1-2-3 Presentations: Municipal Solid Waste

Overview
Each small group will have 25 minutes to read one recent article about our food systems, and create a 1-2-3 Presentation to share with the class. Your presentation should provide a brief overview of your group’s article, and answer the Key Questions below.

Tips for making an effective slideshow presentation
Your slides should tell your story visually, while you tell your story verbally.

When it comes to text, less is more.

Think sleek and simple, not flashy and loud.

Presentation
Each presentation should
- Summarize the article and present the key points
- Discuss how the topic of the article relates to each of the Three Pillars of Sustainability
- Provide at least one example of how the topic of the article relates to your life

Articles
Group 1: American landfills, see twice as much trash than previously thought
Group 2: Go West, Garbage Can!
Group 3: Trash in Lebanon
Group 4: America’s biggest trade export to China? Trash
Group 5: The most watched load of garbage in memory
Group 6: The Ocean’s Plastic Garbage Patch
Group 7: Wasteland
American Landfills See Twice As Much Trash Than Previously Thought

By Dianne Depra, Tech Times | September 23, 10:48 AM

The average American is responsible for twice as much trash than previously thought, according to a study, amplifying estimate effects garbage has on the environment.

(Photo : Quinn Dombrowski | Flickr)

Everyone produces trash everyday but Americans are apparently churning out twice as much as previously thought, resulting in bigger repercussions for the environment.

In a study published in the journal Nature Climate Change, researchers analyzed measurements taken from all landfills in the United States and found that estimates provided by the Environmental Protection Agency are lower than the 5 pounds of trash that the average American actually sends to a landfill everyday.

Originally, the researchers’ goal was to simply determine if methane capture systems in landfills were efficient. Given that landfills are the third biggest source of methane in the country, how well they capture the gas will have an immense effect on efforts to cut emissions from greenhouse gases. And since it is 35 times more potent at retaining heat compared to carbon dioxide, methane is a focus of the Obama administration’s environmental initiatives.

Earlier, the EPA measured how much trash was being sent to landfills according to population data and consumption patterns. It was only in 2010 that the agency required municipal landfills to record just exactly how much trash is being sent to them. Using this new information, the researchers assessed more than 1,200 landfills, gathering more accurate data on just how much trash are ending up in landfills every year.

Based on their findings, the researchers report that 289 million tons of trash were thrown out in 2012, more than double of the 135 million tons that the EPA estimated. Because there appears to be more trash ending up in landfills, the results of the study also showed that less Americans were also recycling. In fact, factoring in the new figures, recycling rates drop to 21 percent from the EPA-estimated 35 percent.

Methane is created when organic trash decomposes so a higher trash volume means that landfills are also producing more methane, most of which are unrecorded because the estimates only accounted for a certain level of the gas being released in the atmosphere.

Instead of investing in more methane capture systems though, it would be better to throw out less organic trash and take advantage of composting. Composting also produces methane but when done properly, creates less of the gas, making emissions more manageable. Aside from learning composting, Americans are also urged to be less wasteful to begin with.

Authors for the study include Jon Powell, Timothy Townsend and Julie Zimmerman. Powell and Zimmerman are affiliated with Yale University while Townsend is from the University of Florida.

Photo: Quinn Dombrowski | Flickr

Related Articles

Volvo Developing Robotic Garbage Truck Worker To Assist With Trash Pickup
More Trash, More Dangerous Bear Encounters In Lake Tahoe
Adidas Has Created A Shoe Made Entirely From Ocean Trash
8 Million Tons Of Plastic Trash Pollute Oceans Every Year: The Worst Polluter Is...
Go West, Garbage Can!

Are we running out of room for our garbage?

By Brian Palmer

As I was trying to cram a greasy pizza box down my apartment building's garbage chute yesterday, I couldn't help but wonder: How much room can we possibly have for garbage in this country? When will the United States run out of landfill space?

Not for centuries. There are plenty of reasons to cut down on waste, but the amount of space left in the ground isn't a pressing concern. Won't you join the Lantern on a brief tour of American trash?

From the 1920s until the mid-1970s, most of our household garbage ended up in dumps—nothing more than manmade craters scattered across the country. They were, in many ways, an environmental disaster. All the liquids in the decomposing trash filtered down to the bottom of the hole and, from there, into the soil and groundwater. This gloop, known as "leachate", could have contained any number of hazardous chemicals, especially in an era when few people thought much about what they
tossed. The rotting garbage also released significant amounts of methane, a greenhouse gas **20 times more potent** than carbon dioxide, straight into the atmosphere.

When Congress passed the **Resource Conservation and Recovery Act** in 1976, it fundamentally changed the way we store trash. The law and its subsequent amendments require disposal facilities to line their gigantic trash holes with layers of **either plastic or clay, or both**. These liners, and a subterranean piping system, collect the leachate, which is then hauled to sewage treatment plants. Landfill operators must also install pipes to vent the methane gas, which is burned off—reducing the superpotent greenhouse gas to mere carbon dioxide. (Some facilities take advantage of the heat created in the process, using it to **power turbines** or turn the methane **directly into liquid natural gas**.)

Though the 1976 law was a huge win for the soil and groundwater, there are drawbacks. Technologically advanced landfills—the word **dump** now applies only to old-school holes in the ground—are more expensive to design and operate. To make up for these costs, landfill operators began to emphasize economies of scale. Rather than having lots of tiny dumps scattered everywhere, we now have a small number of mega-landfills. In 1986, there were **7,683 dumps** in the United States. By 2009, there were just **1,908 landfills** (PDF) nationwide—a 75 percent decline in disposal facilities in less than 25 years.

Which brings us to the problem with the new system: Trash now has to travel farther from your kitchen to its final resting place, and longer trips mean more greenhouse gas emissions. Thirty years ago, a bag of garbage dropped down a chute in Manhattan would have traveled just a few miles by barge to the aptly named **Fresh Kills** facility on Staten Island. (Until 1931, the city dumped most of its trash **in the Atlantic Ocean**.) Today, it would likely make an overland journey to **Ohio, Pennsylvania, or West Virginia**. One ton of garbage traveling 500 miles by train from New York to the Mountain State would generate **115 pounds** of carbon dioxide. If New York City shipped **all of its** trash to West Virginia the commute would produce 760,000 tons of CO2 each year.
How does that compare with throwing it in a dump and letting it vent methane into the atmosphere? It's hard to say. The train trips to West Virginia generate about 40 percent more carbon-dioxide equivalents than the methane the garbage would have released in its first year at an old-school, in-state dump. In the following years, however, the garbage would continue to release methane—though less of it—complicating the calculation.

Analysts from the Environmental Protection Agency and the landfill industry assure us that, despite having fewer landfills, total capacity has increased. That is, landfills are getting bigger, on average, faster than their brethren have disappeared.

Of course, not all states are equally endowed. And a landfill deficit in any region means that the nation's trash will, overall, have to travel farther. The industry publication BioCycle conducts a biennial assessment of America's trash capacity called "The State of Garbage in America." The variation between states is startling. Arkansas reported enough capacity to go more than 600 years without opening another facility. Massachusetts and Rhode Island, on the other hand, have just 12 years of capacity remaining. New York state, despite shipping most of the Big Apple's trash across state lines, has only 25 years of capacity left.

In landfill-strapped states, the problem is more political than geological or geographical. Landfill operators can build a new site from nearly any piece of land (apart from sensitive ecological areas) in six to eight years. But many voters and bureaucrats in the Northeast, for example, would rather ship their trash across state lines than have a landfill near their homes.

Like prisoners, trash shipments can be big business for states willing to accept them. Kentucky, for example, has room for 212 million tons of waste. At the going rate of $29 per ton, that's a $6 billion economic opportunity. Ohio has $21 billion of available landfill space. Because of political opposition to local landfills, most Northeastern states' trash will probably be riding the rails for a long time to come.

The Lantern thanks Nora Goldstein and Dan Sullivan of BioCycle, Scott Kaufman of Columbia University, and Chaz Miller of the National Solid Wastes Management Association.

Like Slate on Facebook. Follow us on Twitter.
Mountains of stinking garbage taking over streets of Lebanon

By Associated Press, adapted by Newsela staff on 08.17.15

BEIRUT, Lebanon — It's summer in this proud Mediterranean city, which is full of international visitors for festivals and parties. Yet the country's own citizens are suffocating from mountains of stinking garbage piling up on the streets.

Lebanon has been relatively calm in contrast with the violence in neighboring Iraq and Syria. Despite a massive flood of Syrian refugees and occasional religious clashes, Beirut is largely quiet. Its politicians, though, have been unable to agree on a new president much less a solution for the capital's rubbish.

They may have to figure out something soon. Two weeks ago, authorities permanently closed Beirut's main garbage dump. The Naameh landfill south of Beirut had already been kept open for a year beyond its planned closure, in hopes that the government would find an alternative. It did not.
Temperatures, Tensions On The Rise

When the landfill closed July 17, Lebanon's government again failed to take action. Piles of rubbish were left to bake in the sun in the streets of Beirut and its suburbs.

It came amid the busiest time of year in Beirut. International singing stars such including jazz musician Richard Bona are performing at Lebanon's famed summer festivals. Cafes and beaches are at full capacity. Partygoers sidestep rotting garbage on the way to bars at Lebanon's famous Gemayzeh Street.

Temperatures are rising, though. The country's electricity cuts are becoming more frequent. The sweltering heat and the stinking, rotting garbage has led to an outcry from Beirut's 2 million residents.

"It is a scandal, and what is even a bigger scandal is the politicians who don't feel the need to resign," said Paul Abi Rached. He is the head of the Lebanese Eco Movement.

Dumping In The Dark Of Night

For 10 days, garbage trucks could not collect the trash, because they had nowhere to dump it. The fumes got so bad that some residents wore surgical masks to try to block out the stench. Piles of trash began growing on streets, sidewalks and near building entrances.

Lebanon's commercial center is full of beautifully restored historic buildings and luxurious apartments. It has been spared the piles of garbage for now. Officials have found a short-term solution by taking most of the trash to an empty lot and covering it with a plastic tarp.

Lebanon’s waste management company Sukleen resumed collection on a small scale. It took trash to two temporary landfills, including one near Beirut International Airport. But those are filling up. Nearby cities have refused to accept Beirut's garbage.

Meanwhile, some people have taken to paying for private pickup truck owners to collect the garbage in front of their homes. The garbage is dumped at night in unknown locations. The country has no recycling services or even basic trash sorting, making the problem worse.

Health Hazard On Many Levels

Abi Rached said garbage is polluting natural reserves, rivers and valleys.

"It's gotten to a point where people are digging up pits and burying the trash," he said.
Some people burn trash on the street. A brown, poisonous haze is drifting over the city's horizon.

"It is my duty to warn of the extensive health perils that may result from the current situation," Health Minister Wael Abou Faour said at a recent press conference. "We don't have the luxury of time or waiting."

He said he was sounding the alarm because some landfills are full, including the dump site near Beirut's airport. The trash poses air safety risks because of smoke and birds flying over the pit.

**No Hurry**

Germany has offered to take away Lebanon's trash by sea. The Lebanese government said it was studying the offer along with proposals for long-term solutions. These include garbage incinerators to burn the trash and developing new landfills.

But the government does not seem to be in a hurry, postponing the issue from one meeting to the next.

The government has long been criticized for failing to take action on Lebanon's ancient infrastructure, from roads and bridges to landfills. It is symptom of the country's poorly working power-sharing system among Lebanon's major religions.

The civil war in neighboring Syria and the 1.2 million refugees living in Lebanon have made the situation worse.

**Where Are The Protests?**

Despite a public outcry, very few have taken to the streets in protest. In typical Lebanese style, life has gone on, but the situation may change as anger on the street mounts.

"Shame on them (politicians) and shame on us if we accept to live like this," Antoine Samaha said. His family was seriously considering taking his mother, who has breathing problems, to live with his brother in Paris. "Every decent Lebanese should protest this situation."
Quiz

1 Which of the following is a central idea of the article?

(A) Germany has offered to help Beirut solve its garbage problem by removing the trash by ship.

(B) It is the worst time for Beirut to have rotting garbage filling the streets because there are many tourists present.

(C) Citizens in Beirut are becoming upset about the garbage and the government’s unwillingness to solve the problem.

(D) The historic downtown area of Beirut does not have garbage in the streets like the rest of the city because they found a place to put it for now.

2 Which sentence from the article is MOST important to include in a summary of the article?

(A) When the landfill closed July 17, Lebanon’s government again failed to take action.

(B) Lebanon has been relatively calm in contrast with the violence in neighboring Iraq and Syria.

(C) Meanwhile, some people have taken to paying for private pickup truck owners to collect the garbage in front of their homes.

(D) Lebanon’s commercial center is full of beautifully restored historic buildings and luxurious apartments.

3 Read the paragraph from the section "Temperatures, Tensions On The Rise."

"It is a scandal, and what is even a bigger scandal is the politicians who don’t feel the need to resign," said Paul Abi Rached. He is the head of the Lebanese Eco Movement.

Which of the following would BEST replace "a scandal" in the sentence without changing its meaning?

(A) a rumor

(B) a suggestion

(C) an embarrassment

(D) an investigation
Which sentence in the section "Health Hazard On Many Levels" uses a word meaning "dangers"?

(A) Abi Rached said garbage is polluting natural reserves, rivers and valleys.

(B) A brown, poisonous haze is drifting over the city's horizon.

(C) "It is my duty to warn of the extensive health perils that may result from the current situation," Health Minister Wael Abou Faour said at a recent press conference.

(D) He said he was sounding the alarm because some landfills are full, including the dump site near Beirut's airport.
America’s Biggest Trade Export to China? Trash

In China’s economic surge, America’s garbage could be a valued chip.

By Jodie Allen, Thomas Jefferson Street blog

It has come to the attention of a growing number of expert observers that the good old USA may have seen its best days on the world stage. But these critics may be overlooking a potential way for America to continue to play at least a major supporting part—if not an especially decorous one—in the world economic drama.

The nation now cast in the role of Eve Harrington to America’s Margo Channing is, of course, China. China’s economic strength continues to make headlines. Most recently: its overtake of Germany as the world’s largest goods exporter last year; its fast rebound to a 10.7 percent growth rate in the 2009 fourth quarter; its projected ascent this year to the No. 2 position among world economies, displacing Japan.

It’s gotten so that even the normally chest-thumping American public is feeling a bit insecure. A Pew Research Center/Council on Foreign Relations poll conducted last fall found 4 in 10 (41 percent) among the public saying the United States plays a less important and powerful role as a world leader today than it did 10 years ago—the highest proportion ever recorded in a Pew Research survey across the years. More to the point, by a 44 percent–27 percent margin, Americans now name China as the world’s leading economic power rather than the United States. As recently as February 2008, 41 percent still saw the United States as the top economic power compared with 30 percent who named China.

Add to this the mounting worry about the exporting of American jobs—not just among displaced workers but now even among mainstream economists—and you can see why Mike Mokrzycki of the ABC News Polling Unit sums up his organization’s new survey thusly: “The ‘American Century’ was sooo last century, as many Americans see it.” The ABC survey shows the public evenly split, 41 percent–40 percent, on whether it will be a Chinese or American century in terms of economic power, and giving a slight 43 percent–38 percent edge to China when it comes to a dominant role in world affairs.

But perhaps there is some room for optimism on the trade front. True, the shrinking of the U.S. trade deficit over much of last year mostly reflected the restricted diet of foreign imports forced upon U.S. consumers by the recession, and its recent resurgence has been viewed as a positive sign of a rebound. But another little-noticed factor was apparently also at work.

As the Wall Street Journal noted in reporting the resurgence of the trade deficit last November, while the U.S. shortfall with most other major trading partners increased, the deficit with China actually declined. The Journal didn’t analyze the components of the shrinkage, but an intriguing table in a recent, little-noticed report to Congress by the U.S.-China Economic and Security Review Commission points to one interesting trend.

The report itself focuses on data in the chart showing a 454 percent surge in Chinese exports of computer equipment to the United States over the 2000-2008 period and an even larger 800 percent rise in communications equipment exports as clear evidence that “China’s industrial policy clearly aims
to promote the manufacturing of higher-technology products, replacing lower value-added and labor-intensive products."

No doubt. But the report draws no attention to the components of a relatively recent surge in U.S. exports to China, perhaps the result of growing American concern about its mammoth trade imbalance with the Middle Kingdom. Between 2004 and 2008, these exports more than doubled from $34.7 billion to $71.5 billion, far short of the $337.8 billion the U.S. imported from China in 2008, but still a step in the right direction.

And while electronic components as well as oilseeds and grain continue to rank among the top three categories of exported goods, the fastest growing and now No. 1 export category is—"Scrap and Trash."


Perhaps not many observers will judge this a suitably glamorous role for America to assume on the global stage. But one might take comfort in the thought that if there is one thing that Americans still excel at producing, it's trash.

Check out our political cartoons.

Become a political insider: Subscribe to U.S. News Weekly, our digital magazine.

Listen to Cheryl Dorsey’s podcast on leadership in the next decade.

TAGS: China, employment, international trade, United States

You Might Also Like

President Obama Cartoons  Gun Control Cartoons  Obamacare Cartoons

News

News Home  Opinion  National Issues  Cartoons  Photos  Videos  Special Reports  The Report

Rankings & Consumer Advice

Education  Health  Money  Travel  Cars

Colleges  Hospitals  Jobs  Vacations  New Cars

Graduate Schools  Doctor Finder  Financial Advisors  Cruises  Used Cars

High Schools  Diets  ETFs  Hotels  Used Cars

Online Programs  Nursing Homes  Mutual Funds  Hotel Rewards  Law

Community Colleges  Health Products  Retirement  Airline Rewards  Law Firms

Global Universities  Health Insurance  Medicare

Arab Universities

http://www.usnews.com/opinionblogs/jodie-allen/2010/03/03/americas-biggest-trade-export-to-china-trash
America's Biggest Trade Export to China? Trash - US News

http://www.usnews.com/opinion/blogs/jodie-allen/2010/03/03/americas-biggest-trade-export-to-china-trash
For a few weeks there, New York City was thinking earnestly about its trash.

It was the spring of 1987, and a barge called the Mobro 4000 was carrying over 3,000 tons of it—a load that, for various reasons, North Carolina didn't want to take. Thus began one of the biggest garbage sagas in modern history, a picaresque journey of a small boat overflowing with stuff no one wanted, a flotilla of waste, a trashier version of the Flying Dutchman, that ghost ship doomed to never make port.

Suspected of carrying all sorts of hazardous materials, the barge, which set sail from New York City on March 22, 1987, was rejected by over a dozen places. It was, according to one NBC reporter, "chased away by the warplanes of two nations." It was called into service by Johnny Carson, who suggested the Mobro be re-routed to Iran. Dan Rather called it "the most watched load of garbage in the memory of man."

We don't tend to want garbage (that's why it's garbage) but it's more complicated than that. The idea that one man's garbage is another man's treasure animates the booming waste industry, from the professional operations that cart away New York's trash to the mom and pop computer chop shops in places like Guiyu and Accra. Of course most of those businesses are toxic as hell. Some of them have been and may long be convenient fronts for organized crime.
But the redemptive value of trash—its post-recycled worth, its potential use as an energy source—was not exactly on the minds of the angry citizens and lawmakers who stared down the _Mobro_ as it drifted, plodded its way, up and down the Eastern Seaboard that spring and summer, looking for a home.

Because it carried what was to many essentially a pile of nothing, the "gar-barge" was, as it was called, became a magnet for symbols. As it trawled down the coast, the barge was, variously, a clarion call for recycling (before an inevitable backlash), a toxic ticking time-bomb, a signal of a country gone to waste, or the punchline of a joke, in that Barthesque, sad funny way. That’s all captured quite well in the first installment (http://www.nytimes.com/video/2013/05/06/booming/100000002206073/voyage-of-the-mobro-4000.html) of Retro Report, a new documentary series in collaboration with the _New York Times_.

The idea to send the trash to North Carolina was nothing new. In the preceding years, space in local landfills had become scarce, thanks in part to new environmental policies. When the _Mobro_ debacle began, policy makers and the media warned that the U.S. was running out of room for its trash. In actuality, there were new larger landfills that were located, in theory at least, in less populated places. Getting the trash there required not trucks but barges or trains, which is how much of New York's trash gets to landfills in other states today. (Before and after the _Mobro_ incident, landfills in North Carolina accepted trash from New York.)
The fear was that it was carrying hazardous medical waste. Upon later dissection by garbage men, it was made mostly by trash, in the technical sense of the word: yo-yos and refrigerators and newspapers and stuff like that.

The plan for the Mobro’s trash was actually an enlightened one. The stinkiest thing about the waste was the guy who owned it. Salvatore Avellino, reputed mob boss of Long Island’s trash-hauling business, took ownership of excess trash at the landfill in Islip for $86 a ton. (Staten Island's landfills were set to close by 1990, as the high water table meant that leaking chemicals threatened the water supply.)

Avellino's plan was to ship it to Louisiana, bury it in a landfill there for $5 a ton, and, thanks to relatively new technology, capture the methane generated by the trash and split the profits with farmers and local officials. (Today, methane captured at New York's biggest retired landfill generates $12 million in revenue a year (http://motherboard.vice.com/blog/how-anunfinished-park-built-atop-a-giant-pile-of-trash-is-making-new-york-city-millions); across the country, some 600 landfill gas projects create 15 billion KwH of electricity a year.)

But Avellino's colleague, Lowell Harrelson, the owner of the barge, hadn't secured the proper agreements. After he hastily arranged for a landfill in Morehead, North Carolina to take it, state regulators there grew nervous. A photograph of the barge showed a bed pan; remembering that organized crime members had previously hidden hazardous waste inside normal-looking trash, some worried that the boat contained toxic waste.

A media frenzy began, and even though many places had extra capacity for trash shipments, no community was willing to take it. The Mobro traveled to the Gulf of Mexico in search of a friendly port; Louisiana, Alabama, Mississippi, Florida, New Jersey, the Bahamas, Mexico and Belize all refused it. After two months at sea, on June 17, the Mobro returned to Brooklyn, where it sat in a legal limbo.

"By that time, we had so much bad publicity; they were saying Jimmy Hoffa was buried in the barge, and it was carrying nuclear waste, and you-name-it, so they didn't want it. They wanted us to get out," Duffy St. Pierre, the captain of the Mobro's tugboat, remembered.
By then, Avellino’s company had declared bankruptcy, effectively abandoning the trash. Five months after it set sail, the barge’s cargo was incinerated in Brooklyn and buried back at the landfill where it had originated, in Islip. The pile of ash, one of the last to be buried on Long Island, was a distant ancestor of another nearby landfill, the one at Flushing Meadows that likely inspired the "Valley of Ashes" (http://rapgenius.com/F-scott-fitzgerald-the-great-gatsby-chapter-vii-lyrics#note-1648493) in Fitzgerald’s *The Great Gatsby*, that symbol of darkness licking at the fancy edges and signaling the decline of Gatsby’s West Egg.

“That is the valley of ashes, a fantastic farm where ashes grow like wheat into ridges and hills and grotesque gardens; where ashes take the form of houses and chimneys and rising smoke and, finally, with a transcendent effort, of men who move dimly and already crumbling through the powdery air.”

That landfill would become an early example of remediation, thanks to Robert Moses, who, as New York’s Parks Commissioner, designated it as the site of the 1939 World’s Fair. Wrote the *Times* then: “The ash heaps towered as high as 90 feet above the earth before the city
picked the Flushing park meadows as the site for the fair. The place was just a swampy dump heap then, with the neighbors complaining of dog-sized rats and mosquitoes with pneumatic drill stingers."

Fifty years later, America's modern relationship with waste was, in all sorts of hard-to-calculate ways, defined by the Mobro. At least, the ship's saga helped to kickstart a municipal recycling movement. Today, the ongoing debate over recycling often runs into questions about cost, which are tricky questions because the costs vary from material to material.

According to 2010 data by the EPA, tossed auto batteries are most likely to actually get recycled, at a rate of 96 percent; paper was the next most popular recycled material, recovered at a rate of about 72 percent. Plastic was the material least likely to be melted and turned into other things: PET (polyethylene terephthalate) bottles and jars had a recycling rate of 29.2 percent, white translucent bottles a rate of 27.5 percent.
New Yorkers are notoriously lazy recyclers, only diverting about 15 percent of their waste from landfills (nationwide, it's about 34 percent). But new Bloomberg-blessed programs that address hard plastics and electronics (http://www.nyc.gov/html/dsny/html/pr2013/050713.shtml), for instance, are helping to raise that rate, saving the city an additional $30 million a year, according to its new "recycling czar" Ron Gonen. The goal is to bring up that rate to 30 percent by 2017, saving the city $60 million annually. Nationally, we're at a record high: of the 250 million tons of trash thrown out of homes in 2010, 85 million was diverted from landfills, which, says the EPA, is comparable to removing the emissions of 33 million passenger cars.

But the Mobro's tale is also the sort of thing we might prefer to relegate to the big waste heap of history. There's plenty. Today, twenty six years after that barge carrying 3000 tons of garbage traveled 6000 miles looking for a home, New York City sends 23000 tons of garbage out of the city on a daily basis. That's seven Mobros every day. The risk of forgetting the barge's saga is the same risk that comes with shipping our trash to far flung places: if we don't have to deal with it, we might not be inclined to reduce it.

Meanwhile, the chances that other places won't want to take our trash are shrinking, as it becomes easier to look at trash like any other commodity. In Norway (http://www.nytimes.com/2013/04/30/world/europe/oslo-copes-with-shortage-of-garbage-it-turns-into-energy.html), for instance, garbage has become quite an important energy source, to the point that Oslo doesn't have quite enough. Now the city is hoping to get ahold of some of America's trash too.

--

**TOPICS:** dustbin of history (/tag/dustbin+of+history), waste (/tag/waste), garbage (/tag/garbage), recycling (/tag/recycling), landfill (/tag/landfill), mobro (/tag/mobro), mobro 4000 (/tag/mobro+4000), new york city (/tag/new+york+city), new york (/tag/new+york)

Contact the author by email (mailto:alexp@motherboard.tv) or Twitter (https://twitter.com/pasternack).

You can reach us at letters@motherboard.tv (mailto:letters@motherboard.tv). Want to see other people talking about Motherboard? Check out our letters to the editor
We dump 8 million tons of plastic into the ocean each year. Where does it all go?

Updated by Brad Plumer on February 12, 2015, 2:00 p.m. ET

@bradplumer  brad@vox.com

What happens to all our plastic bottles and lids and containers after we toss them out?

EVERY SINGLE OCEAN NOW HAS A MASSIVE SWIRLING PLASTIC GARBAGE PATCH
The vast majority of plastic trash ends up in landfills, just sitting there and taking thousands of years to degrade. A smaller fraction gets recycled (about 9 percent (http://www.epa.gov/osw/conserve/materials/plastics.htm in the United States).

But there's another big chunk that finds its way into the oceans, either from people chucking litter into waterways or from storm-water runoff carrying plastic debris to the coasts. And scientists have long worried (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2874019/) that all this plastic could have adverse effects on marine life.

Now we can finally quantify this problem: A new study (http://www.sciencemag.org/lookup/doi/10.1126/science) in Science calculates that between 5 and 13 million metric tons of plastic waste made it into the ocean in 2010 alone. What's more, the authors estimate this amount could more than quadruple by 2025 without better waste management.
We dump 8 million tons of plastic into the ocean each year. Where does it all go? - Vox

And here's another surprise twist: We still don't know where most of that ocean plastic actually ends up. A separate study last year in the *Proceedings of the National Academy of Sciences* identified massive swirling garbage patches in each of the world's oceans that contain up to 35,000 tons of plastic.

Yet those patches accounted for less than 1 percent of the plastic thought to be in the oceans — and no one quite knows where the other 99 percent went. One possibility is that marine creatures are eating the rest of the plastic and it's somehow entering the food chain. But that's still unclear.
China accounts for one-quarter of plastic ocean waste

The new Science study (http://www.sciencemag.org/lookup/doi/10.1126/science), led by Jenna R. Jambeck of the University of Georgia, was the first since the 1970s to try to quantify how much of our plastic waste on land ends up in the ocean each year.

The authors looked at plastic production rates, data on waste management and disposal in 193 different coastal countries. Putting this all together, they estimated that the world threw out 275 million metric tons of plastic waste in 2010 (much of it from plastic packaging).

They then estimated that between 4.7 and 12.7 million metric tons made its way to sea — with a best estimate of 8 million tons. That's enough to cover the world's entire coastline (http://news.sciencemag.org/earth/2015/02/heres-how-much-plastic-enters-ocean-each-year).
We dump 8 million tons of plastic into the ocean each year. Where does it all go? - Vox

China was the biggest contributor by far, accounting for roughly one-quarter of the marine debris produced each year. (Note that these figures only include plastic waste on land that makes its way to sea. It doesn't include things like plastic waste from fishing vessels, which makes up an unknown fraction.)

What's more, the researchers find, the amount of plastic waste could quadruple (or worse) by 2025 unless better waste-management techniques are adopted — like recycling or a reduction in packaging materials used.

Every ocean now has a massive plastic garbage patch

Concentrations of plastic debris in surface waters of the global ocean. Colored circles indicate mass concentrations (legend on top right). (Cozar et al, 2014 (http://www.pnas.org/content/early/2014/06/25/1314705111.full.pdf+html).)

So where does this ocean plastic go?

Many people have heard of the Great Pacific garbage patch (http://en.wikipedia.org/wiki/Great_Pacific_garbage_patch) — a massive patch of trash that's accumulated in a swirling
subtropical gyre in northern Pacific Ocean. Ocean currents carry trash from far and wide into this vortex.

And it turns out that there are at least five of these floating garbage patches around the world. That's according to a separate [2014 study](http://www.pnas.org/content/early/2014/06/25/1314705111.full.pdf+html) in *The Proceedings of the National Academy of Sciences*, led by Andres Cózar of the Universidad de Cadiz based on the results of a 2010 circumnavigation cruise.

These garbage patches aren't visible from up high — or even from a passing boat — since most of the plastic is bobbing just beneath the surface, and most of the particles are smaller than 1 centimeter in diameter. Over time, the plastic bits get broken down into ever smaller pieces as they get battered by waves and degraded by the sun.

Even so, these gyres have a lot of garbage, collectively holding some 7,000 to 35,000 tons of plastic in all. The patch in the North Pacific was by far the biggest — containing about one-third of all the floating plastic found. (Much of the plastic debris from eastern China, for instance, collects here.)

And yet, what was most surprising to researchers was that these plastic garbage patches weren't even bigger. There should be millions of tons of plastic in the oceans. But these subtropical gyres only contained up to 35,000 tons. In particular, there seemed to be much less plastic smaller than 1 millimeter in diameter than expected. So where did the rest go?
99% of plastic in the ocean is missing. Where did it go?

In the PNAS paper (http://www.pnas.org/content/early/2014/06/25/1314705111.full.pdf+html) the authors offer a couple of possible explanations for why they didn’t find nearly as much floating plastic as they expected. The most troubling is that fish and other organisms are eating all the plastic:

**ONE POSSIBILITY IS THAT PLANKTON AND FISH ARE EATING THE PLASTIC**

1) **Maybe the plastic is washing back ashore.** The problem
with this hypothesis is that most of the "missing" plastic is less than 1 millimeter in diameter. It's unclear why only smaller bits would have washed up ashore.

2) Perhaps the plastic somehow breaks down into really, really tiny, undetectable pieces. This is possible, although the authors note that "there is no reason to assume that the rate of solar-induced fragmentation increased since the 1980s."

3) Maybe small organisms are growing on some of the plastic bits, causing them to get heavier and sink deeper into the ocean. This is also possible, although other studies have found that when these plastic pieces sink, the organisms on them typically die and the plastic bobs back up to the surface.

4) Plankton and fish are eating the plastic. This one's a more plausible hypothesis. After all, the tiny plastic bits that seem to have vanished are small enough to be eaten by zooplankton, who are known to munch on plastic. The authors also argue that mesopelagic fish beneath the surface may be eating a lot of plastic too — and, perhaps, pooping it out down to the ocean bottom. This needs further testing though.

Assuming fish are eating all that plastic and it's entering the food chain, it's still unclear how dangerous that is. Obviously some marine organisms, like seabirds, can get digestive problems (and can die) if they eat large pieces of plastic. But what about very tiny pieces? There's some evidence (

http://rstb.royalsocietypublishing.org/content/364/1526)
that toxic chemicals can cling to plastic in the ocean and accumulate — but there's still scant research on how much harm this might actually do as it passes through the food chain.

5) **Plastic is accumulating in the ice caps.** Meanwhile, a separate 2014 study (http://onlinelibrary.wiley.com/doi/10.1002/2014EF00024 in *Earth's Future*) suggested that a great deal of microplastic is accumulating in the polar ice caps. As sea ice forms and expands, the argument goes, it essentially "scavenges" the plastic from the seawater. This, too, might be part of the story.

6) **Someone's estimating wrong.** Alternatively, it's always possible that scientists' best estimates of how much plastic is actually entering the oceans are incorrect. That might help explain the discrepancy.

Either way, something doesn't add up — the current numbers suggest that the vast majority of plastic trash in the ocean is vanishing, and no one seems to know where it went.

**Further reading/listening:**

-- Jenna Jambeck has a fascinating podcast about her research available [here](http://traffic.libsyn.com/sciencemag/SciencePodcast_YYMMDD.mp3)

Wasteland

No one talks much about toxic Superfund sites anymore. But 49 million Americans live close to one.

By Paul Voosen

For most of his adult life Jun Apostol has lived, willingly, in the shadow of a mountain of waste. An accountant who’s now retired, he planted his family in 1978 in a modest new house in Montebello, an industrial cum bedroom community just east of Los Angeles. Behind the house, in neighboring Monterey Park, sat an active landfill—but don’t worry, the developer said. Soon it would close and become a park or maybe even a golf course.

The greens never came. It turned out that the landfill, a former gravel pit that had welcomed so much ordinary trash it had filled to ground level and then kept on rising, had also accepted some 300 million gallons of liquid industrial waste—and it hadn’t been selective. Was your waste laced with arsenic, 1,4-dioxane, or mercury? No problem. The nodding pump jacks nearby, left from the oil boom, wouldn’t care. Some of the waste might have come from drilling those oil wells.

Los Angeles had buried the hazardous waste, but it was far from gone. A few years after Apostol’s development was built, his neighbors began complaining of nausea. Gas had intruded into six homes. Property values plummeted. In 1986 the U.S. Environmental Protection Agency marched in and listed the landfill as a Superfund site, part of its new program to contain the nation’s hazardous waste crisis.

Back then many hoped the national cleanup might end after a decade or two. That didn’t happen at the Operating Industries, Inc., landfill in Monterey Park. The EPA capped the landfill with a processed-clay membrane and two feet of soil. Gases from the waste are now collected and burned; a treatment plant processes 26,000 gallons of contaminated water a day. The EPA has so far recuperated $600 million for the cleanup from various parties responsible for the waste at the site—and it does not foresee an end to its work.

No one talks about the dump anymore. “People have forgotten about it,” Apostol said one afternoon in his indoor patio, with music jingling on his speakers and his small dog, in a faded “Romney 2012” sweater, yapping for attention. House prices are up again, he said, and most residents have stayed put. His wife got breast cancer, but he doesn’t blame the landfill. He’s come to respect it since the EPA intervened: It’s so heavily managed that, unlike people in neighboring towns, he doesn’t worry about mudslides.

“We don’t have any regrets,” Apostol said. “Where else can you go?” He could have moved, he admitted, but the commute from Montebello was too good. Living next to a waste site may not be ideal. But neither is bad traffic.
Today nearly one in six Americans lives within three miles of a major hazardous waste site, though few people could tell you where it is. These sites fall under the Superfund program, created by Congress in 1980 after a high-profile controversy at the Love Canal development in Niagara Falls, New York. Love Canal’s residents crusaded against the Hooker Chemical Company after they found barrels of its chemical waste in their backyards, which had been built on a former dump. Love Canal left many Americans wondering, Could this be happening near me?

There are more than 1,700 Superfund sites, and each has a story. Some are sacrifices to national security, like the 586 square miles at Hanford, in Washington State, where reactors have made plutonium for atomic bombs since the Manhattan Project. Others are the shells of mines, like the Berkeley Pit in Butte, Montana, excavated in pursuit of copper and now filling with water. There are chemical manufacturers, smelters, and grain elevators that were once drenched in fumigant. Water, which can spread poison, is a common theme: New York City’s Gowanus Canal is listed, as are parts of the Hudson River and the harbor of New Bedford, Massachusetts. And then there are the many, many landfills.

That these contaminated places are no longer the focus of national attention is in part due to a rarely cited phenomenon: governmental competence. Despite chronic underfunding, the EPA has finished the cleanup at more than 380 sites and considers the construction of treatment facilities complete at more than 1,160 others, including Monterey Park. Not everything is rosy. Even where the waste is under control it’s still there—and the agency estimates it has 95 uncontrolled sites, where people might one day be exposed to toxics. But the urgency of the 1970s has, for the most part, passed.

Money remains a constant problem. The Superfund program once had two pillars: rules that held past polluters liable for cleanup and a “Superfund”—financed by taxes on crude oil and chemicals—that gave the EPA the resources to clean up sites when it could not extract payment from the responsible parties. Congress let those taxes expire in 1995; the program is now funded by taxes collected from all Americans. It’s low on staff. The Superfund itself is nearly empty.

Superfund sites have entered a mostly benign but lingering state, dwarfed in the public’s eye by issues like climate change, says William Suk, who has directed the National Institutes of Health’s Superfund Research Program since its inception in the 1980s. “It’s not happening in my backyard, therefore it must be OK,” is how Suk sees the prevailing attitude. “Everything must be just fine—there’s no more Love Canals.”

Back when leaking drums were cropping up in people’s backyards, the fear was that hazardous waste would drive a cancer epidemic. That prediction hasn’t come true. Identifying a statistically significant cancer cluster is notoriously difficult, but so far at most three have been tied to hazardous waste in the U.S. (Love Canal is not one of them.) Forty percent of Americans will be diagnosed with cancer during their lifetime, mainly the result of random errors in their DNA that arise as cells divide. As a risk factor, pollution in general ranks below smoking, obesity, diet, alcohol, and several viruses.

That’s not to say that hazardous waste sites are safe. Cancer is only one danger associated with them; birth defects are another. A ghost of uncertainty attends these polluted places. Suk offers the Cuyahoga River in Ohio as an example. When it caught fire in 1969, it helped lead to passage of the Clean Water Act and to cleaner rivers all over the U.S.—but it and other rivers are far from clean enough. “It’s not on fire anymore,” Suk says. “But I wouldn’t swim in it.”

How do we live with contaminated land? We need to find more ways to use these brownfields instead of green ones, says ecologist Erle Ellis of the University of Maryland, Baltimore County. “Brownfields are important to cities,” he says. “In a sense they’re waste, but so is manure. It’s just something that needs to get recycled.”

The EPA agrees. It’s seeking uses for polluted land that could remain under its oversight indefinitely. “Basically we’ll be here forever,” says Julie Santiago-Ocasio, the EPA’s site manager at Monterey Park. It costs $5.5 million a year to treat leachate and landfill gas and make sure that contaminated groundwater doesn’t spread off the site—but a small pilot plot of solar panels atop the landfill offers hope that one day it might collect a lot of solar energy as well.

A more dramatic kind of reuse is happening at the former Rocky Mountain Arsenal, near Denver. During World War II the U.S. Army made mustard gas at the site, which is about the size of Manhattan, and later the nerve gas sarin; the Shell Chemical Company produced the pesticide dieldrin there. Waste was shunted into a basin that became a black hole of contamination.

http://ngm.nationalgeographic.com/print/2014/12/superfund/voosen-text
When Sherry Skipper first arrived at the site as a young biologist in the early 1990s, she would often don booties, respirators, and goggles to check on starlings she was using, like canaries in a coal mine, to monitor pollution. The birds fed on worms and burrowing insects that accumulated dieldrin. Skipper remembers one damp spring in particular when the earthworms emerged—and birds that ate them fell out of trees, convulsing. “That’s never going to happen again,” she said one day last winter.

The place is now a wildlife refuge, and Skipper was riding around it with its manager, David Lucas of the U.S. Fish and Wildlife Service. It’s a wholly altered landscape. The chemical facilities were razed between 1999 and 2003 and covered with a “biota barrier”—ground-up tarmac from the old Denver airport topped by four feet of soil—to keep animals from burrowing into the contamination. Native prairie grasses now whisk water away from it. On the refuge’s fringes, wells block the spread of polluted groundwater. New town houses have sprouted on the border.

With the Denver skyline as a backdrop, we watched for bald eagles—up to 80 of them roost here during winter. There are bison, prairie dogs, and mule deer. People should never live on the site itself, Skipper said. But there’s an upside to that. “What are the chances,” Lucas said, “that there’d be 16,000 acres right here in the middle of Denver—undeveloped, for wildlife—if it wasn’t a Superfund site?”

Paul Voosen is a reporter for the Chronicle of Higher Education. Fritz Hoffmann’s latest article for the magazine was on longevity, in May 2013.