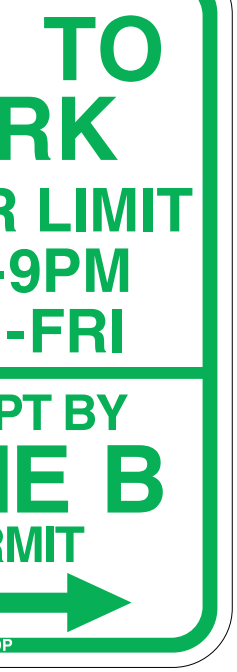
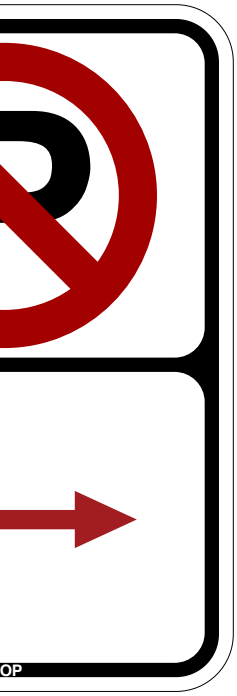



# U.S. PARKING POLICIES:
## An Overview of Management Strategies

Institute for Transportation and Development Policy

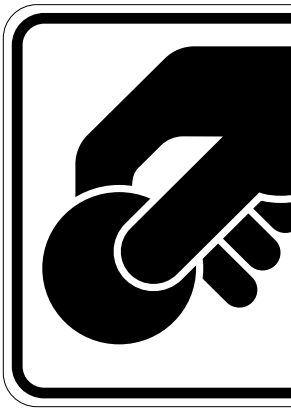
RACHEL WEINBERGER JOHN KAEHNY MATTHEW RUFO











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U.S. Parking Policies:
An Overview of Management Strategies

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# Foreword: Guidance for Policy Makers

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"U.S. Parking Policies: An Overview of Management Strategies" highlights best practices in parking management in the United States. In the last decade, some municipalities have reconsidered poorly conceived parking policies to address a host of negative impacts resulting from private automobile use such as traffic congestion and climate change. Unchecked, these policies have proven to be a major barrier to establishing a balanced urban transportation network.

This report identifies core sustainable parking principles and illustrates how smarter parking management can benefit consumers and businesses in time and money savings, while also leading to more livable, attractive communities.

Many aspects of current parking management in the United States do not work reliably or efficiently for anyone: Motorists find themselves circling for long periods in search of a place to park; retail employees take choice parking locations away from potential customers; developers are compelled to provide more parking than the market requires; and traffic managers encounter difficulty handling traffic generated by new parking as there is often no link between parking price, supply and the amount of available road space. Finally, the old parking paradigm doesn't work for the environment, as hidden subsidies encourage over reliance on private car use—a major, growing contributor to global warming and air pollution.

A few leading local governments around the country have started to chart a different course, earning both economic and political rewards. This report focuses primarily on these success stories and what we can learn from them.

Drawn from this important report are 10 key recommendations for government action:

### 1. Eliminate minimum parking requirements and encourage developers to 'unbundle' parking

In the 1970s, Boston, Portland and New York City removed parking minimum requirements and established parking caps or maximums in downtown areas. Alternatively, cities like Montgomery County, Maryland, have introduced special transit zoning districts where parking requirements are cut by 20 percent near metro stations. But most U.S. cities still have zoning rules that require new real estate developments to include a minimum level of new parking spaces

throughout the city. These minimum parking requirements pay little regard to transit availability and the urban design context in which the development is located. In some cases they led to more off-street parking than is appropriate to the local surroundings, such as in downtowns and transit-oriented residential neighborhoods. Minimums also led to sprawling cities where the costs of driving are shifted to the general public.

To pay for these spaces, developers often include ('bundle') parking into the sale of residential units or leases for office space, thereby forcing developers and their tenants to pay for parking that they do not want or need. Governments can encourage developers to stop including parking as part of a complete package in new construction projects.

The promotion of "shared parking," whereby developers coordinate access to underutilized, nearby parking facilities in other buildings, is another way to reduce minimum requirements. This strategy has been successful in Montgomery County, Maryland, Boulder, Colorado, and Cambridge, Massachusetts.

With excess parking reduced by eliminating minimums and 'unbundling' parking, spaces become priced for the users and not the general public, while also creating denser, more livable communities.

### 2. Coordinate on- and off-street parking management and charging

Many problems with parking management result from the lack of coordination between on- and off-street parking. While the original intention of U.S. planners was to encourage motorists to park off-street, on-street parking in cities like New York and San Francisco is much less expensive, leading to overcrowding at the curbside and underutilization of off-street parking. A coherent parking management strategy requires harmonizing these policies and pricing.

### 3. Charge a price for on-street parking to ensure performance standards, including occupancy rates, are met

Free or very low cost on-street parking benefits only a few commuters. Employees and shopkeepers who arrive first in the morning occupy the most convenient spaces, forcing customers arriving later to waste time and money looking for an available space farther away. Flexible parking meters, which set fees at levels that ensure an 85 percent occupancy rate throughout the day, optimize the use of scarce parking resources. San Francisco's SF*park* and New York City's ParkSmart programs are the closest to this ideal found in the U.S.

### 4. Create parking benefit districts where the revenue is returned to the community

One of the most important innovations in recent years for overcoming local resistance to new or increasing on- street parking charges is to create a special benefit district where the parking revenue is returned to the neighborhood in the form of enhanced public services and improved streetscapes. Of the 20–30 special parking benefit districts around the U.S., some are managed by business

improvement districts (BIDs) and others by special purpose agencies. While not all cities allow such earmarking of parking revenues, this has proven a successful win-win strategy, especially in locations where performance-based pricing is politically infeasible.

### 5. Use parking technologies that offer customers and policy makers the maximum flexibility

Modern parking systems allow customers to use a variety of payment options from credit cards to mobile phones. Multi-space use meters are more efficient than individualized parking meters. They can flexibly accommodate different sized vehicles, and are cheaper to install and operate. State-of-the-art systems can adjust rates based on occupancy, provide motorists with information about parking availability and accept a wide variety of payment methods. Rates can be adjusted after the first hour or two, changing those who overstay meter times from violators into higher paying customers while also maintaining incentives for the timely turnover of spaces.

### 6. Reclaim street space from car parking for other needed public uses such as bike sharing, cycling lanes, widened sidewalks or shared spaces

Nobody wants to lose parking, but given the choice, some communities may prefer alternative uses for the space. A growing number of cities, such as New York City, are removing on-street parking to put in exclusive bus lanes, pedestrian zones and bike lanes. Denver, San Francisco, and Los Angeles have all developed parking plans which identified a variety of options for removing parking to convert street space for alternative uses.

### 7. Design parking facilities that are well integrated with surrounding buildings and walking environments

Off-street parking access can disrupt the safety of a sidewalk, with cars breaching the pedestrian way to enter a garage. A typical garage is also an uninspired structure that deadens street life due to a lack of interactive ground floor space. A growing number of prime commercial locations in places such as San Francisco's Rincon Hill neighborhood and Portland, Oregon, tightly regulate the type and design of parking facilities. Some ban above-ground parking altogether. Others require multi-story facilities or valet parking. Portland and San Francisco restrict how much of a building façade can be dedicated to garage doors and regulate the design and the access to off-street parking garages.

### 8. Incorporate parking policies into metropolitan transportation plans

Metropolitan planning organizations (MPOs) are responsible for developing and approving short- and long-term transportation plans to meet federal funding requirements, such as compliance with the Clean Air Act. Key decision-makers in MPOs must ensure that parking strategies are included as a crucial element in transportation plans for timely attainment of national ambient air quality

standards, climate action plans, congestion management programs and livability initiatives. MPOs can consider using parking as a strategy to generate revenue to support fiscally-constrained transportation investment plans and to fund transit services that face funding cutbacks.

### 9. Include innovative parking management in statewide livability initiatives, congestion management, air pollution control strategies, climate action plans and innovative financing programs

The U.S. Department of Transportation (DOT) and Environmental Protection Agency (EPA) can incentivize and require parking inventories and master plans to be developed as part of State Implementation Plans (SIPs) for non-attainment areas for smog and particulate matter under the Clean Air Act. U.S. DOT can provide technical guidance to cities for the development of parking master plans, as well as significantly increase assistance on parking management strategies. Congress can strengthen incentives and requirements for parking pricing to be considered in the transportation planning process as part of alternatives analysis. Legislation can be adopted to limit greenhouse gas emissions overall and to ensure that transportation contributes in a timely and proportionate way to addressing the climate problem, including efforts to better manage existing resources like parking.

### 10. Promote parking and commuter programs that expand travel choices for employees and customers

Employers can become members of the *Best Workplaces for Commuters* program, which offers benefits to workers that encourage less reliance on driving, including cash in lieu of a parking. These often lead to lower costs and more attractive developments. In today's new market conditions, that is often a formula for success. Developers and real estate industry stakeholders can design new residential, retail and employment centers to include attractive walking and cycling environments with easy access to public transportation, minimizing the need to provide costly parking facilities.

# Executive Summary

In the last 5 to 10 years, U.S. transportation planners have become much more aware of the impact of parking on congestion, air quality, economic development and the pedestrian environment. Historically the "parking problem" has been identified as the problem of too little supply; increasingly the problem is now seen as the poor management of existing supply and, in cases where cities have instituted parking maximums, the problem is understood to be of too much supply. There is a growing realization that the dysfunction caused by poorly conceived parking policies is a major impediment to creating an effective and balanced urban transportation system, it is also a significant cause of traffic and air pollution.

Transportation planners seeking to learn from the United States should take note of how traditional U.S. parking policies have had significant unintended consequences. By and large, these policies have produced excess parking supply. The excess has served to keep the price of parking down—99 percent of driving trips end in free parking—and consequently reduced the cost of car use. By reducing the cost of driving and by consuming large amounts of space, traditional policies have promoted automobile use and dispersed land uses thus undermining public transit, walking and bicycling.

There is a growing movement to employ parking policies that encourage balanced transportation systems and reinforce central cities. These newer approaches emphasize measures which manage parking demand through pricing, shared parking and reduced off-street requirements. These "demand management" oriented policies are most often found in dense downtown areas or central business districts served by public transit.

In the U.S., decisions about off-street parking and land use are made by planning departments within cities, towns and counties. These groups base traditional parking practices on a number of assumptions—the most fundamental of which are the notions that the automobile is always the preferred mode of travel, demand for parking is independent of price, parking should be or will be free, and there is no transit or other travel alternative. Parking policy decisions are typically made without reference to the rest of the transportation system.

This has lead to cities being designed around parking. Builders are required to provide minimum amounts of parking with most new developments—a costly requirement. These "minimum parking requirements" have contributed to a cycle of automobile dependence that is especially damaging to city centers. More parking reduces the cost of car use, which leads to more car use and more demand for parking. The walking environment is undermined and the distance between destinations increases. Ultimately, this leads to lowered densities within cities to a point where transit becomes inefficient. Street life and public spaces cease to function. This indeed is what we see in suburban office parks, big box store developments and dead downtowns. In contrast, some cities are beginning to set parking policies that promote city centers and balanced transportation systems.

Curbside parking on the other hand is frequently managed under the jurisdiction of city streets or public works departments who also have some responsibility for transportation planning. The parking and transportation dysfunction caused by the land use planners setting off-street requirements and public works departments managing curbside supply can be reduced by having clear planning objectives and one entity setting coordinated policy in both realms.

## Basic principles of sustainable parking policy and planning

- Minimum parking requirements subsidize driving by shifting the costs of car use onto development and the non-driving public.
- Required parking imposes significant direct and indirect costs; parkers should bear this cost, not the general public.
- Good access is easily impeded by abundant parking. Conservative parking requirements allow better accommodation for public transit, walking and bicycling.
- Increasing supply lowers prices and stimulates increased parking demand.
- The demand for parking is influenced by price and travel alternatives.
- The supply and price of curbside and off-street parking influence each other.

While these principles are well understood they are infrequently invoked. A handful of cities in the United States are using them to develop new policies which support broader sustainability and economic development goals. The parking innovations underway in seven of those cities are profiled in this report.

## Off-street parking practice and best practice in the United States

The majority of off-street parking is "accessory" to the primary land use and is regulated by land-use zoning codes written by city planning agencies and

commissions. Commercial off-street parking is provided by profit-seeking firms, primarily in dense downtowns. Municipal off-street parking is provided by the public sector, typically as a low-cost, downtown amenity. By the 1950s, most city planning commissions required a specified amount of accessory parking as part of most new residential and workplace construction. These "minimum parking requirements" were a reaction to growing automobile use that, absent any pricing mechanism, was swamping available street space. In addition, single use zoning results in segregated residential and commercial areas triggering more reliance on the automobile. As accommodation to the automobile increased, so did its use. This cycle of dependency soon prompted additional requirements for off-street accessory parking.

Minimums had a huge impact on American cities. Any visitor to the United States will be struck by the difference between cities and towns built before the adoption of minimum parking requirements and those built afterwards. The requirements led to an explosion in new parking and fueled dispersed land uses like the "office park" and "big box stores;" which consist of buildings in the midst of vast parking lots. In the 1970s, the link between the parking supply and car use was explicitly recognized when New York City, San Francisco, Portland and Boston were all forced by lawsuits brought under the federal Clean Air Act to cap parking in their central business districts (CBDs).

Minimum parking requirements is by far the most prevalent government parking policy. They profoundly influence everything from hundreds of billions of dollars in construction costs to land-use density, travel choice, environmental sustainability and the way cities look and function. Yet, the methods used to determine minimums are fundamentally flawed. Typically, requirements are based on the type of land use and its square footage with no reference to the existing transportation system or ambient development. The recommended parking requirements for a restaurant would be the same if the restaurant were in a business district—where customers could walk—or at a highway intersection with no access option other than driving. Most minimum requirements are based on a compendium of minimum requirements assembled by the Institute for Transportation Engineers. The compendium is a limited inventory without contextual analysis.

## Off-street parking best practices

Planners in many cities recognize the high cost of "free" parking and offer a menu of alternative approaches to manage the parking supply more efficiently and account for mixed land uses, transit and pricing parking to manage demand. These include:

**Elimination or reduction of minimum requirements**: used in a number of San Francisco neighborhoods.

**Shared Parking:** encourages the consolidation and reduction of a neighborhood's parking facilities, allowing more productive land uses. It can also be priced in a way that accessory parking cannot. Shared parking is a key part of travel demand management in Montgomery County, Maryland Boulder, Colorado and Cambridge, Massachusetts.

**In Lieu Fees:** paid by developers to a city in the place of building accessory parking. The fee helps fund city-owned shared parking. This is in use in a limited number of cities.

**Transit Zoning Overlays:** special zones that supersede existing use, density, design and parking requirements near rail and bus lines. Typically, parking requirements are reduced.

**Unbundling Parking:** compels developers to sell or lease parking independently of residences or commercial leases. Thus overall parking costs are not subsidized by other uses. San Francisco is piloting unbundling but compliance by developers is proving difficult.

**Cashing-out Parking:** employees are given the cash equivalent of a parking perquisite (where free parking had been offered). The employee may then choose whether to "buy back" the parking space or keep the cash. Where parking cash-out is offered, single occupant vehicle use, and, thus, parking needs, have been reduced.

**Parking Benefit / Travel Demand Management Districts with Curbside and Off-Street Parking Coordination:** Revenues from curbside parking meters in downtown Boulder, Colorado help fund shared, public parking garages and free transit passes for downtown employees. The price of curbside and off-street parking are coordinated to shift curbside demand to off-street parking facilities. As a result, Boulder, which is surrounded by a heavily automobile dependent suburban area, has much higher transit, walk and bicycle to work shares than other small U.S. cities.

## Curbside parking practice and best practice in the United States

Because off-street parking can be continuously expanded and the supply of curbside parking is essentially fixed, curbside parking policy is fundamentally about managing the demand for an unchanging supply.

Commercial streets have the greatest competition for curb space, with delivery and service vehicles competing with shoppers, store employees and local residents for parking spots. Parking policy on these streets has long and complex political histories, reflecting this conflict. However, there is a strong consensus that the most efficient use of commercial curb space is for short-term parking. Businesses largely agree and, as a result, commercial streets have a wide variety of metering, time limits and usage restrictions, intended to encourage short-term use. In contrast, residential streets are not metered, regardless of demand, and

are typically either unregulated or restricted to local residents with residential parking permits. The focus of this report is on commercial streets, where pricing policies and new technology are transforming traditional practice.

Curbside management employs four basic approaches: metering, time-limits, user restrictions and parking bans. All four approaches depend on enforcement to be effective. Unfortunately, numerous studies show that parking enforcement is rarely adequate to prevent widespread illegal parking. Where studies have been done, approximately one-fifth to one-third of vehicles are parked illegally.

However, three technologies in the early stages of adoption have the potential to revolutionize parking enforcement. The first two are license plate or vehicle recognition scanners mounted on vehicles. These can drastically reduce the personnel required to enforce time limits. The third involves the use of sensors embedded into parking spots, as seen in San Francisco's SF*park*.

Enforcement is important because of the considerable costs of illegal parking. Double parked vehicles endanger other road users, especially bicyclists; sharply reduce the capacity of roadways; delay emergency vehicles, buses and other traffic; and add to air pollution and travel costs. Vehicles which overstay time limits reduce parking availability and cause other motorists to spend more time searching or "cruising" for available spots. Studies find that cruising vehicles can represent as much as 40 percent of traffic. Removing these cruisers would free up street capacity that could be reprogrammed for pedestrians, buses or cyclists and ensure smoother flow for buses, delivery trucks and other automobiles.

Metering is demonstrably the most efficient and flexible way to manage curbside demand. However, one- or two- hour time limits represent the majority of applications. Numerous studies show that time limits are difficult to enforce and are thus often ignored. Other studies show that time limits produce longer stays, less turnover and curbs which are 100 percent occupied. Areas with time limits frequently suffer from double parking and additional cruising. During peak travel hours, many U.S. cities also use curbside parking bans to reallocate curb space from parking to buses and through traffic. This traditional measure is easy to enforce. Some cities restrict curb access to particular types of motorists, usually commercial vehicles and government and handicapped permit holders. Unfortunately, widespread abuse of government and handicap permits has been documented in several places.

## Curbside / On-street parking best practices

**Enforcement:** Automated scanning enforcement as employed in Chicago, Illinois; parts of Virginia and Santa Barbara, California, appears transformative, though in its early stages. Other technology, especially wireless, handheld devices with cameras have made traditional enforcement more efficient; as has software which automatically issues and tracks parking summonses.

**Pricing Policy:** Variable or peak-hour metering in which the price is set based on a curbside occupancy target of less than 85 percent is a logical and consistent

way of managing a congested curb. San Francisco's SF*park* is the largest application of this approach, also used in Redwood City, California, and in a flexible form by New York City's ParkSmart. Another effective practice is to both restrict curb access to commercial vehicles and meter them. New York City does this in Manhattan and adds an escalating meter fee of $2, $3, and $4 per hour to encourage short stays, high turnover and faster deliveries.

**Payment methods and meters:** Pay-by-phone is growing rapidly in popularity. Industry experts believe that remote payment will eventually replace meters. In the meantime, the state of the art meters are solar powered, multi-space meters which are in wide use across the U.S.

**Building support for metering via Parking Benefit Districts and revenue return:** In 20 to 30 special parking districts, in cities as varied as Boulder, Colorado, Los Angeles and San Diego, meter revenues support streetscape improvements to attract more retail business.

# Introduction

IN THE LAST FIVE TO TEN YEARS, U.S. transportation planners have become much more aware of the effect parking has on congestion, air quality, economic development and the pedestrian environment. Historically the "parking problem" has been identified as the problem of too little supply; increasingly the problem is now seen as the poor management of the existing supply and, in cases where cities have instituted parking maximums, the problem is understood to be of too much supply. There is a growing realization that the dysfunction caused by poorly conceived parking policies is a major impediment to creating an effective and balanced urban transportation system, it is also a significant cause of traffic and air pollution. This changing perspective, combined with major technological changes, and budget pressures due to the severe recession, is propelling rapid changes in curbside parking practices in the downtown areas of some of America's biggest and most influential cities. Off-street parking policy is in some ways more complex and more important, as it heavily influences urban land use, density, and the pedestrian environment. Indeed, one of the key issues to emerge from this report is the importance of merging these two domains of parking under one policy umbrella.

The relationships between parking infrastructure and transportation choices are as important as that between road infrastructure and transportation choices. Yet research on roads abounds while there is very little on parking.

This report describes how parking policies affect United States cities. Using research and case studies, it takes a historical, theoretical and an empirical approach to analyzing goals for parking management and regulatory policy designed to meet those goals. We include curbside (on-street) parking, which in most U.S. cities is managed and maintained by street and public works departments, and accessory off-street parking which is regulated by planning

**OVERVIEW**

Parking regulations and policies impact urban form. This influences transportation choices and numerous quality-of-life issues, including affordable housing, walkability, storm-water management, air and water quality, traffic congestion, and greenhouse gas emissions. Originally parking regulations were instituted to accomplish one of two objectives. They were intended to mitigate "spillover" effects meaning that parking demands stemming from new developments wouldn't encroach on parking in adjacent areas or parking used for pre-existing development. They were also intended to ensure that auto access to any development was a seamless experience for drivers. Imposing minimum requirements for parking provision accomplished both objectives but stimulated several unintended consequences.

Eventually it became the hope of planners in dense, but declining, urban areas that more free parking would make downtowns competitive with the evolving suburban shopping areas. Minimum parking requirements, again, were used to make the downtowns more similar to the suburbs.

In recent years the relationship between parking availability and high levels of single occupant auto driving has become more clear. Planners and residents of some American cities have come to realize that cities must reform themselves such that residents and visitors have an array of transportation modes from which to choose. These and other concerns, such as auto emissions related violations of the federally established clean air standards have led several cities, such as Los Angeles, Philadelphia, Washington, DC, and Seattle, WA to revisit their parking management strategies.

The need to redevelop parking management strategies has, in turn, led many cities to reform strict parking minimum regulations and to implement a variety of innovative parking management policies. These curbside and off-street policies include parking benefit districts, parking freezes, travel demand management (TDM) programs, pricing through metering and permitting, and parking maximum zoning regulations.

departments through zoning codes. Within curbside and off-street parking there are rules governing both commercial and residential parking. An additional category—private, for-profit parking garages typically found in dense downtowns—is treated only in the context of how parking supply affects other transportation behaviors.

Documenting examples of parking "best practices" used to manage demand and promote mobility and accessibility goals, while mitigating the negative effects of private automobile use and the over dependence on single occupant automobile trips is the focus of this report. Central cities where there is a perceived parking shortage will be at the forefront.

Part One explains historical and status quo practice in both off-street and curbside[1] parking management. Part Two highlights the "business as usual parking policy" and features some recent innovations, including reducing cruising for parking, double and other examples of illegal parking, single occupant vehicle use and reducing the air pollution, traffic congestion and danger caused by unnecessary driving. Part Three systematically describes a host of parking strategies for both off- and on-street parking. Roughly, these strategies fall into the categories of: increasing supply; decreasing demand; and managing supply and / or demand. Locations where these strategies have been implemented are noted. Part Four sets out approaches to parking policy that have been taken by cities at the forefront of innovation.

This report documents parking studies, academic research, and includes comments from many planners, parking managers, parking industry executives and other experts. Not all of the interviewees were comfortable being identified. In those cases where the comments were important enough to include, they are without attribution.

# Part I: Early History

## Curbside parking and the drive to off-street parking minimums

Parking supply and management has been a matter of public policy in the United States since the early 1900s. Parking bans and strict time limits were imposed on downtown streets across the country by police departments and traffic engineers. For example, Detroit imposed time limits on curbside parking in 1915; Boston did so in 1920.[2] For decades after the advent of the automobile, city engineers and planning elites strongly opposed curbside parking because it was an inefficient use of public space and impeded traffic. Parking was banned in "The Loop," Chicago's Central Business District, in 1928, and overnight parking was banned in Manhattan, New York City, until the late 1940s.[3]

However, as car ownership skyrocketed, pressure for parking grew. From 1920 to 1960, American cities responded to this demand by increasing the supply of both curbside and off-street parking. (This increase very likely induced greater demand for driving and parking.) Cities removed curbside parking bans, built huge numbers of both government and business-funded parking garages, metered curbside parking on shopping streets, and, finally, required that both new residential and commercial development include off-street parking. By 1960, almost all U.S. cities had some form of minimum parking requirement: which immediately influenced urban and suburban land use.

Woman paying for parking in downtown Oklahoma City in 1935
COURTESY OF POM INCORPORATED

Curbside parking meters were introduced in 1935, in downtown Oklahoma City, Oklahoma, at the behest of a department store owner who wanted to make parking more available for potential shoppers.[4] His own employees had been parking at the curb and making it harder for customers to access the front door. Metering, recognized as an efficient way of encouraging "turnover" on the curb, spread quickly. By 1955, all major U.S. cities had metered their central business districts (CBDs) and retail shopping streets. Ensuring curb space for short-term shoppers and deliveries remains a primary goal of curbside parking management in the United States. Though, as is discussed later in this report, the implemented policies frequently fall short in supporting that goal. These historic roots help to explain why retailers have a disproportionate voice in establishing curbside parking policy.

Although metering was introduced in the mid 1930s and became commonplace by the mid 1950s, in recent history, the political will to increase meter rates has been lacking. As a result meters became ineffective for promoting turnover.[5] Official attempts to deal with the crowded curb have taken the form of ordinances requiring that new developments include off-street parking.

In 1956, the same year the interstate highway construction was initiated, the Bureau of Public Roads (BPR) published an influential pamphlet defining the parking problem and solution.[6] The authors explicitly promoted parking solutions built around these three assumptions:

- The automobile is the best mode for every trip.
- Highways are equally desirable and appropriate for short neighborhood

and local business trips as they are for longer distance travel between cities, and between cities and suburbs, as well as for access to major shopping centers (now characterized by big box development.)

- Highways should be free flowing, and highway capacity should be increased to accommodate growing demand.[7]

Thus, by the 1950s, public policy toward parking was established to ensure a satisfactory automobile experience. It was believed that motorists should not have to pay much for parking, if anything, nor be inconvenienced with time wasting searches or walks that exceed more than a few minutes. Any competition for parking among new motoring visitors, existing residents and businesses was all but eliminated. Planners steeped in the BPR philosophy defined parking demand for facilities to be at their thirtieth busiest hour.[8] The marginal cost of land in suburban locations meant the cost of developing of parking here was also very low. In that light, the BPR philosophy assumed parking would be free, and that most, if not all, trips would be auto trips. Even momentary parking shortages were deemed unacceptable. Thus city ordinances began to require sufficient parking space to serve the highest projected parking demand, under the assumption that all visitors would arrive by private automobile and that parking would be free.

**Curbside parking meters were introduced in 1935, in downtown Oklahoma City, Oklahoma, at the behest of a department store owner who wanted to make parking more available for potential shoppers.**

The earliest off-street parking policy required minimum amounts of spaces for new development. To this day, parking minimums remain the most prevalent policy. The underlying idea is still adhered to that the demands of new development should not be felt by neighboring land uses. But since the Clean Air Act Lawsuits of the 1970s (see Parking Freezes box p. 43), it has occasionally been questioned (see Hudson Yards box p. 29).

## Determining minimum requirements

Donald Shoup, author of *The High Cost of Free Parking*, observes a highly flawed, three-step process for determining required parking. First, planners define a land use (such as residential apartments, fast food restaurant, or professional office space), choose a starting point that is unrelated to the transportation system (usually square feet of the building), and then specify a number of spaces to require. Planners use building square footage, rather than sales, employees, or other bases for pragmatic reasons: they are easily measured and relatively stable. Parking minimums tend to ignore the transportation system and modes of travel. Because of historical bias toward the automobile and in a quest for simplicity, minimum parking requirements typically assume that all visitors arrive by automobile and have free parking. Thus, the potential behavioral effect of charging for parking, and the effect of visitors arriving by foot, transit or bicycle are minimized or ignored. The fact that catering almost exclusively to motorists fosters more automobile use has been misunderstood, understated or ignored.

Even under these assumptions it is difficult to come to grips with the question of how many spaces a city should require for every elementary school, for

every health club and every church. In many cases planners simply copy the regulations imposed by neighboring jurisdictions. In an attempt to provide standardized guidance, the Institute of Transportation Engineers (ITE) has developed a catalog of existing land uses and the associated parking that has been built alongside of them. The volume, simply called *Parking Generation*, is in its third edition. Most often, planning agencies use *Parking Generation*, which is, in essence, "copying from neighboring jurisdictions" writ large. The Parking Generation guide attempts to report parking demand for hundreds of different land uses but it does so by collecting reports on what has been done by jurisdictions across the country. In many cases the guide relies on a very small suburban sample for each of the many and diverse types of activities to which people travel: work, school, home, recreation in big cities, small towns and suburbs, in places served by transit, in places where people walk and where they drive.

The guide uses observation of *peak* demand at single use, low density, low transit, typically suburban developments to inform its parking demand requirements. The guide "predicts" parking demand based on the averages or simple regression estimates of the number of spaces provided per square foot of building. No analysis with respect to the appropriateness of the methodology or the results for any particular place is made. The assumption supporting this method is that all parking should be provided free and that land is nearly free. Finally, as noted above, observations of the parking demand for specific land uses are often very few: half of all the parking generation rates the guide predicted are based on four or fewer examples. Yet these sparse samples are presented as standard practice, rather than observations which may or may not be applicable to any given community.

Less frequently, though far superior, a particular study takes into account the specific factors of a neighborhood or development. These more realistic parking demand studies consider neighborhood density and design, demographics, transportation options, surrounding land use mix, existing off-street parking and the city's specific goals with respect to the transportation system.

## Unintended consequences

Sixty years of experience with minimum parking requirements has shown several unintended consequences that have in turn become the focus of modern parking policy. Among the unintended consequences are the following:

- Parking minimums cause dispersed land use. The physical space devoted to parking is enormous. In many places this results in more space devoted to parking than to the primary land use. For instance, office space typically requires 175–250 square feet per person; parking spaces require about 200 square feet per vehicle for curbside parking, and 300–350 square feet per car in garages. A recent Manhattan development called the East River Mall couples 485,000 square feet of retail space with over 686,000 square feet of parking.[9]

- Depending on minimum parking requirements, the increasing dispersion makes other modes of travel infeasible. Walking becomes impractical because the space required for parking creates great distances between destinations; transit is adversely affected because densities are lower than reasonable transit service thresholds. Bicycling also becomes untenable because the dispersed land uses are served by collector streets that are too dangerous and uncongenial for cyclists to use.
- By degrading conditions for alternative modes, parking requirements feed a cycle of auto dependency. The parking requirement degrades other travel options and leads to increased auto use.
- Entry points to parking facilities require vehicles to cross sidewalks creating many points of pedestrian / auto conflict. This further degrades the walking environment feeding the dependence cycle.

The sum of these unintended consequences is increased automobile trips, which, in turn results in excess congestion, air pollution and greenhouse gas emissions.

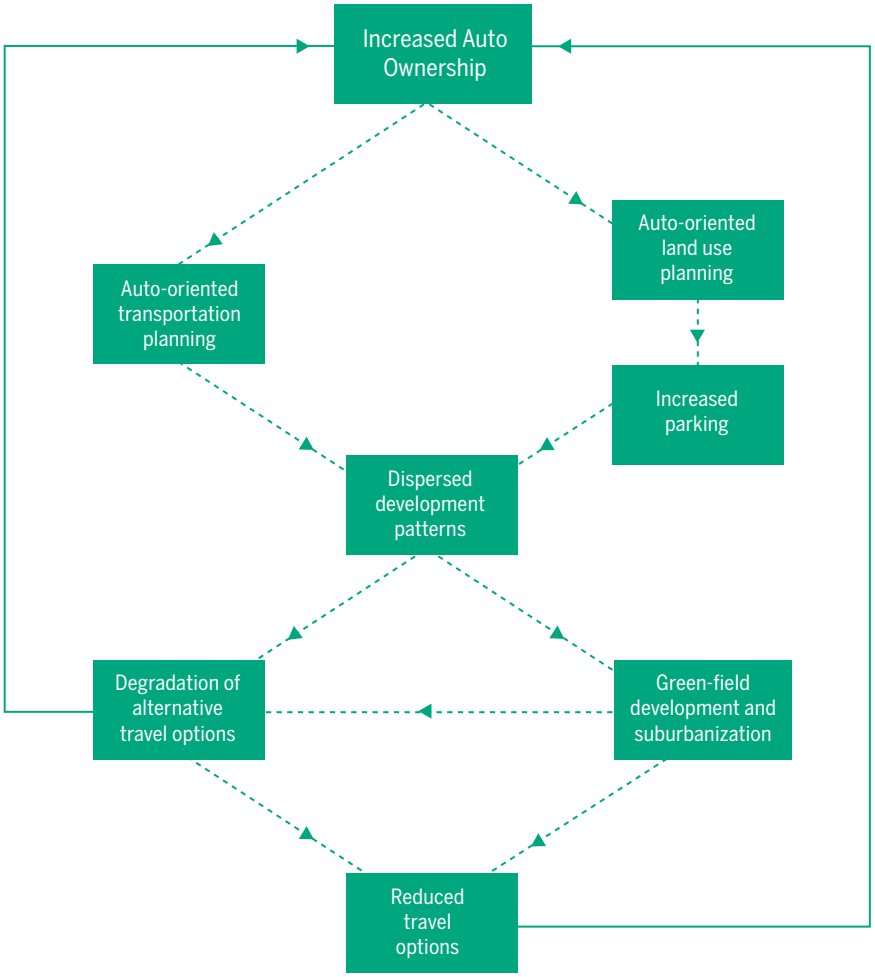
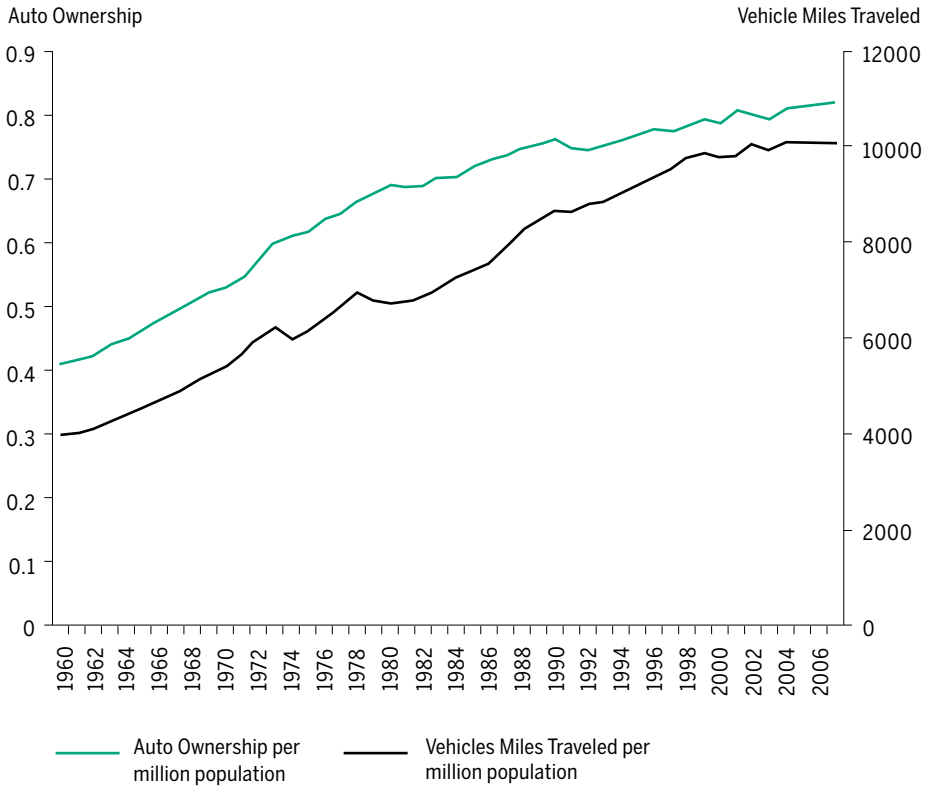



Figure 1: The Cycle of Automobile Dependency

## Car ownership, car use and parking

Fueled by massive road building and ample amounts of new, typically free parking, private automobile transportation became the dominant from of personal travel in the United States. Increases in auto dependence in the United States both drive and have been driven by parking policy. Auto ownership per 1,000 people doubled in the United States from 441 in 1960 to 820 in 2007. Autos are now used for 86 percent of trips.[10] Ninety-nine percent of those trips begin and end in a free parking spot. And experts in the United States and the United Kingdom estimate that automobiles are parked approximately 95 percent of the time. In many places in the U.S., for every automobile there are at least three parking spots: one at home, one at work and one at "play" i.e. any non-work destination. The three-spots-per-car estimate was corroborated most recently by researchers in Indiana. Counting only off-street surface parking spaces, and not including residential land where garages and driveways are common, the research team determined that there were approximately 2.2 spaces per registered vehicle in the county they studied.[11] Where parking is not provided for free or where the cash equivalent of free parking is offered, people respond by carpooling and using public transportation (see Parking Cash Out box p. 19). Several studies show a relationship between high priced and / or restricted parking supply in downtowns and higher rates of public transit use.[12] Two recent studies of New York City show that relatively scarce off-street parking contributes to lower greenhouse gas emissions and keeps vehicle miles traveled (VMT) per capita lower than the national average as well.[13]

Figure 2: Per capita car ownership has doubled in the past 45 years



## Parking and transportation choices

### Off-street parking basics

From a theoretical perspective, it would be easy to predict that minimum parking requirements would lead to auto dependence and the degradation of walkable cities. The automobile transportation system has three components: streets, vehicles and parking. Together streets and parking spaces create the system supply or capacity, vehicles and the amount of vehicle use comprise demand. Regulations that require parking as part of new development facilitate automobile use. They make car use cheaper by eliminating the time-cost associated with searching for a spot, and retrieving a vehicle when it is not parked adjacent to the traveler's origin or destination. Likewise, at least initially, increases in roadway capacity and the road network, reduce a motorist's travel time. As a result of these time savings, car use is made cheaper and, in turn, more common by increasing the parking or roadway supply.

When the price drops on a commodity, more users are drawn into the market and demand increases. The concept that demand for parking is influenced by the free supply of parking has only recently begun to receive widespread recognition in the policy arena. Another important point to consider is that expansion of urban street capacity requires knocking down buildings. Thus, an important side effect of increasing the parking supply is that it creates increased demand for road space, which usually leads to increased traffic congestion until roads can be widened. The converse is also true. When roads are widened, the demand for parking increases.

### PARKING CASH-OUT

Several studies have shown that when individuals are required to pay for their own parking they will drive less. Other studies show that when employees are offered the cash equivalent of their "free parking benefit" many will take the cash and leave the car at home.

Percent of employees who drive alone to work when their employers pay the parking fee versus when they pay the parking fee:

| | Study Date | Employer pays | Employee pays | Greater probability of driving alone |
|---|---|---|---|---|
| Washington, D.C. | 1991 | 72% | 50% | 44% |
| Los Angeles | 1991 | 69% | 48% | 44% |
| Los Angeles | 1980–1989 | 75% | 43% | 74% |
| Portland* | 2001 | 62% | 46% | 35% |

*model estimate
Compiled from Willson (1991); Miller (1991); Shoup (1995) and Hess (2001)

Percent of employees who drive alone to work before and after cash-out:

| | Study Date | Drive alone before | Drive alone after | Reduction |
|---|---|---|---|---|
| Southern California | 1997 | 76% | 63% | 20% |
| Minneapolis, MN** | 1999 | 87% | 67% | 30% |
| Eden Prairie, MN | 1999 | 93% | 87% | 7% |
| Bellevue, WA | N / A | 89% | 54% | 65% |

*Average of eight case studies
**Suburban location
Compiled from Shoup (1995); USEPA (2001)

Marina City in Chicago consists of two condominium buildings with 19 of the first 60 floors dedicated to car parking
MATTHEW RUFO

When it is understood that the parking supply helps induce more driving and demand for parking, it is easy to see that adding capacity increases congestion. A preponderance of research shows that adding capacity increases congestion. In his books, *Stuck in Traffic* and *Still Stuck in Traffic* Anthony Downs shows how the building of more motor vehicle infrastructure results in greater congestion.[14] Likewise Martin Mogridge,[15] in *The Self Defeating Nature of Urban Road Capacity Policy*, describes the history of road capacity policy, how it has not achieved the ends expected and, worse, how it has brought about results opposite of those intended. This has been documented in numerous studies including quite conclusively by the British Government in the 1995 report Trunk Roads and the Generation of Traffic by the Standing Advisory Committee for Trunk Road Assessment.[16]

There are four conditions under which the parking supply meets demand.

- When there is no scarcity of cheap land (for example at the urban fringe);
- When roads are so congested that they (rather than the parking supply) represent a bottleneck on the system;[17]
- When government regulations require so much parking that there is a surplus of parking far exceeding even peak demand; and
- When parking is priced at a level that tempers demand to meet the available supply.

Increasingly planners and transportation system managers are coming to appreciate that requiring a sufficient supply of parking to meet unconstrained demand may not be an efficient or desirable objective and it will likely lead to higher levels of roadway congestion. Instead, strategies to better manage supply and demand or, in some cases, to reduce demand, are being tested. Parking policy is increasingly used to generate revenue (see Chicago case study p. 60), decrease double parking and other illegal parking (see New York City case study p. 62), decrease the "cruising" for spaces that contributes to unwanted congestion and unnecessary emissions (see San Francisco and New York case studies p. 50 and p. 62), mitigate disruptions to the urban fabric and recalibrate the allocation of land, both rights-of-way and parking lots among users of all modes (see Portland case study p. 54).

## Curbside parking basics

The basics of curbside parking are simple. The supply of curbside parking is essentially fixed. It can be affected by the number of curb cuts, restrictions, and the use of angled parking, but by and large, regardless of demand from motorists and regardless of the level of development, the supply is inelastic. If there are fewer curbside parking spots than motorists seeking to park, motorists must circle or search for parking until a spot opens up, double park, seek parking elsewhere or park in an illegal space (e.g. bus stop, loading zone or blocking a fire hydrant). The problem is exacerbated if there are no alternatives to the car for access—such as transit, walking or cycling. While it is often asserted that parking is a "public good" and therefore should be free, a true public good is one whose use by one party does not impinge on its use by another (like a lighthouse or a TV broadcast). Although curbside parking uses public streets, it is clearly not a public good; each motorist who parks takes a potential space away from another motorist, likewise curb cuts for driveways take part of the public right of way and assign it for the exclusive use of the driveway owner. In most dense urban areas, there is excessive demand for curbside parking. In areas where parking is free or underpriced, this means that the curb is almost always full.

## Transportation policy and parking policy: two separate realms

While curbside and off-street parking clearly constitute a city's parking supply, it is rare that consistent policy is set or managed in a way that recognizes their influence on each other. The lack of coordination between transportation agencies that manage the street systems and planning departments that set parking requirements underscores a larger disconnect between transportation and land use planning. Though criticized for its ineffectiveness, the federal government has attempted to address this through successive federal transportation bills. However, the fact remains that transportation policy is most frequently set at a regional, state or national scale and land use policy is set and implemented locally, by sometimes very small towns and lightly populated counties. For example in the nine-county region around Philadelphia there are over 350 local cities and townships which set land use policy without regard for neighboring jurisdictions or larger state or regional goals. While both curbside and off-street parking policies are set locally, the broader transportation context is set regionally and at the state level. This issue is squarely at the crossroads of transportation and land use planning, off-street parking is part of the transportation system but completely regulated by land use plans.

Parking policy, as well, is split into two separate realms with street departments responsible for curbside management and planning departments responsible for off-street supply. Off-street is further divided into public access and accessory parking. Commercial parking is frequently owned and operated by private corporations with prices set at profit earning levels, sometimes it is municipally owned and either municipally or privately operated. In the latter two cases, prices are seldom set to maximize profit but at a politically expedient level or in some cases—e.g. when managed by parking benefit districts[18]—to promote economic development or other transportation goals. Both of these are public access arrangements as these lots are open to all motorists. Accessory parking is parking that is used almost exclusively by patrons of a particular building, and it is usually provided without charge. The cost of such parking is absorbed into other revenue generating centers of the building.

It is unfortunate that on-street and off-street parking have been treated primarily in separate domains with coordination of these two arenas occurring in rare instances, and sometimes only at the behest of small business improvement areas (see Boulder case study p. 56).

## Early mitigations

As early as 1973, three major U.S. cities instituted caps on downtown off-street parking to settle litigation forcing them to comply with the Clean Air Act. These parking restrictions, which explicitly recognize that parking supply contributes to congestion and air pollution, were codified in legal agreements between the cities and the federal government (see Parking Freezes box p. 43).

With the exception of Boulder, Colorado and Portland, Oregon (see case studies p. 56 and p. 54, respectively), there was very little innovation in parking policy for the next 20 years. More recently, a small but increasing number of initiatives have been undertaken in U.S. cities to correct the unintended consequences of past parking policy. They also seek to use parking policy to restore urban centers, mitigating some of the congestion, air pollution, and infrastructure and public health costs associated with over-reliance on automobiles.

# Part 2: Current State of Parking Practice in the U.S.

## Curbside

### Managing "commercial" curb parking

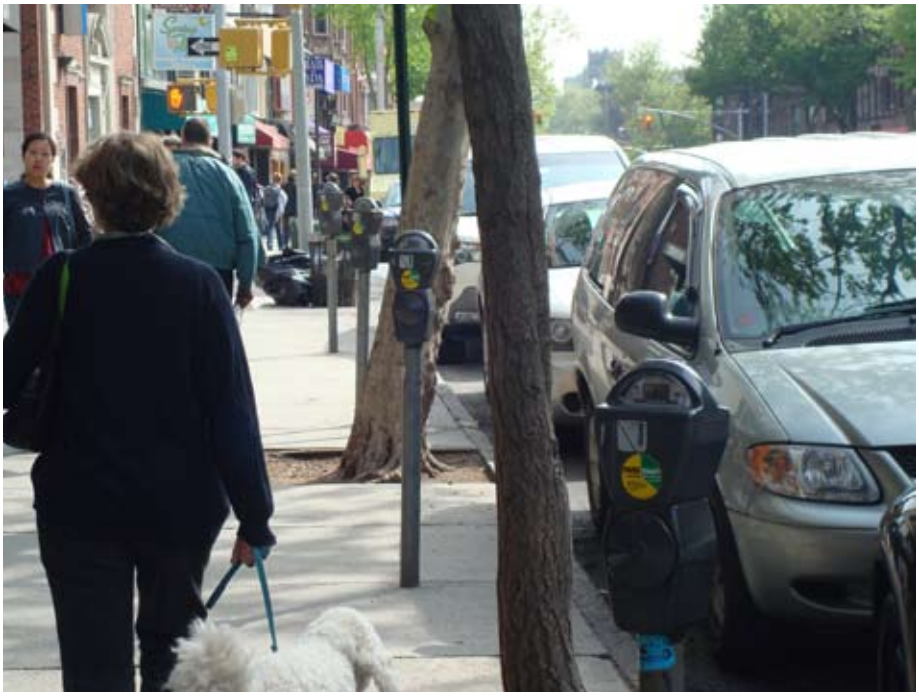
American transportation planners and traffic engineers divide city streets into two basic types: commercial and residential. Commercial streets have retail store fronts or are in central business districts (CBDs). In this section we are most interested in examining commercial on-street parking because this is where the competition for parking is greatest, and the proper functioning of the curb is most important to the transportation system and the overall public benefit. There is a universal consensus among U.S. transportation planners that curbside parking on commercial streets is best used by short-time parkers, including: delivery and service vehicles and short term visitors, often shoppers. Parking shortages are frequently perceived when the curb is full yet nearby off-street commercial lots may be well below capacity.

There are five direct ways to address demand for urban curbside parking, described here from least to most effective.

### Increasing supply

As previously noted, the most popular American strategy for managing the demand for curbside parking has been to increase the supply of off-street parking. As U.S. cities experienced curbside parking shortages, they mandated off-street parking and / or encouraged private garages. There are multiple problems with this approach. Increasing the off-street parking supply encourages more driving. Since the supply of urban street space is fixed, additional driving contributes to traffic congestion, air pollution and other social costs. It also consumes valuable land in the urban core and degrades the pedestrian environment. And, if the cost of curbside parking is lower than off-street parking, additional garages do not reduce curb congestion.

If the cost of curbside parking is significantly below that of off-street, the addition of garages is ineffective in addressing congested curbside parking. In New York City, for example, the Department of Transportation is piloting a "ParkSmart" program which increased meter rates in Park Slope, Brooklyn, from $0.75 to $1.50 per hour during the parking peak. In Greenwich Village, rates have been increased from $1 to $3 per hour as a result of the program. Yet off-street parking rates range between $13 and $25 per hour[19] with the typical rate being $15 or $16. The rate differential results in a $12 to $13 savings per every hour parked at the curb, which is essentially equivalent to paying oneself $12 per hour if it takes a full hour to find a curbside spot. Spending 15 minutes to save $12 is the equivalent hourly rate of someone earning $100,000 annual salary. Indeed, as one recent Philadelphia news reporter[20] said in response to that city's parking meter increase, "Circling the block to find a parking meter is a daunting task, but it's worth it to save a couple of a [*sic*] bucks." Assuming a curbside spot could be found at any moment within an hour the strategy of searching is cost effective for someone who values his or her time up to $56 an hour. If it takes at least 10



ParkSmart meters lining the street in Park Slope, Brooklyn
NYC DEPARTMENT OF TRANSPORTATION

minutes but not more than one hour to find a spot, the expected pay back to the searcher is at a rate of $26 an hour. Many people will not want to bother searching or keeping the meter paid and will immediately enter a lot, but others will continue to exploit the advantage to be gained by cruising for parking.

Even longer term rates (i.e. all day parking) in garages are typically higher than curbside rates. Using New York City again to illustrate, CBD meter rates (outside the ParkSmart pilot areas) are $2 per hour. It would cost $8 to park there for a half day, paying the hourly meter rate, but exceeding the time limit, a common practice. Garage parking in the CBD ranges from $14 to $60 for four hours (it would be the same for eight hours), with a typical rate of $15 or $20[21] for a curbside savings of $7 to $12. All day parking at the curb would finally be equivalent to the low end of the price range for garage parking.

Typical downtown curbside meter and commercial garage rates are shown in Appendix A.

Where these rate differentials exist, drivers have a huge incentive to search for curbside metered parking and, when and if they do find a spot, to occupy it beyond the legal limit.

Where accessory parking is abundant, as in many U.S. cities, the cost to park is usually free. Where it is not, "parking validation" is a common practice where the parking charges are paid by the merchant and not the customer. A merchant will stamp, or validate a customer's parking ticket so that the charges are waived for the customer, but accrue to the merchant. Both accessory parking and validation are a form of "bundling" the cost of parking with the development or activity. In the case of bundling, the cost is passed along to all residents, employees and shoppers using the building, whether they are drivers or not. It amounts to a subsidy for driving. See additional details under "The costs of parking," page 31.

## Managing demand

The remaining four curb management approaches attempt to "ration" the use of the fixed curb parking supply through pricing, time limits, and restrictions on user groups. In practice many cities use a mixture of approaches.

### Restrictions on user groups

Restrictions on user groups can work well if the privileged group, usually commercial vehicles, is also subject to metering and expected to park for short time periods. The most common form of curbside restriction on commercial streets is to ban private cars and allow only vehicles with commercial license plates or permits. These "commercial vehicle only" rules are typically combined with time limits and / or commercial vehicle meters. New York City both meters commercial vehicles and bans private cars from parking on most arterial streets in its central business districts, as does Houston in its metered CBD "Red Zones." These restricted meter zones work well.

Restrictions that allow privileged user groups to park for long periods at the curb without metering contribute to parking shortages and traffic dysfunction. Examples are parking permits for the private cars of government employees and handicap parking permits. Both kinds are widely abused in the cities where they are used. For example, in New York City and San Francisco permit holders consume a hugely disproportionate amount of the curbside spaces. However, in the past two years, NYC has eliminated more than half of the parking permits held by public employees, a reduction of more than 75,000.

### Time limits

Time limits are among the earliest and most common ways to ration space. They have repeatedly been shown to be ineffective and are difficult to enforce. Comprehensive surveys compiled by the *Handbook of Transportation Engineering*, 2004, of unmetered locations in times and places as far apart as Rochester, New York, in 1937, Germany in 1991, Seattle in 2000 found that 40 percent to 60 percent of vehicles overstay free time limits. In Seattle, the average time in one-hour spaces was 2.1 hours. Time limits tend to result in a "shuffle" in which commuters and other long-term parkers periodically move their cars to avoid being ticketed. Not only are time limits difficult to enforce, they are also inherently inefficient compared to metering. Motorists parked at a meter have an incentive, however small, to limit their stay to less than the maximum allowed time. Motorists with free, time limited parking, have no incentive to reduce their parking stays and therefore have been found to park longer than metered parkers.

### Curbside parking bans

As far back as the 1920s, American cities banned curbside parking on commercial streets, and many still do. Cities use the curbside space for buses, through traffic or turning lanes. Also, common are peak-hour parking bans and off-peak delivery hours. Curbside parking bans are generally easy to enforce and are

frequently, though not always, complied with. They allow optimal use of the curb during periods of highest demand, for example, for peak hour bus service. However, where road capacity is adequate and off-street parking scarce, curbside parking bans may not be practical or desirable. As interest in Bus Rapid Transit grows, there has been more demand for dedicated bus-way space and growing interest in curbside parking bans.

#### Metering the curb

Transportation experts quickly recognized the connection between meter prices, curb occupancy and cruising. By 1937, there were detailed studies showing that underpriced curbs led to high occupancy which, in turn, resulted in cruising for a bargain. In 1954, Nobel Prize winning economist William Vickrey explained why higher peak hour metering, and metering generally, was superior to time limits. New technologies, especially meters which take credit cards, have made varying meter prices much easier. As cities begin to experiment with peak-hour meter pricing a number of important conceptual issues have come to the fore. The most important question is how much to charge at the meter. The 1956 BPR report suggests an occupancy rate greater than 90 percent indicated a problem. Donald Shoup has advocated and popularized an 85 percent curbside occupancy target, which has been widely adopted and many experts now advocate setting meter rates at a price that results in an 85 percent occupancy, or one open spot per block. This might be thought of as a market clearing price. Metering is a response to the irrationality of the claim that "paying with your time" is as reasonable a rationing algorithm as paying with money. But this discounts two important facts. First, the motorists cruising for parking pays with his or her time, *and* the time of everyone stuck in traffic behind him. Second, neighborhood residents suffer from the additional air pollution, noise, danger and degraded quality of life caused by cruising and the additional traffic congestion it engenders.

**In 1954, Nobel Prize winning economist William Vickrey explained why higher peak hour metering, and metering generally, was superior to time limits. New technologies, especially meters which take credit cards, have made varying meter prices much easier.**

## Off-street

#### Regulating parking through zoning

With the exception of Houston, all large cities in the United States enforce parking regulations through zoning, the primary tool for land use regulation.[22] Zoning is done at the municipal level, though it requires state level enabling legislation. Municipalities have practiced zoning since 1916 when New York City introduced the country's first zoning ordinance. The United States Department of Commerce created the Standard State Zoning Enabling Act of 1921; which has served as a model for zoning enabling legislation across the nation. In a 1926 court challenge to the legality of zoning as land use regulation, the U.S. Supreme Court ruled zoning legal and constitutional. By 1930 more half the states had adopted zoning laws. Today, all states allow zoning regulations.

The three main types of zoning regulate land by:

- Use (Euclidean Zoning)
- Design (form-based zoning)
- Incentives.

Though Euclidean zoning[23] is by far the most common, together these three methods govern a given parcel's permitted use—whether industrial, residential, commercial, entertainment, or a mixture—and the building characteristics, such as height, lot coverage, setbacks and proportions, and of course, parking requirements. Many municipal planning agencies create zoning codes in compliance with a comprehensive plan that sets the framework for the plan and related zoning code. Most municipalities also employ appeals systems comprised of elected or appointed officials who grant use or form variances to landowners who demonstrate hardships imposed by the existing zoning. In some cases appeals can be used to alter the amount of parking required and / or permitted.

**The proliferation of single-use Euclidean zoning throughout the U.S. resulted in the separation of land uses. Homes are separated from manufacturing and office land uses which, in turn, are separated from shopping and entertainment places.**

The proliferation of single-use Euclidean zoning throughout the U.S. resulted in the separation of land uses. Homes are separated from manufacturing and office land uses which, in turn, are separated from shopping and entertainment places. This segregation has resulted in the need to overcome greater distances between home and the activities of life. Great reliance on private automobiles became the solution to bridge these growing geographic divides. The spatial requirements needed to accommodate automobiles, such as parking and rights-of-way, forced even more space between uses, reinforcing the cycle of auto dependence. Highway funding and development comes from the top of the U.S. government structure and transportation planning is typically done at the regional level. To receive federal transportation funds large regions are required to have a legitimate regional transportation plan—the solution to the growing problem of just where to *put* Americans' parked cars emerged within the planning agencies of municipalities throughout the country.

**Minimum parking requirements**

Since the 1930s, planners have imposed minimum off-street parking requirements to accommodate peak parking demand for an ever-increasing number of defined land uses.[24]

The rationale for creating parking minimums stems from the concern that new developments will fail to provide adequate parking. The assumption is that this lack of parking will create traffic congestion, causing parking to spill over into surrounding neighborhoods where it will compete with current land uses. The resulting scarcity of spaces will lead to cruising, thereby increasing traffic congestion and illegal parking. In addition, planners were concerned that a building's future use may have a higher parking demand than its current use and jurisdictions would have no future recourse to hold tenants accountable for parking shortages due to future changes in land use.[25] Today, municipalities

specify minimum off-street parking requirements for hundreds of different land uses. The underlying idea, that parking demands of new development should not be borne by adjacent areas, is still adhered to but, given the unintended consequences described in Section One, the approach is coming under increasing challenge (see Hudson Yards, NYC box p. 29).

Minimum parking regulations impose major societal costs and undermine efforts to create balanced, sustainable transportation systems. . As discussed earlier in this text and also in *The High Cost of Free Parking*, minimum parking regulations create a cycle that encourages transportation by private automobile, and, in turn, influences public authorities to require more parking. This analysis is strengthened by a New York study which found that accessory parking at home is more likely to generate auto commutes than other factors including household income, auto ownership or a host of other things usually associated with the decision to drive [26]. Minimum parking regulations reduce density, and increase distances between destinations. This reduces land values and increases traffic congestion, storm-water runoff pollution, air pollution, and construction costs, as well as discouraging walking, bicycling and public transit.

Minimum parking requirements are especially damaging to central business districts (CBDs). The inherent advantage of CBDs is density and diversity of land uses. Parking consumes scarce land, reduces density and disrupts and degrades the pedestrian environment. Downtown parking, which is expensive to build, makes mixed residential / office land uses extraordinarily expensive, sometimes inhibiting development. As a result, many American cities experience "dead downtowns" which empty out after work.

Alternatively, large surface parking lots scattered throughout downtowns usurp real estate making development less feasible and creating unpleasant districts that repel shoppers and workers alike.

**HUDSON YARDS, NEW YORK CITY**

In 2004 the New York City Department of City Planning created a redevelopment plan for the Hudson Yards on the west side of Manhattan. The plan required approximately 17,000 new parking spaces. To determine the level of parking planners relied on the principle that parking demand generated by the new development should be met by the new development and not rely on existing parking facilities. The plan did not recognize that both parking demand and driving demand are driven by parking supply. The level of parking called for would inadvertently make driving to the site the preferred mode.

A local civic group understood that parking reduction strategies would complement plans for more efficient access including more public transit, cycling and walking without compromising the development. They knew that the plan would encourage more driving thus undermining the City's efforts to reduce harmful greenhouse gas emissions and to comply with federal clean air standards. The group successfully sued the City claiming that the parking plan violated agreements to meet the federal clean air standards. The new development plan limits parking to about one third of the spaces originally proposed.

Surface parking in downtown Minneapolis, MN between Hennepin Avenue and 8th / 9th Streets
ZACHARY KORB

Implicit in minimum parking requirements are several assumptions and principles that are often unstated in zoning codes. These include:

- Local governments have the responsibility to ensure that each building's users are able to access the building by private automobile.
- Each of these users should be able to park at the building without wait at peak hours.
- The cost of these spaces is irrelevant; additional development costs associated with required parking is simply a cost of doing business, no different from meeting standards of structural integrity.

As shown in the section "Determining minimum requirements," whether or not off-street parking provides a necessary service and prevents parking spillover into adjacent neighborhoods, the methods used to determine the required number of spaces per land use is typically arbitrary and ad hoc.

### Developer response

Studies suggest that the majority of developments build just the amount of parking required by a city's zoning code. One study[27] found that 70 percent of suburban office developments in southern California built exactly the minimum required amount of parking. Similarly, a Chicago Regional Transportation Authority study of office developments in 10 Chicago suburbs found that developers did not supply more parking than the minimum required.[28]

Many cities use ITE's *Parking Generation* manual, with its small samples of peak parking demand in suburban locales, as the basis of their *minimum* requirements. The result is that many of the constructed parking spaces are empty most of the time. Since there is no demand for many of these spots much of the year, the market price of these always empty parking spaces is close to zero, which

helps explains why 99 percent of all auto trips end in a free parking space. The surplus spaces keep parking costs very low and encourage single occupant vehicle use and its attendant societal costs. The excess spaces also prevent property owners from properly pricing parking and compel them to spread the high costs of building and maintaining these spaces—both occupied and empty—throughout the driving and non-driving populace. Recent research has illuminated precisely what these costs are.

## The costs of parking

According to one source, 10 percent of development costs are typically dedicated to parking.[29] Parking costs depend on a number of factors that vary by region, including local land values, the costs of construction, and other aspects such as facility type and size. Regardless of the construction costs, a common thread throughout U.S. municipalities is the small proportion of the total cost actually paid by users. A typical user pays just 5 percent of non-residential parking costs.[30] Two funding sources—public subsidies and developer capital—finance the remaining cost. Thus, the cost of providing parking is passed on to all taxpayers and users of the development for which parking is required regardless of their transportation choices.

### Direct costs

The physical costs of constructing, operating, and maintaining parking spaces are easiest to measure, and are, therefore, the best documented. They include the cost of land, construction, and operations, as well as the opportunity costs.

Off-street parking spaces tend to occupy an average 300–350 square feet / space, including access lanes and landscaping. This translates to 100–150 spaces / acre for a surface lot. Urban land tends to be more expensive than suburban and rural land, and structured parking tends to be cost-effective only when land prices are greater than $1M per acre.[31]

Construction costs vary according to the type of facility. Parking structures are more expensive than surface lots, and underground garages, which require excavation, waterproofing, shoring, ventilation and round-the-clock lighting, rendering them the most expensive.[32]

According to the building construction cost clearinghouse RS Means, the 2009 median price of above-ground parking structures was $18,300 / space.[33] Each space in a parking structure roughly amounts to between $105 and $180 / month. Larger structures may enjoy greater economies of scale since smaller structures must distribute the fixed costs of elevators, ramps, and stairwells among fewer spaces.

Cleaning, lighting, maintenance, repairs, security, landscaping, snow removal, access control (e.g., entrance gates), fee collection (for priced parking), enforcement, insurance, labor and administration all make up parking facility operating costs. A 2005 survey shows that operating costs at commercial facilities range from $450–$850 per space per year.[34]

And as with all developments, opportunity costs factor into the total cost of providing parking. Land devoted to parking could also be used for buildings to lease or sell. The higher a parcel's value, the greater the opportunity costs. These costs are therefore particularly high in central urban areas.

Table 1: Typical Parking Facility Costs
SOURCE: VICTORIA TRANSPORT POLICY INSTITUTE, 2009. ASSUMES 7% ANNUAL INTEREST RATE, AMORTIZED OVER 20 YEARS (2005 DOLLARS)

| Type of Facility | Land Costs Per Acre (000s) | Land Costs Per Space | Construction Costs Per Space | O & M Costs Annual, Per Space | Annual Cost Annual, Per Space | Monthly Cost Monthly, Per Space |
|---|---|---|---|---|---|---|
| Suburban, On-Street | $50 | $200 | $2,000 | $200 | $408 | $34 |
| Suburban, Surface, Free Land | $0 | $0 | $2,000 | $200 | $389 | $32 |
| Suburban, Surface | $50 | $455 | $2,000 | $200 | $432 | $36 |
| Suburban, 2-Level Structure | $50 | $227 | $10,000 | $300 | $1,265 | $105 |
| Urban, On-Street | $250 | $1,000 | $3,000 | $200 | $578 | $48 |
| Urban, Surface | $250 | $2,083 | $3,000 | $300 | $780 | $65 |
| Urban, 3-Level Structure | $250 | $694 | $12,000 | $400 | $1,598 | $133 |
| Urban, Underground | $250 | $0 | $20,000 | $400 | $2,288 | $191 |
| CBD, Surface | $2,000 | $15,385 | $3,000 | $300 | $2,035 | $170 |
| CBD, 4-Level Structure | $2,000 | $3,846 | $15,000 | $400 | $2,179 | $182 |
| CBD, Underground | $2,000 | $0 | $25,000 | $500 | $2,645 | $220 |

**External costs**

A recent study of off-street parking in New York City notes that expanding parking infrastructure serves latent demand by adding capacity and induces additional demand by reducing costs.[35] Thus, parking spaces not only incur construction costs, but induce travel by private automobile. That additional auto use in turn creates additional, indirect costs in the form of traffic congestion, vehicle emissions, costly crashes and injuries to pedestrians, cyclists and other motorists. It also imposes environmental externalities, such as storm-water runoff, flooding and the urban heat island effect.

Congestion creates additional time and fuel consumption costs, which may be measured by fuel costs per mile traveled. The cost of vehicle emissions may be calculated by determining the cost of reducing the average amount of pollutants generated per vehicle mile traveled. Specific costs differ across cities according to their existing congestion and air quality, and fluctuate according to the price of fuel. For instance, the average combined congestion and emissions costs for Los Angeles has been estimated at about 16 cents per vehicle mile traveled, whereas in New Jersey it is between 8 and 13 cents per vehicle mile traveled.[36] The additional travel induced by increased parking supply contributes to these additional external costs.

**Impact of parking on costs of other resources**

Required parking spaces add costs to developments that are often passed through to the tenants and users. For instance, a study found that each parking space provided for urban affordable housing, adds 12.5 percent to the total

development costs.[37] Nonprofit affordable housing developers in San Francisco report that the city's requirements added 20 percent to the cost of each unit and decreased the number of buildable units on site by 20 percent.[38] Using a hedonic price model for homes in six San Francisco neighborhoods, a 1999 study determined that the price of single family homes and condos that included off-street parking was over 10 percent higher than those that did not include parking.[39] Though the result is due to two unrelated studies and may not be directly comparable, if the additional development cost to provide parking is 12.5 percent of a unit cost and only yields an additional 10 percent on the sale price then inclusion of off-street parking is valued in the market below its cost to provide. The parking is subsidized by the unit.

### When public parking is privately owned and operated (off-street)

The majority of commercial off-street parking available to the public in the U.S. is owned by private companies. Additionally, private companies operate government owned garages in many central business districts. There are significant policy implications to the public and private ownership of off-street parking.

The goal of private garage owners is to maximize profit. Because demand for short-term parking is less elastic than everyday commuter parking, private garages make much of their profit by charging very high rates for the first hour. It is also likely that their labor costs are reduced by accommodating long-term parkers rather than high turnover which requires more intervention. The net effect is a price structure that charges high rates for short-term parking. Unless curbside meters are comparably priced which occurs more frequently when the curbside and off-street is managed jointly, as in Boulder and Ann Arbor, these high first hour prices increase demand for curb parking, and add to cruising and double parking. This phenomenon is observed in Manhattan, downtown San Francisco, and within the Chicago Loop.

# Part 3: Rethinking the Curb and Traditional Parking Policies

## Curbside parking

There are two basic problems associated with on-street parking: too much demand (high occupancy) and insufficient enforcement of existing regulations. This section highlights some of the innovative policies and technologies used to address these problems. Since parking policy is so highly political, new parking innovations are often as much a response to political constraints as they are to practical issues.

### Curb Occupancy

#### Measuring turnover versus measuring occupancy

Historically, parking meter rates have been determined, somewhat arbitrarily, by politics and "turnover" with the goal of maintaining 100 percent occupancy, though early guidance indicates that occupancy below 90 percent is desired.[40] Turnover measures how many vehicles occupy a parking spot in a given time period. A fundamental conceit of current parking practice is that 100 percent curb occupancy is attainable if the right turnover is established. While in theory full occupancy has some appeal, in practice it is impossible to achieve. One hundred percent occupancy would require a perfect choreography between the arrival and departure of motorists or a queue of waiting vehicles standing ready to occupy each newly vacated space. To complicate the issue, there is no standard definition of turnover, there is no optimal turnover rate and there is no standard way of measuring it. As a result, even traffic professionals are not really sure what turnover calculations done by other cities or agencies really mean. In fact, it is impossible to have an optimal turnover rate, since the optimal turnover would naturally vary depending on specific land-use, and land uses are endlessly varied. In the real world, 100 percent occupancy, typically even 90 percent, results in cruising, double parking and other illegal parking. Turnover is difficult to measure, so when turnover is the basic measure of success, it is difficult to know whether or not policy objectives are being met and equally difficult to make policy corrections when they are not met.

In contrast, curbside occupancy targets are easy to measure. Keeping one open spot per block ensures motorists do not need to circle or park illegally. It is also relatively easy to gradually increase or decrease meter rates until this rate is achieved. Different prices can also be set to address the different levels of demand experienced at different times of day. New York City, San Francisco and a number of smaller cities are experimenting with variable meter rates, in which higher meter prices are charged during periods of highest demand.

#### In U.S. cities, illegal curbside parking is a big portion of all parking

In American cities with high curb demand, poor enforcement and underpriced curb space combine to produce large scale illegal parking. There is strong evidence to suggest that a large share of all curb parkers overstay their time or fail to put money in the meters. A 2004 University of California study in the City of

Berkeley found 32 percent of motorists in one-hour metered parking overstayed. Though curbs were 90 percent occupied, parking turnover for eight hours was only 4.2 vehicles, instead of the roughly 7 to 8 expected if all parkers heeded the one hour time limit. Furthermore, surveys suggest that 30 percent of driving commuters in the area parked illegally every day. A 2007 study by the San Francisco comptroller found that in and near downtown, more than a third of parkers overstayed time limits or did not pay at metered parking.[41] San Francisco also found that disabled permit holders, who comprise 10 percent of all vehicles, occupied 20 percent of all available metered time. In 1998 Arlington County, Virginia, where vehicles displaying handicap license plates or placards had been allowed to park for free, revoked that privilege because of well documented placard abuse. In New York City placard abuse by government employees has also been well documented.[42]

Other studies such as one conducted in 2008 in New York City found 20 percent of all vehicles parked in one Brooklyn neighborhood were illegally parked. A similar study in Manhattan found the average stay in one hour metered parking was 93 minutes. Audits by a scanner equipped vehicle in Fredericksburg, Virginia, found that 25 percent of all curbside parkers overstayed time limits. In that case rigorous enforcement, using the same scanner vehicle, created 20 percent more parking availability. In Seattle, Washington, 2,000 spaces in 35 neighborhoods were surveyed. Analysts found that the average parking duration in one hour parking zones was 2.1 hours.


Enforcement vehicle with mounted cameras used to scan parked cars in Fredericksburg, VA
FREDERICKSBURG POLICE DEPARTMENT

A 2007 study in Park Slope, Brooklyn, found that illegal parking increases exponentially as curb occupancy exceeds 85 percent.[43] This means that one form of illegal parking, overstaying time limits, triggers other types of illegal parking. The most common infractions are parking in no standing or no parking zones followed closely by double parking, other violations include parking at bus stops, blocking fire hydrants and overstaying time limits.[44] Vehicles are also observed parking in driveways and sometimes on sidewalks.

The scale of illegal parking in the U.S. has major implications for street management. Double parked vehicles significantly degrade available street capacity, delay buses and endanger cyclists and pedestrians. Vehicles parked in bus stops force buses to stop in traffic lanes also degrading street capacity. Vehicles parked in loading zones prevent trucks from accessing the curbs, and vehicles in fire hydrants cause unnecessary risk where cities have attempted to maintain safety standards.

### The airport model

Sometimes high occupancy results from the poor distribution of the demand. This can take place when there is a poor match between supply and demand when the excess supply may be relatively near-by. A nearly universal airport model of parking management parcels parking into short-, mid-, and long- term parking. The supply is managed by pricing the lots to distribute parkers among them. There is a huge amount of variation in the actual rates but the general principal is that the daily maximum cost of short-term parking is typically three or four times the daily maximum for long-term parking. The pricing mechanism

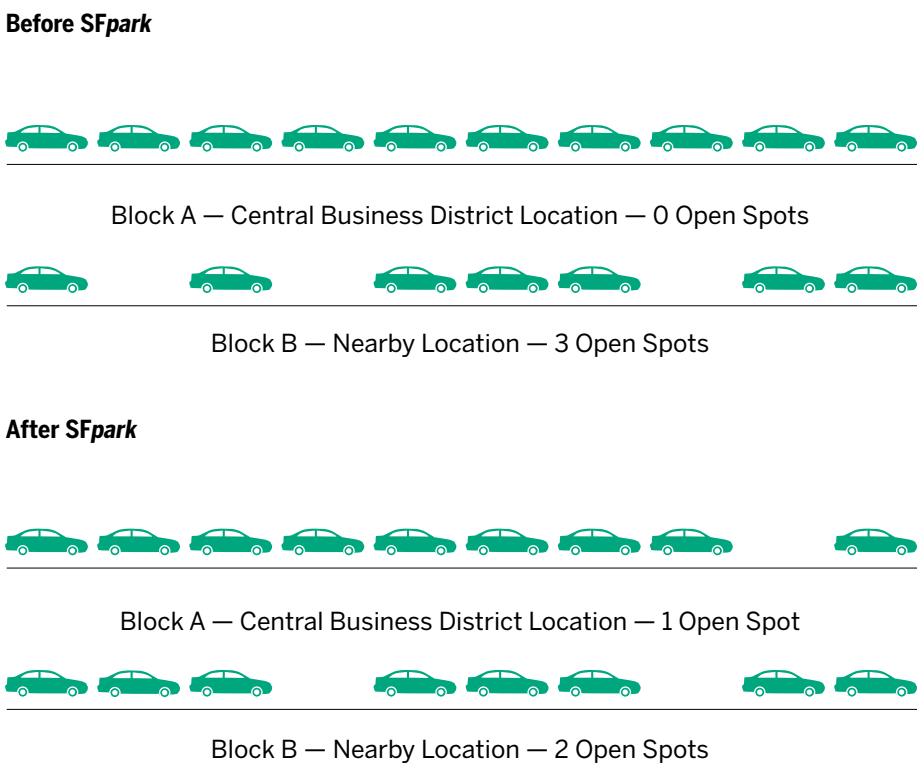



Figure 3: S*Fpark*, San Francisco's curbside parking reform plan, illustrates the logic of the airport model

rations the parking in such a way that travelers wanting to leave their vehicles for several days are encouraged to park remotely and use a shuttle to arrive at the terminal, while people who are simply dropping off or picking up passengers and only need a half hour or an hour of time will be able to easily access the terminal.

The urban analog is commuters and other all-day parkers versus parkers who are making deliveries, shopping, picking up an item or attending a meeting. From a space rationing perspective it makes more sense to have employees of an establishment—who will be there for several hours a day—park somewhat more remotely[45] and walk a block or two to their destination rather than have someone else walk a block or two to perform a short task. The scheme is very well accepted in the case of airports but has gained little traction in cities where meter rates tend to be more uniform. Some cities operate shuttle services from remote parking fields to downtowns, but these add to travel time and have not been popular.

#### Increasing metering opportunities

There is usually local political opposition to metering more parking. Even in areas with high spillover and very high curbside parking demand, the political cost of metering more parking is perceived to outweigh the public benefit. Metering is, therefore, typically constrained to spots directly in front of retail store fronts and on arterial streets. As a result there is often a high level of curb dysfunction in dense neighborhoods with mixed land-uses, because only a small share of total curbside parking is metered. This encourages cruising for free parking on non-metered side streets. The only cities we have identified as adding new metered spots are Houston and Chicago. As part of the creation of 20 miles of new light rail, Houston is more than doubling the number of parking spots it meters. By 2016, Houston plans to add 7,500 new metered spots to the 6,300 spots it already meters. Many of the new metered spots will be near light rail stations and areas expected to have land use changes because of the new transit. In Chicago the city has entered a long term lease turning over future meter revenue on 34,500 meters but it will establish 4,400 new metered spots for which the city will retain control.

**In Chicago the city has entered a long term lease turning over future meter revenue on 34,500 meters but it will establish 4,400 new metered spots for which the city will retain control.**

## Parking enforcement: technological transformations

Urban parking managers agree that consistent, frequent parking enforcement is essential if curbside rules and meters are to be effective. However, they also agree that illegal parking is rampant, and enforcement, especially in big cities, is grossly inadequate, sporadic, and not well distributed. In some parts of San Francisco, fewer than 20 percent of vehicles are legally parked. This level of illegal parking may seem surprising since parking fines can be expensive. However, parking managers in several cites told us that their city councils approve inadequate numbers of parking agents because parking enforcement is unpopular.

Along with being understaffed, parking enforcers face a myriad of obstacles, ranging from difficulty enforcing time limits to being bullied and assaulted by motorists. However, parking enforcement appears to be on the cusp of major technological advances that will result in stricter and more consistent enforcement. In turn, reliable enforcement has been shown to significantly increase available parking and turnover. Parking enforcement can be divided into four tasks—detection, ticketing, collection and adjudication—all of which are being transformed by technology.

**Detection**

There are two major, and very new, technological advances in detecting and responding to illegal parking. These include networked curbside sensors, like those to be used in San Francisco's SF*park* and vehicle mounted scanners using vehicle and / or license plate recognition. Curbside sensors can determine how long vehicles are parked and they can direct enforcement agents to vehicles which have not paid or are over time limits. Vehicle mounted scanners, like AutoChalk and AutoVue, have been used in Fredericksburg, Virginia, and Santa Barbara, California, to keep track of how long vehicles remain parked and issue automatic citations when appropriate. License Plate Recognition (LPR) reads plates and determines if a vehicle is over the time limit, registered in a residential permit parking zone or even stolen. LPR for parking enforcement is in use in smaller cities including Ft. Collins, Colorado, to enforce time limits. LPR is also in use on 100 street-cleaning vehicles in Chicago.


AutoChalk is a vehicle mounted scanner used for parking enforcement in Santa Barbara, CA
SANTA BARBARA POLICE DEPARTMENT

### Ticketing / Citations

Most large cities and towns employ parking agents, equipped with handheld computers or PDAs. The handhelds scan vehicle windshield registration stickers, print tickets and transmit citation information to a central computer. The next generation of enforcement technology is vehicle mounted detection systems like Autochalk and Autovue which can automatically issue tickets. These systems are currently uncommon because they are new to the market and can be expensive and in many places their adoption is constrained by political opposition and by laws forbidding photo enforcement.

### Collection and adjudication

Modern ticketing software significantly reduces errors. This translates into much higher payment of fines and fewer voided tickets. Additionally, many jurisdictions use PDAs which photograph illegally parked vehicles.

## Curb pricing technology

The technological revolution spawned by the advent of the microchip and wireless networking is changing how Americans pay for curbside parking. This is important to policy makers because new, credit card and cash capable, meters and pay-by-phone systems make variable meter pricing and higher meter rates much easier to implement than coin only meters. Experts suggest that much of the real technological advance has been in software system integration which allows for secure credit card payment and extremely accurate auditing of cash payments and automated receipts.

Many parking meter experts believe that within 20 to 30 years, parking meters will be completely replaced by pay-by-phone, pay by web, SMS text messaging or other digital systems. However, the tech transformation is still in its early days. Parking industry experts estimate that fewer than 10 percent of the country's approximately two million metered curbside spots are metered by modern multi-space meters which can take credit cards or cash. Less than 2 percent of metered spots can be paid by phone. Furthermore, roughly 85 percent of meters still take only coins.

### Multi-space meters

The state of the art curbside meters are solar powered, wireless, multi-space, pay and display meters. Each meter controls eight to ten parking spots and is networked with a central computer which can process credit and pre-paid parking cards. Multi-space meters have several advantages which accrue to both the user and the city. Their ease of payment, capable of handling credit cards, pre-paid cards, cash and taking payment by cell phone, have increased the convenience and popularity with the public. Because each meter handles eight to ten cars, the actual parking spot designation is less rigid. Depending on the vehicle size, this sometimes results in up to 15 percent more parking spaces than would be available using conventional meters and conventional spacing.

Drivers pay 25 cents for 5 minutes of curbside parking in Chicago, IL
COURTESY OF ITSBETTERONAMAC/FLICKR

Multi-space parking meter in Chicago
COURTESY OF WIKIMEDIA COMMONS

From a city's perspective multi-space meters are more reliable than coin machines which are often out of service due to vandalism or sabotage. They have a higher revenue return—typically 20 percent to 30 percent more—due to increased ease of payment. The computerized audit trail reduces theft and employee pilferage, improves revenue tracking and provides good data for policy analysis. The meters also allow flexible pricing which is extremely important for cities that wish to vary their meter rates to manage demand throughout the day.


Pay-by-Phone parking is available in Miami, FL
ZEB DROPKIN

**Pay by phone**

Miami, Florida has the largest pay-by-phone curbside operation in the U.S. with 5,500 spots and plans to expand to 8,000 within the next few years. Motorists there are very enthusiastic about the service, which includes texted reminders that parking time is expiring and the option to pay to extend time. Numerous other U.S. cities are using pay-by-phone on a smaller scale, and use is spreading rapidly. Even meter manufacturers say that pay-by-cell or Smart Phone will eventually become the primary form of payment. However, pay-by-phone is still new in the U.S., and older motorists and those without credit cards have not embraced it. Adoption has also been slowed by high cell phone charges. Miami motorists using pay-by-phone pay $1.25 / hour for parking and a $0.35 charge to their cell phone.

**Sensors and data integration**

New meters can be networked with software which allows parking managers to easily assess revenue and parking activity at a glance. The technology is so new that meter vendors say few cities have taken full advantage of it. Two that have are San Francisco and Los Angeles where experimentation with parking sensors is ongoing. (see San Francisco case study, p. 50).

**Information on space availability**

Seattle is attempting to reduce pressure on curbside parking by directing more parkers to off-street parking garages via the large scale introduction of a real-time Electronic Guidance System which tells motorists via variable message signs and the web what parking is available in nearby garages. The system is based on those installed in major German as well as other European cities. It will be operational in 2012. A drawback of electronic guidance systems is that they are generally unattractive adding to the visual noise of a district. Urban design considerations may restrict their use.


A rendering of the electronic parking guidance system planned for Seattle, Washington
SEATTLE DEPARTMENT OF TRANSPORTATION

**In-Vehicle meters**

As of this writing, in-vehicle meters are used in few places and are thought by both industry vendors and city parking managers to have been leapfrogged by pay-by-phone / PDA technology and to have no future.

## Private versus public parking: Curbside

It is very common in the U.S. for private businesses to have a role in curbside operations. In all cases, the municipal governments set policy to determine how curbside space is used and, if it is used for parking, how that parking is regulated. City governments determine whether a curbside parking spot has a time limit, is metered, what the meter rate is, or whether parking is restricted to certain user groups. City governments also set the fines for parking violations and receive all revenue—even if a private vendor is paid to collect fines.

Outside of determining curb uses and regulations, city governments employ many different combinations of public and private sector workforces to operate their parking systems. In other words, governments set the rules, but how those rules are enforced, parking fines collected, meters maintained, and meter revenue collected, varies a great deal. Most common is for city governments to enforce parking regulations and collect fines, but hire private sector vendors to supply and maintain parking meters, process credit card transactions, and run the computer systems which issue parking and track parking summonses. In some cities, including Charlotte, North Carolina, a private vendor completely manages everything from issuing parking tickets, to adjudicating those tickets. They collect fine revenue, install meters and collect revenue from those meters. Other cities, including New York City, purchase meters from private companies, but conduct all other parking operations using city workers. There is no authoritative analysis of the advantages or disadvantages of various forms of operating curbside parking systems, though one is needed. There appear to be regional patterns, with Southern cities using the most private vendors.

In Chicago, Illinois, meter rates are set based on a contract between the government and a private vendor. (see Chicago case study p. 60) In return for a $1.15 billion upfront payment, Chicago agreed to give 75 years of future meter revenue to a private consortium. However, even in Chicago, the government may raise, lower or eliminate meter prices, or eliminate parking, as long as the vendor is provided the same level of revenue as it would from the contractually agreed upon meter rates. This means that a new metered spot in one area could be substituted for another in a similar location. However, in practical terms, this limits Chicago's ability to convert metered parking to bus or bicycle lanes or other uses. Additionally, Chicago continues to keep all parking fine revenue and enforces and adjudicates parking fines.

## Institutional arrangements (hybrid curbside and off-street management)

### Parking benefit districts and "revenue return" to neighborhoods

Parking meters were invented to open up curb space for short shopping visits to downtown retail areas. But as time passed, and suburbs rapidly expanded, the same downtown merchants who initially supported metering became afraid that metering would steer customers to free parking at suburban malls. As a

result, meter prices in many American cities remained unchanged for decades. Ironically, these artificially low curbside prices contributed to the exact parking shortages and inconvenience for shoppers so feared by downtown merchants. These fears of the draw of free suburban parking are still a major influence on urban parking policy.

In 1970, Boulder, Colorado, suspected that properly priced curbside parking meters might revitalize its struggling downtown commercial district. Boulder's conceptual breakthrough was to create a Parking Benefit District (PBD), where meter rates would make curb parking more available, pay for parking structures, and pay for streetscape improvements to make the downtown more attractive. Merchants were persuaded that customers would pay more for parking, if they got more in return. A fundamental tenet is to create a "park once" area, where motorists could leave their cars and walk. Thus, PBD's would help restore walkable neighborhoods in city and town centers.

Today, there are approximately 20–30 Parking Benefit Districts in the U.S. Most were established in the 1990s and modeled on the Boulder concept. They are most frequently found on the West Coast but their success has prompted spreading across the country.

The most common Parking Benefit Districts are run by existing Business Improvement Districts in walkable, historic downtown districts where retail businesses have deteriorated because of competition from suburban big box malls. Augmented by funding from a special real estate tax, some or all revenue from curb meters goes to pay for new parking structures and often public space improvements. One of the best known parking benefit districts is Old Pasadena, Los Angeles, which was established in 1995.

The most extensive, and oldest, PBDs are in Boulder, Colorado and Ann Arbor, Michigan. Those PBD's are actively engaged in Travel Demand Management and subsidizing and promoting public transit (see Boulder case study p. 56). Additional, but small-scale, parking meter revenue-return experiments, in which meter revenue pays for streetscape and other improvements in the neighborhood where they are collected, are underway in Washington, D.C., and Austin, Texas. In those cities, a portion of meter revenue is dedicated to cycling, walking and transit improvements in residential neighborhoods. The revenue-return model is predicated on the idea that community acceptance will be heightened if the community sees direct benefits. The Washington, D.C. and Austin programs are too new, and small, to evaluate.

## Off-Street

### Set Maximum requirements

When cities set minimum standards, they are *requiring* that parking be provided. Maximum standards *allow* parking to be supplied up to a certain level. A few cities imposed parking caps in the 1970s to resolve litigation forcing them to comply with federal air quality standards (see Parking Freezes box p. 39). The connection

between parking supply and auto mode choice was, by then, already established and the parking caps were intended to reduce or arrest auto use. This was one of several strategies to reduce harmful auto emissions.

Recently, additional cities, such as San Francisco, California, Redmond, Washington, and Cambridge, Massachusetts,, have begun to impose *maximum* off-street parking regulations. Their objectives include promotion of higher density development, walkable downtown areas, promotion of transit and other transportation modes (to increase choice and reduce congestion), as well as the original intent of reducing auto use and harmful emissions. Maximums are often coupled with minimums, thus creating a range from which a developer may choose. Similar to minimums, maximum amounts are typically expressed according to square feet of built space in a city's zoning code. In more rare cases, maximums are calibrated to transit capacity (see Portland case study p. 54), but even then the number of spaces is tied to building characteristics.

Parking maximums can be stipulated in many different ways. In some San Francisco areas, for example, the rule is that parking cannot be more than 7 percent of the gross floor area of a building. In Downtown Portland, Oregon, where there is a high level of transit service and where maximums are calibrated to the level of transit service, one parking space is allowed for every 400 square feet of office area which equates roughly to one space per two employees. Smaller cities experimenting with maximums sometimes set them too high to have any effect.[46] Redmond, Washington, for example has set its maximums at 3.5 spaces per 1,000 square feet. Since a typical office layout allows about 250 square feet per worker, the Redmond maximum is about 3.5 spaces per four workers or 1 space per 1.14 people—allowing enough parking so that 87.5 percent of employees can drive alone to work. With parking set so high, the city is unlikely to see non-auto mode shares exceeding 13 percent of commute trips.

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**PARKING FREEZES**

U.S. cities such as Boston, Portland, OR, and New York City have implemented parking freezes to contain the negative impact of excessive off-street parking supplies on congestion, urban form and air quality, under the notion that excess parking enables additional vehicle miles traveled. The 1972 Clean Air Act, which created federal air quality standards for cities, spurred these two northeastern metropolises to forge agreements with the EPA to limit off-street downtown parking growth through parking freezes.[1]

Planning agencies uses freezes to cap the number of public and / or private off-street spaces in specified districts. These policies typically are viable in central cities served by reliable transit options, and encourage development by increasing project profitability, for fewer required spaces allows developers to devote more project square footage to leasable or sellable space[2].

**Clean Air Districts: New York & Boston**

At the time of the Clean Air Act's passage, New York City's zoning code accommodated substantial off-street parking provisions: it required off-street parking for at least 40% of units in residential developments, allowed up to 225 off-street spaces as-of-right for commercial and civic developments, and allowed public parking lots up to 150 spaces in size as-of-right.[3]

In response, in 1973 the New York State and City of New York adopted the Transportation Control Plan, which aimed to lower the CBDs' off-street parking by 40%. New York City implemented an amendment to its zoning code that froze off-street parking construction in specific districts in the area of Manhattan below East 96th Street and West 110th Street, which includes the city's densest residential areas and the Midtown and Downtown office districts. (continued)

Appropriate limits to the number of off-street parking spaces landowners may develop can meet both city and developer interests. The cities gain environmental benefits from preserved open space, limited impervious surfaces, and more attractive and pedestrian-friendly urban design. In addition, the disincentive to single occupant auto use created by limiting parking availability encourages use of alternatives such as public transit, bicycling, walking and carpooling. Consequent reduction in private automobile use may improve mobility by reducing congestion, and improve air quality. When developers and their competitors each face parking restrictions, they gain from minimizing construction, maintenance and operation costs of typically low-revenue generating land use, and increased FAR and leasable space.

The most rational approach to setting maximums is to pre-determine the desired levels of access by different modes and ensure adequate facilities for each. If high auto access is desired, large amounts of parking should be in place. If high transit access is preferred, more transit capacity and less parking should be made available, likewise for bicycle and pedestrian access. Parking provided in excess of the desired levels of auto access will likely impede the mode split goals.

### Eliminate or reduce minimum requirements

The most straightforward parking policy reform that planners may pursue would be to eliminate minimum off-street parking regulations allowing developers and building owners to decide how many spaces to voluntarily provide. Proponents of deregulation argue that these parties are best qualified to make the case-by-case decision of how many parking spaces to provide, for it is in their best financial interest to provide enough parking to satisfy tenants and customers while avoiding a wasteful oversupply.[47]

**PARKING FREEZES (CONTINUED)**

The 1982 legislation prohibited public parking lots in the Midtown, Downtown and convention center districts. It also replaced the residential minimum requirement with a maximum limit of parking spaces for 20% or 35% of new units, depending on neighborhood; and, reduced the number of allowable parking spaces for hospitals to 100, for 15% of units for hotels (up to 225), and all other commercial and civic spaces to one space per 4000 square feet of floor area (up to 200 total).[4]

The City of Boston implemented a similar parking freeze plan following the passing of the Clean Air Act. Similar to New York, the city's plan is included in a statewide transportation plan, the Massachusetts State Implementation Plan, which created the city's Air Pollution Control Commission. In addition to reducing VMT, the plan aimed to limit CBD public commercial parking ratios to a 1 per 2.500 square feet of commercial floor area.[5] The freeze prohibits parking spaces from increasing beyond 10% of the 1973 levels in downtown Boston.

The city has applied the parking freeze to separate uses in three different neighborhoods over the last few decades: commercial public spaces in the CBD, Back Bay and South End (1973); non-residential, commercial off-street parking in South Boston (1993); and rental and park-and-fly spaces in the airport district of East Boston (1993) .

Data from a 1998 inventory conducted by the city suggests that the parking freeze has successfully limited parking space growth and encouraged use of public transportation for commuting. From 1977–1997 the total number of spaces in these areas grew just 9% from 51,000 to 59,100 spaces, whereas the number of exempt spaces grew by 26%—which the city attributes to employee space growth.[6] And according to a 1992 survey, 43.4% of CBD commuters use transit, compared to 37.1% single occupancy vehicle. The rest carpooled, walked or biked.[7] Increased parking prices have made Boston's blic off-street parking market the second-most expensive in the U.S. (after Manhattan), but the city, however, is one of the largest in compliance with the EPA's standards.[8]

Reducing, rather than eliminating minimum requirements, however, may prove to be a more politically saleable method for lowering parking supply. It may also be a wise move on the part of planning agencies to rethink their parking management strategies in terms of reducing minimums, applying maximums or taking other actions rather than simply abdicate responsibility to the developer community.

In addition to lowering existing zoning requirements, planning and development agencies may create transit zoning overlays or lower requirements on a case-by-case basis for uses or combinations of uses that generate lower parking demand.

Transit Zoning Overlays are special zones that supersede the use, density, design and parking requirements of a neighborhood's previously existing regulations. Planners use this tool in areas served by regular, reliable transit, such as bus rapid transit or light rail, subway, or other service under the notion that neighborhoods well served by transit demand an urban form different from those more reliant on private automobile (i.e., they require less parking supply). For instance, Montgomery County, Maryland, which lies outside Washington, D.C., reduces parking minimums for sites near Washington Metro stations by 20 percent, while Milwaukee, Wisconsin, allows up to a 15 percent reduction in minimum parking requirements in its transit overlay zones, which pertain to half of the city's area.[48]

Some cities grant minimum parking reductions to affordable and senior housing developments, whose residents tend to have lower rates of car ownership. Los Angeles, for example, reduces its space per unit requirement by 0.5 spaces for deed-restricted affordable housing. Seattle, Washington, permits fewer required parking spaces for affordable and senior housing as well as for multifamily developments that reserve spaces for car sharing.[49]

## Shared parking

The most efficient way to use off-street parking is to share it. The driving rationale behind shared parking facilities is that different uses attract visitors at different times throughout the day; thus, spaces that are built to meet a maximum demand at the peak for one use would sit empty at other times of the day. Naturally commercial for-profit parking is shared and parking for a multi-use mall is frequently shared but accessory parking—that which is required to be provided as an accessory to the primary use—is usually single use. Under typical zoning rules a hardware store and the restaurant next door must each provide the amount of parking prescribed for their use even though one business is used almost exclusively in the daytime and the other in the evening. Shared parking allows the same spaces to be used by both businesses.

Shared parking encourages the centralization, consolidation and reduction of a neighborhood's parking facilities, thus improving urban design and allowing more productive land uses. Developers, tenants and building owners benefit

from reduced construction expenses and from creating "captive markets," such as residents of a condominium that shares a parking facility with a gym.

Several cities such as Portland, Oregon, Cambridge, Massachusetts, Boulder, Colorado, and counties like Arlington County, Virginia and Montgomery County, Maryland, have successfully implemented shared parking in their codes. Security, liability and operational obstacles, and the need to overcome perceived customer preferences may pose challenges for potential facility operators.[50] One method is to calculate the demand for each use sharing the parking facility by time period, such as weekday vs. weekends, and mornings vs. evenings, then add the demands for each use to determine the total demand by time period. The highest number of parking spaces demanded among the different time periods would serve as the shared parking minimum requirement. Montgomery County conducts this analysis for shared parking proposals, provided all uses sharing the facility are within 500 feet of it. Alternatively, some cities allow the building owners / developers to propose the number of spaces for a shared parking facility, based on their own analysis.[51]

Commercial and municipal parking can be priced in a way that accessory parking cannot. When parking is required developers and property owners have an incentive to bundle the cost of accessory parking into their leases and sales. Thus, downtown businesses with accessory parking typically provide free parking for customers. Private operators seek to maximize profit, whereas government-owned parking seeks high, but paying, occupancy.

### In-lieu parking fees

Several U.S. cities allow developers to reduce minimum parking requirements in exchange for a fee paid to the city to fund construction of shared public parking facilities.

These "in-lieu parking fees" offers key benefits. First, they allow developers the flexibility to choose whether or not to build what can be an expensive amenity, particularly in urban infill locations. The subsequent reduction in construction costs makes affordable housing or historic preservation, for example, more financially viable. Second, by reducing and consolidating scattered off-street parking spaces, a city has the opportunity to significantly improve a district's urban design.

Most cities set uniform fees rather than decide on a case-by-case basis, which can be time-consuming and expensive, as well as creating uncertainty for a developer or owner. To avoid subjecting building developers to a lengthy and unpredictable variance process, cities should clearly delineate the terms of reductions in the zoning code.[52]

Cities have collected the fees either up front or as a surcharge added to property tax bills. A 2002 survey of 15 cities' in-lieu payment programs found that fees averaged $16,146 per space, from as little as $2,500 in Concord, California to $50,994 in Palo Alto, California, which was that city's cost of constructing a parking space in a public structure.[53]

## Lower demand for parking

Thus far, this study has reviewed techniques cities used successfully to lower the number of parking spaces in their communities. Numerous states and cities have also pursued policies that reduce the demand for parking, thereby removing the private sector's incentive to construct more parking. The following pages highlight some of the more common strategies for lowering parking demand.

### Cash-Out programs

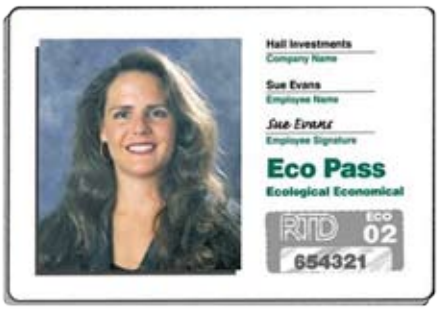
Work trips account for 33 percent of all vehicle miles traveled in the U.S.[54] Employers often provide free parking as a benefit to employees, regardless of their choice of transportation. Cash-out Programs give employees a choice to either accept the free parking or a tax-free transit subsidy (see Transit Incentives, below), or cash, which commuters who bicycle or walk to work may prefer. If employees accept cash payments smaller than cost to the employer of providing the parking space, the employer saves (see Cash Out box p. 19).

California's 1992 cash-out legislation requires firms that have more than 50 employees and lease parking to offer a cash-out option. A study of eight California firms found that the cash-out program reduced solo drivers by an average 11 percent.[55]

### Transit incentives

Employers, cities, residential property managers and other institutions may contribute to reduced demand for parking spaces by offering transit incentives to employees and residents. These often take the form of a subsidized bus or rail pass. Some municipalities, such as Montgomery County, Maryland, grant reductions in minimum parking requirements to entities offering employer-paid transit incentives.[56]

Since 1993, Boulder, Colorado, has offered free bus passes to its 7,500 downtown city employees, and partially subsidized passes for downtown employers to provide for their employees. The employer provided bus passes, or Eco Passes, are partially subsidized by meter revenue. The city has found that the Central Area General Improvement District (CAGID) program reduces employee parking demand by 850 spaces, thereby freeing inventory for short-term downtown shoppers.[57]




A typical Eco Pass funded by parking revenues through CAGID in Boulder, CO
CITY OF BOULDER

### Unbundling

Cities such as San Francisco (see case study p. 50) have created mandates in some neighborhoods for developers to "unbundle" accessory parking spaces from the sale of a residential unit. The logic is that by including a parking space as part of a residential unit, a seller prevents the buyer from making the choice of whether s/he needs a parking space or not. While unbundling applies more often to residential developments, some commercial building owners bundle parking spaces with office leases as well. A city may require developers and

building owners to unbundle parking spaces through site plan conditions or through zoning.[58]

## Urban design best practices

Cities have used zoning codes and neighborhood plans not only to limit the number of parking spaces, but also to set design guidelines that regulate the location, appearance, and type of parking. Effectively enforced design controls can accommodate parking while preserving neighborhood character.

Whether these guidelines are mandated through zoning or neighborhood plans or just strongly encouraged often depends on the district's market conditions. For instance, the high demand for office and residential space of downtown San Francisco and Chicago allow these cities to require specific parking designs, such as underground parking, which is far more expensive than above grade parking.

However they are enforced, parking design guidelines generally regulate the type, location, or appearance of a parking facility. Possible strategies within each of these categories include:

Type

- Prohibit surface or above-grade parking. Examples include San Francisco's Rincon Hill neighborhood and downtown Portland, Oregon.
- Encourage tandem / stacked parking and valet parking.

Location

- To preserve urban fabric and promote a pedestrian oriented streetscape, prohibit parking in between buildings and the property line facing the street—so-called "strip mall" style parking. Rather, locate parking facilities behind buildings.
- Limit the location of curb cut entrances to parking facilities, which disrupt the pedestrian experience.
- Restrict the percentage of a street-facing façade dedicated to a parking use. The Portland, OR ordinance limited garage doors to 50 percent of the street-facing façade, or 12 feet for houses less than 24 feet wide.

Appearance

- Screen for parking lots and architectural treatments for parking structures
- Chicago's 1999 Landscape Ordinance represents an element of the city's strategy to mask the appearance of parking structure by both requiring and encouraging landscaping. Consistent with the city's aim to "green" its urban environment, the ordinance goals include reducing heat, air and noise pollution, and increasing property values. It requires parking facility developers to submit a landscaping plan that specifies elements such

A parking facility wrapped with street level retail at 15th and Pearl Street in Boulder, CO
CITY OF BOULDER

as hanging plants or flower boxes for half of all garage street openings. Similarly, the zoning code requires that downtown garages use design elements like glass and louvers to hide their sloping floors, and mandates masonry materials for their facades. In some cases density bonuses are awarded for additional landscaping.

An innovative approach to improving the design of parking structures is to wrap the ground floor of parking structures with more conventional uses. Also known as laminating or lining, this technique ensures that a parking garage does not deactivate pedestrian street life. San Diego, for example, requires that at least half of the street wall of the parking structure be wrapped with retail or commercial uses. Petaluma and San Francisco, California, prohibit parking within 20 feet of a building's outer envelope (exceptions are made for small properties). Wrapped parking is particularly useful for large, mixed use developments that attract a variety of different users, such as shoppers, residents, and employees. Small sites, however, present challenges to this type of strategy.

# Part 4: Case Studies

## San Francisco, California

### Off-street

San Francisco has evolved over the last half century from a municipality that once required one parking space for every new dwelling to one of the most innovative examples of parking management in the country. This has occurred through investment in transit, gradual replacement of off-street parking minimum requirements with maximums, parking unbundling, and proactive on-street parking management. A relatively small proportion of the city's residents—about 70 percent—own a car.[59] High density development and a preponderance of buildings that pre-date off-street parking mandates has helped keep the number of autos per person low.

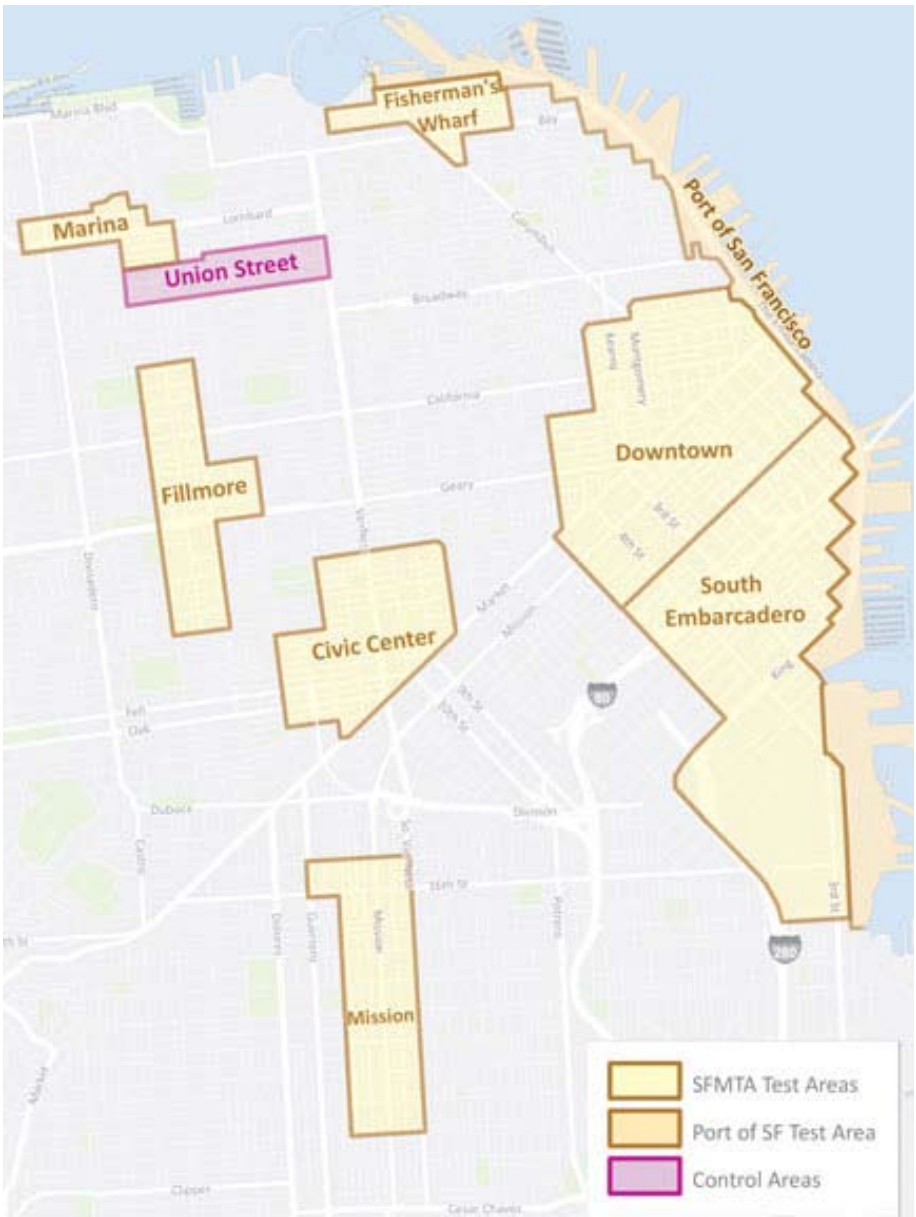
SAN FRANCISCO

**Population:**
808,976

**Metered Spots:**
25,000

**SF*park* Spots:**
6,000

**Meter Revenue:**
$30 million




COURTESY OF SFMTA, SF*PARK* PROGRAM

Due to its low residential population and high number of commuters, the city introduced many of its parking reforms downtown. Following the opening of the Bay Area Rapid Transit Authority (BART) rail line in 1973, the city authorized a cap of all downtown commuter parking spaces. Minimums do not apply to any use downtown, and a maximum of one space is permitted for every four downtown residential units. Similarly, parking may occupy no more than 7 percent of an office building's gross floor area—about one space for every 20 office workers.[60]

San Francisco has proceeded to eliminate residential minimum parking requirements through the adoption of neighborhood plans for districts close to the downtown, and first through the Mission Bay Redevelopment Plan in 1997. More recently, the 2005 Rincon Hill Plan was the first to eliminate minimum parking requirements for *all* uses in a residential neighborhood.

Recent developments subject to residential parking maximums demonstrate that the maximums are having a binding effect. Most developers build up to the maximum allowed number of spaces.[61] The city's residential parking maximums range from 0.5 to one space per unit, depending on neighborhood factors such as access to transit and density; these were often converted from the existing minimum requirements.

"To some extent (parking maximums) have been achievable because they have been part of a larger package of policy and infrastructure and other changes for neighborhoods as prerequisite for development," reports Joshua Switzky of the San Francisco Planning Department. The drawback to comprehensive neighborhood planning, however, has been its slow pace. Several of the neighborhood plans recently implemented have taken nearly 10 years to complete, due to occasional funding gaps and the state's lengthy environmental review process.

The 2005 Rincon Hill Plan also mandated that developers unbundle parking spaces from residential units and dedicate parking spaces to car share and covered bicycle parking in larger residential developments. In April 2008 the city extended these reforms to the Hayes Valley, Duboce Triangle, and North Mission neighborhoods, and made unbundled residential parking a requirement throughout San Francisco.[62]

Enforcement of parking unbundling is difficult and some developers have sought to circumvent the requirement. They legally unbundle the sale of a parking space from the residential unit but price the space well below market rate (such as for $100) to the buyer of a residential unit. The token sum leaves parking nearly free thus essentially bundled, but in compliance with the letter of the law. When parking spaces are unbundled, assessing the land they occupy has proven difficult. The city assessed unbundled parking spaces separate from the residential unit, but the spaces rather function more as easements. This is particularly the case when unbundled parking spaces are not independently accessible—that is, when parking spaces are "stacked" for greater efficiency.[63]

Although the city board of supervisors is not planning additional extensive neighborhood plans, it is considering parking reforms at the neighborhood scale, such as eliminating minimum parking requirements. The San Francisco Municipal Transportation Agency (SFMTA) is currently studying unbundling commercial parking from leases and adjusting the city's development congestion impact fees to reflect a development's proposed number of parking spaces rather than units.[64]


SFpark multi-space, solar-powered parking meter in San Francisco, CA
BRYAN GOEBEL

## Curbside Parking

### San Francisco's SF*park*: Circle Less Live More

#### A revolution in technology and practice

San Francisco's SF*park* is the largest, and by far the most sophisticated, curbside parking reform project underway in the United States. By the summer of 2010, the San Francisco Municipal Transit Agency's (SFMTA) $24.75 million federally funded project will encompass 6,000 of San Francisco's 25,000 metered curbside parking spots in seven pilot neighborhoods. The heart of SF*park* is a Data Management System which sorts a tremendous amount of data collected from the networked array of remote sensors in all 6,000 parking spots. San Francisco installed new electronic, multi-space meters in 2009 and will activate parking spot sensors attached to the pavement sometime in 2010. These wireless sensors can detect whether a spot is occupied by a vehicle and report parking occupancy information in real time to a central computer. City officials and technology vendors say the parking sensors are so sensitive they can recognize the magnetic signature of individual vehicles. The project will produce valuable data about the effect of meter pricing on occupancy.

#### Overall Goals

Paraphrasing the SFMTA, the city's transit provider and street manager:

> [SF*park*] "...will use pricing to help redistribute the demand for parking. The goal is to encourage drivers to park in garages and lots, and to almost always have one space available on every metered block. . . . With more availability, drivers will circle and double park less. Muni (buses) will be faster and more reliable, and greenhouse gas emissions reduced."

The SFMTA's unstated hope is that SF*park* will change public attitudes towards metering through positive examples, and by providing better information and better customer service. It is expected that SF*park* will foster public support for a curbside parking system based on broader transportation goals rather than local politics.

#### SF*park* Has three operational goals:

1. To provide real-time parking information.

2. "Just right" meter prices that mitigate parking demand.

3. Easy-to-pay meters and extended time limits for added convenience.

Additional goals include better ways to measure parking usage and better enforcement of parking rules. SFMTA internal surveys have shown that enforcement is erratic and poorly targeted, and as many as one third of vehicles are illegally parked at any given time. Data collected will provide real time information on turnover, length of stay, failure to pay and other illegal parking allowing the city to precisely and more effectively deploy enforcement personnel.

**Changes in parking operations**

- Rates are set based on occupancy targets. They may range from $0.25 to $6.00 per hour. Based on their effectiveness, rates will be reset in increments of up to $0.50 / hour every four.
- Rates will be set differently at different times of day and during special events to achieve the desired occupancy / availability objectives.
- Some meters are in effect longer than they had been. Again to ensure that occupancy and availability goals are met.
- Extended parking time limits: Probably from two to three or four hours.
- Real-time information is available via web for curbside parking; information on off-street parking is available by web, variable message signs and SMS.
- More convenient payment methods are available: credit cards, pre-paid SFMTA smartcards and cash.

San Francisco probably has the most politically favorable environment for large scale parking reform of any major U.S. city. Though car use is high, the political boundaries of the dense city encompass very few car dependent areas.

**Project History and Politics**

San Francisco probably has the most politically favorable environment for large scale parking reform of any major U.S. city. Though car use is high, the political boundaries of the dense city encompass very few car dependent areas. Prior to 2009, the city council / Board of Supervisors had already approved the highest curbside parking rates in the U.S. Curbside meter rates on neighborhood commercial strips were two to three times higher than New York or Chicago. Despite this, meter rates were still politically sensitive, and apparently set too low because San Francisco continues to suffer from chronic curbside parking shortages. The resulting cruising and double parking led to heightened air pollution and significant bus service delays as documented in the SFMTA's Transit Effectiveness Project.

The SFMTA, overseen by the mayor, is the only major transit agency in the U.S. to control curbside parking and to receive all parking meter and fine revenue.[65] Thus, the agency has a double financial incentive to properly manage curbside parking: it makes money from meters and fines, plus it saves money from bus operations when it reduces bus service delays caused by circling and double parked vehicles.

Before San Francisco shifted to digital meters over the last decade, it was losing $1.5 to $2.0 million a year to theft. As recently as 2007, the city was only collecting 22 percent of the maximum potential meter revenue it could, compared to 38 percent in San Diego and over 50 percent in Boston.[66]

San Francisco Hourly Parking Rates

| Area | Pre-SF*park* | SF*park* (Max-Minimum) |
|---|---|---|
| Downtown/Commercial | 3.50 | 0.25 to 6.00 |
| Near Downtown | 3 | 0.25 to 6.00 |
| Neighborhood retail | 2 | 0.25 to 6.00 |

**PORTLAND**

**Population:**

582,130

**Density:**

4,288 people / sq mile

## Portland, Oregon

By combining a variety of innovative off-street parking policies and regulations, Portland has for decades served as a model for effective parking management. The city's investment in extensive, reliable public transit infrastructure has enabled it to wean residents and commuters off private automobiles. Since 1992, the state has mandated that all localities guide their development with transit accessibility goals. The Portland region set the goal of reducing VMT and parking spaces per capita by 10 percent over a 20–year period.[67] The outcomes include improved air quality, increased transit ridership, and improved urban form.

Portland's proactive approach began in the early 1970s, when they city's downtown air quality violated federal carbon monoxide standards one out of every three days. This led to a freeze at 45,000 parking spaces in 1972. Thanks in part to this measure and to the improved technology of automobile exhaust systems, downtown Portland has not exceeded the carbon monoxide standard since 1984. In 1997, the city lifted the freeze replacing it with a more flexible system of parking maximums and minimums to manage, rather than prevent, parking space construction.[68]

Parking minimums are not applied to developments in the city's densest commercial neighborhoods, including downtown, and neighborhood commercial districts, and central residential districts. Similarly, minimums do not apply to any sites within 500 feet of a transit line that provides service at least every 20 minutes during peak hours.[69]

A developer or owner also benefits from reduced minimums if willing to manage parking by arranging space sharing or bike parking in a facility. When the parking demands from two or more uses located near one another occur at different times, the city's zoning code allows a shared parking facility with fewer spaces than the combined, separate requirements for each use. Similarly, bicycle parking may substitute up to 25 percent of required car parking spaces. For every five bike parking spaces a developer builds, one fewer car parking space may be constructed.[70]

"Limiting the number of spaces allowed promotes efficient use of land, enhances urban form, encourages use of alternative modes of transportation,


Approximately two car parking spaces removed in Portland, Oregon can be replaced with a bike corral that holds 24 parked bicycles
COURTESY OF TRIMET

provides for better pedestrian movement, and protects air and water quality," states the city's zoning code. Thus, parking maximums complement minimums in many neighborhoods. The city conducted a study to determine parking demand under different policy scenarios. Taking account of transit capacity, they calibrated parking requirements to meet their travel demand forecasts within the context of the entire transportation system and their land use objectives. Consistent with the city and state's commitment to public transit, the maximums vary according to a site's distance from bus or light rail—closer to transit less parking is permitted. Several neighborhoods are therefore subject to low maximums.

Downtown office and retail developments, for example, are limited to one space per 1,000 square feet of floor space, and hotels may provide only one space per hotel room.[71] Given this low limit, developers almost always build up to the maximum; no waivers to build above the maximum have been granted since 1974.[72]

Because the city treats parking as a transferable entitlement, however, a developer choosing to build below the maximum—or the owner of a historic building that lacks parking—may transfer its parking development rights to another property. In this model a developer may transfer (but not sell) parking rights up to the maximum allowed to another developer as long as the transfer agreement has been completed prior to the laying of the new development's foundation. For pre-existing buildings or for new development where a transfer agreement had not been made prior to the foundation laying the existing building may transfer up to 70 percent of the original entitlement to another developer. In return, the transferring property has the right to use its parking entitlement in the facility where the rights have been transferred but they must pay the prevailing rate for

the privilege. This policy maintains city control over a district's parking supply yet allows developers the flexibility necessary to finance, build and operate new and existing developments.[73] It also helps to consolidate facilities, reducing the number of curb cuts and intrusions into the pedestrian realm.

The impact of this group of programs and policies has been significant. The city reports that transit use increased from 20 to 25 percent in the early 1970s and to 48 percent in the mid-1990s.[74]

**BOULDER**

**Population:**

91,685

**Daytime Population:**

140,000

1,671 people / sq mile

**Metered Spots:**

1,445

**Revenue to:**

BID / TDM

**Residential Permits:**

Yes

**Multi-space meters:**

Yes

## Boulder, Colorado

### Parking as the cornerstone of sustainable downtown.

Boulder, a small city 30 miles from Denver, has a compact street grid, pre-war neighborhoods, a defined, walkable downtown and an extensive bus system. Boulder also has the oldest, most sophisticated, Parking Benefit District in the U.S. The Central Area General Improvement District (CAGID). It was created as a city controlled, self-taxing district in 1970.

### Downtown Boulder: better than a big box mall, not like one.

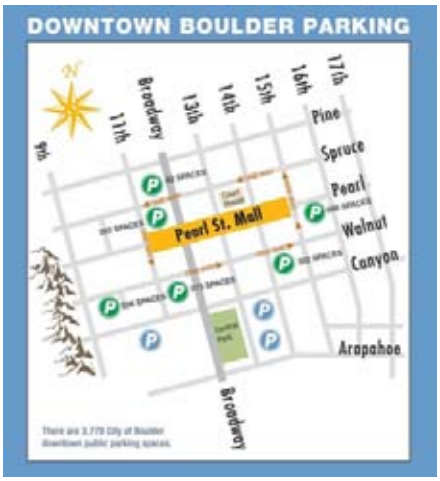
In the mid-1960s Downtown Boulder was stuck in a parking dilemma of its own creation—a problem which continues to this day in much of the country. The downtown merchants, who advocated for meters in 1946, insisted on keeping meter rates too low to affect turnover because they were afraid of losing customers to suburban shopping malls. Curbside parking was monopolized by longer-term parking commuters, many of them store employees. Potential customers, who might have paid for parking, instead had nowhere to park, and avoided downtown. Business suffered. Some merchants even proposed tearing down sections of downtown to build free parking structures. Instead a large scale collaborative planning effort called Boulder Tomorrow was launched in 1966. Boulder Tomorrow persuaded merchants that Boulder's strength was its large inventory of attractive, historic architecture, its human scale and walkable streets. The way to compete with suburban shopping malls was not to try to be like them, but to be better and different than them.

CAGID (pronounced "k-jid,") is operated by a city agency, the *Downtown and University Hill Management Division and Parking Services*. The agency, called Parking Services, has a threefold mission: improve access to downtown, manage and promote downtown public space, and promote downtown business. It does this while working to reduce single occupancy vehicle use and encouraging transit, walking and bicycling.

Parking Services is faced with a balancing act in CAGID. Compact, walkable Boulder is dwarfed by the fast growing sea of suburban sprawl that surrounds it. To promote business downtown, Parking Services / CAGID must welcome visitors from its car dependent environs, and grow downtown employment while still reducing car use. Parking Services does this well, only 36 percent of downtown commuters drive alone. The key to CAGID's success is a set of land-use

and parking strategies which result in the majority of motorists paying for parking and reduction in incentives for private businesses to build and provide free parking.

## Boulder's CAGID / DMC Parking Benefit / Transportation Improvement District features these characteristics:




1. Most motorists pay for parking whether they park at the curb or off-street.
2. There are five centrally located public garages which are wrapped with active storefronts thus complementing street life.
3. Curbside and off-street parking is both priced and time limited to encourage short term use.
4. Parking revenues fund bus passes and public space refurbishment.
5. There is an extensive and effective bus system[75] in which bus passes for downtown employees are subsidized.

The net result of these policies is to make transit inexpensive, and driving just expensive enough to discourage car commuting, while still keeping curbside parking available and affordable for day-tripping shoppers and tourists. Key to this is that CAGID sets prices in public garages and at the curbside. They can charge to maximize turnover and use. To accomplish their goal they set garage prices equal to curbside prices for the first three hours; the fourth hour is not permitted at curbside incentivizing longer term parkers to use off-street parking; after four hours prices increase which encourages people who are staying long term—such as commuters—to use alternative modes. Private, for-profit garages, operate in such a manner as to maximize profit rather than use. They tend to set high prices for the first hour or two and marginally low rates after that. Their strategy takes advantage of the fact that short duration trips are less elastic than long duration trips and that labor costs of turning over parking are likely higher than managing a smaller number of long duration parkers. The profit maximizing objective is not well aligned with the public objective.

## CAGID Parking Inventory, Prices and Use

| | | | | | |
|---|---|---|---|---|---|
| Curbside | 871 spots | 23% spots | 38 % parking | $1.25/hr | 3 hour limit |
| Off-Street | 2,209 spots | 59%spots | 30% users | $1.25/hr | $2.50/hr after 4 hours |

CAGID's efforts were immensely successful, and have become the template for generations of other U.S. Parking Benefit Districts. Over a 25–year period CAGID has:

1. Created a bondable revenue stream from real estate taxes and parking meters.

2. Raised meter rates to create turn-over and raise revenue for bonds and operations.
3. Issued debt and received a federal grant to build a retail pedestrian mall as a town center.
4. Issued debt to build centrally located public garages, which include ground floor retail.
5. Helped promote seasonal events to attract visitors and promote business.
6. Subsidized Eco Pass bus passes for employees of all businesses downtown.

Pop jets funded by parking revenues enjoyed by kids on a sunny day in downtown Boulder
DOWNTOWN BOULDER INC.

### Public garages are important to central district Travel Demand Management

In a place like Boulder, with no minimum parking requirement in its downtown and public garages providing the vast majority of off-street parking, these garages can help reduce motor vehicle use. This is counter-intuitive, since increasing the supply of parking would be expected to induce car use. But that is not the case in Boulder. In the absence of parking requirements, public garages, which charge a modest parking fee, can help deter both free accessory parking, and paid, private garages and thus effectively act to cap the parking supply. Parking structures are very expensive. If an affordable public alternative is available for


Tulip plantings and other public space improvements funded by parking revenues at the Pearl Street Mall in downtown Boulder
DOWNTOWN BOULDER INC.

commuters and shoppers, then commercial developers can save by not building parking. Since government can borrow at a cheaper rate, and government does not have to turn a profit, public garages can charge less than private garages and deter private garages from being built. Additionally, short-term parking can be priced at a low rate to encourage motorists to park off-street and thus relieve demand for curb space.

CHICAGO

**Population:**

2.53 million

**Metered Spots:**

34,500

**Privatized Spots:**

34,500

**Meter Revenue:**

$1.157 billion one time

$23 million pre-09

**Fine Revenue:**

$200 million (est.)

**Revenue to:**

General fund

**Residential Permits:**

Yes

**Multi-space meters:**

Yes

## Chicago, Illinois

In 2009, Chicago undertook the biggest and boldest curbside parking initiative in the United States, perhaps anywhere. Chicago leased its 34,500 curbside parking meters to Wall Street giant Morgan Stanley for the next 75 years, trading meter revenues for an upfront payment of nearly $1.16 billion. The unprecedented "Public Private Partnership" includes a fixed schedule of meter rate increases which, raise rates two to four fold by 2013 and will result in Chicago having the highest curbside meter rates in the United States. The agreement was closely watched by at least seven U.S. cities, including Los Angeles and Pittsburgh, which are both considering privatizing portions of their curbside meters. Chicago Mayor Richard Daley Jr. championed the secretive deal to plug massive budget deficits exacerbated by the global economic crisis. It was hurriedly passed 40–5 by the City Council.

Mayor Daley's fundamental argument was that privatization was the only way for the city to unlock the value of the Department of Revenue's underpriced curbside meters. Daley pointed out that due to a lack of political will, rates on 25,000 of the 34,500 meters had been frozen for 20 years. Meters were netting $20 million annually. Had rates simply kept pace with inflation, revenue would be double that. Chicago has previous experience with large scale transportation privatization; in 2004, the City granted a 99 year lease to a private concessionaire to operate the Chicago Skyway. The value to the City was $1.8 billion.

### Terms of Chicago Parking Meter Privatization Deal include the following:

- $1.157 billion one-time payment to Chicago from Morgan Stanley.
- For 75 years all meter revenue will accrue to Morgan Stanley.
- Meter rates will be set based on a four-year, fixed schedule, then indexed to inflation.
- Overall hours of metering were increased 27 percent, to include Sundays and late nights.
- Morgan Stanley will modernize meters by 2011 to take cash and credit cards. The cost of this improvement is estimated at $50 million.
- Chicago must pay Morgan Stanley for all metered spaces taken out of operation. Payment set equal to the potential maximum meter revenue during period of service.
- Chicago will enforce meter violations and receive all fines.
- Chicago is metering an additional 4,400 previously free curbside spots along Lake Michigan. The City will retain control of these new metered spots.

Chicago Meter Pricing Schedule (Dollar / Hour)

| Location | Pre-deal | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|
| Loop/CBD | 3.00 | 3.50 | 4.25 | 5.00 | 5.75 | 6.50 |
| Outer CBD | 1.0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 |
| Neighborhoods | 0.25 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 |

Source: Chicago Metered Parking System Concession Agreement—Exhibit A Metered Parking System

## Backlash

The terms of the parking privatization deal have been harshly criticized throughout the city. It has been condemned by groups representing sustainable transportation and good government advocates, neighborhood groups, motorists and editorial boards. In spite of this, there has been no serious movement to reverse it as of July 2009. Much of the criticism has been on the hurried and secretive process, and restrictive terms. But the backlash was intensified by a bungled roll-out that required motorists to carry far more quarters for the coin-only meters than they had in the past. This was particularly true outside the Loop and in the city's neighborhoods where rates increased substantially. In May, the Chicago Inspector General's office issued a comprehensive report which disputed the mayor's financial model and claimed that the system would be worth approximately $2.13 billion (in present dollars), or $974 million more than the city received. The Inspector General also noted that the length of the lease was excessive and that the city had put itself at a disadvantage by not including opportunities to renegotiate aspects of the deal in the future.

## Impact on Chicago Transportation Policy

The fundamental argument for privatizing transportation facilities is that they are not part of the "core functions" of city governments, and that private companies can operate them more efficiently and profitably. However, in Chicago, the city has done more than privatize meter operation and revenue collection. It has essentially made the meter franchise agreement the highest street management priority for the next 75 years. Under the meter agreement Chicago cannot shorten hours of meter operation, reduce rates or remove meters without compensating Morgan Stanley. Thus, planners must take into account the expense of losing meter hours when considering any change in street use, including: bus rapid transit, pedestrian bulb-outs, or protected bicycle lanes. Since most of the city's arterial streets are metered, these restrictions could seriously impinge reprogramming street space for pedestrians, bicyclists and transit. Additionally, the rigid, and blanket price zones adopted in the parking deal may have created local parking dysfunction as nearby blocks with vastly different parking demand are priced the same.

### Revenue Maximization versus Optimal Curb Use

Whatever its procedural flaws and fiscal wisdom, Chicago's privatization deal has inverted the curbside parking paradigm. In other big U.S. cities, curbside parking is underpriced and there are parking shortages. In Chicago, curb prices have been set to maximize revenue, likely resulting in parking surpluses. A few months after meter prices were raised, an alderman claimed half of his district's metered spots were unused. However, according to local transportation experts, it appears that parking demand has evened out, and complaints about large swaths of empty curb space have diminished. Though as yet, no before or after occupancy studies have been released.

## New York, New York

**NEW YORK CITY**

**Population:**
8.3 million

**Metered Spots:**
75,900

**Commercial Spots + ParkSmart Spots:**
9,500

**Meter Revenue:**
$127 million

**Fine Revenue:**
$596 million

**Revenue to:**
General fund

**Residential Permits:**
No

**Multi-space meters:**
Yes

### Islands of innovation in a politically hostile sea

New York City is the largest, densest and most transit- and pedestrian-oriented city in the United States. It is the only U.S. city in which a majority of households do not have a car. Despite this, New York City is very much an American city in the way it under prices and under uses curbside parking meters. Meter rates are far lower than in other leading world cities, and New York suffers from high levels of cruising and double parking. Only a small percentage of New York streets are metered (the city has 32 percent fewer meters per capita than Chicago, for example): all are on retail strips and in the Manhattan Central Business District.

Like other U.S. cities, curbside parking rates in New York City are largely determined by politics, not by policy goals. In 2005, the city council overrode a mayoral veto and objections from the Department of Transportation and eliminated metered parking on Sundays. Rates on most meters were frozen from 1992 until 2009. In February 2009, the rate on 53,000 of the city's 75,900 meters was raised from $0.50 per hour to $0.75 per hour. Because of political resistance, curbside parking reform lags far behind the city DOT's aggressive efforts to promote bicycling and new pedestrian spaces. The business community has been divided in its support of parking reform. Some Business Improvement Districts have lobbied the city for changes, others to maintain the status quo.

Yet, despite the difficult political environment, the city DOT has undertaken three curbside parking initiatives from which other cities can learn.

### NYC Commercial Congestion Parking Program

In 2000, the NYC DOT began metering commercial parking in the CBD using escalating hourly rates and modern, multi-space, "Muni-meters." By 2009, the NYC Commercial Congestion Parking Program had steadily expanded to include about 8,000 curbside parking spaces available only to commercial vehicles. The meters cover a two- by one-half- mile swath of Manhattan from 60th Street to 14th Street. Rates for commercial vehicles are $2 for the first hour, $3 for the second, and $4 for the third hour. Muni-meters accept coins, credit cards and pre-paid

parking cards. According to DOT internal studies, commercial parking availability has increased and double-parking and overall traffic delays have decreased.

Prior to the commercial curb pricing program, the areas suffered from severe parking-related congestion, chronic shortages of commercial parking, double parking and circling traffic.

Parking problems were especially severe because Manhattan's dense Central Business District has no alleys and relatively few off-street loading docks. Prior to the commercial curb pricing program, commercial parking was regulated by a complex series of time-of-day rules centered on a much ignored three-hour parking time limit. The political impetus for the project came from building managers and large vehicle fleets frustrated with the time and expense of the dysfunctional parking. Since regulations already restricted the free parking to commercial vehicles, local community planning boards, which often vociferously oppose meter rate increases, supported commercial metering as a way to reduce circling traffic, congestion and parking spill-over. The program is considered a big success by stakeholder groups and the DOT and has received a number of industry awards for innovation.


ParkSmart meters limit parking to 1 hour for more efficient turnover at the curb in Park Slope, Brooklyn
NYC DEPARTMENT OF TRANSPORTATION

## ParkSmart NYC

**Creating consensus for curbside parking changes**

In October 2008, the NYC DOT introduced ParkSmart at 281 metered spots in Manhattan's transit- and pedestrian-oriented Greenwich Village. ParkSmart is an opt-in program in which DOT approaches community planning boards and asks for their participation. The articulated goal of the program is to increase curbside availability and reduce circling and double parking. By 2014, ParkSmart will

include six neighborhood pilot programs encompassing 1,500 to 2,000 existing meters, and no new meters. In May 2009, a second pilot began in Park Slope Brooklyn. During the six-month trial period in Greenwich Village, DOT raised meters rates from $1 to $2 an hour during the peak 12 p.m. to 4 p.m. period. The project was well received by the public and the rates have been adjusted to $3 since then, reducing curbside occupancy during peak times. All the meters are programmed to allow a maximum of one paid hour, which limits the convenience of meter feeding for an extended period.

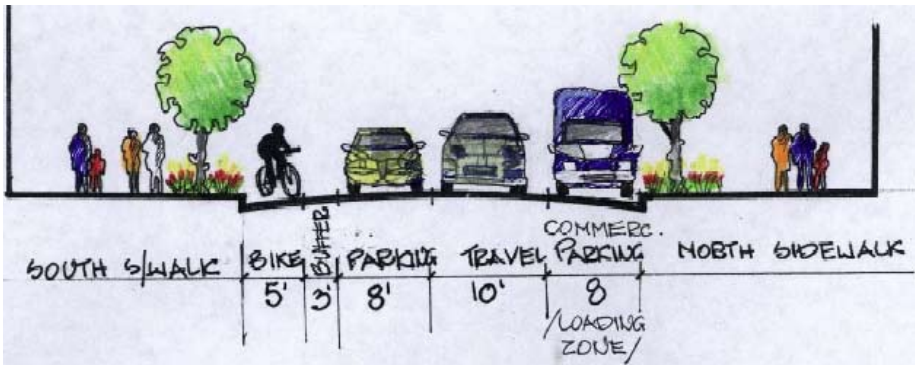
ParkSmart is noteworthy because it is a thoughtful, sustained effort by a major city to change public attitudes towards higher meter rates. The DOT is well aware of the problems caused by underpriced curbside parking. Well publicized studies by the advocacy group Transportation Alternatives found that circling for parking accounted for 28 percent of vehicular traffic in Lower Manhattan's SoHo neighborhood, and 45 percent of traffic in Park Slope, Brooklyn. But neighborhood political resistance to raising meter rates remains very high. DOT hopes that positive results in ParkSmart neighborhoods will help create a new public consensus throughout the city that higher meter rates are a benefit.

## Grand Street Protected Bicycle Lane

**Using curbside parking to protect bicyclists**

On Lower Manhattan's Grand Street, the NYC DOT used on-street parking to create a low-cost, protected bicycle lane. The DOT moved curbside parking to the first traffic lane and a painted a curbside lane. The project is a model for how to quickly reprogram road space freed up when on-street parking is properly priced. Eliminating circling and double parking creates substantial excess street capacity which can be reprogrammed for bicyclists and pedestrians, or which will otherwise draw more through traffic.

A bicyclist using the parking protected bike lane on Grand Street in NYC
NYC DEPARTMENT OF TRANSPORTATION




A bicyclist using the parking protected bike lane on Grand Street in NYC
STREETSBLOG, THE OPENING PLANNING PROJECT

**CAMBRIDGE**

**Population:**

105,594

**Density:**

15,767 people / sq mile

## Cambridge, Massachusetts

Cambridge's zoning code specifies both minimum and maximum parking requirements—the latter since the early 1980s—for office, retail, government and university buildings. Offices, for example, are required to provide between 1 and 2.5 spaces per 1,000 square feet. Minimums are reduced for sites that are close to transit, share parking, provide affordable housing, or are near public or commercial parking. The planning board allows developments to exceed the maximum in the case of demonstrated unusually high parking demand. Whereas parking maximums in San Francisco and Portland are often binding and few variances are allowed, those of Cambridge create a range of viable parking allowances, and developers do not always build up to the maximum allowed. Even with maximums allowed, the planning agency encourages developments applying for permits to target the minimum required amount of off-street parking.

In 1998 Cambridge instituted its Travel Demand Management (TDM) Ordinance, a policy that seeks to lower travel by private automobile by mandating that new developments seeking to add parking to their sites provide alternative transportation resources, such as transit pass subsidies, bicycle parking, priority carpool parking, and other measures. The policy's objective is to reduce generation of single occupancy vehicle trips by 10 percent, relative to 1990 levels. The city employs a TDM officer to perform annual surveys and counts of parking facilities subject to the TDM ordinance.

# Conclusion

Parking policy exerts great influence on mode choice and urban design. In turn these affect air and water quality; development density; the ratio of active, tax ratable land uses to accessory land uses; and the quality of street-life or pedestrian environment. Many cities take a passive approach to managing parking. They borrow strategies from neighboring jurisdictions and promote the objectives to avoid spillover effects and assist private automobile use. They fail to recognize parking policy's wider potential to affect environmental objectives and to promote positive economic outcomes.

The unintended consequences include reinforced dependence on the automobile by concomitantly, though inadvertently, subsidizing auto use and undermining availability and effectiveness of other modes. Ironically, making auto use less costly has resulted in increased traffic and parking congestion, ultimately making auto use more costly. By undermining other modes, people are left without alternatives to the automobile. Classic parking policy also results in increasing the cost of development and discouraging development in some cases.

A few cities, including those highlighted here, are taking steps to align parking policy with the broader city goals of accessibility, economic development and better quality of life—such as clean air and water and increasing access and travel alternatives.

There are few examples and many of the experiments in alternative parking approaches are relatively new, so it is difficult to recommend a one-size-fits-all account of best practices. In spite of that concern, sufficient consistency has emerged in these practices to make the following observations:

### Price Sensitivity

Even small price adjustments will induce changes in behavior. Coordinating off-street and curbside pricing is effective in eliminating excess demand at the curb while off-street parking space remains available.

Increasing prices of both off-street and curbside parking will induce mode shifts when alternatives are available.

Introduction of travel alternatives along with parking pricing can reduce demand without placing an onerous burden on travelers or diverting them to alternate destinations.

When employers offer a choice of free off-street parking or its cash equivalent, some of their workers choose the cash thus reducing demand for parking spots. Similarly, when the cost of parking is unbundled from housing and other developments, demand for off-street parking is reduced.

Time limits have been notoriously difficult to enforce, though some new technologies may make it easier. Alternatively, escalating prices with increasing duration of stay have proven effective at increasing turnover and yielding greater productivity from the same number of spaces.

## Performance Standards

To the extent there are standards for curbside performance, full occupancy with high turnover is one that has been articulated. Full occupancy can only be achieved when there is a queue of vehicles waiting for curb space.

Vehicles waiting for curb space are typically cruising for parking or double parked. In both cases they are using street space that could be used for bicycle lanes, wider sidewalks, smoother transit operations and / or smoother vehicular traffic flow. Vehicles unable to find space at the curb are also frequently parked illegally blocking bus stops, loading zones or access to fire hydrants, thus, impeding transit and commerce and / or creating a dangerous hazard in the event of a fire.

Better performance standards include the elimination of illegal parking—including double parking—and elimination of wasteful cruising for free curb space. Some people have advocated vacancy targets as another way to achieve these objectives.

Without well-defined, measurable standards policy objectives are impossible to achieve.

## Supply

Minimum accessory parking requirements tend to flood the market. Minimums are based on the assumption that drive trips should be accommodated with easy parking at the destination. Excess parking developed based on minimum requirements drives the price of parking to zero. Minimums are generally set without respect to the development context or reference to the total transportation system. Excessive parking induces auto trips and contributes to greater congestion.

While some jurisdictions allow shared parking among uses that have different time-of-day use profiles, the most efficient sharing is found in commercial and / or municipal lots, i.e. non-accessory lots. These lots can be centralized; they can serve multiple users minimizing excess spaces; and they concentrate and reduce pedestrian vehicle conflict points, improving opportunities for good urban design.

Without accessory parking, commercially or publicly shared parking can be priced at market clearing rates since its cost is not easily shifted to another land use. When municipally owned, parking can be priced to accomplish transportation goals including reducing parking demand by reducing automobile trips and increasing parking turnover (potentially increasing automobile trips).

In lieu fees and transfer of parking rights both facilitate central, shared parking.

Parking maximums should be set according to constraints on the entire transportation system. Transit capacity is a factor in setting maximums in at least one city. Additional transit capacity can also counter perceived need for additional off-street parking space.

## Epilogue

Dysfunction will continue as long as parking policy is viewed independent of transportation policy and as long curbside and off-street parking are treated independently. Frequently, this manifests in excess auto trips, spot shortages at curb-side, an excess of empty off-street parking spots and degradation of transit service and the pedestrian environment. Failure to develop coherent policy is a missed opportunity for achieving transportation and revenue objectives.

Cities like Chicago, New York City and San Francisco are experimenting with new policies in select locations. Boulder and Portland have much more comprehensive citywide transportation policies with parking policy a prime component. While there are lessons to be gained from all of these cities, it is Portland and Boulder who have truly had the most success in achieving their objectives.

# Appendix A: Commercial Off-Street and Curbside Hourly Parking Rates for Select U.S. Cities

(COMPLIED 7/1/2009)

| | Curbside Rates | | | | | Commercial Off-street Rates |
|---|---|---|---|---|---|---|
| **New York City** | **1st Hour** | **2nd Hour** | **3rd Hour** | | | |
| CBD (commercial 6,500 meters) | $2.00 | $3.00 | $4.00 | | | Not applicable |
| CBD | $2.00 | | | | | $20 |
| CBD/ParkSmart (12pm–4pm) | $3.00 | | | | | $15 |
| Near CBD Neighborhood | $2.00 | | | | | $15 |
| **Los Angeles** | | | | | | |
| CBD | $4.00 | | | | | $6.50 |
| Near CBD | $1.50 | | | | | Not available |
| **Chicago*** | **2009** | **2010** | **2011** | **2012** | **2013** | |
| Loop/Inner CBD | $3.50 | $4.25 | $5.00 | $5.75 | $6.50 | $17 |
| CBD | $2.00 | $2.50 | $3.00 | $3.50 | $4.00 | |
| Near CBD Neighborhood | $1.00 | $1.25 | $1.50 | $1.75 | $2.00 | |
| *Chicago PPP deal mandates these rates | | | | | | |
| **Houston** | **1st Hour** | | | | | |
| CBD/Red Zone–Commercial only | $5.00 | | | | | Not applicable |
| CBD | $1.50 | | | | | $13* |
| **San Francisco** | | | | | | |
| Core CBD | $3.50 | | | | | $12 |
| Overall CBD | $3.00 | | | | | |
| **Phoenix** | | | | | | |
| CBD only | $1.50 | | | | | Not available |
| **Denver** | | | | | | |
| CBD | $1.00 | | | | | Not available |

*average maximum NOT hourly

# Appendix B: Curbside Parking Highlights in Select U.S. Cities

**Houston**

As part of the creation of 20 miles of new light rail, Houston is more than doubling the number of parking spots it meters. By 2016, Houston plans to add 7,500 new metered spots to the 6,300 spots it already meters. Many of the new metered spots will be near light rail stations and areas expected to land use changes because of the new transit.

**Miami**

Miami has 5,500 pay by phone, metered curbside spots. This is far more than any other U.S. city. The program is politically popular and will be expanded to 8,000 spots within the next few years.

**Los Angeles**

L.A. policy makers are intensely interested in the transportation and land use implications of parking policy. The city's 2006 parking report recognizes key structural issues to changing parking policy and using parking policy as a transportation management and sustainability tool.
http://www.ladot.lacity.org/pdf/ParkingReport2006.pdf

**Denver**

In 2009, Denver undertook an extensive, Strategic Parking Plan, much of which is available online. This plan, and LA's and San Francisco's SF*park*/ SFTA parking recommendations are the three most advanced parking studies undertaken by major U.S. cities.
http://www.denvergov.org/Default.aspx?alias=www.denvergov.org/parking

**Seattle**

Seattle is attempting to reduce pressure on curbside parking by directing more motorists to off-street parking garages through the introduction of a real-time electronic guidance system, which uses variable message signs and the web to promote available parking spaces in nearby facilities. The system is based on those installed in German and other European cities. Seattle hopes the project will reduce circling for parking, especially in residential neighborhoods.
http://www.seattle.gov/transportation/innovativepark.htm

**Redwood City/ Silicon Valley, Northern California**

Maybe the only city in the United States which has abolished time limits for most metered parking. Additionally, as part of an overall parking plan, Redwood City has established an average 85 percent occupancy target for metered parking downtown and set meter rates accordingly. Though meters are inexpensive by big city standards and free parking remains plentiful.
http://www.redwoodcity.org/cds/redevelopment/downtown/Parking/parkingbigpicture.htm

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# Endnotes

1 Throughout the report "off-street" refers to parking in surface and structured lots and in driveways or garages, on-street, or curbside, parking refers to spaces allocated in the public right-of-way, typically adjacent to curbs.

2 Norton, Peter, *Fighting Traffic* (Cambridge: MIT Press, 2008), p. 175.

3 Ibid. p. 145

4 Ironically one of the persistent myths in curb pricing overlooks this astute idea and merchants frequently protest pricing for turnover for fear it will negatively impact the customer's experience.

5 Until the past couple of years meter rates in NYC, Chicago and most other major cities had remained unchanged for over 15 years. See Appendix A for a comparison of meter rates in several U.S. cities

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Endnotes for Side Bar: **Parking Freezes**

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