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Chapter 14

Setting the agenda for parking research in other cities

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Chapter Outline

Parking is an orphaned research field, resting at the intersection of the transportation, land-use planning, urban design, and urban economics disciplines. No well-established group has claimed ownership of parking research. Moreover, gaps in data limit in-depth examinations of parking in many cities. All too often, cities simply do not know how much of their space is taken up by parking. A number of contributors to this volume lament that only rough estimates are available of the total area blanketed by parking (see also Brown, 2015). Hence, it is impossible to determine where a particular city ranks in terms of parking supply.

This is problematic because when parking supply is unknown, the private and public costs of parking also cannot be known. A few extreme examples circulated in academic and popular press publications suggesting that private parking spaces are more of a cost to owners than the motor vehicles themselves (Jakle and Sculle, 2004). Also, that parking spaces cost homeowners between 10% and 12.5% of their dwelling construction costs (Litman, 2016). Also, that the market value of a parking space can be as high as AU $120,000 in Sydney and US$660,000 in Hong Kong (Bianchi, 2015; McMillan, 2017). However, these reports remain anecdotal. With the cost of public parking remaining hidden, we do not know how much the public of

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any given city spends to subsidize the storage of automobiles. The evidence base is scant and highly fragmented.

Clearly, more cities than those included in this volume are needed to create, maintain, and monitor inventories of their parking stock: any parking reforms will require solid evidence on parking demand, supply, and costs. Given the enormity of this task for large urban areas (as opposed to rural towns), academic researchers are needed to assist cities in the creation of their parking inventories. Researchers need to go beyond mere counts however, to engage with emerging social and technological trends that could transform the relationship between urban denizens and driving. By so doing, the academic sector could preempt parking demand and reevaluate parking policy and regulation. More specifically, research could provide the necessary input so that practitioners would be able to use parking policy as a lever to achieve other urban sustainability objectives. The ultimate goal is to reclaim ground now lost to parking.

In Chapter 1, Learning from parking reforms in other cities, Donald Shoup provides a menu of "best" or "good" parking policies and practices that are highlighted in this book's 12 case studies. This compilation of successes can be of use to urban planners, developers, and decision makers to draw inspiration and to gather support for change in their cities. In this concluding chapter, we reflect on these 12 case studies and consider their implications for future research. At the end of the chapter we set out a new agenda for parking research in large cities.

Trends influencing parking

The case studies contained in this volume go some way to demonstrate that parking cannot simply be regarded as a standalone element of the transportation or land-use system, or of the urban economy. Rather, parking should be considered as an integral component of policy, technology, economics, society, culture, and even urban design. Our conceptual framework for a new parking research agenda, shown in Fig. 14.1, links digital technologies, spatial planning, and mobility preferences. This is discussed in the following sections.

Digital disruptors

The term "digital disruptor" denotes digital technologies that are expected to rapidly and profoundly alter behaviors, cultures, markets, and systems. At present, there are multiple digital disruptors that are poised to open up new mobility markets and alter the cultural significance ascribed to mobility, vehicles, proximity to friends, and workplace perks such as company cars and workplace parking (Christensen, 1997). A list of digital disruptors that may affect parking is provided below.

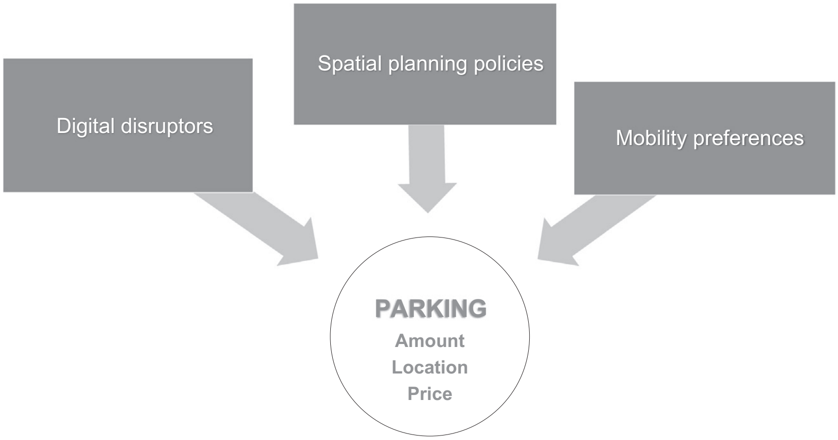

FIGURE 14.1 Conceptual framework for a new parking research agenda.

Smartphones are fundamentally changing the professional and social significance of automobility. A number of parking-related apps are available which provide real-time information on parking availability and cost, allow drivers to book and pay for parking in advance, help with navigation to the nearest parking space, and remind parkers that are about to overstay the time limit. (Some apps eliminate the time limit and charge by the minute until the car leaves the space.) These include, but are not limited to, ParkWhiz, PayByPhone, Parking Panda, Parkopedia, SpotHero, ParkMe, Parker, JustPark, Waze, and Honk.

eCommerce is changing the mobility patterns as online shopping services (such as Amazon, eBay, and Netflix) reduce the utility of driving for shopping and entertainment, while delivery services (such as Deliveroo, Foodora, and UberEats) reduce the utility of employing individual couriers and providing parking spaces for restaurants. Dating services, such as Tinder, reduce the need to physically travel to bars, cafés, and other traditional meeting venues.

Mobility as a service (MaaS) integrates the planning, scheduling, and purchasing of public and commercial parking, public transport, bikeshares, and rideshares (Sipe and Pojani, 2018a,c). By reducing the financial and temporal burdens associated with trip-chaining between private and public vehicles, MaaS has the potential to further diminish the appeal of owning, driving, and storing private vehicles (ITS Australia, 2018). Whim is the first commercial app to apply the MaaS concept.

Demand responsive pricing for parking is dynamically adjusted according to the occupancy rate, in order to ensure vacancy and minimize cruising (Shoup, 2011, 2014; Marsden, 2006; Weinberger, 2009). Early adopters, such as SFpark in San Francisco, discovered that dynamic pricing helps to slightly reduce parking fees (Pierce and Shoup, 2013) as drivers seek parking in underused areas and garages, thus reducing the pressure at overused locations (San Francisco Municipal Transportation Agency, 2017). In Istanbul, demand responsive pricing comes with a set entry fee to discourage frequent parking turnover (Jansson, 2010). Dynamic parking systems are increasingly connected to the Internet so that drivers may locate, and even reserve, parking prior to their arrival.

Sharing economy emerged in the early 1990s as platforms (such as eBay, Amazon, Craigslist, and Couchsurfing) leveraged communication technologies to enable peer-to-peer exchange networks across greater distances than was previously possible (Ryu et al., 2018; Martin and Upham, 2016). The rise of parking-sharing services such as Parkhound, Kerb, and ParkAtMine, which allow people to rent out surplus parking, provide an opportunity to reclaim some of the deadweight costs imposed by parking minimums. As such, parking-sharing services may initiate a revaluation of the expense and public revenue tied up in parking space.

Car-sharing is making noncare ownership attractive. The popularity of services such as GoGet, Flexicar, and CarNextDoor, which allow users to hire a car owned by a company, suggest that car ownership and private parking are losing their appeal in inner cities. Unlike traditional car rental services, car-sharing: (1) is charged by the hour rather than by the day or month, making it suitable for short, intra-city trips; (2) involves a monthly membership fee, as in a club, to indicate commitment; (3) is entirely paperless; (4) allows booking via smartphone for immediate access; (5) does not require vehicle inspection prior to drop-off; (6) allows one-way trips at no extra cost; and finally (7) uses numerous but small parking lots which are conveniently distributed around cities.

Ride-hailing, through companies such as Uber, Lyft, and Didi, is making car ownership and parking unnecessary, at least in inner cities. The rise of ride-hailing suggests that driving is also losing its appeal in favor of the door-to-door mobility provided by professional or semiprofessional drivers. Some cities are starting to subsidize ride-hailing journeys that start or end at public transport nodes in order to reduce the overheads associated with operating feeder buses below capacity (Woodman, 2016). Even traditional carmakers are now embracing the ride-hailing concept. For example, Ford's Chariot connects passengers to professional drivers operating higher capacity vehicles (e.g., vans), owned by the company.

Ride-sharing, rather than connecting passengers with professional drivers, uses platforms such as Uber Pool and Waze to focus on connecting passengers with drivers and passengers already traveling in the same general direction (e.g., during the work commute). Car-pooling arrangements have informally existed for decades [e.g., among neighbors traveling together to a central business district (CBD)]; the difference with modern ride-sharing is the use of technology that allows strangers to connect and ride together.

Shared e-scooters provided by companies (such as Lime and Bird) provide a solution for the “last mile” problem in urban transportation, where the nearest train or bus stop is too far to walk and too close to drive, even if one could be sure of finding parking. E-scooters could shift short-distance passengers away from cars and thus reduce parking demand. Shared e-scooters provide a number of advantages over shared e-bikes. The rider can stand up which, for office workers, means no wrinkling of clothes. The posture is more convenient for women wearing skirts and dresses. Scooters are also easier than bicycles to maneuver along narrow paths. In some places, e-scooters are still not subject to helmet requirements (Sipe and Pojani, 2018b). Subcontractors such as Lime’s “Lime Juicers” recharge and redistribute flat e-scooters during the night. This helps to solve the problems posed by dockless bicycles which have been accused of provoking vandalism and littering (Richter, 2017; Pojani and Corcoran, 2018). At present, the e-scooter industry is highly lucrative and competition for operating licenses is becoming fierce (Madrigal, 2018).

Autonomous vehicles (AVs) are expected to minimize human error in traffic, improve traffic efficiency (Anderson et al., 2016), enable vehicle platooning (thus reducing road size requirements) (Fernandes and Nunes, 2012), and eliminate parking requirements at destinations (Guerra and Morris, 2018; Fagnant and Kockelman, 2014). The convenience of traveling door-to-door without having to drive or park is expected to accelerate the adoption of AVs (Anderson et al., 2016). At the same time, AVs may reduce the appeal of public transport (Fraedrich et al., 2018) and active transport, if privately owned rather than commercially shared. Walking and cycling might potentially become more dangerous given that, unlike AVs, pedestrians and cyclists will not be network-connected (Stead et al., 2018). The other risk associated with AVs is their enabling of urban sprawl. Workers may choose to live farther from employment centers since the commutes will no longer involve time wasted driving but can used for more productive or enjoyable activities, such as working or watching a movie inside a driverless car (Kane and Whitehead, 2017; Milakis et al., 2017; Papa and Ferreira, 2018).

Autonomous delivery drones are poised to disrupt mobility by eliminating pickup journeys (which require parking at the end). Indeed without the driver payload to transport, wheeled drones can have a smaller road footprint and flying drones no road footprint altogether.

In combination, these digital disruptors have been termed “new urban mobilities” to highlight the fact that, just as horse-drawn carriages and stables gave way to automobility and parking lots, automobility is giving way to digital connectivity (Stout, 2015). A future society has been envisioned, one which will no longer inhabit “spaces of places” comprised of physical transportation networks and land uses but rather embody abstract “spaces of flows” in which one digitally tethered place is as close as the next

(Castells, 2015). We note that, at this stage, the list above is by no means comprehensive; new technologies may be emerging as this book goes to press.

Spatial planning policies

In contrast to the tech industry whose motto is "move fast and break things," spatial planning policies tend to change much more slowly. However, some progress has been made. Owing to a growing interest in livability, urban consolidation and densification are increasingly stated as goals by many cities (Wheeler, 2013). Alternative residential housing models are being introduced, which (deliberately) do not offer any parking; instead, they provide spaces for bicycle parking and car sharing.

These new approaches affect parking because in dense and compact cities where little space is sacrificed to store vehicles, distances between destinations and shorter and alternative transport are more viable; thus reducing the need to drive and park. With the advent of ride- and vehicle-sharing and automated delivery services, curb management has also emerged as a planning policy goal (Fehr and Peers, 2018; Institute of Transport Engineers, 2018). This represents a change compared to earlier decades during which the curb was regarded simply as a place to store cars for relatively lengthy stretches.

Also increasing in popularity is transit-oriented development (TOD), which is another form of land-use consolidation around public transport nodes and corridors. TOD is defined as compact, medium-to-high-density, mixed-use development near, and/or oriented to, mass transit facilities, including train stations, metro stations, light rail stops, bus stops, and ferry stops. TOD is known to benefit from high-quality urban design, traffic calming, "walkability," and "cyclability"—all of which are the antithesis of "parking lot urbanism" (Pojani and Stead, 2015; Willson, 2005).

TOD is a useful planning concept at two spatial levels. At the neighborhood level, it promises to reduce driving, parking, and related externalities; at the regional level, it can deconcentrate large activity hubs. Because the term TOD originated in the United States, this model is often assumed to be a recent import from North American cities (Calthorpe, 1997). However, TOD has been historically widespread in Western Europe (Pojani and Stead, 2018) and East Asia (Kong and Pojani, 2017). It is now becoming increasingly common in Australia and elsewhere, at least at the policy level (Searle et al., 2014; Yang and Pojani, 2017; Pojani and Stead, 2014).

International comparative studies suggest that the key factors that enable successful implementation of TOD include political stability at the national level, the presence of regional land-use transportation bodies, working relationships between actors in the region, public participation, interdisciplinary implementation teams, and certainty for developers (Thomas and Bertolini, 2017; Thomas et al., 2018). While TOD areas have been effective in reducing car dependency, this may be due to self-selection bias if individuals who prefer a car-free lifestyle are displacing individuals who prefer driving (Zahabi et al., 2012). Additional research on self-selection in TOD areas is needed.

While TOD may thrive in inner-ring suburbs and transit-rich areas, thereby reducing demand for parking, suburbanites who lack easy public transport access must continue to rely on cars. But rather than drive all the way to a CBD, commuters can opt for park and ride at suburban stations. Park and ride is a form of "intermediate parking" that enables drivers to park near public transport nodes, and continue their journey riding public transport (Organisation for Economic Co-operation and Development, 2013). By enabling car-dependent residents to park outside the inner-city, park and ride can, in theory, relieve inner-city traffic congestion (Ison and Mulley, 2014). However, the relationship between TOD and park and ride is complex and under-researched (Willson, 2005).

It is a basic TOD tenet that minimal space be reserved for parking, both on- and off-street (Bajracharya et al., 2005; Griffiths and Curtis, 2017; Chatman, 2008). As such, park and ride is in philosophical conflict with TOD. Some commentators maintain that, in countries with well-patronized rail systems it is wasteful to provide large park and ride facilities at transit stations. In TOD areas with abundant residential parking, public transport use is lower (Weinberger, 2012). Moreover, in successful TOD areas, increasing land values might preclude the provision of large park and ride lots adjacent to transit nodes (Ginn, 2009; Public Transport Users Association, 2016). While in theory, park and ride facilities could be located at a distance from the core of a TOD precinct, the transfer would greatly inconvenience commuters. To be successful in reducing traffic congestion, park and ride policies must coordinate with inner-city parking pricing policies (Young et al., 2010). While park and ride is popular in practice, there is little research analyzing its effectiveness in reducing travel and overall parking demand.

The introduction of new technologies such as AVs will have huge implications for parking demand (as outlined earlier). At the same time, spatial planning policies will play a key role in shaping how this technology influences the spatial and temporal patterns of parking in cities. Among other things, this will depend on the degree of access afforded to AVs in cities, and the locations where they are permitted to collect and drop off passengers (Stead et al., 2018; Stead and Vaddadi, 2019).

The introduction of AVs, in combination with traffic management and spatial planning control, has the potential to improve the public realm in cities and, more generally, to contribute to more sustainable and livable places. The space currently occupied by car parking, or made unattractive by transport infrastructure, could be put to new and innovative uses. To a limited degree, this has already begun in cities by introducing the concept of "pavements to parks," which has started to encourage the conversion of roadside parking spaces, sometimes on a temporary basis (see, e.g., Chapter 8: The Netherlands), into new uses such as gardens and cafés (see, e.g., Townsend, 2014).

Ultimately, the future role of AVs in influencing parking is not so much dependent on the technology and level of automation of vehicles, but rather on the regulation of this technology and the governance of cities and regions via traffic management and spatial planning controls (Stead and Vaddadi, 2019).

Mobility preferences

At the global level, the number of people living in cities continues to grow. Urbanization has produced both sprawl and high-density living, depending on the context (see Pojani and Stead, 2017). With globalization and rising migration toward OECD countries, wealthier cities increasingly comprise populations that have lived auto-free and are yet to develop the Western love affair with automobility (Klocker et al., 2015). In contrast, areas where high residential density has already developed can be zoned for TOD given that this density enables public transport to operate at greater efficiency and improves the viability of active transport thus leading to network effects (Warren, 2014).

More developed countries have been experiencing a phenomenon known as "peak driving" whereby there is a decline per capita in the number of drivers' licenses, the amount of private car ownership, and the vehicle kilometers traveled (Bastian et al., 2016; Millard-Ball and Schipper, 2011). In part, peak driving has been due to the Great Recession (the global financial crisis that began in 2008), and with the economy recovering, auto-dependence is again increasing. However, people on higher incomes still tend to choose active or public modes of transport for their commute (Keyes and Crawford-Brown, 2018). This shows that a change in mobility attitudes and preferences may be permanent among some groups, who may ultimately reorient their lifestyles toward local services and amenities and away from more distant ones that require motorized travel (Neff, 1996).

Changing mobility attitudes and preferences owe a great deal to the Millennial generation (and its successor, Gen Z). As "digital natives," Millennials have always been immersed and tethered to digital networks, and therefore have had less reason to regard private automobiles as a symbol of freedom and mobility (Lyons, 2015; McDonald, 2015). Millennials conduct much of their life, work, shopping, entertainment, and socializing online rather than in physical space; some commentators even wonder whether this is a "go-nowhere" generation (McDonald, 2015). Social media has changed the significance of mobility and copresence. To Millennials, public transport has been more liberating than cars as it frees their attention (and hands) from activities such as driving and parking and allows them to engage in social media while riding.

Unlike their parents and grandparents, Millennials are embracing urban living. Consequently, many parts of the world are undergoing a veritable urban revival movement, which is reversing the effects of the 1970s' suburban flight. Beyond "global cities" such as London, New York, and Tokyo, smaller trading nodes of past eras—Amsterdam in Europe, Brisbane in Australia, and Shenzhen in Asia—are gaining in centrality and economic vitality. They have become crucial in the new "knowledge industry." In earlier decades, by contrast, cities were not considered ideal places to live. Public transport stations, in particular, were perceived as hotbeds of drug dealing, loitering, begging, prostitution, and other undesirable activities. Concerned about safety and status, many middle-class households left for the suburbs. Now, the new well-educated, highly skilled, highly paid "creative" workforce prefers trendy and vibrant locations with high-quality design, public and active transport services, and social and cultural offerings; in other words, cities (Florida, 2019). Millennials cherish urban individuality, choice, and difference rather than suburban uniformity. Moreover, for contemporary dual-employment families, it is often more convenient to live in transit-rich areas, which are less likely to be found in low-density suburbs. Refound urbanity is a windfall for sustainable transportation planning.

Another aspect of the Millennial lifestyle is economic insecurity. As cities become more popular, space becomes scarcer and costlier. Indeed, events such as the Great Recession and economic conditions keeping employment precarious and housing unaffordable throughout the adult lives of Millennials may explain why they are accumulating further labels including "generation rent," "precariat," "freeter," and "NEET" (Not in Employment, Education, or Training) (Hoolachan et al., 2017). As a consequence, Millennials increasingly perceive automobile costs as unnecessary or frivolous, while they regard the car itself as a junk asset (Delbosc and Currie, 2013). Meanwhile, digital communications are facilitating an access-based economy where people can easily trade the temporary utility of cars without having to carry their depreciation cost (Belk, 2014; Ballús-Armet et al., 2014; Steffen, 2013; Kassan and Orsi, 2012; Rifkin, 2000). If Millennial interest in car ownership continues to wane, then so too will demand for parking and particularly at home.

Key tasks for parking research

Based on our conceptual framework outlined earlier, we provide a new agenda for parking research that is shown in Fig. 14.2. This research agenda comprises six areas, each of which is outlined below. Given the magnitude of these tasks, the assumption is that most research will initially proceed on a case study basis before sufficient momentum is achieved to enable

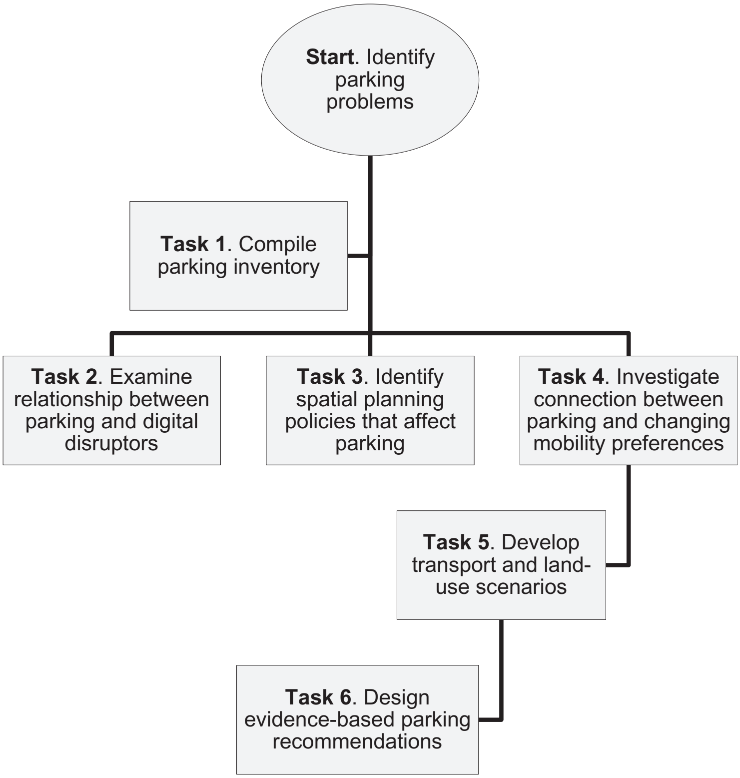

FIGURE 14.2 Key research tasks to chart the development of parking research internationally.

conducting broader citywide and ultimately cross metropolitan comparative studies.

Task 1. Develop an empirical approach for estimating both the on-street and off-street parking supply, based upon existing data. This task would entail a major data collection, cleaning, and harmonization effort. Suitable datasets could include building surveys, development applications, and remotely sensed imagery. Through the use of these data, it may be possible to develop toolkits suitable for estimating parking supply and its public return on investment, and to predict locations more likely to experience parking oversupply or undersupply.

Task 2. Investigate whether parking policies, supply, and regulations are in step with the uptake of digital disruptors. This task would entail examining and experimenting with sharing platforms, parking applications, MaaS platforms, and logs from public parking services such as digital parking meters, parking stations, and park and ride lots. With this understanding, it may be possible to adopt or further develop the options delineated in Chapter 1, Learning from parking reforms in other cities.

Task 3. Identify transport and land-use policies and regulations that govern the supply, pricing, and location of parking within individual cities. This task would entail a literature review of national, state, and local planning policies and regulations, and a city-by-city comparison of these policies and regulations. Furthermore, this task would include interviewing residents, traders, developers, and civil servants regarding their experiences relating to parking policy and regulation. At this point, it could be possible to develop a general model of parking supply and demand that would inform and coordinate policies at the metropolitan level.

Task 4. Investigate whether parking policies, supply, and regulations are in step with changing mobility preferences. This task could entail examining various national census and other surveys, and interviewing residents, workers, and traders to determine the extent to which changing mobility preferences are explained by cultural shifts, urban design, or spatial inequalities. With this understanding, it may be possible to inform both short-term (5 years) and long-term scenarios (10−20 years) of parking demand in a city.

Task 5. Develop scenarios that prepare cities for future socioeconomic and mobility transformations. These could serve as a foundation to develop models and simulations based upon real-world road networks, origin−destination pairings, neighborhood profiles, and mobility preferences. Such models and simulations would empower metropolitan authorities to tailor transportation and land-use planning to their area much better than they could in the past.

Task 6. Design evidence-based parking recommendations bespoke to particular cities and regions. These could support planners seeking to reduce wasteful parking oversupply; address the parking undersupply that is responsible for traffic congestion and social tension; make active and public transport more viable; and increase the public return on investment in active and public transport infrastructure. Furthermore, evidence-based recommendations could support the introduction of new legal frameworks around parking (see Shoup, 2011).

The complexity of these six tasks does not, by any means, imply that cities should wait to have complete datasets and scenarios before undertaking parking reforms such as those reported throughout this book and summarized in Chapter 1, Learning from parking reforms in other cities. In most cases, action will be needed much sooner.

Conclusion

Parking, albeit prosaic, is an international issue of rising importance. Worldwide, the amount of land dedicated to the storage of motor vehicles is substantial and urgently needs to be carefully enumerated and then reconsidered in the context of progress toward an environmentally, economically, and socially sustainable urban future. Cities need to develop better ways to reclaim and repurpose underutilized parking space, and to use parking supply as a tool to influence travel behavior. This will simultaneously reduce the collective carbon footprint, disruption to natural habitats, time spent on the road, and income spent on parking infrastructure.

Urban policy, regulation, and design initiatives can be rolled out effectively if planners and policy makers have a closer understanding of the nexus between parking, land use, technology, and society. Research that helps this understanding should be high on the agenda of federal, state, and local governments. Through this volume, we have tried to shed light on the critical issue of parking in cities across all continents. We hope that it will catalyze, inspire, guide, and encourage researchers to consider this often overlooked and yet critical urban issue, and to identify how new approaches to parking, combining issues of technology, spatial planning, and mobility preferences can have multiple benefits for cities in the future.

Acknowledgments

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