E.I.7. Bicycling

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Definition: The bicycle used to be described simply as a non-motorised two-wheeler, referred to then as slow mode, but today as active mode. Although mopeds are also two-wheelers, they are seen as a different mode. With the advent of electric two-wheelers, increasingly varying in shape and speed, it is technically and legally increasingly complex to name all the distinctions.

History: Although the rise of the bicycle and the car almost coincided in the late nineteenth century, the share of the bicycle was initially much higher. Bicycles increased accessibility in cities, especially for commuting, enabling further urban expansion. In European cities, cycling peaked between the 1920s and early 1960s. In the US, cycling peaked earlier, but was also more quickly replaced by the rise of the car. Thereafter, bicycle use declined sharply everywhere, although not equally: in the Netherlands, cycling remained an important daily travel mode (Oldenziel et al., 2016). China experienced a peak in the last decades of the twentieth century, followed by a decline and recently a revival in some cities (Zhang et al., 2014). A gradual recovery has been visible worldwide for several decades, especially in relatively compact cities. Global comparisons of current shares of bicycle use are incomplete. They show a few percent in Australia, the Americas, southern Europe and the UK. The share is higher in central and eastern Europe and is highest in northern European countries and parts of China. Nevertheless, even in countries with low bicycle use, cities with high aspirations and high bicycle use occur, partly thanks to bicycle-sharing schemes (Pucher & Buehler, 2012; Fishman, 2016).

Theory: Economic theory of travel behaviour considers transport as a derived demand, in which travel is a disutility that does not derive utility from itself, but from activity at the destination. Mode and destination choices are mainly dependent on travel time and money. Choices regarding cycling are more complex, as physical effort, and thus cycling distance, play a limiting role. Heinen et al. (2010) synthesised travel demand factors from existing literature, highlighting that while cycling tends to decline with longer trip distances, it increases near destinations, particularly in compact, mixed, built environments. Cyclists are notably sensitive to environmental conditions, especially weather (and seasons) and the natural environment (slopes). Perceptions of road safety, especially prevalent in car-centric cultures like the US and the UK, often serve as significant barriers to cycling uptake. Infrastructure determines the degree of separation between slow and motorised traffic (such as cycle lanes); intersections and traffic lights restrict fast flow for cyclists. Additionally, vulnerability to theft further complicates cycling. Psychological theories supplement economic perspectives by considering leisure activities, personal attitudes, social norms and employer expectations as contributors to cycling demand. These factors correlate with individual characteristics, such as gender, age, health, income and residential environment.

Conceptualisation: Travel behaviour is intricately intertwined with the built environment. As the built environment is more compact and mixed, car use decreases, public transport support and use increase, and distances to destinations are shorter, on average, making slow modes more attractive. This principle is articulated in the pursuit of compact urbanisation and tested by Cervero & Kockelman (1997) through the three Ds: density, diversity, and design. Cycling infrastructure has traditionally been based on separating slow and motorised traffic, either physically or with lines; Broach et al. (2012) found that cyclists value separated paths. A recent development is the bicycle street, where, although cars and bicycles share the road, bicycles are given priority (Rivera Olsson & Elldér, 2023). On a regional scale, express cycle lanes have been developed to bridge longer distances; they are wide, well-paved, and have a minimum of intersections. Speed pedelecs and mopeds are sometimes banned from cycle paths to ensure safety.

New developments: More innovation than ever is taking place around cycling. Technological advancements, including electrification, have given rise to a variety of bicycle-like vehicles, such as speed pedelecs, cargobikes, fatbikes, and scooters. Technological innovations in infrastructure include smart traffic lights and intelligent bicycle parking systems. New business models, such as bicycle sharing, lead to additional bicycle use where it was previously lacking (Fishman, 2016). E-bike trips are expected to

reduce driving, but in the Netherlands, they predominantly replace conventional cycling (De Haas et al., 2022).

Policy relevance: Climate and the need for sustainable cities have brought cycling into the spotlight of travellers and policy-makers (Pucher & Buehler, 2012). The emerging policy attention comes with both benefits and challenges. Cycling alleviates traffic congestion, reduces parking demand, and improves air quality. Yet, bicycle parking shortages in urban centres and transportation hubs also emerge. Moreover, in some metropolitan areas, congestion on cycle paths and conflicts with emerging bicycle-like modes increase stress (Teixeira et al., 2020). Although cyclists hardly cause danger to other road users, there are increasingly road casualties, partly one-sided. Exercise, such as walking and cycling, is seen as a cure for diseases of affluence, such as obesity and diabetes.

Application fields: In Europe, compact urbanisation received attention (even becoming a part of national policy in the Netherlands). The aim was to maintain compact, cohesive urban regions, with an explicit focus on short distances in favour of walking and cycling. In North America and Australia, New Urbanism and Smart Growth aim for compact and mixed-use, walkable neighbourhoods. Several Dutch cities have restricted car through-traffic, prioritising ample space for bicycle traffic, notably exemplified in the suburb of Houten (Teixeira et al., 2020). The concept of the 15-minute city advocates for essential amenities – living, working, supplying, caring, learning, and leisure – within a comfortable walking or cycling distance. A prerequisite for this is self-sufficient neighbourhoods, mixed land use, and bicycle-friendly infrastructure. Paris was one of the first cities to aim for this.

Prospect: Cycling will increase, driven by global demands to enhance urban liveability and innovations that improve competitiveness, such as bike-sharing, dedicated infrastructure, and electric bikes. However, mature cycling countries reveal bicycle (parking) congestion and safety concerns, necessitating collaborative solutions from urban and transport planners and academia.

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