

# How much energy does NYC waste?

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Credit: Javier Gil

New York is the most wasteful megacity in the world according to a 2015 report on the per capita energy consumption of 27 global megacities.

A "megacity" is a metropolitan area with over 10 million people, so, in New York's case, this includes the over 22 million people in the five boroughs as well as those who reside (and drive) around the city in Long Island, parts of the Hudson Valley, New Jersey, Connecticut and Pennsylvania. Metropolitan New York's [energy](#) usage far exceeds that of Tokyo, the world's largest megacity with a population of 34 million. This is largely because New York uses more transportation fuel and heating and industrial fuel.

New York also generates more than 33 million tons of waste each year, much of it from construction, while Tokyo produces about 12 million tons. And New York's total water consumption is higher than any other megacity, 54 percent of which is used in thermoelectric plants to produce electricity.

It is expected that 70 percent of the world's population will live in cities by 2050. Many environmentalists believe urban living has the potential to be inherently more sustainable, but the megacities report reveals that this is not necessarily so. When megacities become wealthy, they consume and waste more per capita. Megacities produce almost 12.6 percent of the world's waste, though they comprise only 6.7 percent of the global population. The average New Yorker uses 24 times more energy than a typical Kolkata resident, and produces 15 times as much solid waste.

But New York City itself has been called the greenest city in the United States and one of the greenest in the world. Because of the city's density and public transit, per capita [energy consumption](#), water use and solid waste production in the city are less than in the rest of the U.S. New Yorkers consume two to three times less energy than residents of less dense American cities. In fact, energy consumption in New York City decreased by 7.9 percent between 2005 and 2011.

New York City's buildings account for two-thirds of the energy the city consumes—a much greater share than in other parts of the U.S. where people use more energy driving. In 2012, the Sustainable Engineering Lab at Columbia University produced an interactive map of New York City, estimating the energy consumption of almost every building in the five boroughs. The map, which breaks down energy consumption by how it is used—whether for heating, cooling, hot water or electricity (lighting and plugs)—shows that midtown Manhattan has the most intensive energy use of the five boroughs. And while two-thirds of city buildings are residential, commercial real estate, like much of midtown, uses significantly more energy per square foot. Most of the [energy usage](#) in these midtown buildings goes toward electricity and space heating.

In a [2011 article](#), David Bartlett, then vice president for Smarter Buildings at IBM, wrote that by 2025, buildings will likely be the largest consumers of energy in the world and that as much as half of a building's energy and water is usually wasted.

The main ways buildings waste energy are: running space heaters along with air conditioning when buildings are too cool; keeping doors of air-conditioned stores open to lure shoppers in; running heating and cooling systems simultaneously because of poorly maintained equipment; using sprinklers that are poorly aimed and that run in rainstorms or at the hottest time of the day when up to a quarter of the water can be evaporated; using hoses to clean sidewalks; keeping lights on all day when sunlight could light the space; using too much lighting when task lighting would suffice; and leaving lights, heat, air conditioning and electronic equipment on all night or on weekends when it is not necessary.

Have you ever wondered just how much energy New York City wastes when you enter freezing cold buildings, buses or subway cars in the summer? Or when air-conditioned stores leave their doors wide open?

Or when building lights are blazing at night? It is impossible to quantify exactly how much energy New York City actually wastes, but certainly, the city is guilty on many fronts. To be fair, though, New York is also taking serious steps to address its wastefulness.

Air-conditioned stores often leave their doors wide open in the summer to entice shoppers into their overcooled spaces. A recent [National Resources Defense Council survey](#) of 300 businesses found that 20 percent of retailers in Manhattan and Brooklyn were leaving their doors open during the hot days of summer. According to the Long Island Power Authority, this can boost electricity use at those stores by 20- 25 percent. Moreover, to meet the high demand for electricity on the hottest days, utilities must rev up expensive and polluting peak-power fossil fuel plants. 2008's Local Law 38 made it illegal for businesses 4,000 square feet or larger, and chain stores, to keep their doors open when air conditioning is on, but it left smaller businesses unregulated. A new bill, making it illegal as of June 1, 2016 for commercial buildings of any size to keep their doors open while [air conditioning](#) is running, has just been sent to Mayor de Blasio.



Credit: Christopher Porter

Lighting in New York's non-residential buildings accounts for about 18 percent of the energy used by buildings. Local Law 88 requires all large non-residential buildings to upgrade their lighting to meet the latest energy efficiency standards by Jan. 1, 2025. The law also mandates these buildings install electrical sub-meters in large spaces so individual tenants can monitor and potentially reduce their own energy use. In addition, a new bill has been introduced in the City Council that would require most commercial buildings over 20 stories high to turn off their lights after midnight if no one is inside. Small stores, iconic buildings and Times Square would be exempt. (Dimming the lights would also save the lives of many migrating birds that collide into buildings.)

Forty percent of the average city's electricity is used for street lighting, and according to the International Dark-Sky Association, an estimated 30 percent of outdoor lighting in the U.S. is wasted, shining where or when it is not needed. Los Angeles' project to switch its streetlights to energy efficient LEDs and turn them into a smart network that can dim, brighten, flash for emergencies and eventually monitor conditions has cut the city's energy use 60 percent. New York City will retrofit its 250,000 streetlights with LEDs by 2017, which is expected to save \$6 million in energy costs each year.

New York City's [OneNYC](#) plan is aimed at reducing the city's greenhouse gas emissions 80 percent by 2050 from 2005 levels, and making the city more resilient and equitable. Since almost three-fourths of New York City's greenhouse gas emissions come from heating, cooling and powering buildings, making buildings more energy efficient is key to achieving this goal.

[One City, Built to Last](#), an ambitious green buildings plan launched in 2014, aims to retrofit city-owned buildings that consume significant amounts of energy by 2025 and install 100 megawatts of renewable power onsite. Privately owned buildings will have efficiency targets to

meet, incentives to encourage voluntary compliance and mandates if targets are not reached. The city will install solar arrays on over 300 city-owned building rooftops, support the development of more renewable energy resources, pilot new clean energy technology, and raise standards for building and energy codes in new construction.

A suite of laws put into place by the Bloomberg administration launched the efforts to increase energy efficiency in large existing buildings by mandating them to benchmark their annual energy and water use (Local Law 84), meet the latest energy code for renovations and alterations (Local Law 85), do energy audits every 10 years as well as fine-tune systems to meet energy efficiency goals (Local Law 87) and upgrade lighting (Local Law 88).

Because New York is the second most gridlocked metropolitan area in the U.S. (Washington, D.C., is number one), the average New York commuter wastes a great deal of energy as well as 74 hours a year sitting in traffic, according to a recent report. OneNYC will make commuting easier by modernizing and expanding subway and bus transit throughout the city, and developing the ferry and bike networks.

To reach its goal of sending zero waste to landfills by 2030, OneNYC plans to expand the organics, textiles and electronics recycling programs and offer single-stream recycling (which won't require separating different materials) by 2020. It also aims to reduce commercial waste 90 percent by 2030.

These are just a few of the ambitious goals the city has set to save energy, waste less and reduce greenhouse gas emissions. Of course to shed the title of most wasteful megacity in the world, metropolitan New York's surrounding communities also need to take action, and they are doing so.



Midtown Manhattan buildings. Credit: Jeffrey Zeldman

The good news is that across the country, between 1993 and 2009, energy used for space and water heating declined. However, even though appliances have become more efficient, the energy consumed by appliances and electronics is on the rise as Americans bring more and more devices into their lives.

Michael Waite, a Ph.D. candidate in mechanical engineering at Columbia University and a former building technology engineer, acknowledges that there are proven benefits to energy efficiency, but also sees limitations to what can be accomplished with energy efficiency policies.

"About 5 years ago, we passed the point where more than half our energy use in homes is not for heating or cooling," he said. "Heating dominated for a long time, and then heating and cooling dominated. Now the trend is towards energy being used more for things other than thermal comfort. But a lot of this other stuff is very difficult to proscribe what you should do—I don't know anyone advocating limiting the number of televisions you have!"

The bottom line is that our energy consumption would not be as much of a critical issue if we could stop producing most of our energy by burning fossil fuels, which exacerbate global warming. Along with becoming more energy efficient, we need to move quickly toward getting more of our energy from clean renewable resources.



Credit: Stephen Rees

New York City has plenty of potential for solar and wind. A [solar map](#) created in 2011 found that the city could generate 5,800 megawatts, enough to meet about 40 percent of the city's peak demand, if the buildings suitable for solar panels were outfitted with them. Paul Sclavounos, MIT professor of mechanical engineering, calculated that an offshore wind farm of 4,000 5MW turbines could produce enough electricity to meet the city's annual electric consumption.





Credit: Carspotter

"I'd like to see us do things in the city that work well with renewable energy," said Waite. "I accept that we're going to have to use some fossil fuels for now, but let's do it in a way that will make the transition (to renewables) later easier." For example, if natural gas is being considered a bridge fuel (a lower carbon alternative to coal while zero-carbon resources like wind and solar scale up), then it should be treated as such. Instead of building one 500 MW natural gas-fired power plant which will last generations, Waite suggests we instead build 5,000 100kW generators to distribute throughout the city. "Those are going to be much easier to eventually replace with a battery or maybe a clean fuel cell," he said. "You can't replace half of a 500 MW power plant, but you can replace half of small generators."

On Sept. 24, New York City became a signatory to the [2 MOU](#) climate agreement, joining 37 other cities and countries from around the world in a pledge to reduce [greenhouse gas emissions](#) 80 to 95 percent below 1990 levels by 2050. The pact's goals include assessing the anticipated impacts of climate change on communities, improving air quality by reducing black carbon and methane, promoting zero-emission vehicles, and sharing technology and research to promote [energy efficiency](#) and

renewable energy.



Though electronic devices are increasingly efficient, we use more of them.  
Credit: David Sim

Provided by Earth Institute, Columbia University

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