The Downside of 5G:
Overwhelmed Cities, Torn-Up Streets, a Decade until Completion

As carriers launch their 5G networks, the promise of superfast wireless is clashing with the reality of the rollout. "The real onslaught has not yet begun" —Gerard Lavery Lederer, an attorney representing municipalities in a suit against FCC rules limiting cities' ability to manage the 5G rollout.

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By Christopher Mims
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In every major city in America where carriers are rolling out 5G, there's someone like Keith Hubbard, manager of a 16-person fiber technician team for AT&T. His job: to set up shop in a trailer in the middle of a busy street, after other teams have already dug up the street or sidewalk and laid fiber-optic cable under it. On sweltering summer days in Atlanta, where his team is based, his technicians must perform surgery on a 1¼- inch bundle of glass fibers. In a typical cable there are 864 insulated strands, splayed out like a head of hair, and each is a high-bandwidth conduit to some business, home or cell tower. Cut the wrong strand, and people lose internet access.

Thousands of engineers and planners like Mr. Hubbard, along with diggers of trenches and installers of antennas, must coordinate to link more fiber-optic cable, in more places in the U.S. than ever before. All so we can do more stuff on mobile devices.

This is the paradox of 5G, the collection of technologies behind next-generation wireless networks: They require a gargantuan quantity of wires. This is because 5G requires many more small towers, all of which must be wired to the internet. The consequences of this unavoidable reality are myriad. The 5G build-out, which could take more than a decade, could disrupt our commutes, festoon nearly every city block with antennas, limit what cities can charge for renting spots on their infrastructure to carriers on which to place their antennas, and result in an unequal distribution of access to high-speed wireless, at least at first.

Of course, it's also a bonanza for the companies that supply this fiber-optic cable. Verizon announced a $1 billion purchase of fiber from Corning Inc. in spring

2017. This amounts to 12.5 million miles of cable a year—enough to circle the Earth 500 times—for three years, says a Verizon spokeswoman. And that's just Verizon's biggest fiber deal.

Buying the fiber is the easy part for the carriers. "The secret nobody likes to talk about is when you're deploying a network, the equipment—fiber, cable—is actually a small cost compared to the cost of digging holes," says Claudio Mazzali, senior vice president of technology at Corning Optical Communications, a subsidiary of Corning. That high cost also includes getting city permits, striking deals with landowners and installing the antennas themselves.

In a 2017 report, Deloitte Consulting LLP principal Dan Littmann estimated that it will take combined carrier spending of between $130 billion and $150 billion in order for most Americans—including those in rural areas—to have a choice of providers of high-speed broadband and 5G wireless.

The level of investment required to achieve widespread 5G has also been used, by Federal Communications Commission chief Ajit Pai and others, to argue for the necessity of a merger between Sprint and T-Mobile. (Sprint's CEO, meanwhile, has argued that the company's 5G technology and rollout is perfectly fine on its own, while T-Mobile's CEO insists the two companies will be stronger together.)

Marachel Knight, the senior vice president in charge of rolling out 5G at AT&T, says her company estimates it will take a decade to completely build out its 5G network.

The Long Rollout

Some analysts and industry insiders think even a decade isn't long enough, warning that a lack of cash and local cooperation could slow 5G rollout or even stall it completely outside the richest, densest cities.

Meanwhile, local municipalities are suing the FCC to overturn rules designed to make it easier for carriers to install new, smaller cellular antennas of the sort required to make 5G happen. Some in Congress are also working on legislation that could overturn the rules, which are seen by many as favoring telecoms to the point that cities will essentially be subsidizing the 5G build-out.

The driving force behind this enormous build-out is that 5G networks don't work like previous wireless cellular networks. Where 2G, 3G and even 4G rely on large towers with powerful antennas that can cover many square miles, the shorter-

range, higher-frequency radio waves used by 5G networks—essential to their ability to deliver the 10- to 100-times faster speeds they promise—mean that 5G networks must have small cells placed much closer together.

Typically these small cells must be placed about 800 to 1,000 feet apart, says AT&T's Ms. Knight. Small-cell antennas are typically the size of a pizza box, but can be much larger, and require both a fiber-optic connection to the internet and access to power. They go wherever there's space: on buildings, new 5G-ready telephone poles and, often, retrofitted lampposts.

In 2018, the U.S. had 349,344 cell sites, according to CTIA, a wireless industry trade organization. The organization estimates that—to achieve full 5G coverage—carriers will have to roll out an additional 769,000 small cells by 2026.

Battling Cities

This rollout could mean three or four different carriers will be arriving at your street, each trying separately to dig to bury fiber. (And yes, fiber-optic cable almost always has to be buried.)

These companies acknowledge there might be less disruption if they coordinated, laying fiber at the same time, in the same trenches. But so far, that happens on an ad-hoc basis, when crews on the ground notice crews from a competing company digging on the same day, or when local—and overtaxed—permitting offices notice a coincidence in dig requests, say representatives from both AT&T and Verizon.

Some states and cities are enacting "dig once" policies—in other words, all the fiber goes into one trench or pipe—says Mr. Littmann. In some cases, this means that new roads must include underground conduits suitable for future fiber cable installation, so they needn't be dug up every time.

City leaders across the country complain they don't have the staff to handle all these permits, and it's hard for them to charge more to support the added strain: The FCC limited how much cities can charge companies to install small cells and dictates that they must decide whether to allow or disallow them within 60 days.

In response to these new FCC rules, the Conference of Mayors issued a statement saying the agency "has embarked on an unprecedented federal intrusion into local (and state) government property rights that will have substantial and continuing adverse impacts."