"Smart" phones offer the intelligence of a computer, with the convenience of a phone. "Smart" meters let homeowners choose between using cheap and expensive electricity. The next frontier: "smart" trash?

A 5-year-old group at the Massachusetts Institute of Technology has spent the last year attaching thousands of tracking devices to pieces of garbage in Seattle and New York City. The devices send out pulses to signal where they are. The signals go to MIT's SENSEable City Lab for analysis. Last year, they also went to art exhibits in both cities, where live maps revealed the many paths garbage takes. For example, a plastic soap bottle tossed in a Manhattan recycling bin took several twists and turns around the city before crossing the river to Kearny, N.J. The aim of project "Trash Track": to study where recyclables go. Dietmar Offenhuber, a doctoral student in the lab, said there's plenty of research on how things are made, but little is known about how they degrade and finally disappear. Among the questions here -- especially for cities paying millions for recycling programs -- are how much greenhouse gas is created and how much energy is wasted in the process. Another might be whether recycling really happens. That's partly because trash goes through so many handoffs en route to its final destination, Offenhuber said. Trash companies follow their own haul, for example. But once they separate the aluminum and sell it to a collector, their records end. No single database tracks a soda can through its cycle. Environmental groups and sustainability-minded cities have taken interest in the technology, since it could add credibility to the recycling system. There's been cause for doubt, particularly with electronic waste. Last November, the CBS program "60 Minutes" followed a suspicious crate leaving a Denver-area company that claimed to recycle its e-waste in the United States. The crate ended up in Hong Kong -- illegally, since the United States prohibits export of e-waste containing hazardous materials like lead. In the United States, tracking trash can also reveal whether recycling benefits the climate. Recycling is supposed to recover energy-intensive materials and thrust them back into the production chain. But early returns from Seattle, Offenhuber said, show that telephones and printer cartridges get shipped across the country -- to Chicago, Miami and New York. "Because the recycling process itself generates, of course, an environmental burden, this burden is also depending on the transportation distance," he said. "So if you have an object that yields very little energy in the recycling process, and you have to carry it through the whole country, then you have probably a higher environmental burden than gain."

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