

Understanding people's concerns and attitudes toward smart cities

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If you own an internet-connected "smart" device, chances are it knows a lot about your home life.

If you raid the pantry at 2 a.m. for a snack, your [smart lights](#) can tell. That's because they track every time they're switched on and off.

Your Roomba knows the size and layout of your home and sends it to the cloud. Smart speakers eavesdrop on your every word, listening for voice commands.

But the data-driven smart tech trend also extends far beyond our kitchens and living rooms. Over the past 20 years, [city governments](#) have been partnering with [tech companies](#) to collect [real-time data](#) on daily life in our cities, too.

In [urban areas](#) worldwide, sidewalks, streetlights and buildings are equipped with sensors that log foot traffic, driving and parking patterns, even detect and pinpoint where gunshots may have been fired.

In Singapore, for example, thousands of sensors and cameras installed across the city track everything from crowd density and traffic congestion to smoking where it's not allowed.

Copenhagen uses smart air quality sensors to monitor and map pollution levels.

A 2016 report from the National League of Cities estimates that 66% of American cities had already invested in some type of 'smart city' technology, from intelligent meters that collect and share data on residents' energy or water usage to sensor-laden street lights that can detect illegally parked cars.

Proponents say the data collected will make cities cleaner, safer, more efficient. But many Americans worry that the benefits and harms of smart city tech may not be evenly felt across communities, says Pardis Emami-Naeini, assistant professor of computer science and director of

the InSPIre Lab at Duke University.

That's one of the key takeaways of a survey Emami-Naeini and colleagues presented April 25 at the ACM CHI Conference on Human Factors in Computing Systems (CHI 2023) in Hamburg, Germany.

Nearly 350 people from across the United States participated in the survey. In addition, the researchers conducted qualitative interviews with 21 people aged 24 to 71 from underserved neighborhoods in Seattle that have been prioritized for smart city projects over the next 10 to 15 years.

The study explored [public attitudes](#) on a variety of smart city technologies currently in use, from air quality sensors to surveillance cameras.

While public awareness of smart cities was limited—most of the study respondents had never even heard of the term—researchers found that Americans have concerns about the ethical implications of the data being collected, particularly from marginalized communities.

One of the technologies participants had significant concerns about was gunshot detection, which uses software and microphones placed around a neighborhood to detect gunfire and pinpoint its location, rather than relying solely on 911 calls to police.

The technology is used in more than 135 cities across the U.S., including Chicago, Sacramento, Philadelphia and Durham.

Though respondents acknowledged the [potential benefits](#) to public safety, they worried that the tech could contribute to racial disparities in policing, particularly when disproportionately installed in Black and brown neighborhoods.

Some said the mere existence of smart city tech such as gunshot detectors or security cameras in their neighborhood could contribute to negative perceptions of safety that deter future home buyers and businesses.

Even collecting and sharing seemingly innocuous data such as air quality raised concerns for some respondents, who worried it could potentially drive up insurance rates in poorer neighborhoods exposed to higher levels of pollution.

In both interviews and surveys, people with lower incomes expressed more concern about the ethical implications of smart city tech than those with higher income levels.

Emami-Naeini has spent several years studying the [privacy concerns](#) raised by smart devices and appliances in the home. But when she started asking people how they felt about the risks posed by smart tech in cities, she noticed a shift. Even when people weren't concerned about the impacts of particular types of data collection on a personal level, she says they were still concerned about potential harms for the larger community.

"They were concerned about how their neighborhoods would be perceived," Emami-Naeini says. "They thought that it would widen disparities that they already see in marginalized neighborhoods."

Lack of attention to such concerns can hamstring smart city efforts, Emami-Naeini says.

A proposed high-tech development in Toronto, for example, was canceled after citizens and civic leaders raised concerns about what would happen with the data collected by the neighborhood's sensors and devices, and how much of the city the tech company wanted to control.

In 2017, San Diego launched a \$30 million project to cover half the city with smart streetlights in an attempt to improve traffic congestion, but faced backlash after it surfaced that police had been quietly using the footage to solve crimes.

"It's not just a waste of resources—it damages people's trust," Emami-Naeini says.

Worldwide, spending on smart cities initiatives is expected to reach \$203 billion by 2024. But amid the enthusiasm, Emami-Naeini says, a key component has been neglected: the needs and views of city residents.

"There's a lack of user-centered research on this topic, especially from a privacy and ethics perspective" Emami-Naeini says.

To make sure the 'smart cities' of the future are designed with residents firmly in mind, "transparency and communication are really important."

Her team's findings indicate that people want to know things like where sensors are located, what kinds of data they collect and how often, how the data will be used, who has access, whether they have the ability to opt in or opt out, and who to contact if something goes wrong.

The researchers hope the insights generated from their research will help inform the design of smart city initiatives and keep people front and center in all stages of a project, from brainstorming to deployment.

"Communities that come together can actually change the fate of these projects," Emami-Naeini says. "I think it's really important to make sure that people's voices are being heard, proactively and not reactively."

More information: Pardis Emami-Naeini et al, Understanding People's Concerns and Attitudes Toward Smart Cities, *Proceedings of the*

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