



Creative Partnerships for Solar Micro-Mobility and Resilient Placemaking

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Abstract

This paper presents an overview of creative partnerships that meld solar mobility and placemaking to yield adaptive solutions for resilient communities working to reduce their carbon emissions. As cities and universities plan for the challenges of the 21st century they must incorporate new forms of multifaceted sustainable energy and transportation services into their climate resiliency plan. Rethinking on a massive scale is required to change global energy consumption within the next 10 years to meet the goals set by the [Paris Agreement](#). *Could micro-mobility services and flexible infrastructure help cities and universities reshape the land they have previously dedicated to the automobile?* Transportation leaders project that future mobility options will focus on multi-model services and not a product (private vehicle). Mobility innovators are launching shared and on-demand electric vehicle services that connect with public transit and cyclist infrastructure. San Francisco based Sol Design Lab has piloted off grid solar charging stations for electric bicycles with cities like San Jose, CA and Austin, TX and campuses like Stanford University and The University of California Davis. User experience and research related to rapid changes in mobility and energy, local and national commitments to the [UN's](#) Sustainable Development Goals and public space design practices demand that we rethink how to shape our cities and embrace micro-mobility infrastructure.

Keywords: *solar charging station; micro-mobility; resilient cities; climate change; woonerf*

1. Introduction

This paper explores the potential for new micro mobility infrastructure in turning outdated parking spaces into car free bike lanes with supporting solar charging stations that connected to public transit hubs and provide shelter from the weather. *What role should cities play in supporting micro-mobility regulation processes to help reshape their sustainable transportation and energy infrastructure?* Ride-hailing services like Uber and Lyft are investing in urban electric bicycle share systems because they see 2-5 miles trips being done faster and cheaper on two wheels. Recent studies are debating if ride-hailing services like Uber and Lyft are increasing traffic congestion and reducing public transit ridership in cities like [New York](#) and San Francisco. Expanding micro-mobility services are proving to be cheaper and more convenient than car ownership for a range of people. New free floating elective bicycle and scooter startups like Lime Bike, Jump Bike, Scoot, Bird and Skip have exploded in

popularity with \$1-\$3 rides in cities like San Francisco, Barcelona, Austin, Santa Monica, Seattle and beyond. Cities are now faced with navigating new permitting process, parking regulations, theft and a need for more light wheeled vehicle lanes and charging infrastructure. San Francisco based Scoot Network has prioritized safety by providing electric scooter driver safety trainings and helmets to their members. Currently, vans pick up most free floating electric bicycles and scooters for overnight charging and early morning redistribution. Electric scooter startups like [Bird](#) offer user incentives for home charging (Bird catching) inadvertently creating a nuisance in student dorm buildings at the University of California Berkeley. *Could new solar powered micro-mobility infrastructure play a role in eliminating the need for circulating vans and still provide green job opportunities?*

Aarion Marwhall of [WIRED](#) writes “In 2016, [the average Uber trip](#) in San Francisco was around 5 miles; in Boston, about 4.5; Chicago, around 5.5. E-bike-share has its eyes on the shorter trips—journeys that are too far to walk, but stay within the urban core. Jump Bikes says its average ride in DC and San Francisco is around 3 miles.” Marwhall also points out that San Francisco’s traffic filled streets average 12.2 mph and that Jump’s pedal assist electric bikes can reach 20 mph and be a much faster and enjoyable trip.

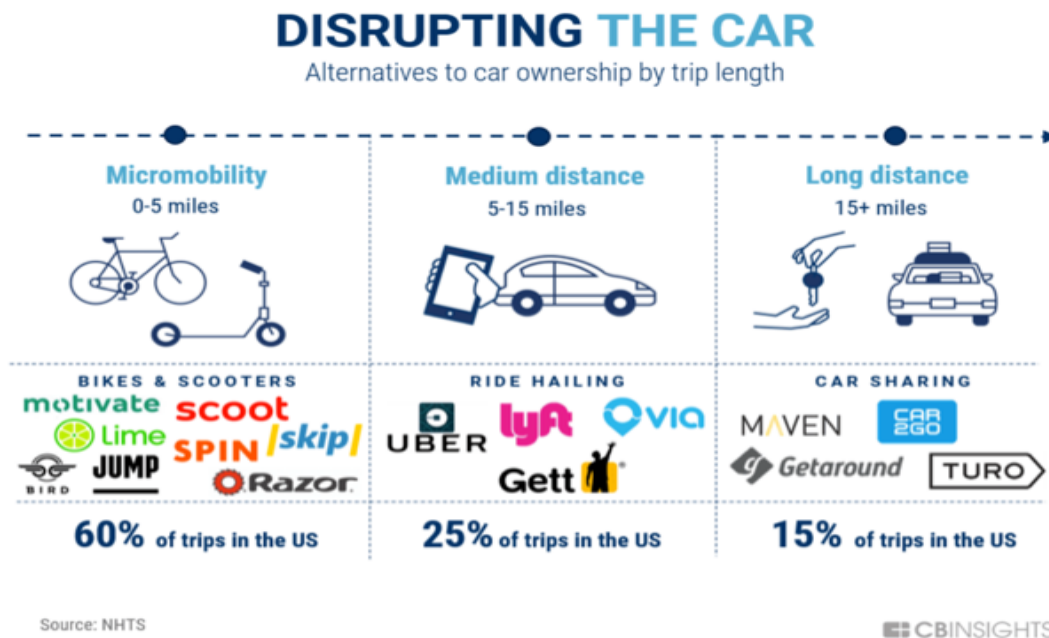


Figure 1. (a) Disrupting the Car graphic (b) Image: NHTS [CBInsights](#)

Adele Peters of [Fast Company](#) argues that major cities in the United States have allocated too much public and private space to parking and highways. “Americans have been [driving less over the last decade, especially in cities](#), and as ride-hailing increases—and eventually self-driving cars—even fewer people will own cars. The vast urban area now devoted to car storage could be put to higher use. In Seattle, which is in dire need of new affordable housing, 40% of the land area is currently used for parking.” In 2014, Seattle piloted a woonerf (Dutch for living street to reduce traffic) that is designed to have pedestrians, cyclists, and cars share four blocks around Bell Street Park. “While the design allows for some parking spots, it’s mainly divided into a circuit board of ped zones along the side of the street that occasionally jut out into a shared ped-and-cars zone, creating eddies where people can gather around food trucks, gardens, and play equipment” writes Josh Feit of [Seattle Met](#). Cities now have the opportunity to reshape valuable urban space dedicated to the automobile into multipurpose resilient infrastructure such as electric vehicle charging, park, [tiny forests](#), wetlands, flood control bike lane levels, affordable housing, solar farms, public transit and emergency community support centers.



Figure 2. (a) Bell Street Park, Seattle, Washington **(b)** Image: SVR Design

Figure 3. (a) Ohboy Hotell, Malmö, Sweden **(b)** Image: Peter Carlsson

In the city of Malmö, Sweden where 30% of its residents are cyclists they have just opened the [Cykelhuset](#) (bike house) and Ohboy Hotell for cyclists offering secure bike parking and cargo bike elevators. There is a growing opportunity for architects and developers to shift their focus on providing expensive residential car parking to shift to only providing bicycle infrastructure. Fewer and fewer young people are buying [cars](#) and prefer to live in smaller apartments connected to multimodal transit options, active cities and cycling.

2. Electric Vehicle Solar Charging Infrastructure

Solar micro-mobility includes the development and implementation of solar charging stations for two-wheeled electric vehicles such as personal or shared electric bicycle or scooter services. The [Electric Drive Solar Kiosk](#) designed by [Sol Design Lab](#) is an innovative combination of solar technology, energy storage, public art and civic place making. Sol Design Lab started in 2009 by partnering with arts and music festivals like South by Southwest, Coachella, Roskilde, and The ZER01 San Jose Biennial to engage the public in free solar energy. Austin Energy, a public utility has developed a showcase for electric transportation and shared services like bike and car share in the heart of downtown Austin Seaholm EcoDistrict called [The Electric Drive](#). This future innovation hub features DC fast charging for charging in minutes as opposed to hours, as well as Charge Points level 2 charging for customers to use while they explore the EcoDistrict. The solar powered kiosk includes charging for electric bicycles, scooters and wheelchairs plus mobile electronics. The structure provides shaded seating and emergency power during blackouts. Recently, Austin Energy received \$1.6 million from Texas Commission on Environmental Quality to expand their EV charging infrastructure based on the success and popularity of the Electric Drive pilot program that won the Austin Green Award in 2017. During the SXSW 2018 Technology and Music festival electric [pedicabs](#) charged at the Electric Drive Solar Kiosk proving that solar mobility is growing in popularity and efficiency.



Figure 4. (a) The Electric Drive Solar Kiosk, Austin, TX **(b)** Image: Sol Design Lab

“Austin is a community that puts a premium on clean air, renewable energy, and, increasingly, electric vehicles. The Austin City Council has set ambitious goals to reduce the City’s carbon footprint. We’ve expanded our EV charging infrastructure and we’ve increased our supply of renewable energy.” said [Jackie Sargent](#), Austin Energy General Manager.

Currently, Sol Design Lab is collaborating with the University of California Davis Center for Transportation Studies and a grant from the [National Center for Sustainable Transportation](#) to install a solar charging station in the West Village Square Park in Davis, CA. This sunny location is currently a Jump Bike redistribution site and will include an electric bicycle and wheelchair charging with shaded companion seating. This project will feature air sensors from the grassroots group [PurpleAir](#) that use a colored air quality index on a real-time website map. Northern California has experienced hazardous air quality in the range of 300-400 AQI during the devastating Camp Fire in November 2018.

3. Regenerative Placemaking



Figure 5. (a) Pickleweed Park and proposed community resiliency center that would withstand flooding in San Rafael, CA **(b)** Image: [Elevate San Rafael](#) proposal by Team Bionic.

Figure 6. (a) A proposed bike lane levee on city owned land would double as flood protection for the majority of at-risk housing and businesses. **(b)** Image: [Elevate San Rafael](#) proposal by Team Bionic.

Multi-disciplinary design teams with participant firms like WXY and the Studio for Urban Projects have envisioned raised light wheel trails that could double as coastal levees that would help to mitigate flooding in vulnerable neighborhoods built above infilled wetlands. This work can be seen as part of the 2018 Bay Area Resilient by Design Challenge from Team Bionic for San Rafael, CA. The team has also proposed new resilient park infrastructure to double as emergency gathering points in times of flooding, earthquakes or wildfire air pollution. Team Public Sediment from the Bay Area Resilient by Design Challenge proposed to increase sediment supplies to strengthen the Bay Area's ecological infrastructure- its marshes, mudflats, and coastal edges.

4. Conclusion

We know that without extreme behavior change that would eliminate greenhouse gas emissions from cars, power plants and factories that we will not be able to stay below 1.5 degrees Celsius above pre-industrial levels as set the by [Paris Agreement](#). Matt Simon of [WIRED](#) writes “At 2 degrees, 10 million more people will be at risk of rising seas than at 1.5 degrees. That extra half a degree also means significantly larger populations will be exposed to water shortages. You're looking at an ever greater loss of biodiversity, worsening storms, ever more people thrust into poverty, and relentlessly shrinking yields for essential crops like rice and maize and wheat.”

Risk taking micro-mobility services are emerging around the world with growing popularity offering affordable last mile rides from public transit hubs and urban centers. Solar charging infrastructure could have a powerful impact on this new form of mobility. Cities willing to work collaboratively with climate innovators, business leaders, researchers, regulators, and transit designers to phase out private gas vehicles will be the true climate leaders. If we embrace the opportunity to reshape the land currently dedicated to the automobile we can strengthen the resiliency infrastructure needed in this urgent transition period. Implementing sustainable mobility systems thus creating green job opportunities is an important step in meeting the challenges of the 21st century head on. *How can cities keep up with the speed of this growing industry?* Regina Clewlow, CEO of [populus.ai](#) argues that we need private mobility data to manage new mobility services. “With data, cities can measure progress towards public goals such as reducing congestion, expanding equitable access to transportation, and improving safety. Without data, it is unclear which direction we are headed.” Electric bicycle products like the Copenhagen Wheel log its miles traveled with an app. Electric bicycle shops record the number of miles their clients get out of each battery after each servicing. *How can we make the data on lighter and human powered bicycles more openly available?* Mobility regulators must work collaboratively with designers, startups, researchers, vendors, city managers, and utilities to give people as many flexible options as possible to reduce private vehicle ownership and re-envision our streets. As micro mobility grows in popularity, there is an exciting future for adaptable green infrastructure and regenerative placemaking that will meet the needs of different urban climates, terrains and communities.

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Conflict of Interest

The author declares no conflict of interest.

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