

**PPD 631 Geographic Information Systems for  
Public Policy, Planning & Development**

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**Allocation Strategy for Tesla's Charging Stations in  
Beijing CBD**

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## **Introduction**

Tesla Motors, the Palo Alto, California-based vehicle manufacturer, has expected China to be its second largest electric vehicle market after the US. In order to compete with rivals such as BMW and Daimler AG's Mercedes-Benz for a share of China's emerging green vehicle market, Tesla has been putting in plenty of effort to boost the sales volume of its Model S sedans in China. The lack of charging stations, however, threatens to hamper that effort. The different life styles and commuting patterns between China and the US further complicate the issue.

To retrieve the situation and to focus on its largest oversea market, Tesla has promised to lay out a network for its fully electric cars to operate: “a wide-reaching, convenient system by which its cars can travel wherever, quickly, and without the fear of running out of juice.”<sup>1</sup> Last year, it announced that its network of ‘supercharger’ stations and regular charging outlets would expand greatly and hit most major cities in China.

There are several concerns that Tesla is supposed to take into consideration when constructing the network of charging stations. First, different from American people’s life style, most Chinese people prefer to live in condos and apartments in urban areas, which means there could be obstacles when located charging poles at customers’ residence. According to the data revealed by Tesla China’s sales team, more than 60% of Model S owners in China have complained difficulty when negotiating with their property management about setting up charging poles at their residential buildings<sup>2</sup>. Second, Tesla’s charging equipment requires stable and high-power electric supply and currently most China’s residential buildings can hardly meet relative requirements, which results in further issues when achieving special permits and facilities

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<sup>1</sup> <http://online.wsj.com/articles/SB10001424052702304549504579320642277821448>

<sup>2</sup> <http://news.mydrivers.com/1/330/330664.htm>

support from the government and electricity providers. Based on the issues stated above, currently the best solution for Tesla is to provide more charging stations at workplace to offset the insufficiency of home charging.

Take Beijing as an example, there are currently 18 charging stations, totally 52 charging outlets within Beijing's main urban area. However, in Beijing Central Business District, which area boasts the highest density of middle and high end office buildings, most Fortune 500 companies and therefore most potential Tesla owners, there are only 4 charging stations with 14 outlets deployed<sup>3</sup>. Consequently, the current insufficient charging facilities may exert negative influence on the brand perception and sales of Tesla in Beijing market.

## **Study Objective**

This paper was designed to demonstrate the potential locations of Tesla's workplace charging stations in Beijing CBD by using GIS visualization and relative data. The result of this study may help Tesla optimize its charging network and increase its sales in Beijing. At the same time, this study may give some valuable insights to other EV manufacturers on their future allocation of charging stations in Beijing CBD.

## **Data Collection**

The data used in this study included:

1. Beijing's base map and shape files from a Chinese third-party GIS provider (not available from China's government)
2. Cushman & Wakefield's Beijing office market analysis and transaction summary

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<sup>3</sup> According to Tesla's China sales team, 70% of Model S buyers are Fortune 500 company executives and senior managing individuals, by the end of May 2014. (Specific number is confidential).

3. Tesla's sales reports and information from official website.

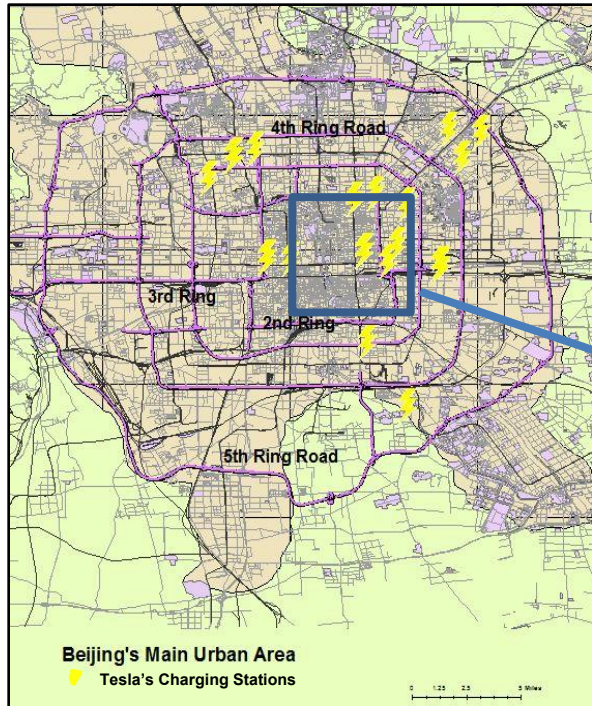


Figure I

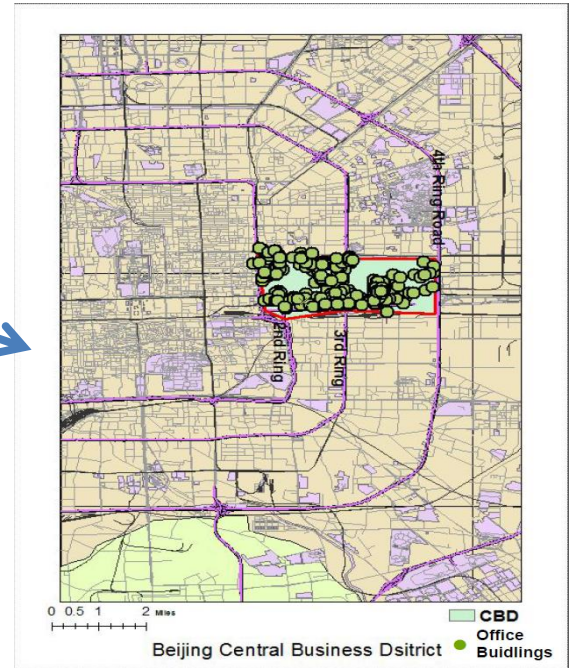


Figure II

## Analysis

As stated in previous sections, there are currently 4 charging stations with 14 outlets available to Tesla owners in Beijing CBD. All of the 4 stations are located at the parking lots of 4 office buildings—Parkview Green (5 outlets), Beijing IFC (6 outlets), Yintai Center (2 outlets) and Xinzhu Tower (1 outlet). According to Cushman & Wakefield's market analysis, Parkview Green, Beijing IFC and Yintai Center belong to Class-A level while Xinzhu Tower Class-B<sup>6</sup>. Regarding the distance and allocation of these four spots, Beijing IFC and Yintai Center are close to each

<sup>4</sup> Please resort to full-size version at the end of the paper

<sup>5</sup> Please resort to full-size version at the end of the paper

<sup>6</sup> Office building classifications are not absolute and are based on different criteria used by different companies. As for Cushman & Wakefield, it has a complicated 10-point evaluation system to classify the office buildings in the market; the buildings achieving more than 8.5 points (including 8.5) are Class-A and all the other ones are Class-B. Intuitively, Class-A buildings represent the highest quality in their market. They are generally the best looking buildings with the best construction, and possess high quality building infrastructure. Class A buildings also are well-located, have good access, and are professionally managed. As a result of this, they attract the highest quality tenants and also command the highest rents.

other and comparatively far from the other two apart buildings. Base on the amount of available outlets each building provides, Figure III depicts the theoretical service area each station may cover<sup>7</sup>. It turns out that the current supply of charging stations can hardly serve half of the office buildings in CBD. There is not even one charging station in the area east to 3rd Ring Road.

Figure III



Current Locations of Tesla Charging Stations in CBD

- Charging Stations
- Office Buildings
- Class-A Office Buildings
- CBD

<sup>7</sup> According to Kou, Liu and Zhou's *Modeling Algorithm of Charging Station Planning for Regional Electric Vehicle*, currently one charging outlet in Beijing is able to serve an area of approximately a 0.5-kilometer radius. The buffer in Figure III is therefore based on this hypothetical datum.

Figure IV

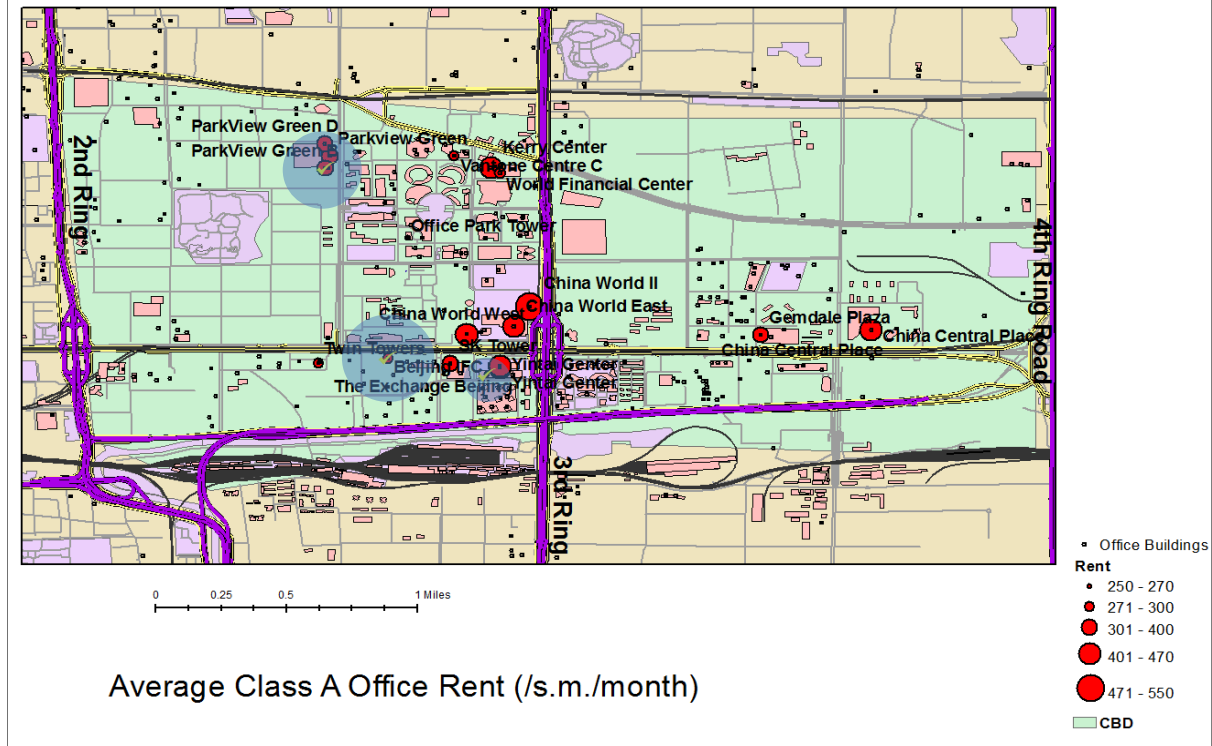


Figure IV shows all CBD Class-A buildings' average market rents. China World phase 2 has the highest rent of 550 RMB/sq.m./month<sup>8</sup> in CBD, followed by China World phase 1, and Kerry Center and Yintai Center, with 500 RMB and 470 RMB per square meter per month, respectively. The rest Class-A buildings have rents ranging from 250 RMB/sq.m./month to 450 RMB/sq.m./month.

Building Name	Rent(RMB/SQ.M./MON)
China World II	550
China World West	470
China World East	470
Yintai Center	450
Kerry Center	450
China Central Place I	410
China Central Place II	410
Gemdale Plaza	390

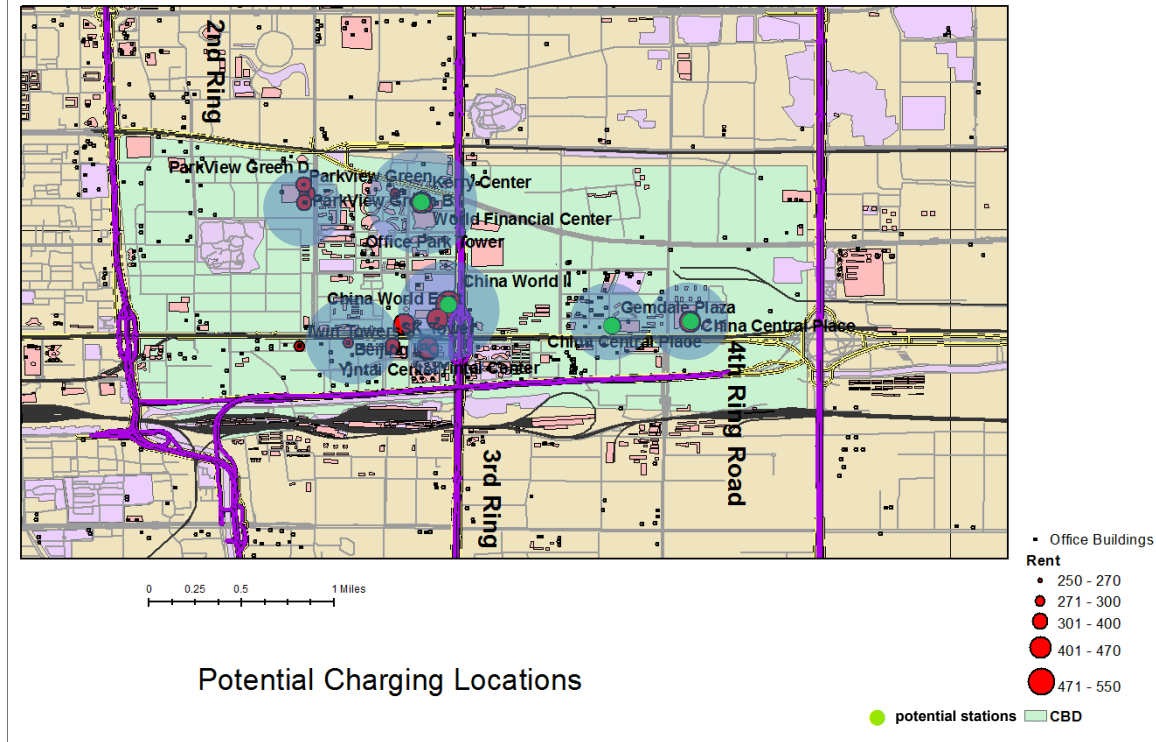
<sup>8</sup> 550 RMB/sq.m./month=89.5 USD/sq.m./month, based on exchange rate: 1 USD=6.1329 RMB (Nov 30, 2014).

<b>SK Tower</b>	360
<b>Parkview Green A</b>	350
<b>ParkView Green B</b>	350
<b>ParkView Green D</b>	350
<b>World Financial Center</b>	300
<b>Twin Towers</b>	300
<b>Vantone Centre C</b>	280
<b>Beijing IFC</b>	280
<b>Office Park Tower</b>	270
<b>The Exchange Beijing</b>	250

Based on the assumption that Tesla can choose high-quality office buildings to be optimum locations for charging stations, this study selected China World phase II, China World phase I, Kerry Center, Gemdale Plaza and China Central Place to construct the first batch of potential charging stations. Considering the fact that China World II and China World I are next to each other and share pretty similar quality level, this study has decided to only allocate charging station at China World II instead of both of them.



Figure V



## Conclusion:

In order to achieve ideal charging network, minimize cost and achieve the highest coverage, different amounts of outlets were assigned to 4 potential locations, based on their distances between each other, and distances between the candidates themselves and surrounding buildings—7 to Kerry Center, 6 to China World II, 5 to Gemdale Plaza and 5 to China Central Place, respectively. In Figure V, the charging network after the deployment of new stations is demonstrated. By calculation, more than 60% of CBD's office buildings would be covered by the new charging network, significantly increasing the sufficiency of charging stations in Beijing CBD.

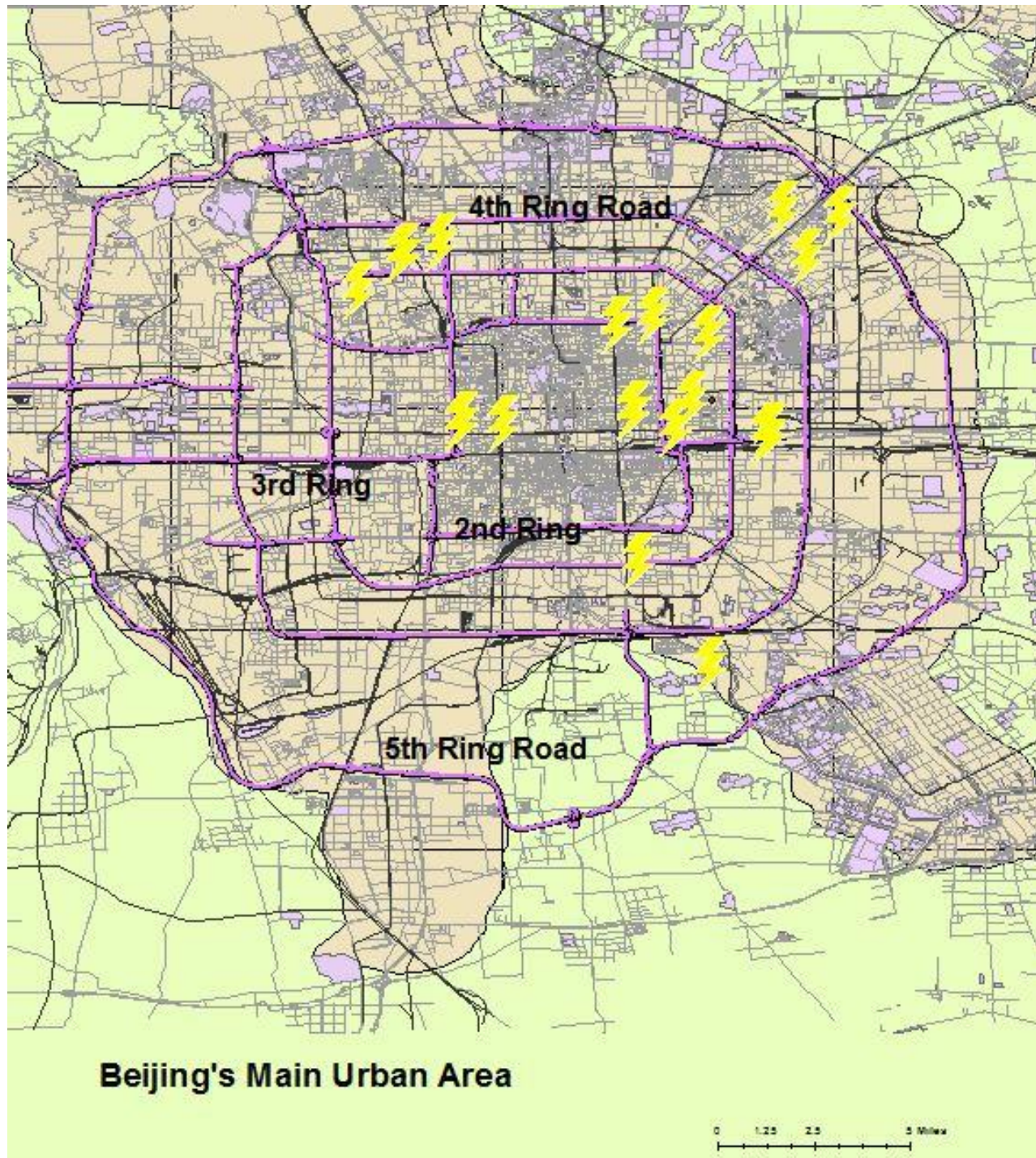


**Limitations:**

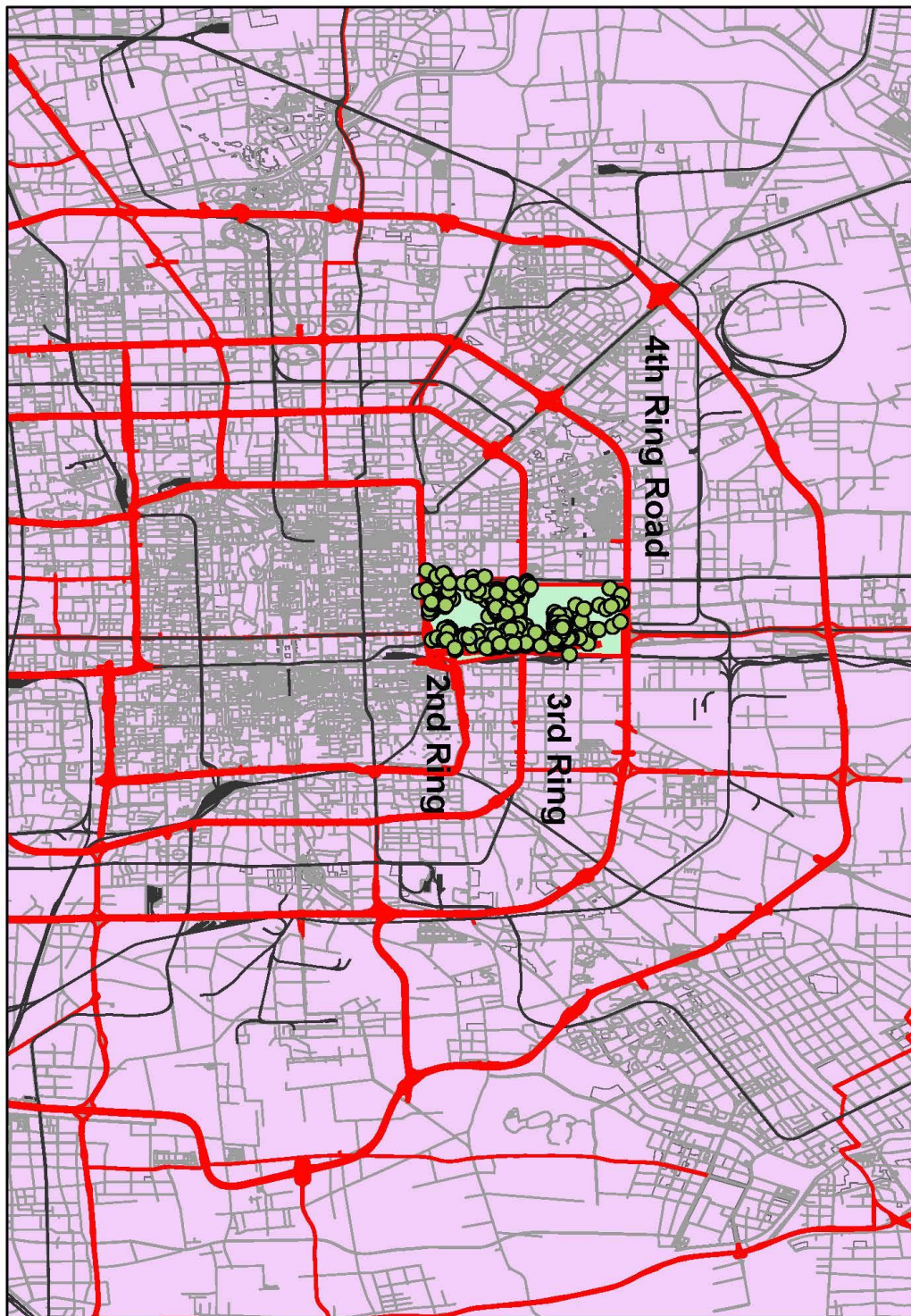
This study may show some major limitations. First of all, China's government does not provide detailed GIS data and information to the public and therefore the base map was achieved from a third-party map company, which means that the data may not be up-to-date and the accuracy may be questionable. Secondly, the area that a charging outlet can serve was based on an academic paper and to a huge extent hypothetical. Thirdly, a series of factors were not taken into consideration when locating the potential charging stations, such as traffic pattern, engineering difficulties, construction cost and easiness of negotiation with landlords. The paper could be significantly improved with more accurate data, comprehensive research and rigorous conception.

## Appendix

Full-size versions of Figure I and II







0 0.75 1.5 3 Miles  
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## Beijing Central Business District

CBD  
 Office Buildings

## References

Cushman & Wakefield, Beijing, 2014 Q3 Marketbeat-Office Snapshot

Kou, Liu and Zhou, *Modeling Algorithm of Charging Station Planning for Regional Electric Vehicle*, Modern Electric Power

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<http://news.mydrivers.com/1/330/330664.htm>