



Cycling towards a more sustainable transport future

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EDITORIAL



Cycling towards a more sustainable transport future

As argued in our 2008 article “Making Cycling Irresistible”, cycling is probably the most sustainable urban transport mode, feasible not only for short trips but also for medium-distance trips too long to cover by walking (Pucher & Buehler, 2008). Cycling causes virtually no environmental damage, promotes health through physical activity, takes up little space and is economical, both in direct user costs and public infrastructure costs. In short, cycling is environmentally, socially and economically sustainable.

Until recent decades, however, cycling was largely neglected by most European, North American and Australian transport planners and academics, not even considered a legitimate mode of transport, and thus excluded from most travel surveys and studies. Fortunately, that has changed. As shown in Figure 1, there has been a dramatic increase in published research on cycling over recent decades. The Transportation Research International Documentation (TRID) index of transport publications (including both refereed and non-refereed articles, reports and books) shows an increase from an average of 197 cycling-related publications per year in 1991–1995 to 610 per year in 2011–2016 (3-fold growth). According to the Web of Science, the average annual number of peer-reviewed cycling articles (in the field of transport) rose from only 22 per year during the period 1991–1995 to 284 per year during the period 2011–2016 (13-fold growth). Thus, growth in cycling literature has been especially fast in peer-reviewed scientific journals. That is also confirmed by the sharp increase in the average annual number of papers submitted for peer review to the bicycle committee of the Transportation Research Board (TRB): from 15 per year in 2001–2005 to 101 per year in 2011–2016 (sevenfold growth).

Similarly, in the two decades from 1990 to 2009, Transport Reviews published a total of only 5 articles related to cycling (1% of 534 total articles), compared to 22 articles in the 7-year period 2010–2016 (10% of 212 total articles). The average annual number of cycling articles in Transport Reviews rose from 0.25 to 3.14 per year between the two time periods. That 13-fold increase is similar to the 13-fold increase reported by the Web of Science between the two time periods 1991–1995 and 2011–2016. Indeed, over the past 10 years (2007–2016), 3 of the 10 most cited Transport Review articles have been about cycling (Web of Science, 2017).

In addition to booming academic research on cycling, there has been a proliferation of professional and academic conferences on cycling; increasingly influential, widespread and interconnected local, state, national and international cycling organisations; Internet sites devoted to sharing knowledge about best practices; various other information-sharing forums, including social media. The growing worldwide network of researchers, planners, advocates, and cyclists has inspired, enabled and actively promoted cycling.

Information exchange about the best ways to increase cycling has been especially important. The first and most extensive efforts to promote more and safer cycling were in Western Europe, especially in the Netherlands, Denmark and Germany, starting in the 1970s and continuing today (Pucher & Buehler, 2008). The successful cycling infrastructure,

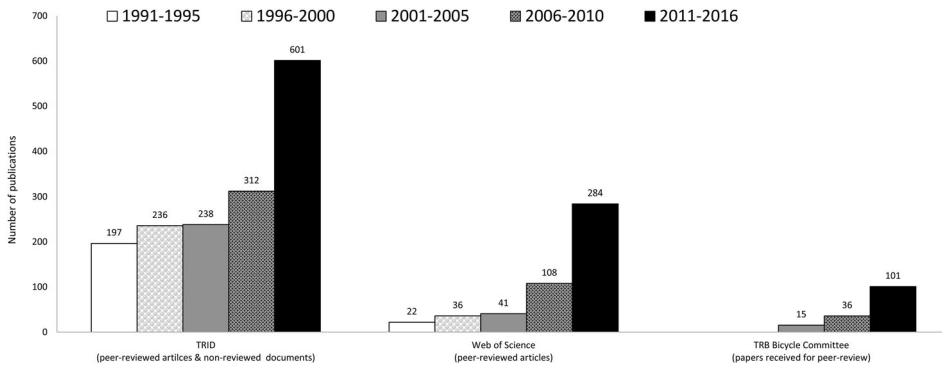


Figure 1. Average annual number of publications about cycling by five-year periods, 1991–2016. Sources: TRB Committee for Bicycle Transportation, (2017); TRID, (2017); Web of Science, (2017).

Note: These numbers only include publications about cycling in the transport literature, as opposed to trade magazines and industry reports. For TRID and Web of Science, the search terms used were “bicycling”, “cycling”, “bicycle” or “bike”. All TRB paper submissions were specifically on the topic of bicycle transportation.

programmes and policies in Dutch, Danish and German cities were adopted in many other European cities during the 1980s and 1990s, as well as in North American and Australian cities, especially since 2000 (Pucher & Buehler, 2016; Pucher, Buehler, & Seinen, 2011; Pucher, Garrard, & Greaves, 2011). The result has been impressive growth in cycling.

Cycling boom in large cities of Europe and the Americas

As shown in Figure 2, the bike shares of trips in 19 major cities of Western Europe, North America and South America have risen sharply in recent decades. The most dramatic growth has been in cities where cycling had not previously been a regular means of daily travel. In most of the North American cities shown, for example, cycling mode share tripled or quadrupled between 1990 and 2015. Paris, London and Vienna, all without historical cycling cultures, roughly tripled cycling. The most rapid growth among the 19 cities was in Sevilla (Spain), Bogota (Colombia), Buenos Aires (Argentina) and Portland (Oregon) – all of which increased cycling by more than six-fold. Equally impressive are the increases in Amsterdam and Copenhagen, where large increases were in addition to already high cycling levels.

Improvement in cycling safety

One of the main deterrents to more cycling is the perceived danger of cycling on roadways with motor vehicle traffic. Thus, one of the most important approaches to increasing cycling – especially among vulnerable and risk-averse population groups – has been to provide off-road bikeways and mixed-use paths (shared with pedestrians) and protected on-road cycling facilities, separated from motor vehicles by physical barriers or buffer zones. That has required large investment in expanded and improved cycling infrastructure.

The available evidence indicates that such efforts have succeeded in improving overall cycling safety. Annual traffic fatality data provided by the Organisation for Economic Cooperation and Development (OECD) show that from 1990 to 2014, cycling fatalities per 100,000 inhabitants fell by 30% in the U.S.A., 46% in Australia, 47% in Japan, 49% in Canada, 53% in the U.K., 56% in the Netherlands and Germany, 64% in France and Spain and 68% in Denmark and Sweden (Buehler & Pucher, 2017).

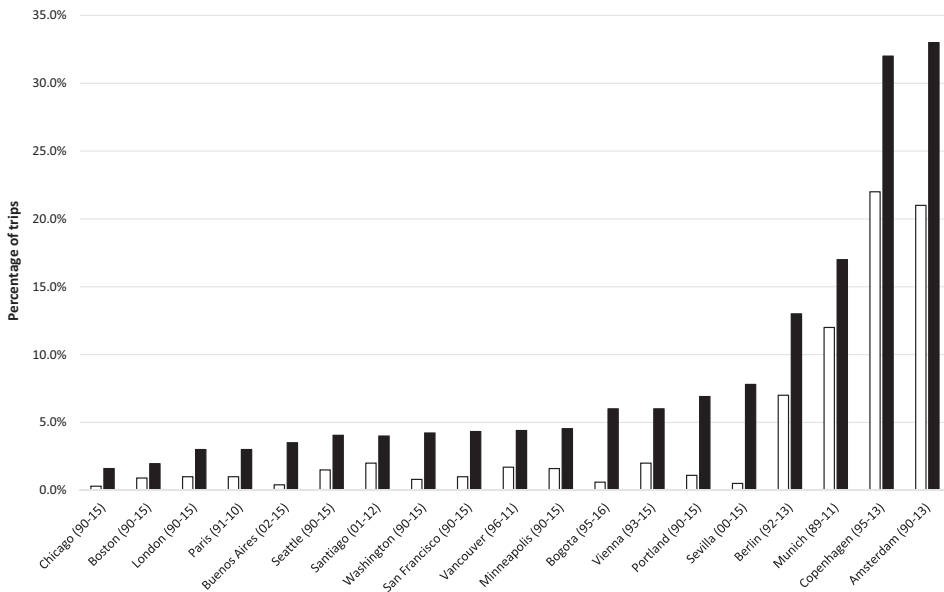


Figure 2. Increasing bike mode shares in large cities of Europe and the Americas, 1990–2015. Sources: Based on travel surveys conducted for each city.

Those per-capita fatality rates do not control for changing exposure rates over time. But even cyclist fatality rates per 100 million kilometres cycled fell from 2000 to 2010 by roughly a third in the U.S.A., U.K., Germany and the Netherlands (Buehler & Pucher, 2017). Similarly, cyclist fatalities and serious injuries (requiring overnight hospitalisation) per 100,000 bike trips fell from 2000 to 2015 by 79% in Minneapolis, by 72% in New York City and Portland, Oregon, and by 50% in Washington, DC (Pucher & Buehler, 2016).

Policies needed to promote more and safer cycling

Mounting scientific evidence from cities throughout the world demonstrates the crucial need to provide physically separated, protected cycling facilities on major roads with high-volume and fast-moving vehicular traffic (Buehler & Dill, 2016; Furth, 2012). The largest (and quickest) increases in cycling levels shown in Figure 2 were in Bogota and Sevilla, both of which installed integrated networks of over 300 km of protected cycle tracks within just a few years, leading to a bicycling boom in both cities. Many studies have found that such protected facilities are especially important for women, children and seniors, but also for anyone who is risk-averse or feels vulnerable cycling on roads with motor vehicles. The expansion, improvement and integration of such protected cycling facilities are proven ways to increase cycling levels, improve cycling safety and get more women, children and seniors on bikes.

Cycle superhighways are a promising recent development. Such express bike routes increase the speed and safety of long-distance cycling by providing separate bike paths parallel to major roads, with minimal road crossings and sometimes with a green wave of synchronised traffic signals at intersections timed for faster cycling. Cycle superhighways are proving to be increasingly popular and necessary to serve the longer distance bike commutes in metropolitan areas, which are spreading out not only in North America and Australia, but in Europe as

well. Dozens of European cities already have cycling superhighways of various kinds, with many more cities planning them.

Comprehensive traffic calming of residential streets has great potential to increase cycling, as well as walking, in local neighbourhoods. Traffic-calmed streets have legal speed limits of 30 km/h or less, which are enforced by roadway redesign featuring fewer traffic lanes, curves (chicanes), speed humps, raised intersections and crosswalks, and dead-ends (diverters) for cars and trucks to discourage through motor vehicle traffic, but permit convenient passages and short-cuts for cyclists and pedestrians. Several studies demonstrate the much greater safety of traffic-calmed neighbourhood streets, especially for children.

Traffic calming was developed in the Netherlands, which still leads Europe, with over 75% of its urban roads traffic-calmed at 30 km/h or less (SWOV, 2017). Traffic calming has spread to many other cities in Europe as well: for example, 85% of streets in Munich, 78% in Berlin, 75% in Vienna, 63% in Basel, 54% in Zurich and 50% in Hamburg (Buehler et al, 2017). Traffic-calmed streets generally have so little traffic at such slow speeds that they become safe and convenient cycling routes, even without any special cycling infrastructure such as bike lanes or paths.

Dutch, German, Swiss and Austrian cities have demonstrated how effective traffic calming can be (Buehler et al, 2017). Yet cities in most other European countries, and even more so in the U.S.A., Canada and Australia, have resisted traffic calming, except for a few isolated neighbourhoods (Pucher et al, 2011). Comprehensive traffic calming of residential neighbourhoods in many more cities and more countries is essential, not only to promote cycling but also to improve overall traffic safety, reduce noise and congestion on local streets, divert through traffic out of residential neighbourhoods, and enhance the overall attractiveness and livability of urban neighbourhoods.

Future of cycling

Cycling will increase even more in the coming years due to two recent innovations. Bike sharing has been around in various forms for decades, but it is now growing at truly extraordinary rates. From the first large-scale automated system in Lyon, France in 2005 (1500 bikes), bike sharing expanded to 1286 systems in the world as of May 2017, with a total of 3,415,750 bikes (Fishman, 2016; Meddin, 2017). Bike sharing greatly increases the availability of bikes, the flexibility of routing, and access to and from public transport. Bike-sharing systems are continually advancing technologically, thus enabling their future integration into comprehensive mobility packages, including public transport, car sharing and Uber-like taxi services, all of which provide alternatives to the private car.

The other dramatic development has been the rapid adoption of electric-assist bikes (E-bikes), first in China and now in northern Europe. The total number of E-bikes rose from only 290,000 in 2000 to 9.9 million in 2005, 30.7 million in 2010 and 35.3 million in 2016 (Campbell, Cherry, Ryerson, & Yang, 2016). Over 90% of those E-bikes are in China, but the number of E-bikes in northern Europe has been rising sharply: from only 98,000 in 2006 to 1.5 million in 2016, a 15-fold increase in ten years (CONEBI, 2016). In both the Netherlands and Belgium, E-bikes accounted for 30% of all bike sales in 2016. In Germany, Austria and Switzerland, they accounted for 10–15% of all bike sales.

E-bikes provide a more competitive alternative to the private car, as they are faster than mechanical bikes, thus facilitating cycling over longer distances. They also make cycling easier in hilly terrains and with heavy loads. Especially in urban areas with many intersections, E-bikes assist cyclists when having to start up again after waiting at stop signs and traffic lights. Seniors and long-distance work commuters might seem like the most likely

customers for E-bikes. However, the experts we interviewed (via email) in the Netherlands and Belgium emphasised the increasing popularity of E-bikes among all groups and for various trip purposes. To some extent, E-bikes are substituting for mechanical cycling, but they also open up new markets that did not previously exist, getting people on bikes who had not previously cycled. Moreover, studies show that E-bikes are far more energy-efficient and less polluting than motorcycles and cars; so they contribute to overall transport sustainability.

Although less dramatic than the stunning growth in bike sharing and E-bikes, real-time information technology for cycling has been steadily improving, providing better guidance on optimal routes, parking locations, bike-sharing locations and availability, and public transport stops.

Perhaps most promising for the future of cycling is the documented shift in cultural attitudes and preferences towards less reliance on the automobile and increased demand for living in mixed-use, compact developments in or near the city centre (Goodwin & van Dender, 2013). Many city centres in Europe and North America have experienced a revival and, in particular, the influx of new residents in their 20s and 30s who are more willing than their parents to walk, bike, and ride public transport. That cultural shift in locational and travel preferences is likely to facilitate further growth in cycling.

Disclosure statement

No potential conflict of interest was reported by the authors.

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