

Emerging economies are rapidly adding to the global pile of garbage

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THE OFFICES OF Miniwiz in central Taipei display all the trappings of a vibrant startup. The large open space on the 14th floor of an office block overlooking Taiwan's capital is full of hip youngsters huddled around computer screens. A common area downstairs includes a video-game console, a table-tennis table and a basketball hoop. But a hint that this is not just another e-commerce venture comes from neatly sorted sacks packed with old plastic bottles, CDs and cigarette butts.

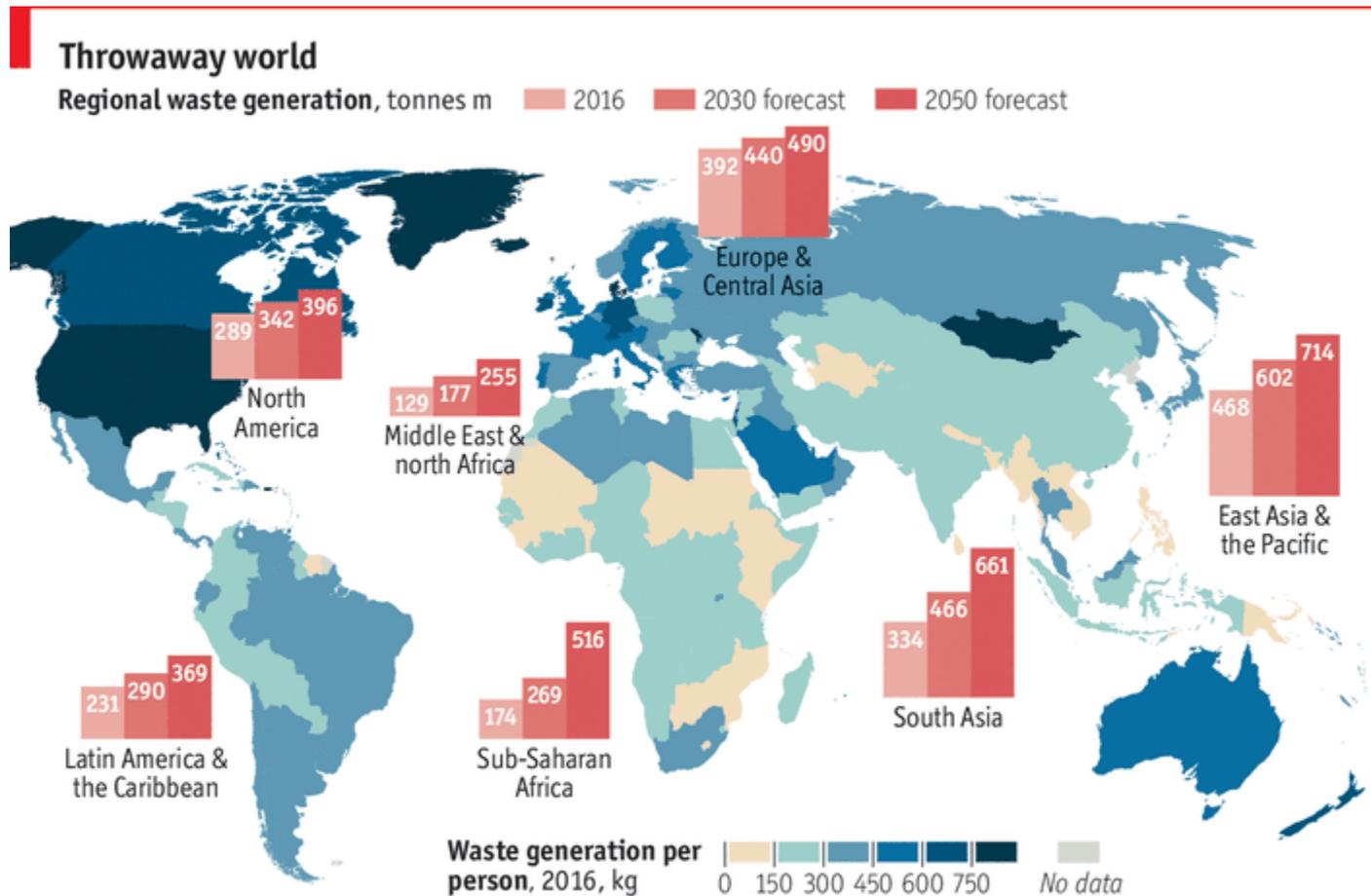
Rather than peddle brand-new virtual products, Miniwiz derives value from physically repurposing old rubbish. Chairs in the conference room began life as plastic bottles, food packaging, aluminium cans and shoe soles. The translucent walls separating it from executives' dens owe their amber-like quality to recycled plastic mixed with discarded wheat husks. Coffee is served in glasses made of broken iPhone screens. Arthur Huang, the company's 40-year-old founder and chief executive, who holds a masters degree in architecture from Harvard, first tried setting up shop in New York in the mid-2000s. That effort failed when he discovered that few Americans shared his obsession with limiting the world's waste. By contrast, many of his fellow Taiwanese did.

They still do. The island is a poster child for recycling, recovering 52% of rubbish collected from households and commerce, as well as 77% of industrial waste, rivalling rates achieved by South Korea, Germany and other top recycling nations (America recycles 26% and 44% respectively). Its recycling industry brings in annual revenues of more than \$2bn. Lee Ying-yuan, the environment minister, boasts that 16 of the 32 teams competing at this year's football World Cup in Russia sported shirts made in Taiwan from fibres derived from recycled plastic.

For more than two centuries since the start of the Industrial Revolution, Western economies have been built upon the premise of "take, make, dispose". But the waste this created in 20th-century Europe and America was nothing compared with the rubbish now produced by emerging economies such as China. According to a new World Bank report, in 2016 the world generated 2bn tonnes of municipal solid waste (household and commercial rubbish)—up from 1.8bn tonnes just three years earlier. That equates to 740 grams (1lb 6oz) each day for every man, woman and child on Earth.

That number does not include the much bigger amount produced by industry. Industrial solid refuse contains more valuable materials like scrap metal and has long been better managed by profit-seeking firms. And then there is the biggest waste management problem of all: 30bn tonnes of invisible but dangerous carbon dioxide dumped into the atmosphere every year.

As people grow richer, they consume—and discard—more. Advanced economies make up 16% of the world’s population but produce 34% of its rubbish. The developing world is catching up fast. On current trends, the World Bank projects, by mid-century Europeans and North Americans will produce a quarter more waste than they do today. In the same period, volumes will grow by half in East Asia, they will double in South Asia and triple in sub-Saharan Africa (see map). The annual global total will approach 3.4bn tonnes.



Source: World Bank

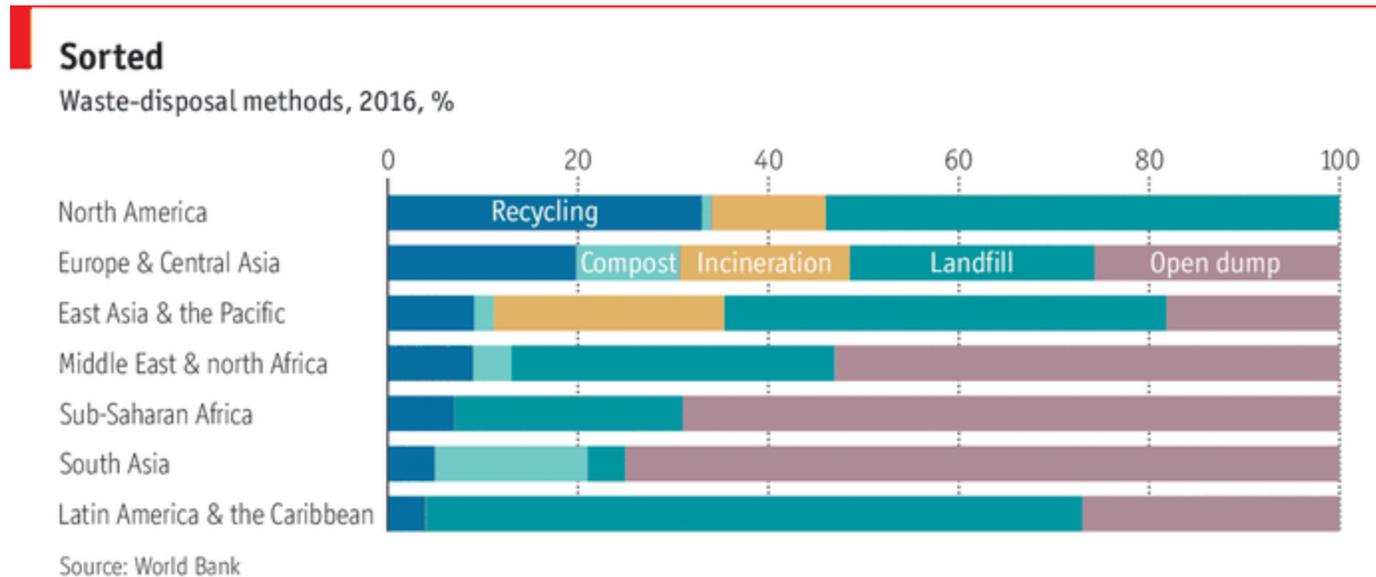
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This special report will argue that waste generation is increasing too fast and needs to be decoupled from economic growth and rising living standards. That will require people to throw away less and reuse more—to make economies more “circular”, as campaigners say. This can only happen if people “equate the circular economy with making money”, claims Tom Szaky of Terracycle, which develops technologies to use hard-to-recycle materials. “Take, make, dispose” must now shift to “reduce, reuse, recycle”, he says.

Virtuous recycle

Global waste may not present as apocalyptic a challenge as climate change, but it may be easier to solve. This is because local action to clean it up and recycle it can lead to immediate local effects. That can in turn transform into a virtuous cycle of change. People are more likely to take action if they can quickly see the results of their change in behaviour. All the more so because reducing waste offers two benefits not just one. It not only removes an affliction (solid waste) but, unlike tackling smog, it also creates a tangible benefit at the same time, in the shape of the recycled materials that can be reused. On top of that, solid waste (the only type that this report will discuss) is a visible eyesore. It is hard for anyone to deny that it exists.

That does not mean it will be easy to move to a more circular economy. Currently 37% of solid waste goes to landfill worldwide, 33% to open dumps, 11% to incinerators (see chart). Some goes to compost heaps. Two-thirds of aluminium cans are currently recycled in America, but only 10% of plastic. All told, only 13% of municipal solid waste is recycled globally. Everyone agrees that this is far too little.



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The urgency of the problem is not in dispute. In July India's Supreme Court warned that Delhi, the country's capital, is buried under "mountain loads of garbage". When dumps or landfills catch fire, as more than 70 have in Poland over the sweltering summer, noxious smog smothers their surroundings. Toxic runoff can permeate soils and poison waterways. Some rivers in Indonesia are so blanketed with litter that it completely conceals the water beneath. According to the United Nations, diarrhoea rates are twice as high in areas where waste is not collected regularly, and acute respiratory infections are six times as common.

Discharged into seas, rubbish can return to wreak havoc on land. In August the Arabian Sea spewed 12,000 tonnes of debris and litter onto the shores of Mumbai in two days. Or it can despoil the ocean. Fishermen in the Arabian Sea complain they net four times as much plastic as fish. The "great Pacific garbage patch", an Alaska-sized ocean gyre in the north Pacific Ocean,

where currents channel all manner of flotsam, may contain 79,000 tonnes of plastic debris. Greenhouse gases from the waste industry, mainly emitted by a cacophony of chemical reactions in landfills, could account for 8-10% of all climate-cooking emissions by 2025. Left unchecked, this groundswell of garbage risks overwhelming the planet.

The good news is that around the world politicians and the public appear increasingly alert to the economic, ecological and human costs of waste, as well as to the missed opportunities it presents. Many governments in the developing world are grasping that spending less—or nothing—on waste management means paying more for things like health care to treat its effects. In the developing world, only half of all municipal waste is collected. In low-income countries as much as 90% ends up in open dumps. Lowering these proportions requires more investment in waste infrastructure such as managed landfills or low-polluting incinerators. Taiwan’s example shows that these can be clean and need not discourage recycling.

Rich countries already have such facilities, and more. They need to improve the recovery of valuable materials from their waste streams. For two decades they have relied on emerging economies, primarily China, to recycle their refuse. Over the past 25 years, the world deposited 106m tonnes of plastic in Chinese ports for recycling. The system ran aground in January when China banned imports of virtually all plastic and unsorted paper, out of concern for its environment. This left Western waste-managers with tonnes of unwanted rubbish—and left policymakers with piles of unanswered questions about how to boost the capacity of domestic recyclers, and ultimately change citizens’ carefree approach to waste.

Politicians in Europe and American states and cities—if not Donald Trump, America’s distinctly ungreen president—are issuing ambitious recycling targets and trying to revamp the way they manage their rubbish. Techies and entrepreneurs like Mr Huang or Mr Szaky are dreaming up clever—and lucrative—ways to manage and reuse it. Multinationals are toying with resource-light business models based on service contracts rather than product sales. And many consumers are adopting leaner lifestyles.

But municipal budgets are tight everywhere. Trade tiffs can dampen legitimate exchange of scrap (as recycled waste is also known). Regulations for handling waste are necessary but can be obscure. Policymakers have yet to devise a way to boost large-scale investment in recycling, which is discouraged by periodic declines in the cost of primary commodities, with which recyclers compete. And some worry that switching to a more circular economy will harm those built on the old model.

These problems are real. But, as this report will argue, they are not insurmountable. In the 1990s, economic growth, rising living standards and soaring consumption outpaced Taiwan’s capacity to clean up its waste, earning it the unflattering moniker of “garbage island”. As recently as 1993 nearly a third of Taipei’s rubbish was not even formally collected and virtually none was recycled. By 1996 two-thirds of landfills were nearing capacity.

In the face of mounting protests the government undertook to erect 24 incinerator plants to burn the waste instead, at a cost of \$2.9bn. It also incentivised the Taiwanese to produce less rubbish in the first place. Under an “extended producer responsibility” (EPR) scheme, manufacturers and

brands began to contribute to the cost of their products' disposal, either through paying a fee into a fund earmarked for waste management or sometimes by managing the waste themselves. The less recyclable the product, the more expensive for the company. The scheme continues today. Households are charged for the amount of general mixed waste they produce but not for paper, glass, aluminium or other recyclables. Those caught dumping their trash illegally face hefty fines and public shaming. A typical Taiwanese person now throws out 850 grams daily, down from 1.15kg 20 years ago.

Half a century after environmentalists first began imploring consumers to reduce, reuse and recycle, similar exhortations are now echoing from San Francisco to Shanghai. And the world, drowning in garbage, has begun to listen.