

We Rode the Copenhagen Wheel

The smart electric conversion is a lot of fun, but is it really the best e-bike for the city?

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The Copenhagen Wheel is slick, but is it wheel-y a good idea? (Andrew Small/CityLab)

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After a few prototypes and soft launches, the Copenhagen Wheel has officially arrived. This is an e-bike made-easy—an electric hybrid bicycle wheel that houses a motor, battery, and computer, all in a single red hub you swap out for the rear wheel of nearly any bike of your choosing. Made by the Massachusetts-based company [Superpedestrian](#), the Wheel has long captured the imagination of would-be cycling commuters: It's been hyped as the bicycling-aid that can turn lazy Americans into refined European *velocipedestrians*. Now, you can finally buy one, for \$1,499 (or \$1,999 pre-installed on a bike).

The wheel has been greeted with excited reviews from [tech geeks](#), [urbanists](#), and [Bostonians](#) for its inventive design, which was developed at the Massachusetts Institute of Technology's [SENSEable City Lab](#). (No relation to this CityLab.) Back when a prototype emerged in 2014, this site's Nate Berg gave it a test ride, declaring, "If an Electric Bike Is Ever Going Hit It Big in the U.S., [It's This One](#)."

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Now that the Wheel has hit the mass market and is widely available to consumers, it's time to put it through its paces in the real world and see how it fares.

But first, some history. The Copenhagen Wheel Story begins not in Copenhagen but in Cambridge, Massachusetts, where Assaf Biderman, Superpedestrian's CEO, taught urban studies and urban planning at MIT and worked with SENSEable City Lab from 2004 to 2012. He left in 2012 to take the wheel developed by the lab—which was originally unveiled at the 2009 United Nations Climate Conference in Copenhagen—into the market.

The idea behind the device, Biderman says, was to use technology to help the bicycle solve our current and future urban transportation woes. If current patterns of demand keep up, traffic on the roads [might triple](#) over the next three decades. Trading car trips for bicycle trips is often touted as a solution, but there are some big challenges to overcome. “If you look at mobility behavior, most people are willing to spend around twenty five minutes on a bike, maximum, for a one-way trip,” he says. “The bicycle was invented about 150 years ago. In that same time frame, the average city grew about 20 times in land area. The bike stayed the same, but the city expanded.”

That's where the Copenhagen Wheel comes in. “Regular bikes are great vehicles,” says Biderman. “But the average human body puts only about 75 to 100 watts into cycling.” The Wheel, on the other hand, packs 350 watts of power, giving the rider the ability to scoot through openings in traffic and muscle up hills without undue exertion.

And, unlike purpose-built powered bikes, it can be fitted onto your existing ride. “By allowing bike stores to fit the Copenhagen Wheel onto your favorite bike, we removed the middle men from the equation, who would have otherwise marked up the electromechanics,” Biderman claims. “This process enables us to offer the ‘Ferrari’ of products with a price that is disruptive in the e-bike market.”





A view of the Copenhagen Wheel's charge and power usage. (Superpedestrian)

The Wheel also features dozens of sensors that collect real-time data to process the streetscape and profile the rider's cadence and power. The amount of meta-data that Superpedestrian will collect—from altitude to noise levels to CO2—is enough to make any urban planner geek out. But, for the rider, all this technology should be invisible. “Just pedal and enjoy the ride,” says Biderman. “That's the most important thing. We put a lot of effort into the technology so that it would disappear.”

I picked up my tester Copenhagen Wheel-equipped bike from local bike shop [District Hardware](#), which is part of the company's network of authorized dealers. The bike is a standard-issue city commuter, one of three possible styles, but Neil Conway, the store's owner, swapped the original tire to accommodate the weight of the new hub that houses the motor, battery, and sensors.

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After filling me in on the basics of the bike, Conway handed over the virtual Bluetooth keys via the Superpedestrian app that controls the device's settings. I didn't fiddle with my phone before setting off, however, so I unknowingly started my ride in “Turbo” mode, maxing my speed to 20 miles per hour.

Turbo mode could not have made me happier. I laughed out loud from the surprise of smoothly overtaking a car with speed and shouted calls of glee as I climbed a hill without any extra effort. The Copenhagen Wheel's signature red hub might be ostentatious, but its power is discreet and makes no sound. It's like being some sort of bike ninja.

Even at the less power-intensive standard setting, the bike opens up the city. Throughout the weekend, I whisked away to appointments with little lead time. It gave me speed without sweat and the ability to climb roads while keeping pace with cars. It expanded my orbit for errands and the time I could spend in the city. When the work week came around,

the wheel cut my commute time in half. When I forgot my laptop one day, I just cycled back to retrieve it with little fuss.



Not quite like your iPhone charger. The Copenhagen Wheel advertises a two hour charge time for 80 percent battery and a four hour charge time for 100 percent battery. (Andrew Small/CityLab)

The Herculean power that the Wheel gives its rider is a little addictive, but after I hit a few potholes too hard on a morning commute, I was reminded of the device's potential limitations. The bump likely jostled the heavy wheel loose from the frame and gave the chain too much slack, leading to constant chain-drops. A quick pitstop at a bike store fixed the issue, but it made me worry about how durable this rig would be in a city without a Danish-level commitment to road maintenance.

There's also a potential range anxiety issue: Armed with a regenerative braking feature that partially recharges the battery when coasting downhill, the Wheel promises a potential top range of up to 30 miles, but a heavy hand with Turbo mode will cut into that; absent juice, the Wheel becomes a 17-pound drag.

For a more expert take on the Wheel, I reached out to Court Rye, founder of ElectricBikeReview.com, a site that's been reviewing e-bikes for about four years in Austin, Texas. He visited the team at MIT behind the Copenhagen Wheel and you can read his review of the [2014 prototype](#) and the [2015 update](#) on his website.





The Copenhagen Wheel pouring its guts out. (Superpedestrian)

When I asked Rye what e-bikes he'd recommend for city dwellers, he emphasized weight. "Most e-bikes weigh around 50 pounds while an unpowered bicycle is closer to 25 or 30. So I ask people, 'Do you live upstairs?' 'Do you have an elevator?' It's a challenge if you live in an apartment," Rye says.

The "Big Three" bicycle companies in the United States—[Trek](#), [Giant](#), and [Specialized](#)—all now make their own e-bikes, all in the range of \$2,000 to \$6,000. There are also e-bike specific brands such as [Haibike](#) and [Bow](#). Most of these purpose-built e-bikes boast more speed and range than the Copenhagen wheel, which is priced and marketed with a younger audience in mind. "Before [the Copenhagen Wheel], e-bikes aimed at baby boomers who are maybe interested in cycling as a hobby for fun but were struggling to hit those hills or discouraged by weather or wind," Rye says.

Sleek as the all-in-one design can be, it has some inherent trade-offs. "You have the battery right there by the motor—which is going to produce heat," Rye says. "Extreme heat and colds are tough on batteries, they don't last as long for as many cycles. Compare that to the [Specialized] Vado, which has a special vent designed to pass air right by the motor and it is not connected to the battery." There's also no quick way to swap in a battery once its lost its charge, unlike bikes with a pack attached to where you would normally put a water bottle cage.





A Cannondale 2017 Kinneto with a mid-drive pedal assist motor. (Andrew Small/CityLab)

The physics of hub-mounted motors are also not ideal. Most e-bikes also use mid-drive systems, typically made by [Bosch](#), [Yamaha](#), and [Brose](#), where the motor sits on the frame and the power gets distributed from the crank rather than the gear hub. Putting a hunk of unsprung weight on the aft end of the bike affects its handling. Even the most comparable Copenhagen Wheel alternative, a wheel-based conversion systems sold by [BionX](#), minimizes the weight in the hub by embedding the battery on the bike frame.

“Not to sound alarmist, but that unsprung weight distribution on the bike is important,” Rye says. “It adds pressure on the axles, and the spokes are much shorter because you have this hub in the middle. Spokes create comfort—they bend and flex—so it’s a much harder ride. It’s OK, but without suspension, it could be painful for your neck and back.”



Look ma, no smartphone. (Andrew Small/CityLab)

To compare this properly, the next weekend I tried a bike with a mid-drive system at D.C.’s downtown [Bicycle Space](#). To be short, that bike was not nearly as cool, quiet, or as smooth as the Copenhagen Wheel, but in the end I could see how it would be more comfortable and convenient choice in the long run.

With the motor and battery weight held by the frame instead of the wheel hub, the bike's weight distribution was indeed better balanced; I no longer felt like the rear wheel hub was some extra appendage to protect while I dragged it from behind. But the bike as a whole was noisier—you can hear the motor running and gears shifting. Simply put, the technology didn't disappear; I missed that seamless feeling of machine-enhanced riding that the Wheel provided.

If you're going to be doing heavy-duty long-range urban riding, spending a bit more for a mid-drive e-bike with a removable battery could be the more responsible decision: It's the stodgy workaday appliance instead of the cool candy-colored toy, a Buick instead of a Miata. But for sheer joy, I'll take Turbo mode.