Published in *Handshake,* IFC's (International Finance Corporation) quarterly journal on public-private partnerships, Issue #12, January 2104
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BURN OR BURY? COMPARING ENERGY FROM WASTE FACILITIES TO LANDFILLS

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 (WTE), 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 modern 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."* 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.

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 citywide 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).

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.

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.

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 decisionmaking process and supports an ongoing waste management program.

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.

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