

# Identifying High Amenity Zones in the U.S. and China with Advanced GIS Techniques

Richard P. Greene and Siqin Wang

Department of Geography  
Northern Illinois University  
DeKalb, IL 60115 USA  
rgreene@niu.edu

**Abstract**—This paper applies a variety of GIS techniques to examine the spatial pattern and extent of high amenity zones (HAZ) in selected cities of the U.S. and Guangzhou, China. HAZs are adjacent to downtowns and represent high density upscale residential areas whose residents support neighborhood retailing and service employment that can often result in the misclassification of the areas as employment centers. To define the HAZ consistently across U.S. cities, we first develop a weighted median job density measure for the census tracts of each city and include census tracts that are in the upper quartile in job density and have an employment residence ratio below 1.25, the critical value used to define job centers. In the absence of employment data for China at a census tract scale, Starbucks coffee houses are mapped as they were found in an earlier study to be spatially coincident with high amenity zones in the U.S.. Google Earth and GPS field work allowed us to locate each Starbucks for Guangzhou China. Preliminary findings from Guangzhou and the designation of its *Tian He District* as an HAZ allows for some cross cultural comparisons of the HAZ concept.

**Keywords**—High Amenity Zone; Weighted median job density; Employment residence ratio

## I. INTRODUCTION

Greene [1] coined the term “high amenity zone” (HAZ) to suggest that the types of amenities being discussed in the urban amenity and creative class literature [2] are highly concentrated in cities. The concept came about from a surprise finding when examining the relationship between job density and net commuting into census tracts for Los Angeles [3] and Chicago [4]. The results showed that the neighborhoods which had lots of jobs but did not qualify as job centers because of high residential densities were clustered next to downtown and other close in job centers (Fig. 1). For instance, in Los Angeles these



Figure 1. Los Angeles high amenity zone.

filled the gaps between the Downtown, Hollywood, Beverly Hills, and Santa Monica job centers and they tended to represent high density upscale residential areas whose residents supported neighborhood retailing and service employment. Wilshire Boulevard is the major street connecting these job centers with upscale residential areas with lots of service jobs fanning off to the side. A somewhat similar area was identified in Chicago, likewise contiguous to Downtown and extending toward the North Side and also an upscale residential zone (Fig. 2). The HAZ for Chicago was highly correlated with

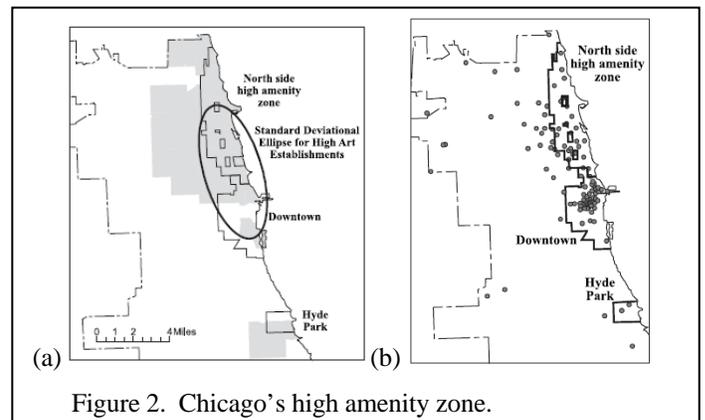


Figure 2. Chicago's high amenity zone.

theater and artist establishments (Fig. 2a). For Chicago, Greene [5] also examined the distribution of Starbucks retail outlets relative to Downtown, its HAZ, and the remaining areas of the city (Fig. 2b). Starbucks, he argued, is a critical component of the “consumer city” hypothesis as they are equal to juice bars in the original treatise on the “consumer city” concept by Clark [2]. Greene therefore argued that Starbucks is a cultural marker of the creative class. Greene and Wang [6] extended the Starbucks analysis to Guangzhou, China where a similar HAZ has emerged in and around the new Tian He district's CBD [Fig. 3]. The Starbucks addresses for Guangzhou were obtained from the Starbucks corporate web page. In the absence of a GIS road centerline file with address ranges, it was necessary to use alternative methods for mapping the Starbucks locations, thus we used a combination of Google Earth with a follow up visit to capture the GPS locations of each Starbucks. A total of 27 Starbucks were mapped for Guangzhou of which 17 were located in the Tianhe District.

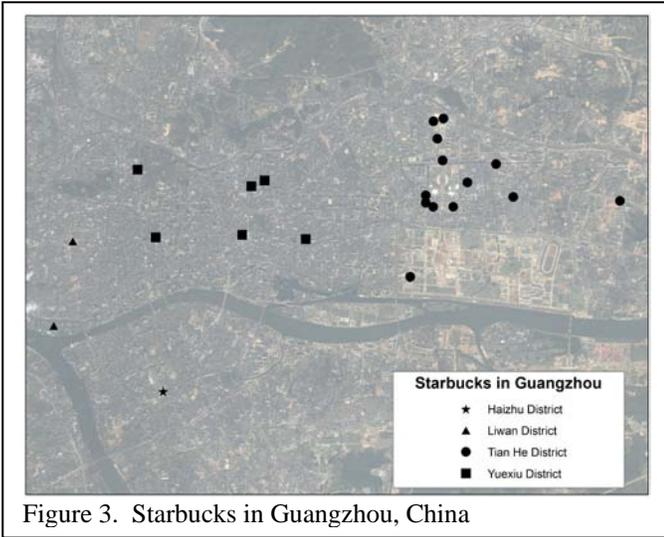


Figure 3. Starbucks in Guangzhou, China

## II. BACKGROUND

### A. Job Concentrations and Edge Cities

In an earlier study of the spatial distribution of 1990 jobs in Los Angeles, Forstall and Greene [3] delineated 120 job centers. A follow up study by Greene and Forstall [4] applied the same methodology to Chicago with 1990 job data and delineated 115 job centers. They found, not to their surprise, that jobs were not spread randomly throughout these urban areas, but instead were concentrated in job centers that had a spatial logic consistent with traditional theories of urban spatial structure including agglomeration economies and the multiple nuclei model of urban development.

Forstall and Greene [3] proposed a straightforward method for defining job centers that could be applied across places and time. The main goal was to be able to compare quantitatively employment distribution and decentralization. This was seen as particularly important as “edge cities” had recently been discovered by Garreau [7] and a number of urban geographers such as Hartshorn and Muller [8] had previously brought attention to “suburban downtowns.” Nevertheless, Garreau [7] only provided a few general guidelines or characteristics for an edge city none of which could be applied and measured systematically across urban regions.

### B. Job Density and E/R Measurements

Giuliano and Small (1991) delimited employment centers in Los Angeles using a job-density criterion:

$$\text{Job density} = \frac{\text{number\_of\_jobs\_in\_area}}{\text{square\_miles\_of\_area}} \quad (1)$$

Their cutoff to identify an employment center was a zone with at least 10 jobs per acre, i.e. 6400 jobs per square mile [9]. The job density approach to define job centers has been extended recently with the use of a geographically weighted regression for deriving the minimum job density [10, 11].

Forstall and Greene [3] used the ratio of employment to resident workers (E/R) for delineating job centers, reflecting the balance of workers and jobs. An important advantage of this method compared with the density method is that it catches important job centers like airports which necessarily include a lot of land and therefore may fail to meet a density criterion. For instance, the Los Angeles airport area (LAX) was not identified by Giuliano and Small as a job center, but it ranked as the third largest Los Angeles job center in Forstall and Greene’s [3] study, with 165,200 jobs. Also, the expansion of employment centers in outer parts of metropolitan areas in recent decades has frequently been at relatively low densities, which would result in them being overlooked by a job density only criterion.

The E/R ratio is defined as follows:

$$\text{E/R ratio} = \frac{\text{number\_worker\_s\_working\_in\_area}}{\text{number\_of\_worker\_s\_residing\_in\_area}} \quad (2)$$

An important quality of the E/R ratio is that it captures areas devoted specifically to employment because of its emphasis on commuting. An E/R of 1.0 or greater implies that a tract has more jobs than it has resident workers, in other words, a net commuter inflow into the tract. An E/R below 1.0 indicates that the tract has fewer jobs than resident workers, that is, a net outflow of workers from the tract. Job centers can then be identified in terms of aggregations of contiguous tracts with high E/R ratios. We adopted 1.25 or net in-commuting of 25% as the minimum limit for a tract to be included in a job center [3]. Others have adopted a lower E/R ratio of just greater than one on the grounds that it will identify areas that attract workers from the outside [12].

### C. Downtowns and High Amenity Zones

The HAZ concept was first discovered (although not referred to it as an HAZ until much later) after a sensitivity analysis was run to evaluate the E/R method versus the more conventional job density criterion for delineating job centers. The results showed that a small number of high job density tracts had not been assigned to job centers defined according to the E/R criterion. For Los Angeles [3], when these latter tracts were mapped it was learned that a good number of them filled the gaps between the Downtown, Hollywood, Beverly Hills, and Santa Monica job centers and they tended to represent high density upscale residential areas whose residents supported neighborhood retailing and service employment. Likewise for Chicago, these tracts were contiguous to Downtown and extended toward the upscale North Side. Greene [1] isolated this area by choosing tracts with job densities greater than 5,000 and E/Rs below 1.25 and then designated it as the North Side HAZ. For Los Angeles he did the same but used the original 6,400 jobs per square mile and an E/R lower than 1.25 and then designated that cluster of tracts as LA’s West Side HAZ [13].

### III. DELINEATING HAZS CONSISTENTLY ACROSS CITIES

#### A. HAZs in the U.S.

Greene [5] attempted to extend the HAZ concept across the U.S. by applying the same job density criterion as he did for Chicago (5,000 jobs per square mile) and an E/R less than 1.25, but he found it unsatisfactory as the job density structure of U.S. cities varied too much. For instance, in that experiment, most all of the residential areas outside of New York City’s downtown were classified as HAZs. For this paper, in order to account for the varying spatial structure of job density among U.S. cities we designate tracts as HAZs if their job density are within the upper 25 percentile of their metropolitan area’s weighted job density and have an E/R below 1.25 (Table 1).

TABLE I.

Metro Area	Weighted Job Density,		
	Job Density Threshold	Number of Tracts	Cumulative Jobs
Boston	6,432 per Square Mile	43	900,220
Chicago	7,042 per Square Mile	68	1,079,215
LA	9,623 per Square Mile	27	1,581,145
NYC	59,822 per Square Mile	17	2,014,225

The weighted median density method was applied to four cities, two of the original cities studied (Chicago and Los Angeles) and Boston and New York City were added to compare with two older urban areas that have higher population density in their central areas. New York City had the highest job density level and its new HAZ definition based on 59,822 jobs per square mile was vastly improved upon when compared to 5,000 jobs per square mile used earlier (Fig. 4).

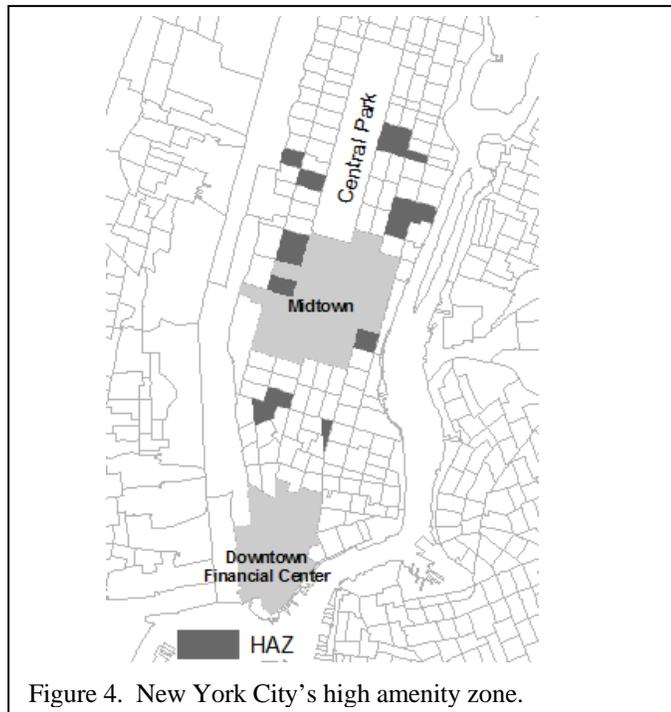


Figure 4. New York City’s high amenity zone.

A total of 17 census tracts were classified as HAZ when we considered only those tracts in the top 25 percent of the region’s job density and that had an employment residence ratio less than 1.25. The pattern that emerged was much more consistent with that found for Chicago, Los Angeles, and Boston, that is, adjacent to downtown or in the case of New York City, its two downtowns.

#### B. Guangzhou’s High Amenity Zone

As shown earlier in Fig. 3, many of the Starbucks of Guangzhou are concentrated in the new CBD of the Tianhe District, located in the middle of the Guangzhou urban area and adjacent to Yuexiu District to the west, Huangpu District to the east, Baiyun District to the northwest and the Haizhu District to the south separated by the Pearl River. The overall area of Tianhe District is 96 square kilometers with a population of 1.12 million. The Starbucks of Tianhe District are clustered within the area designated in 1991 as a new CBD which later mushroomed into a modern downtown with many glass-walled skyscrapers [14]. As early as the mid 1990s, research on the social areas of Guangzhou showed that Tianhe district was luring professional and intellectual populations [15]. A more recent study of Guangzhou’s social areas using China’s 2000 Population Census found that Tianhe District, particularly the area east of the CBD, is composed of a large share of the urban area’s young workers in the private foreign-funded industrial sector [16].

For these reasons we designate the Tianhe CBD and its surrounding area as the Tianhe HAZ. The CBD itself has excellent access as it is located in the southwestern edge of Tianhe District and includes the east railway station connecting Guangzhou to Shenzhen and Hong Kong. It has a lot of upscale retail including a mall inside the 80-storey CITIC Plaza building, the sixth tallest skyscraper in the world [15]. The central axis of the CBD consists of green public land and squares, similar to the HAZ of Chicago where natural amenities blend with the zone’s cultural amenities. The land function surrounding the CBD is mainly residential intermixed with businesses. There is also the Guangzhou Sport University specializing in physical education with the very large Tianhe stadium in close proximity.

A survey of customers who visited Starbucks in the Tianhe District was conducted to determine if they represented the creative class [6]. The survey included 30 subjects and 25 of them finished all of the questions. Forty percent of them worked in finance, insurance and real estate, while thirty two percent of them came from the field of education, science, management and administration. This is consistent with Chicago’s HAZ where many of the residents of the HAZ are working in financial companies located in nearby downtown. In the Starbucks of the CBD of Tianhe District, white-collar workers tend to talk about work and meet for business. Nearly fifty percent of them considered themselves traditional and open and willing to accept western culture and its consumption view.

#### IV. CONCLUSION

The high amenity zone (HAZ) concept came out of a project designed to delineate employment centers for Los Angeles and Chicago. HAZs are areas that have many jobs, but they are more residential in character than a typical job center. The traditional approach, using job density to establish job centers would assign these HAZ tracts to job centers but an employment resident ratio classifies the tracts as residential instead. Further investigation into these neighborhoods for Los Angeles and Chicago showed them to be in close proximity to downtown, upscale in character, and home to young professionals who worked in downtown offices in the case of Chicago, but in the case of Los Angeles they also worked in the office complexes that extend out from downtown along Wilshire Boulevard all the way to Santa Monica.

In this paper we examine the HAZ phenomenon more broadly, so as to draw comparisons across the U.S. urban system but also to begin an international comparison with Guangzhou China. Urban spatial structure varies considerably across the U.S., so the job density thresholds used to define the HAZ for Los Angeles and Chicago were inappropriate for other U.S. cities. Using the upper quartile of employment density for each metropolitan area as a threshold, seemed to improve HAZ identification as it standardized the measure according to each metropolitan area's employment density distribution. For instance, in New York City the HAZ tracts identified by the weighted median density approach had a spatial pattern consistent with that of Los Angeles and Chicago where the HAZ tracts were adjacent to and in close proximity to downtown.

For Guangzhou, China we lacked the employment data that we used in the U.S., but we were able to map the locations of Starbucks with Google Earth and GPS, which was relevant as Starbucks were found to be spatially coincident with HAZs in U.S. cities. Most of the Starbucks in Guangzhou were clustered in and around the new CBD of the Tianhe District. Recent studies of Guangzhou social spatial structure characterize the Tianhe District, particularly within and around the CBD, as being composed of young working professionals. The new CBD itself is well endowed with both physical and cultural amenities including universities, arts, entertainment, and public open space, similar to what you find in close proximity to the HAZs of Los Angeles and Chicago. A survey of recent patrons who visited Starbucks in the Tianhe CBD confirmed our impressions of the area qualifying as a HAZ similar in character to those we identified in the U.S. context. Future research will continue to standardize our measures, so that we can draw more substantial cross cultural comparisons between the U.S. and China urban systems.

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