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Untying the Traffic Knot

The average American driver wastes about an hour each week stuck in traffic on the way to and from work, and cities across the nation are facing debilitating traffic loads. Eleven U.S. cities rank among the top 25 most congested metropolises in the world, according to transportation research firm INRIX.

In addition, traffic congestion costs the U.S. economy nearly $300 billion a year—$1,400 per driver—in wasted fuel and lost productivity, INRIX estimates. It also raises costs for shipping products by truck—costs that are passed along to consumers as higher prices.

Traditionally, Americans have endured the traffic knot for the same reason they once explained away pollution billowing from smokestacks as the smell of meat and potatoes. “The number-one cause of congestion is a healthy economy,” says Paul Lewis, vice president of the Eno Center for Transportation, a Washington, D.C.–based think tank. When cities do not have jammed roads, “it’s because their economies aren’t good,” he says.

But what was once an inconvenience is worsening to the point where it hinders business activity and potentially affects urban property values as both people and employers make individual decisions to relocate to a place—whether on the other side of town or in another state—where the chances of getting delayed by traffic do not have to be factored into every decision they make.

Land use is an essential part of solving the traffic problem, says Don Elliott, a zoning consultant and director of Denver-based Clarion Associates. For much of the 20th century, he explains, public sector planners did not give much thought to traffic.

“They drew up beautiful plans for where to put the housing and then said to the roads guys, ‘Figure it out,’” he says. In contrast, “these days, cities more often are likely to recognize that they never will be able to build all the transportation capacity they need so that there’s no congestion. So instead they’ll put density where it’s able to be served efficiently by transit.”

As congestion grows to the point at which it affects urban accessibility, developers across the United States are seeing an opportunity to build mixed-use transit-oriented developments in urban areas, where people can live, work, shop, and play while avoiding traffic altogether.

In Pittsburgh’s East Liberty neighborhood, a system of smart traffic lights armed with artificial intelligence can automatically adjust to help traffic flow more efficiently.

One such project is being developed near Atlanta, the fourth-most-congested U.S. city, according to INRIX, where commuters spend an average of 70 hours per year stuck in traffic. Assembly Yards, a 145-acre (59 ha) mixed-use project being built on the site of a former General Motors plant, will include everything from a movie studio and creative office space to shops, restaurants, residences, and recreational spaces.

A key attribute of the project is its location directly on the Metropolitan Atlanta Rapid Transit Authority (MARTA) rail line, enabling transit access to much of the Atlanta area, says Christopher Martorella, president of commercial real estate for Atlanta-based developer Integral Group. New residents flocking to the traditionally automobile-centric area “are demanding connectivity,” he notes. “They want to be able to get to place to place without jumping in the car.” Integral has similar projects in the pipeline in Denver, Fort Worth, and Los Angeles.

In Miami, which INRIX ranks as the fifth-most-congested U.S. city, developer Terra Group is converting a former parking garage in Coconut Grove into that neighborhood's first new office building in decades. In addition to 75,000 square feet (7,000 sq m) of office space, the Mary Street complex will have 20,000 square feet (1,900 sq m) of street-level retail and dining space. It is designed to facilitate a car-free lifestyle in which residents rely on walking and bicycles.

"People don't want to sit for an hour and a half on U.S. 1," says Terra Group president David Martin. "If we can create livable nodes within congestion areas, we can relieve some of the traffic."

Elsewhere in Miami, 13th Floor Investments and the Adler Group are partnering to develop Link at Douglas, a massive development with a rail station at its center; it will include 1,000 apartments, a 150-room hotel, and retail space. The project will also have transportation access via multiple other modes, ranging from walking and biking to buses, notes Arnaud Karsenti, a managing principal of 13th Floor Investments.

A rail station lies at the center of the Link at Douglas, being developed in Miami by 13th Floor Investments and the Adler Group. It will include apartments, a hotel, and retail space, and is being designed for easy access by multiple modes of transportation, including walking. *(A rail station lies at the center of the Link at Douglas, being developed in Miami by 13th Floor Investments and the Adler Group. It will include apartments, a hotel, and retail space, and is being designed for easy access by multiple modes of transportation, including walking.* *(13th Floor Investments and the Adler Group)*

"What we're seeing in Miami is that traffic congestion is a top issue," says Karsenti. "That stems from so much growth and development. Twenty years ago, it took 20 minutes to get to work from my house. It takes 45 minutes to an hour now."

That has created a new reality for developers. "If you're in a site where there's a lot of congestion but your users are going to have the competitive advantage of being able to access public transit, that's a huge advantage."

Even in less congested areas, such as North Carolina's Research Triangle, developers are seeing value in projects that provide alternatives to using a car. Beacon Street Development is working on a 300-acre (120 ha) infill residential project near Chapel Hill that is designed to emulate housing stock from the early 1900s. "People are turning back to where the automobile isn't the dominant factor in the design process," says Jim Wiley, president of Beacon Street. "The car needs to fit in, but it needs to be secondary."

To support such development, cities need to provide more transportation options. In Seattle, for example, to cope with the needs of a fast-growing population, the city has been developing a multimodal transportation infrastructure designed to make it possible to live without a car. "We've grown 45,000 new jobs in downtown in the past few years, and 95 percent of those jobs are filled by people who walk, bike, or take public transit to work," says Scott Kubly, director of the Seattle Department of Transportation.

The city's transportation infrastructure includes innovations such as sensors designed to detect cyclists at intersections. "If you're riding your bike, we can get you a green light," Kubly says. The city also has streamlined its regulatory processes—eliminating cumbersome requests for proposals and simply issuing permits—to make it easier for ride services and bike-sharing companies to put innovations in place quickly.

Ultimately, the best way to manage the traffic knot may be to plan with more than traffic congestion in mind, Kubly explains. "It's less about traffic management and more about transportation management," he says. "Instead of just focusing upon vehicular, we should be trying to make all the modes work."

Tech Solutions

An assortment of emerging technologies could help people cope with burgeoning gridlock, including smart traffic signals that use artificial intelligence to predict and prevent traffic jams, and vehicles that communicate with roads, traffic lights, and other cars as a network to optimize traffic flow and direct it to the most efficient routes. But experts say such innovations will not be enough unless cities also see traffic as a people problem rather than just a car problem and provide commuters with multimodal transportation alternatives, including buses and bikeways.

In Los Angeles, for example, in addition to creating new mixed-use developments in the heart of downtown, the city is looking to technological solutions to ease the traffic flow. Each day millions of vehicles jam the asphalt arteries of Los Angeles, a place where, according to one recent study, two-thirds of the population commutes to work by car. Meanwhile, in a darkened room downtown, traffic engineers for the Los Angeles Department of Transportation (LADOT) use the city's Automated Traffic Surveillance and Control (ATSAC) system to wage a continuous struggle to keep those cars moving.

An array of computer monitors displays multicolored arcs and grids—visualizations of data collected by tens of thousands of magnetic sensors at intersections—and a wall lined with TV screens shows images streaming in from the city's 560 traffic surveillance cameras. Additional information is provided by Waze, a GPS-enabled smartphone app that crowd-sources information from drivers to help them find the best routes. A leader board displays incidents that threaten to disrupt the flow.

ATSAC, which was built gradually over the past several decades at a cost of $400 million, has remarkable capabilities, including the ability to monitor in real time and, when necessary, adjust the timing of all 4,600 of the city's traffic signals to optimize traffic flow. Its digital brain does most of the work by itself.

"The system adjusts automatically," explains LADOT senior engineer George Chen. "Humans will jump in specific situations where it's better to have a person—for example, if there's a special event, such as the L.A. Marathon."

Los Angeles's investment in ATSAC has shown results. One study found that it allowed drivers to increase their speed by 2.3 miles per hour on average and shaved the time needed to travel five miles (8 km) from 20 minutes to 17 minutes and 20 seconds.

But, despite ATSAC's technological sophistication, traffic remains a daunting problem in Los Angeles, which experiences congested conditions for nine hours and 35 minutes each day—nearly twice the national average, according to the Federal Highway Administration (FHA). Last year, an INRIX study found that the average driver in Los Angeles spent an astonishing 104 hours—more than four days—in traffic jams each year. And as Chen notes, traffic density is worsening: "The population continues to go up, and there's more traffic as the result of that."

Tech Challenges

Some transportation analysts fear the traffic problem could become even worse as driverless robotic vehicles take to the streets and highways over the next few decades, disrupting transportation patterns, and e-commerce clogs cities with more and more trucks making deliveries. Unless autonomous cars are restricted to a few designated routes, they will have to share city streets with human-driven vehicles, cyclists, and pedestrians.

As people figure out how to exploit the robots' sensitive crash-avoidance systems to their advantage, traffic could slow to a crawl. "They're going to stop every time a jaywalking pedestrian walks in front of them," says Wes Guckert, chief executive of the Traffic Group, a Baltimore-based transportation engineering and planning consultancy. "It's going to cause more congestion."

In optimistic scenarios, most driverless vehicles would be shared and autonomous technology would cut the cost of Uber and Lyft fares so much that commuters would have an incentive to let a robot do the driving. A study released in March by Sam Schwartz Transportation Consultants, engineering firm Arcadis, and economic development firm HR&A Advisors predicts that 44 percent of Los Angeles commuters might end up leaving their cars behind and shifting to ride services.

But even that shift could backfire. As panelists at the recent American Planning Association (APA) national conference warned, cheap rides in driverless cars might siphon away bus and subway commuters instead of potential drivers, making transit systems less economically sustainable. And fleets of robot taxis making continual drop-offs in front of buildings could increase traffic delays.

If private cars go driverless, experts warn that congestion could blow up to drastically worse levels. "Imagine if I could go downtown, where parking is expensive, and just tell the car to drive around while I do my business, or else send it out to the suburbs where the parking is free," says University of Michigan professor Jonathan Levine. As futurist Paul Saffo warned in a panel discussion at ULI's 2015 Fall Meeting in San Francisco, that city may someday have "traffic jams of empty cars." And because driverless vehicles would free their passengers to work, sleep, or watch movies in the back seat, they may encourage longer commutes and increase crowding on highways.

The societal shift to e-commerce already puts added strain on city streets. "Just like you have a first-mile, last-mile problem in transit: with e-commerce, you have a last-50-feet [15 m] problem with deliveries," says Kubly. If 20 percent of first-try deliveries fail, he says, those are vehicles that have to make additional trips later and add even more to congestion.

While driverless vehicles could exacerbate congestion, other inventions may help reduce it.

In Pittsburgh, Carnegie Mellon University robotics professor Stephen Smith has developed traffic signals equipped with individual computers and software with artificial intelligence capabilities: they use cameras and

radar to spot approaching vehicles and continually adjust their timing to make traffic flow more efficiently. The traffic plan for each intersection is recomputed every few seconds, and over time the smart signal learns from the data how to become even more efficient in keeping cars moving. “Intersections can build a larger horizon plan that’s based on this information,” Smith says.

He started working on the problem in 2009, when he was approached by the late industrialist Henry Hillman, who was concerned that gridlock might interfere with Pittsburgh’s efforts to remake itself as a technology and health care hub. He installed a few experimental prototypes at intersections in the city’s congested East Liberty neighborhood and immediately got impressive results—a 25 percent decrease in motorists’ average travel time and a 40 percent reduction in time spent idling in traffic jams. Today, the network has grown to 50 intersections, and last November the city obtained federal funding to add another 150.

While the smart traffic lights are capable of making such decisions individually, they also send and receive data from other signals in the network, enabling them to anticipate traffic while it is still headed in their direction. Smith’s startup company, Surtrac, already is marketing his current generation of smart signals to other cities; this year, he will be installing them at 25 intersections in Atlanta, and he has a contract in Kane County, Illinois, near Chicago. Meanwhile, he continues to add capabilities, such as sensors that not only would detect pedestrians approaching intersections, but also spot pedestrians with disabilities who might need more time to cross the street.
Smart signals could be even more effective if they communicate wirelessly with approaching cars before they become visible to sensors—and possibly help guide them to the least-congested routes. Smith, who already is working with Pittsburgh-area transit officials to equip buses with radio transmitters, says that in computer simulations he has been able to push traffic through the network 25 percent faster than it flows now.

Companies such as AT&T and Panasonic are working to develop technology for such vehicle-to-everything (V2X) communication—both vehicle to vehicle, and vehicle to road infrastructure. A 2015 FHA study found that such connected vehicles had the potential to reduce travel time on arterial urban corridors by 6 to 27 percent. But Levine cautions that V2X will only make a difference if transportation planners start thinking about congestion differently. “We make a mistake when we just seek to optimize vehicle throughput in our transportation system,” he says. “Vehicles don’t matter. People do.”

Levine hopes to see V2X used to transmit information about how many passengers are in a particular vehicle, which might enable a traffic system guided by artificial intelligence to guide buses or carpooling commuters to the quickest routes while directing solo drivers elsewhere.

Even with those innovations, traffic consultant Guckert thinks cities may have to resort to a more drastic measure—tolls with higher prices for drivers who choose to be on the road during periods of peak congestion. He cites London, which has been imposing such fees since the early 2000s, as a potential template. “If people have to pay a toll to get into the city, they’ll ride-share or get on the subway,” he says.