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Waste: the challenges facing developing countries

Large cities in developing countries are facing a waste crisis. Integrated waste management is a key to developing sustainable solutions. What can be the contribution of the private sector?

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Open dumping of waste presents a real threat to the environment and to human health and is commonplace in developing countries. Constrained by budget pressures, towns and cities in the southern hemisphere are struggling to deal with the proliferation of municipal solid waste. Global production has practically doubled over the past ten years and is expected to reach 2.5 billion tonnes per year in 2025 as a result of the combined effect of urban development and changes in consumption patterns.

The exponential growth of waste calls for a change in practices. Sustainable waste management means reducing the volume of waste at source, improving sorting, and increasing recycling and waste recovery in the form of energy or compost. However, developing the waste sector requires investment and competencies that the public sector is not always in a position to provide. Local authorities are therefore turning to the private sector, hoping to benefit from its know-how and competitive prices. Private entities are mainly involved in waste collection, but also in operating landfill sites and recycling. The treatment of waste and derived products offers new economic opportunities for the private sector.

However, prospects for the private sector are still largely dependent on the establishment of a strict, secure regulatory framework, good public governance and better access to finance. They are also constrained by the local authorities' limited financial resources. To some extent, recycling and recovery activities are not affected by budgetary limitations. With energy and raw materials becoming more and more expensive, does this not present a major opportunity for this sector? How can we create sustainable attractive economic models for the private sector? What are the best financing mechanisms? How should private operators be financed? This issue of Private Sector & Development attempts to answer these questions so as to define favourable conditions for involving the private sector in the municipal solid waste sector over the long term. —

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Municipal Solid Waste: turning a problem into resource

The management of municipal solid waste (MSW) is not just a public service, it is also an important economic sector. The sector is worth USD 390 billion in both OECD and emerging countries, and provides up to 5% of urban jobs in low-income countries. Global MSW production is projected to double in the next 15 years. MSW management in developing countries is currently inadequate, posing a challenge, yet also an opportunity for private sector.

Alexandra Le Courtois

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The solid waste market is not just a public service, it is also an important economic sector, which is worth USD 390 billion in OECD countries (Chalmin, P., Gaillochet, C. 2009) and large emerging economies combined, and provides up to 5% of urban jobs – including waste pickers – in low-income countries. As the world continues to urbanise and develop economically, waste production is growing steadily, with stronger trends in developing countries. In this global waste market, MSW, which refers to the waste generated by residential, commercial and institutional activities, occupies about half of that market (Box). Considering that MSW management in developing countries is insufficient today, the challenge in these countries will be considerable in the years to come. At the same time, the sector will offer great opportunities for private sector participation and for revenue-making businesses.

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A CHALLENGE FOR CITIES

MSW has significant negative externalities, with impact on the environment and health. Uncollected solid waste in cities provides a favourable habitat for insects, vermin, and scavenging animals, which proliferate and spread air- and waterborne diseases such as plague, dengue fever and diarrhoea among local populations.

When not disposed of with sound sanitary practices, leachate[2] produced by accumulated MSW can leak into the environment and contaminate ground water and surface water. MSW also contributes to some global environmental challenges, such as the increase of greenhouse gas (GHG) emissions in the atmosphere – contributing almost 5% of total human-based GHG emissions (Hoornweg, D., Bhada-Tata, P., 2012). Open burning in dumpsites releases particulates as black carbon and persistent organic pollutants, which bioaccumulate in the food chain. In addition, many cities engaged in flood management programs recognise that uncollected solid waste – which blocks drains – is a major factor causing flooding. Sound waste management is thus a daily matter for local public authorities aiming at offering a safe and quality environment to their residents.

"In developing countries, the per capita waste generation rate ranges from 0.4 to 1.1 kg per day."

Global urban MSW production, which has nearly doubled in the last 10 years, is projected to double again in the next 15 years, increasing from 1.3 billion tons a year in 2010 to 2.2 billion tons a year in 2025 (Hoornweg, D., Bhada-Tata, P., 2012). The increase is mostly attributed to developing countries, where it is driven by the combination of high urbanisation rates and economic development. When revenues increase, consumption, and consequently, waste production, do too. In developing countries, the per capita waste generation rate ranges from 0.4 to 1.1 kg per day, reaching in some urban areas 2.4 kg per day and more in tourist areas. In poorer settlements, the values can be much lower[3] (Chalmin, P., Gaillochet, C. 2009). MSW services vary largely by country, as prac-

[1] *Disclaimer: This article is a personal contribution by the author. The positions expressed do not necessarily reflect the views of the World Bank, the Executive Directors of the World Bank, and/or the governments they represent.*

[2] *Leachate refers to liquids that migrate from the waste carrying dissolved or suspended contaminants. It results from precipitation entering the landfill and from moisture that exists in the waste when it is disposed.*

[3] *In developed countries, waste generation rate averages 1.4 kg per day (and up to 2 kg per day in the United States). There might be minor differences in values according to the sources.*

tices are guided mostly by the availability of financing and ecological awareness. The quality of MSW services in developing countries is improving, but is still lagging behind developed countries. Local authorities rarely offer universal service coverage and sanitary waste disposal. Priority is usually given to collection, rather than disposal. This is aimed at offering a safe and healthy living area for residents, but is also guided by electoral concerns. On average, collection coverage is 41% in lower-income countries and 85% in upper-middle income countries, but can be as low as 10%, as in Parakou, Benin, and as high as 100%, as in many large Chilean cities (Hoornweg, D., Bhada-Tata, P., 2012). Collection also varies according to the waste type and urban location. It is relatively high in industrial, commercial and institutional areas, because costs are lower and payment is better obtained. In contrast, residential waste is more scattered, and thus, collection requires more time and longer distances for the same quantity of waste. Downtown areas, where businesses and hotels usually are concentrated, usually have regular and high-quality collection systems.

"MSW [...] can comprise as much as half of the municipal budget in many low-income countries."

Ecological concerns have emerged recently in developing countries, which explains the variation in disposal practices with respect to their environment impact. In fact, open dumping is still the predominant mean of disposal. For example, in the Latin American and Caribbean region, about 60% of the waste ends up in dumps (Hoornweg, D., Giannelli, N. 2007). Provision of sanitary landfills is increasing though, with some facilities meeting international standards. Incineration, which is used in some developed countries, such as Japan, is limited in developing countries because of its high costs and the associated stringent operating requirements.

The financial dilemma and private sector participation

Developing countries spend around USD 46 billion annually on MSW management, but it is estimated that they should spend another USD 40 billion to cover the service delivery gap. Considering the projected increase in MSW generation, their financing needs could surpass USD 150 billion annually by 2025 (Hoornweg, D., Bhada-Tata, P., 2012). MSW is often an important budget item for municipalities, and can comprise as much as half of the municipal budget in many low-income countries. Considering the actual gap between MSW costs and the funding of these, and the forthcoming growth of the waste sector, local authorities must enhance their service efficiency and access other sources of funding if they wish to lower the burden on their finances. Public authorities in some middle-income countries – as in developed countries – establish financial schemes to internalise the cost of waste externalities, through a direct fee to the waste generator or a tax on the product used (which adds to the purchase price). But in low-income countries, a residential user fee is largely untapped, with low collection fees. Very often, the issue is not an unwillingness to pay, but improper price setting relative to the low quality of service.

As with many public services, the private sector can provide many benefits. First, it allows for part of the financial costs of MSW to be transferred out of the municipal budget, either for investment, operation, or both. Thus, private sector participation may be a way of assisting the public sector to address the huge financial shortfall. Second, always seeking to reduce financial losses and improve service effectiveness, the private sector is more likely to provide a high-quality service at a lower price, whereas due to a lack of incentive, the public sector often fails to achieve this (Kessides, I.N. 2004). In addition, community-based enterprises prove more innovative in proposing suitable and cheap solutions in slums. In fact, the MSW sector has already started this shift from public to private operation, with the private sector largely active in waste collection, and some successful experiences – notwithstanding failures too – suggesting great potential for the private sector operation of landfills and recycling activities. In this context, local authorities are moving from service operation to service management. The challenge is to build the capacity among local governments to prepare and negotiate contracts and control contract implementation.

New business opportunities

The natural resources market faced huge price increases in the early 2000s up to the financial crisis in 2008, raising awareness of the limited availability of fossil energy, mineral resources, and agriculture and forest products, and questioning the model of our consumer society.

One solution to limiting the human impact on the planet could take the form of using waste as a valuable resource, either as a form of energy production or for reuse and recycling ▸▸▸

FOCUS

The World Bank is a vital source of financial and technical assistance to developing countries around the world in helping to reduce poverty. With regard to cities, its Urban Development and Local Government Unit plays an important role in helping governments address the challenges that come with urbanisation. Established in 1944, the World Bank is headquartered in Washington, D.C. and has more than 9,000 employees worldwide.

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▶▶▶ with access to the global market of secondary materials such as scrap metal, paper, or cellulose fibre or local markets such as compost.

The world produces four billion tons of all types of waste per year, but only a quarter is currently diverted from disposal. Even with the high prevalence of valuable products in MSW, such as cardboards, plastics, glass, and metals (up to 50% in developed countries), the recycling and waste valorisation chains have been hardly profitable, considering the low prices of recycling materials on the global market. Only in 2007-2008 did the prices of waste-derived materials – pulled up by five-time price increases on energy and primary material markets – grew substantially enough to incentivize the recycling industry. But those prices fell again after the 2008 financial crisis, showing high price volatility and bringing into question the sustainability of the sector. Most recently, the international market again exhibited recycling material price increases, which may this time prove the potential of the sector in a very consumerist world (Kelly, T., Matos, G. 2011).[4]

"Most recently, the international market [...] exhibited recycling material price increases."

In developing countries, the recycling sector is very different in many respects compared with developed countries. With very little experience of public incentive, the sector benefits from very cheap labour, driving its local-market-based profitability. Recycling is mostly run by the informal sector involved in waste separation. For this reason, data is scarce, making it impossible to properly estimate the genuine rate of waste diversion. Usually, countries report low levels of waste diversion, except for South Korea, which claims a 49.2% MSW recycling rate (Chalmin, P., Gaillochet, C. 2009). Overall, valuable products, such as glass and metal scarp, nearly never enter the formal waste stream, tending to prove that a certain level of recycling probably exists in this segment. But considering the large amounts of waste disposed of, there is an obvious untapped potential for waste diversion.

As an example of the potential of the sector, composting is a promising recycling chain in developing countries, considering the very high organic content (around 50/80%, mostly food waste) and high moisture levels of MSW, as well as its associated finance-enhancing possibilities: revenues from the sale of compost, cost reductions from avoided transportation of waste if composting is operated within the community, and from avoided disposal costs (including the price of land) (Hoornweg, D., Bhada-Tata, P., 2012). Moreover, composting has also positive social impacts, by creating jobs. Yet, except in Europe and few Asian countries, composting is insignificantly developed. The many failures of the sector show its fragility and the need for public intervention to strengthen the regulatory framework and attract the agriculture sector.

In the way forward, how can developing countries move from an informal sector to a more integrated and systematic approach to waste diversion? Based on the experiences of developed countries, the role of public authorities is paramount to creating a favourable environment and supporting the sector's sustainability. In this regard, the implementation of urban policies to encourage recycling commitments from municipalities as well as economic policies to promote the use of recycling or recycled products and materials are essential. As sorting can represent as much as 50% of total operating costs, it is also very important to design incentives to promote waste separation at the source, which ultimately reduces recycling costs. ●

[4] *For example, on the London Metal Exchange, copper even peaked at nearly USD9,000/ton in the first semester of 2008, equivalent to a 5.4 times increase compared with 2002.*

BOX: WASTE TYPOLOGY

The waste sector is typically broken down into five main categories of waste: MSW; waste resulting from industrial activities; construction, demolition, and mining waste; agricultural waste; hazardous waste generated by all of the above-mentioned waste producers and normally including medical waste.
Around half of world waste production is MSW from the residential, commercial and service sectors.
MSW is mostly composed of food waste, paper, textiles, garden waste, wood, rubber, plastics, metal, and glass.
Each category usually has its own waste stream, and each waste generator can have a different level of responsibility.
Local public authorities are responsible for the collection and disposal of MSW, even though some large businesses are required to organise their own collection. Special waste producers are usually required by law to manage their own waste.
In fact, a large part of the waste is reused internally by these sectors, without entering the waste stream, and some large waste producers have their own disposal facilities. Hazardous waste requires dedicated collection and treatment care to ensure safe handling and control.

REFERENCES / **Chalmin, P., Gaillochet, C. 2009.** *Du rare à l'infini.* Panorama mondial des déchets 2009. Paris, Economica. / **Hoornweg, D., Bhada-Tata, P., 2012.** What a Waste: A Global Review of Solid Waste Management. Washington D.C., World Bank, Urban Development & Local Government Unit, March 2012, No. 15, 98. / **Hoornweg, D. Giannelli, N. 2007.** Managing municipal solid waste in Latin America and the Caribbean: integrating the private sector, harnessing incentives, GRIDLINES (28). Public-Private Infrastructure Advisory Facility, PPIAF: Washington, DC. Retrieved February 20, 2009 from, www.ppiaf.org. / **Kelly, T., Matos, G. 2011.** Historical Statistics for Mineral and Material Commodities in the United States. U.S. Geological Survey, Data Series 140 (Jan. 10, 2011), available at http://minerals.usgs.gov/ds/2005/140/. / **Kessides, I. N. 2004.** Reforming Infrastructure: Privatization, Regulation, and Competition. Oxford and New York, Oxford University Press for the World Bank. / **London Metal Exchange** (LME) website: http://www.lme.com/.

Cameroon own path towards municipal solid waste management

Cameroon's municipal solid waste management policy is based on a public-private partnership which ensures regular collection and processing service for domestic waste in the major cities. The model has proved successful: on a continent where many capitals struggle to provide a daily waste collection service, it represents an interesting solution even though questions remain regarding the sustainability of its financing model.

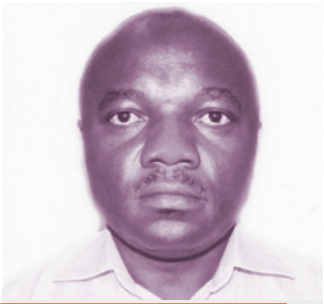
Jean-Pierre Ymelé

Director of Hysacam's Douala branch office

In 1969, Douala became the first city in Cameroon to outsource the management of its municipal solid waste to a private operator, after having realised that the municipal solid waste management system was failing. The city of Yaoundé followed suit ten years later. In 1987, the government's decentralisation drive transferred responsibility for waste management, not to the Urban Communities[1] of Douala and Yaoundé, which cover the administration of the whole city, but to the newly created district councils[2], which cover smaller administrative units. The legislators believed that this would support the concept of a neighbourhood service, but not a single district council managed to provide the requisite service, despite being funded to do so: the very limited scale of each district, poor coordination, payment of arrears by the councils, and a lack of private-sector expertise condemned the experiment to failure. At this time, the metropolitan areas of Yaoundé and Douala were regarded as two of Africa's dirtiest major cities.

For nearly a decade, the Cameroonian government merely tinkered with the problem. In 1994 though, in partnership with the World Bank, it created a special domestic waste management programme called Emergency Social Program[3] to clean up the metropolitan areas of Douala and Yaoundé, which at the time were dotted with open landfills. This programme – which also sought to offset the impacts of the economic crisis and currency devaluation by promoting labour-intensive initiatives – was a failure. Centrally managed by the Finance Ministry, which was poorly equipped for the role, it was unable to supervise or monitor the waste management system closely enough. In addition, the service delivery was entrusted to NGOs and organisations that proved ill-equipped for the task. This programme's failure once again confirmed the fact that rapid urban growth – which the authorities had not anticipated – was no longer compatible with an unprofessional waste collection and processing system, determined by external constraints. In 1998, therefore, new contracts were signed between the Urban Communities of Yaoundé and Douala, and Hysacam, which had been operating in the sector since the time of the first private-public partnerships. ▶▶▶

"A lack of private-sector expertise condemned the experiment to failure."



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[1] *"Communautés Urbaines" in French*
[2] *"Communes d'arrondissement" in French*
[3] *"Programme Social d'urgence" (P.S.U.) in French*

FOCUS

Hysacam, established in 1969, is the country's leading private municipal solid waste management company. Based in Douala and Yaoundé, the company also provides waste management services to 12 other towns and cities. Hysacam operates across the entire municipal solid waste management chain, from collection through to processing. It has 5,000 employees and a fleet of 400 vehicles. Its annual revenues are around CFA 20 billion (€30,5 million), of which 85% is state-derived.

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▸▸▸ KEY FEATURES OF MUNICIPAL SOLID WASTE MANAGEMENT POLICY

Based on these different experiences and failures, Cameroon's has developed its own municipal solid waste management policy. It is is based on three major principles. The first is that municipal solid waste management must be an integral element of governmental organisation: the system needs to be set up and managed at the largest municipal scale, under the authority of a single institution – in this case the relevant Urban Community. This view differs from the one of other African countries which have opted for decentralisation to the neighbourhood-level or for privatising the entire system by requiring operators to collect payment for their service directly from the households using it. The latter system, where the user pays – also known as 'pay as you dump' – has proved highly unsuitable for waste collection services: enforcement options relating to users are far more limited than in the water or electricity sectors: a household which has not had its waste collected will always find some other way of getting rid of it. The second principle of Cameroon's municipal solid waste management policy is that waste management is a specialist business calling for an industrial approach. In order to meet quantified targets and observe budgetary constraints, it is necessary to move beyond an exclusively public-sector management regime, which is overly subject to political and social influences. The local communities need to retain the role of regulator and supervisor – traditionally its area of competence – while the private sector contributes with its technical expertise and management efficiency. Performance contracts are signed between the two parties to clearly define their respective duties and responsibilities (Box 1). This is also about moving beyond alternative waste management methods – such as collection by donkey carts or the pay-as-you-dump model. These methods, supposedly better suited to the towns of sub-Saharan Africa (Parrot et al, 2009), have clearly shown their limitations, especially in cities with several million inhabitants. The third principle is that waste management should be allocated dedicated funding, transferred by the state in a system of controlled decentralisation, because of the importance of the issues involved (Follea et al., 2001).

"One of the reasons for Hysacam's success is its ability to adapt to changing requirements."

BOX 1: PERFORMANCE CONTRACTS IN CAMEROON

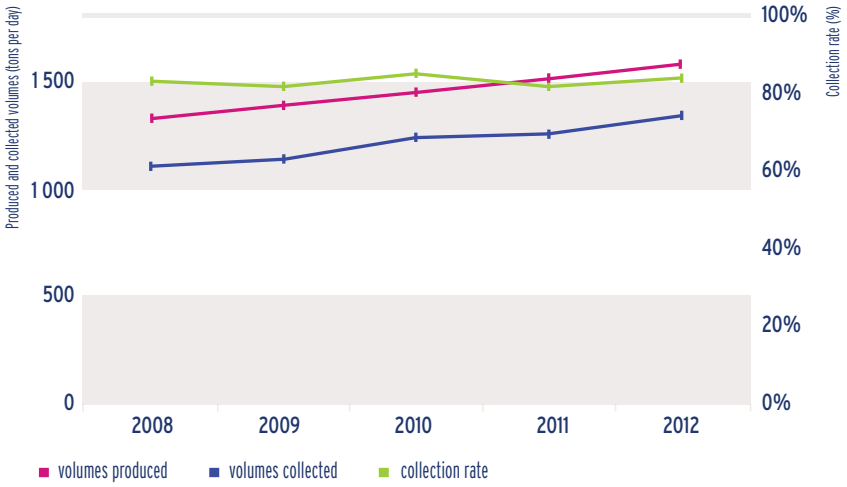
The Urban Communities and Hysacam sign performance contracts which specify very precisely the content of the service to be delivered by the latter party. The Urban Community specifies exact targets regarding collection and cleaning schedules for each area. The collection tonnage is monitored by the municipality on a daily basis – and any failure to meet the specified targets incurs penalties. The administration also supervises the availability of equipment, schedule compliance and the frequency of collection and cleaning services. Individual Hysacam teams are responsible for meeting their performance targets, and any failure to do so is easily identified. Collecting household waste in cities with several million residents calls for high-quality resources, notably trained staff, a fleet of specialist vehicles, etc. These resources require a high level of investment: service contracts of sufficient length (five years) are therefore necessary to enable the operator to recoup these costs.

RECOGNISED EFFECTIVENESS OF HYSACAM

Hysacam is Cameroon's leading private municipal solid waste management operator, holding management contracts with 14 towns and cities in the country. In December 2009, a meeting of African mayors in Marrakech (Morocco) recognised the company's effectiveness by awarding it the first Africités prize for waste management in Africa. One of the reasons for Hysacam's success is its ability to adapt to changing requirements. It has recruited trained personnel and deployed modern, well-maintained equipment – key requirements for managing waste in towns and cities with as many as several million residents – when many outside observers considered such an organization oversized for a country like Cameroon. As a result, it is able to achieve collection rates of 80-90%. To reach harder-to-access neighbourhoods, Hysacam has developed pre-collection agreements with community based organisations that gather the waste from the inaccessible areas and transfer it to the company's collection bins. This kind of arrangement can only work if the private operator keeps to its commitments, and if the collection points are clearly defined (Ps-Eau & PDM, 2003).

Hysacam is also aware that waste management is a public service mission entailing very specific requirements and a high level of social sensitivity. This makes it very important to ensure continuity of service even if the client falls into payment arrears. Hysacam has adapted to this requirement, offsetting the potential difficulties

FIGURE 1: EVOLUTION OF THE MSW COLLECTION RATE IN DOUALA (2008-2012)



Source: Hysacam, 2012

by building strong relationships with local banks. This business model based on a permanent and constructive dialogue between the public and the private sectors has helped to reassure public authorities that the company is reliable; today they are convinced of the benefit of using private-sector services. Hysacam's success has helped to enhance the sector's value – and the return of the waste industry multinationals to Africa is currently being witnessed[4]. Their comeback has been rather halting, however the multinationals still find it difficult to adapt to the characteristic features of the African situation. Excessively high costs and low levels of confidence in African markets inhibit their investment.

THE CHALLENGING EQUATION OF WASTE MANAGEMENT FINANCING

The taxation relating to municipal solid waste management in Cameroon is based on a system of direct local taxes dedicated to financing local services: street lighting, water supplies, removal of household waste. The central state centralises the collection of taxes from workers and businesses and redistributes them to municipal authorities. The fundamental problem with this tax is the narrow base from which it is drawn, limited as it is to the formal and public sectors, which represent less than 10% of the population (INS, 2011). In the main cities, Douala and Yaoundé, this tax finances less than one tenth of the waste collection and processing activities[5] – the remainder of the financing is covered by central state subsidies.

"The central state allocates 85% of the finance necessary for the management of waste."

Rather than implementing measures to improve and increase taxation, which would have weighed too heavily in social terms, the Cameroonian government opted for a system of allocating dedicated funding to cities for the processing of domestic waste. Municipalities are required to allocate these resources exclusively to this expenditure item. The central state allocates 85% of the finance necessary for the management of waste in Cameroon's main cities from its own budget, thus showing the importance it gives to keeping cities clean. The central state therefore compensates for the low level of direct taxation at the local level, without making any changes to the tax regime. In itself, this state contribution cannot represent a long-term solution; it will be necessary to find a more sustainable financing model. One of the issues to overcome is that the users have become accustomed to a high-quality domestic waste collection service – without being aware of the level of subsidy provided by the central state in order to finance it. The idea of indexing the tax for domestic waste removal to electricity bills does not offer an effective solution: not only would it create the impression of higher energy costs – which could have a knock-on inflationary effect on the cost of basic products – but it would fail to solve the problem of the narrow tax base.[6] One solution worth exploring could be a tax on all imported products, in accordance with their potential for generating waste, following the European model of ▶▶▶

[4] *Veolia in Dakar, Pizzorno in Mauritania, Nicollin in Algeria and Morocco.*
[5] *The removal of household waste represents almost 20% of the municipal budgets of Douala and Yaoundé – which total nearly CFA 42 billion (€64 million) and CFA 35 billion (€53.5 million) respectively.*
[6] *In the city of Douala (3 million inhabitants representing 800,000 households), for example, the electricity supplier lists fewer than 200,000 customers. This means all the electricity company's customers would have to pay an average of more than CFA 50,000 per year (€75) to cover the costs of waste collection.*

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▶▶▶ extended producer and consumer taxation. Waste from imported products, accounts for 35% of all waste produced in Cameroon.

TOWARDS A CHANGE IN THE STATUS OF WASTE

The Cameroonian government is gradually emerging from a hygienist vision of municipal solid waste management and is adopting a more environmentalist, sustainable approach. Although no legislation to this effect is currently in place, the Ministry of Environment and Sustainable Development has incorporated the concept of sustainable development in its waste management strategy document. This official strategy is clearly structured around three priorities. The first is to prevent and reduce the production and harmfulness of waste by developing clean and more resource-efficient technologies. The second priority is to ensure that more waste is recovered and recycled, and the third is to dispose of non-valuable waste in a sustainable way. Implementing this kind of policy, however, runs into the obstacle of the sector's funding problems. With the country's waste management's current remuneration levels – less than €6 per ton, compared with €40 to €120 in Europe (Ademe, 2006) – it is difficult to find an ecological solution to the processing of non-biodegradable waste. At these remuneration levels it is difficult to comply with all the local environmental standards – let alone international standards such as the International Finance Corporation (IFC)'s environmental and social performance standards. This policy also runs into the practical difficulties of recovering and recycling waste in the current environment in Cameroon where the recycling component of the waste is low. There is, however, room for improvement as 100% of the collected waste is sent to landfill. Solutions are possible, especially in the field of recycling (Box 2). Hysacam is helping to drive this process forward, with initiatives that include projects for capturing and processing the biogas generated by decomposing domestic waste at its waste facilities; for example, the company has established Central Africa's first biogas processing plant at the waste facility in Nkolfoulou, a suburb of Yaoundé using the Kyoto Clean Development Mechanism (CDM). This example shows yet again the value of involving the private sector to improve waste management and identify efficient, sustainable solutions for the sector. Cameroon's strategy for municipal solid waste management went against the trend of the recommendations made by institutional donors at the time it was put in place. It was based on strong political leadership from public authorities, accompanied by the provision of appropriate resources by the delegation of service provision to a local private operator and a strong cooperation between the public and the private sectors. Although there are still many challenges to overcome – stability of financing, waste recovery, etc. – this model has nonetheless facilitated the emergence of an efficient, sustainable collection system which has proved capable of adapting to the strong growth of African cities. Today, Cameroon is one of the leading Western and Central African countries with its municipal solid waste management system. ●

"Cameroon's strategy for municipal solid waste management [...] was based on strong political leadership."

BOX 2: WASTE RECOVERY IN CAMEROON

Currently, all municipal solid waste collected in Cameroon is sent to landfill. The only existing recycling industry relates to products such as iron and bottles, which are recovered by waste pickers before the waste is collected. Metals are sold to industry – mainly in China and India. Establishing widespread recycling is problematic due to the composition of the waste, which has a very low recyclable component – except for the biodegradable material (60% of the total volume), which can be used to produce compost. Yet here the market is dominated by competition from chemical fertilisers: only taxation and limits on their usage, combined with a increasing awareness of their damaging effect on the soil, could pave the way for growth in the compost sector. Industrial recovery of other materials is unlikely to be cost-effective – although the current trend in raw materials costs is making sorting and separating increasingly economically attractive.

REFERENCES / **ADEME, 2006.** The price of sending non-hazardous waste managed by local authorities to landfill in 2005. Summary, March. / **Follea et al., 2001.** Executive summary: Comparative review of urban waste management methods adopted in different PSZ (Priority Solidarity Zone) countries. AFD. / **INS (Institut National de la Statistique), 2011.** Second survey of employment and the informal sector in Cameroon by Cameroon's National Institute of Statistics. / **Parrot, L., Sotamenou, J., Kamgnia Dia, B., 2009.** Municipal solid waste management in Africa: strategies and livelihoods in Yaoundé, Cameroon, Waste Management 29(2), 986-995. USA. / **Ps-Eau & PDM, 2003.** Sustainable management of waste and urban sanitation.

Linking public and private action for sustainable waste management

When it comes to managing waste in developing countries, the private sector can contribute technical skills, organisational capabilities and flexibility. Yet private sector involvement alone will not solve all the problems. The public sector, while far from abrogating its responsibilities, has to strengthen regulations and step up project management. It is also vital to improve the financing of waste management services and to ensure a better-structured regulatory framework.

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Solid waste management is often regarded as the most local of all public utilities. Since the first steps were taken to decentralise this service in developing countries, responsibility for it is increasingly falling to municipalities, as it has been the case in Europe for decades. Frequently subject to financial, material and work force constraints, municipalities try to manage just the most urgent needs, such as removing waste from cities to keep them clean. Many focus their efforts on developing basic cleaning services – street sweeping, waste collection, gutter maintenance and running landfills – with mixed results and high costs. In some cities in sub-Saharan Africa, operating costs can account for 30 to 50% of a municipality's total annual budget. Yet this approach, based on collecting and storing waste in open landfills, falls short of managing municipal solid waste on a long-term basis.

The exponential growth in waste, which is a consequence of increasing urbanisation and change in consumption habits, requires a change in practices to reduce landfill deposits and incineration. For several years, government authorities in the South have had to conduct in-depth reviews of how waste management services are configured and have been encouraged to safeguard the environment and protect public health. Improving the geographical coverage of such services so that vulnerable or peripheral neighbourhoods are no longer excluded is also a major social challenge. Developing facilities, managing infrastructure and recovering and recycling waste are increasingly considered critical to any public waste management policy. Yet more often than not, such policies are implemented in a deprived economy, and management costs inevitably increase as infrastructures become more sophisticated and the number of stakeholders multiplies. Against this backdrop, it is essential for the private sector to become more involved, which would require a renewed public-private partnership.

"Solid waste management is often regarded as the most local of all public utilities."

The need for integrated management of municipal solid waste

Reducing the quantity and noxiousness of waste at the source, introducing separate collection and sorting procedures to encourage recycling and reuse, organising waste trans- ▶▶▶

AMANDINE DUKHAN, CHRISTEL BOURBON-SÉCLET AND NATHALIE YANNIC

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▶▶▶ portation, and investing in recycling, energy and organic recovery technologies are the fundamentals of sustainable waste management. All the links in this chain are interdependent: they follow exactly the same path and address the same issues, regardless of region. An integrated system based on prevention-sorting-recycling-recovery-reuse is therefore key to reducing waste production over the long term and reducing the amount of waste deposited in landfills.

When waste management was decentralised relatively recently, skills were transferred, but not the corresponding resources. Municipalities are still struggling with the organisation of the different stakeholders and the recurring expenses related to collecting waste and depositing it in landfills. The challenges involved in waste recovery and recycling are sometimes given low priority and dealt with in part by the informal sector. The public sector's efforts to develop waste management toward an integrated system are hindered by the difficulties associated with investing in and maintaining facilities, the lack of business competencies in certain links of the chain, and the ongoing absence of sustainable financing sources.

"Private sector management of all or part of the system does not solve the problems entirely."

Redefining the roles of public and private sectors

The private sector can address the management difficulties encountered in a state-run system and provide the technical skills sometimes lacking in the public sector. In best-case scenarios, private operators have qualified staff and appropriate production resources, while still being flexibly organised.

Since costs cannot be fully covered by the fees collected from users, calling on specific service providers (for collecting waste, operating a waste transfer plant or technical landfill centre) is more widespread than the appointment of a large-scale private operator covering the entire sector. Public-private partnerships involving a BOT[1] contract are the most common; these involve a system of direct payment to the private operator by public authorities, based on a management cost per metric tonne. This rate not only covers operating costs but also, in some cases, investment in initial infrastructure and upgrading works. As it is difficult for municipalities in developing countries to pay private operators enough to cover the cost of all waste management services, the central state often has to provide additional funding. The private network is therefore split between primary collection organised by a very active informal service and the rest of the waste management chain, where one can find global corporations as well as local operators, some of whom are from the informal sector.

But private sector management of all or part of the system does not solve the problems entirely, and public authorities have to step up their involvement as regulator and project manager even further. Perhaps more so than for other public utilities, waste management requires coordination among numerous stakeholders[2] at different stages in the process, and calls for a broad range of skills and know-how. Implementing a proper waste management policy implies a strong involvement from the public authorities in running the service. This includes controlling costs, planning investment, negotiating contracts with service providers, educating users, establishing and enforcing regulations, and involving producers and consumers.

Success factors of private sector involvement

To attract private investment, local authorities need to establish a strategic framework tailored to local conditions and based on consultation with all local stakeholders. The project must take into account the town's socio-spatial structure, the type of waste involved, the resources available, the institutional setting, and whether those involved are from the formal or informal sector. Adopting European standards is often counter-productive for local authorities lacking the necessary financial and technological resources. For a public waste management policy to be sustainable, a pragmatic, customised and progressive approach is essential. Such an approach is preferable to applying high standards from the beginning. More generally, a clearly defined regulatory framework enabling companies to compete equitably is a prerequisite for effective private sector involvement.

The public authorities should be able to offer a clear, well-defined and securing contractual framework for the private sector. Public-private contracts must be relatively long term so that private operators can customise and improve the services provided, while complying with municipal budgets. Shared responsibilities must be stated explicitly so that private operators are best able to manage their risks. Financial and legal stipulations (such

[1] *The goal of a BOT (Build, Operate and Transfer) contract is to appoint a private operator for the design, construction, operation and maintenance of a project. It implies a transfer of ownership of the project to the government at the end of the contract.*

[2] *The challenge for public authorities is to include, structure and regulate the informal sector, which handles a significant portion of waste sorting, recycling and reuse.*

as penalties or termination conditions) must be included in the contract to ensure that private operators fulfil their role in a professional manner and comply with the strategic framework (particularly in terms of service level and access). Ultimately, local authorities must have the work force and sufficient resources to be able to monitor and control contracts and, more generally, implement a consistent public policy.

A COMPLICATED FINANCIAL EQUATION

Solid waste management services in both developed and developing countries rarely reach financial equilibrium. Local authorities in the developing countries often have to resort to three different funding sources – household waste collection fees paid by the user, a household waste collection tax, and general budget contributions – in an attempt to cover sector costs. Waste collection fees are paid directly by each household and usually apply to collection only. The amount is kept low, to be manageable for households, and is typically paid to private or informal waste collection operators. These fees are generally not enough to cover the system's upstream costs.

Local authorities therefore try to obtain additional financing via a household waste collection tax, which is used to finance other aspects of the service. This tax is usually linked to a land tax on developed properties. In the case of local authorities in the developing countries, the base of this tax is reduced, and payment rates are low. Furthermore, the tax is collected by the state and channelled through the treasury. Due to the lack of transparent systems for paying local taxes to municipalities on an ongoing basis, losses inevitably occur. Waste management services in the developing countries are therefore subject to the problem of mobilising tax resources in towns and cities. Consequently, the income generated is not sufficient to cover the costs of setting up an integrated waste management system.

Some interesting initiatives have been introduced to improve tax revenues. For example, the city of Lomé has been experimenting with levying fees on major producers of waste (manufacturing industries, restaurants, hotels, business, and so on), while Addis Ababa has been experimenting with indexing the household waste collection tax based on a household's water bill. These fees, generally proportional to consumption, mean that at the very least, payments are spread in keeping with living standards.

Mobilising the private sector, skilled as it is, does not in itself constitute a solution for better waste management. To be effective and appropriate, a waste management system must be accompanied by better financing mechanisms, increased technical and institutional capabilities on the part of public authorities, and a well-structured regulatory framework.

"Mobilising the private sector (...) does not in itself constitute a solution for better waste management."

In the absence of such an environment, private sector involvement – even if it can temporarily fill public management gaps – may still not be enough to achieve an integrated and sustainable waste management system. ●

FOCUS

The Agence française de développement (AFD) supports development of the integrated management of municipal solid waste in several cities such as Lomé, Addis-Abeba, Cap Haïtien and Gaza. Through loans or subsidies, it mainly focuses on the reorganisation of the precollection, collection and transport of waste, and the improvement of waste storage and elimination. It also supports innovative projects involving waste recovery and recycling.

Integrating the informal sector for improved waste management

In many cities of the developing countries, the informal sector plays an important role in managing municipal solid waste. The informal recovery of recyclables from the solid waste system reduces overall solid waste management costs for municipalities. Millions of Euros are saved annually in the process. Apart from this, informal sector waste management activities also helps municipalities achieve recycling objectives and reduce use of precious landfill space.

Dr Sanjay K Gupta

Independent adviser and consultant[1]

Waste management systems in the cities of many developing countries could not be managed without the informal sector: waste pickers, scrap collectors, traders and recyclers. The International Labour Organisation (ILO) defines informal sector waste workers as individuals or small and micro-enterprises that intervene in waste management without being registered and without being formally charged with providing waste management services. This sector is often not officially recognised and acknowledged, yet its members contribute significantly to the waste management of cities, by collecting, sorting, processing, storing and trading waste materials in the recycling value chain. Many more tonnes of recovered materials come via informal channels in the cities than *via* formal channels (Table 1). In most developing countries, 15-20%[2] of the waste generated is managed by the informal sector, providing financial and environmental benefits to municipalities.

In most developing countries, the informal recycling sector is structured like a pyramid. At the bottom of the waste trade pyramid are the waste pickers who engage in the free collection of waste from municipal garbage bins, streets and dumps. Above them are the itinerant scrap buyers who purchase small quantities of waste (plastic, paper, glass, metals, etc.) from households. In several countries, households also sell their recyclable waste to itinerant buyers in street shops. Between the waste collectors and the reprocessors are various levels of traders, including retailers, stockists and wholesalers, many of whom are not registered as businesses. The trade gets more specialised as it moves up the pyramid. At every successive level, waste is sorted more specifically; the finer the segregation, the more value is added. Where city waste collection systems are efficient, some of the players may be missing or combined. Materials recovered by the informal valorisation sector are sold into the industrial value chain. In a recent development, waste picker cooperatives have been formed by informal sector workers in many countries with the help of non government organisation and donor agencies. These workers undertake some formal work under contract to a municipal authority, while also being involved in informal recycling, thus in this respect, making their role semi-formal.

"Many more tonnes of recovered materials come via informal channels in the cities than via formal channels."

Providing environmental and economic benefits

Many studies indicate that the informal sol-

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[1] *Dr David Wilson, Independent Waste and Resources Management Consultant and Visiting Professor at Imperial College London, provided valuable feedback on this article at different stages.*

[2] *These figures refer only to recyclables material retrieved and sold to scrap dealers by informal sector waste pickers and not necessarily the total waste collection, which is often higher than the referred 15-20%.*

TABLE 1: WASTE RECOVERY RATE IN SEVEN CITIES

	Belo Horizonte (Brazil)	Canete (Peru)	Delhi (India)	Dhaka (Bangladesh)	Managua (Nicaragua)	Moshi (Tanzania)	Quezon City (Philippines)
Tons per year recovered all sectors	145,134	1,412	841,070	210,240	78,840	11,169	287,972
Percent recovered by formal sector	0.1%	1%	7%	0%	3%	0%	8%
Percent recovered by informal sector	6.9%	11%	27%	18%	15%	18%	31%

Source: CWG-GIZ / Scheinberg et al., 2010

id waste management sector is more active and effective in recovering and valorising resources than the formal one in low- and middle-income countries. The reasons for this are as follows: first, the informal sector usually works in the recovery and recycling of valuable materials, while the formal sector focuses on collection and disposal; second, the informal sector achieves higher recycling rates. Although operational costs are often higher than in the formal sector, the high revenues from materials result in a much lower cost per tonne, in most cases a net benefit. Informal valorisation businesses only extract, process, and sell those materials that have a high intrinsic value and on which they can make a profit. All informal valorisation activities along the entire value chain are profitable. The informal sectors in Cluj (Romania), Lima (Peru), Lusaka (Zambia), Pune (India), Quezon City (the Philippines) and Cairo (Egypt) together make a net profit of about EUR 130 million (CWG-GIZ, 2011). The large profit is able to sustain or add valuable income to sustaining about 73,000 informal sector workers in these cities.

The informal recovery of recyclables from the solid waste system reduces overall solid waste management costs for municipalities (Figure 1). If material is recovered through door-to-door collection by the informal sector, this material no longer needs to be collected, so all expenses – collection, transport and disposal – are reduced according to the amount that is recovered. The savings on transport depend on the point at which the material is removed from the waste stream for recycling. If material is recovered at the disposal site, transport costs are not reduced, but disposal costs are reduced. Millions of Euros are saved in the process. For example, Delhi (India) saves around EUR 6.7-7.5 million annually. A study conducted in six cities of developing and emerging markets suggests that most of the avoided costs are for collection. The average avoided costs per worker are EUR 571, which in many cities is more than that same worker earns in a year (CWG-GIZ, 2010).

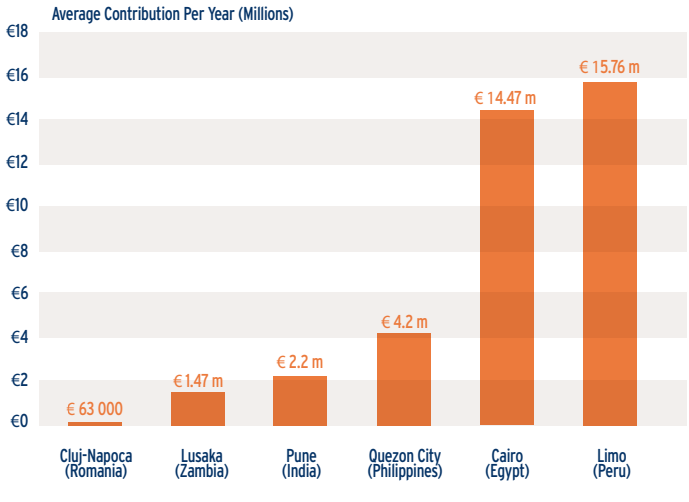
"The informal recovery (...) reduces overall solid waste management costs for municipalities."

By engaging in recycling activities, the informal sector also creates environmental benefits for the municipal authorities, helping them to reach recycling targets and save precious landfill space. It also reduces the extraction of raw materials and returns secondary raw materials to the production cycle, resulting in less energy being used for recycling processes than for production processes with primary raw materials. Moreover, informal sector recovery scores considerably better than formal recovery in terms of reduced fossil energy use. This is because many informal activities rely on human or animal muscle traction, rather than on motorised transport.

A SOURCE OF LIVELIHOOD FOR MILLIONS OF PEOPLE

The informal recycling sector provides a livelihood to millions of people in developing countries, who survive on in- ▶▶▶

FIGURE 1: COST SAVINGS OF WASTE PICKERS FOR MUNICIPAL WASTE COLLECTION AND DISPOSAL, BY CITY



Source: CWG, GIZ, 2010

▶▶▶ formal waste picking and recycling (Table 2). It is estimated that nearly 15 million people are engaged in waste management activities in the informal sector. In many cities, the informal waste sector provides more livelihoods than the formal waste sector. Waste pickers' earnings also vary widely among regions, in terms of the type of work they do, and between women and men. Although waste picking is the lowest paid part of the recycling chain in many places, these workers often earn more than the minimum wage. In Brazil, for example, data collected shows that 34% of waste pickers earn 1 to 1.5 times the minimum wage, and 54% of them earn 1.5 to 4 times the minimum wage.

However, work in the informal recycling sector is usually insecure, and carried out under appalling health and occupational safety conditions, sometimes inhuman. Waste pickers face great risks of injury, especially those who work at open dumps: they may be run over by trucks or become the victims of surface subsidence, landfill slides and fires. They are also exposed to great quantities of toxic fumes at the disposal site. It is generally accepted that morbidity among waste pickers is higher than among formal waste collectors.

Mobilising and formalising the informal sector

Attitudes of municipal authorities towards the informal sector differ from place to place: in some places there is hostility, in others indifference, and in some places they are regarded as a useful part of the waste management system and are given the opportunity to enhance their livelihoods. The role of municipalities is critical to mobilising the informal sector and organising the informal valorisation sector.

The first way to upgrade the informal sector would be to integrate waste pickers into directly collecting waste at source, with a right over recyclables and a guarantee of regular access to waste. In 2006, the Pune Municipality granted waste pickers the right to collect waste and a service fee from households (Box 1). In Bogota (Colombia), the Appellate Court struck down the exclusive right over waste to a municipal waste contractor and restored the right over waste to the street waste pickers.

Mobilising the informal sector entails municipalities establishing direct contractual or covenant relations with informal sector organisations. But to facilitate this, the informal sector needs to organise itself into cooperatives or other legal or semi-legal structures. For efficient waste management, it is more appropriate and economical to use the existing structures of the informal sector or to modernise it. For example, Brazilian municipalities partner with waste picker cooperatives, giving them the right to receive recyclables collected by the municipality and to rent recycling cen-

"The role of municipalities is critical to mobilising the informal sector."

BOX 1: SWACH - A WASTE PICKERS' COOPERATIVE IN PUNE, INDIA

Solid Waste Collection and Handling, or officially, SWaCH Cooperative, is India's first wholly owned cooperative of self-employed waste pickers/waste collectors and other urban poor. It is an autonomous enterprise that provides front-end waste management services to the citizens of Pune. SWaCH is authorised by the Pune Municipal Corporation (PMC) to provide door-to-door waste collection and other allied waste management services. The scope of SWaCH includes collection, resource recovery, trade and waste processing. Currently, through its 1,867 members, it provides services to the population of over 1.5 million people of Pune. SWaCH bridges the garbage gap between people's doors and the PMC collection points. It offers total solutions for wet garbage and dry garbage, while enabling the waste pickers and collectors to keep their livelihoods and get trained to carry out their work professionally and in an occupationally safer way. The integration of the waste pickers through SWaCH has helped to reduce waste disposal by more than 20%. For the PMC, the cost of engaging with the informal sector is much cheaper than engaging with private sector.

[3] *Waste Concern was founded in 1995 with the motto " Waste is a Resource". Later Waste Concern Group was formed to achieve a common vision to contribute towards waste recycling, environmental improvement, renewable energy, poverty reduction through job creation, and sustainable development. Waste Concern Group is a Social Business Enterprise (SBE) comprising both "For Profit" and "Not-for Profit" enterprises.*

TABLE 2: INFORMAL AND FORMAL LIVELIHOODS IN SIX CITIES

City / Indicator	Cairo	Cluj	Lima	Lusaka	Pune	Quezon
Total no. of livelihoods in informal waste sector (persons)	33,000	3,226	17,643	480	8,850	10,105
Total employment in the formal waste sector (persons)	8,834	330	13,777	800	4,545	5,591
Ratio of persons working in the informal sector to those in the formal sector	3.7	9.8	1.3	0.6	1.9	1.8
Average informal workers' earnings (EUR/year)	2.721	345[1] / 2.070	1.767	586	1.199	1.667

[1] *Represents actual earnings from about 50 days of labour per year of €345 multiplied by 6 for purposes of comparison with other cities.*

Source: CWG-GIZ, 2010

tres. In Bangladesh, Waste Concern[3] and a few other NGOs train waste pickers in organic waste recycling (composting). The pickers sell the compost to a large fertilizer company.

Informal workers have limited general business knowledge, and are often socially disadvantaged. For this reason, policy changes need to consider the specific circumstances of the informal sector. Municipalities could provide waste pickers with identity cards and health insurance schemes; they could also support them in establishing cooperatives or SMEs, and provide them with training.

Partnering with the private sector

In the context of privatised waste collection services, collaboration between the informal sector and the formal waste collection sector is possible. Waste pickers can partner with waste collection enterprises or *vice versa*. For those who are not engaged in recycling, a partnership with the informal sector would reduce the volume of waste collected and would cut their transport costs. In Brazil, for example, the private sector delivers recyclables to informal sector recyclers, while informal recyclers make arrangements with formal recycling enterprises, processors and waste buyers (Scheinberg et al., 2010).

In some cases, conflicts may arise with the private sector. For the private contractor or enterprises engaged in collection on payment of paid-per-ton disposed at the landfill, the informal sector waste collection becomes a competitor and cuts into their profits. These firms have an interest in collecting the largest possible quantity of waste to increase their revenues (Box 2). In this context, they may be inclined to develop strategies to access waste at the earliest possible stage or to prevent the informal sector from collecting waste. In such a situation, the public sector should either help integrate the informal sector to work with the formal sector or ensure that contracts for private sector operators are designed in a way that ensure the informal sector has access to and the right to waste.

Regularising and integrating informal recovery into the overall solid waste system could enhance recyclable recovery rates and reduce overall solid waste management costs. Generally, policies that facilitate the integration of the informal sector will result in an increase in the rate of material recovery. Consequently, disposal rates will drop, allowing for savings in transportation and landfill operations. Many forms of waste valorisation are found in different combinations: personal or commercial reuse, reuse with repair, recycling, and composting. In all these scenarios, municipalities make a net gain and can therefore reach higher recycling and landfill diversion rates quicker than with their conventional systems. •

BOX 2: PRIVATE SECTOR WASTE MANAGEMENT IN COIMBATORE, INDIA

In Coimbatore, waste is collected door-to-door every day by the local authority, whereas transport, composting, processing and landfill is the responsibility of a private company called UPIL for a period of 25 years. Its revenues come not only from landfill site fees, but also from the sale of the compost and recyclable materials collected. Since then in Coimbatore, waste pickers are no longer allowed access to landfill sites and the door-to-door collection system is starting to squeeze out the informal waste picking from public spaces. In this city, a third system also exists, run by the Indian Tobacco Company (ITC), a large industrial conglomerate that operates three paper mills in India. To feed its paper mills, in 2010, ITC introduced a new system for collecting waste paper directly from more than 20,000 households. Because it is positioned well upstream in the process, this system also cuts off the source of supply for waste pickers and scrap dealers. This example shows that waste is perceived as much as a recoverable resource as "just rubbish". The rivalries between these systems are more than straightforward economic competition. They raise questions concerning the distribution of resources and the definition of rights of ownership to the materials, to avoid them being monopolised by a single operator. Here informal sector waste pickers are not only displaced but also overall recycling and recovery is anticipated to be much lower than what it could have been with the integration of waste pickers in the formal system.

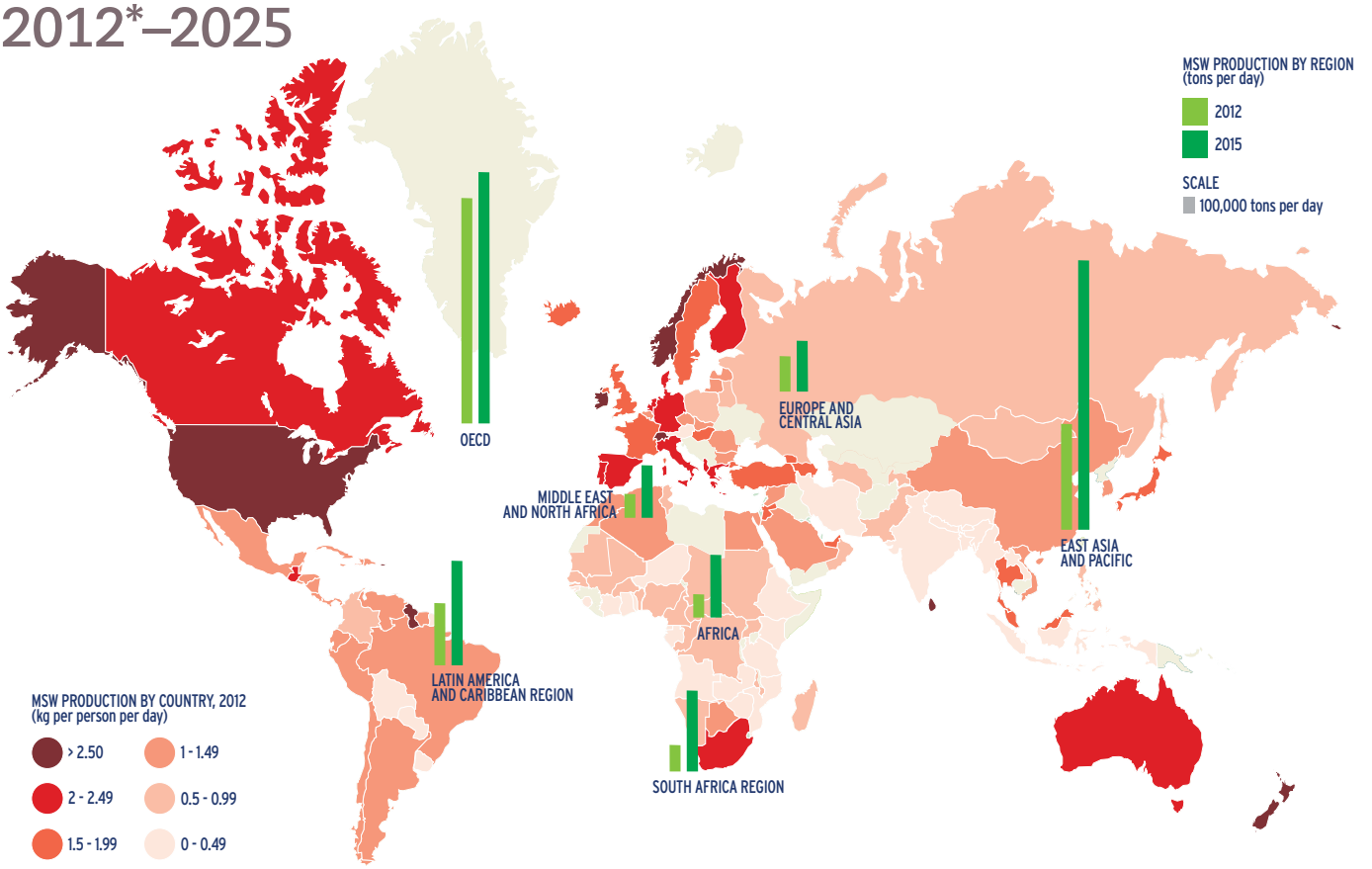
(AFD, 2010)

References / **Cavé, J., 2010.** Waste management in Coimbatore (India): friction between public policy and private-sector initiatives, AFD – Working paper n°104, Laboratoire Techniques, Territoires et Sociétés (LATTS), CNRS. December / **CWG-GIZ, 2010.** The Economics of the Informal Sector in Solid Waste Management. CWG Publication Series No 5. available at http://www.cwgnet.net/prarticle.2010-11-04.5920431459/prarticle.2011-03-30.0366272418 / **Gerold, A. 2009.** Integrating the Informal Sector in Solid Waste Management Systems. Basic Aspects and Experiences. GIZ. / **Scheinberg, A., Wilson, D.C., Rodic, L. 2010.** Solid Waste Management in the World's Cities. Published for UN-Habitat by Earthscan, London.

Waste: the challenges facing developing countries

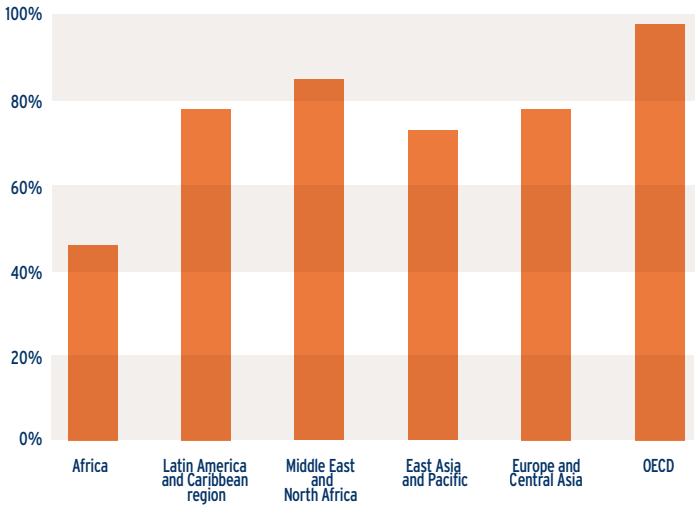
Big cities in developing and emerging countries need to tackle municipal waste management to keep pace with the exponential growth of towns and to avert health and environmental disasters. There are a number of ways to go about this including cooperating with the informal sector, finding solutions to the financial equation, improving waste treatment modalities and above all, exploring the potential of the waste recycling markets.

World production of Municipal Solid Waste (MSW), 2012*–2025



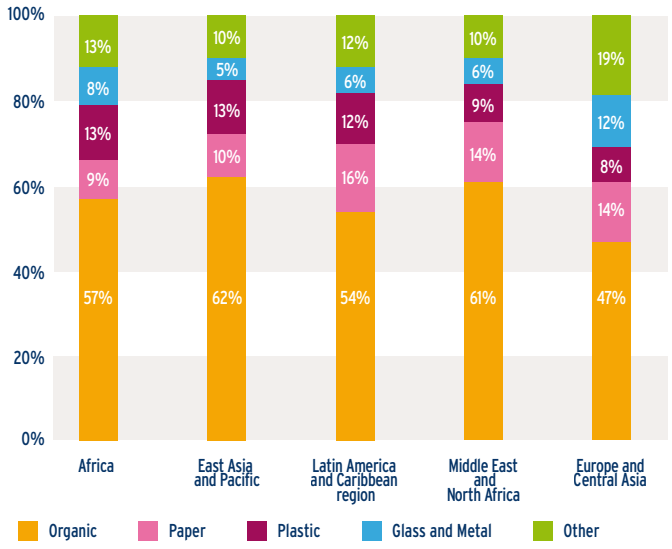
Source: The Economist, The World Bank, 2012

MSW collection rates by region, 2012*



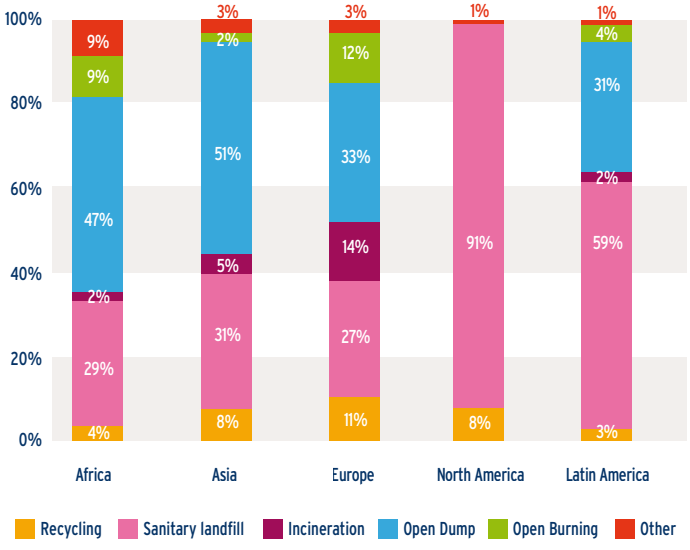
Source: The World Bank, 2012

MSW composition by region, 2012*



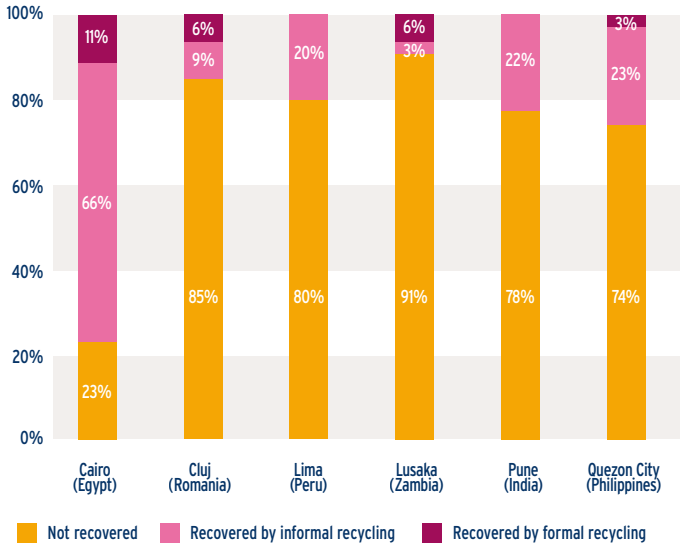
Source: The World Bank, 2012

MSW disposal by region, 2012*



Source: The World bank, 2012

MSW recovery rate, 2007



Source: GTZ/CWG, 2007

Cost of waste collection and disposal by income, 2012*

(USD per ton)	Low-income countries	Lower-middle income countries	Upper-middle income countries	High-income countries
Collection	20-50	30 - 75	40 - 90	85 - 250
Sanitary Landfill	10 - 30	15 - 40	25 - 65	40 - 100
Open Dumping	2 - 8	3 - 10	na	na
Composting	5 - 30	10 - 40	20 - 75	35 - 90
Waste-to-Energy Incineration	na	40 - 100	60 - 150	70 - 200
Anaerobic Digestion	na	20 - 80	50 - 100	65 - 150

Source: The World Bank, 2012

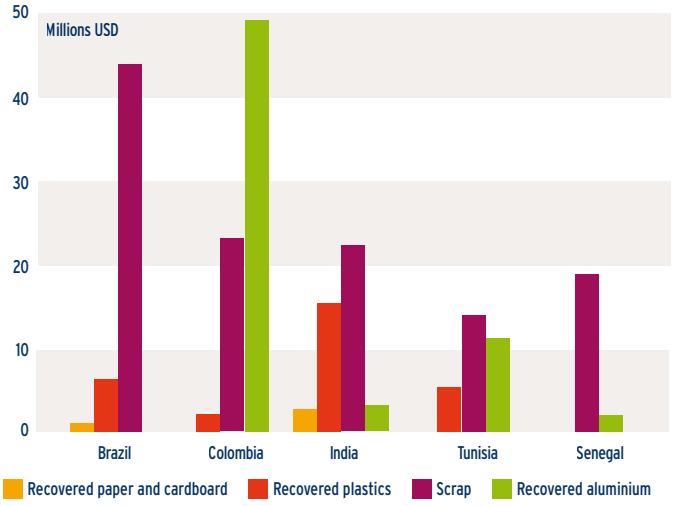
Note This is a compilation table from several World Bank documents, discussions with the World Bank's Thematic Group on Solid Waste, Carl Bartone and other industry and organizational colleagues. Costs associated with uncollected waste—more than half of all waste generated in low-income countries—are not included.

Annual municipal waste management budget, 2010

City	Country	Population (hab)	Total waste management budget (USD)	Solid Waste budget per household (USD)
Bamako	Mali	1,809,106	1,443,308	5
Delhi	India	13,850,507	99,726,833	37
Sousse	Tunisia	173,047	2,366,870	55
Canete	Perou	48,892	269,927	24
Dhaka	Bangladesh	7,000,000	15,755,620	10
Belo Horizonte	Brazil	2,452,617	115,500,000	146

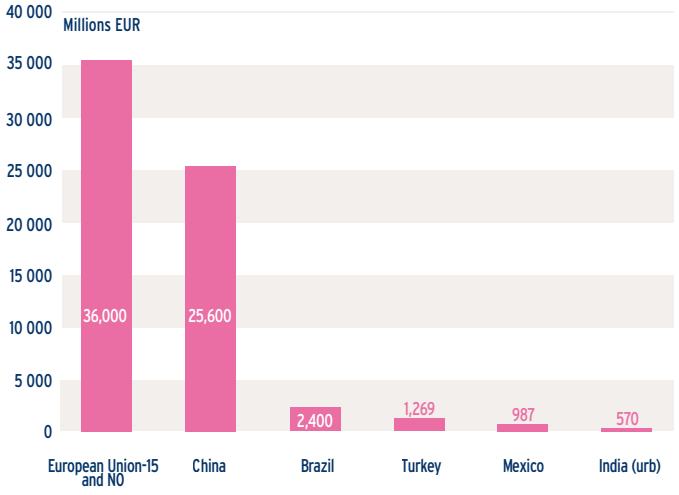
Source: UN Habitat, 2010

Exports of secondary raw materials, 2007



Source: Chalmin, P., Gaillochet, C. 2009

Estimates of MSW market, 2009



Source: Chalmin, P., Gaillochet, C. 2009

**These figures refer to current estimates. The year of data may vary depending on cities. Solid waste data should be considered with a degree of caution due to global inconsistencies in definitions, data collection methodologies, and completeness.*

Setting the trend in waste processing, a story from India

In India, increase in solid waste exceeds 5% per year. Due to unsatisfactory municipal solid waste (MSW) management standards, the government has introduced new obligations for the disposal of MSW. Implementation remains slow though. Consequently, India is turning to the private sector. With a market for collection and disposal valued at USD 570 million, private sector initiatives are being attracted. The waste sector is offering new business opportunities.

Dr Irfan Furniturwala

Founder of Hanjer Biotech Energies Ltd

Every year about 50 million tons of MSW is generated in India. Waste production is increasing by 5% per year due to urban growth, lifestyle and consumption changes. Current MSW management standards are far from satisfactory in India: large cities collect 70-90% of the MSW generated, whereas smaller cities collect less than 50%. Uncontrolled landfilling is practiced in most Indian cities, without any processing. More than 91% of collected MSW is landfilled on open lands and dumped, raising major environmental issues. Every year the open burning of MSW and landfill fires together release a lot of pollutants, requiring immediate intervention.

DR IRFAN FURNITURWALA

Dr Irfan Furniturwala founded Hanjer Biotech Energies in 2003. He helped design the innovative waste processing technology employed at Hanjer and has taken it to a leading position in the waste recycling and resource recovery sector. He has explored new business models and partnerships, while establishing Hanjer's innovative offerings with civic and government bodies. He holds an honorary PhD from Burkes University in the United Kingdom.

In response, the government of India framed the Municipal Solid Waste Rules 2000, introducing new obligations for municipal authorities throughout the country, irrespective of size and population. This program introduced objectives and obligations for the better collection, segregation, transportation and suitable disposal of municipal waste, and for the elaboration of awareness programs for segregating waste at source, to promote higher recycling rates. However, implementation remains slow, due to lack of communication with the general public, lack of financial resources, understaffing, lack of adequate training, lack of accountability and lack of support by the states. Consequently, India is now turning to more flexible instruments involving the private sector. With a MSW market for collection and disposal currently valued at approximately USD 570 million[1] and a recycling market that could reach USD 2.5 to 3 billion in the near future, the private sector becomes more and more attracted to the MSW sector. Increases in the prices of energy and raw materials are also pushing Indian companies to preserve resources, revealing waste processing as a business opportunity (Figure 1).

Given the limited additional funds available to finance the application of such new rules and the potential financial penalties incurred by the municipalities if they do not reach the new standards, this regulatory framework has also encouraged private sector participation to share their technical and managerial capabilities in the establishment of an integrated waste management system through profitable Public-Private Partnerships. About 36% of MSW processing contracts in India today are awarded to the private sector. The various models for private sector participation in the Indian MSW value chain include the Tipping Fee Model, in which municipalities pay private MSW companies a tipping fee for every ton of waste collected, processed and dumped. This is the most prevalent model in India. The drawback of the model is that the private companies enrolled have low incentives to reduce waste going into landfill sites, increasing the financial and environmental burden on municipalities. Recently, a few private Indian players such

"More than 91% of collected MSW is landfilled on open lands and dumped."

[1] *The collection cost is USD 16 per ton and the disposal cost is USD 5 per ton.*

FIGURE 1: COMPOSITION OF MUNICIPAL SOLID WASTE IN INDIAN TOWNS (%)

Population (million)	Paper	Rubber, leather and synthetics	Glass	Metal	Total compostable materials	Inert materials
0.1 to 0.5	2.91%	0.78%	0.56%	0.33%	44.57%	43.59%
0.5 to 1	2.95%	0.73%	0.56%	0.32%	40.04%	48.38%
1 to 2	4.71%	0.71%	0.46%	0.49%	38.95%	44.73%
2 to 5	3.18%	0.48%	0.48%	0.59%	56.67%	40.07%
5 and over	6.43%	0.28%	0.94%	0.8%	30.84%	53.9%

Source: Chalmin, P. Gaillochet, C. 2009

as Hanjer have entered into agreements based on the Non-Tipping Fee Model, in terms of which private MSW players process the waste collected by municipalities without any charge. Revenue is generated exclusively by recycling the waste collected. This model incentivises minimising landfill waste and requires players to have innovative processing and segregation technologies. The introduction of the private sector brought greater efficiency and enhanced performance due to the introduction of competition, stronger experience and technical capabilities, more flexible organizations and better management and accountability. Faster response, associated with the ability of private organizations to raise capital, along with a better service, associated with the business image exposure from the private sector, are also key success factors.

AN INNOVATIVE BUSINESS MODEL

Hanjer is one of the few players that have adopted the Non-Tipping Fee model for MSW processing in India. The company has set up and successfully runs 24 integrated MSW processing plants, with a cumulative processing capacity of 4 million tons per year or 11,500 tons per day (tpd). The plants convert non-hazardous MSW into derived recycling products such as compost, refused-derived fuel (RDF), sand and plastic ingots, which are sold in the open market.

For each facility, the company has entered into a concession agreement with the municipality on a Build, Own, Operate and Transfer (BOOT)[2] basis for a period of 20 to 30 years. Through the concession agreement, the company is granted rights to set up and operate an MSW plant and is also assured the supply of minimum guaranteed MSW free of charge by the municipality to its plant site. To reach profitability, Hanjer has developed an innovative in-house technology to segregate MSW into its wet and dry components and to convert them into multiple usable industrial products. This pioneering technology enables the company to reach higher recovery rates and a higher quality of end-products. Hanjer is able to recycle up to 85% of the MSW received from the municipalities. As a comparison, the maximum recovery achieved by another nation in reducing landfill is France with 65-70%.

"Hanjer is able to recycle up to 85% of the MSW received."

The company's experience in multiple locations with various climatic and weather conditions across India has enabled it to perfect its process and technology. The key success of Hanjer lies in its production of several types of uniform value-added products, which ▶▶▶

[2] *Build–operate–transfer (BOT) or build–own–operate–transfer (BOOT) is a form of project financing wherein a private entity receives a concession from the private or public sector to finance, design, construct, and operate a facility stated in the concession contract.*

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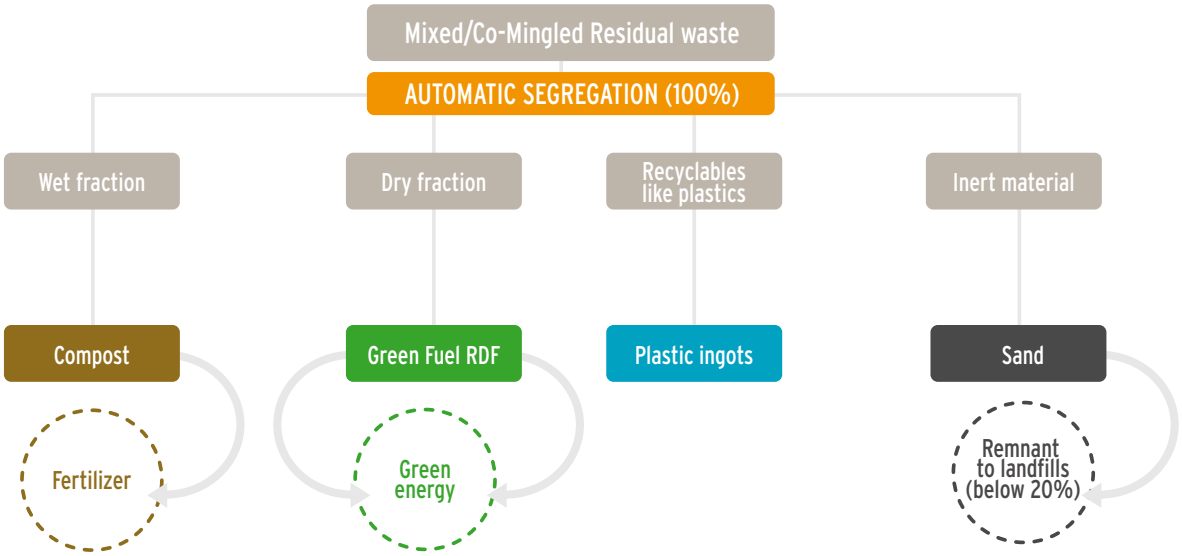
Hanjer processes MSW, converting it into bio-compost, green fuel, sand and plastic, minimising landfills by up to 85% and reducing environmental impact, at no cost. It works with 15 municipalities in India, and has 24 operational plants. A further six plants are being implemented. Its vision for 2015 is zero waste to landfills, green power from green fuel and a strong awareness of effective waste handling.

FIGURE 2: HANJER'S MULTI-LINE PRODUCTS



Source: Hanjer, 2012

▸▸▸ offer a stable and consistent yield, and in achieving high product quality, making them suitable for commercial and industrial use (Figure 2).

A RANGE OF HIGH-QUALITY PRODUCTS

Historically, compost has been an alternative to farmyard manure, but due to inferior quality and poor supply issues, it experienced a negative perception. Hence, Hanjer invested in Research & Development (R&D) to achieve a consistent quality of its manufactured compost. From 2006 to 2008, the Hanjer marketing team conducted extensive field trials with farmers at a grass-roots level and continuously interacted with them thereafter, obtaining feedback with respect to the quantity and quality of farm yields. These field trials brought about the desired shift towards the 'Organic Uniform High-Quality Compost' manufactured by Hanjer. This compost offers several benefits. First, it is 40% cheaper than chemical fertilizers. Second, yields obtained are higher, as the bacterial elements in Hanjer's compost significantly enhance the effectiveness of fertilizers on the crop. Finally, Hanjers' presence across cities has helped it to deliver large quantities of compost at a minimal transportation cost compared with other suppliers. Due to positive trial results, major fertilizer companies like the Gujarat State Fertiliser Corporation approached Hanjer to co-brand and market its compost in their name. In addition, a law passed by the Fertilizer Ministry, stipulating that fertilizer companies must sell three bags of compost with every six bags of fertilizer, helped the cause further, and within two years, Hanjer had entered into association agreements with nine fertilizer companies to commercialise its compost, in addition to its direct sales to farmers. Hanjer's presence across cities helped it deliver large quantities of compost at minimal transportation cost as opposed to other suppliers of compost.

Used as a source of energy in many industries, RDF is produced by shredding and dehydrating MSW with waste conversion technology. Traditional RDF has a high plastic content, around 12-15%, and a moisture content of 25-30%, with a gross calorific value of 4500 Kcal. For this reason, it was termed a 'rogue fuel' and was unable to command a fair price. Hanjer worked out how to refine the product further, by reducing the plastic content to 5% and the moisture content to 20%, which helped transform the product into a 'green RDF' - with emissions within permissible limits due to its low plastic content. It is a universal fuel and a direct alternative to coal, lignite and biomass. Through subsequent interactions with the potential consumers of green RDF – such as textile mills, chemical plants, and agro industries – Hanjer was able to provide a cheaper and greener solution, translating into total cost savings to users of approximately 30%. Green RDF has the advantage to industries of not necessitating any modification to their existing boilers, as the transition from lignite to green RDF can be immediate. As the MSW is delivered free of cost

by municipalities, Hanjer is also advantaged by a profitable product being delivered with a 'zero input cost'. An increase in the price of coal, lignite and biomass was a compelling reason for large erstwhile corporate customers of coal, lignite, biomass to switch to green RDF. So far, power and cement plants have formalised plans to use green RDF and have joined forces with Hanjer for quantities ranging from 100 tpd to 400 tpd. Going forward, Hanjer plans to sell around 50% of its green RDF to corporates and 25% to medium and small-scale consumers.

Recycled plastic ingots are a conventional product and are widely accepted in the market. They are extensively used in the manufacture of plastic moulding, irrigation pipes, pallets, etc. For these kinds of products, the use of a high-quality virgin plastic is approximately three times more expensive than recycled plastics ingots, and is not required.

Challenges and key success factors

The collection processes in India are not optimal for processing companies, which receive what is left behind by around 500,000 ragpickers, and hence what remains can be classified as having very low content quality. Also, Indian household waste is significantly inferior in quality in terms of worldwide standards, and still follows the single bin format. This absence of segregation at source makes recycling activities more difficult. Thus, international technologies are inadequate for this type of poor waste, and many MSW processing companies have not been able to reach sustainability. In this context, it is important to invest continuously in R&D to develop consistent innovative technologies.

"Hanjer continuously invested in R&D to shift towards high-quality products."

Hanjer continuously invested in R&D to shift towards high-quality products and to reach more commoditised market segments, to minimise distribution risks. It follows a cluster-based approach, by targeting nearby clients through its regional coverage, decreasing transportation costs and offering flexibility and proximity to clients. It has also spread its presence across different states, so as to minimise its political and counterparty risk. Hanjer has also entered into long-term MSW contracts, with firm commitments from the municipalities to ensure a minimum level of raw materials. It has developed an in-house technology, to control the technology used, which has helped to reduce its production costs by 50% in a five-year period. It also requires full exclusivity from its suppliers, to protect its know-how. The execution risk is mitigated by a modular approach, as each machinery component can be moved to another site in a very short lead time, to face capacity constraints, while reaching challenging construction deadlines. It was able to set up a 500 tpd plant in less than nine months. Hanjer now has a proven history of successfully operating MSW plants that reach more than 90% of capacity utilisation. Thanks to a model adapted to local conditions, Hanjer has been able to provide an alternative for municipalities by not requesting a tipping fee, helping them to minimise the environmental burden through an exceptional recycling rate of 85%, at no additional cost to the public sector. Benefiting from a first mover advantage, Hanjer has emerged as the most preferred bidder and operator for different state municipalities while most competitors still require tipping fees to reach sustainability.

One of the biggest challenges for Hanjer entails continuing its progress on social and environmental standards. Hanjer has also adopted local environmental standards that are constantly monitored through third-party audits. All plants have international standards certification (ISO 9001:2008, ISO 14001:2004 and OSHAS 18001:2007) and are regularly visited and inspected by ICLEI - an international association of national and international government organisations committed to sustainable development - and the Indian Pollution Control Board. Hanjer has won six awards for best practice, such as the Golden Peacock Award 2012 for eco-innovation in waste management. Still, it continues to work at further improvements to be able to reach international standards in the medium term. Further investment in R&D will be key for this business to be able to consolidate its first-mover advantage in the market and replicate its model abroad. •

References / **Chalmin, P.,Gaillochet, C. 2009.** From waste to resource, An abstract of world waste survey, Cyclope, Veolia Environmental Services, Edition Economica, France.

Transforming municipal solid waste into a net carbon reducer

While municipal solid waste contributes relatively little to climate change, namely 3-5% of anthropogenic greenhouse gases (GHG) emissions, the waste management sector offers immediate, cost-effective and fast-acting opportunities to achieve substantial cuts in global GHG emissions. The private sector is actively participating in this trend by utilising funding and other opportunities, under notably the Clean Development Mechanism of Kyoto Protocol.

Jeff Cooper

President of the International Solid Waste Association (ISWA)[1]

The waste industry is positioned as a potential reducer of GHG emissions to mitigate the causes of climate change and advance towards more sustainable development (Scheinberg, A., Wilson, D., Rodic-Wiersma, L., 2010). Waste management contributes relatively little to climate change, namely 3-5% of anthropogenic GHG emissions, predominantly from the methane emissions of landfill sites and dumps. However, the waste management sector offers immediate, cost-effective and fast-acting opportunities to achieve substantial cuts in global GHG emissions. Using existing technologies that can be deployed in virtually all regions and cities, waste management can be transformed into a net carbon reducer. A number of developing countries have instituted and are implementing policies to enhance waste management practices in order to reduce their GHG impact, and the private sector is actively involved in these processes. It has notably engaged in the funding opportunities under the Clean Development Mechanism (CDM) and is examining options under the Nationally Appropriate Mitigation Action (NAMA) framework.

JEFF COOPER

Jeff Cooper is President of the International Solid Waste Association (ISWA), an NGO with 38 National members and 1,000 other type members. His experience in waste management spans 30 years, including working with the Environment Agency for England and Wales. Jeff Cooper specialises in waste management consulting and research, and is a frequent speaker at conferences on waste management and climate change.

[1] *This article is based on the ISWA publication, White Paper on Waste and Climate Change (ISWA, 2009).*

TECHNOLOGIES FOR SAVING GHG EMISSIONS

The contribution of GHG emissions from waste-related activities varies from country to country according to their dependence on specific waste treatment technologies. For developing economies, the greatest impact of GHG emissions in the sector stems from the methane and carbon dioxide from the predominantly organic component of their dumped waste. The organic component of municipal waste generated in developing countries is greater than in developed economies, comprising well over 50% in these countries compared with less than 30% in developed countries. Incineration and most other methods of energy recovery from waste appear inappropriate in these countries, as the moisture fraction of the waste is too great to make it autothermal (ISWA, 2011). Furthermore, local repair and maintenance operators are absent, and there are several examples of abandoned incineration plants in Asia, Africa and South America. In that context, biological treatment, composting in particular, can help recover and transform organic waste into soil conditioners and fertilisers. These processes reduce GHG emissions by sequestering biogenic carbon in the soil, improving its physical properties, adding nutrients, and reducing the need for pesticides. This appears to be a more practical solution than the more advanced technologies such as incineration. Moreover, the meth-

"Waste management contributes relatively little to climate change."

FOCUS

ISWA is a global NGO representing national professional associations, companies, organisations, academics and researchers specialising in the management of waste and resources. Based in Vienna, ISWA has ten working groups, one of which is dedicated to the relationship between waste management and climate change. ISWA has been actively involved in the most recent United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (CoP) meetings in Copenhagen, Cancun and Durban.

ane (not the carbon dioxide) produced can be captured to produce electricity.

Engineered landfill, rather than open dumping, can also contribute to GHG mitigation. Landfilling refers to disposal sites where waste is placed in lined sections, where it degrades while producing CO_2 and methane. Landfill processes can be controlled in order to stimulate a biogas reactor. The main output of a modern landfill system is electricity production from the combustion of biogas, with an average energy efficiency of 35%. Engineered landfills enable the control of fugitive emissions. Another pretreatment option for landfills is Mechanical Biological Treatment, a means of diverting and stabilising biodegradable waste before landfilling. Another alternative is producing high-calorie fuels through subsequent thermal processing, for example, in cement kilns.

"Waste-related projects account for approximately 18% of all CDM projects."

However, the greatest savings in GHG emissions are associated with the recovery and reprocessing of recyclable wastes, provided that these materials can be reclaimed and reutilised. This is due mainly to the large environmental savings that accrue from substituting secondary raw materials for those produced from primary extractive sources. Recycling reduces the amount of waste that must be disposed, and provides substitutes for the use of raw materials in product manufacturing. For many industries, using recycled materials avoids the need for extraction, transportation to the production site, and the energy used in producing new products from virgin materials.

Opportunities and pitfalls of the CDM

The CDM[2], introduced under the Kyoto protocol, has provided an opportunity for the waste sectors in developing countries to generate revenue from the sale of carbon credits, thereby making significant advances towards reducing GHG emissions. However, owing to a number of barriers in the early stages of developing the CDM, the available possibilities have remained in many ways unexploited. As a result, the adoption of more resource-efficient and GHG-reducing waste management practices in developing and transitioning economies were slower than desired by ISWA and other international organisations.

Waste-related projects account for approximately 18% of all CDM projects. The former include solid waste projects (landfill gas recovery, composting and incineration) as well as methane-avoidance technologies (composting, anaerobic and aerobic treatment) for waste water, agricultural and forestry waste. Since the inception of the CDM, over 200 municipal solid waste (MSW) projects have been registered worldwide. Nearly 90% of registered solid waste projects involve landfill gas flaring and recovery. One of the most ambitious schemes is the landfill gas-to-energy scheme in Bogota, Colombia. The landfill site accepts 6,000 tons per day of waste, and is now engineered to trap landfill gas and utilise the methane to produce electricity for up to 70 neighbouring brick kilns, replacing the fossil fuels currently used. But many of the landfill-related CDM projects are less ambitious, offering controlled flaring rather than the utilisation of energy potential.

Only a limited number of large-scale projects have been registered that involve advanced MSW treatment technologies such as large-scale composting, gasification, anaerobic digestion, refuse-derived fuel processing, and thermal treatment without incineration (Box 1). CDM projects in the waste management sector have been unevenly distributed and have generally not yet benefited the least developed countries. However, there is significant and unrealised potential for additional CDM projects, in terms of ▸▸▸

BOX 1: A SUCCESSFUL COMPOST CDM PROJECT IN BANGLADESH

One of the earliest and best examples of a non-landfill CDM project is in Dhaka, the capital city of Bangladesh. Dhaka is the 11th largest megacity in the world, and generated 13,300 tonnes of waste per day in 2005. This figure has subsequently doubled. Anything not salvaged by the informal sector is deposited in open dumps. Therefore, most of the waste is organic.

In 2003, World Wide Recycling BV, a private company based in the Netherlands, was approached by Waste Concern, an NGO based in Bangladesh, to start a large-scale composting project. This project obtained UNFCCC approval for its CDM submission in September 2005. The project includes the design, construction and operation of a composting plant for the processing of organic waste from Dhaka City. The plant, which took 18 months to set up, costs €12 million and was opened in November 2008. It employs 800 staff drawn from the poorest areas in Dhaka. Seven hundred tonnes per day of selected organic waste from markets in Dhaka are processed to produce compost in the new joint-venture compost plant. The compost allows a reduction in the use of chemical fertiliser by 25-50% and increases crop yields by up to 30%. In March 2009, the compost as a fertiliser was approved by the national fertiliser committee. The entire project is effectively funded through the 89,000 tonnes of CO_2 of carbon credits owned jointly by the project partners. (Sudhakar, Y., 2012)

[2] *The CDM enables countries, or entities within countries that have agreed to GHG emission reductions under the Protocol, to invest in emission-reduction projects in developing countries and to use the associated emission-reduction credits towards achieving their own targets, as a supplement to their domestic GHG reduction actions.*

▶▶▶ technological solutions and host-country coverage.

Although significant progress has been made on the CDM since its inception, improvements in the approval process could lead to a much greater number and better geographical distribution of implemented emission-reduction projects. One of the demands of ISWA is to improve the operation of the CDM, assuming that this mechanism is still in place beyond 2015. The system needs to be streamlined though, and the bureaucracy reduced. To extend the range of projects currently being supported by CDM credits, especially recycling projects, GHG emission measurement methods also need to be improved. Current methodologies form a valuable basis for the assessment of GHG emissions from waste activities; however, improvements are required to adequately cover the full life cycle of materials and energy. CDM methodologies should cover a broader range of GHG emission reduction or avoidance benefits in activities such as recycling and composting. The accurate measurement and quantification of GHG emissions is vital in order to set and monitor realistic reduction targets at all levels. Given the number of players from collection to reprocessing, another issue is the property rights to the Certified Emission Reduction (CER) credits, which are more complicated than for other sectors.

"NAMA offers new mechanisms to support waste-management-enhancing initiatives in developing countries."

From the CDM to NAMAs

Initially set out in the Bali Action Plan in 2007, NAMA offers new mechanisms to support waste-management-enhancing initiatives in developing countries (Box 2). The substantial, short-term potential for GHG reduction inherent in the waste management sector makes it an essential, front-running element for the development of NAMA and the support of the Green Climate Fund (GCF)[3]. Of the 47 NAMA submissions generated by September 2011, approximately one third included waste-related actions.

NAMAs tend to focus more on the development of policies or strategies than on specific projects, such as those in the CDM. The purpose of NAMA is to provide support to sectors that provide long-term or indirect emission reductions, initiatives that address underlying barriers to mitigation measures, and actions that cannot easily be valued in tonnes of CO_2 equivalent. This is a very valuable approach to waste management as it complements the CDM.

The NAMA system has yet to be formally agreed upon by UNFCCC. At present, therefore, the precise manners in which national governments and the private sector can realise benefits from this mechanism have yet to be set down. However, it is widely anticipated that national governments in developing countries that have sound proposals for the enhancement of their waste management practices set out within a NAMA, either as a standalone proposal or incorporated within a suite of GHG emission-reduction targets, will benefit from the provision of funding through the GCF. The relationship between waste management and climate change has been recognised by the World Bank (Hoornweg, D., Bhada-Tata, P., 2012). This report acknowledged that waste management was a challenge comparable to climate change. This should help secure greater funding for international agencies and allow access to improved financial mechanisms for waste management improvement in developing countries after the Kyoto Protocol comes to an end in December 2012. ●

[3] *Launched in 2011, the Green Climate Fund (GCF) was founded within the framework of the UNFCCC as a mechanism to transfer funds from the developed countries to the developing world to assist developing countries with adaptation and mitigation practices for combating climate change. It is governed by a board of 24 members.*

BOX 2: SUPPORT FOR DEVELOPING COUNTRIES THROUGH NAMA

The term NAMA was first used in the Bali Action Plan in 2007, and was later formalised in the Copenhagen Agreement and Cancun Agreements. It refers to a set of policies and actions undertaken, on a voluntary basis, by developing countries to reduce GHG emissions and to mitigate climate change. The term 'nationally appropriate' implies that NAMAs are country-driven. Where no clear definition exists at the international level, a distinction has been made between unilateral NAMAs, which rely on domestic resources, and supported NAMAs, which require international financial support. NAMAs give developing countries the opportunity to access international finance, technology and capacity-building support for their policies and programmes promoting GHG reductions.

NAMAs include different types of action: data-gathering, research and development; strategy development at a national/regional and sector level; implementation and enforcement of regulations; capacity and institution building; provision of financial incentives; awareness raising campaigns; and technology penetration programs, technology demonstration projects, and other projects.

REFERENCES / **Hoornweg, D., Bhada-Tata, P., 2012.** What a Waste: A Global Review of Solid Waste Management. Washington D.C., World Bank, Urban Development & Local Government Unit, March 2012, No. 15, 98. / **ISWA, 2009.** Waste and Climate Change, ISWA White Paper - available online at: *http://www.iswa.org/nc/en/110/news_detail/article/iswa-white-paper-on-waste-and-climate-change-released/109.html* / **ISWA, 2011.** In the Know, ISWA. / **Scheinberg, A., Wilson, D., Rodic-Wiersma, L., 2010.** Solid Waste Management in the World's Cities, Earthscan / **Sudhakar, Y., 2012.** Replication of urban innovations – prioritization of strategies for the replication of Dhaka's community-based decentralized composting model, Waste Management & Research Volume 30, issue 1 (January 2012), p. 20-31.

Financing waste projects, a challenging opportunity

Governments increasingly seek to rely on the private sector's involvement and financing for improving municipal solid waste management. But, private companies involved in that sector have difficulties in raising capital. Development Finance Institution have a role to play, as they can provide suitable financing solutions, while introducing measures to contribute to an improvement in environmental and social conditions.

Felix Busse

Senior Investment Manager, DEG

Developing countries face the challenge of rapidly increasing waste volumes beyond what their current infrastructural and organisational, institutional and financial arrangements can cope with. The investment requirements for the physical infrastructure and capacity building to properly collect, segregate and recycle waste materials are substantial. The cost of providing basic Municipal Solid Waste (MSW) services to all Indian cities, for example, is estimated at between USD 500 million and USD 5 billion annually (David Hanrahan et al., 2006). Another indicator is the size of the market for technologies that specifically deal with MSW management, and which is estimated to be in the range of USD 2 - 3.5 billion for India alone (Yes Bank, 2010). Not all of this investment can be publicly financed. In order to decrease the financial pressure and improve MSW service provision, governments increasingly seek to rely on the private sector's involvement and financing.

While private companies express interest in investing in this sector, they often find it difficult to raise the required capital. The major barriers include the unavailability of long-term finance, high transaction costs, and the limited value of the assets as collateral, due to the specialised nature of the technical operations and assets. Development Finance Institutions (DFIs) therefore have a role to play, as they can provide maturity-matched financing for large-investment projects, and are geared towards cash flow–based lending. Further, with the involvement of DFIs, measures could be introduced that minimise the negative impacts of MSW and contribute to an improvement in environmental and social (E&S) conditions. Considering the multiple economic, environmental and social benefits, there are major reasons for DFIs engagement in the waste sector. However, experience shows that, even for this kind of institutions, investments in waste management projects are challenging. This article illustrates the sector-specific aspects that have proven critical to the successful engagement of DFIs.

"Technological know-how alone, though, does not guarantee successful project implementation."

FELIX BUSSE

Felix Busse is a senior investment manager at DEG – Deutsche Investitions und Entwicklungsgesellschaft mbH. Based in the Manufacturing Industry and Services department, he is responsible for projects in waste management and energy efficiency. He worked in project financing and consulting. He has a diploma in business administration from the University of Applied Science in Heilbronn, and a Master of Science from the London School of Economics.

Technologies matching local conditions

The waste sector is a specialised industry, with high technological standards. Thus, engagement with the sector requires in-depth experience, thorough research and engineering know-how. The proven track record of a promoter or team of specialists is therefore the basis for successful project development. Technological know-how alone, though, does not guarantee successful project implementation. Many of the technologies applied in reprocessing and recycling waste, ex- ▶▶▶

FOCUS

DEG, a subsidiary of KfW, is one of the largest European development finance institutions specialising in long-term project and company financing. For 50 years, DEG has been financing and structuring the investments of companies in developing and transitioning countries, in order to contribute to sustainable progress. DEG invests in all sectors of the economy, from agriculture to infrastructure, and manufacturing to services.

▶▶▶ tracting energy and producing other products from the waste and gas captured from landfills, may have been tested in commercial use in industrialised countries. But, the effort required to adapt these technologies to local conditions is usually underestimated. Even a dated technology like landfill gas extraction does not work in Tunisia in the same manner as it does in Germany. Knowledge of the local context and the appropriate adaption to local conditions are therefore just as important as technological know-how. The applied machinery must match with the composition, quantities and qualities of waste delivered to the facilities, the local climatic conditions and the potential demand for products derived from the waste. There have been projects where the entrepreneur concerned was not aware that basic recyclable wastes are removed at the point of collection. Although the applied technology was of the latest standards, the business model failed. Sales were meant to be generated from recycled plastic, but the waste that was delivered to the borrower's facilities was virtually plastic-free. Waste pickers typically take away about 10-15% of the waste (by weight), which consists of the basic recyclable waste such as glass, plastic and metals, reducing the nominal value of the waste (Hanrahan D. et al., 2006). A private company that processes such basic recyclables is most likely to face bottlenecks in the supply of raw materials in low-income countries if it does not know how to ensure a proper supply.

"Implementation of E&S standards often needs to be carried out in several steps."

The need for existing markets

In line with the development of new technologies, the quality of products generated from waste has been improved. As a result, the sale of compost, refuse-derived fuel, sand, plastic and waste-to-energy has become the standard business model of the recycling industry, including in developing countries. However, many of the smaller recycling companies have a single product focus. While specialisation in a single product is viable in terms of economies of scale and process know-how, the focus also makes the company vulnerable to market or waste composition changes. The composition of MSW differs from one location to another, based on lifestyle, taste, economic status and the preferences of the people staying in an area, and it evolves over time. Consequently the output volume of the respective product generated from the waste will also vary. Hence, multi-product production lines are beneficial for mitigating the risk, as producing multiple products reduces dependency on the composition of MSW.

Another important factor to be taken into consideration is whether a market already exists for the sale of the output products. Depending on the region and the product, potential customers may be sceptical about purchasing products generated from waste, due to cultural, ethical, and religious restraints; due to their lack of knowledge of the product; or due to an unsuitable regulatory or incentive environment. There have been cases where local farmers have accepted compost derived from waste as a substitute for chemical fertilizers only after substantial marketing efforts. By the time the market was finally created, the company suffered from liquidity shortages. The evaluation of existing marketing tie-ups should therefore also form an important element of the feasibility of the project.

Environmental and social requirements

Waste projects include significant environmental, health and safety risks that are linked to the collection, treatment and disposal of waste. Associated problems include the contamination of land and water resources, air emissions, and a negative impact on the health and safety of workers and residents. In order to overcome these challenges, E&S management systems requirements, based on international best practices, need to be implemented by private companies. These E&S requirements are incorporated into an action plan, which forms an important element of the DFIs financing documentation to be signed. In order to ensure the implementation of the envisaged standards, a stringent monitoring system lead by external consultants is required.

DFIs should accept that the implementation of E&S standards often needs to be carried out in several steps over a long period of time. Investing in below-standard but still acceptable facilities and then contributing to important E&S improvements is preferable to rejecting a finance request due to reputational concerns. In a lot of cases, unfortunately, the revenues of the private companies are not sufficient to address all the E&S requirements of the DFIs. Technical assistance provided by the financial institutions can form a partial solution to implementing the required E&S actions, but it is not always sufficient when the financial requirement is too large. A particularly sensitive social issue in connection with financing waste projects is the role of the

waste pickers. It is critical for the lending institution to determine the extent to which the envisaged financing affects the income generating capacity of the waste pickers, and which instruments are available to enhance their living and working conditions, and their income levels. One option is the establishment of a close operating relationship between the formal and informal sector. Eventually, such cooperation may contribute to a progressive formalisation of the waste sector so that the waste pickers receive training, health protection, benefits, and fair compensation for their labour.

A SECURE REGULATORY, FINANCIAL AND LEGAL FRAMEWORK

Private sector involvement in Municipal Solid Waste Management (MSWM) implies a shift in the role of government institutions, from service provision to regulation, delegation to the private sector and monitoring of the service provided by private companies. Unfortunately, the public institutions in developing countries often fail to provide what is required to ensure a proper and sustainable transfer to the private sector. At best, the government promulgates a MSW law, but it is rarely properly enforced, as appropriate systems of monitoring and control, along with relevant skills at the respective government and municipal levels are mostly not established. The governments focus on delegating responsibilities to municipalities, but these are often too weak and do not have the financial means, the organisational structure, nor the professional capacity to cope with the challenges of MSWM, and they do not have any mandate to regulate the sector. Besides, the sector is evolving quickly, and this requires adapting the regulation, which public entities are enable to do rapidly. This uncertain regulatory framework and lack of structure makes it difficult for an investor to identify and mitigate its risks.

Another consequence of capacity limitations at the institutional level is that the contracts executed between municipalities and private enterprises may be of poor quality. Some of the primary issues of concern are the unclear definition of roles and responsibilities and inadequate risk mitigation measures. Another issue is municipalities tending to contract for more services than for which they are able to pay. Once the services have been billed, the municipalities may delay payment or try to lower the billed amounts by querying the service provided. As it is difficult to amend the contractual documentation signed by the municipalities, because of lack of experience or for bureaucratic reasons, it is very important for DFIs to assess the risks associated with these uncertainties and to define the minimum requirements to be included in these agreements. These requirements should include, among others, that the period of the agreement matches the period of the DFIs' financial engagement in the project; that major regulatory approvals, such as land leases, are obtained directly by the municipality; and that a guaranteed quantity of waste is to be provided by the municipality to the private recycling operator.

The above illustrates the wide variety of critical issues that need to be overcome in order to mitigate investment risk for DFIs. There are of course niches where private companies can already invest and develop profitable business models, particularly in recycling. Such projects are very important as showcases for the public and decision makers. It is the role of the DFIs to carefully select those projects with acceptable risk profiles and to provide adequate financing solutions. Gradually, this may lead to the increased confidence of both investors and other financiers, and could contribute to the development of a mature commercial MSWM sector in developing countries. However, project financing alone may not be sufficient to remedy the deficiencies of the sector in developing countries: satisfactory capacity building and appropriate budgets also need to be addressed by the municipalities, in order to regulate the sector in proper ways. The question is whether DFIs should confine themselves to risk mitigation at a project level or whether they should in parallel support sector development, for instance, by providing policy loans dedicated to the development of an 'enabling environment' for more advanced MSW projects. •

"Private sector involvement in Municipal Solid Waste Management (...) implies a shift in the role of government institutions."

REFERENCES / **Hanrahan, D., Srivastava, S. Sita Ramakrishna, A. 2006.** Improving Management of Municipal Solid Waste in India – Overview and Challenges. Environment and social Development Unit, South Asia Region. The World Bank. / **Yes Bank ,2010.** Project Appraisal Memorandum.

Lessons learned from this issue

BY JULIEN LEFILLEUR EDITOR IN CHIEF

Global production of municipal solid waste is expected to double in the next fifteen years. This increase is primarily attributable to the developing nations, driven by the combined effect of strong urban growth and economic development. Waste management in these countries is a major challenge for the years ahead: the negative external impacts of solid municipal waste are serious, including in particular major impacts on the environment and on health, as open waste dumps remain the dominant processing mode in developing countries. The impacts are especially severe for the 15 million people in the informal sector who work in these dumps, processing between 15% and 20% of the waste produced. The increase in volume also represents an economic challenge. The waste sector alone accounts for as much as 5% of urban employment. Every year developing nations spend some US$46 billion on managing their municipal solid waste, and these investments could exceed US$150 billion per year by 2025. Public authorities are finding it difficult to raise the necessary finance to meet these costs. Often they are compelled to concentrate on urgent needs – collection – to the detriment of processing, the result being that they incur high costs while achieving poor performances. In these circumstances sustainable waste management appears difficult to envisage.

Public authorities are increasingly turning to the private sector to alleviate the financial pressure on them and improve the management of their municipal waste. The private sector – intervening primarily in collection and recycling – is often better equipped to deliver a quality service at a low price, as public bodies are constrained by political factors and are poorly resourced both financially and materially. Experience shows that succeeding in this sector calls for the closest possible proximity to the project environment: operating methods do not necessary transpose well from one country to another. In particular, companies need to dovetail their intervention effectively with the public sector, understanding its needs but also identifying its capabilities and limitations. Their business models also need to take account of the informal sector – a sector with which they are sometimes in competition, but which also offers opportunities for cooperation: it is often, after all, a source of innovation. In the case of recycling they also need to test the receptiveness of the markets they are addressing: recycled products are often poorly understood and not always accepted.

Yet major challenges remain to be addressed. Local authorities' resources remain limited as their funding base is restricted and financing by state subsidy – often necessary to supplement limited local resources – cannot be regarded as a sustainable solution. The private sector, for its part, struggles to access financing, as waste projects are still regarded as very risky. The concept of the waste sector as a whole, integrating all the various players involved within an overarching vision of the waste chain, is not yet sufficiently developed. At the same time the regulatory environment is not robust enough to reassure investors. Finally, public authorities need to learn to switch position – moving from the role of service provider to that of contractor and regulator. Despite all these challenges, the waste sector can offer genuine economic opportunities. After all, in an environment where the costs of energy and raw materials are escalating, waste represents an attractive resource; processing it can become a profitable business – leading to the establishment of sustainable management practices within the sector. —

In our next issue

New players and new banking models for sub-Saharan Africa

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