

David A. King and Kevin J. Krizek

Viewpoint

Visioning transport futures through windows of opportunity: changing streets and human-scaled networks

The COVID-19 pandemic helped reveal much-needed insights about how people view cities and interact with public space. City leaders, planners and even the public realised how much space in streets is devoted to moving automobiles at the expense of walking and bicycling. Responses to the pandemic, furthermore, helped people become aware of how the character of streets can change quickly. For more than a century, street planning has primarily focused on moving automobiles. Yet this auto-centric focus is traced to well-documented negative impacts on climate change, safety and social equity – all of which were severe problems before the pandemic and will persist afterwards unless strong forces for change are enacted. These are compelling reasons to prioritise other forms of travel forthwith.

Streets are the workhorses of a city's transport system. The processes guiding their design and management are in dire need of modernisation. Whatever innovations in mobility or vehicles come next will be constrained by the asphalt already laid *and* by known vehicle types – planners can't set guidelines for something that doesn't exist. Transport modes that are currently used can provide needed levels of mobility and they can be scaled up immediately. To this end, we argue that prioritising bicycle and comparable transport modes offers a feasible and immediate solution, while maintaining high levels of accessibility (King and Krizek, 2020). City planners should help set new rules to guide how to use street space based on bicycle characteristics: smaller vehicles, reasonable speeds for mixed traffic, and quiet. Then vehicle design can adapt to principles of good city building as opposed to the other way around; think in terms of neighbourhood electric vehicles or e-bikes.

We argue that there is an urgency to act now, being on the brink of a once-in-a-century occurrence where street use is changing potentially at the same time as new vehicle types. We view the condition of the pandemic as one capable of spurring rapid change to fix long-standing problems with urban transport. These problems existed prior to the pandemic and will still need to be fixed once it is over. Planners, elected officials and researchers should seize the moment to accelerate aggressive reform to manage and design streets by focusing efforts to quickly build human-scaled transport networks.

David A. King is an Assistant Professor, Arizona State University, Lattie F. Coor Hall, PO Box 875302, Tempe, Arizona 85287-5302, United States; Kevin J. Krizek is a Professor, University of Colorado at Boulder, Environmental Design and Environmental Studies Program, 1060 18th St, Boulder, CO 80309, Boulder, Colorado 80309-0401, United States; email: david.a.king@asu.edu; kevin.krizek@colorado.edu

Reset expectations of streets: to what?

The idea that streets need to alter their character away from automobiles is hardly new. Yet changing streets to prioritise bicycles, rather than cars, is a notion often deemed too extreme for elected leaders and citizenry alike. Streets barren of automobiles in 2020 due to the pandemic provided a first step to that extreme option. A concept typically considered to be outside the range of acceptable outcomes – what political economists refer to as the ‘Overton window’ – has shifted, thereby expanding what is possible. Expectations for how streets should be used were reshaped, almost overnight, both to improve health outcomes and provide economic opportunity. As the economy recovers following the immediacy of the pandemic, however, the window may shift back to transport conditions prior to the pandemic – if, that is, city leaders should fail to act to solidify other futures.

Elected officials, practitioners, advocates and researchers seek ways for people to easily get around using vehicles that are environmentally, economically and socially sound. First, these vehicles should be quiet and emit as little carbon as possible. Next, they should prioritise the simplest effective solution with the fewest negative consequences. And third, many but not all technical experts and policy advocates in this area argue that vehicles should operate at speeds that allow space to be shared between many users doing many things and be space-efficient in their own right.

Bicycles meet all of these characteristics. Start with speed of travel. Not too fast to mix with people not bicycling, yet not too slow so residents can’t reach where they seek to go quickly. In 20 minutes, even a modestly abled person can cycle 7 kilometres across town, further or faster when aided by electric propulsion. Bicycles provide for rhythm of mobility comfortable for many, and safer for all. Average bicycling speed allows for eye contact with passers-by and, if needed, the ability to stop quickly and avoid conflict. The bicycle’s core apparatus, a crankset holding together two wheels and triangle of piping, ensures that humans retain powers of balance, navigation and propulsion rather than fully surrendering them to a machine.

Furthermore, in space-confined cities, bicycles are an efficient alternative. Four square metres while travelling around town is plenty for a cyclist; most cyclists are comfortable with far less. When a Ford Focus, a modest-sized car, is driven around town, it requires 40 square metres of asphalt – a tenfold increase over that needed for a bicycle. A bicycle’s dual characteristics of speed and human-centricity allow it to share space with people and other bicycles in ways that bridge the competing needs of transport for residents with the forces of modern cities. Beyond these characteristics, there is an established and still growing research base on bicycling’s benefits (Pucher and Buehler, 2017) which help solidify its value.¹

1 Relying on the Web of Science, research manuscripts addressing bicycling increased thirteenfold from 1991–1995 to 2011–2016, including systematic and detailed catalogs of the emerging knowledge base.

While we stress the value of bicycles as an object for planning, in the traditional or conventional sense of the definition, our core message underscores the value of other vehicles imbued with ‘bicycle-like’ characteristics: modest speed, human scale, environmental friendliness. Recent transport innovations, which vary widely by geography and culture, can rally around bicycling – writ large – to address an urgent situation. Other small vehicles such as electric bicycles, scooters, modified golf carts or small single-seater cars that share characteristics of bicycles are also being developed; using these devices could provide mobility needs in inclement weather or for those with disabilities. All such variations can coexist with other street users should the rules of the road be guided by bicycles as the vehicle of choice.

Bicycling’s feasibility relative to settlement patterns

We argue that bicycles should be used to guide future street planning *and also* that ample evidence supports bicycling’s potential to offer a mobility remedy with immediate benefits, and one that will improve given technological advancements. Our thinking is foundationally tied to understanding the typical distance for most bicycle trips relative to the patterns of settlement in most urban areas. Analysing data from bicycling trips in cities from China to the US, India and the Netherlands reveals a demand curve which is the same across each setting (Arasan et al., 1994; Iacono et al., 2008; Zhang et al., 2014; Harms and Kansen, 2018). One-quarter of bicycle trips are less than 1 kilometre and bicycling’s use drops quickly with initial gains in distance. But, importantly, 80 per cent of all bicycle trips are less than 6.5 kilometres and the majority of them fall between 1.5 and 6.5 kilometres.

Match this range with the short distances automobiles are typically driven in urban areas. In US cities, for example, every other time a driver gets in a car they travel less than 6.5 kilometres (Krizek and McGuckin, 2019). Cars and bikes are time-competitive in this distance band and, sometimes, bicycling is quicker. Even in cities such as Tempe, Arizona (US), a typical suburb in a sprawling region, 80 per cent of the services people go to daily are easily reachable within 6.5 kilometres (Capasso Da Silva et al., 2020). Coarsely speaking, the settlement patterns in most urban areas *could* be amenable to using traditional bicycles for the majority of trips. Obviously, the majority of trips has a glaring weakness in that it doesn’t include commuting, which in the US is a bit less than 20 per cent of trips. For commuting there may be alternatives, however, including mass transit, which needs its own protected space to operate smoothly, and telework, which has increased dramatically during the pandemic and will likely remain elevated even as people return to offices. These solutions won’t work for everyone, but perhaps will work for enough to dampen overall auto traffic.

Ultimately, the problem most people have with using a bicycle isn’t distance or time, but the stress imposed by sharing space with cars and trucks. For cyclists, using

streets to get where they need to go requires, at some point, exposing themselves to high-stress links and nodes in the network with fast-moving automobiles. These instances pose threatening safety risks and are deterrents to cycling for most people. Gauging cycling accessibility to employment in the fifty largest metropolitan areas in the US documents how, using any street (low- or high-stress), more than 15,000 jobs are available on average within a 20-minute bicycle trip. Using only a low-stress street network, a cyclist can reach only one-third of those jobs (Owen and Murphy, 2019).² The lack of a human-scaled transport network is mostly what stands in the way of the future we envision.

Accelerating network development

Many cities around the globe responded to the COVID-19 pandemic by installing temporary tactical changes to streets, like opening select segments only to bicycles and people outside cars (Combs, 2020). While a good start, such initiatives, even if made permanent, represent minuscule portions of total street space. They lack the continuity of a transport system that residents demand for safer, more resilient and economically sound cities. Simply put, these actions are too incremental to amount to big change. Daniel Burnham would have argued these are too-small plans as they have no magic. Piecemeal bicycle facilities are particularly aggravated in US cities whose bicycle planning infrastructure lags considerably relative to many global or European counterparts. There are too many instances where bicycle facilities, should they exist, suddenly vanish. City leaders, working with planners, can improve existing efforts by taking advantage of the window that has been opened by the pandemic to rapidly build a new-generation, human-scaled transport network.

We prescribe recommendations for planners immediately, in the short and the long term. In the short term, planners should support initiatives, already existing in many cities, to use existing street space differently – as conduits for walking and bicycling. Planners can help demonstrate to the public how these spaces allow people to access activity centres while avoiding automobiles and transit services.

In the longer term, it is imperative that planners lead the charge to aggressively and permanently reallocate street space in efforts to form a network favouring smaller vehicles that encourages innovation. Recent efforts from some municipalities (e.g. London) are headed in this direction. Essential to consider here is that components of this agenda apply to both links (e.g. street segments) and nodes (e.g. junctions, intersections). Networks of bicycles lanes, where everything people want is safely and swiftly

2 The average number of jobs reachable in twenty minutes via any street for the fifty largest US cities is 15,191; using only low-stress streets, 5,364. The differences were less in Oklahoma City, Philadelphia, Richmond and Louisville, which revealed less than 50 per cent difference; the biggest differences were in Tampa Bay, Columbus and Las Vegas.

accessible, are far more valuable than a collection of unconnected bicycle facilities.

All transport networks develop in ways that resemble how innovations diffuse (Rogers, 2010). An S-shaped curve progresses through a nascent period to quick acceleration and eventually maturation. Any growth stems from the positive externalities that are generated when any component in the system is improved. Upgrades make that part of the network more valuable to existing and potential users; then, additional users spur demand for more upgrades, thereby inviting more users. Triggering this positive feedback loop is a critical step to accelerate the point to take-off – the location of the curve with the greatest inflection relative to the initial growth rate (Levinson and Krizek, 2018). The broken x-axis in Figure 1 indicates, over past decades, the limitations of and slow progress toward incremental bicycle planning efforts in reaching the inflection point.

Hence, the important short-term action is to support links and nodes that have high potential for attracting bicycle-like travel in order to ensure that network growth extends beyond the inflection point and continues on the S-curve. Strategically planting seeds by targeting priority places where many short trips start or stop, such as those less than 6.5 kilometres, and repurposing those select links and nodes, will accomplish this. Such locations vary by city but are generally around schools, campus environments, neighbourhood retail shops and the first and last stages of trunk transit services. Such criteria can be merged with others such as streets that don't carry much automobile traffic. Enacting bicycle-friendly streets at these spots will lead to mutually supportive results because any change to one part of the network has multiplicative effects – a fundamental principle that helps networks quickly grow.

A parallel consideration is that the human-scaled networks that have been built under COVID-19 responses need to be maintained in ways that preserve characteristics that define good and useful networks, which are only as strong as their weakest nodes. Should critical nodes or intersections be dismantled, then gains in cycling, walking and safety will fail to hold. The mindset approach we urge is to strategically think about networks *as a whole*, rather than a set of interconnected facilities, and to build them quickly.

The longer-term action item is to spearhead street-reform initiatives that prioritise, not only support, the qualities of bicycles as the vehicle of choice. Important here is that street space design can influence vehicle types rather than the other way around. City leaders can work to influence the types of vehicle designs to be invented, which is reversed from current processes (i.e. the auto industry currently sets standards of vehicle types which cities must then physically accommodate). The days of building more streets and parking for ever larger vehicles must end. New types of vehicles can include climate controls for rain, snow and heat, while ensuring that access for all means that no one with disabilities is excluded. Electrification, 3D printing, and other technologies mean that cities can continue to work with transport providers directly

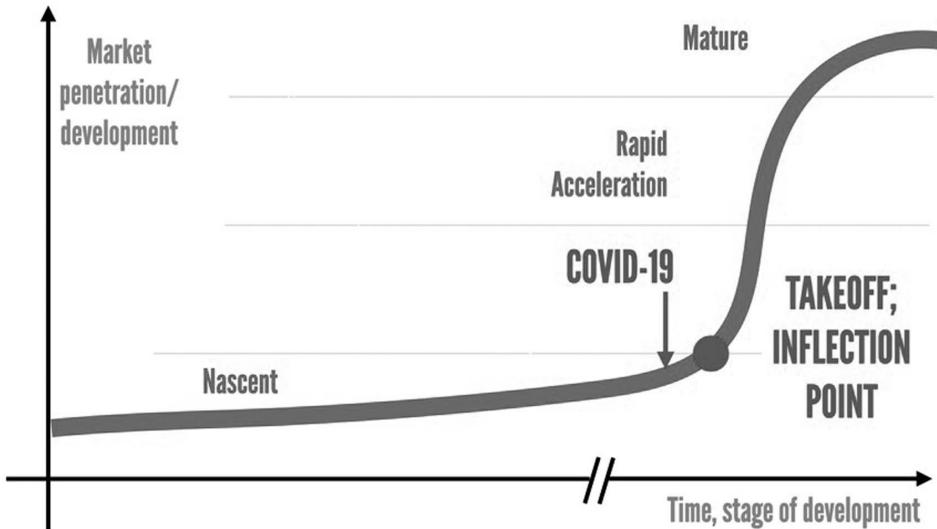


Figure 1 Potential S-curve for developing a human-scaled transport network during COVID-19
Source: Kevin J. Krizek

concerning what works for their cities, which continues negotiations that started with regard to ride hailing, bike sharing and other recent innovations. City leaders and planners can also take actions on what they have the legal basis to manage, which is space in the streets (Glaser et al., 2020). We do not dismiss the hardened challenges of street reform (Hess, 2009); we simply proffer a values *and* an evidence-driven framework to strive for in moving away from goals of providing space to support the hegemony of automobiles and maximising what people can do without automobiles.

With so much still uncertain, but so much potential, ushering in bicycles and bicycle-like inventions now aids overcoming the slow evolutionary approaches (Bertolini, 2007) which have plagued transport reform in the past. Planners of all kinds have a role to play in assuming the mantle of changing how our streets are used. All of what we suggest can happen imminently owing to the context of dramatic reductions in travel due to the coronavirus. But this window won't stay open forever. Now is *not* the time for city planners to be beholden to city bureaucracies or, worse yet, to fall to the sword of automobile street standards. *Now* is the time to make plans that stir people's blood.

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