



Green Dot Awards

Transportation – Eco-Innovations in Mobility

Entrant:

Senseable City Lab, MIT

77 Massachusetts Ave. Suite 9-209,

Cambridge, MA 02139

Phone: 617-516-7910

Contact: Eric Baczuk (ebaczuk@mit.edu)

Description:

The SENSEable City Lab is a cutting-edge multidisciplinary research group at MIT that studies the interface between cities, people, and technologies. The group is focused on understanding how the ubiquity of digital devices and telecommunication networks that augment our cities, are impacting urban living. With an overall goal of anticipating future trends, we bring together researchers from over a dozen academic disciplines to work on groundbreaking ideas and innovative real-world demonstrations. This research is undertaken in partnership with cities, the private sector and other universities, and through this collaborative approach we strive to reveal how a new, rapidly expanding network of digital devices is serving to modify the traditional principles of understanding, describing and inhabiting cities, as well as how we design and manage them.

Project:

The Copenhagen Wheel,

For Kobenhavns Kommune

In cooperation with Ducati Energia, spa and Supported by

The Italian Ministry for the Environment Land & Sea

MIT senseable city lab:::

THE COPENHAGEN WHEEL

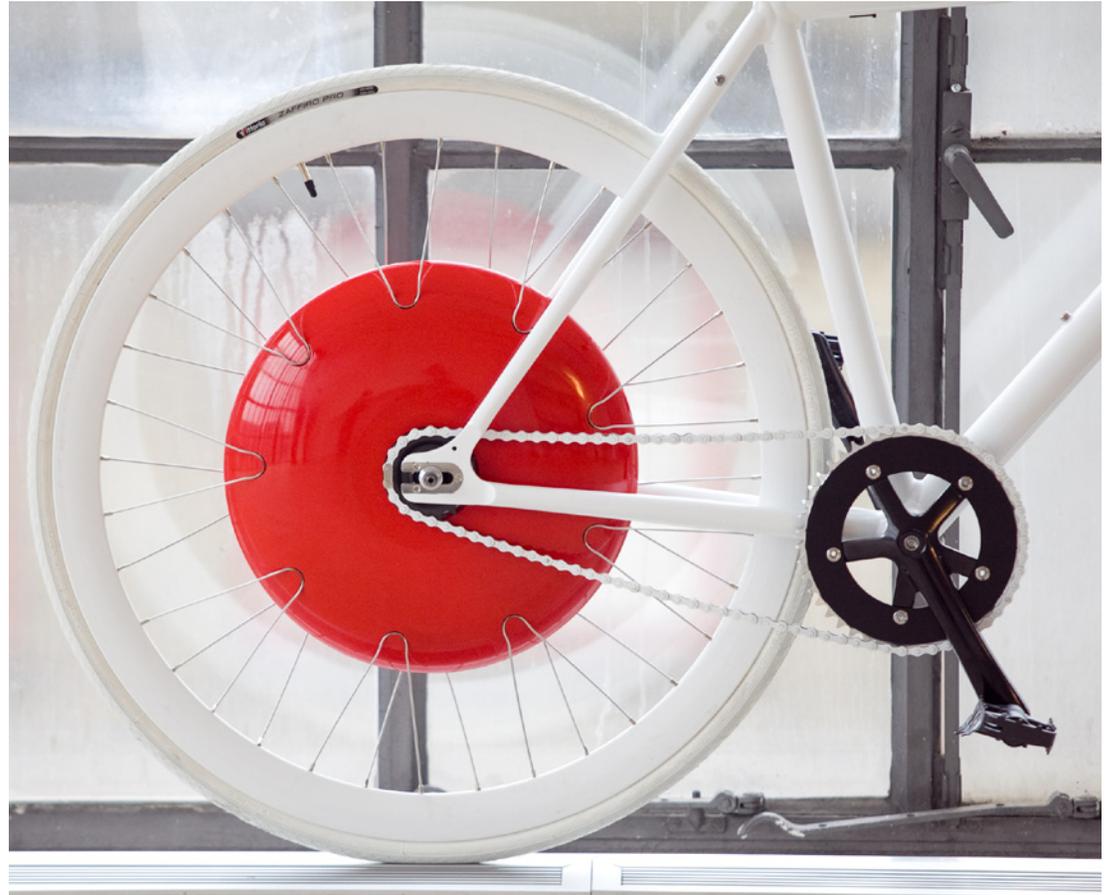


Photo: Max Tomasinelli

Names of the team:

Carlo Ratti (Director, SENSEable City Lab),
Assaf Biderman (Associate Director, SENSEable City Lab),
Christine Outram (Project Leader)

Vincenzo Manzoni, Xiaojie Chen, Roon E Kang, Mark Yen, Jennifer Dunnam,
Myshkin Ingawale, Ari Kardasis, Andrea Cassi, Eric Baczuk, Giovanni Alli

Detailed explanation

The Copenhagen Wheel's sleek red hub is packed with a motor, batteries and an internal gearing system – allowing users to capture the energy dissipated while braking and cycling, and save it for when they need a bit of a boost (great for overcoming hills and long distances!). But the Copenhagen Wheel is more than a new type of electric bicycle. It's also a smart sensing device that provides real time feedback, through your phone or the web, about your fitness and exercise goals, upcoming traffic conditions, road conditions and pollution levels. You can keep the data your sensors collect, or share it with friends, gaining access to a larger pool of information. Alternatively, when many cyclists donate the information their wheel is collecting to their city, cities gain access to a new scale of fine-grained environmental information. Through this, they can cross analyze different types of environmental data, on a scale that has never been achieved before, or build a more detailed understanding of transportation on a city's infrastructure and study dynamic phenomena like urban heat islands. Ultimately, this type of 'crowd-sourcing', can influence how cities allocate their resources, how they respond to environmental conditions in real time, or how they structure and implement environmental and transportation policies.

Initial prototypes were unveiled at the United Nations Climate Conference in 2009. Since this time we have received global interest from individuals and cities in both developed and developing nations. We are now exiting the university environment, building our next set of prototypes, custom building parts and refining the electronics and control system to ensure a safe and reliable product. Our final set of prototypes will be released in January 2012, and our pre-series commercial launch is scheduled for Q3 2012. We are also in discussion with the city of Copenhagen to launch a showcase demonstration of the Wheel in the summer of 2012. Currently, each wheel has an estimated cost of \$600 US, and we hope to market them through partnerships with retail outlets and distributors worldwide.

EXTRA POWER

The energy dissipated while cycling and braking is saved in batteries. That power can later be used to give the rider an extra boost when needed.



WHEEL'S BRAIN

Hub sensors and GPS allow riders and cities to get information on air and noise pollution, congestion, and road conditions via a smartphone or the web

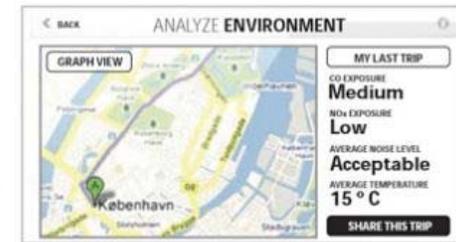
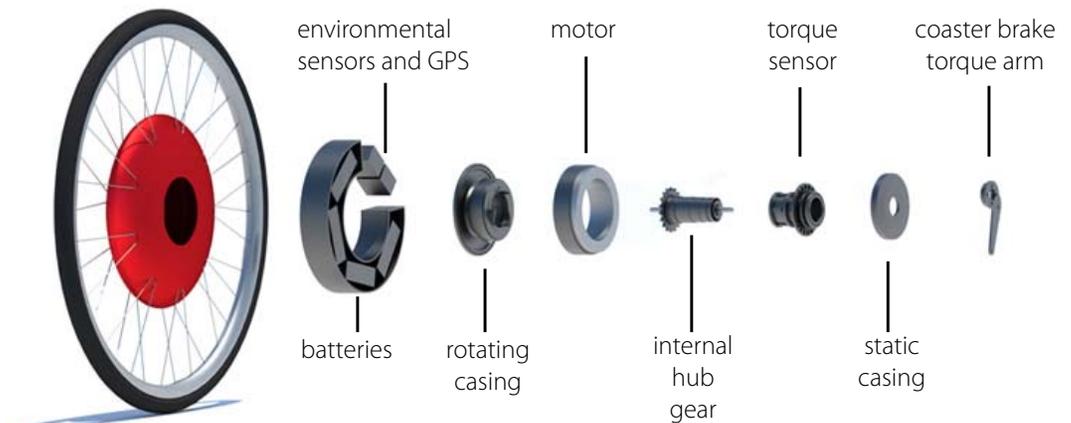


Image: The Boston Globe

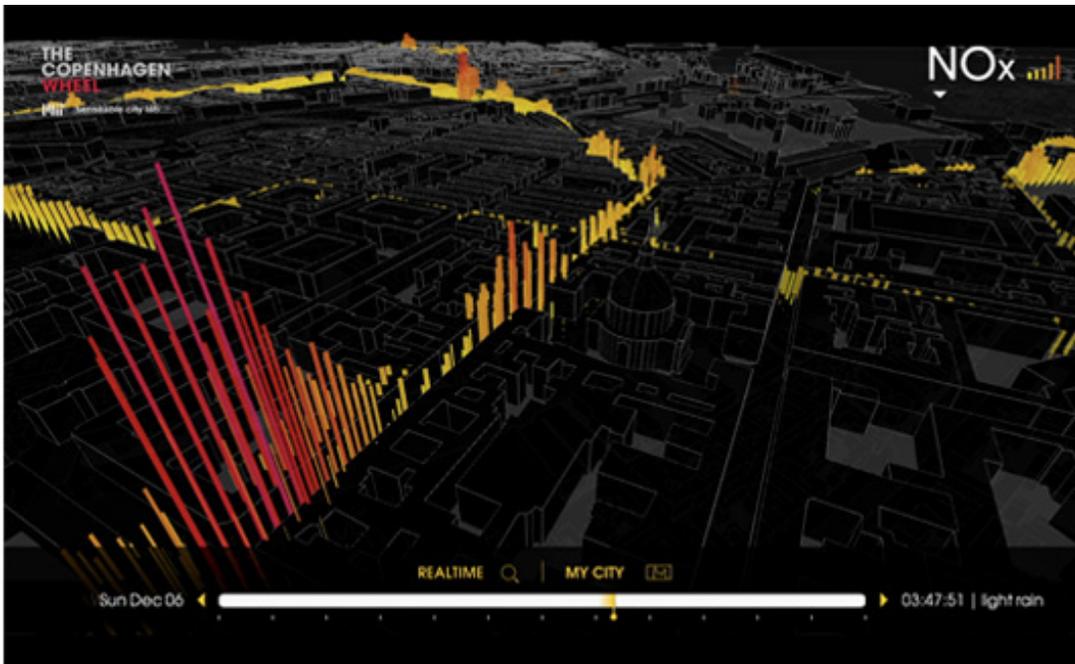
wheel, spokes and external casing





Excellence in sustainability and environmental responsibility

The aim of the Copenhagen Wheel is to make bicycle transportation more accessible to a wider range of the population. Of course, the use of bikes has a number of ecological advantages over automobiles, including reduced carbon emissions and improved air quality, safer and quieter neighborhoods, cleaner surface water runoff, and less land required for roads and parking. We estimate that an average commuter traveling 10km/day, would save approximately 2.5 barrels of oil a year by switching from their car to a Copenhagen Wheel. That may not seem like much, but if applied across an entire city, like Copenhagen (pop. 2 million), the benefits really add up. If the Copenhagen Wheel could increase bicycle ridership by a mere 10%, the city would cut nearly ½ million barrels of oil consumed annually – and save over 91,000 tonnes of CO2 emissions! This has an immense impact on urban air quality by not only reducing the amount of CO2 in the atmosphere, but also the amount of air-borne particulates, NOx, SOx, and CO that afflict so many cities around the world.



Crowd-sourced NOx data visualized on an interactive map

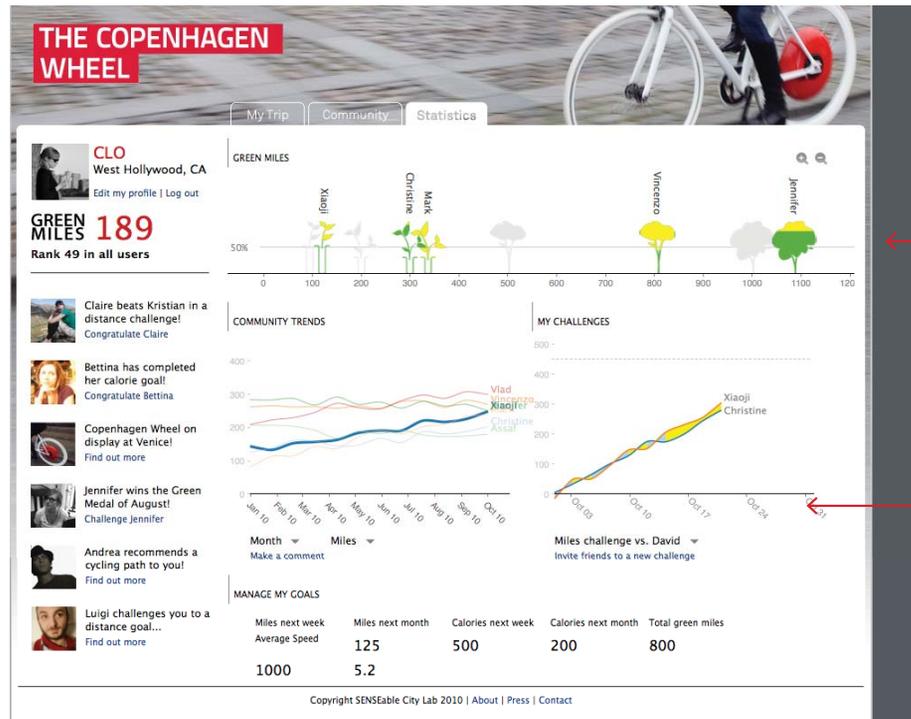
Additionally, a number of other features intrinsic to the Copenhagen Wheel were designed with the environment in mind. The green miles program (similar to a frequent flyer program for cyclists) provides incentives for people to ride more. Green miles would allow users to earn points for every mile they ride on their bike – miles which can be redeemed at participating vendors, outlets, retailers for discounts on everything from coffee to coffee tables. Further, by formally quantifying the number of miles traveled by bike, cities would be able to identify and estimate potential opportunities for new urban-scaled social programs, such as carbon trading schemes. Finally, because the Copenhagen Wheel can be retrofitted onto existing bikes, it encourages you to use what you already have, and therefore contains much less embodied energy than a new electric bicycle would.



Impeccable design, technology, & ease of use

Our team believes that innovation in any market is more than a cost-competitive improved technical solution. Instead, successful solutions are those that can also be integrated into our culture in a sustainable manner. The Copenhagen Wheel aims to fulfil this belief. Firstly, it is a leap-frog technical solution for electric bikes: unlike other e-bikes, that are clunky, have external wiring, no regenerative braking and require the purchase of an entire bike, the Copenhagen Wheel is an easy to use, 'sexy', cost-competitive, self-contained unit that can be plugged into any bike. It has the power to traverse steep hills, can collect energy from braking and has batteries that last the average commuter a week between charges. Its smart on-board torque-sensors detect how much effort your pedalling with, and matches that effort level or lets you choose how much or how little assistance you desire.

Secondly, with the benefit of some cheap electronics and a few small sensors, the Copenhagen Wheel is much more than simply a transportation alternative. It is a new type of smart-device that - when networked -has the power to create a much greater environmental impact on urban policies, infrastructure planning and transportation habits around the world. Join us in helping to make the Copenhagen Wheel an intrinsic part of urban mobility in a city near you!



← The cyclists position amongst friends

← The cyclists community and key challenges and goals

Image: Concept of what the Green Miles on-line web interface might look like



**THE
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