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handshake

IFC's quarterly journal on public-private partnerships

In this issue

WEIGHING THE OPTIONS: Burn or bury?

WASTE AND CLIMATE: Supporting governments

COMMUNITY ENGAGEMENT: Integrating India's informal sector

INTERVIEW: "Trashed" documentary Director

BONUS: Podcast with 2013 CNN Hero on community cleanups

WASTE ppps



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Disclaimer

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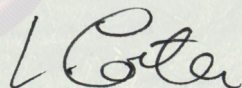
In this issue

One of the most pervasive myths about waste is that there's always an "out"—as in, when something is no longer useful, you can throw it out. But trash stays with us long after we think we're rid of it. And this is not your grandfather's trash. The alarming accumulation of waste today is a product of unrelenting urbanization as well as the materials that power growing economies. This waste pollutes air, land, and sea, hastening climate change, which in turn worsens the effects of natural disasters.

New approaches in public-private partnerships (PPPs) in the waste sector combine public sector leadership, private sector skill and efficiencies, community involvement, and innovative financing methods to tailor solutions to local conditions that can beat back this grim vision. Partnership successes in Berhampur, India, for example, create a model ripe for replication, as we see in "Consensus for Cleanup." The Clinton Climate Initiative's support for PPPs that reduce methane ("Nurturing New Partnerships") may ultimately blunt waste's impact on the climate.

Technology can provide solutions for many different waste management scenarios. "When does EFW work?" and "Due Diligence" both guide municipal officials toward a tailored solution that's best for their area. In "Burn or Bury," authors Daniel Hoornweg and Perinaz Bhada-Tata, known most recently for sounding the waste alarm in *Nature*, explore the choices of landfill versus incineration.

It's critical to engage communities in partnerships to reduce and manage municipal waste. The 2013 CNN Hero of the Year, Chad Pregracke, founder of the nonprofit cleanup group Living Lands and Waters, knows this first-hand. As he says in the first *Handshake* podcast: "These are big problems with no easy answers, but we're creating solutions as we go."



Laurence Carter, Director



Tanya Scobie Oliveira, Editor

IFC Advisory Services in Public-Private Partnerships

Features

Overview

Due diligence | 10

America's dirty love affair with trash | 20

PPPs

Linking public & private | 22

E-waste explained | 31

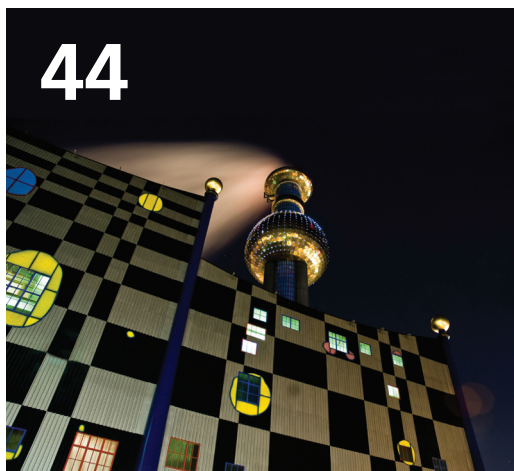
Cleaning up the law | 34

Ukraine clears the air | 36

Consensus for cleanup | 40



44



Energy from waste

When does EFW work? | 44

Burn or bury? | 52

Climate

Mitigation via waste management | 56

Nurturing new partnerships | 60

Post-Kyoto | 64

..... *In this issue*

Community Engagement

Integrating the informal sector | 66

Kampala's campaign | 74

Innovation

Crowdsourcing for waste management | 76

Together in trash | 78



Interviews

Candida Brady: Giving garbage its “aha” moment | 16

Chad Pregracke: Trash talk | 72

Columns

PERSPECTIVE

Insights & opinions

What a waste | 06

INSIDE INFRASTRUCTURE

Commentary on current events

The world's waste
dilemma | 14

COMPASS

Surveying the PPP landscape

A decade of deals | 26

MONEY TALKS

Financing & Funding PPPs

PPPs turn trash to treasure | 32

LEGALEASE

Law & legislation, decoded

A legal look at EFW | 50

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INTERVIEWEES

Candida Brady

founded Blenheim Films in 1996 and has produced and directed documentaries on a variety of subjects. In 2012 she completed her first solo documentary feature film, "Trashed," which follows Academy Award winner Jeremy Irons on a world tour as he discovers the pressing issues surrounding waste and sustainability.

Chad Pregracke

founded the nonprofit group Living Lands and Waters, which is credited with collecting over 7 million pounds of debris from American rivers. He has received the Jefferson Award for Public Service, America's version of the Nobel Prize, and was the 2013 CNN Hero of the Year.



WHAT A

WASTE

*By Daniel Hoornweg, University of Ontario Institute of Technology
& Perinaz Bhada-Tata, Consultant*

Photo © United Nations, Connecticut, U.S.A.



Municipal solid waste (MSW) management is the most important service a city provides; in low-income countries as well as many middle-income countries, MSW is the largest single budget item for cities and one of the largest employers. Solid waste is usually the one service that falls completely within the local government's purview. A city that cannot effectively manage its waste is rarely able to manage more complex services such as health, education, or transportation.

Not surprisingly, poorly managed waste has an enormous impact on residents' health, the local and global environment, and the economy; improperly managed waste usually results in down-stream costs higher than what it would have cost to manage the waste properly in the first place. The long-term impact is also dire, as improperly managed waste contributes to climate change in the form of greenhouse-gas emissions (the methane from the organic fraction of the waste stream), and has serious short- and long-term health impacts.

This issue of *Handshake* delves into the messy area of MSW for all of these reasons and more. Authors share innovations at work in developing countries, public-private partnership (PPP) models that can be replicated, and technology

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It's important to understand in what ways [waste] is a new problem that requires a fresh look.

.....

that is increasing efficiency in the sector. Several articles also help demystify the many options available to municipal officials today, such as the choice of landfill model versus energy from waste (EFW) model.

MORE PEOPLE, MORE TRASH

The articles in the following pages explain the scope and scale of the waste problem, but first it's important to understand in what ways this is a new and growing problem that requires a fresh look. Solid waste is inextricably linked to urbanization and economic development, and globally the pace of urbanization is increasing. As countries urbanize, their economic wealth increases. As standards of living and disposable incomes increase, consumption of goods and services increases, which generates more waste. According to the World Bank Report “What a Waste,” almost 1.3 billion tonnes of MSW are generated globally every year. The actual per capita rates are highly variable, geographically, as there are considerable differences in waste generation rates across countries, among cities, and even within cities.

Solid waste is generally considered an “urban” issue. Waste generation rates tend to be much lower in rural areas since, on average, residents are usually poorer, purchase fewer store-bought items (which results in less packaging), and have higher levels of reuse and recycling. By 2050, as many people will live in cities as the population of the whole world in 2000. All these city dwellers will likely generate more than 8 million tonnes of waste a day—twice as much as today.

This will add challenges to an already tough problem. The public and private sector together will need to assume much more responsibility for waste generation and disposal, specifically product design and waste separation. Formalizing these responsibilities through well-structured PPPs can result in significant improvements in efficiency and quality to solid waste management.

To make PPPs for MSW successful, governments must consider the content and volume of the existing waste stream, the appropriate technologies, the imperative of stringent environmental standards and community engagement, who will pay for what, and the availability of experienced private partners.

These are big, complicated issues, but the results are straightforward. As the world hurtles toward its urban future, how we handle municipal solid waste today will be one of the best predictors of future generations' welfare. ■

.....

The public and private sector together will need to assume more responsibility for waste generation and disposal.

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This article was adapted in part from “What a Waste: A Global Review of Solid Waste Management” by Daniel Hoo-rnweg and Perinaz Bhada-Tata, Urban Development Series Knowledge Papers, World Bank, March 2012, No. 15.

WASTE MARKETS PREDICT ECONOMIC TRENDS

.....

In the last 10 to 20 years an additional challenge has emerged for the waste industry: the growing global vagaries of secondary materials markets. Many municipal recycling programs in Europe and North America were started with the recycling markets relatively close to source. More recently, marketing of secondary materials has emerged as a global business. The price paid per tonne of waste paper in New York City is often based on what the purchase price is in China. The majority of waste recycled in Buenos Aires, for example, is shipped to China. The volatility of secondary materials prices has increased, making

planning more difficult. The price is often predictive of economic trends, dropping significantly during economic downturns (when a city is least able to afford price drops). Although there are some hedging opportunities for materials pricing, secondary materials marketing does not yet have the same degree of sophistication as other commodities (largely due to issues of reliability, quality, externalities, and the sheer number of interested parties).

—Excerpted from “What a Waste: A Global Review of Solid Waste Management”

DUE DILIGENCE

Urbanization and economic growth are leading to a rapid rise in municipal waste generation. In 2012, the World Bank projected that municipal solid waste will grow from 1.3 billion tonnes in 2010 to 2.2 billion tonnes by 2025. Many cities are struggling with municipal waste that is increasing in quantity and changing in composition while the financial resources to manage waste remain flat.

But solving the solid waste problem is not always a matter of increasing investment. Cities could first focus on the fundamentals—understanding local context and not overly complicating the waste management system—while designing for the anticipated change in waste quantities and composition.

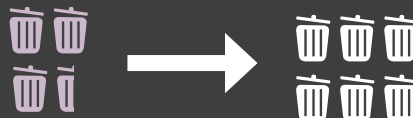
Waste can be a financial asset if cities collaborate to attract investors, select appropriate technologies, extract value from recoverable materials, and work with the informal sector.

—*Silpa Kaza & Farouk Mollah Banna,*
World Bank

THE CHALLENGE

3.5 MILLION

tonnes of solid waste generated globally per day in 2013.



6 MILLION

tonnes of solid waste expected to be generated globally per day in 2025.

“For every truckload of product with lasting value, 32 truckloads of waste are produced. We have a waste-making system. Clearly, we cannot continue to dig up the Earth and turn it to waste.”

—Ray Anderson, Founder of Interface
✿ Fortune magazine’s “Greenest CEO in America.”

WATCH THE TED TALK

Ray Anderson: The business logic of sustainability



THE SOLUTION



Build MSW systems that reflect local waste quantities and composition.



Focus on fundamentals of waste management before racing to sophisticated solutions.



Prioritize waste collection and disposal methods that are affordable for the local customer base.



Select technologies that can be operated and maintained locally.

..... AN EFFECTIVE SWM



FUTURE-PROOF YOUR SYSTEM

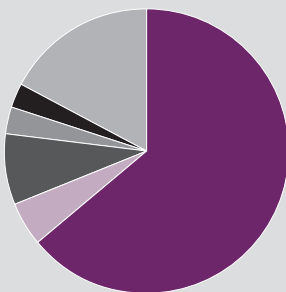
- Design the system in a way that it can grow with the population.
- Anticipate whether economic growth will change local waste composition.
- Consider the future impact of climate change on your facilities.



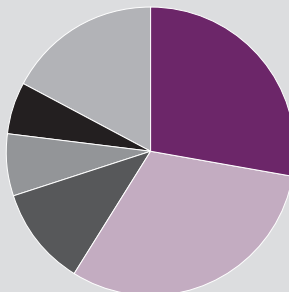
GET PRICES RIGHT

- Make polluters/waste generators pay.
- Ensure your pricing incentivizes waste prevention and diversion.

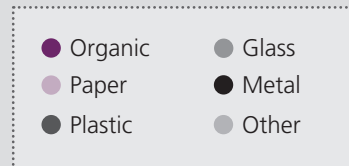
WASTE COMPOSITION BY INCOME



LOW-INCOME COUNTRIES



HIGH-INCOME COUNTRIES



EFFORT STARTS HERE



MAKE NICE WITH YOUR NEIGHBORS

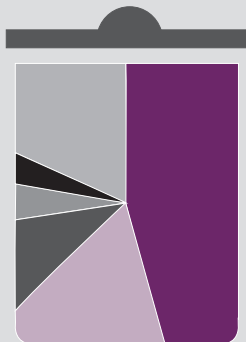
- Regional waste facilities are cheaper to build and operate.
- Bundling multiple waste systems within a region makes a deal more attractive to the private sector.









EXTRACT WEALTH FROM WASTE

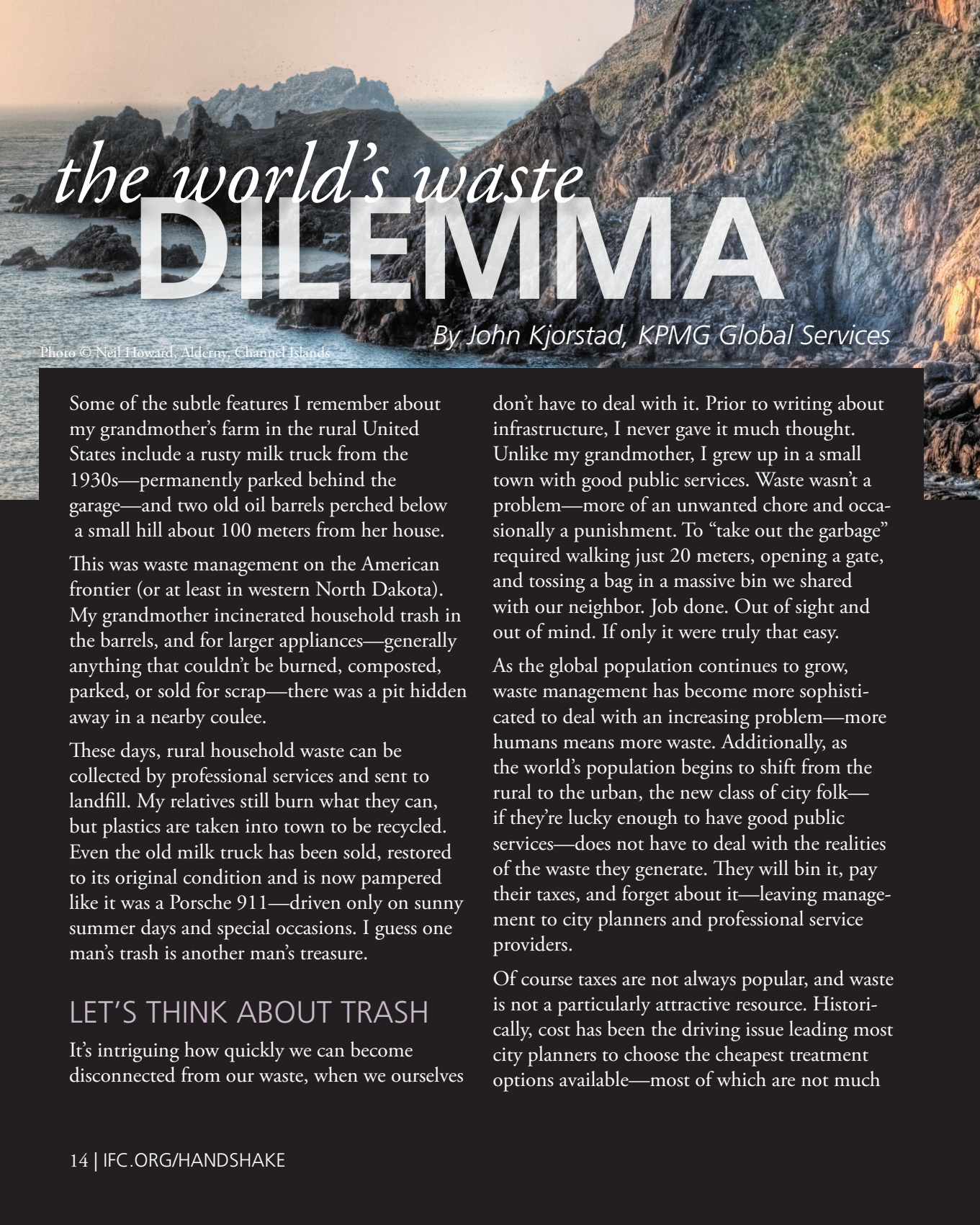
- Create jobs for informal sector.
- Pull energy from waste.
- Divert waste to save money.
- Mine the waste stream for valuable commodities.

GLOBAL SOLID WASTE COMPOSITION



 Organic—46%	 Glass—5%
 Paper—17%	 Metal—4%
 Plastic—10%	 Other—18%

Source: “What a Waste: A Global Review of Solid Waste Management” by Daniel Hoornweg and Perinaz Bhada-Tata, Urban Development Series Knowledge Papers, World Bank, March 2012, No. 15.



the world's waste **DILEMMA**

Photo © Neil Howard, Alderney, Channel Islands

By John Kjorstad, KPMG Global Services

Some of the subtle features I remember about my grandmother's farm in the rural United States include a rusty milk truck from the 1930s—permanently parked behind the garage—and two old oil barrels perched below a small hill about 100 meters from her house.

This was waste management on the American frontier (or at least in western North Dakota). My grandmother incinerated household trash in the barrels, and for larger appliances—generally anything that couldn't be burned, composted, parked, or sold for scrap—there was a pit hidden away in a nearby coulee.

These days, rural household waste can be collected by professional services and sent to landfill. My relatives still burn what they can, but plastics are taken into town to be recycled. Even the old milk truck has been sold, restored to its original condition and is now pampered like it was a Porsche 911—driven only on sunny summer days and special occasions. I guess one man's trash is another man's treasure.


LET'S THINK ABOUT TRASH

It's intriguing how quickly we can become disconnected from our waste, when we ourselves

don't have to deal with it. Prior to writing about infrastructure, I never gave it much thought. Unlike my grandmother, I grew up in a small town with good public services. Waste wasn't a problem—more of an unwanted chore and occasionally a punishment. To “take out the garbage” required walking just 20 meters, opening a gate, and tossing a bag in a massive bin we shared with our neighbor. Job done. Out of sight and out of mind. If only it were truly that easy.

As the global population continues to grow, waste management has become more sophisticated to deal with an increasing problem—more humans means more waste. Additionally, as the world's population begins to shift from the rural to the urban, the new class of city folk—if they're lucky enough to have good public services—does not have to deal with the realities of the waste they generate. They will bin it, pay their taxes, and forget about it—leaving management to city planners and professional service providers.

Of course taxes are not always popular, and waste is not a particularly attractive resource. Historically, cost has been the driving issue leading most city planners to choose the cheapest treatment options available—most of which are not much



more sophisticated than what my grandmother did on her farm. The two mainstays of global waste management involve either burning trash or burying it in landfill. Both of these options carry some significant environmental baggage. As the world's population grows (particularly with a wealthier middle class), these activities are viewed as unsustainable—and, increasingly, socially unacceptable.

A 21ST CENTURY APPROACH

While public authorities can change to some extent how people consume—by incentivizing the use of more efficient packaging and biodegradable materials—governments cannot feasibly limit consumption. This requires the waste issue to be viewed and managed more holistically in the 21st century.

Therefore, more and more private companies and public authorities are developing strategies for not only reducing cost but also generating revenue from waste and recycling. With such a valued asset to manage, this will have a profound impact on the quality of life surrounding historical waste treatment facilities.

In India, for example, the closure of the Gorai dumping ground in Mumbai was a public-private partnership that transformed the quality of life in the local community. In addition to the health, safety, and counter pollution benefits achieved by sealing in the dump in 2009, the new operators now have designs on generating electricity from waste methane currently flared from the site.

This is how waste management is rapidly evolving in urban areas. Unfortunately, the pace of


change in rural communities is not keeping up, but progress is being made.

In 2010, I flew on a small private aircraft to Alderney, a place in the Channel Islands between the United Kingdom and France. As the plane circled around the small island of about 2,500 people to land, the pilot pointed to a cliff hanging out over the sea and said, “That’s the local tip.” In other words, this is the point from which residents dumped trash into the waters below.

To be fair, Alderney has a modern waste disposal and recycling program with containerized garbage taken to appropriate facilities on nearby Guernsey. The island is also considering energy from waste via anaerobic digesters to cut both waste export and energy import costs as the community currently burns expensive oil for power.

However, tipping waste into the sea was once the cheapest solution for the residents of Alderney. While it may no longer be such an issue there, it remains a serious problem around the world. Unlike other critical sectors—such as transport or energy—the waste industry has no strong economic driver to support innovation. The truth is, there is no shortage of innovative solutions available to treat and manage waste, but rather a general and widespread unwillingness to pay for anything other than the cheapest option.

This has to change. Poor waste management is a debt for future generations to pay. As the pace of technology quickens, our public authorities need to evolve their approach to waste and explore how technology can be integrated into existing systems to enhance efficiency and sustain relevance for future users. ■

A man with a beard and long hair, wearing a grey shirt and a dark vest, is sitting on a beach. The beach is covered in a large pile of trash, including tires, plastic bags, and other debris. He is looking out at the ocean. The sky is blue and the water is calm.

In the documentary “Trashed,” producer/director Candida Brady sets out to discover the extent and effects of the world’s waste problem. As she travels around the world with actor Jeremy Irons to destinations wrecked by pollution, she brings the problem close to home—literally. Here, she speaks to Handshake about how to effectively convey the scope of the global garbage crisis.

Interview by Alison Buckholtz

Giving garbage its
**“AHA”
MOMENT**

INTERVIEW



One of the most difficult things to convey about the waste problem is its scope—people tend to see it as it affects themselves and their immediate community or city. In “Trashed,” you tackle this problem by allowing the viewer to follow you to several places around the world that have been devastated by waste. What did you see in these travels that you hadn’t understood before about waste?

I understood the scale of the problem fairly quickly from my research. I spoke to many people from communities all over the world who all had similar horror stories to tell about waste.

But in the film, we saw the scale with our own eyes. If you stand on what was once a white sandy beach in a once-beautiful, historic ancient port and see not one but two trash mountains, each over 40 meters high, and think every city in the world has these in one way or the other, it really brings it home.

“We hope the film will demonstrate that by changing the way we live our lives, we can contribute to our own survival and well-being and ultimately that of the planet.”

—Jeremy Irons,
from the “Trashed” website

Photo © Blenheim Films

Waste and climate change are inextricably linked. But other than the areas of the world hardest hit by climate change-related disasters, this link is still abstract to many. When conveying this to others, what points do you find most persuasive? In other words, what arguments tend to cause the “aha” moment of understanding in the person you’re talking to?

I don’t think anyone has the same “aha” moment. For me, it was the fact that during my research I read a study about babies being born with over 250 different manmade and toxic chemicals in their blood, flame retardants and the like. These children were all tested from different hospitals in different areas. Up until that point I had hoped I had imagined it all. I also found the research on the effects of pollution on the killer whales and other cetacea; one scientist I spoke to believes these will be gone in our lifetime because the chemical burden in their bodies is too great. We made sure we only used facts which were backed up by peer reviewed published papers.

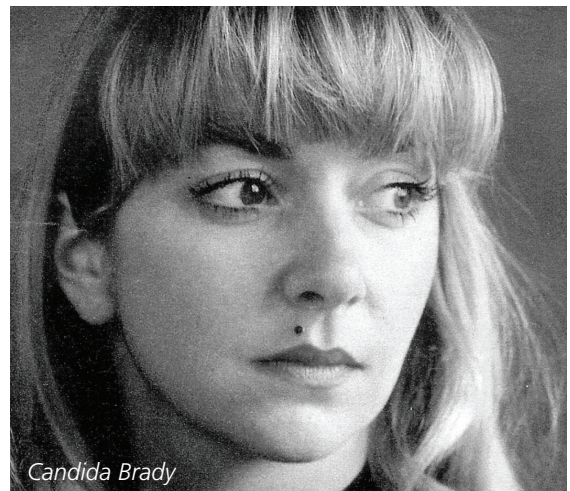
I have said this before but I also think everyone should stand in a landfill for a day to understand the smell and how it makes you feel. None of us could talk after filming in them and one of my crew members was violently ill after we filmed in the one in Lebanon.

Individuals can exert control over the trash issue, but often feel inertia because they think that one person can’t make a difference. How do you prove otherwise?

We showed really positive change in different ways, from the individual to the big city. If a city like San Francisco, with all its high rise buildings and busy people, can effect such a dramatic change—80 percent diversion from landfill— isn’t that how change has always started? It’s one person at a time.

If “Trashed” has a sequel in 10 years, what do you think the message might be?

One of hope—that change happened. **h**



Candida Brady

Photo © Blenheim Films

WATCH THE TRAILER





America's dirty love affair **WITH TRASH**

By Edward Humes, author of Garbology: Our Dirty Love Affair With Trash

The head of a plastic bag industry group, whose full-time job consists of battling local bans on disposable grocery sacks, made a provocative observation to me about trash recently: Don't be so quick to reject waste, he warned.

"Zero waste would mean a zero economy."

Equating green with economic ruin is a familiar refrain, of course, but this claim about waste is worth a hard look. Trash really is the biggest thing Americans make, and it tends to get bigger in good times while shrinking during recession. Does that mean, as counter-intuitive as it sounds, that garbage is good? Should the old saw about waste not, want not really be waste more, get more? Should Americans just chill out and revel in the fact that we are the most wasteful people on the planet, rolling to the curb 7.1 pounds of trash a day for every man, woman, and child—a personal lifetime legacy of 102 tons of garbage each? Doesn't that just show that we're buying lots of stuff and living large—that we should throw ourselves into a dirty love affair with trash?

Just the opposite. After immersing in the world of *Garbology* I've learned some shocking truths about the high costs of our garbage. Here are some numbers to consider:

AMERICANS MAKE TWICE AS MUCH WASTE PER PERSON AS IN 1960.

Most of the increase is from "instant trash"—packaging, wraps, containers, and bags, the biggest component of our garbage these days.

GARBAGE IS OUR NUMBER ONE EXPORT.

Not computers, cars, or planes. Our biggest export is the scrap paper and metal that China turns into products and packaging, which they sell back to us. America has turned itself into China's trash compactor.

MANY AMERICAN COMMUNITIES PAY MORE FOR WASTE.

More money is spent on waste management than for parks and recreation, fire protection, or school textbooks.

MANY AMERICANS CREATE HIGH AMOUNTS OF WASTE.

The average American makes 7.1 pounds of trash a day, according to the best available data (from a biannual survey of American landfills by Columbia University and the journal *BioCycle*). That compares to 2.5 pounds per person in Japan.

THE U.S. MAIL IS MORE THAN HALF JUNK MAIL.

Eighty-five billion pieces of junk mail, weighing 4 million tons, were sent last year (about one out of every 100 pounds sent to the landfill). We subsidize junk mail with an artificially low postal rate and by excusing the creators of this unwanted waste product from cleaning up their own mess.

AMERICA SENDS 69 PERCENT OF ITS MUNICIPAL SOLID WASTE TO LANDFILLS.

By comparison, the Netherlands and Austria landfill 1 percent of their trash; Sweden, 2 percent; Belgium and Denmark, 4 percent. Germany claims zero landfilling. Those countries recycle at two to three times the rate of the U.S., and make energy with the rest of the refuse. We, on the other hand, make geographic features out of our trash.

Waste is a cost, not an economic engine. Businesses understand this—Wal-Mart has reduced its landfilling in California by 80 percent and is ramping up recycling and reusing to the point that waste is now a profit center instead of a cost.

Families know it too: Artist Bea Johnson of Marin County, California has presided over

her family's commitment to buying unpackaged bulk goods, refusing plastic and disposable products, selecting used and refurbished items, and buying more wisely, with a focus on durability and need rather than disposability and impulse purchases. It's not enough to reuse and recycle, Johnson says. "You have to refuse!"

The Johnsons' household expenses have dropped by 40 percent, making college funds, a hybrid car, and cool vacations possible. Their non-recycled, non-compostable trash fits in a mason jar—for the year.

Zero waste doesn't mean zero economy. It means a different economy, with different winners. And fewer mountains of garbage. **■**

Reprinted with permission of the author. Photo courtesy of Garbology: America's Dirty Love Affair with Trash. For more information: <http://www.edwardhumes.com>.

YOUR GARBAGE QUESTIONS, ANSWERED

Is all the hoopla about garbage just hype? What belongs in a landfill? How much incentive money should governments pay people to recycle? *Garbology* author Edward Humes answers all these questions and more in a Q&A with the authors of *Freakonomics*.

Photo © David Bayles



linking

PUBLIC & PRIVATE

Photo © Green Energy Futures

*By Amandine Dukhan, Agence Française de Développement;
Christel Bourbon-Séclet & Nathalie Yannic, Proparco*

When it comes to managing waste in developing countries, the private sector can contribute technical skills, organizational 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.

Solid waste management is often regarded as the most local of all public utilities. Since the first steps were taken to decentralize 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 percent 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 NEED FOR INTEGRATED MANAGEMENT

Reducing the quantity and noxiousness of waste at the source, introducing separate collection and sorting procedures to encourage recycling and reuse, organizing waste transportation, 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.

However, 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.

REDEFINING THE ROLES

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

To attract private investment, local authorities need to establish a strategic framework tailored to local conditions and based on consultation with all local stakeholders.

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 center) is more widespread than the appointment of a large-scale private operator covering the entire sector. Public-private partnerships involving

a build-operate-transfer 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 government often has to provide additional funding. The private network is therefore split between primary collection, organized 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.

A COMPLEX CONNECTION

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 regulators and project managers even further. Perhaps more so than for other public utilities, waste management requires coordination among numerous stakeholders 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 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.

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. For a public waste management policy to be sustainable, a pragmatic, customized, 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.

Significantly, 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 mobilizing tax resources in towns and cities. Consequently, the income generated is insufficient to cover the costs of setting up an integrated waste management system.

For a public waste management policy to be sustainable, a pragmatic, customized and progressive approach is essential.

As sketched in this scenario, mobilizing 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. 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. **h**

This article was adapted with permission from Proparco's magazine, Private Sector & Development (Issue 15, October 2012).



COMPASS

A

DECADE OF

DEALS

the rise of the PPP



By Muhabbat Mahmudova, Infrastructure Journal

Governments that are concerned about the state of landfills and the environmental impact of waste typically get a crash course in the waste management sector, and especially in the importance of introducing sustainable practices to the system. More and more, government officials' education includes lessons on how to implement a public-private partnership (PPP).

As PPPs become accepted practice, investments in the waste sector have grown as governments attract private capital and technical expertise for the construction, operation, and management of waste projects. Most commonly, these projects include waste incineration, waste treat-

ment, recycling, and energy from waste (EFW) projects.

A LOOK BACK

Through a PPP, governments contract with private companies to construct, operate, and maintain waste facilities. PPP transactions have been widely applied in the delivery of waste treatment and EFW facilities in the past decade. Most of the volume generated between 2005 and 2013 was from public projects tendered as PPP concessions: a total of 68 deals in the waste sector, worth \$17.3 billion.



Photo © cbclove, Integrated Processing & Transfer Facility

EUROPE'S INVESTMENTS IN THE WASTE SECTOR, 2005-2013



Source: Infrastructure Journal

Because of Europe's long-term political and regulatory stability, there has been a clear legislative strategy for waste infrastructure.

Over the past decade, the countries with most active PPP market have been the U.K., Spain, Singapore, Australia, Poland, Italy, and France. In 2013 alone, the U.K. saw nine deals reaching financing close in the waste sector, including the construction of waste treatment plants and EFW facilities, with a total investment of \$3 billion.

On page nine we can see the volume of global investments that financed waste projects (PPP and other) from 2005 to November 2013. In total, there were 105 projects with a total value of around \$22.5 billion.

EBB AND FLOW

The graph shows a wide fluctuation in waste market financing during the past decade. The onset of the global financial crisis produced a steep fall after 2007. It picked up again in 2010 when the global sentiment temporarily improved. Then it dropped again due to the protracted economic slowdown.

Although the volume in 2009 dipped at the peak of the financial crisis, the U.K. managed to close five waste PPP projects that year, including a long-delayed \$1.1 billion Greater Manchester Waste PFI project. The largest privately financed deals over the same period were all U.K. projects: Staffordshire

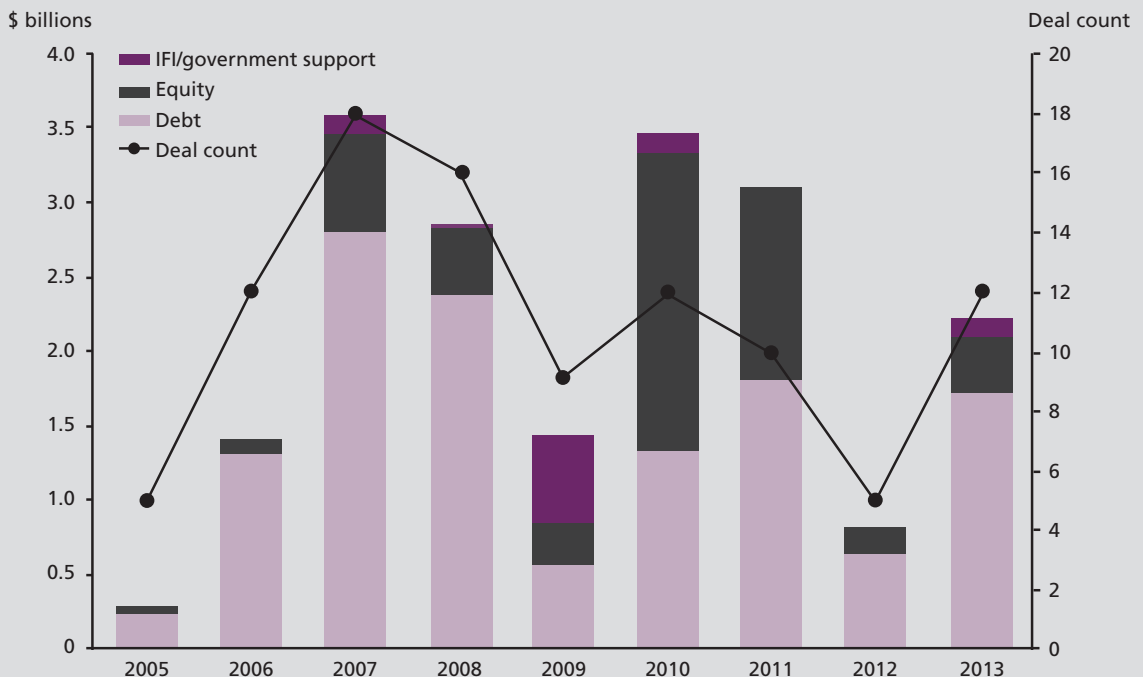
Waste PFI, Western Riverside EFW, and Greater Manchester Waste PFI valued over \$1 billion each.

In 2013, a number of projects were able to secure financing despite the difficult economic conditions remaining in many countries. Looking ahead to the next year, however, it appears that deals that require substantial financial commitment may face delays.

GEOGRAPHY IS DESTINY

Europe has been the most prominent region for private capital investments in the waste sector. Because of its long-term political and regulatory stability, there has been a clear legislative strategy for waste infrastructure, as well as mechanisms in place—such as PPP structures—to support private capital investments.

GLOBAL INVESTMENTS IN THE WASTE SECTOR, BY SOURCES OF FUNDING (2005-2013)



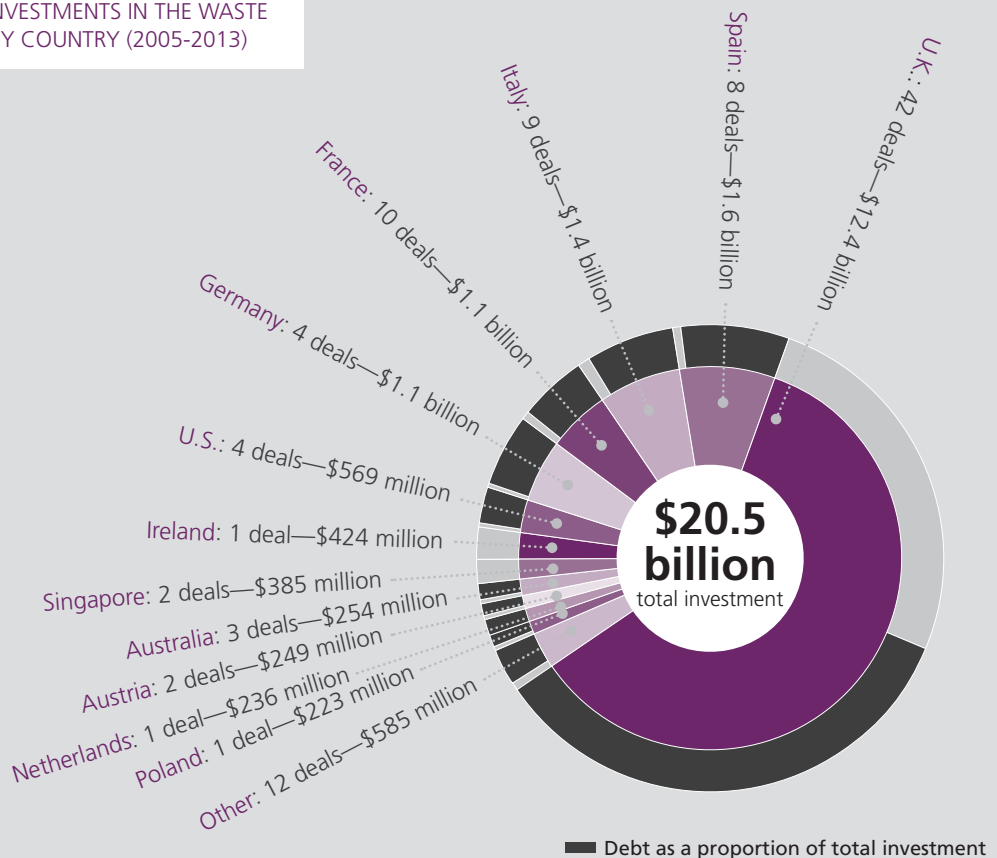
Source: *Infrastructure Journal*

Continuing this trend, the U.K. has a considerable pipeline of waste projects that it hopes to develop in order to meet environmental targets set by the European Union by 2020.

Looking ahead globally, many countries in Asia, Latin America, and the Gulf region have been targeting private capital investments in the waste

sector. These countries are especially important for the sector because they have fast-growing populations and labor mobility. These two factors prompt many to move from rural areas into cities. This in turn creates increased demand for infrastructure assets—including waste treatment and management—and the cycle of growth continues. **h**

GLOBAL INVESTMENTS IN THE WASTE SECTOR, BY COUNTRY (2005-2013)



*All numbers rounded.

Source: *Infrastructure Journal*

E-WASTE EXPLAINED

40 million

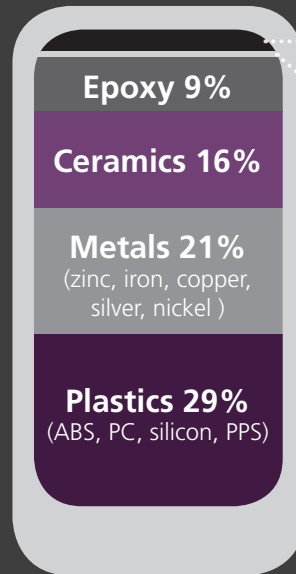
metric tons of electronic waste are produced each year globally.



Only 13% of this electronic waste gets recycled. Most of it is burned and dismantled informally in developing countries with adverse effects on health and the environment.

Sources: Nokia, Population Reference Bureau/ILO

WHAT'S IN A CELL PHONE?



Other 4%
(lead, antimony, beryllium, aluminum, etc.)

Flame retardants 1%



WATCH 60 MINUTES: FOLLOWING THE TRAIL OF TOXIC E-WASTE

Follows America's Toxic Electronic Waste As It Is Illegally Shipped To Become China's Dirty Secret



PPPs turn

TRASH *to* TREASURE

By Jeff Delmon,
World Bank

Our modern world, with its convenience and consumption, creates a whole lot of trash that in turn suffocates cities and undermines economies. Managing trash is a municipal nightmare. But it should be a banker's dream, right? Demand will only grow, and the problem needs a solution—without it the entire economy suffers.

But if there's a simple solution, it has eluded us all. The management of solid waste would seem to lend benefit from the structuring, efficiencies, financing, and latest technology that can come with public-private partnerships (PPPs). Let's examine the options at our disposal.

OUT OF SIGHT, OUT OF MIND

Poorly managed waste spreads disease, contaminates water resources, increases the cost of potable water, increases flooding, pollutes the air, and repulses tourists. But municipalities have neither the money nor the skills to manage solid waste well. In Sub-Saharan Africa, for example, municipal waste management can amount to 30 to 50 percent of a municipality's total annual budget.

The developing world tends to rely on informal waste pickers, who comprise 5 percent of urban jobs in developing economies. But these small scale solutions are inefficient and difficult to

regulate. Global experience points to the benefits of integrated management and PPPs.

AT YOUR DISPOSAL

But the solid waste sector isn't a natural fit for partnerships, as some other sectors are. From a commercial or financial perspective, cost recovery from households in the form of fees paid for trash collection is generally very poor. Industrial waste collection can be more lucrative, but rarely covers costs. Sanitary landfills are expensive, and rare. But there is hope where the disposal of solid waste is carefully planned. Here are some successful routes:

Recycling: Recycling of scrap metal, paper, glass, plastics, cardboard, and composting is a large industry in many developed countries, but use of recycled materials is often not well developed. In Tanzania, as in many countries, ships carry containers full of used plastics back to China for recycling since the local market is insufficient.

Composting: Organic waste can be used to create compost to defray methane gas production and be used as inputs for fertilizer.

Energy: Properly dried and sorted waste can provide a potent (and green) source of fuel for some industrial processes, in particular power generation and cement kilns, allowing their

parent companies to fulfill their international obligation to reduce their carbon footprint. These energy sources may also qualify as renewable energy, and therefore may provide access to carbon credits, preferential tariffs for electricity generated, or other subsidies designed to encourage green activities.

Sanitary landfill: Where the above do not achieve full disposal of waste, the balance needs to be delivered to a sanitary landfill, to limit its impact on people and the environment.

Some developing economies might also be able to replicate the approach in India, which has succeeded in issuing a few “no gate fee” PPPs for solid waste. Here, the private sector is required to provide integrated solid waste management services with no fees for disposal, maintaining a clear incentive on the private sector to avoid dumping and monetize waste to the extent possible.

TURNING TRASH INTO TREASURE

It's possible to turn trash to treasure with the revenue opportunities available in solid waste.

User fees for collection of solid waste are usually kept artificially low. Collection can be facilitated by combining waste management bills with electricity bills (as in Mombasa) or water bills (as in Addis Ababa). Municipal taxes can provide a solid revenue stream, but are usually spread over a small part of the total population.

Taxes on importers and producers of waste. For examples, see the tax being proposed in Kenya on imported tires, or in Togo, where a tax on industries, hotels, and other large enterprises shifts the tax burden to large producers of waste.

Carbon finance can be accessed through the reduction of methane gas, generation of renewable electricity, and the reduction of carbon footprint by offsetting other thermal heat generation. Potential annual carbon finance in Sub-Saharan Africa may amount to around \$2.6 million per million people for landfill gas recovery, \$1.3 million for composting, and \$3.5 million for recycling. But even these amounts are less than 10 percent of waste management costs.

Energy fees from power generated, or calorific value provided to kilns or other high energy (and high temperature) activities, create value while also breaking down the chemical composition of the waste.

Recycling fees, including the value of recycled plastics and compost, for purchase by local firms to transform into saleable goods, or to export the materials where they can be used effectively.

Gate fees for dumping of waste are usually constrained by municipal budgets and low user fees. High gate fees can result in diversion of waste to informal dump sites. The municipality may also be a poor credit risk, leading investors to ask for government guarantees or other security rights.

It is tempting to pick up the trash one piece at a time. But by approaching the issue in an integrated manner, revenue generation can get close to cost recovery, or even provide a profit. So while the solution is seldom simple, especially when it comes to matters of finance, PPPs do provide benefits when applied to solid waste management. **H**



Cleaning up **THE LAW**

Fifteen years of strong economic growth in Brazil has increased citizens' consumption of goods along with their disposable income. According to recent data, Brazil is the largest world market for personal care products, and the third largest world market for electronic products, pet care, and home cleaning products. With at least 60 percent of the population now considered middle class, consumption will only increase—and along with it, waste.

By Carlos Silva Filho, Brazilian Association of Waste Management Companies

Brazil's economic growth is a popular story, and for good reason: the GDP per capita variation from 2003 to 2012 in the country was a remarkable 20.8 percent. But if there's a downside to this good news, it's that the country's waste generation, linked to this growth, is also on the rise. The Brazilian Association of Waste Management Companies (ABRELPE) calculates that from 2003 to 2012, Brazil generated almost 63 million tons of municipal solid waste (MSW)—a 21 percent growth over the previous 10-year period. During the same period, the population growth was 9.65 percent—waste generation increased two times more than the population.

Waste collection procedures have not yet caught up with this drastic growth. Almost 10 percent of the MSW generated in Brazil is not even collected. Almost half of the MSW is going to inadequate disposal sites like open dumps and uncontrolled landfills, and only 3 percent is recycled effectively.

To rectify this, ABRELPE estimates that Brazil needs a \$2.75 billion investment in modern solid waste management. This investment need generates significant business opportunities if federal, state, and municipal governments create the right environment to attract the private sector.

A LEGISLATIVE REMEDY

The first steps toward this solution have already been taken. In 2010, the National Waste Law

(no. 12.305/2010) was passed to establish a series of new procedures for waste management. The law requires waste management companies to develop integrated waste plans; introduces the waste hierarchy principle; requires some sectors to implement a producer responsibility system; and creates many other important incentives and directives.

Once implemented, this law will:

- improve natural resource conservation;
- promote economic development within the industry by stimulating new businesses related to recycling, recovery, and treatment activities;
- improve environmental and public health by the closure of open dumps and inadequate disposal sites by August 2014;
- promote social inclusion; and
- mitigate climate change effects by reducing greenhouse-gas emissions.

With this law, Brazil has an opportunity to achieve new waste management standards through systems, technologies, and practices tailored to local characteristics and demands. This leap forward may ultimately break the existing paradigm, moving a linear waste management system to a cyclical system featuring recycling, reuse, and recovery. **n**



UKRAINE CLEARS THE AIR

PPPs TAP INTO LANDFILL GAS
FOR POWER GENERATION

By Mick Mullay & Tatiana Korotka, USAID

Photo © David Dodge/Green Energy Futures, methane collection



Ukraine, like other countries of the former Soviet Union, inherited highly inefficient and polluting solid waste management systems upon independence in 1991. The country has been struggling with its garbage ever since. According to a recent World Bank study, Ukraine generates 17 million tonnes of waste per year. Its waste recovery rate is alarmingly low—about 5 percent. The rest ends up in landfills or illegal dumps near cities, posing health and environmental risks to the public and contributing to harmful greenhouse-gas emissions. Regardless of future government actions and potential changes in consumer behavior, Ukraine needs to significantly expand its landfill capacity.

The Ukrainian government has taken important steps to foster a legislative environment that will enable the processing and recycling of waste. Encouragingly, municipalities have recognized lately that tapping landfill gas for power generation is an effective component of a comprehensive solid waste management system. The USAID Public-Private Partnership Development Program (P3DP) is in the forefront of this movement, helping two Ukrainian municipalities develop biogas technology as part of their respective waste management systems through public-private partnerships (PPPs).

These partnerships are a relatively new tool in the government's arsenal for improving infrastructure and delivering public services. The approach produces energy and reduces environmental impact while potentially freeing up scarce budget funds that can be applied elsewhere.

VALUE IN VINNYSTIA

Vinnystia, a city of 370,000 in western Ukraine, plans to decommission its existing landfill and generate electricity from its landfill gas, which mostly consists of methane—a greenhouse-gas with over 20 times the impact of CO₂. The city's developing PPP project will generate and sell electricity using biogas that is currently flared. The proceeds will be used to recultivate and close down the landfill once its capacity expires.

The municipality has completed feasibility studies and expects to be ready to issue a competitive tender in 2014. An independent study showed that the project could attract up to \$3 million in private sector investment, generate \$5 million in tax revenues, and reduce gas emissions of nearly 460,000 tonnes of CO₂.

The idea is catching on. After visiting the site in Vinnytsia, the town of Ivano-Frankivsk pushed for a similar PPP in its region. A feasibility study is underway and is expected to be completed in mid-2014.

With solid waste management a top priority for the Ukrainian government, this is a good time to demonstrate how PPPs can improve the collection, processing, and disposal of solid waste.

THE DEMONSTRATION EFFECT

With approximately 100 landfills in Ukraine suitable for extraction and utilization of landfill gas, these encouraging steps forward could be replicated across the country. If this becomes an ingrained aspect of Ukraine's solid waste management system, landfill gas utilization will ultimately contribute to more efficient and environmentally friendly use of the country's resources.

Other benefits include:

- **Lower energy costs.** The high cost of energy in Ukraine is a drain on the economy and local budgets. Business is uncompetitive and municipalities do not have the necessary funds to address infrastructure needs.
- **Greater energy independence.** Ukraine imports most of its natural gas from Russia, making it vulnerable to geopolitical pressure. Using landfill gas will reduce the need for imports.
- **Opportunities for small business.** Local Ukrainian businesses will have greater opportunities to participate in the solid waste and energy sector.
- **Reduced greenhouse-gas emissions.** Ukraine is a leading contributor to carbon emissions on a per capita basis. A study by Biogas, an engineering firm, estimates Ukraine could save the equivalent of 6 million tonnes of CO₂ annually by using landfill gas.

With solid waste management a top priority for the Ukrainian government, this is a good time to demonstrate how PPPs can improve the collection, processing, and disposal of solid waste throughout the country. PPPs bring private sector investment for infrastructure and public services, as well as new technologies and managerial skills that play a major role in increasing energy efficiency and mitigating climate change. Landfill gas PPPs could lead the way, forming an integral component of a sustainable solid waste management program. **h**



AGRICULTURAL WASTE AS A BIOFUEL

Cities and industry aren't the only source of waste in Ukraine. The country's agricultural sector, which produces over 50 million tons of grain annually, generates huge amounts of straw as a by-product. When compressed into pellets, it burns at temperatures high enough to substitute for natural gas or coal to provide heating.

In Malyn, a town of 27,000 in Ukraine's Zhytomyr Region, USAID is advising city officials on a PPP to heat schools using straw pellets as an alternative, renewable biofuel. The PPP will reduce costs, enable the schools to operate at warmer temperatures, and provide local producers of pellets with a new market.

Furthermore, heating with agricultural waste doesn't contribute to greenhouse-gas emissions, as the carbon released by burning equals the carbon absorbed by crops during the growing season. The PPP is expected to go to tender in 2014.





CONSENSUS *for* CLEANUP

By Adele Paris, IFC

INDIA'S NEWEST PPP FOR WASTE COLLECTION INCLUDES COMMUNITY OUTREACH

In the Indian state of Odisha, a new PPP with a private operator improved waste collection and disposal, raising the quality of life for the residents of one large city. A targeted, well-developed outreach program was critical to the project's success and is now being used as a model throughout the state.

The municipal solid waste management system in Berhampur, a city of 350,000 people in the Indian state of Odisha, suffers from a lack of investment and inadequate staffing and management. In addition, like many other smaller cities in India, its solid waste management system is not in compliance with national regulations. Door-to-door collection is provided only in about half of the city, where roads are wider.

Households from the economically weaker section, living in other sectors where roads are narrower, deposit their waste at collection points, often on the side of the road. It is then picked up by municipal workers and small private operators, and transported to a dumpsite on the outskirts of the city. What is not collected by them or by street sweepers continues its journey in the drains. Citizens are exposed to health risks resulting from pollution, water contamination, and untreated waste.

To solve this problem, Odisha's Department of Housing and Urban Development and the Berrampur Municipal Corporation turned to IFC to help structure an affordable PPP transaction and attract a private operator. The goal was to improve the collection, transportation, treatment, and disposal of waste and raise the quality of life for city residents. An extensive outreach program, conceived and deployed to reach citizens from all areas of the city, helped ensure that the goals and mission of the new system were shared widely.

TALKING "TIPPING FEES"

In most places in India, the municipality covers most of the costs related to management of municipal waste. There is little to no financial contribution from users. As a result, waste management is a cost center on the municipality's budget. A private operator taking over the management of the waste system will look for reliable revenue sources to recover the costs of building, equipping, and operating the waste collection, transport, treatment, and disposal in an adequate landfill. These revenue sources

typically come from the sale of by-products (recyclables, compost, refuse-derived fuel, and power, depending on the optimal treatment solution for the city).

But in India, the sale of by-products, mostly recyclables and compost, is insufficient to recover the investment made in the treatment and disposal segment, let alone the collection part. Therefore the municipality must pay a "tipping fee" to bridge this gap. The real struggle is to set the tipping fee to a level low enough that the municipality can afford it, and high enough that the investor finds the project profitable.

In this case, what the municipality could afford was not enough. After analysis, IFC proposed that the state contribute to financing the initial investment for the construction of the treatment and disposal facilities through the provision of a grant and a concessional loan. These instruments are provided by the Odisha Urban Infrastructure Development Fund (OUIDF), a specialized fund of the Housing and Urban Development Department of the state of Odisha, financed by KfW, the German government-owned development bank.

For the tender process, the tipping fee was fixed at an affordable level for the municipality of about \$21 per tonne. The portion of concessional loan offered by OUIDF was fixed at 25 percent of the initial project cost. The project was bid out on the basis of the amount of grant required by the private sector to make the project viable, with a cap at 25 percent of the initial project costs.

IFC also recommended that the municipality start building consensus among residents regard-

ing the beneficiaries' willingness to pay for the significant improvements outlined under the project. In the future, this will help the municipality recover some of the expenses toward the tipping fee.

SPREADING THE WORD

Officials from Berhampur, along with IFC, understood early on that successful implementation of the project depended on the municipality's ability to raise awareness of its objectives, benefits, and risks. The detailed outreach initiative that emerged alongside the deal introduces the project's benefits to city residents, employees of the sector, and others who are impacted.

"I am convinced that the stakeholders' engagement, consultation, and communication strategy, created and implemented with IFC's support, will effectively help Berhampur Municipal Corporation," says Dr. Ajit Kumar Mishra, Municipal Commissioner of Berhampur. "The project has made Berhampur a statewide role model by addressing the specific concerns of all the stakeholders for a clean and better city."

To recognize the needs of each group and achieve consensus among all parties, the outreach targets:

- ***Beneficiaries of the project.*** The municipality is undertaking awareness drives on the benefits of the proposed system to encourage users to adapt their current waste disposal practices to make the city clean.
- ***Communities living close to new and old sites.*** This involves informing communities near the proposed new site about the project

activities proposed through its life cycle and the technological interventions.

- ***Employees of the municipality.*** No city employee shall be retrenched due to private sector participation. The municipality will consult with the sanitation employees and workers to assess potential redeployment opportunities so that the workload is optimized and there is seamless integration of operations between the municipality and the PPP contractor.
- ***Workers in the informal sector.*** Programs targeted at rag pickers and other informal recyclers in the system will educate them about their potential reintegration in the new system.
- ***Government bodies.*** Internal coordination among the multiple governmental agencies involved across the proposed transaction structure is vital.
- ***Employees of existing private contractors.*** While contracts with these existing private contractors will be terminated, the private concessionaire will need to continue to employ them.
- ***NGOs working in the social and environmental sector.*** These groups also need to be consulted with and kept abreast of developments.

"A CLEANER BERHAMPUR"

The winning bidder, a consortium led by UPL Environmental Engineers Limited, is a large Indian environmental engineering construction firm with 15 years of experience in solid and hazardous waste management, wastewater

treatment, recycling, and other environmental projects.

The concession agreement was signed on August 30, 2013 and collection is expected to begin in the spring of 2014. Expected results include:

- Over 350,000 residents, one-third of whom live in low-income areas of Berhampur, will benefit from daily door-to-door waste pickup services without increasing costs to the municipality.
- Environmental and health risks for the city's residents will be reduced.
- The private operator will construct and manage a composting facility with a capacity of 150 tonnes per day.
- The project will attract total private sector investments of \$10.3 million.
- There is high potential for replication in other Indian municipalities; bid documents developed under this project are being used for two other projects in Odisha.

"The citizens of Berhampur are eager to have a clean and hygienic city," says Berhampur's Mayor, K. Madhabi. "We are committed to efficient delivery of basic public services in our city. This PPP model is the most affordable solution to deliver our vision for a cleaner Berhampur." ■

FUNDS PUT TO GOOD USE

KfW Development Bank finances investments and advisory services in developing countries on behalf of the German Federal Ministry for Economic Cooperation and Development. It is committed to the primary goal of sustainably improving the economic and social conditions of the people in developing countries.

Odisha is among the pioneering states to introduce the Odisha Urban Infrastructure Development Fund (OUIDF), a funding mechanism for the creation and improvement of urban infrastructure. The OUIDF has been set up as a fully owned trust by the state government under the Housing and Urban Development Department. It includes a loan component of €52.5 million and state government contribution of €5.5 million.

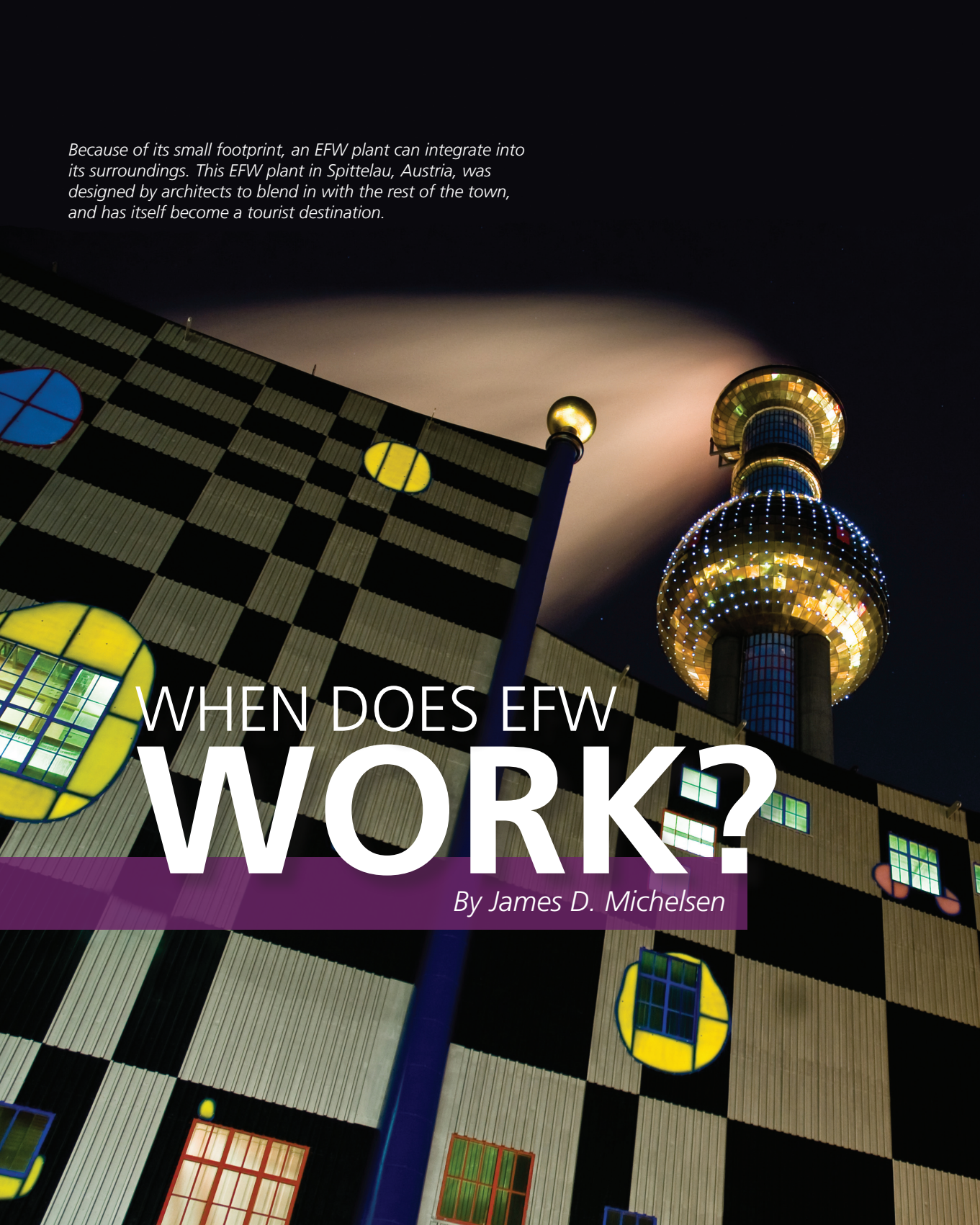
OUIDF has been set up with the goal of developing sustainable financial structures that will effectively link external, non-budgetary sources of finance and capital markets with the financing needs of urban local bodies and municipalities. Public and private players are able to access the fund, which also provides viability gap funding up to 50 percent in case of any gap in the commercial viability of a project. The fund will encourage private investors to avail themselves of this funding to set up PPP projects.

The Berhampur solid waste management project is the first project to benefit from the financial contribution of the OUIDF.

Because of its small footprint, an EFW plant can integrate into its surroundings. This EFW plant in Spittelau, Austria, was designed by architects to blend in with the rest of the town, and has itself become a tourist destination.

WHEN DOES EFW WORK?

By James D. Michelsen



The debate over creating energy from waste (EFW) is as heated as the process of creating energy itself. Although EFW is already a proven, successful technology in some developed countries and select emerging markets (such as China), many developing markets have not yet adopted the model and are weighing carefully the pros and cons. EFW merits close examination, taking into consideration the geography, population, and economies of the locations that need waste sector services the most.

DEFINING OUR TERMS

Energy from waste (EFW): The process of producing energy in the form of electricity or heat from the thermal breakdown of waste through any thermal conversion technology or combination of thermal technologies.

Conventional EFW: Refers to grate-fired or fluidized bed combustion of waste.

Advanced Thermal Conversion Technology: Refers to non-combustion technologies recently

applied to municipal waste treatment—including pyrolysis, gasification, and plasma gasification.

Other Conversion Technologies: Refers to anaerobic digestion (AD) of organic municipal waste to generate biogas after processing/separation from recyclables and inerts or landfill gas-to-energy, or other technologies applied to waste to extract energy.

Photo © Stefan Baudy, Vienna Hundertwasser, Austria



For EFW to be worthy of consideration in emerging markets, many of the following conditions should exist:

Land and transport infrastructure is constrained. EFW facilities can be put in city centers as they require little land and lower waste transport costs. This is helpful when large land sites for landfills are not available near urban centers, land is expensive, and when road infrastructure is constrained for truck traffic.

Electricity tariffs or energy costs are high in the grid or for end users. Electricity tariffs are high in the grid or for large end users who could contract for the electricity or steam. The site can also be located close to energy demand, co-located with an end user for “behind the fence” (i.e., on-site) co-generation or district heating/cooling applications.

EFW will not be the answer for many emerging markets.

There are attractive electricity tariffs for EFW and/or tipping fees exist. Many EFW projects in emerging markets rely predominantly on electricity revenues. Projects become more viable in markets where there is a renewable feed-in tariff or renewable portfolio standard for which EFW is eligible and/or there is a practice of paying for waste disposal or “tipping fees.”

There is evidence of end cost recovery for waste services. Revenues from tipping fees to support electricity tariffs can more readily be achieved when constituents pay a fee, however small, for waste services received. This allows for a level of cost recovery that can be built upon, which would not otherwise exist.

There is a large urban center with a growing population and GDP. Megacities or very large cities, particularly in middle income countries, often have many of the characteristics that make EFW an attractive option, especially if they can take part in an integrated solid waste management plan including recycling, reuse, and waste reduction.

The government considering EFW is a small island nation. Island nations are also a good fit for EFW plants because land is constrained, economies are driven by tourism, and there are high electricity costs.

When several of the conditions above are met, EFW might be a good solution for local governments, electric utilities, and constituents, as well as for waste companies. In the “win/win” scenario, utilities and governments can get base load renewable electricity sources, while entities responsible for solid waste get an environmentally sustainable disposal solution financed by the private sector. EFW services can favorably impact other sectors and elements of urban infrastructure, such as tourism, property values, transport, and water and air quality. EFW can also contribute to the reduction of greenhouse-gas (GHG) emissions (see box at right).

Furthermore, adoption of the EFW concept can drive policies and regulatory regimes that improve solid waste management and enforcement, give opportunities to improve cost recovery, and improve grid diversity in the electricity sector.

The shift toward requiring constituents to pay for improved service can also pave the way for public-private partnerships. When constituents pay for services, another revenue source opens up that can be used to manage risk, and this sound fiscal municipal policy supports a private sector transaction.

A CHALLENGING PROPOSITION

But there are significant challenges that may prevent EFW from achieving its potential in emerging markets.

High cost: Most notably, from a utility's point of view, EFW may not be the least cost base load option, and not the least cost renewable option. From the perspective of public solid waste management authorities, EFW may not be the least cost waste disposal option, either.

Difficult to site: EFW is difficult to site for both utilities and public solid waste authorities because residents tend to reflexively reject the idea of waste processing and disposal taking place in their

A PLUS FOR CLIMATE

Adoption of the EFW concept is climate beneficial. Although EFW facilities emit CO₂ as part of combustion process, they achieve a net reduction of GHG emissions over their lifecycle.

Most of the emissions are from biogenic (natural) sources, with remaining waste from anthropogenic (man-made) sources. Greater climate benefits can be achieved if linked with a recycling program.

EFW facilities reduce emissions several ways:

- The harmful GHG emissions (methane) that would have been generated from the waste if it were sent to a landfill are avoided;
- It displaces electricity that would be otherwise provided by fossil fuel power plants; and
- Ferrous and non-ferrous materials can be recovered and recycled, requiring less energy than processing raw materials.

vicinity. This is also known as the NIMBY effect (“Not In My Backyard”). Once local citizens are educated about EFW—understanding that the footprint is small and low-impact, and that the facility can be integrated architecturally with the surroundings—perceptions can potentially change.

The shift toward requiring constituents to pay for improved service can pave the way for public-private partnerships.

Landfill still needed: EFW does not eliminate entirely the need for a sanitary landfill as part of the solid waste management plan. Landfills are still needed to address ash disposal, non-combustible waste streams, climate events (such as hurricanes), or extended facility outages.

Poor quantity and quality of waste: Smaller waste quantities (scale issues) and poor waste quality (low calorific value and high organic and moisture content) have also traditionally created challenges for EFW in emerging markets. Technological advances, driven by emerging markets’ requirements, are producing new designs and operating procedures better able to handle low calorific value waste.

Limited access to finance: Access to finance can be a concern in developing economies consider-

ing EFW. However, as environmental and social considerations become increasingly important for global financial institutions, countries can improve their access to finance by:

- Satisfying stringent air and effluent emissions requirements;
- Showing evidence of community engagement and acceptance; and
- Incorporating environmentally sustainable practices, including sustainable ash disposal solutions.

PLAN FOR SUCCESS

A solid waste management plan that integrates the EFW facility, demonstrating that it is technically and financially the best solution for the community, is one of the most effective ways for a government to evaluate whether or not an EFW plant is the right fit for its community. When recycling, waste reduction, and re-use concepts also complement the model, and there is a plan to leverage existing formal and informal sector participation, many of the pieces may begin to come together for the winning waste strategy that so many developing economies are searching for. **h**

ADVANCED THERMAL CONVERSION TECHNOLOGIES (ATCTs)

Many ATCTs have been in existence for a long time and successfully applied to homogeneous, high heat content waste streams. However, they have only been recently applied to municipal solid waste on a commercial scale—and with mixed results. Successful technologies have been characterized by high capital and operating costs, requiring in turn high tipping fees and electricity rates to cover costs.

Local governments in emerging markets are promised strong results from ATCTs. But to most accurately evaluate its potential, they should consider the following criteria:

- The potential partner has an existing facility in operation, or uses a third party technology with a facility already in operation, including upfront waste processing and syngas treatment.
- The existing facility operates at a similar scale (waste throughput and output) to the project being planned.
- The potential partner can provide operational and performance data (including emissions) for their existing operations, demonstrating that the commercial facility can operate off the same feedstock continuously for an extended period.
- The syngas should be used as feedstock in the energy conversion equipment (for example, reciprocating engines, turbine, or boiler) for an extended period.
- There are substantial performance guarantees from the private operator.
- And finally, nothing substitutes visiting the existing facility and talking to project stakeholders.

Photo © BASF—The Chemical Company, syngas complex, Malaysia





A LEGAL LOOK AT EFW

*By Jonathan Brufal
& Tom Gray,
Wragge & Co LLP*

Energy from waste (EFW) facilities are becoming a popular solution in developed markets. They answer the requirement for higher levels of renewable energy while reducing landfill waste. An established, market tested risk allocation structure and payment mechanism allows for the successful construction and operation of EFW plants by private sector participants.

There is an interesting dynamic at play in developing markets: ongoing urbanization is resulting in an ever-increasing need for energy and a growing volume of waste. Is EFW the answer in these emerging economies as well? It's worth considering the following points from a legal perspective when reviewing potential EFW projects in such markets.

LARGE COMMERCIAL CONTRACTS

EFW plants rely on a constant supply of waste, either commercially generated or from the local population. When originating from residents, it is typically collected and delivered to the plant by the relevant municipal authority.

In countries where that municipal authority “owns” and is responsible for the waste of its residents and has the requisite infrastructure, it is possible to institute an efficient collection system necessary to supply the EFW plant. In these cases, the authority funds the collection by

levying a fee by way of tax. In emerging markets, where waste collection might not yet be an established responsibility of the local authority, certainty of waste supply is a significant risk. Developers and lenders need assurance of sufficient waste. If the municipal authority cannot provide such certainty, they either won't enter into these deals, or will refuse to take on volume risk without a minimum payment guarantee (reducing the value of the deal for the authority).

Project companies in developed countries bolster waste volumes (thereby offsetting any supply risk) by securing large commercial contracts. This could be a solution for emerging markets, but relies again on local companies producing sufficient waste, which may or may not be a dependable outcome.

DEPENDABLE ENERGY OUTPUT

The supply of waste should not only be constant and sufficient but also of a composition that allows for viable energy production. The calorific value of waste directly impacts energy output. While developers and lenders have generally become comfortable with the project company taking composition risk in established markets (owing to a level of certainty regarding calorific values), the willingness to do so in developed markets is unlikely.

Uncertainty surrounding composition will make developers reluctant to commit to any minimum energy output—in direct conflict with the public sector objective to assure a reliable energy source.

GATE FEE ECONOMICS

Notwithstanding the relative lack of supply risk in developed markets, the income stream that a EFW plant can deliver through the sale of energy alone has not generally been considered a bankable proposition. Instead, developers usually require the municipal authority to pay a “gate” or “tipping” fee per tonne of waste the plant accepts. Due to the importance of a consistent income stream, developers may require the authority to commit to providing a certain tonnage of waste per month and make the gate fee payable for that tonnage regardless of whether or not the authority can actually deliver it.

In markets where waste collection is an established (and taxable) function of municipal authorities, those authorities are normally willing to take this risk. But authorities in emerging markets may not be able to afford the fees, nor be willing or able to increase local taxes for collection.

STRONG REGULATORY ENVIRONMENT

Strong regulatory and policy support is a necessary condition for successful EFW plants. A fast track planning system and an established and efficient process of obtaining approvals give developers and lenders the reassurance that they can move from conception to financial close in good time. Such a regime is likely to be absent

in emerging markets, but its development is crucial to the success of EFW projects in such jurisdictions.

A strong regulatory environment is often backed by governmental or intra-governmental policies that support and incentivize EFW. This fulfills the twin objectives of increasing renewable energy production and reducing landfill. In the U.K., incentives typically represent two-fifths of a EFW plant’s income. (The gate fee also represents two-fifths, and the sale of energy the remaining one-fifth).

However, the likelihood of replicating this model in emerging markets seems slim. In real terms, this means that the payment structure will be highly negotiated and potentially onerous for the municipal authority, with higher gate and energy fees required to make up the incentive shortfall.

NEW FRAMEWORK

Applying the established contractual model in developing markets is likely to prove difficult. New technologies might broaden the composition of acceptable waste and increase the efficiency with which plants can produce energy. This in turn may result in lower gate fees and a reallocation of supply risk.

However, lenders are cautious. In emerging markets particularly, they want to see proven technology being used. For the foreseeable future, municipal authorities in developing countries are likely to have to guarantee supply levels and pay high gate fees—and take risks which are usually carefully negotiated between the parties—to make EFW a viable option in emerging markets. ■



COMPARING ENERGY FROM WASTE FACILITIES TO LANDFILLS

*By Daniel Hoornweg, University of Ontario Institute of Technology &
Perinaz Bhada-Tata, Consultant*

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There is no ideal way to dispose of waste. All options are expensive and have myriad impacts, so waste managers need to select from among several challenging choices. The most hotly debated topic in many waste management discussions is whether to burn or bury our waste. This discussion centers around the world's two most popular waste disposal options: energy from waste (EFW), which is also known as waste to energy, and landfilling. But rarely is there an "either/or" scenario; landfill and EFW must co-exist as they each fulfill different roles in an integrated waste management program. Here we discuss the merits of each model from the perspective of technology, cost, local considerations, and global environmental impact.

TECHNOLOGY

Yesterday's highly polluting trash incinerators and leaking, stinking dumps burden both landfills and EFW efforts. Today's EFW air pollution control technology is so highly advanced that dangerous pollutants, such as dioxins and heavy metals, have been virtually eliminated—in some cases by as much as 99 percent. Germany's Ministry of the Environment reports, for example, that residential fireplaces emit 20 times more dioxins than EFW plants.

Many EFW plants also enable real-time monitoring of key operational parameters, such as carbon monoxide levels and temperature of stack emissions, providing important assurances to nearby residents and regulatory authorities. Such plants benefit from regular and sustained technological advances.

Landfilling, although not as dependent on technology as EFW, also benefits from regular process improvements. Procedures to recirculate leachate, improve leachate treatment, and update collection of landfill gas are constantly reevaluated.

COST

Overall (total) costs for EFW are about \$70 to \$200 per tonne, while sanitary landfilling is less than half that at \$40 to \$100 per tonne. Learn more from "*What A Waste: A Global Review of Solid Waste Management.*"

BUYING BETTER EFWs

EFWs are capital intensive, and much of the system cost is upfront. Similar to buying a car or computer, it is important to get the technology as correct and flexible for improved downstream operations as possible. The large initial contracts associated with EFW can attract unwanted political influence. Local governments, when acquiring EFW plants or services, should ensure that the selection process is as transparent as possible, with all costs over the life of the facility considered.

However, these costs are often difficult to compare directly as ancillary benefits and local subsidies can drive overall costs.

The method of procurement is slightly different for EFWs and landfills. An EFW plant is similar to purchasing a costly building that is operated over its lifespan. A landfill, on the other hand, is similar to an ongoing civil works project. The finished product is a green space such as a golf course or park. Financing an EFW requires upfront capital, usually issued through bonds or the operator's own financing.

Comparing costs of landfilling and EFW is challenging since they are considerably different. The total cost is impacted by considerations that are often set by political dictate, like feed-in tariffs

for generated electricity, a price on carbon, and location and cost of land. Other important cost inputs include prices of recyclables, ash disposal costs, environmental legislation (stack emissions and leachate treatment standards), and tipping fees.

LOCAL CONSIDERATIONS

Few other issues have the potential to generate street protests from angry residents than announcing a planned landfill or other waste disposal facility. The fury is often exacerbated by the perception of local residents who see urban garbage being dumped in a rural setting. Additional truck traffic and real and perceived impacts make siting any kind of waste disposal facility very difficult.

EFW facilities are often located in more industrial settings, closer to city centers. Their siting

is certainly not free of opposition, but they tend to generate less angst.

The waste hierarchy ranks waste management options in order of preference: reduce, reuse, recycle, recover, and finally, dispose. Using waste as a fuel has benefits such as displacing fossil fuel and reducing the volume of waste by up to 90 percent.

EFW complements recycling, if sized correctly. Research from the European Union and communities in the U.S. with EFW plants shows that jurisdictions with the highest recycling rates often have EFW facilities. When EFW facilities are too large—with “pay or put” contracts that require local governments to always provide a minimum amount of waste—they can discourage long-term waste reduction and recycling efforts.

BUILDING SITING LANDFILLS

Landfills are similar in scope and complexity to large, ongoing civil works projects. For 10 to 20 years, a landfill requires heavy machinery to compact waste, excavate, and move soil cover material. Waste managers need to ensure that there are always funds available for fuel, civil works, and liners for new cells, along with site supervision and communications with local residents.

Landfills also need to be fully integrated into local land use plans. Before work starts, the final land use should be known. Will the closed site be a golf course, public green space, or used for agriculture? Local residents are more amenable to a landfill site if they know what the site's final use will be and what the time frame is.

Siting a landfill is a complicated process with many aspects to consider. Those considering this option will find more detailed, step-by-step information from Waste Treatment and Disposal.

For best operational efficiency, EFW plants require upfront waste processing and recycling. Materials like PVC plastic and florescent light bulbs should be removed at source to reduce emissions. These efforts can be linked to city-wide recycling and hazardous waste programs. Moreover, EFW operators are keen to have these wastes removed to protect equipment and ensure safe operation.

Landfills, on the other hand, tend to be more forgiving of spurious waste products, or wastes with high moisture content. Unlike EFW, landfills are constrained by total volume. Recycling and diverting waste can extend the life of landfills (although, similar to EFW, local governments that rely on waste tipping fees for overall revenue might have an incentive to accept more waste).

In an ideal world of less waste, fewer EFW plants and fewer landfills would be needed. But as waste volumes around the world are expected to double in the next 30 years, more landfills and EFWs are inevitable.

Landfills may be more appropriate in communities where waste tends to be high in moisture, collected erratically, and sustained regulatory oversight may be missing. For best effect, EFW

also needs to be integrated with a nearby energy customer.

ENVIRONMENTAL IMPACT

EFW is often considered a renewable energy source, or at least climate-neutral, according to the Intergovernmental Panel on Climate Change. Although EFW plants emit greenhouse-gases, the major portion (50 to 67 percent) of carbon is biogenic, so the combustion does not increase the total amount of carbon in the atmosphere. This is because the carbon is part of the earth's carbon cycle already.

In addition, combusting one ton of waste in an EFW plant prevents one ton of CO₂ being emitted, according to the Environmental Protection Agency. By comparison, landfills generate methane, which is a 21 times more potent greenhouse-gas than CO₂. Landfill gases need to be collected and combusted (also often generating energy).

In an ideal world of less waste, fewer EFW plants and fewer landfills would be needed. But as waste volumes around the world are expected to double in the next 30 years, more landfills and EFWs are inevitable.

For peak performance, both EFW plants and landfills require professional management and unrelenting attention to waste separation and community involvement. Better decisions are made when the public is part of the decision-making process and supports an ongoing waste management program. ■

A photograph showing a massive pile of unsorted waste, including plastic bottles, bags, and debris, next to a concrete wall. The waste is piled high, filling the frame. The text 'MITIGATION VIA WASTE MANAGEMENT' is overlaid on the image.

MITIGATION VIA WASTE MANAGEMENT

By Atilio Savino, International Solid Waste Association

Photo © Jayaprakash R, Thiruvananthapuram, India

While waste contributes relatively little to climate change—only 3 to 5 percent of anthropogenic greenhouse-gas (GHG) emissions—certain waste management approaches offer an immediate, cost-effective way to achieve significant cuts in global GHG emissions. Using existing technologies that can be deployed at scale in virtually all regions and markets, waste management can be transformed into a climate mitigation tool.

Every city, region, and country has a unique foundation of waste composition, technologies and infrastructure, climate conditions, and economic capability. During the past 50 years, the waste management sector has developed the technology and expertise to tailor its approach to these specific conditions of each area. A key advantage of waste management's GHG mitigation potential is that it can use these conditions as a foundation to enhance overall performance.

There are several strategies in the waste management sector with the potential to reduce GHGs. They provide opportunities for both upstream and downstream cost savings, energy efficiency improvements, and public health and lifestyle benefits.

These strategies include:



COLLECTION & TRANSPORTATION

- Optimize collection routes and streamline operations to improve fuel efficiency.
- Use alternative fuels (e.g., biodiesel, bioethanol).
- Develop alternative means of transportation (e.g., rail and waterway transport).



RECYCLING AND REUSE

- Increase material recovery rate to save energy.
- Recover substitute fuels (e.g., waste oil, refuse-derived fuels).



ENERGY FROM WASTE

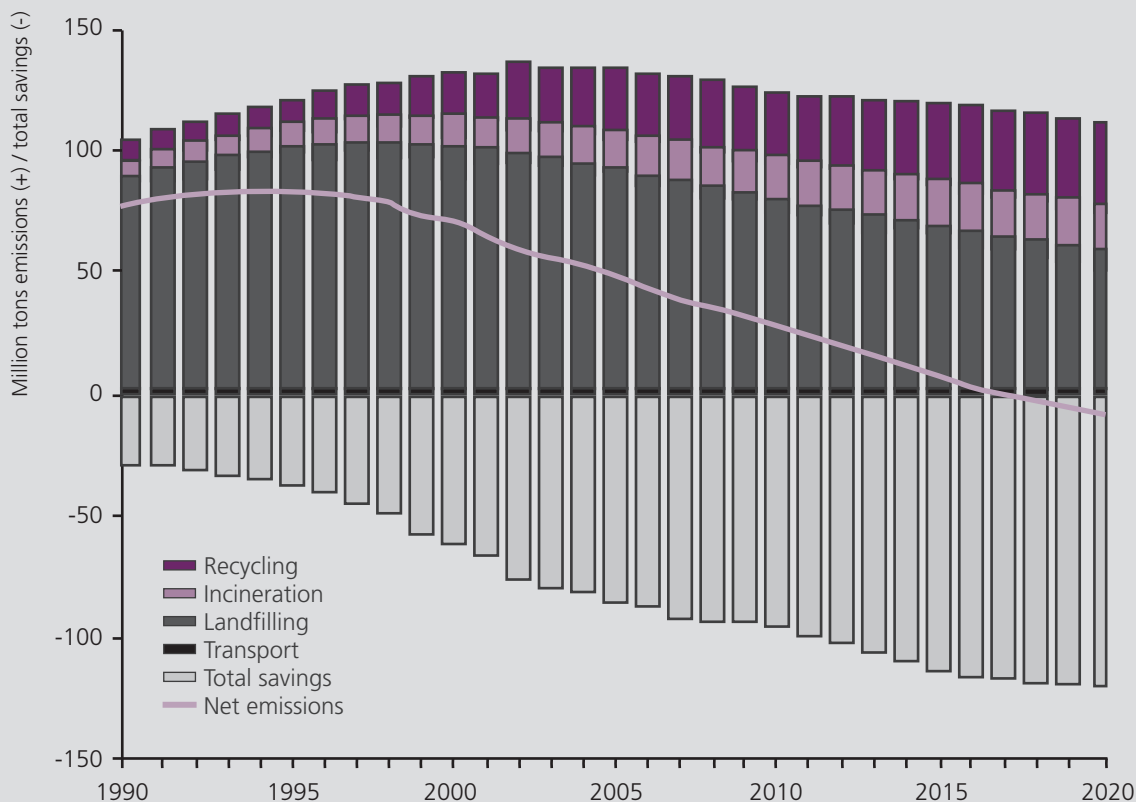
- Generate thermal energy and electricity from waste combustion as a cost-competitive substitute for conventional fossil fuels.
- Recover metals and bottom ashes from incineration.



BIOLOGICAL TREATMENT

- Increase compost production (a low-emitting treatment solution).
- Recover methane from anaerobic digestion processes.

POTENTIAL EMISSION SAVINGS FROM EU LANDFILL DIRECTIVE



LANDFILL

- Install active landfill gas collection and treatment systems.
- Use landfill gas as a fuel to produce electricity or thermal energy.

THE EU AND BEYOND

Recent experience in European Union (EU) countries has shown that through the combination of proven waste management technologies, comprehensive regulatory standards, and broad, multi-stakeholder coordination and communication, municipal waste management can achieve substantial, near-term reductions in GHGs.

Between 1995 and 2008, for example, municipal solid waste management systems in the EU have reduced approximately 48 million tonnes of CO₂-equivalent. Another 62 million tonnes of CO₂-equivalent will be reduced by 2020 as the EU Landfill Directive is fully implemented in the coming decade. This will make the municipal waste sector a net GHG reducer between 2012 and 2020.

In developing countries, however, rapid increases in population and urbanization are resulting in increased waste generation. GHG emissions will also increase unless a new approach takes hold. Implementing effective waste management systems in these developing regions can bring a wide range of environmental, economic, and social benefits.

ENVIRONMENTAL BENEFITS

- Reduced GHG emissions generation.
- Reduced environmental degradation from uncontrolled waste disposal.
- Resource and energy conservation through material recovery.
- Energy recovery to reduce demand on limited natural resources.

ECONOMIC BENEFITS

- Access to international financing.
- Revenues from the sale of carbon reduction credits, recovered energy, and materials.
- Technical expertise and training to facilitate technology transfer and build capacity.

SOCIAL BENEFITS

- Improved sanitary and health conditions.
- New jobs from construction of new facilities and projects.
- Training and capacity building in support of waste management modernization.

Moving from waste management to resource management is a transition critical to the success of all economies. In this transition, waste prevention, resource recovery, reuse, and recycling are essential and enabling components of strategies that can help slow the negative effects of climate change for generations to come. **h**



nurturing **new partnerships**

By Karen M. Luken, Clinton Climate Initiative

CLINTON CLIMATE INITIATIVE CURBS METHANE EMISSIONS

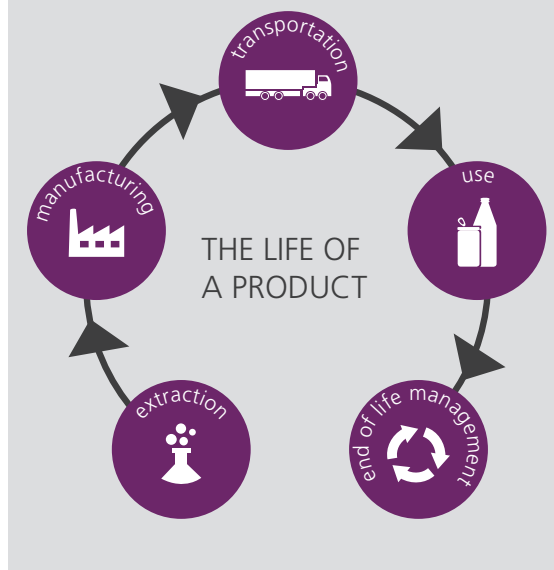
Developing public-private partnerships for integrated waste systems can be challenging, especially in developing cities and countries. The Clinton Climate Initiative can help guide municipal and national governments in changing waste systems to reduce methane emissions.

While the term “carbon footprint” is so widely used that it is now included in the Webster-Merriam dictionary, the impacts and origins of methane are just beginning to be recognized. Methane is the second most prevalent greenhouse-gas emitted from human activities. Methane’s lifetime in the atmosphere is much shorter than carbon dioxide, but methane is more efficient at trapping radiation than carbon dioxide—and also more damaging. Pound for pound, the comparative impact of methane on climate change is over 20 times greater than carbon dioxide over a 100-year period.

METHANE 101

Methane from human activities can be emitted from natural gas and petroleum systems, raising livestock, and discarding organic wastes in landfills and wastewater treatment facilities. When organic wastes, such as food, garden trimmings, wood, paper, and sludge decompose, methane is released into the atmosphere.

For many communities, landfills and waste water treatment systems can be the largest single source of methane emissions. But these emissions can be significantly reduced by initiatives that divert waste from disposal, such as composting, or capturing the methane to use as a biogas for generating energy. This is one of the reasons why the William J. Clinton Foundation’s Clinton Climate Initiative (CCI) is guiding municipal and national governments in changing their waste systems in a manner that reduces the emission of methane.



The other reason for the CCI’s focus on methane is that the annual quantity of waste generated, especially in emerging markets, is growing at an alarming rate and is expected to triple by 2025. For most of these cities and countries, waste management systems are still in their infancy. Without guidance, there is high potential for waste to be improperly managed. This can create serious health and environmental consequences.

Globally, waste accounts for approximately 3 to 5 percent of greenhouse-gas emissions from human activities. However, waste has the potential to become a significant contributor to the reduction of greenhouse-gas emissions. This is because recovering waste to manufacture new products or create energy avoids emissions during the product life cycle.

DEVELOPING SUCCESSFUL PPPs

Because of the limited financial resources, institutional capacity, or technical knowledge, many developing cities and countries are considering the use of PPPs to implement their integrated waste systems. However, for PPPs to succeed and flourish in the waste sector, the risks to the private project developer, public officials, and financial investor must be diligently assessed and mitigated.

A waste PPP is a 10- to 20-year relationship—so it is paramount that all partners are committed to collaborating, especially in the more complex environment of an emerging market.

Public-private partnership (PPP) projects in waste carry unique risks. Overall, the most common challenges for developing cities and countries include an unclear delineation of roles and responsibilities, inability to regulate, and unrealistic financial expectations.

Unclear delineation of roles and responsibilities

Even if the PPP mandates a private company to design, construct, finance, own, and operate the new integrated waste system, the public sector will still have a role and responsibility in its

implementation. Unless roles and responsibilities are clearly understood, the success of the PPP can be compromised.

For example, it is not uncommon for the market conditions for the products and energy to be assessed only after a private project developer and waste technology has been selected. The private developer will assume that the public officials are securing off-take agreements for the products and energy that the waste system will create unless the tender documents clearly indicate that responsibility. Conversely, public officials often think that identifying a market's product and energy is the responsibility of the private developer.

Inability to regulate

Regulations to govern waste systems and advanced waste technologies are either non-existent or severely insufficient. Consequently, ascertaining public and political support can be an insurmountable barrier for developing waste systems. This is due largely to safety, health, and environmental concerns. These concerns are justified as cities without regulations are often targeted by developers and technologies that would never be considered in North America or Europe. Thus, it is essential for regulations to be in place before the procurement process commences, along with training for public officials to monitor and inspect waste systems.

Unrealistic financial expectations

Private investors typically seek a 15 to 20 percent return on investment (ROI) to consider the project financially viable. While a facility within

an integrated waste management system may be able to achieve this ROI, most financial assessments do not examine the associated waste infrastructure costs (i.e., collecting and transporting the waste to the facility).

Although most solid waste projects need to demonstrate a guaranteed quantity of waste over the project duration to receive financing, developing cities and countries typically do not have the operating or maintenance equipment to guarantee the delivery of waste. Therefore, while the facility can be profitable, the waste system will not succeed if the public sector incurs the entire financial burden of improving the waste infrastructure.

A waste PPP is a 10- to 20-year relationship—so it is paramount that all partners are committed to collaborating, especially in the more complex environment of an emerging market.

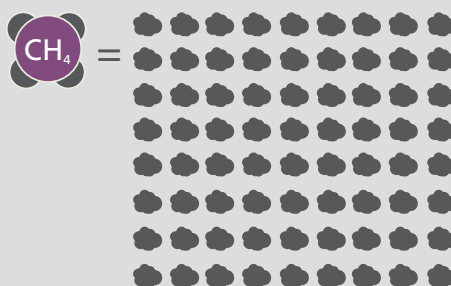
For private sector developers and investors, this may mean allocating additional time and resources to educate their public sector partners on the technical and financial components of their new waste systems. For public officials, establishing an unprecedented level of transparency in their government procurement process may be required.

Following this advice will help waste PPPs succeed and yield systems where waste can become a resource for making new products and energy, rather than contributing to global warming. **■**

METHANE PRODUCTION



The critical factor in methane production (CH_4) is the amount of biodegradable waste sent to landfill sites. Over a 20-year period, one ton of methane causes 72 times more warming than one ton of CO_2 .



Sources: Environmental and Energy Study Institute, World Bank Group



By Jeff Cooper, International Solid Waste Association

POST-KYOTO

A way forward for the Clean Development Mechanism

The Clean Development Mechanism (CDM), introduced under the Kyoto Protocol, provided an opportunity for the waste sector to generate revenue from the sale of carbon credits, thereby creating significant incentives for greenhouse-gas (GHG) emission reductions. However, the early development of CDM has faced a number of challenges. To solidify and expand the post-Kyoto efforts, the following steps should be considered:

STREAMLINE BUREAUCRACY

Although significant progress has been made on the CDM since its inception, a more streamlined

approval process could lead to a greater number and better geographic distribution of implemented emission-reduction projects.

ARTICULATE BENEFITS

The ways national governments and the private sector can benefit from CDM have not been well articulated. However, national governments in developing countries can reap significant rewards. Those that have sound proposals for the enhancement of their waste management practices set out within a Nationally Appropriate Mitigation Action plan, either as a stand-alone proposal or incorporated within a suite of GHG

emission-reduction targets, qualify for funding through the Global Climate Fund.

EXPAND ENERGY FROM WASTE

Nearly 90 percent of the more than 200 registered CDM solid waste projects involve landfill gas flaring and recovery. However, most of these employ controlled flaring of trapped gases and do not convert those gases to energy. An example of an ambitious initiative is the landfill gas-to-energy scheme in Bogota, Colombia. The landfill site accepts 6,000 tonnes of waste per day. By trapping the methane, the site produces electricity and gas for up to 70 neighboring brick kilns, replacing the fossil fuels currently used.

ENCOURAGE USE OF TECHNOLOGIES

Similarly, only a limited number of large-scale projects involve advanced solid waste treatment technologies, such as large-scale composting, gasification, anaerobic digestion, and processing refuse-derived fuel. These technologies are significant not only for tackling GHG emissions but also for providing secondary resources and renewable energy sources.

EVENLY DISTRIBUTE BENEFITS

CDM projects have been unevenly geographically distributed and have therefore not resulted in significant benefits for developing countries. However, there is notable unrealized potential for additional CDM projects, including the advanced technological solutions outlined above. This potential includes host-country coverage that includes the least developed countries (which currently have a very limited uptake of CDM projects).

ABOUT THE KYOTO PROTOCOL

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its parties by setting internationally binding emission reduction targets.

Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of “common but differentiated responsibilities.”

The Kyoto Protocol was adopted in December 1997 and entered into force in February 2005. Its first commitment period started in 2008 and ended in 2012.

The relationship between waste management and climate change is now recognized widely. This should help secure greater funding for international agencies and allow access to improved financial mechanisms for waste management improvement in developing countries of the post-Kyoto world. In addition to the traditional and widely recognized health and environmental benefits of enhanced waste management, we can now add GHG mitigation and the production of secondary resources and renewable energy. ■

Photo © Troels Dejgaard Hansen, UN Climate Wall, Copenhagen



Integrating the **INFORMAL SECTOR**

by Sanjay K. Gupta, Consultant

*Combining strengths to
improve waste management*

In many cities in 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 (SWM) costs for municipalities. Apart from this, informal sector waste management activities also allow municipalities to achieve recycling objectives and reduce use of precious landfill space. Formalizing the roles of the informal sector and integrating their activities into municipal strategies could institutionalize and strengthen a labor market with valuable skills to offer.

Waste management systems in the cities of many developing countries could not be coordinated without the informal sector: waste pickers, scrap collectors, traders, and recyclers collect, sort, process, store, and trade waste materials. In fact, many more tons of recovered materials come via informal channels than formal channels. In most developing countries, as much as 15 to 20 percent of waste is managed by the informal sector.

INDIVIDUAL AND PUBLIC ECONOMIC BENEFITS

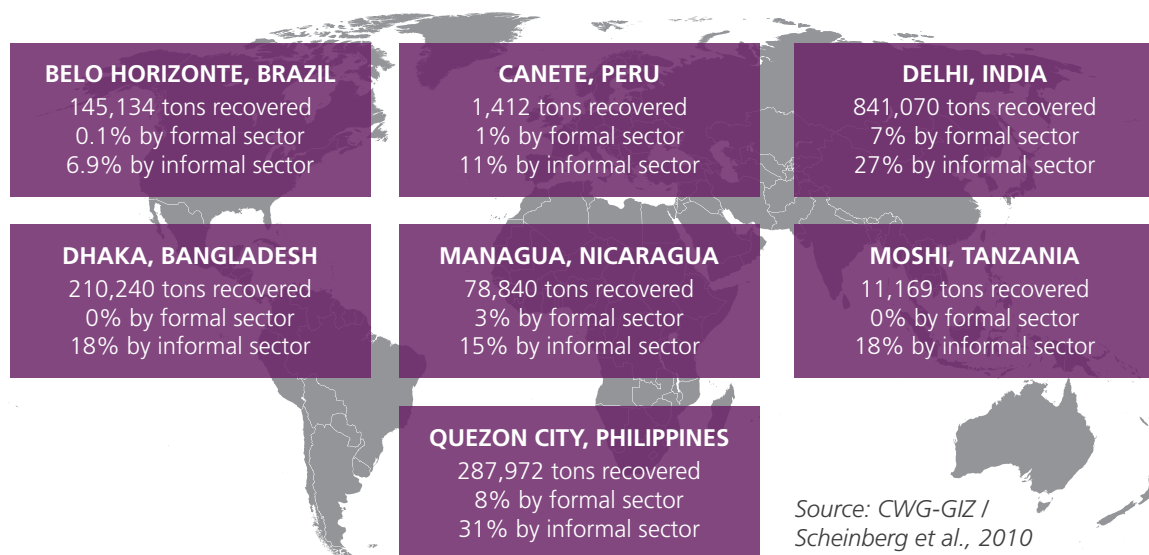
Profit-making opportunities for materials with high intrinsic value create incentives for much higher levels of recovery and recycling in the informal sector.

The informal recovery of recyclables also reduces overall SWM costs for municipalities by reducing the need for collection, transport, and disposal. 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. For example, Delhi, India saves around €6.7 to €7.5 million annually.

ENVIRONMENTAL BENEFITS

The increased recycling activities help municipalities reach recycling targets and save precious landfill space. It also reduces the extraction of raw materials and returns secondary raw mate-

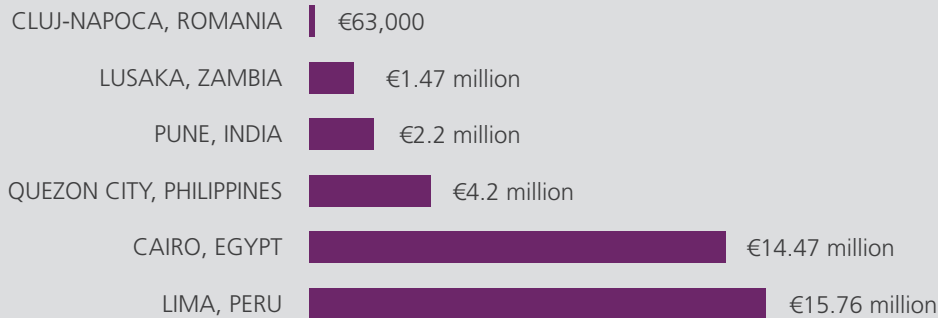
WASTE RECOVERY RATE IN SEVEN CITIES



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

COST SAVINGS OF WASTE PICKERS FOR MUNICIPAL WASTE COLLECTION AND DISPOSAL (AVERAGE CONTRIBUTION PER YEAR)

Source: CWG, GIZ, 2010



rials to the production cycle. Since recycling requires less power than production processes with primary raw materials, there is a significant secondary benefit of reduced energy consumption. Additionally, informal sector recovery itself uses less energy since many informal activities rely on human or animal muscle traction, rather than motors.

FORMALIZING THE INFORMAL

Attitudes of municipal authorities toward the informal sector vary: in some places there is hostility, in others indifference, and in some places they are regarded as a useful part of the SWM system and are given the opportunity to enhance their livelihoods.

The role of municipalities is critical to mobilizing the informal sector and organizing the informal valorization sector. For example, municipalities can integrate waste pickers into the collection

of waste at the source, by giving them rights over recyclables and guaranteeing them regular access to waste. In 2006, the Pune Municipality in India granted waste pickers the right to collect waste and a service fee from households. In Bogota, Colombia, the appellate court struck down the exclusive right over waste of a municipal waste contractor and restored the right to waste to the waste pickers.

To transfer these rights, municipalities must enter into direct contractual or covenant relations with informal sector organizations. Given limited business knowledge, education, and socio-economic means, the informal sector needs support to organize into cooperatives or other legal structures. Municipalities or NGOs can provide legal support in establishing cooperatives, providing training, and creating other services to improve working conditions (such as identity cards and access to health insurance). In Bangladesh, for example, Waste Concern

INFORMAL & 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 formal waste sector (persons)	8,834	330	13,777	800	4,545	5,591
Average informal workers' earnings (€/per year)	2.721	345 ¹ /2.070	1.767	586	1.199	1.667

¹Represents actual earnings from about 50 days of labor per year of €345 multiplied by 6 for purposes of comparison with other cities.
Source: CWG-GIZ, 2010

and other NGOs train waste pickers in organic waste recycling. The pickers then sell the compost to a large fertilizer company.

PARTNERING WITH THE PRIVATE SECTOR

In the context of privatized 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.

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. 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.

Regularizing 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 valorization 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. [h](#)

This article was adapted with permission from Proparco's magazine, Private Sector & Development (Issue 15, October 2012).

SHOW ME THE MONEY

Waste pickers' earnings 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 percent of waste pickers earn 1 to 1.5 times the minimum wage, and 54 percent of them earn 1.5 to 4 times the minimum wage.

INFORMAL RECYCLING SECTOR: WASTE TRADE PYRAMID



INTERVIEW



WITH THE 2013 CNN HERO

Photo © Sean Suddes Photos, The Great Mississippi Cleanup

Interview & Podcast by Alison Buckholtz


In the new podcast conversation between Handshake and the 2013 CNN Hero Chad Pregracke, founder of the nonprofit Living Lands and Waters, Pregracke shares his strategies on communicating the need for cleanup.

If you've ever tried to communicate how the world's growing mounds of garbage threaten the environment and worsen the effects of climate change, you already know that the scale of the problem defies easy explanation. But that didn't stop Chad Pregracke, head of the nonprofit Living Lands and Waters. When he tried to work through local government to solve the garbage problem in rivers near his home in Illinois, no one responded. So he started circulating pictures of the trash in his community. These pictures captured residents' attention, and they volunteered to pick up rubbish. With Pregracke at the helm, they kept volunteering; eventually, he launched a trash barge as a floating classroom to continue education and encourage group cleanups.

Fast forward 15 years: about 70,000 volunteers have pitched in, helping collect more than 7 million pounds of trash across the U.S. and in other parts of the world, including Belize and South Africa. In 2013 alone, Living Lands and Waters conducted 167 cleanup events. For his efforts to tackle the world's waste problem starting at home, Pregracke was named 2013 CNN Hero of the Year.

Pregracke literally lives his job: nine months out of the year, he resides on a barge with members of his 12-person crew. As recounted by CNN, the team goes around the U.S. with a fleet of boats, and they try to make cleanup fun for the

volunteers who show up in each city. As someone on the ground—and in the water—Pregracke's perspective on what it takes to get others invested in the environment is practical rather than theoretical. Although he does now work in partnership with some of the local governments that first ignored his efforts, his corporate partners have been equally strong backers. In fact, as he tells *Handshake*, he reached out to his first corporate sponsor when its name flashed on the screen while he was watching a NASCAR race. "If they're interested in the community, they should be interested in the community's environment, too," he says.

Though this particular "hero" is quick to give credit to everyone on his team, Pregracke's effort to engage his community in cleanup efforts started for the most personal of reasons: he was appalled at how garbage littered the land he loved. The strategies he followed to attract others who shared his goals inspire and teach those who want to make a difference. 

HANDSHAKE ORIGINAL:
PODCAST WITH CHAD
PREGRACKE





KAMPALA'S *campaign*

Engaging
the informal
sector

By Delphine Arri, Eva Rossi, &
Christopher Olobo, IFC

Photo © Wastepickers Alliance Uganda

Whether a new technology for waste management is being developed, or an old dump rehabilitated to make place for a sanitary landfill—and whether it takes place in a developed or an emerging economy—every solid waste management (SWM) project will have to engage with concerned communities and other interested parties. Successful SWM projects integrate community engagement into each phase of the project, giving the stakeholders the opportunity to contribute to the project, provide valuable information, and help identify key issues that will be prominent in the various project phases.

The level of engagement depends on the project type, magnitude of the challenge, and stakeholders' concerns. Therefore, planning and managing an effective community engagement process and keeping stakeholders in the loop is key to a project's success.

The informal sector plays a major role in the SWM system of many countries. Best-practice SWM strategies incorporate the views of the informal sector in the decision making process. A successful strategy will also integrate, organize, upgrade, support, and incorporate informal sector individuals into the SWM system to ensure their livelihood and quality of life is restored or enhanced by the project's activities.

THE CASE OF KAMPALA

In Uganda, the Kampala Solid Waste Management public-private partnership is shaping up to be an especially good example of how to structure SWM outreach to engage the informal

sector. In Kampala, many people dispose of solid waste through indiscriminate dumping, burning, and burying. Only 55 percent of solid waste generated is collected, transported, and disposed of in the city's one landfill site. Solid waste collection and transportation in the project area is currently carried out by the Kampala Capital City Authority (KCCA) alongside private sector and informal collectors, depending on an area's income level. The city's landfill is close to capacity and is in need of remediation. There are currently 380 registered waste pickers at the landfill. In addition, there are Community Based Organizations (CBO) involved in recycling at source and collecting waste for a nominal fee from informal settlements.

To resolve these challenges, KCCA is developing the new Kampala City Integrated Waste Management System. The new system will improve collection, transport, and treatment of municipal waste, and incorporate the informal sector as part of an integrated approach across the waste management value chain.

The informal waste pickers and other informal recyclers have the potential to be reintegrated in the new system, and KCCA is undertaking the following key steps to help them:

Identify, Plan, Inform, and Consult

KCCA is designing a strategy and plan to identify, inform, and consult all relevant stakeholders. The goal is to communicate effectively the overall objectives and mechanisms of the proposed project, and collect and address key community comments and concerns.

Formalize Strategy and Plan

KCCA is setting clear objectives and measurable targets to be achieved with an effective stakeholder engagement, consultation, and communications strategy. The project uses tools such as education and knowledge sharing campaigns, interviews with key stakeholders, stakeholder conferences, an on-site consultation forum, and tailored communications material.

Require the PPP to Create Commercial Waste Picking Opportunities

KCCA is committed to improving waste pickers' livelihoods while improving waste management services through the project. KCCA will organize activities to engage and educate waste pickers and other informal recyclers about their potential reintegration in the new system. KCCA will also require the winning bidder of the landfill operation to incorporate the waste pickers into commercially viable operations, and develop a communication strategy and plan that will ensure continuity.

Encourage CBO Partnerships to Ensure Sustainability

The CBOs are also being encouraged to form operational partnerships with established waste collectors in the city so that working relationships with the informal sector extend beyond the bidding phase of the project. **■**



CROWD SOURCING *for waste management*

By Antonis Mavropoulos, CEO & Founder of D-Waste

Waste Atlas is a crowdsourcing open source map that visualizes municipal solid waste management data across the world for comparison and benchmarking purposes.

After 15 months of effort from more than 1,000 scientists around the world, the first Waste Atlas Report (www.atlas.d-waste.com) was published this past fall. This is an important milestone in the global waste management community because scientists from 93 different countries cooperated to compile data from 162 countries, 1,800 cities, and more than 1,800 facilities.

RESULTS ARE IN

After analyzing almost 60,000 documents, the report concludes that more than half of the world's population does not have access to regular refuse collection services. The negative health effects are immeasurable.

Other Waste Atlas 2013 Report findings are more easily quantified, but no less shocking.

Every human being generates an average of about 270 kg of solid waste every year, but only 15.4 percent of this refuse is recycled in official schemes. (Until this study, there was no way to quantify the contribution of informal recyclers.)

Furthermore, for every dollar spent in the global marketplace, about 47 grams of waste is produced—with worldwide municipal solid waste generation totaling about 1.9 billion tonnes per year. At least 37 percent of this waste is disposed of at dump sites.

D-Waste's newest software tools include the app that allows measuring distances from facilities and dumpsites. These and other apps under development to verify content and assure quality will continue to make D-Waste essential in measuring the impact of waste. [\[1\]](#)

Illustration © Aleksander Velasevic/istock



The groundbreaking report and the free, interactive tool is published by the Waste Atlas partnership, a non-commercial initiative involving D-Waste consultants, the University of Leeds, the International Solid Waste Association, GIZ/SWEEP-Net, the Waste to Energy Research Council (WTERC), and the Solid Waste Network of Asian and Pacific Islands.



together in trash

By Markus Luecke, GIZ / SWEEP-Net

SWEEP-Net helps its partner countries make the shift from a conservative solid waste management strategy to an efficient, integrated resource management solution.

Integrated solid waste management, which in the Middle East and North Africa (MENA) region has historically been administered by local authorities, is one of the region's major challenges. But alongside the problem of fast-increasing quantities of waste, the region suffers from additional roadblocks—like poor political will, limited awareness, and lack of financial and technical capabilities to reduce the amount of waste going to landfills and disposal sites.

The negative impact of current disposal practices has dire consequences for the entire region. Adverse consequences include groundwater and surface water pollution, foul odors, and methane

generation, all of which are serious environmental concerns. Loss of valuable resource materials and income-generation opportunities are also significant. On a regional level, organic waste management and composting are key elements for municipal waste management in countries where about 60 percent of waste composition is organic.

THE PRIVATE SECTOR PILLAR

Private sector involvement is an important pillar for the development of innovative approaches to integrated solid waste management. A successful

partnership between the public and the private sector paves the way for clear political decisions and a reliable legal and regulatory framework. This allows both parties to develop and implement projects that create employment and protect the environment.

SWEEP-Net was launched to facilitate these partnerships. Through pilot measures, guidelines, training, and the identification of best practices, SWEEP-Net helps its partner countries make the shift from a conservative solid waste management strategy—based on traditional end-of-pipe solutions—to an efficient, integrated resource management solution. This latter approach replaces the use of fossil resources through innovative and cleaner production processes, as well as through a change of consumption patterns. This concept may open new doors for economic opportunities that have not been seen before—especially in developing countries.

RECYCLING RESULTS

Recycling activities are one area of SWEEP-Net's focus that may lead to substantial resource savings and income generation. It is estimated that every ton of recycled paper saves up to 17 trees and up to 50 percent of the water needed for its production. But recycling initiatives require a clear political commitment that is translated into legal and administrative action. This in turn allows the private sector to develop and implement innovative economic solutions. The absence of an adequate regulatory and legal framework hampers the development of a “green” sector in many countries of the MENA region.

By assisting its partners through policy advice and collaboration, SWEEP-Net can make a difference in creating these much-needed recycling initiatives. With proven regional models and pooling of resources in place, local authorities can develop policies and market incentives that have the potential to reduce the problem of capital misallocation. This in turn promotes economic development that allows for sustainable resource management. [h](#)

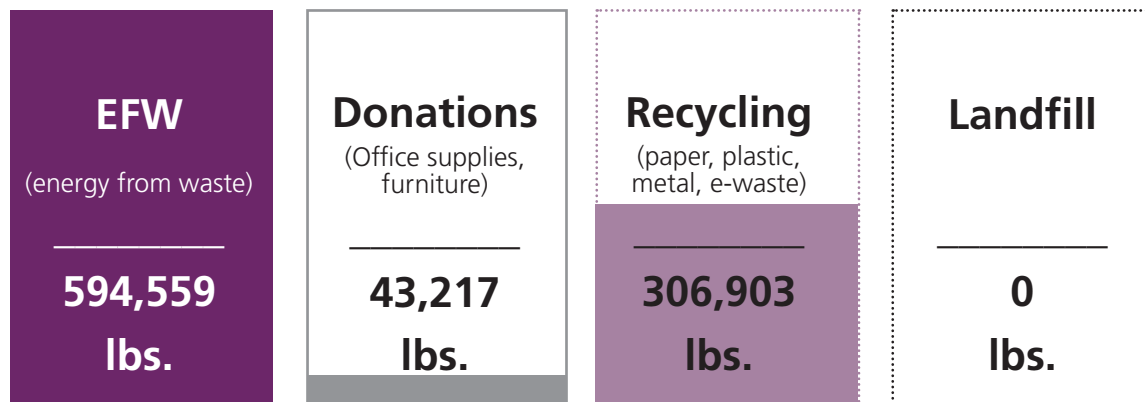
SWEEP-Net, the regional network for integrated solid waste management in the Middle East and North Africa, launched in September 2009 with the support of the German Ministry of Economic Cooperation and Development (BMZ) through the Gesellschaft für international Zusammenarbeit (GIZ). Ten countries from the region, including Algeria, Egypt, Jordan, Lebanon, Mauritania, Morocco, the economies of West Bank and Gaza, Syria, Tunisia, and Yemen, joined to strengthen their capacity for an integrated waste management solution. The SWEEP-Net network translates local experience into regional action, providing a platform for experts from the public and private sector, academia, civil society groups, and regional and international organizations with the relevant expertise.

Walking

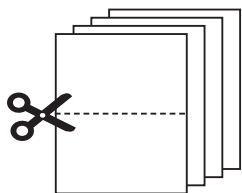
THE WALK

Large organizations such as IFC produce a significant amount of waste from day-to-day operations. Reducing waste is a key part of IFC's commitment to sustainability.

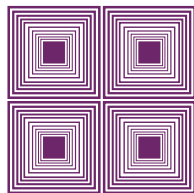
IFC recycling and composting in FY12



IFC's ongoing initiatives



IFC has used 100% recycled paper since 2008 and plans to reduce paper use by 15% this fiscal year.




IFC's carpet is 30% recycled and 100% recyclable.



IFC uses filtered tap water, which reduces the consumption of bottled water.



IFC started composting in November 2013.

A photograph of a paved path winding through a dense forest. Sunlight filters through the trees, creating a hazy, ethereal atmosphere with visible light rays. The path is covered in shadows from the surrounding trees. The quote is overlaid on the right side of the image.

“In the end, our society will be defined not only by what we create, but by what we refuse to destroy.”

—John Sawhill, former president and
CEO of The Nature Conservancy

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