# Project aims to track big city carbon footprints

May 13 2013, by Alicia Chang

Senior research scientist Stanley Sander stands on the rooftop of the California Laboratory for Atmospheric. Remote Sensing (CLARS) facility at Mount Wilson, Calif., Friday, April 12, 2013. A mile above this city, sensors gaze down on the basin from atop Mount Wilson the way a satellite fixates on Earth, collecting pieces of information about Los Angeles' carbon footprint. (AP Photo/Jae C. Hong)

Every time Los Angeles exhales, odd-looking gadgets anchored in the mountains above the city trace the invisible puffs of carbon dioxide,

methane and other greenhouse gases that waft skyward.

Halfway around the globe, similar contraptions atop the Eiffel Tower and elsewhere around Paris keep a pulse on emissions from smokestacks and automobile tailpipes. And there is talk of outfitting Sao Paulo, Brazil, with sensors that sniff the byproducts of burning fossil fuels.

It's part of a budding effort to track the carbon footprints of megacities, urban hubs with over 10 million people that are increasingly responsible for human-caused global warming.

For years, carbon dioxide and other greenhouse pollutants have been closely monitored around the planet by stations on the ground and in space. Last week, worldwide levels of carbon dioxide reached 400 parts per million at a Hawaii station that sets the global benchmark—a concentration not seen in millions of years.

Now, some scientists are eyeing large cities—with LA and Paris as guinea pigs—and aiming to observe emissions in the atmosphere as a first step toward independently verifying whether local—and often lofty—climate goals are being met.

For the past year, a high-tech sensor poking out from a converted shipping container has stared at the Los Angeles basin from its perch on Mount Wilson, a peak in the San Gabriel Mountains that's home to a famous observatory and communication towers.

Like a satellite gazing down on Earth, it scans more than two dozen points from the inland desert to the coast. Every few minutes, it rumbles to life as it automatically sweeps the horizon, measuring sunlight bouncing off the surface for the unique fingerprint of carbon dioxide and other heat-trapping gases.

In a storage room next door, commercially available instruments that typically monitor air quality double as climate sniffers. And in nearby Pasadena, a refurbished vintage solar telescope on the roof of a laboratory on the California Institute of Technology campus captures sunlight and sends it down a shaft 60 feet (18 meters) below where a prism-like instrument separates out carbon dioxide molecules.

On a recent April afternoon atop Mount Wilson, a brown haze hung over the city, the accumulation of dust and smoke particles in the atmosphere.

"There are some days where we can see 150 miles way out to the Channel Islands and there are some days where we have trouble even seeing what's down here in the foreground," said Stanley Sander, a senior research scientist at the NASA Jet Propulsion Laboratory.

Riley Duren, the chief systems engineer for the Earth Science and Technology Directorate at NASA's Jet Propulsion Laboratory(JPL) demonstrates on the laser radar designed to measure carbon dioxide in the air at Caltech's Linde +

Robinson Laboratory in Pasadena, Calif., Friday, April 12, 2013. A mile above this city, sensors gaze down on the basin from atop Mount Wilson the way a satellite fixates on Earth, collecting pieces of information about Los Angeles' carbon footprint. (AP Photo/Jae C. Hong)

What Sander and others are after are the pretty much invisible greenhouse gases spewing from factories and freeways below.

There are plans to expand the network. This summer, technicians will install commercial gas analyzers at a dozen more rooftops around the greater LA region. Scientists also plan to drive around the city in a Prius outfitted with a portable emission-measuring device and fly a research aircraft to pinpoint methane hotspots from the sky (A well-known natural source is the La Brea Tar Pits in the heart of LA where underground bacteria burp bubbles of methane gas to the surface.)

Six years ago, elected officials vowed to reduce emissions to 35 percent below 1990 levels by 2030 by shifting to renewable energy and weaning the city's dependence on out-of-state coal-fired plants, greening the twin port complex and airports and retrofitting city buildings.

It's impractical to blanket the city with instruments so scientists rely on a handful of sensors and use computer models to work backward to determine the sources of the emissions and whether they're increasing. They won't be able to zero in on an offending street or a landfill, but they hope to be able to tell whether switching buses from diesel to alternative fuel has made a dent.

Project manager Riley Duren of JPL said it'll take several years of monitoring to know whether LA is on track to reach its goal.

Palm trees are seen through an observatory door at Caltech's Linde + Robinson Laboratory in Pasadena, Calif., Friday, April 12, 2013. A mile above this city, sensors gaze down on the basin from atop Mount Wilson the way a satellite fixates on Earth, collecting pieces of information about Los Angeles' carbon footprint. (AP Photo/Jae C. Hong)

Scientists not involved with the project say it makes sense to dissect emissions on a city level to confirm whether certain strategies to curb greenhouse gases are working. But they're divided about the focus.

Allen Robinson, an air quality expert at Carnegie Mellon University, said he prefers more attention paid to measuring a city's methane emissions since scientists know less about them than carbon dioxide release.

Nearly 58 percent of California's carbon dioxide emissions in 2010 came from gasoline-powered vehicles, according to the U.S. Energy

Department's latest figures.

In much of the country, coal —usually as fuel for electric power—is a major source of carbon dioxide pollution. But in California, it's responsible for a tad more than 1 percent of the state's carbon dioxide emissions. Natural gas, considered a cleaner fuel, spews one third of the state's carbon dioxide.

Overall, California in 2010 released about 408 million tons of carbon dioxide into the air. The state's carbon dioxide pollution is greater than all but 20 countries and is just ahead of Spain's emissions. In 2010, California put nearly 11 tons of carbon dioxide into the air for every person, which is lower than the national average of 20 tons per person.

Gregg Marland, an Appalachian State University professor who has tracked worldwide emissions for the Energy Department, said there's value in learning about a city's emissions and testing techniques.

"I don't think we need to try this in many places, but we have to try some to see what works and what we can do," he said.

Launching the monitoring project came with the usual growing pains. In Paris, a carbon sniffer originally tucked away in the Eiffel Tower's observation deck had to be moved to a higher floor that's off-limits to the public after tourists' exhaling interfered with the data.

So far, $3 million have been spent on the U.S. effort with funding from federal, state and private groups. The French, backed by different sponsors, have spent roughly the same.

Riley Duren, the chief systems engineer for the Earth Science and Technology Directorate at NASA's Jet Propulsion Laboratory(JPL), shows the global map of carbon dioxide at Mount Wilson, Calif., Friday, April 12, 2013. A mile above this city, sensors gaze down on the basin from atop Mount Wilson the way a satellite fixates on Earth, collecting pieces of information about Los Angeles' carbon footprint. (AP Photo/Jae C. Hong)

Scientists hope to strengthen their ground measurements with upcoming launches of Earth satellites designed to track carbon dioxide from orbit. The field experiment does not yet extend to China, by far the world's biggest carbon dioxide polluter. But it's a start, experts say.

With the focus on megacities, others have worked to decipher the carbon footprint of smaller places like Indianapolis, Boston and Oakland, where University of California, Berkeley researchers have taken a different tack and blanketed school rooftops with relatively inexpensive sensors.

"We are at a very early stage of knowing the best strategy, and need to learn the pros and cons of different approaches," said Inez Fung, a professor of atmospheric science at Berkeley who has no role in the various projects.

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Citation: Project aims to track big city carbon footprints (2013, May 13) retrieved 16 April 2024 from https://phys.org/news/2013-05-aims-track-big-city-carbon.html

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