respecting standards where appropriate to ensure compatibility, safety and value for money? Do they have in place the systems to audit that equipment and services meet the tender specifications? Do they have in place the systems to audit that equipment is maintained correctly so as to preserve its ability to perform the waste management operation?

Professional Capacity

Does the authority have a good internal professional capacity, and a track record in implementing projects? Do they have well qualified staff who will be able to make the project happen? Is the authority reasonably consistent, pragmatic and fair? Do they project themselves as partners?

6. Financial Performance

How can we make investment more mobile and responsive to the rapidly changing situation in the World's cities?

Sources of financing

As presented in the introduction, waste management economics is a complex issue because waste management is at the same time a demand-driven business, a policy driven activity; and a public good.

Financing is also best understood when looking separately at the different waste management activities and dividing them into operational revenues and investment financing. Operational revenues in waste management are user fees and charges, and the revenues from the sale of recyclables, compost or the calorific value of various waste streams. Additional to these there are a wide range of economic instruments that are used to raise additional operational financing for waste management.

Cities in the developing world rarely have their own budget for financing capital investment for waste management. Sources of investment financing for expanding municipal waste management services are typically donors, private investors, local and national budget or a combination of these. Often these investment schemes are carried out through various Public Partnerships. No matter what combination of these sources is used, private banks are usually involved and they ask for collaterals or guarantees and local co-financing. Commercial banks charge their usual rates, depending on the feasibility of the investment and the country, these may be between 6 to 15%, while development banks usually provide soft loans, with interested rates from 1 to 3%.

A second set of revenues are those that are made available through market regulations through the so called economic instruments. There is a wide variety of such instruments to choose from and an infinite variety of systems that can be still invented to suit the specific situations in a given city. However these always fall under the two types of economic instruments in waste management, the revenue-generating instruments and the non-revenue generating instruments, or put another way, the stick and the carrot. The revenue generating instruments are mostly taxes and the non- revenue generating instruments are mostly subsidies.

The table below lists the most well-known economic instruments as quoted in various literature sources, and according to the experience of the authors. Some of the instruments are a mix of the two in order to incentivize the desired behaviour. For example differentiated fees may mean lower collection cost for separately collected items, in this case it is a non-revenue generating instrument, but it also may function as an extra charge for those who do not separate, in this case it's a revenue generating instruments. Such instruments are listed in both columns.

Table 5: Types of economic instrument

Revenue generating instruments (<i>sticks</i>)	Non- revenue generating instruments (<i>carrots</i>)
Differentiated fees (charging more for handling certain waste streams, i.e. hazardous waste or waste that could be prevented)	Differentiated fees (charging less for source separated waste)
Cross subsidies in user charges (revenue generating for the poor)	Cross subsidies in user charges (non-revenue generating for the wealthy, for institutions and for enterprises)
Taxes (i.e. landfill tax, product tax, raw material tax)	Subsidies (i.e. subsidies for green electricity, carbon credits, recycling plants)
Subsidy reductions	Tax cuts (recycling credit or avoided disposal cost reimbursement)
Extended producer responsibility schemes	Extended producer responsibility schemes
	Development rights and property rights
	Green Procurement

Source: adapted from S. Cointreau & Professor David C Wilson

Discussion

When modernizing waste management, we usually think of large investments into infrastructure and equipment. These projects are often financed by IFI's in the developing world and the financing comes in big chunks of money based on feasibility studies carried out for the whole system.

On output based financing

There are several arguments in favour of one time large investments. They allow allocation of funds for high standard technologies that work at the right economies of scale. If we go by the view that waste management is about logistics for the most part, it makes sense that no matter what other activities you do, you cannot solve a logistics problem without solving the problem of infrastructure and equipment first.

At the same time there are arguments that favour an output based or performance based financing approach:

- First of all, inherent to output based financing is the incentive to waste managers to perform: no output, no money.

- Money flows are coming over time, keeping the system more flexible and able to adapt to rapidly changing situation in the world cities, such as economic climate, population density, etc.
- It is likely that there is more attention to operation costs and a tighter planning of investments, thus limiting investments to what is really needed and keeping operation costs down.
- Reduced risk of putting up large scale technologies that do not fit local conditions.

From the point of view of banks, investors, donors, waste management would become easy if there were much more standards world-wide that would enable us as a community to judge faster about a waste management business plan.

On transaction costs and standards

Financing organizations want to understand costs, revenues, technologies at a glance. For other sectors there are industrial standards developed and there are typical financial performance indicators for investment projects in a typical sector. This would urge us to work towards standardizing cost categories, deciding up front on technologies and solutions.

IFIs tend to push the waste sector to this direction, but implicitly also impose artificially high standards to developing countries, allocating funds to investment projects that cities in the developing world cannot necessarily afford. The reality of waste management is that everything is different from city to city, from the waste composition to climate, to the institutional set-up, distances, road-conditions, cultural context, etc., making it close to impossible and dangerous to standardize much in waste management.

On financial incentives

Financial incentives are operational revenue streams. These are set up to navigate service delivery and environmental performance to the targets where decision-makers want them to be. Incentives may be built in a waste management system at any point where there is a transfer of waste/resource associated with a monetary transaction. For example, recyclables markets may be boosted by increasing prices of secondary materials or by increasing fees for landfilling and diverting away materials from the landfill this way.

However, financial incentives are controversial and sometimes backfire and thus their impact must be closely monitored and continuously fine-tuned. For example setting unreasonably high collection fees or gate fees might lead people to dump their waste illegally. The private sector unfailingly reacts to subsidies, and because it is very difficult for policy makers to have a correct overview of the complexities of markets, the results may be contrary to the intention. For example subsidizing bio-fuel may be putting food security at risk by using critical agricultural plots for energy plantations.

On taxing for revenues

In any waste management system there is the eternal conflict between the business-person wanting to get return on investment and the city mayor who wants to keep the fees to citizens affordable. The negotiations will be centred on the level of cleanliness that can be guaranteed for a certain budget. Fees never cover full costs. Usually, even after all possible cross-subsidies are considered the budget is still not enough to implement high environmental standard waste management systems.

One economic instrument used to raise financing for the waste management budget is through specific environmental taxing such as the landfill tax. In South Australia for example introducing a landfill tax and legally ring-fencing a proportion of the money that is collected from this tax for investing in non-landfill initiatives has worked really well.

Landfill tax can be calculated and justified based on the environmental impact of waste disposal, and/or the long term depreciation of property values on and around the site. It is debateable whether landfill taxes are an appropriate policy measure in a developing country or a middle income country, where putting in place basic sanitary landfill already involves a step-change in costs. However, there might be a role in some countries for a 'dump site tax' or a graduated landfill tax, which incentivises/finances investment into upgrading dump sites into sanitary landfills.

7. Policy Issues for Consideration

A number of findings and discussion points arise from the paper.

- The waste management sector suffers from very poor data, and a very low level of up-to-date market information. To some extent this is symptomatic of the position on the policy agenda, but it is also indicative of the inherent complexities in governing the sector.
- The nature of the investment demand varies considerably depending on where you are in the world, and what systems you already have in place. There is no ‘one size fits all’ waste management system. While some countries are focusing on high technology innovation, others are trying to implement basic collection and disposal systems to cover at least a majority of the urban population.
- The scale of investment demand is so great that many different investment sources and partnership approaches need to be applied if there is any hope of meeting a reasonable fraction of this demand.
- Investments from IFI’s can only really satisfy the ‘tip of the demand iceberg’. There is a considerable transaction cost/time required to put this investment in place, and therefore these investments should be viewed strategically, focusing on putting in place the frameworks required to leverage investment from other sources.
- Whilst there are opportunities for carbon financing to meet some aspects of the demand for waste management services, such as composting, landfill gas extraction and utilization and recycling of certain material streams, there is a considerable residual financing demand which needs attention.
- Producer responsibility is an important economic/policy instrument for incentivising reduction of waste quantities, and injecting finance into the management of packaging and other special waste streams.
- The sector will continue to rely heavily on state and private sector financing. Waste management services generally require capital subsidy in one form or another. This should not, however, be used as a basis for not raising local taxes and fees/charges to a reasonable level in order to cover at least the operation & maintenance costs of the services. Maximizing all available revenue streams is important.
- Investment finance can generally be sourced for projects which have been carefully prepared, are founded in the rule of law, are supported by properly functioning institutions, can be financed from a guaranteed revenue flow either from users or municipal government and which are affordable

- Most aspects of waste management are revenue generating, and therefore soft of commercial loans are quite attractive in reality. Credit lines adapted to various sizes of national waste management companies and local entrepreneurs are much needed.
- Globally, the investment demand is very heavily influenced by policy. Where there is a strong policy and also the institutional, financial and contractual framework to implement it, there is a higher investment demand.
- This should not be taken as a green light for heavy policy interventions. The consequences of policies need to be carefully weighed up, and balanced with the other competing resource and service demands of society.
- Supply of investment generally flows to those countries which have ability to attract, deliver and sustain investment. Putting in place institutions which at the very least have a mandate to promote and coordinate investments in the sector, but preferably also have some statutory role in implementing waste management strategies, will yield benefits.
- Once investment financing is raised its important to choose the partnership setup that will promote cost efficiency and high service level and it may be worthwhile to construe output based financing systems. This way, cities could make sure that investments do not generate increases in operational budget deficit.

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