
Urban development from parking lots considering inner-city parking density

1. Background and goals

Automobiles are now a vital means of transportation for the elderly and persons with disabilities, to the extent that in rural parts of Japan, there are over 0.8 automobiles for person. Every automobile requires around 15 m² of parking space, both at the point of departure and at the destination; this is approximately the same amount of space per person in an average Japanese residence. As a consequence, parking spaces in many cities currently occupy approximately 20–30% of the inner-city surface area. In a typical planned city, parks occupy approximately 3% of the surface area and roads approximately 25%. Accordingly, the area required for parking cannot be ignored in urban planning.

2. Research content

In this project, emphasis is placed on three “D”s and one “M.” The first “D” is “density,” which refers to how many parking spaces are needed in inner cities. The second “D” is for “disposition,” which refers to where parking lots should be placed. The third “D” is for “design,” which refers to specifically what kind of parking lots should be provided. The “M” in this study is “management,” which refers to how to manage parking lots. Each of these four aspects must be carefully considered. This paper presents an overview of research regarding density, the most fundamental of the four points described above.

2-1. Level of parking needed in urban areas

To investigate the required scale of parking lots needed in inner-city areas, we performed on-site investigations in Japan, the United States, United Kingdom and Germany (Fig. 1). We found that the cities with the most parking spaces available were Houston and Dallas in the United States, which had over 200 spaces/ha. The locations with the least parking were central London and Westminster.

As for Japanese cities, downtown Yokohama, Shibuya, Yokosuka, Odawara, Shinjuku and Tachikawa have approximately 50–70 spaces/ha. There were slightly more in Chiba, Kofu and Saga, which had approximately 75–80 spaces/ha, and relatively new towns located some distance from Tokyo such as Chiba New Town and Tsukuba New Town had around 100 spaces/ha, thanks to the numerous large-scale parking facilities in those areas. Note that most locations have approximately 60–70 spaces/ha, which is thought to be because local government ordinances regarding parking spaces in Japan mandate a nearly identical level.

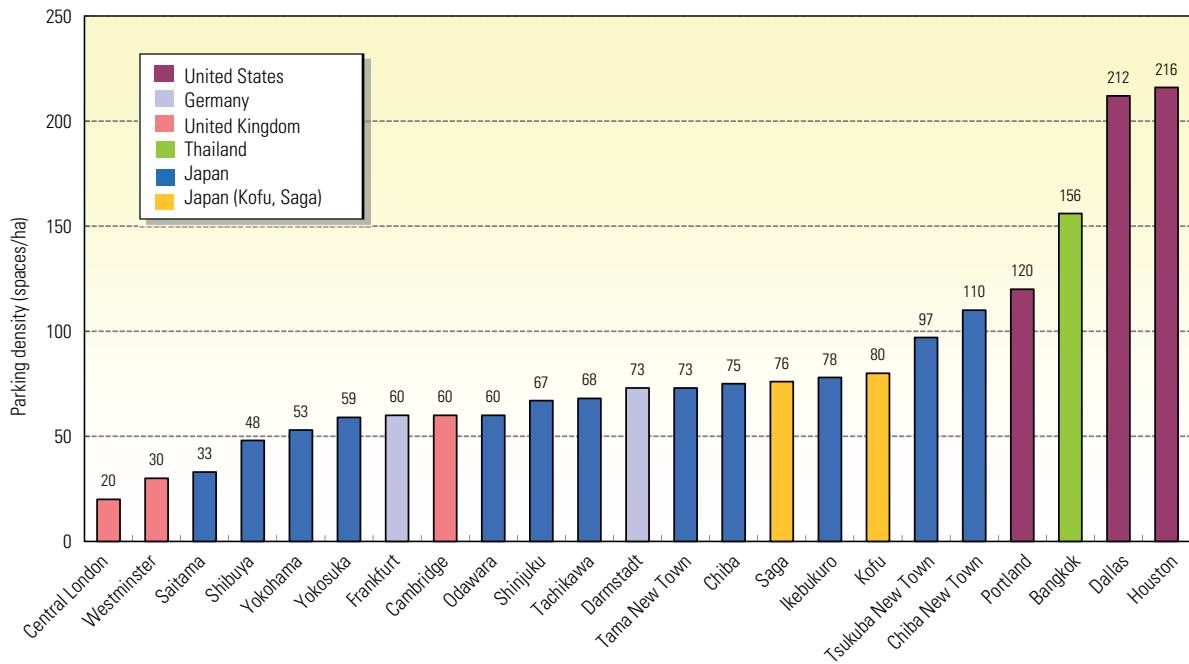


Figure 1. Parking density
 Japan: Designated parking development districts;
 USA: Inner-city business improvement districts; Europe: Inner loop areas
 (Locations that clearly seem to be privately owned garages are excluded)

2-2. Comparison of local government regulations regarding parking spaces

The primary reason for the situation in Japan is established by local government ordinances regarding parking spaces. Table 1 shows an international comparison of similar local government regulations in other countries. Houston, which has the largest number of parking spaces, has established requirements for a minimum number of available spaces. The parking requirements in downtown Houston are on par with those of suburban shopping centers (around 200 spaces/ha), and furthermore specify that at least 75% of parking spaces should be provided on site, meaning that there are ample parking spaces even in inner-city areas.

Among the areas studied, London has the fewest parking spaces. It places an upper limit on the number of parking spaces that can be created. On the other hand, Japan has established lower limits like Houston, so while there is some variation between industrial and commercial areas, requirements generally mandate 30–60 spaces/ha. Other cities examined, such as Portland, Cambridge and Frankfurt, have local government regulations regarding parking spaces that fall somewhere between those of Houston and Japan.

2-3. Parking situation in overseas cities

Differences in the laws and standards of various countries have a strong effect on their parking circumstances. We therefore next compared two cities closely associated with this project and introduce their main features below.

Table 1. Comparison of local government regulations pertaining to parking availability standards (offices, commercial)

Houston (At least 75% on site)	Lower limit	Offices Commercial	269 spaces/ha 431–538 spaces/ha
Portland (Core Area, converted as NFA = 0.6 GFA)	Upper limit	Offices Commercial	75 spaces/ha 180–358 spaces/ha
Cambridge (Within the inner-city controlled parking zone (CPZ))	Upper limit	Offices Commercial	Within CPZ 100 spaces/ha + disabled parking Disabled parking only Outside CPZ 250 spaces/ha + dis- abled parking 200 spaces/ha
Frankfurt (FF) (Inner city, 90% cash payment)	Upper limit	Offices Commercial	286 spaces/ha 333–666 spaces/ha
Japan	Lower limit		30–60 spaces/ha
London	Upper limit		7 spaces/ha

Houston, Texas

Houston is the fourth largest city in the United States. Most of its downtown is contained within a 2×2 km area. Within that area are approximately 100,000 parking spaces, for a density of 216 spaces/ha. This is approximately the same level of parking service found in large-scale suburban retail stores. There are 90 multilevel parking garages with approximately 800 parking spaces each. There are also approximately 300 surface lots.

Portland, Oregon

Portland is a public transportation-oriented city with an approximately 2×1 km downtown area sandwiched between a river and an expressway. Similar to Houston, the streets in inner-city Portland are generally in a grid pattern, as are streets in many American cities that were planned out during the pioneer days. As a result, roads alone account for approximately 40% of land use in the downtown area. The average parking density is approximately 120 spaces/ha, a density far higher than that of Japan, despite the city's image as being highly oriented toward public transportation.

3. Conclusions

Looking at the parking situation of major cities in Japan and overseas, the density of parking spaces in highly automobile-oriented societies is approximately 200 spaces/ha, but in cities with highly developed public transportation a density of around 60 spaces/ha is sufficient. Between those extremes, public transportation-oriented American cities and local cities in Japan seem to have around 90–120 spaces/ha.

However, effort is required to maintain the density at these levels, despite the fact that the results of deriving a relational equation for standards of local government regulations regarding parking space and parking density show that insofar as standards are adhered to in local Japanese cities, this density is maintained. This is because when parking space availability follows demand, the density soon increases to 150 spaces/ha. In such cases, half of inner-city areas become devoted to parking and buildings consequently seem to exist in a sea of parking lots. Our hope is that this project will contribute to preventing such an outcome through the development of attractive, functional urban spaces.

4. Future outlook

In the major cities of Japan, even when accounting for illegal parking, there is a surplus of inner-city parking spaces. This indicates the need for a more flexible approach to local government regulations regarding parking spaces (revising basic units, establishing mechanisms for utilization of parking spaces in remote locations, providing alternative parking through cost-burden sharing, etc.) and proactive aggregation of existing parking lots. We also believe there is a need to consider drastic changes to laws pertaining to parking lots, such as by adding provisions that place upper limits on the number of required on-site parking spaces. The handling of parking spaces has a large effect on inner-city land use and thus will require greater attention in the future.