Building Sustainable Cities: A Case Study in Beijing

Bin Meng
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Supervisor: Carole L. Crumley
Evaluator: Paul Sinclair
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Meng, B., 2016: Building Sustainable Cities: A Case Study in Beijing. Master thesis in Sustainable Development at Uppsala University, 70 pp, 15 ECTS/hp

Abstract:
More than half of the world’s population lives in urban areas and this figure is expected to increase. The worldwide trend is in the direction of urbanization. Building sustainable cities is one of the sustainable development goals (SDGs) initiated by United Nations Sustainable Development Solutions Network. In the anthropocene of human induced climate change, what makes a city sustainable? This paper takes Beijing as the case study, uses building smart infrastructures and lowering ecological footprints as the main thread, uses a mixed research method of questionnaires, interviews and site survey, and discusses four aspects -- transportation, waste management, green spaces and energy saving buildings -- from employees’ perspectives of how to build a sustainable city. This paper also discusses the relations between smart infrastructure and the resilience of a city, and relations between lowering ecological footprints and a green city, and draws a conclusion that a resilient and green city is a sustainable city. We can build a sustainable Beijing only through vigorously developed public transportation, well managed waste, the development of diversified green spaces, and buildings that efficiently use natural resources as energy supplies.

Keywords: Sustainable Development, Resilience, Ecological Footprints, Transportation, Waste Management, Green Spaces, and Energy Saving Buildings.

Bin Meng, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden
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Summary: Beijing is the capital city of China -- the largest developing country in the world. During the last three decades, Beijing has achieved a great leap in economic development. But many societal and environmental challenges came along as well such as the dramatic increase in population and the number of vehicles, unpleasant working and living conditions, lack of water, and severe air pollution. The management of a balanced environmental, social and economic relationship is thus of high importance and urgency. And the speculation of how to build the city into a pleasant place to live is the issue before government and city constructors.

This paper uses four aspects that are closely related to people’s daily lives – transportation, waste management, green spaces and energy saving buildings as the survey and discussion topics; uses questionnaires, interviews and site survey as the mixed method; and find out what employees in Beijing think of the city’s performance in the four aspects, their attitudes to the proposed changes and their opinions on government and stakeholders’ reactions to the proposed changes.

Survey results show there are a lot of opportunities that need to be improved in these four aspects in the city. This paper provides detailed proposals toward the issues; discusses building a resilient and green city by developing smart infrastructures that are easily accessible and comfortable for people, and by lowering ecological footprints; and draws a conclusion that a sustainable city is a resilient and green city. Only by wisely prioritizing investment and planning in public transportation, managing waste to minimize landfills, developing diversified green spaces (compared with an economically driven development), and constructing or retrofitting buildings to use natural resources as energy supplies, can we build a sustainable Beijing.

This paper offers the strong belief and emphasizes the interdependent relationship between man and nature, and advocates that humans manage natural resources in a respectful way – to work with nature instead of working against it.

Keywords: Sustainable Development, Sustainable Development, Resilience, Ecological Footprints, Transportation, Waste Management, Green Spaces, and Energy Saving Buildings.
1 Introduction

Sustainable Development is defined in many ways. The most widely accepted version is from the Brundtland Report: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p.43). The most prevalent and influential way of representing and introducing the concept of sustainable development has been through the image of three overlapping circles, separately representing concerns connected with the economy, society and the environment. Sustainable development lies in the three-fold overlap at the center, where it integrates the three areas of concern (Connelly, 2007).

In this increasingly global world, 54 percent of the world’s population lives in urban areas and this figure is expected to increase to 66 percent by 2050 (United Nations, 2014). The worldwide trend is in the direction of urbanization. It is expected that the world’s population will reach to 8 billion by the year 2025 and 9 billion by 2040. All of the increased population is expected to live in urban areas as the total rural population is expected to remain persistent at about 3.3 billion by 2035 and then decline slightly to 3.2 billion by 2050. All future population growth on the planet is thus urban population growth (Sachs, 2015).

Combined with the concept of sustainable development and the process of urbanization, the sustainable development of cities is therefore of great importance. “Sustainable cities are economically productive, socially (and politically) inclusive, and environmentally sustainable. In other words, they must promote efficient economic activities, ensure that all citizens can benefit from them, and must do so in a way to preserve the biodiversity, safe air and water, and physical health and safety of the citizens, especially in an age of climate change and increasing vulnerability to extreme climate catastrophes” (Sachs, 2015, p.366).

How then can we make a city sustainable? To answer this question, we need to make clear what main factors a city should have to be called sustainable. Are resilient and green the factors? If so, can we realize resilient and green of a city by using smart infrastructures and by lowering people’s ecological footprints? This paper will take Beijing as the case study and, from the perspectives of employees, to understand the performances in the development of the city – their opinions on present situations and their attitudes toward the solutions that could be taken for improvements.

This paper selects Beijing as the case study because of its particularity, and its problems are prominent. Beijing is the capital city of China -- the largest developing country in the world. It had a total resident population of about 21.5 million by the end of the year 2014; its annual Gross Domestic Product (GDP) per capita was US$16,278 in 2014, which is 19.42 times that of the year 1978 when the Reform and Opening-up Policy was first adopted (Beijing Municipal Bureau of Statistics, 2016). While Beijing achieved a great leap in economic development, many societal and environmental challenges came along such as the dramatic increase in population and the number of vehicles, unpleasant working and living conditions, lack of water, and severe air pollution. The management of a balanced environmental, social and economic relationship is thus of high importance and urgency that lies ahead of the government.

This paper will use smart infrastructure and ecological footprints reduction as the principal line and
discuss solutions from four aspects: transportation, waste management, green spaces and energy saving buildings. The significance of this paper is to explore how shall we manage our natural and social resources correctly, scientifically and efficiently, and build a city that is interdependent between man and nature. The efforts, attempts and practices that Beijing makes can be a demonstration and provide experiences and inspirations to other (mega) cities that have similar situations or problems.

The following parts of the paper include: part two is a literature review of the relevant research on sustainable cities and resilient cities, and research related to the four aspects that the paper will be discussed; part three is the description of the methodology used for this research project; part four is the data and results drawn from the method used; part five is the discussion of solutions of the four aspects, the discussion mixed technical, administrative, emotional, sustainability and pragmatic aspects of the research question; part six is the conclusion and limitations; part seven is the acknowledgement; part eight gives the references; the final part is Appendixes.

2 Literature Review

There is a considerable amount of research on sustainable cities from perspectives of designing or shaping physical dimensions of cities like transportation, water system, housing, open space, workplace, sanitation (McGranahan, 2001; Low, 2005; Zetter & Watson, 2006; Cooper, Evans & Boyko, 2009; Jenks & Jones, 2010); providing institutional and practical decision-making tools and solutions to governments (Cooper, Evans & Boyko, 2009; Mega, 2010; Polk, 2015); country programmes for building sustainable cities (Person & Tanner, 2005; Nkhuwa, Mwanza & Chama, 2009; Yari, 2009; Zhao, 2011); compact cities (Jenks & Burgess, 2000); designing sustainable cities in a developing world (Jenks & Burgess, 2000; Zetter & Watson, 2006); and from abstract perspectives like gender, wellbeing, social and cultural issues (McGranahan, 2001; Hallsmith, 2003; Mega, 2010; Bank European Investment, 2011).

There are many literature on resilient cities, the contents of which are mainly on designing or governing the resilient cities (Lombardi, 2012; Brown, Dixon & Gillham, 2014; Wakefield & Braun, 2014); responding to or adapting to climate change (Newman, Beatley & Boyer, 2009; Otto-zimmermann, 2011; Otto-zimmermann, 2012); vulnerabilities to disasters and recovering from disasters (Vale & Campanella, 2005; Prasad, 2009).

As this paper will discuss on four aspects: transportation, waste management, green spaces and energy saving buildings; literature related to these four areas are also reviewed.

Literature on public transportation includes those that describe the practices in improving mobility and accessibility (Jones, 2013); stop location and tariff zone design, and evaluation of bus stops (Schobbel, 2006; Kooi, 2007). There is a paper that reviews how public transportation contributes to sustainability goals and concludes by offering suggestions for future research into the sustainability performance of public transit (Miller, et al., 2016). There are many papers on transportation demand management (TDM) in Beijing (Gert, Zhao & Lue, 2010; Guo, et al., 2015) and transit oriented development (TOD) in Beijing (Xu, et al., 2010; Shi, Wu & Jin, 2011).
There are many articles about municipal waste management in Beijing (Li, et al., 2009; Hu, van der Voet & Huppes, 2010; Wang & Wang, 2013) and good practices of city in Sweden (Bernstad, 2013). There are also a lot of articles on waste management practices in countries like Japan, Germany, the United States and Canada that in real life demonstrate very good experiences.

Studies of Green Spaces are mainly about relations between exposure to green spaces and health; green spaces and birth weight and gestational age; green spaces and stress. The studies show that percentage of green spaces in people’s living environment has a positive association with the perceived general health of residents, and that the development of green spaces should be allocated a more central position in spatial planning policy. Green spaces also produce ecosystem services such as enhanced energy and climate management, water quality and habitat and biodiversity (Maas, et al., 2006; Young, 2010; Dadvand, 2012).


This paper is to study sustainable cities from Beijing employees’ perspectives of the issues that exist in the city, their attitudes to the proposed changes, and their opinions toward the government and stakeholders’ responses to the proposed changes; these are gaps in current studies.

The study of building sustainable cities is an extremely large topic and it contains every aspect of our social lives. The majority of the literature limits the field of research to a smaller topic and connects the research questions to the concept of the sustainable development of cities. My way of thinking is to firstly have an ideal map/picture of how a sustainable city looks like followed by looking into the details what aspects can contribute to the sustainable development of the city and how to realize that.

To write a smaller topic or to write a larger one is a choice of a researcher. In this master thesis of mine, I choose to try the latter. The reason is that my initial plan of this research is to design a closed and self-sustained micro system of an office buildings community and discuss from smart infrastructure and ecological footprint perspectives. I consider these four aspects are the most relevant ones to my design. The fossil fuels consumption reduction in transportation and buildings are directly related to the decrease of greenhouse gas emissions. The way of how we manage waste is not only related to greenhouse gas emissions reduction but also the contamination of water (especially ground water if the waste is landfilled), land use, smart use of energy supply and so on. The diversity of green spaces helps enhance resilience. None of these aspects can take care of themselves and need to be planned ahead. All these issues are all city level issues, too. If the practice can be demonstrated well in an office buildings community, then it can be enlarged to the city level and realize the goal of building a sustainable city.

There are many other very important aspects to discuss in building a sustainable city like water and sewerage. Due to time constraint and thesis page number limitation, they are not included in this paper.
3 Method
This study employs a mixed research method: questionnaires, interviews and site survey.

3.1 Questionnaire designed toward Beijing employees (city-wide)
In order to look into the experiences and opinions about the commuting statuses and working environments of employees in Beijing, and to find out opportunities that exist in transportation, waste management, green spaces and the energy saving characteristics of buildings, a questionnaire named “Build a working environment that has an interdependent relationship between man and nature” was designed on a Chinese survey website www.sojump.com.

The questionnaire has 16 single choice questions and 6 multiple choices questions. Among them, two questions are associated with their previous questions separately. The first associated question is “Do you often encounter traffic jams when you commute?” If the participant chooses “Yes”, then he or she will see the correlated question “In your opinion, what is/are the reason(s) for traffic jams?” If “No” is chosen, then the participant will not see the correlated question. The second associated question is “What is the city’s performance on correctly and finely sorted waste?” If the participant chooses “Very bad” “Bad” or “So-so”, then he or she will see the next correlated question “What do you think the reason(s) is/are that we do not sort waste correctly and finely?” If “Good”, “Very good” or “Do not know” is chosen, then the participant will not see the correlated question. Ten questions are designed to have the choice “Others (please explain)”. This is for participants to write down their own experiences or thoughts that are not indicated in the above choices. Similarly, six questions are also given spaces for further explanations if the participant chooses “No” in the particular question.

The questionnaire was published on the website where it had been designed. At the same time, I sent the web link through Chinese social media to my friends so that those who work in Beijing can fill it out. I also solicit their help to forward the link to their friends so that more people could be involved. In the meanwhile, I published a note including the link to the questionnaire on another Chinese social media website where the audiences are not necessarily my friends. I also copied the note to five people that have some social influence hoping that they could fill out and forward the message. The contents of the questionnaire are in Appendix 1.

3.2 Questionnaire designed toward employees who work in Central Business District (CBD) in Beijing (CBD-wide)
As employees who work in the Central Business District (CBD) are considered to have very convenient transportation and very good indoor and outdoor working environments, this study also uses a questionnaire to look into their views toward the four aspects. It is named “Transform CBD in Beijing from a traditional business function district into a sustainable and ecological-humane interdependent district”. It has 17 single choice questions and 11 multiple choices questions. Some of the questions designed are similar or the same to those described in Method 3.1, but there are some other questions that fit in CBD specifically. The website for which the questionnaire was designed is the same to Method 3.1. Its transmission ways include being published on the website
where it had been designed, the web link of it was sent to my friends through the same Chinese
social media with Method 3.1. The contents of the questionnaire are in Appendix 2.

3.3 Interviews toward employees who work in or visit Central Business
District (CBD) in Beijing

“The interview is a flexible and adaptable way of finding things out” (Robson, 2011, p. 280). Three
one-on-one semi-structured interviews were made in order to investigate more about people’s views
in detail. Two respondents have been working in the CBD, and one respondent visits the CBD from
time to time. The interviews were done by telephone. Notes were taken down throughout the
process of the interviews. The interview guide is in Appendix 3.

3.4 Site survey

The metro in Stockholm is said to be clean, safe, with problems only rarely, not quite so expensive
and that people of all economic or social classes take the metro. In order to learn common ground
and the differences on infrastructure, price, service and interval of the metro system between
Beijing and Stockholm; aiming for knowing what good practices Beijing can learn from Stockholm,
I went to Stockholm to have a metro site survey on Tuesday April 12, 2016. The study routes are
indicated in Metro map in Stockholm (Fig.1).

The first time period site survey was started at 11am at red line station T-Centralen and ended at
4pm at blue line station Kungsträdgården. The routes were T-Centralen to Universitetet (red line
T14), Universitetet to T-Centralen (red line T14), T-Centralen to Kista and Husby (blue line T11),
Husby to Kungsträdgården (blue line T11). During the survey, I stopped at different stations to
observe traffic flows, facilities both of the stations and trains, services, intervals, artistic decorations
in some stations along the blue line, the indoor environment of trains, people who take metros,
entrances and exits designs of the stations.

The second time period site survey was started at 5:30pm at red line station Gamla Stan and ended
at 8pm at green line station T-Centralen. The routes were Gamla Stan to Stadion (red line T14), this
is because I observed that it had a big traffic flow at Stadion in the first period site survey, so I went
there again to see what things were going on at rush hour in the evening; Stadion to Liljeholmen
(red line T14), Liljeholmen to T-Centralen (red line T13), T-Centralen to Tensta (blue line T10),
Tensta to Fridhemsplan (blue line T10), Fridhemsplan to T-Centralen (green line T17). T-Centralen,
Liljeholmen and Fridhemsplan are transfer stations, and T-Centralen is the transfer station for all of
the three metro lines (blue, red and green) in Stockholm. Traffic flows and train intervals are the
focuses of observation of this time period.
4 Results

This part will report results of city-wide questionnaire, CBD-wide questionnaire, the comparison on results of the same questions in two questionnaires, interviews and site survey.

The differences between the two questionnaires are: the city-wide questionnaire does not mention parking but focuses on public transport only while the CBD questionnaire has four questions on parking at CBD and two questions on other means of commuting; the idea of an underground transmission system connected with incineration plants for unrecyclable waste is described in city-wide questionnaire while two questions on how participants deal with recyclable office waste are asked in CBD questionnaire; the proposal of warm water supplies in washrooms of office buildings heated by using human body temperature are asked in city-wide questionnaire; the types of green spaces that participants like, the connection between basic service infrastructures in CBD and participants’ lives, set up public kindergarten, and participants’ opinions on the function of CBD are asked in CBD questionnaire while there are none of these in city-wide questionnaire.

Six questions are quite the same in both questionnaires, among which four questions use different
words when asking, two are identical. But the city-wide questionnaire has more choices for each question.

The design of CBD questionnaire is based on the interview guide. Influenced by the conversations of interviews, some of the choices in it are subjective; questions on ideas of vegetable greenhouse and warm water supply in office building washrooms heated by human body temperature were actually not asked. Also, there are minor repetitions on the same topic questions. Learned from the experiences of CBD questionnaire, the contents of the city-wide questionnaire were adjusted and improved – choices are more complete, and questions are more specific.

4.1 City-wide questionnaire results

This questionnaire has 61 participants. As one participant’s answers are all blank, the valid number of participants is 60. But the blank answers still have an effect on the statistical results because every question has a 1.67% of information blank. All the data written in percentages are kept one digit behind the decimal point, and half adjust.

Among the participants, 23 (37.7%) of them are male and 37 (60.7%) are female. Education and research (16.4%), finance, human resources & administration (14.8%) and real estate, construction & property management and civil servants (both 11.5%) are the four fields of working that have the highest percentages of participation. Other working fields are sales and marketing (9.8%), projects (1.6%), IT and communication (6.6%), finance and insurance (4.9%), manufacture (1.6%), media (4.9%), consulting and legal (3.3%), self-employed (1.6%) and others (marked with equipment management, student, doctor, and freelance) (8.2%). As far as the overall degree of comfort of their indoor and outdoor working environments is concerned, almost half (45.9%) of the participants chose “So-so”. Approximately a quarter (24.6%) participants reported uncomfortable, while 13.1% of them responded comfortable. The percentages of participants who feel quite uncomfortable and quite comfortable are the same, which are 6.6%. One participant (1.6%) remarked that the indoor environment is good, but the outdoor environment is not good. Percentage distribution of employees’ descriptions on the degree of comfort of their indoor and outdoor working environment is presented in Figure 2.

![Fig. 2. Percentage distribution: employees’ descriptions on the degree of comfort of their indoor and outdoor working environment.](image)

4.1.1 Transportation

This part of the questionnaire is designed in four sections: employees’ choices of their means of transportation and related reasons; the frequency of traffic jams they encounter when commuting and the reasons for congestion; their single commuting durations and ideal optimum durations if
they choose public transportation; their attitudes toward ticket prices and proposed methods for the
development of public transportation.

4.1.1.1 Four characteristics of employees’ choices of means of commuting and related reasons
Firstly, public transportation is the main means of commuting for employees in Beijing. More than
half (52.5%) of them chose metro and almost half (42.6%) chose bus. The top three reasons for
their related choices of means of commuting are time guarantee, fast and convenient, and cheap
ticket prices, respectively 59%, 45.9% and 29.5% of the participants chose them.

Secondly, a commute by private vehicles is another popular means. Almost half of the participants
(44.3%) travel in this way. Seven participants commute only by driving private vehicles, which is
the biggest number of employees who use only one transportation pattern for commuting.

Thirdly, commute by taxies and buses operated by a privately owned company are a relatively new
but flexible means of transportation. Commuters need to place orders through the App of the
service provider and nearly a quarter (24.6%) of the participants commute in this way.

Fourthly, employees usually choose a mixed means of transportation. Five of them use a
combination of bus and metro, and four use a combination of bus, metro and private cars. These
two modes are the top two mixed means of transports among other mixed means. Employees’
choices of means of commuting and their related reasons are summarized in Figure 3 & 4.
4.1.1.2 Traffic jams frequency and reasons

Forty-four out of the sixty participants (72.1%) encounter traffic jams frequently. Sixteen participants (26.2%) do not often encounter traffic jams, and eight of them walk to work.

Reasons for traffic jams can be divided into three main categories.

Physical condition is the first category. It includes the big number of cars and the large population, the two factors of which are respectively chosen by 70.5% and 34.1% of the 44 participants who frequently encounter congestions.

Human behavior is the second category. Drivers do not obey traffic rules (52.3%), pedestrians do not abide by traffic regulations (34.1%) and the necessities of commuting across districts (18.2%) are three factors in this category.

The third category is about administration and management efficiencies of government bureaus. The percentage of participants who chose “unreasonable road planning” is as high as 63.6%. “Police on duty on the frequently congested roads at rush hours are insufficient” “bus route distributions are not wide and meticulous” and “basic infrastructures and services in urban construction need to be improved (e.g. pipelines for rain discharge are not smooth, the speed and efficiency of snow clearing is not high)” are another three factors that were chosen by participants (25%, 20.5% and 22.7% respectively). This part is presented in Table 1.
Table 1: Reasons for traffic jams chosen by related numbers and percentages of participants.

<table>
<thead>
<tr>
<th>Reasons for traffic jams</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large population</td>
<td>15</td>
<td>34.1</td>
</tr>
<tr>
<td>Big number of cars</td>
<td>31</td>
<td>70.5</td>
</tr>
<tr>
<td>Drivers do not obey traffic rules</td>
<td>23</td>
<td>52.3</td>
</tr>
<tr>
<td>Pedestrians do not obey traffic rules</td>
<td>15</td>
<td>34.1</td>
</tr>
<tr>
<td>Necessity of commuting across districts</td>
<td>8</td>
<td>18.2</td>
</tr>
<tr>
<td>Unreasonable road planning</td>
<td>28</td>
<td>63.6</td>
</tr>
<tr>
<td>Police on duty on the frequently congested roads at rush hours are insufficient</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Bus route distributions are not wide and meticulous</td>
<td>9</td>
<td>20.5</td>
</tr>
<tr>
<td>Basic infrastructures and services in urban construction need to be improved</td>
<td>10</td>
<td>22.7</td>
</tr>
</tbody>
</table>

4.1.1.3 Commuting duration by public transportation

This question was designed with six commuting durations for a single journey: within 30 minutes; 30-45 minutes; 45 minutes to 1 hour; 1-1.5 hours; 1.5-2 hours; 2-3 hours. Altogether 77.1% of the participants commute within one hour, but still slightly over 20% (21.3%) of the participants spend more than one hour to commute. When asked about their ideal optimum commuting duration, the percentage of the participants who chose “within 30 minutes” is as high as 67.2%. Details are reported in Table 2 (A).

Among the 60 commuters, 41 of them use public transportation or a mix of public transport and other forms of transport. Compare their real and ideal single journey commuting durations, 14 commuters hope to spend about 15 minutes less; 11 of them want to shorten about 15-30 minutes; 3 of them hope their commuting duration could reduce 30-45 minutes, 8 participants wish to spend at least 30-60 minutes less and 1 participant wants to shorten 60-75 minutes. Nineteen participants including those in the smallest duration group don’t want a change in their commuting duration. In Table 2(B), a detailed number of participants with their ideal commuting duration and real duration by current means of commuting are reported. Public transport is the focus, so it is ranked higher than other forms. Unless there are commuters who use metro or taxi only, public transport at here includes bus, metro and taxi. In the table, “App” is actually the kind of public transport service provided by privately owned companies. It is picked out from public transport as this is a new form and is going to be reported separately in either two questionnaires or interviews in this chapter. Four participants’ choices of ideal durations are longer than their current ones.

Table 2 (A): Participants’ single journey commuting duration and their ideal optimum commuting duration.

<table>
<thead>
<tr>
<th>Duration</th>
<th>Single journey commuting duration</th>
<th>Ideal optimum commuting duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of participants</td>
<td>% of participants</td>
</tr>
<tr>
<td>&lt; 30 minutes</td>
<td>17</td>
<td>27.9</td>
</tr>
<tr>
<td>30 – 45 minutes</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>45 minutes – 1 hour</td>
<td>16</td>
<td>26.2</td>
</tr>
<tr>
<td>1-1.5 hours</td>
<td>12</td>
<td>19.7</td>
</tr>
<tr>
<td>1.5-2 hours</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>2-3 hours</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 2 (B): number of participants with their ideal commuting duration and real duration by current means of commuting.
Abbreviations: m – minutes; h – hour(s); W – Walk; B – Bike, electric bike & motorbike; App – taxi or commuting bus run by privately owned companies; PT – public transportation; PV – Private vehicle; CB – Commuting bus; OC – Official car.

<table>
<thead>
<tr>
<th>Commuting duration now</th>
<th>Ideal commuting duration</th>
<th>Number of participants</th>
<th>Means of transportation</th>
<th>Sub total number</th>
<th>Total</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5-2 h</td>
<td>30-45 m</td>
<td>1</td>
<td>CB</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1-1.5 h</td>
<td>&lt; 30 m</td>
<td>4</td>
<td>W/B+PT</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>PT+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>App</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PT+OC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-45 m</td>
<td>2</td>
<td>PT</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>45m – 1 h</td>
<td>1</td>
<td>PT+App+PV</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45m – 1 h</td>
<td>&lt; 30 m</td>
<td>6</td>
<td>PT</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>PT+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-45 m</td>
<td>1</td>
<td>W+PT</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PT+App</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>W+B+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>PT+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>45m -1h</td>
<td>1</td>
<td>W+PT+PV</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-45 m</td>
<td>&lt;30 m</td>
<td>4</td>
<td>PT</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>CB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>W+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-45 m</td>
<td>2</td>
<td>Metro+PV</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Metro+App+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Taxi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-1.5 h</td>
<td>1</td>
<td>PV</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30 m</td>
<td>&lt; 30 m</td>
<td>3</td>
<td>W</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>W+PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>W+PT+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PT+PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>OC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>PV+OC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30-45 m</td>
<td>1</td>
<td>W</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>W+B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>45m – 1 h</td>
<td>1</td>
<td>PV</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.1.1.4 Commuters’ attitudes toward ticket prices and the proposed methods of developing public transportation
Almost half (47.5%) of the participants consider that the ticket prices of public transportations are neither cheap nor expensive, Almost 40% (39.4%) of them believe that the prices are cheap (24.6%)
or very cheap (14.8%). Four participants (6.6%) think the prices are expensive, and one participant (1.6%) thinks them very expensive. Two participants (3.3%) chose “Others”: one drives to work and does not have ideas on the prices of public transport; the other considers that the prices had been cheap before the charging rules were changed to “metro ticket pay by travel distance; bus ticket cancel the discount of 60% off” in December 28, 2014. Employees’ descriptions on public transport ticket prices are reported in Table 3.

Table 3: Employees’ descriptions on public transport ticket prices.

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Cheap</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>Cheap</td>
<td>15</td>
<td>24.6</td>
</tr>
<tr>
<td>So-so</td>
<td>29</td>
<td>47.5</td>
</tr>
<tr>
<td>Expensive</td>
<td>4</td>
<td>6.6</td>
</tr>
<tr>
<td>Very expensive</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Currently, vehicles are restricted to be on bus lanes during rush hours of 7-9 am and 6-8 pm during the day in Beijing. When asked about if the bus lanes should restrict other vehicles the whole day, 70.5% of the participants chose “Yes”. Those (27.9%) who chose “No” gave various reasons: it is a waste of road resources, and we should increase the utilization of the roads; no need to do so; restrict other vehicles at different time slots; buses should be restricted within fixed lanes (Buses are free to be on any lanes now in Beijing); and vehicles for emergency should not be restricted. Among the seventeen participants who chose “No”, ten of them use private cars for commuting.

As for the efforts and attempts of using spaces above ground and under ground that the government could make to develop public transportation, more than half (52.5%) of the participants chose “Build multilayer viaducts”. More than a third of participants believe that increase the number of entrances and exits of metro (34.4%) or tunnel transport (39.3%) would also work. Around a quarter of participants chose “Bilayer compartments of subway” (27.9%) and “Three- or four-story metro rails” (23%). Almost 15 % (14.8%) of participants chose “Cableway transport”. Another 4.9% of participants chose “Transport on river”. Seven participants gave other proposals like zoning separately bus lanes like BRT model, zoning parking areas especially for buses, dismantle walls of communities so that traffic flows can be diverted, good designs in entrances and exits of roads, and variable direction vehicle lanes. One participant remarked that the key is the planning on urban functional areas but not the spaces usage. These eight participants account for 13.1% of the total participants. The summary of the proposed methods and related percentages of agreements is reported in Table 4.

Almost all (97%) of the participants are willing to sacrifice their degree of comfort temporarily caused by the inconveniences that construction work brings for the benefits of developing public transportation and reducing using private vehicles if the proposed methods are feasible after environmental assessment and technical evaluation. The only one participant who is unwilling to do so given by her comments is that she does not have a private car.
Table 4: Proposed methods for developing public transport by using spaces above ground and under ground.

<table>
<thead>
<tr>
<th>Proposed methods descriptions</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cableway transport</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>Build multilayer viaducts</td>
<td>32</td>
<td>52.5</td>
</tr>
<tr>
<td>Transport on river</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td>Bilayer compartments of subway</td>
<td>17</td>
<td>27.9</td>
</tr>
<tr>
<td>Three- or four-story metro rails</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>Increase the number of entrances and exits of metro</td>
<td>21</td>
<td>34.4</td>
</tr>
<tr>
<td>Tunnel transport</td>
<td>24</td>
<td>39.3</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>13.1</td>
</tr>
</tbody>
</table>

### 4.1.2 Waste management

This part of the questionnaire mainly contains two sections: employees’ opinions on the performances of waste assortment in the city and their attitudes toward the proposed changes of individual behavior in the working environment and waste management in the city level.

#### 4.1.2.1 Employees’ opinions on the performances of waste assortment in the city

There is no participant who agrees that the city has a good performance in waste assortment. On the contrary, almost two thirds (61%) of the participants think that the city is doing very poorly in this issue and approximately 20% (19.7%) consider it is bad. The rest 18% participants think it is so-so.

The reason that the city does not correctly and finely sort waste can be divided into the so-called “hardware” and “software” issues. Hardware refers to “The processing ability of waste management plants in the city is not strong enough” “Short of clear instructions to the citizens on how to sort” and “Lack of clean and esthetic waste sorting facilities”. The percentages of participants who chose these three factors are 58.3, 63.3 and 23.3 separately. Software refers to the humane and cultural factors, among which more than two thirds (68.3%) of participants chose “No such kind of consciousness”, and it has the highest percentage of participants’ agreement. Other factors include “Lack of education” “Lack of propaganda” and “Lack of supervision”, which are chosen by around 60% of participants (61.7%, 58.3%, and 61.7% separately); another three issues are “No incentive or punishment measures” “No such kind of traditional habits” and “No such kind of social moral atmosphere” with percentages of 58.3, 51.7 and 43.3 respectively. A descending arranged numbers and percentages of participants with related reasons chosen is presented in Table 5.
Table 5: Reasons that the city does not correctly and finely sort waste and the number and percentage of participants’ agreement.

<table>
<thead>
<tr>
<th>Descriptions of reasons</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>No such kind of consciousness</td>
<td>41</td>
<td>68.3</td>
</tr>
<tr>
<td>Short of clear instructions to the citizens on how to sort</td>
<td>38</td>
<td>63.3</td>
</tr>
<tr>
<td>Lack of education</td>
<td>37</td>
<td>61.7</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>37</td>
<td>61.7</td>
</tr>
<tr>
<td>The processing ability of waste management plants in the city</td>
<td>35</td>
<td>58.3</td>
</tr>
<tr>
<td>Lack of propaganda</td>
<td>35</td>
<td>58.3</td>
</tr>
<tr>
<td>No incentive or punishment measures</td>
<td>35</td>
<td>58.3</td>
</tr>
<tr>
<td>No such kind of traditional habits</td>
<td>31</td>
<td>51.7</td>
</tr>
<tr>
<td>No such kind of social moral atmosphere</td>
<td>26</td>
<td>43.3</td>
</tr>
<tr>
<td>Lack of clean and esthetic waste assortment facilities</td>
<td>14</td>
<td>23.3</td>
</tr>
</tbody>
</table>

4.1.2.2 Employees’ attitudes toward the proposed changes on waste management

The advantages of not using garbage baskets and garbage bags are to reduce using the materials that cannot be degraded, and hence alleviating environmental pollution. When asked about whether they are willing to throw the garbage into the facilities that are clean, esthetic and with clear assortment instructions in the public rest area in the office but not the garbage baskets besides their desks, 92% of the participants chose “Yes”. Those who chose “No” (6.6%) commented that they feel they are lazy, or that they can sort by themselves in their baskets, or that they feel it is troublesome.

As far as the non-recyclable waste is concerned, an underground waste transmission system is proposed to transport the vacuum packed waste to the incineration plant. The methane and heat generated from incineration can be used on public transport vehicles and as energy supplies for buildings. The majority (90.2%) of the participants thinks it is feasible and would like to accept the inconveniences caused by construction of such facilities in the process of making changes. But minor participants (8.2%) think it is not feasible because the cost of either construction or maintenance is so high and once the system is out of order, it will generate very big impacts. Two participants think that gases from incineration are toxic.

4.1.3 Green spaces

This part of the questionnaire is designed to understand the relation between the sizes of green spaces in the working environments of employees and their influences on them.

The sizes of green spaces in the participants’ working environments vary from very large (3.3%), large (11.5%), average size (29.5%) to small size (27.9%), very small size (19.7%) and even no green space (6.6%). Almost half (47.6%) of the participants’ working environments have small or very small green spaces. More than half (54.1%) of them think the size of green spaces greatly influences their moods and working efficiencies. The rest (44.4%) of the participants think that it has very small influence (37.7%) or no influence (6.6%) at all. The result shows that small and very small sizes of green spaces generate big influences on participants generally. But the large or very large size of green spaces does not always in proportion to the big influence generated on participants. In fact, the average sizes of green spaces in eleven participants’ working environments generate very small influences on them. Green space sizes of the surrounding environments of the four participants who chose “No influence” range from no green space to large size. The percentage
distribution of green space sizes of the participants’ working environments is presented in Figure 5 and the influences of different sizes of green spaces generated on participants in their working environments are summarized in Table 6.

![Fig.5. Percentage distribution: green space sizes of the participants’ working environments.](image)

**Table 6: Summarization of different sizes of green spaces in working environments generated on participants.**

<table>
<thead>
<tr>
<th>Sizes of green spaces</th>
<th>Very big influence</th>
<th>Very small influence</th>
<th>No influence</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very large</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Large</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Average (So-so)</td>
<td>6</td>
<td>11</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Small</td>
<td>10</td>
<td>7</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Very small</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>No green space</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>23</td>
<td>4</td>
<td>60</td>
</tr>
</tbody>
</table>

If given the opportunities to plant or garden the green spaces at non-working hours claimed or rent by the companies as a kind of employee welfare, 85.3% of the participants believe it will increase their sense of commitment to their employers. Participants (13.1%) who have different opinions think that the gardening will occupy their spare time and they are not available to do that; planting is nothing related to the sense of commitment to an employer because that is a personal habit.

### 4.1.4 Energy saving buildings

Generally speaking, the extent of using natural resources as energy supplies in an office building can actually save lots of energy produced from fossil fuels. The proposed methods in the questionnaire include green roof – passive cooling of the building and a place for employees to release fatigues and pressures; scientifically use natural light; install auto-induction solar panels above windows – at the time of sun shading, they absorb solar energy as one of energy supply sources for the whole building; collect human body temperature through the ventilation system to heat the water in a converter and use it as warm water supply in the washrooms of the building. In this regard, a majority (91.8%) of the participants would love to work in this kind of energy saving buildings; less than 5% (4.9%) of them think it will not be realized. One participant (1.6%) who chose “No” commented that it will not come true in a short time, and at least in twenty years. No one considers that work in an energy saving building does not matter to him or her. The number and percentage distribution on participants’ willingness to work in energy saving buildings is reported in Figure 6.
4.1.5 Employees’ attitudes toward the difficulties in realizing the proposed methods

When asked about the reasons if the proposed methods toward the four aspects cannot be or hard to be put into practices, the majority of the participants consider that institutional obstacles are the key reasons: lack of unified coordination and cooperation among related executive bureaus (78.7%), and relevant stakeholders need to make big investments or have great economic losses (63.9%). Over half (54.1%) of the participants believe that people are not aware that the cost for the destructions of ecological environment we need to pay is far more than that of for improving infrastructures. Nearly 40% (39.3%) participants think no one is willing to take the lead. Only 13.1% of the participants consider it not possible because it is technically infeasible. Less than one tenth (8.2%) of participants think it will bring many inconveniences to people’s daily lives. One participant believes that the assumptions are impractical except the one on energy saving buildings. Participants’ opinions on why proposed methods are hard to or cannot be implemented are presented in Table 7.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>It will bring many inconveniences to people’s daily lives</td>
<td>5</td>
<td>8.2</td>
</tr>
<tr>
<td>Technically infeasible</td>
<td>8</td>
<td>13.1</td>
</tr>
<tr>
<td>Relevant stakeholders need to make big investments or have great economic losses</td>
<td>39</td>
<td>63.9</td>
</tr>
<tr>
<td>Lack of unified coordination and cooperation among related executive bureaus</td>
<td>48</td>
<td>78.7</td>
</tr>
<tr>
<td>No one is willing to take the lead</td>
<td>24</td>
<td>39.3</td>
</tr>
<tr>
<td>People are not aware that the cost for the destructions of ecological environment we need to pay is far more than that of for improving infrastructures</td>
<td>33</td>
<td>54.1</td>
</tr>
<tr>
<td>Others (Impractical except the assumption on energy saving buildings)</td>
<td>1</td>
<td>1.6</td>
</tr>
</tbody>
</table>

4.2 CBD-wide questionnaire results

There are total 7 participants and all are female. All the data written in percentages are kept one digit behind the decimal point, and half adjust.

As for the overall impression of CBD, participants like that CBD has a good geological location with convenient transportation; comfortable, high level; and it is a place concentrated with “white-collars” (highly educated employees with high salaries), the percentages of which are all 42.9. The top three issues that they dislike are high consumption (71.4%), congestion (57.1%), and traffic flow restrictions in some metro stations (42.9%). The number and percentage distribution of participants’ likes and dislikes about the district are summarized in Table 8.
Table 8: Number and percentage distribution: participants’ likes and dislikes about CBD.

<table>
<thead>
<tr>
<th>Likes</th>
<th>Dislikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Number of participants</td>
</tr>
<tr>
<td>Sense of success</td>
<td>2</td>
</tr>
<tr>
<td>Concentrated with “white-collars”</td>
<td>3</td>
</tr>
<tr>
<td>Convenient transportation</td>
<td>3</td>
</tr>
<tr>
<td>Good working environment</td>
<td>1</td>
</tr>
<tr>
<td>Comfortable, high level</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

4.2.1 Transportation

As for the means of commuting, metro is the most frequently used one as 85.7% of the participants chose it. Taking bus (28.6%) and taxi & bus ordered via App provided by private companies (28.6%) are another two ways. Only one participant (14.3%) commutes only by driving a private car. Time guarantee, and fast and convenient are the two most important reasons of their related choices, both of which get 71.4% of the participants’ agreements. Another two reasons are cheap ticket prices, and green and environmentally friendly, the percentages of participants who chose them are both 42.9. Two participants (28.6%) chose “Safe”. The percentage distributions of participants’ means of commuting and related reasons are presented in Figure 7 & 8.

Fig.7. Percent distribution: employees’ means of commuting.  
Fig.8. Percent distribution: related reasons with employees’ choices.
4.2.1.1 Public transportation

More than two thirds (71.4%) of the participants accept their commuting durations to be within one hour. One participant (14.3%) can accept one to two hours.

As for the reasons of congestion, all participants agree that the population is large. Percentages of participants that choose unreasonable road planning and insufficient bus routes are all 42.9. Percentages of participants agree on the reason “Big range of commuting” and “Commuting across districts” are all 28.6. The percentage distributions of the participants’ opinions on reasons of congestion are showed in Table 9.

Table 9: Percentage distribution: participants’ opinions on reasons of congestion.

<table>
<thead>
<tr>
<th>Reasons of congestion</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large population</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>Big range of commuting</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>Commute across districts</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>Unreasonable road planning</td>
<td>3</td>
<td>42.9</td>
</tr>
<tr>
<td>Insufficient bus routes</td>
<td>3</td>
<td>42.9</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

In order to encourage people to take public transportation for commuting and drive less, four participants (57.1%) agree on adding more routes, and four (57.1%) agree on increasing departure frequency; three participants (42.9%) agree on reducing the number of bus stops. Three participants made their comments as follows: shuttle bus could be added (but she didn’t mention the types of shuttle bus - those that rent by employers, or the shuttle bus services provided by privately owned companies); reasonable routes planning; and guarantee no congestion and not crowded.

As far as the free shuttle buses that run within CBD and depart from different metro stations are concerned, five participants (71.4%) would like to take it, and the other two (28.6%) chose “It depends”.

4.2.1.2 Other means of transportation

Many people choose to get a lift from other commuters with the same direction by paying a certain amount of fees nowadays. Though this method is environmentally friendly, it is illegal because when people pay, then it turns out to be a business. But private car drivers do not have the type of driving license that permits them to drive for a business purpose even though it might be a small amount of payment. When asked about the importance of the responsibility of safe travel and the satisfaction of being able to get to destination, three participants (42.9%) chose the former and three (42.9%) chose the latter. Another one participant (14.3%) thinks that personal safety is the most important thing but this method frees people from finding a parking lot.

4.2.1.3 Parking at CBD

All participants care about whether they could find a parking lot in the CBD. Five (71.4%) of the participants care about the price of parking. About their choices on the parking fees they could accept, one participant (14.3%) chose less than RMB 2000 per month, one (14.3%) chose less than RMB 1500 per month, and another one (14.3%) chose RMB 16-20 per hour; two participants (28.6%) accept RMB 6-10 per hour; another two (28.6%) accept RMB 2-5 per hour. No one chose
RMB 11-15 per hour, and less than RMB 1800 per month.

Three participants (42.9%) would like to park in the building where her office is in. Three participants (42.9%) chose to park somewhere else with cheaper fees within CBD. One participant (14.3%) would park on the edge of CBD and transfer to public transport or walk to office. If given to park at somewhere else with cheaper fees within CBD, their ideal walking time to office is 6-10 minutes (3 participants, 42.9%), less than 5 minutes (2 participants, 28.6%), and 10-15 minutes (2 participants, 28.6%) separately.

4.2.2 Waste management
For recyclable office waste like paper, newspaper, magazine, cartridge, and ink box, six participants (85.7%) chose to sell them instead of throwing them away. One participant (14.3%) chose none of the two but didn’t make any comments. And if given a specialized area for collecting these wastes on the same floor as their offices, all of them would like to put the waste in the specialized place.

All participants would like to throw away waste correctly and finely if there are clean, esthetic facilities with clear assortment instructions. The top two reasons for not being able to correctly sort waste in the city, in participants’ opinions, are the processing ability of waste management plants is not strong enough, and lack of propaganda and education, which are agreed by six (85.7%) and five (71.4%) participants respectively. Two participants (28.6%) agree on the other two reasons “Lack of supervision” and “No incentive or reward measures” respectively. One participant commented that the sorted waste are actually mixed together in the end. Another participant marked that waste assortment is the duty of cleaners’, and only by firstly encourage them can it be effectively carried out. A descending arranged percentage distribution of participants’ choices on reasons of not correctly sort waste is reported in Table 10.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>The processing ability of waste management plants is not strong enough</td>
<td>6</td>
<td>85.7</td>
</tr>
<tr>
<td>Lack of propaganda and education</td>
<td>5</td>
<td>71.4</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>No incentive or reward measures</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>28.6</td>
</tr>
</tbody>
</table>

4.2.3 Green spaces
As for the sizes of green spaces in CBD, five participants (71.4%) think they are small, one participant (14.3%) believes them very small and another one (14.3%) considers them big. Four participants (57.1%) think the size of green spaces is important to her working life, and another three (42.9%) don’t think that matters much to their working lives. But when asked if it is important to relax in green spaces after lunch or when feel tired in a working day, six (85.7%) of them chose “Yes”, only one (14.3%) chose “Does not matter too much”.

As for the type of green spaces, more than two thirds (71.4%) of participants like “central park” with vast green space. Less than one third (28.6%) of them like various sizes of green spaces among different buildings and to make use of every single space. Same percent (28.6%) of participants like a combination of both types. More than half (57.1%) of the participants think that the diversity of
green spaces is also needed, and the same percentage of participants thinks labels introducing the variety of plants are needed. One participant also suggested that screens could be installed in the rest areas to spread environmental protection in a more vivid form. The percentage distribution of the types of green spaces participants like is reported in Table 11.

Table 11: The percentage distribution of the types of green spaces participants like.

<table>
<thead>
<tr>
<th>Types of green spaces</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central park and vast amount of green spaces</td>
<td>5</td>
<td>71.4</td>
</tr>
<tr>
<td>Various sizes among different buildings, make use of every single space</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>The combination of both above two types</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>Not only green spaces, the diversity is also needed</td>
<td>4</td>
<td>57.1</td>
</tr>
<tr>
<td>Labels are needed to introduce the variety of plants</td>
<td>4</td>
<td>57.1</td>
</tr>
<tr>
<td>Others (screens be installed in the rest areas to spread environmental protection)</td>
<td>1</td>
<td>14.3</td>
</tr>
</tbody>
</table>

If given the opportunities to plant or garden the green spaces at non-working hours claimed or rent by the companies as a kind of employee welfare, four participants (57.1%) believe that it will increase their sense of commitment to their employers because this activity has a breath of life, or it is comfortable and has a communication space with colleagues. Three participants (42.9%) don’t think so. One participant remarked that she doesn’t have time to participate. Another one remarked “Green spaces should be uniformly managed by properties or the state. If freedom is increased, then green spaces will turn into vegetable fields very soon. It is not suggested to do so in ten years time. Maybe the next generation (could try). Material basis is the precondition that guarantees the comprehensive moral culture (of a person)”.

4.2.4 Energy saving building and diversity of the function of CBD

All participants agree that they would love to relax there if their office buildings have green roofs. They like it because the environment is relaxed and is helpful in alleviating people’s pressures; the field of vision and air quality on green roof are good; if the weather is good and there is no smog, then people can “breathe oxygen” there. All participants believe that natural light is important to them and it can improve their working efficiencies. Six participants (85.7%) think it important to be able to work in energy saving buildings while one participant (14.3%) considers it does not matter too much.

As for the connections between basic service infrastructures like supermarket, vegetable greenhouse and shopping center in CBD and employees’ daily lives, four participants (57.1%) think the wider the relationships the better, while the other three (42.9%) consider that does not matter too much.

When asked about establishing public kindergarten in CBD so that employees could send off or pick up their children before or after work, participants’ opinions were different. More than half (57.1%) of them consider it is only a choice. Less than one third (28.6%) of them chose “It depends on my means of transportation”. One participant (14.3%) believes it is needed, while one participant (14.3%) thinks it is not needed. One participant (14.3%) marked that it is not appropriate to set up kindergarten in CBD area; on the contrary, it should be built near parks because children should stay away from the business area. The percentage distribution of the opinions on establishing kindergarten in CBD is reported in Table 12.
Table 12: Percentage distribution: employees’ opinions on establishing public kindergarten in CBD.

<table>
<thead>
<tr>
<th>Opinions</th>
<th>Number of participants</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is only a choice</td>
<td>4</td>
<td>57.1</td>
</tr>
<tr>
<td>It depends on my way of commuting</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>Needed</td>
<td>1</td>
<td>14.3</td>
</tr>
<tr>
<td>Not needed</td>
<td>1</td>
<td>14.3</td>
</tr>
<tr>
<td>Others (not appropriate, children should stay away from business areas)</td>
<td>1</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Four participants (57.1%) believe that CBD should have diversity but not the business function only. Another three participants (42.9%) consider that it would be great to have diversity, but that will not have much influence on them. No one agrees that it is fine for CBD to have business function only.

4.3 Comparison of results for the “same” questions in two questionnaires

As it is mentioned in the introduction of this part, four out of the six “same” questions were asked in different words, and two of them are identical. In this comparison section, the six questions are described uniformly. In the comparison, city-wide group is called “Group A”; CBD-wide group is called “Group B”. Symbol “---” in Tables means the related choices are not included in the questionnaire.

4.3.1 Employees’ means of commuting

Metro is still the most frequently used means of commuting in both groups, but the percentage in Group B is much higher than Group A. Similar range of percentages (20-30%) are distributed for means “App” in two groups. There is a bigger percentage of commuters take the bus and the private vehicle in Group A. Some commuters take bikes or taxis in Group A, while there are none in the other. The comparison is reported in Table 13.

Table 13: Comparison of means of commuting.

<table>
<thead>
<tr>
<th>Means of commuting</th>
<th>City-wide commuters (Group A)</th>
<th>CBD commuters (Group B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Walk</td>
<td>19</td>
<td>31.2</td>
</tr>
<tr>
<td>Bike, electric bike, (3-wheel) motorbike</td>
<td>8</td>
<td>13.1</td>
</tr>
<tr>
<td>Bus</td>
<td>26</td>
<td>42.6</td>
</tr>
<tr>
<td>Metro</td>
<td>32</td>
<td>52.5</td>
</tr>
<tr>
<td>Private vehicle</td>
<td>27</td>
<td>44.3</td>
</tr>
<tr>
<td>Official car</td>
<td>5</td>
<td>8.2</td>
</tr>
<tr>
<td>Taxi</td>
<td>10</td>
<td>16.4</td>
</tr>
<tr>
<td>App (privately owned companies)</td>
<td>15</td>
<td>24.6</td>
</tr>
<tr>
<td>Others (commuting bus)</td>
<td>2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

4.3.2 Reasons for their choices of means of commuting

Time guarantee, and fast and convenient are the two reasons that get the top 2 highest percentages of selections in both groups. Safe, cheap ticket prices, and green and environmentally friendly are three reasons that get (much) higher agreement in Group B than in Group A. There are a very small number of participants (2) think that the infrastructure is good in Group A, while there are none in
Group B. The comparison is reported in Table 14.

Table 14: Comparison of the reasons of commuters’ choices of means of commuting.

<table>
<thead>
<tr>
<th>Reasons of commuters’ choices</th>
<th>City-wide commuters (Group A)</th>
<th>CBD commuters (Group B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Safe</td>
<td>12</td>
<td>19.7</td>
</tr>
<tr>
<td>Time guarantee</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>Good infrastructure</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>Cheap ticket prices</td>
<td>18</td>
<td>29.5</td>
</tr>
<tr>
<td>Green, environmentally friendly</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>Fast and convenient</td>
<td>28</td>
<td>45.9</td>
</tr>
<tr>
<td>Private space</td>
<td>15</td>
<td>24.6</td>
</tr>
<tr>
<td>Others (close to home)</td>
<td>3</td>
<td>4.9</td>
</tr>
</tbody>
</table>

4.3.3 Reasons for congestion

Both groups believe that unreasonable road planning is an important reason for congestion, while the necessity of commuting across districts is not. Large population and bus route distributions are not wide and meticulous get less consents in Group A than in Group B. The comparison is reported in Table 15.

Table 15: Comparison of commuters’ opinions on reasons of congestion.

<table>
<thead>
<tr>
<th>Reasons of congestion</th>
<th>City-wide commuters (Group A)</th>
<th>CBD commuters (Group B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Large population</td>
<td>15</td>
<td>34.1</td>
</tr>
<tr>
<td>Large amount of vehicles</td>
<td>31</td>
<td>70.5</td>
</tr>
<tr>
<td>Pedestrians do not obey traffic regulations</td>
<td>15</td>
<td>34.1</td>
</tr>
<tr>
<td>Drivers do not obey traffic regulations</td>
<td>23</td>
<td>52.3</td>
</tr>
<tr>
<td>Unreasonable road planning</td>
<td>28</td>
<td>63.6</td>
</tr>
<tr>
<td>Bus route distributions are not wide and meticulous</td>
<td>9</td>
<td>20.5</td>
</tr>
<tr>
<td>Necessity of commuting across districts</td>
<td>8</td>
<td>18.2</td>
</tr>
<tr>
<td>Police on duty on the frequently congested roads at rush hours is insufficient</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Basic infrastructures and services of urban construction need to be improved</td>
<td>10</td>
<td>22.7</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

4.3.4 Employees’ willingness to dispose of waste correctly and finely

If there are clean, esthetic waste assortment facilities with clear instructions in the office, all participants in Group B chose they are willing to dispose of waste correctly, while in Group A there are a few participants who are not willing to do so. A summary of the comparison is in reported in Table 16.
Table 16: Summary in the comparison of employees’ willingness to dispose of waste correctly and finely.

<table>
<thead>
<tr>
<th>Choice</th>
<th>Number</th>
<th>%</th>
<th>Choice</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>56</td>
<td>91.8</td>
<td>Yes</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>6.6</td>
<td>No</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Facility won’t be efficiently used after some time</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.3.5 Reasons for not sorting waste correctly and finely

There is a higher percentage of agreements on the reasons of the processing ability is not strong enough, and lack of education and propaganda in both groups. As for reasons of lack of supervision and no incentive or punishment (reward) measures, the percentages are more than doubled in Group A than Group B. In the latter group, participants remarked that the sorted waste are actually mixed together at the end of the process; and that cleaners are the very persons who are responsible for cleaning and collecting recyclable materials like newspaper in the majority of companies in the CBD generally, and only by disseminating knowledge to them at the first stage of spreading environmental protection can it be effectively implemented. A summary of the comparison is reported in Table 17.

Table 17: Summary in the comparison of reasons for not sorting waste correctly and finely.

<table>
<thead>
<tr>
<th>Descriptions of reasons</th>
<th>Number</th>
<th>%</th>
<th>Descriptions of reasons</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>The processing ability of waste management plants in the city is not strong enough</td>
<td>35</td>
<td>58.3</td>
<td>Root cause – the processing ability of waste management plants is not strong enough</td>
<td>6</td>
<td>85.7</td>
</tr>
<tr>
<td>Lack of clean and esthetic waste assortment facilities</td>
<td>14</td>
<td>23.3</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Short of clear instructions to the citizens of how to sort</td>
<td>38</td>
<td>63.3</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Lack of education</td>
<td>37</td>
<td>61.7</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Lack of propaganda</td>
<td>35</td>
<td>58.3</td>
<td>Lack of propaganda and education</td>
<td>5</td>
<td>71.4</td>
</tr>
<tr>
<td>Lack of supervision</td>
<td>37</td>
<td>61.7</td>
<td>Lack of supervision</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>No incentive or punishment measures</td>
<td>35</td>
<td>58.3</td>
<td>No incentive or reward measures</td>
<td>2</td>
<td>28.6</td>
</tr>
<tr>
<td>No such kind of traditional habits</td>
<td>31</td>
<td>51.7</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>No such kind of social moral atmosphere</td>
<td>26</td>
<td>43.3</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>No such kind of awareness</td>
<td>41</td>
<td>68.3</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>Others (waste will be mixed together at last; should educate cleaners first)</td>
<td>2</td>
<td>28.6</td>
</tr>
</tbody>
</table>

4.3.6 Connection between sense of commitment to employers and green spaces

Though an employer claims or rents a piece of green space and employees could plant or garden there during free time, not all participants think it can increase their sense of commitment to employers. The percentage of participants in Group A who think it can is 28.2% higher than that of Group B. A summary of the comparison is presented in Table 18.
Table 18: Summary in the comparison about connection between sense of commitment to the employers and green spaces.

<table>
<thead>
<tr>
<th>Choice</th>
<th>Number</th>
<th>%</th>
<th>Choice</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
<td>85.3</td>
<td>Yes</td>
<td>4</td>
<td>57.1</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>13.1</td>
<td>No</td>
<td>3</td>
<td>42.9</td>
</tr>
</tbody>
</table>

4.4 Interviews

The results of interviews will be presented mainly in the form of comparisons of different opinions of respondents on the same questions. Information about interviews and respondents is reported in Table 19.

Table 19: Information about interviews and respondents.

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Interview date</th>
<th>Fields of working</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female administrator</td>
<td>2016-04-20</td>
<td>University education</td>
</tr>
<tr>
<td>Male director</td>
<td>2016-04-20</td>
<td>Sales</td>
</tr>
<tr>
<td></td>
<td>2016-04-21</td>
<td></td>
</tr>
<tr>
<td>Female manager</td>
<td>2016-04-20</td>
<td>Government Affairs</td>
</tr>
</tbody>
</table>

One participant worked in the CBD for three years and one for almost one year. The reasons for them to leave are all that their companies move to another place. As for the general impressions of the environment, one said that the buildings are modern. One said that he likes every aspect of the CBD, it is comfortable and high level; it gives people a sense of success; the location is good. He also compared the working environment he is now working in with that of the CBD and he felt that there is not a good work atmosphere now as there are so many people of various kinds including floating population. He used “jumble” to describe the place. The third respondent likes the internationalization of the CBD and that she could see foreigners and their residential areas frequently. She likes the diversified food stores in the area, and the conveniences CBD can provide to her daily life. Her overall attitude is “do not reject and do not worship”.

4.4.1 Transportation

4.4.1.1 Public transportation

All respondents agreed that metro is the means of transportation chosen by the majority of commuters because of time guarantee, fast and convenient. They usually spend one hour for single journey commuting. The issue is that it is too crowded at rush hours even though the interval is as short as one minute. Two of them use the word “No dignity” to describe how crowded it is because people huddle together tightly and it is especially embarrassing to females and in summer times. One respondent takes metro at about 7:30am and she could usually get on the train after seven or eight trains have passed.

The reasons for being so crowded are twofold. The first is that the population is large, which is mentioned by all the three respondents. One respondent said that not only the local population but also the floating population are large. Another one said that the city has a large population base, but the resources are limited; people’s commuting times are fixed and not too many employers can really carry out flexible working time. One phenomenon she observed is that in the train, not as many people offer seats to elder people, pregnant women or children nowadays as what people did.
before. “People feel tired in the commuting journey. Maybe after a whole day’s work they feel more tired. Even young people would not like to offer his/her seat”, she said. The second reason emphasized by her is the big range of commuting. “People commute across districts more today with the process of severe urban sprawl. Their places of work are not in the same district with where they live”.

All the three respondents did not show much interest in the shuttle bus that run within the CBD and depart from different metro stations around the CBD. One of them observed that the buses are always full, but he would rather walk as a kind of body exercise than taking them. Another one took them sometimes, but not frequently.

4.4.1.2 Other forms of (public) transportation
There are several other new forms of commuting nowadays that are operated by privately owned companies. The commute bus is one of them. The companies schedule various routes especially popular commute lines. Or, if there are demands for certain routes from commuters and the number of people is enough to make a bus full, then the routes will be operated. This is the so-called customization line, which could be ordered via App of the service provider by passengers. The advantages of it described by two respondents are seat guarantee, direct line from home to office, commuters can have naps on the way to work or home, and not expensive. The other form is to use the App to order “taxies”. The taxi drivers can be those who are employed by private companies, or could be any private vehicle owners who are willing to accept orders through the App. The second form “actually impacted the traditional taxi industry and is defined illegal by the government. Many drivers from traditional taxi companies quit their jobs, bought their own cars and joined this new form of operation. One company called ‘di-di’ operates well and opened markets abroad in two countries; the other one called ‘di-da’ is not very cost-effective”, said one respondent.

As for getting a lift from other commuters with the same direction by paying a certain amount of fees, there are different views from two respondents. One said he had observed that this form is shrinking gradually because it is hard to define the responsibilities of the driver when there is a car accident. People who can afford to buy a car do not care about making a small amount of money in this way. Though this way of commuting is environmentally friendly, the safety responsibility is much more important, which is cared about by more and more private car owners recently. He gave an example of his own experience. Once, he was waiting for green light at a cross with another passenger who took the lift, his car was rear-ended by another car that was driven behind his. Fortunately, no one was hurt. He said when this way of commuting emerged, he himself got lifts from other drivers. Sometimes, the car was even with the brand of Benz, BMW, or Landrover. But gradually, people are increasingly reluctant to let others get lifts. It is illegal, too. On the other hand, the other respondent believed that the demand in the safety of travel is weaker than the demand of the satisfaction of a successful travel, especially under the circumstances that there is a large number of people but insufficient resources.

When asked about if they would like to bike or walk to work, and other than the distance between their homes and offices that restrict them to do so, what other restrictions do they have? Two respondents said “air pollution”. The male respondent said the distance is the main reason, and that he is fine with either walk or bike if the distance is within five to six kilometers, which does not make him tired. He specifically pointed out that taking electric bike is a more relaxed way.
4.4.1.3 Driving and parking

All respondents agreed that there are so many cars on roads. One respondent described his experiences of spending a single three-hour journey to visit his client and friend by driving a private car. “The time cost is so high”, he said.

Only one respondent commutes by driving. But if given three choices of parking locations, all of them chose to park somewhere in the CBD with cheaper parking fees (the other two choices are: park in their office buildings; park at the edge of the CBD and then transfer to public transport or walk to office). Two respondents accepted five-minute walking time to their offices, another one accepted ten-minute walking time. When asked about which one is important to them - parking fees or parking space, three respondents gave three answers. One thought parking fees is most important, one believed a parking space is important, and one considered these two factors are connected and both are important.

Three respondents gave various opinions on zoning by the sizes of cars. One said it would not improve parking spaces much, as the cars won’t be too small. The second one said it would help, but the effects would not be good. He suggested using multistory parking lots. “Fully use spaces can actually lower the cost and hence parking fees will drop. When parking lots are operated with full capacity, profits are made. That will be much better than simply charge high parking fees, which actually stops people from parking in it”. The third respondent said two factors could be researched in this regard. One is the vehicle models and the related numbers of drivers. “People will not park there if the prices of their cars are less than RMB 100,000 as parking fees are not attractive to them”. The other is the type of tenants in the building. “If parking spaces are paid by employers then no one will care about how expensive the parking fees are”. She also said that the multistory parking lots will help, but not many people would like to park there because it is troublesome and has a high demand in the driving skills of drivers. “The parking spaces are small and the cars are easy to be scratched. It is not popular yet. That is why it has not been widely accepted. But still people will park there if they really cannot find a parking space”.

4.4.1.4 Solutions

All respondents said the routes of public transport are not enough. Add more routes and more buses and metro trains were suggested to distribute traffic flows. One of them also mentioned to shorten metro train intervals to half a minute at rush hours. Another one suggested that good practices of Shanghai could be learned, which are to make good use of spaces above ground and under ground (not only refer to metro). Viaducts, railway like the airport express uses, and tunnels can be built. “Bonds and loans can be issued for the construction. I am not an expert. So, the possibilities of various attempts are unknown. Maybe we should take the surrounding environments into consideration first. But I believe that people are willing to sacrifice their degree of comfort temporarily for the development of public transportation. Only by vigorously developing public transportation can we reduce travel in private vehicles”, he said.

Two respondents spoke of safety issues. One said that “platforms of two metro lines (line 1 and line 2 - the first two metro lines in Beijing) do not have screen doors on the platforms yet, and news of suicides by jumping off the rails were reported even nowadays”. The other one said “I travelled from Bordeaux to Paris and found that the conditions of trains are not as good as that of in Beijing.
It is neither comfortable nor safe. There was few service staff along the journey. In Beijing, on the other hand, though we have a security check at the entrances of the metro, which might ‘lose our privacy’ and is inconvenient, we have a high population density and it is worthwhile in order to keep safe by sacrificing a little bit privacy”.

“A congestion fee is going to be charged soon. I hope that the purpose of the government by doing so is not to increase tax revenue, but they could really use the fees to increase travel modes for the convenience of the citizens. The government should support and disseminate the means of transportation operated by privately owned companies, define them legal and let them develop. For the car sharing (get the lift in private vehicles), the government should initiate an insurance scheme and let the drivers and passengers be worry free”.

4.4.2 Waste management
All respondents agreed the city is not doing well in sorting waste. The reasons for that are more administrative rather than technical. None of them collect recyclable waste.

When asked whether they would like to throw waste correctly if given clean, esthetic waste assortment facilities with clear instructions in the offices, and if they would mind to put their recyclable office waste like newspaper, magazine, ink box or cartridge in a certain place on the same floor as their offices, their responses were different. One was reluctant even though the facility itself is good. According to her, the reason is that she is lazy. The second one believed that it is not family life and that to dispose of waste correctly is the cleaner’s job. The thing she can do is to hold the waste till she sees a dustbin and not to litter. “Even though there is a good facility, it will not be efficiently used after a short-period sense of curiosity. If there is no supervision, no material incentive measures (not need to be expensive), people would rather to pay less effort. It is not an issue of education. Nobody will read the hand out instructions. The root cause is that the sorting ability is not strong. We do not have the concentrated processing ability especially toward the waste of special pollution sources. If people are asked to sort, it will actually produce many problems. The relevant bureaus’ management ability, ways of management, the cultures, and the abilities of the scientific and technological industries are also important. Those ‘software’ issues that we don’t have now make us unable to catch up with the developed countries in ten to twenty years”. The third one said he would like to change his behavior if he can really see the waste correctly and finely sorted. He believed that only driving powers like supervision, consensus and condemnation would work for the formation of the waste assortment system. All three respondents think waste is dirty and they should keep away from them, rather than looking upon waste management as an industry.

As for the method to transmit food waste from canteens of office buildings by pipes underground to incineration plants, two respondents had quite the opposite opinions. One respondent said that the waste edible oil has a huge profit chain, the chain is hard to be cut down and that the method is not feasible. The other respondent did not think it workable, but agreed it would work if pipes connected with waste collection vehicles at the other end near the building. As for the profit chain, he believed that it will be cut off and no individual is able to stop the trend.

4.4.3 Green spaces
All respondents expressed their like of green spaces whatever the sizes are. They talked bout the
benefits green spaces can bring – relaxation during the breaks of working time and improvement in air quality. They also pointed out the fact that there are few green spaces in their working environments. One female respondent emphasized that green spaces should have diversity and have plants growing all year round, and it would be better to attach the introductions to the varieties. She also suggested a green plant association could be formed to organize family activities at the green spaces at weekends. She added that CBD has convenient transportation. After activity is over, families can then go to their next destinations. The male respondent likes green spaces very much. He said that he plants since he was very small and is keen to that. “To be able to spend some time at green spaces when depressed works much better than to drink a cup of coffee”, he added. On the other hand, he also doubted and said not many people would like to give up profits for green spaces, especially at CBD where the cost of land is so high.

4.4.4 Energy saving buildings
All of them like the green roof idea and think that is a place for people to have breaks, see green spaces and change mood. One respondent said he was surprised to see green roofs when he first saw them once he was travelling, and wondered that roofs can be built in that way. But he also said it is impossible to be implemented in CBD because few people will give up profits for greenery since that will have a lot of investments. Also, there are a lot of wireless devices on the roof of the buildings. He said usually customers that have large energy demands adopt it to avoid wasting. He explained by presenting two communities in Beijing that use special materials for exterior walls and insulations for interior walls so the buildings are free from using air-conditioners. One of the communities is the Olympic Village.

When asked if (part of) the energy supplies of the office building use of natural resources will make a difference to their feelings, for an example, use ventilation system to collect human body temperature to heat a converter with water in it, and transmit the water as warm water supplies in washrooms of the office building, three respondents gave different answers. One said it is different and is good. The second one said it would not make a difference to her. The third one said it is related to national policy. “People will have driving forces to design if government bureaus regulate the emission budgets of buildings. Top down implementation will be effective”.

Toward the auto-induction solar panels installed above windows, there are two different views. One respondent said they do not look comfortable. The other respondent said esthetic problems are easy to be solved. But the driving power for implementations is the issue. “Who is willing to do it? The thing that cannot be changed is the idea from higher levels to grass roots”. He said he would like to share with his friends if he could work in a building that is energy saving.

4.4.5 Vegetable greenhouse
Respondents were asked if they buy food after work every day. If so, how long it usually takes before they could start cooking at home. This is for introducing an idea of “vegetable greenhouse” to them to see their interests, and to find if this idea can help increase diversity of CBD especially in aspects of green spaces and natural resource usage, and help employees save their time after work. It is described as moderate sizes of vegetable green houses are opened in CBD within walking distance to their offices. The green houses have moveable roofs and have glass walls. Vegetables are planted in movable facilities like tram rails. Heights and angles of the rails can be adjusted. Spraying is used as the irrigation method, which saves water efficiently. Both rails moving and
spraying are controlled by computer systems so that all vegetables can receive sunlight and water evenly. People who work in CBD can buy fresh vegetable or half processed dishes in these green houses during their lunch break time or after work. A lot of time in buying food after work and cooking will be saved. Vegetables can also be provided to canteens in office buildings. It is fun and healthy, and it is an attempt of urban green common as well.

Two respondents said that employees’ demands need to be surveyed and analyzed. Factors like ages of employees; their transportation methods; their interests; the price, quality and category of vegetables; the number of people who are willing to buy need to be considered. Young employees will not have this demand if they do not cook. Also, if people have to take metro for commuting, then they would rather buy food near their home rather than carrying it home after work. Male respondent always consider more. He said that this assumption needs an integrated cooperation. The price of land in CBD is very high. Which property would like to try? Will government bureaus approve that? Are they harmonious with the surrounding environments? These are all factors need to be considered. To him, this is not quite meaningful and he may try once or twice but will not buy there frequently. No one connects this idea with green spaces and the diversity of the district.

4.4.6 Set up public kindergarten and primary school in CBD
Respondents were asked about their opinions on introducing public kindergartens and primary schools in CBD. There is an international kindergarten Eton in CBD now. The tuition fee is quite high and their customers are foreigners who have high salaries. Introduction of public schools can provide affordable education to children of those moderately paid employees. It is also convenient for parents to take care of their children by sending them to kindergartens or schools before work, and pick them up after work. Middle schools are not spoken of at here because it is assumed teenagers can take care of themselves in transport to schools at their ages.

Two respondents welcomed the idea and one of them said the precondition is if the education qualities are good or not. The scales of schools are planned uniformly with the surrounding area. Another respondent, who is a mother, gave a more detailed answer. She said the approval of lands for education and business purposes are different. Even if the schools are successfully set up, employees’ willingness to attempt is also needed (At here she gave an example of a famous e-commerce retailer in China. After that company moved to an economic development district in the city, they set up a kindergarten for the children of the employees). When choosing schools, parents usually consider the distance between home and school. If the parents can drive their child to school, then it is fine; if parents need to take metro, then they would not take the child laboriously. In addition, another important point is that the primary school selection is usually connected to the middle school selection. That means parents consider middle school education for their children even before they enter primary schools. A good middle school may guarantee their children entry into a good university. The education quality of the district where CBD locates is apparently not as good as some other districts. Moreover, as the city is still using Hukou (a household registration system) to limit parents’ choices of primary education for their children, pupils usually go to primary schools in the same district and close to where they live. Lastly, schools need to make profits. So, it is good to have pubic kindergartens or primary schools in CBD, which means there are more choices. But the effectiveness needs to be balanced comprehensively.
4.4.7 Indoor and outdoor working environment they like to have
Respondents were asked to describe the indoor and outdoor working environment they like. One said that she likes to work in a building that is not high with common offices and rest rooms; and there are green spaces in front of the building. One said that the commuting time is within one hour for single journey; has flexible working time; and the closer the relation between basic service infrastructures like supermarket and shopping center is better for her. The last one said that the most important thing is the recognition of the (culture of) enterprise; the location and environment of it is the second thing to consider.

4.4.8 Diversity of the function of CBD
All respondents believe diversity is great, but they all doubt it will really happen. “Who can really care about next generations?” “The diversity of the environment is good, but it has no relations with me.” “Goodwill is fine, but they are not practical” are their final comments.

4.5 Site survey
The site survey of metro in Stockholm is divided into five sections: infrastructure, price, services, interval and other aspect.

4.5.1 Infrastructure
T-Centralen is a big transfer station in Stockholm where all the three lines (red, blue and green) pass. Different lines use the same rails is efficient, but it takes more waiting time. It is a 3-story transfer station and makes good use of the underground space. There are four rails in parallel at some other transfer stations, which could reduce people’s transfer time. There are no security checks at the entrances. People don’t need to use cards to exit.

4.5.2 Price
There are several ticket types in Stockholm. Fees are paid by single trip ticket (SEK 36), 24-, or 72-hour trip ticket (SEK 115, SEK 230 respectively), 8 trips ticket (SEK 220), or monthly card (SEK 790, student price SEK 570).

4.5.3 Service
In Stockholm, there are a few service staffs at T-Centralen station. At other stations, there is one person selling tickets but no service staff on the platform. One cleaner was observed cleaning compartments at the final stop Kungsträdgården. There are separate lifts for people who use wheelchairs. In some stations, there are two up and two down rolling elevators but not that many passengers were observed. Some stations are decorated beautiful along the blue line. There are many chairs on the platforms. Dogs are allowed to be on the train. In the compartments, maps are on the roofs of trains and people need to face upward to read it; there are signs of emergency ways and not too many advertisements. Broadcast reminds next stops only once without specifically reminding the transfer stations, and only in Swedish.

4.5.4 Interval
There are longer intervals after evening rush hour. It was observed that interval was six minutes at 6:45pm and nine minutes at 7:19pm. It was not that crowded even at peak time, but not every one
has seat in the compartment.

### 4.5.5 Others

Overall speaking, metro in Stockholm is clean, but litter was also observed on the platforms at some stations. A variety of people come from different countries. There are people who help proactively. Some people hand out advertisements or sell books on the train but not many. Also, there are emotional passengers on the train (the passenger was urged by the driver to get on the train quickly, and she kept on complaining about this in a loud voice even after several stops), and beggars at the metro entrances. As I have been living in Beijing and have some understandings about metro conditions in the city, differences and common ground of metro in Stockholm and Beijing are reported in Table 20.

<table>
<thead>
<tr>
<th>Category</th>
<th>Stockholm</th>
<th>Beijing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure</strong></td>
<td>1. Different lines use the same rails at T-Centralen station (efficient use; may also cause more waiting time); 2. T-Centralen station is a 3-story transfer station; 3. Some transfer stations have 4 rails in parallel, which reduce transfer time; 4. No security check, saves time (might because of privacy); 5. No need to use card at the exits.</td>
<td>1. Separate lines, some need shorter transfer time, some need longer transfer time; 2. 2-story transfer station; 3. Security check takes time; 4. Need to use card to exit.</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>Pay by single trip (SEK 36), 24- or 72-hour trip (SEK 115, SEK 230 respectively), 8 trips (SEK 220); monthly card (SEK 790, student price SEK 570).</td>
<td>Pay by the distance travelled. At least RMB3.</td>
</tr>
</tbody>
</table>
| **Service**   | 1. There is service staff at T-Centralen station. At other stations, there is one person selling tickets; no service staff on the platform; 2. Separate lift for people who use wheelchair; 3. Two up and two down rolling elevators in some stations, but haven’t seen that many people; 4. Some stations are decorated beautifully; 5. More chairs; 6. Can take dog; 7. Maps on the train roof; signs of emergency ways; 8. Not too many advertisements; 9. Broadcast reminds next stops only once without specially reminding transfer stations, and only in Swedish. | 1. There are service staff and volunteers on the platform at peak time; 2. Ticket machines at every entrance/exit in every station; 3. Clear waiting arrows signs on the ground; 4. Has toilets at each station; 5. Every station has equipment for people who use wheelchairs; and has lifts; 6. Have screen doors (full-closed; semi-closed) on the platforms for the safety of passengers and some other benefits like energy saving except line 1 & 2 that were constructed at the earliest time; 7. Clear maps above the doors, use red and green shining lights on the map to remind the past stops and next stop; broadcast twice reminding the next stop in Chinese and English; also reminds when the next stop is a transfer station; 8. TVs beside the doors (news and recreation
9. Clear signs for emergency, and tools for breaking windows when emergent;
10. Visually impaired passengers are allowed to take guide dogs into the metro; pet dogs are forbidden;
11. At some stations, there are bank ATM; beverage machines; plastic bottle recycle machines; magazine and telephone card booth.

| Interval | 1. Longer interval after evening rush hour (6:45pm—6 minutes; 7:19pm – 9minutes);
2. Not that crowded even at peak time, but not everyone has seat in the compartment. |
|----------|------------------------------------------------------------------------------------------------------------------------------------------|
|          | 1. Peak time interval 1 or 2 minutes;
2. Longer intervals before 6 am and after 10:30pm but within 10 minutes;
3. Crowded at peak time. At some stations outside city center, long queues wait to enter into station. |

| Common ground | 1. Clean;
2. A variety of people from different countries/cities within China;
3. There are people who help proactively;
4. There are people who hand out advertisements and sell books on the train, but not many;
5. There are emotional passengers on the train, and beggars at the entrances of metro. |

5 Discussion
This section will use the survey results to discuss practical solutions toward the four aspects which can be concluded as using smart infrastructures and lowering people’s ecological footprints, their relationship with resilient and green city, and hence answer the research question introduced in the first section: how can we make a city sustainable. In whatever the aspect, this paper emphasizes the interdependent relationship between man and nature – humans use natural resources to meet people’s needs in a scientific way. And with favorable conditions, say an office building community that is going to be developed, it is hoped that these assumptions be designed and realized in a closed loop.

5.1 Transportation
In the city-wide questionnaire, 59 out of 60 participants are willing to sacrifice their degree of comfort temporarily brought by the construction of infrastructures of public transports in order to benefit from reducing using private vehicles. It shows people’s concern about the benefits public transport brings and the problems that the many private vehicles produce. Citizens need smooth and pleasant transport environments and their needs should be satisfied. How can they be satisfied? As revealed from the results of questionnaires, interviews and site survey, large population, large amount of vehicles and unreasonable road planning are the three main reasons of congestion. All of them can be concluded as inadequate accessibility. Large population is the thing we cannot change. But what we can change is to distribute traffic flows by improving infrastructure designs and services, to reduce using private vehicles and to improve road planning. Reasonable road planning helps enhance accessibility and development of public transportation, and only by providing comfortable and human oriented public transportation can drivers be attracted to convert from...
driving private vehicles to taking public transport.

The Beijing municipal government made a great investment in the transportation industry. The investment in fixed assets in roads, pivot and matched facilities in 2014 was RMB 21.8 billion, which was 24.7% of the total investments in transportation industry of the year (Beijing Transportation Research Center, 2015). Though great investments were made, the overall effectiveness was yet to improve. In city-wide questionnaire, 7 participants commute by driving private vehicles only. All of them often encounter traffic jams when commuting, but they still drive to work. The reasons behind this need to be speculated upon and analyzed. The ultimate aim of investment should be the outcome of conveniences and comforts to all people, and hence the sustainable development of public transport.

In 2014, the number of retained motor vehicles was 5.59 million in Beijing, among which 4.5 million were private vehicles. The amount of people driven in cars was 8.99 million every day. Among the composition of all means of transportation (excluding walk) of Beijing residents, the ratio of travel by car was 31.5% in a day, and the figure at rush hours was 14.3% in the morning and 13.3% in the evening. Commuting occupied 50.7% in people’s travel structure (Beijing Transportation Research Center, 2015). Combined with the huge amount of people who travel by cars, the travel ratio of cars and the percentage that commuting holds to the whole travel structure, great opportunities are seen to attract private vehicle commuters to take public transport. By doing so, traffic conditions and air quality are hoped to have great improvements in the city.

To make access easier, this author believes that diversified modes of transport that enable people to make convenient, comfortable and pleasant travels is the answer. In realizing it, comprehensive uses of technologies, designs and esthetics are going to be used. The following part will discuss ideas of improving public transportation accessibility including bus, metro, biking, parking and land use planning.

5.1.1 Bus
5.1.1.1 Increase the number of bus routes and departing frequencies
Participants in both questionnaires believe that bus route distributions are not wide and meticulous. More than half of the participants in CBD questionnaire think increases in bus routes and departing frequencies are needed.

People’s wishes have some contradictions with real data. In 2014, there were total 23667 buses in Beijing run in 877 bus routes with a daily average carrying capacity of 12.84 million people (Beijing Transportation Research Center, 2015). Literally, each bus carried 542 passengers during one day. If so, the bus would not be that crowded because the number of passengers were distributed into at least 12 hours in a day. So, the issue should be something else like accessibility or services instead of (only about) increasing bus routes and departing frequencies.

5.1.1.2 Bus Rapid Transit (BRT)
Beijing opened its first BRT line in 2005, and now there are total 4 BRT lines. In a survey after the first BRT line was put into use made by the Institute of Transportation Engineering at Tsinghua University in 2007, participants’ main traffic modes had transferred from bus to BRT, which indicated that BRT had great attraction on various of users including taxi, car, bus and pedestrians
as well. Participants’ average satisfactory degree on safety, price, punctuality, speed, information and IC card system was high, but the score on crowding was rather low due to the buses were too crowded during rush hours (Shi, Wu & Jin, 2011).

It is widely known that Bus Rapid Transit (BRT) in Curitiba, Brazil plays a big role in making the city livable. “It offers many of the features of a subway system – vehicle movements unimpeded by traffic signals and congestion, fare collection prior to boarding, quick passenger loading and unloading – but it is above ground and visible” (Goodman, Laube & Schwenk, 2006, p.1). BRT in Beijing is not as widely used as that of in Curitiba, and there are several differences between the two. Unlike in Curitiba, BRT in Beijing are not completely dedicated lanes, in some parts of the whole lines buses need to use lanes with other vehicles. Fares are collected after boarding. As ticket fees are charged by the distance travelled, passengers need to use their public transport card twice both of getting on and getting off the bus. There are no convenient designs for quick loading and unloading and there are no facilities that help passengers who use wheelchairs. These real conditions in Beijing limit accessibilities of passengers and cause the buses to be crowded.

This author believes that several efforts could be made to improve accessibility. Firstly, use dedicated lanes during the whole transits. Secondly, two more doors could be designed on the bus in order to increase the speed of loading. Thirdly, we can learn from Curitiba that “instead of steps, buses have extra wide doors and ramps that extend out to the station platform when the doors open” (Goodman, Laube & Schwenk, 2006, p.2). This design could greatly provide conveniences for passengers and especially elder people, children and people who use wheelchairs or trolleys. It can accelerate the speeds of loading and unloading at the same time. Fourthly, fare charged prior to boarding is also a good way to speed up loading. Lastly, bus stops need to be easier for passengers to get to. In Beijing, many bus stops especially those on the artery roads are separated by fences with footpaths. Passengers need to walk across an overpass to get to the bus stop. The same stair is used for all passengers who get into and get out of the bus stop. It prolongs passengers’ accessibilities and brings dangers to passengers who walk in the opposite directions on the same stair. The dangers increase if the stair is steep. If the stair is not steep, then passengers need to walk longer distances. So, the crowds and inadequate accessibilities extend from inside buses to outside. If bus stops can be located right beside the footpaths and bicycle lanes, then passengers need less time to reach bus stops, and the unloading passengers are more quickly to be distributed into different directions. The picture of a bus stop of Beijing BRT line 1 and its connected overpass is shown in Figure 9.

![Fig. 9. A bus stop of Beijing BRT line 1 and its connected overpass. Source: https://www.google.se/ (2016-05-10).](https://www.google.se/)
5.1.1.3 Bus lanes should restrict other vehicles the whole day

The majority of bus lanes in Beijing are not BRT and they restrict other vehicles during the four rush hours (7-9am & 6-8pm) in a day. This paper proposes that bus lanes restrict other vehicles the whole day and give full priority to buses. About a quarter of the city-wide questionnaire participants do not agree with this proposal explaining this is a waste of road resources or only if public transport are guaranteed a smooth travel can private vehicles be reduced. To look into the modes of travel of the participants who do not agree, all of them use private vehicles (or at lease private vehicle is one of their means of transportation), official car, and commuting bus to travel except two participants, one of whom walk to work, the other one use public transport but his answer is that emergency vehicles should be excluded. So, the majority of commuters do not agree because it will have impacts on their travels.

The proposal is to guarantee smooth travels for buses. Otherwise, accessibility of buses will not be improved and private vehicles drivers cannot be attracted to take public transport, and the negative cycle will be continued. Also, to judge if it is a waste of road resources to give buses dedicated lanes should not depend on the numbers of vehicles that run on them, but the value of the lanes. Dedicated lanes improve accessibility to buses, hence attract people convert their modes of transport. “Energy consumption per person per kilometer of public transport, including bus, subways, etc., is less than 30% of that of private cars” (Shi, Wu & Jin, 2011, p. 3). The large amount use of vehicles run by internal combustion engines burning fossil fuels is one of the major sources of severe air pollution in Beijing (Lu, 2016). Private vehicle drivers’ conversions of taking public transport directly decrease fossil fuel consumptions and consequently improve air quality. The advantages that dedicated bus lanes bring are thus worthy of the road resources. “Dedicated” itself is value.

5.1.1.4 Customized bus

Beijing Bus Group has customized bus lines including business bus, rapid direct line, tourist route, and holiday line (Beijing Bus Group, 2016). As we mainly discuss transportation for commuting, this paper refers the first two as customized lines. Business bus was opened online on September 1, 2013. Up until now, there are total 126 lines with a daily volume of 5000 passengers. Passengers place orders and pay online and use mobiles to receive text messages for confirmation of orders. On February 10, 2015, the function of ordering remaining seats for the next day was opened; and on August 13 the same year, the function of ordering remaining seats for the very day began to be effective. Passengers could self-check tickets and show them to the drivers when boarding from August 5, 2015. Rapid direct line was opened on July 31, 2015 and now there are total 107 lines. Passengers pay by cash or IC card (Beijing Bus Group, 2016).

The advantages of the customized bus lines are seat guarantee, no need to transfer, and passengers can take them around communities where they live without needing to go to bus or metro stations. But, there are also disadvantages. Firstly, the departure time is usually very early and not many alternatives are provided because there is only one shift for each direct line, and three shifts the most for business bus. In addition, the duration does not have advantage, some of which are as long as 100 minutes (Beijing Bus Group, 2016), and delay in arrival is not uncommon (this information is acquired from delay announcements on Beijing Bus Group website bulletin board). Moreover, rapid direct line bus can use dedicated bus lanes and has the priority of first pass, which is considered not equal to ordinary buses by this paper. Lastly, ticket fees are fair if they are paid
monthly and with discounts. But the fees are usually one third higher than taking public transport even though with discount if paid by each time (this is concluded after calculation and comparison according to the ticket prices published on Beijing Bus Group website). Take the duration into consideration, this author believes that it is not quite reasonable to take customized lines and the answer goes back to mass public transport again.

As for customized lines buses or taxies run by privately owned companies, for passenger safeties and rights sakes, this author believes that state owned company can cooperate with them in bus routes run within large community areas and communities to metro stations. But managements on routes and drivers should under the state owned company. This is to regulate transport market and concentrate development on public transport. In fact, state owned public transport company has a long history. Privately owned companies can hardly take much share from the market. Sometimes, a privately owned shuttle bus carries very few passengers, which is actually not environmentally friendly. It was also reported that privately owned companies cancelled shuttle bus when there were not many passengers without notifying other passengers in time and delayed their travels; taxi drivers robbed passengers or other illegal events happened (Huaxia News, 2015; Renmin News, 2016). This paper proposes information sharing among different bureaus so that when privately owned companies check backgrounds of drivers, they could evaluate applicant drivers by knowing their driving histories and criminal records, and make final decisions seriously.

In conclusion, this paper mainly proposes using dedicated lanes for all bus routes, reasonable bus stop locations, designs in ramps and two more loading doors on buses and fare charged prior to boarding. All efforts made are to enhance accessibility and shorten travel time. Step by step, we strive to shorten commuting duration within 30 minutes as most participants hope.

5.1.2 Metro
In 2014, there were total 4664 metro trains run on 18 lines with a daily average carrying capacity of 9.28 million passengers (Beijing Transportation Research Center, 2015). Survey result shows that among the 49 participants who chose “time guarantee, fast and convenient” as the reasons of their choices of means of commuting, 28 of them take metro.

Metro system in Beijing in recent years serves very well (Sachs, 2015). It is clean and safe. Infrastructures and services are good. As compared to metro in Stockholm in last section, Beijing’s is not inferior to Stockholm’s and in some aspects even better. Broadcastings are in Chinese and English so people come from abroad can also understand. Clear maps using red and green shining lights remind the past stops and the next stop. Service staff and volunteers provide help on the platforms. Full-closed or semi-closed screen doors made of glass are installed on the edge of the platform that separate platform from the railway for the safety of passengers and for energy saving as well (This facility protects passengers from wind turbulence and air-borne debris when the train comes into or leaves station. It prevents passengers from falling into the railway or equipment areas with or without intention. It also saves energy -- prevents the loss of heat or cooling by air convection. When trains come into the station and stop, the screen doors and the trains’ doors open at the same time; when trains leave the station, they close at the same time --- drivers are not distracted too much to observe what is happening on the platform because before the doors open or close, there are warning tones that can be heard both inside compartments and on the platforms). These are all advantages of the metro in Beijing. But research data especially interviews show that
there are still opportunities that need to be improved and the most obvious one is that it is too crowded at rush hours. Restriction in traffic flows at rush hours is the method taken currently in order not to have accidents. Usually, passengers need to wait outside in a long queue to enter stations group by group. When they are allowed to go in, most people walk very fast even on the elevators to get to platforms, where there are also queues to stand to get on the trains. The interval at rush hours is 1 minute. Basically, when the last train leaves the station, the next train comes into the same station shortly after. But one respondent hoped that the interval could be shortened to half a minute, which might endanger trains, however.

This author believes that it comes to the accessibility issue again. There are ways that the city governors and metro management staff could explore but traffic flows restriction is not one of them. By doing so, the issue is just transferred to another segment but the problem is still there. Restriction should be changed to distribution in order to enhance accessibility.

Firstly, Underground Pedestrian Systems (UPS) provide alternative walkways that are safe, accessible, efficient and pleasant for pedestrians (Cui & Lin, 2015). It is an “optimized integration with subway networks” (Cui & Lin, 2015, p. 6). Therefore, UPS could be built especially around those large or transfer metro stations. By doing so, more metro entrances and exits that connect to UPS could be added and traffic flows could thus be distributed. Along the pedestrians, civil service machines like those for selling electricity, natural gas and water of domestic use and for bottle recycling can be installed. Newspaper and magazine booths can be introduced. Even fast food stores can be opened there, so that those small booths selling breakfast can no longer stand right beside the metro entrances, which actually impede passengers’ accessibilities and not quite good for street hygiene. The UPS can be designed in artistic ways so people’s spirits can be pleased.

Secondly, railways can be built in as deep as three or four stories. When passengers need to transfer, they could just walk down or up directly from different story platforms and no need to walk around for longer distances as what some of the transfer stations currently are in Beijing. Transfer time is thus saved and carrying capacity improves as well. As it is found in site survey, T-Centralen in Stockholm is a three-story transfer station where all three metro lines pass. Plus the one story from ground to the first metro story, there are total four stories. So, to build such a structure of metro railways in Beijing will also be possible technically.

Thirdly, new designs in train compartments. Bilayer compartments or wider compartments of trains could be designed and put into use at rush hours. In bilayer compartments trains, commuters who travel longer distances could go upstairs and come down before arrival. Safety and stability of the trains should be also guaranteed. So, at the fixed commuting time for most commuters, the carrying capacity of trains could be raised, double at most if bilayer compartments trains can be used. In the meanwhile, this method requires higher and wider railway spaces, which is best to be considered at the planning stage.

Fourthly, two other services need to be improved. One is that more chairs on the platforms are needed. This author considers that metro in Stockholm has a lot of chairs due to their longer waiting time other than for the sake of serving passengers. In Beijing, there are far less chairs or even none on the platforms. It might because passengers hurriedly come and go, but that is the reasons of passengers themselves. From passenger service point of view, chairs should be provided. The other
is facility for passengers who use wheelchairs need to be separated. In Beijing, there are facilities installed on handrails of stairs for wheelchairs to move up and down. There is no service staff near the stairs. Therefore, if the passenger who use wheelchair travels alone, it might be very hard for him/her to deal with it independently. There are elevators can be used, but both elevators and stairs are shared with common passengers. It is found in the site survey that separate lifts are prepared for wheelchair users. It is like a van fixed on the rolling elevator in separate spaces. It respects and dignifies disabilities at the time of providing conveniences to them. Beijing is also suggested to learn from Stockholm.

Lastly, passengers can be loaded and unloaded at two different sides of the train body at the same time in order to save time. This method is an ideal assumption. There are other practical conditions. One is that more spaces/platforms are needed and this is not possible for the existing metro lines. And it seems that they are only apparently useful in enhancing accessibility at rush hours. So, cost and benefit analysis or life cycle analysis and environmental assessments need to be made beforehand. The other is that it requires passengers to be fully familiar and aware of their destinations so that they could prepare for getting off right beside the doors before the train stops. Otherwise, they are most likely to be blocked by passengers who get on the train at rush hours.

In conclusion, this paper proposes to fully use underground spaces to distribute traffic flows and increase carrying capacities for the metro system.

5.1.3 Biking and walking

In 2014, an average of 3.59 million people travel by bike every day (Beijing Transportation Research Center, 2015). The city should make sure “there are safe open areas for bicycling, and sidewalks and footpaths for walking” (Sachs, 2015, p. 373). In Beijing, one phenomenon is that automobiles occupy bicycle lanes a lot, which endangers bikers’ lives. This paper proposes government bureaus’ strict supervisions on this illegal behavior.

Biking and walking are sustainable ways of transport. When encouraging people to bike or walk, good environments should be created for them first. Other than safe bicycling areas, sufficient and convenient bike parking areas and facilities without charges should also be provided. Parking areas are not only limited to places close to metro or bus stations, but also communities, commercial areas, office buildings, or places where public services locations are concentrated. Parking areas next to bus and metro stations should be convenient for people to transfer to their next travel modes.

There are bike-sharing systems outside of metro stations in Beijing. People can use their public transport IC card to rent a bike and return it at any service locations. The renting service need deposit, ID card and at least RMB 30 in the IC card. It is free of charge for the first hour, after that it charges by hour. If the bike is lost or damaged, renters need to compensate for it and the prices are according to the degrees of depreciations of bikes. The development degree of bike-sharing in Beijing is not as advanced as that of Vélib in France. Reasons are various (Phoenix News, 2014). Service locations are insufficient – people feel it hard to find facilities to return bikes; maintenances of bikes are not in time – people find the bikes are easy broken and the IC card system frequently works wrong; parking spaces are not enough – people need to wait someone else to rent a bike before they could have a place to return his/hers. All of the issues need to be solved concretely to really provide conveniences to people. Bike-sharing should not be a slogan, but a real way of life.
Beautiful and comfortable green spaces along footpaths and bike lanes attract people to walk and bike. As we can see from interview results, respondent would like to bike or walk if travel distance is within five or six kilometers. One main reason that restricts people to do so is air pollution. But the pollution is connected with modes of transport. And the issue comes back to good public transportation again. City governors are required to think ahead, embrace these interconnected complex issues, and revive the shrinking green travel modes.

5.1.4 Parking
Though public transportation is highly advocated, parking is an inevitable topic because driving is one of the ways of transport no matter it is welcomed by public opinions or not, and the needs of this group of people should also be satisfied.

In the best practice of Curitiba, “very limited public parking is available in the downtown area” (Goodman, Laube & Schwenk, 2006, p.2). But the city’s population numbered approximately 2.3 million as of 2011 and 85% of the population use BRT daily (United Nations, 2011). Beijing’s city population is 8 times that of Curitiba and there are a lot more cars (Beijing Transportation Research Center, 2015). Limit public parking is not an ideal method and may cause other social problems.

In 2014, there were 6448 public parking lots in Beijing with 1.76 million parking spaces, and the number of vehicles was 5.59 million (Beijing Transportation Research Center, 2015). A big gap in parking demand is seen. Even though people convert to use public transport, the vehicles need places to be parked. Parking lots are not constructed for charging high fees and stop people from parking. Full capacity use of the parking areas makes profits. Therefore reasonable parking fees need to be set scientifically. But “reasonable” means different to different people. This author considers it means flexible rather than neither expensive nor cheap.

This paper has two proposals on parking. One is that zoning parking spaces by sizes of vehicles to increase parking capacity. In this way, more spaces are created especially for small sized vehicles within the same areas as before. When more vehicles are parked fares can be decreased, and the total revenue would not be affected. The other proposal is that parking spaces at communities and office/commercial buildings can open to each other during the day. In the day, when there are more available parking spaces in communities, cars outside of communities whose drivers work nearby can be parked there; in the evening, when there are more available parking spaces in office/commercial buildings, cars outside of these buildings whose drivers live nearby can be parked in. As it showed in CBD questionnaire, almost half participants can accept a 6-10-minute walking distance, and nearly 30% of them accept 10-15 minutes. Therefore, this method is workable. Flexible charging systems are thus needed. Usually, fees are higher in the day and lower in the evening. As for what prices are reasonable, a comprehensive survey of the prices of cars and their owners’ backgrounds need to be made, and one tenth of their average monthly income would be fine. By this strategy, the expenses for drivers to pay are not cheap, but the amount will not affect their lives that severely. If people really need cars for daily transport they still can afford.

In conclusion, the purpose is not to simply restrict people, but make them feel comfortable in the way of dealing with issues and in paying parking fees.
5.1.5 Land use planning
Either research or practical experiences remind us integrated road planning and land use planning are highly important. In the research of Guo, et al., (2015), uncoordinated transportation and urban development is one of the problems associated with implementation of congestion mitigation measures. Physical pattern-based urban sprawl in Beijing brought increases in long distance travel due to low density of housings; functional urban sprawl created problems related to provision of public transportation and thus an increase in private vehicles due to low degree of mixed land use and decreased local job-housing (Zhao, 2010). Some super-large communities are called “sleep town” to describe what the situations are – people go in town to work and travel back to home for sleep. All other time are consumed on ways between office and home. So, governors should take serious considerations on relations between sustainable transportation and urban sprawl. Laws should play the roles in constraining construction of communities that are not well supported in public transportation. This is to use legal measures to ensure the transport-oriented development in the intersection of transit and land use planning.

5.1.6 Summary in Transportation Discussion
“The concept of sustainable transportation includes at least four aspects: a high level of accessibility (shorter travel distance or duration), environmentally efficient transport modes (use of renewable energy and low emissions), public transportation and social equity” (Zhao, 2010, p. 2). For a long period of time, Beijing’s public transportation development emphasized the satisfaction of travel demands of low-income and working classes featuring in low price point. “The significance and urgency of satisfying high-end transit users are ignored, which makes public transportation service unattractive to private vehicle users” (Guo, et al., 2015, pp.8-9). Now, public transportation fees are paid in distances travelled, and people’s costs in transportation increase a lot. This author hopes that the increased revenues can be used in improving basic infrastructures and services for the travel needs of all people. By actively enhance accessibility and equity of public transportations in various methods, and by using clean energy, the sustainable transportation in Beijing is achievable.

5.2 Waste management
Waste management is absolutely an essential aspect of urban infrastructure (Sachs, 2015). Some wastes are recyclable while some are not. Whatever we look upon waste – dirty and keep away from it, or it is an industry, it is human beings who produce waste and we should treat waste properly.

The survey results show that all participants do not think the city is doing well in waste management. The biggest reason for not doing well given by the two groups are “No awareness” (Group A) and “The processing ability of the waste management plants is not strong enough” (Group B) respectively. Due to the multiple choices to the same question in two questionnaires are different, we are not able to testify if “No awareness” would also be chosen as the important reason in another group. But this paper agrees with Group B and one of the interview respondent’s opinions that the root cause is processing ability issue. If this final segment plays a strong role, then the requirement to down stream behaviors is thus a natural thing. One of the participants in Group B remarked that “the sorted waste mixed together at last”, which reminds us that “to enable an increase in the quality of waste that can be utilized, there is a need for adequate treatment capacity” (Traffic and Waste Management Administration, City of Stockholm, adopted 2013, p.9) in the city.
The Municipal Solid Waste (MSW) generated in the city in 2010 was 6.35 million tons (Ecology, Environment & Conservation, 2013) and food waste comprised almost two thirds to total (Li, et al., 2009). “The main waste disposal technology used in Beijing is landfill, which accounts for 92.27% of the total designed capacity in 2008 and 78.54% in 2009” (Wang & Wang, 2013, p.1). Landfill has manifested significant adverse environmental impacts caused by methane emissions from landfills and many other emissions from transfer stations (Zhao, et al., 2011). On the other hand, it was also reported that Beijing is constructing several waste incineration plants and gradually decrease the waste landfilled. One of the incineration plant started operating in the beginning of 2016 with a daily treatment capacity of 1800 tons, which could generate electricity 0.29 billion kWh (Xinhua News, 2015). That means Beijing is taking measures to reduce using landfills and manage waste in ways that less detrimental to environment.

Sweden is a leader in waste management. Swedes produce 4.4 million tons of waste a year. Less than 1% goes to landfill. The rest of them are half and half recycled and energy recovery. About 40% of households get heating from incineration of garbage, sorted household waste and industrial waste. According to the staff of an incineration plant, 3 tons of waste contains of as much as 1 ton of fuel oil (The Swedish Recycling Revolution, 2016). As what we can see and learn from a global leader in waste management, Beijing has a great potential in well managing the waste from all aspects needed: processing ability, accessibility and service, education and supervision.

5.2.1 General principles for waste management
For waste management in Beijing, this author believes that several principles could be followed. And the precondition is that government performs well first in creating systems that influence and appeal to people so that they can behave correctly instead of asking for people to care first. Everyone loves esthetics. “Only when waste management systems work well for those involved is it possible to achieve the desired positive environmental effects” (Traffic and Waste Management Administration, City of Stockholm, adopted 2013, p.19).

Firstly, as we manage waste from a human perspective, we should respect nature first. Prevention from the source is the best way to manage waste. All we use for our daily lives are taken from the nature. But things we produce are not always what we need such as excessive packaging, and they are given back to nature in the form of waste. So, we should always consider environment first and do not produce things we apparently will not use like the excessive packaging. As individuals, rational consumption is advocated so that unnecessary waste can be avoided.

Secondly, waste management system should be characterized by accessibility and service. Cleanliness of the waste assortment facilities increases people’s willingness to behave correctly and most likely would not leave them messy. In addition, clear information including words and symbols or pictures on separate dustbins are needed to communicate with people instead of just prepare two dustbins saying recyclable and unrecyclable and people usually do not quite clear what wastes are recyclable and what are not. Moreover, esthetic design of the facilities also plays an important role. It can be a reminder and a way of communication with people as it is argued that “behavioral changes are influenced by many factors other than planned information on the part of the municipality” (Bernstad, 2013, p. 95). Beijing could learn from Sweden that the indoor waste facilities could be esthetic and easy to recognize. Different dustbins are put in one facility. Outdoor
waste facilities are usually in a small wooden house where larger dustbins are placed in order that it makes people easy to do correct and difficult to do wrong. Finally, safe and secure system should be established to people both throw away waste and manage waste.

Lastly, educative information is the key in accomplishing behavioral changes. “Everyone who lives and works in the city is responsible for waste management functioning at their respective link in the chain” (Traffic and Waste Management Administration, City of Stockholm, adopted 2013, p.19). So, dispose of waste correctly and finely is not just the cleaners’ jobs as what part of the participants and respondents consider. Waste management involves every one.

5.2.2 Waste management in office buildings
Waste generated in office buildings are usually office supply waste including paper, newspaper, magazine, pens, ink box and cartridge, all of which are recyclable. Usually, the waste is thrown away omnivorously. Sometimes, when newspapers and magazines are collected to a certain amount, employees sell them to waste pickers. Waste pickers “play an important role in the recycling system and are considered to make the greatest contribution to waste recycling” (Li, et al., 2009, p. 3). They are individuals who make livings on curbside waste collection. This paper proposes that property owners organize waste pickers around the office building area uniformly. Several places on the same floor of the building can be separated specifically to collect office supply waste. The number of places depends on the area of the floor, but the locations should be convenient for employees from whatever part of the floor to reach. Waste pickers can collect at regular time once or twice a day. In this way, employees can “omnivorously” put the waste at the fixed places anytime of the day, which avoid throwing away and they do not need to save the waste to a certain amount to be accepted by waste pickers for selling; waste pickers can actively and regularly collect the waste but not wait to be given the business; the recyclable waste can be accelerated cycling and everyone is actively involved in the system.

Food waste is another main source of waste generated in office buildings including lunch boxes or food bring by employees themselves, and those generated in canteens, restaurants, coffee shops and cake shops. These waste are mixed together and packed and collected by municipal waste collectors. “Separation of food waste from other waste fractions can improve qualities in residual waste for incineration purposes. The energy content in food waste can be used as biogas for vehicles. Food waste contains nutrients, which can be recycled” (Bernstad, 2013, p. 27). Food waste sorting at the source is thus of great importance. This paper proposes that a separate pipeline be installed in the building for transmitting food waste. The pipeline, like an elevator, has a platform at each floor. On each platform, paper bags are prepared for packing sorted food waste. The bags are distinguished by different colors and there is information on the bags indicating what sorts of food waste they hold. When the waste in each bag is full, they are automatically packed in vacuum and transmitted to the other end of the pipe, where waste collection vehicles wait. In this closed micro system, paper bags absorb the moisture and are helpful for the final incineration; vacuum packing can effectively prevent the leakage of waste and odor; separate pipeline connected with vehicles prevent the pollution caused by the exposure of the waste.

In whichever facilities for the recyclable office supply waste or food waste, the ideal state is to take waste management as part of infrastructure. So, before new office buildings are constructed, spaces for these kinds of facilities can be designed. The accessibility and convenience of operation of the
facilities are also important.

Waste management system needs a combination of planning, technology, and information transmission. It is important for employees “not to get the feeling that what they do will not matter to other people since they may not care, and so those efforts made by some would be in vain” (Bernstad, 2013, p. 94). Everyone is an important part of the chain. People’s awareness can be cultivated. Improvement in processing ability, treatment capacity and information transmission are needed so that people know in what direction they head for. At the same time, people’s efforts are also needed so that the basic and important assortment stage can contribute to different waste management stages -- recycle or energy recovery.

5.3 Green spaces

Urban green space is green infrastructure that offers great value. “Maintaining different types of green areas contribute to the creation of heterogeneity on a landscape level, which is generally held to increase biodiversity” (Andersson, Barthel & Ahrne, 2007, p.10). Green spaces generate “a diverse set of ecosystem services of substantial significance for human well-being” (Barthel, et al., 2005, p. 1). It is more than just a luxury and the percentage of green space in people’s living environment has a positive association with the perceived general health of people (Mass, et al., 2006). However, “the high concentration of people, the diverse preferences that individuals, groups, business, and the state have for the city and the various demands for ecosystem services will cause continuous tension” (Andersson, et al., 2014, p. 5). The city-wide questionnaire results show that almost half (47.6%) of the participants’ working environments have small or very small green spaces and more than half (54.1%) of them think the size of green spaces greatly influences their moods and working efficiencies. Also, an interview respondent doubted relevant stakeholders’ willingness to open up green spaces for the sake of profits.

To deal with these challenges, it requires that people “connect to their interdependence with nature” (Barthel, Folke & Colding 2010, p. 9) and deepen understanding of “whether and how local stewardship and engagement in practical management of green infrastructures increase biodiversity and availability of ecosystem services in metropolitan landscapes, and if and how it actually stimulates a wider awareness and articulation of our global reliance on ecosystem services and results in an urban footprint both smaller and less detrimental to the resilience of the biosphere” (Andersson, et al., 2014, p. 7).

5.3.1 Open up small-scale patches green spaces

Nowadays, large-scale green structure is the commonly concern for urban planning (Andersson, et al., 2014). This paper proposes that besides the large sized green spaces, small-scale patches could be opened up within the built up areas available as much as possible. Within the spaces, a variety of floras are planted to enhance biodiversity, and hence strengthen resilience of the city. This is a practical solution especially for the built up areas without planning green spaces ahead.

Research shows that “urban green commons (UGC) could to a greater degree be designed in areas where people live and work”. They “represent places promoting cultural integration and exchange at many levels” (Colding & Barthel, 2013, p. 6, 8) and “constitute a source of resilience for ecosystem services in the broader landscape” ((Barthel, Folke & Colding 2010, p. 1). So, in places
like where there is a concentration of office buildings, these spaces can play a diversified role in providing beautiful sceneries and social communication places that benefit people’s health physically and mentally. Either look outside to the green spaces from office buildings or to approach them will help people alleviate working pressures and improving working efficiencies. And in a deeper meaning, green spaces have a strong relation with urban resilience, which is highly needed for the sustainability of a city. “Ensure all New Yorkers live within a 10-minute walk of a park” was written in New York City’s PlaNYC sustainable development goals (Sachs, 2015, p. 387). In Beijing, when the city is not able to realize goals like that of New York City’s at a stroke, small steps that help achieve similar effectiveness can be taken. And open up small-scale patches green spaces that are convenient for people to reach is the effort we can make for those small steps.

5.3.2 Use legal force to promote green spaces planning
For the concern that properties or related stakeholders would reluctant to give up profits simply for opening up green spaces, actually there are social phenomenon that green spaces promote the prices of real estates – the closer to green spaces, the higher the prices of the real estates. So, the key of this issue is not about economic gains simply, it is about wise governance, management, and appropriate designs for managing cultural and biological diversity that are mismatched in tiny geological locations (Colding & Barthel, 2013). This paper proposes that legal items can be formulated to regulate the areas of green spaces matched to the real estates. This solution could play an important role in shaping economic driven development toward more sustainable outcomes.

In the transformation of cities toward socially and ecologically integrated environment, human agency and skills are also needed besides legal systems (Barthel, Parker & Ernstson, 2015). A research on the urban green commons shows that employees of the companies who actively involved in the management of natural area surrounding factories and business buildings are more committed to their employers. Besides, positive effects on community relations and an improved relationship with regulators were recorded. Therefore, the habitats at business sites may be seen to provide benefits for people, biodiversity and profit because of this co-management (Colding, et al., 2013). In survey result of this paper, the number of participants who consider that there is a positive relationship between their senses of commitment to employers and green spaces outweigh those who think that there is no such relation. Though the assumption that employers claim or rent green spaces for employees to plant at non-working hours as a welfare is yet to attempt, and the results are yet to testify, it is a hope of this author that by proactively building up this human-ecology relationship in small scales, a larger-scale social-ecological benign environment will be formed.

“Designing future urban resilience is the need to re-ignite urban minds about the close connection between urban people and their life-support systems” (Barthel & Isendahl, 2013, p. 9). Diversified green spaces play a pivotal role in urban resilience, and people from all social factors should well manage to exert roles of urban green spaces in building a resilient city.

5.4 Energy saving buildings
“Energy is the lifeline of national economy, and energy efficiency is the cornerstone of sustainable development of energy policy” (Zhou, Sun & Zhang, 2011, p. 1). Energy saving buildings directly relate to the reduction in energy use and greenhouse gas emissions. This kind of buildings “uses a careful integrated design strategy that minimizes energy use, maximizes daylight, has high degree
of indoor air quality and thermal comfort, conserves water, reuses materials and uses materials with recycled content, minimizes site disruptions, and generally provides a high degree of occupant comfort” (Kozlowski, 2003, p. 27). In this mega city with such a large population, if buildings in Beijing can be designed, built, or retrofit to the largest extent in scientifically using natural resources as energy supply, then a lot of energy generated from fossil fuels can be saved and people’s living and working conditions can be much more “green”.

Energy saving building is smart infrastructure that largely uses natural resources as energy supplies. One of the respondents pointed that only if the idea can be implemented from higher level to grass roots, can it generate effective results. Regulations indicating specific emission budgets are thus proposed to issue in construction industry. But this author believes that sustainable urban development cannot only rely on government, it must also stress involvements from below.

Several aspects can be attempted in constructing or retrofitting energy saving buildings. This paper will discuss from office building perspective. Compared today, the proposed actions might mean cost increase to properties or stakeholders. But the increase can be related to the costs that arise in absence of planning or controlling of energy use. Men are actors to manage natural resources, not to possess them. Cost in energy consumptions can be saved superficially from long run perspective, but what we finally saved are the natural resources that people rely on.

5.4.1 Green roof
“Green roofs are a passive cooling technique that stop incoming solar radiation from reaching the building structure below”. It “offers a building and its surrounding environment many benefits including storm water management, improved water run-off quality, improved urban air quality, extension of roof life, a reduction of the urban heat island, enhanced architectural interest and biodiversity” (Castleton, et al., 2010, p. 1). The roof of a building can be fully or partly converted to green roof (Castleton, et al., 2010), which is highly proposed in existing buildings.

All participants and respondents like green roof. It is great that they know green roof is not simply a place to relax but also plays a big role in purifying air. So, employees could be a driving force in advocating and promoting properties or stakeholders to consider and implement retrofitting green roofs. When it comes into reality, employees can be an active group in helping cultivating the plants on the roofs. One may argue that employees are not free labor forces in the cultivation of plants. But this author believes “relationship” is much more important than economic rewards. The benefits employees can get physically and mentally from the close relations with nature cannot be balanced in materials.

Not every building has the potential to be retrofitted into green roof such as a high rise. This is because the percentage of the roof area to the total areas of the body of building is small. So, the passive cooling effect may just be effective to three or four floors close to the roof. And the result is that the idea be given up. This author considers that besides environmental advantages it brings, green roof can also be a cultural exchange platform that provides employees or visitors a place for communication. A coffee shop or bookstore can be opened close to the roof. Parties or movie screen can be held in warmer times. All efforts or attempts are to make people feel comfort in a working environment that is usually considered full of pressures. Again, this paper emphasizes “relationships” between man and nature. “Cognitive understanding of the environment can establish
behavioral patterns” (Giusti, Barthel & Marcus, 2014, p. 19). In people’s working environment, intentional design of the emphasis on man-nature relation helps remind the interdependence of human and biotic well-being (Giusti, Barthel & Marcus, 2014). When relations are right, people tend to be open, tolerant and mature. Sustainable individuals can contribute to the sustainable development of the city. Everything is connected, and we should trust and have hopes in the positive changes a small step effort can bring.

### 5.4.2 Natural light and solar panels

There are many studies on using natural light in a building by using different technical skills like light shelves, prismatic glazing, mirrors and hologram, anidolic ceilings and louvres and blinds. Some of these methods need to be considered and designed before the construction of the building like light shelves, which is not quite applicable to the existing office buildings. Besides, it usually needs a mixed use of these methods to get the most out of the natural light (Gago, et al, 2015). In reality, companies locate by three sides of a building and have windows can enjoy natural light. The majority of the areas within a building do not have sunshine. In the companies that have natural light, rooms by windows are often allocated to managers or levels above by using partitions. So, the availability of natural light that can be shared by more employees is rather low. Comparing to install devices that introduce natural light in a building that has a low availability, this paper proposes to install auto-induction solar panels above windows. When the sunlight is strong enough, solar panels automatically extend themselves. In this way, at the same time of sun shading for people who work beside windows, they absorb solar energy as (part of) energy supplies for the whole building so that everyone in the building can enjoy the benefits they bring.

### 5.4.3 Human body temperature as a source of energy supply

When I was working in an office building in Beijing CBD, I happened to find a large room in the third floor below ground. It might be the dormitory of security guards or service staff of the building. The temperature of the room without having air conditioning was so high. I realized that a living environment that is not decent is exactly in the same building that has a fancy appearance. My first thought was that ventilation systems should be installed for these workers. But inspired by the energy supply system that collects passengers’ body temperature in Stockholm Central Station as energy supply for the building opposite the station (Sweden, 2016), I thought that office buildings in Beijing that have a concentration of people may also use this principle for their energy supplies. The ventilation system of the office building collects human body temperature to heat the water in a converter, and the water is pumped up as warm water supply in washrooms of the building. In this way, heat from human body can be well used instead of being emitted to air; a certain amount of heating cost can thus be saved; and importantly living conditions of workers in this case can be improved though they are a small group of people who often be neglected.

Whether warm water supply of a building can totally reply on human body temperature is not known, but at least it can be part of the energy supply during the five working days. If this solution works well, it can be extended to other places where there are large amounts of people like metro stations especially transfer stations. The average daily traffic flow in Stockholm Central Station is 0.25 million. A big metro transfer station in Beijing can also have similar traffic flow or even more. So, there is a great potential in developing this energy supply system for sake of energy saving and greenhouse gas emission reduction.
5.5 Sustainable governance

Interviews respondents’ final doubts and apathetic attitudes toward building sustainable city represent a lot of people’s opinions. It impels us to think what does sustainable development really mean? Sustainable development is for whom and by whom? Questionnaire result shows that institutional issues and people’s awareness in environmental issues are the main reasons that hinder the proposed solutions to be realized. The result reminds us that it is human being’s roles that underpin the realization of the construction of smart infrastructures and lowering ecological footprints, and hence the sustainability of a city. Good governance in exerting people’s roles is thus needed. The governance not only refers to that of government and related bureaus, but also social actors like corporations, property owners, stakeholders, and individuals.

By good governance, it needs responsibility and transparency. Government and related bureaus are accountable for formulating laws, regulations and policies, and for supervision of the executions of them. At the same time, they should publish progress reports of various projects to all citizens in order to guarantee it is a mutual supervision scheme. Corporations, property owners and stakeholders should take up their social responsibilities and insist on doing the right things. Ask employees’ participation in decision-making process so that voices from grass roots can be heard and reasonable decisions can be made. To be able to get the utmost supports from citizens or employees, government and stakeholders need to be transparent for what they are doing and what they plan to do. People’s trusts and improvements in relation with them are established on transparency.

Another important point is self-governing. It means each individual should be responsible for what he/she does and the influences their behaviors may produce. This sense of self-governing may not simply be obeying to regulations issued by government or employers. It should be a higher ethical responsibility toward the nature.

5.6 An assumption of a closed-loop office building community

Workplace is somewhere an employee spends at least one third of a day. Whether it is green, smart and comfortable means a lot to the person’s working life. This paper proposes an assumption that an office building or several neighboring office buildings form a closed loop. In it/them, a self-sustained system is formed. In this micro system, people reuse or recycle materials to the largest extent. They exchange things for reuse. Those that cannot be reused are sent to next stage for recycling. Food waste generated is incinerated on site. Heat generated from incineration is used as energy supply of buildings; methane generated can be used as biogas for vehicles; the nutrient content in food waste can be used as fertilizer in green spaces. Install solar panels on roofs that cannot be retrofitted to green roofs and above windows in order to use solar energy as heating or lighting supplies of buildings. Use natural ventilation instead of air conditioner. Use natural light to a larger extent. Use green walls inside and outside of buildings. Use auto-induction or timer lamps. Keep biodiversity in green spaces to enhance urban resilience. People who work in this area have low ecological footprints without losing a higher quality of working life. They are physically and mentally healthy and are positively involved in contributing sustainable development of their working communities. To realize this, both top down and bottom up management are needed. And
the precondition of the assumption is people’s vision and unanimous agreement on a sustainable future.

5.7 A sustainable city is a resilient and green city

In the age of Anthropocene and in the era of planetary boundaries, we are going to be experiencing more jolts of human-induced climate change. Cities need to be planned for those changes (Sachs, 2015). Smart infrastructures like transportation, waste management, green spaces and energy saving buildings help enhance resilience of a city. So, it is able to prepare for environmental shocks. Green not only refers to green spaces in the city but also its economic impact on the environment, the ecological footprint of the city, is also limited (Sachs, 2015). How does the city’s energy system contribute to its greenhouse gas emissions is a key indicator in evaluating it sustainability. When we largely rely on renewable energy, ecological footprints will reduce and greenhouse gas emissions will dramatically decrease. So, when the construction of a city is resilient and green, the development of the city can be called sustainable.

Beijing is facing its choices. Whether it can wisely make investment and planning in public transportation, or let the massive automobile use be continued; whether it can manage the waste in a smarter way, or prolong the landfill treatment; whether to develop the diversity of green infrastructures, or to focus on the short-term benefits that land prices could bring; whether to work with nature when designing buildings, or to work against nature driven by economic purposes, all of which are alternatives in determining the sustainability of the city. The right way in making Beijing sustainable should rely on the interdependent relationship between man and nature. They way of meeting people’s all sorts of needs should based on reasonable use of natural resources, which is to respect nature instead of harming it. Only by using sustainable solutions for cities can we live in harmony with nature.

6 Conclusion

“Empower inclusive, productive, and resilient cities” is one of the sustainable development goals recommended by the United Nations Sustainable Development Solutions Network (UN SDSN). “The goal is to make all cities socially inclusive, economically productive, environmentally sustainable, and secure and resilient to climate change and other risks” (Sachs, 2015, p. 488). The fast speed of urbanization and rapid population growth require responsible government effectively manage natural and social resources to ensure an effective urban transformation and a sustainable urban development.

This paper takes Beijing as a case study, uses building smart infrastructures and lowering ecological footprints as the main thread, and discusses four aspects -- transportation, waste management, green spaces and energy saving buildings from employees’ perspectives of how to a build a sustainable city. This paper uses a mixed research method of questionnaires (both city-wide and CBD-wide), interviews and site survey. Survey of questionnaires and interviews is to find out what employees think of the city’s performance in the four aspects, their attitudes to the proposed changes and their opinions on government and stakeholders’ reactions to the proposed changes. Site survey is to observe how metro system in Stockholm is well operated, what the differences and common ground
are of the metro systems between Beijing and Stockholm, and what Beijing can learn from Stockholm.

Survey results show that Beijing has a lot of opportunities to improve in all these four aspects. Frequent and severe congestion brought by the dramatic increase in private vehicles cause many inconveniences to people’s lives, the unreasonable road planning, insufficient public transport routes, and the large population, all of which lead to longer commuting durations of employees. The safety and responsibility issues of commuting via privately owned companies’ vehicles make people stop attempting further. Bike lanes occupied by motor vehicles, the frequent smog weather, and the underdeveloped bike-sharing system, all of which make green transport shrink. The waste assortment processing ability in the city is not strong, no clear instructions of how to collect waste, and several other reasons like lack of awareness, inspection, education and penalty measures, all of which make the city weak in waste management. Working in office buildings that are not energy saving and with very few green spaces around are employees’ working environments. Though the city has many problems in basic infrastructures, it is great to know that people are willing to accept the inconveniences caused by the construction in the process of changing the city into a better place to live.

Toward the opportunities that need to be solved or improved, this paper proposes several solutions either based on my own understandings or borrow good practices from other cities, hoping that they are practical, meaningful and valuable in exploring ways of building a sustainable Beijing.

In transportation section, this paper highly advocates diversified public transportation. Improving accessibility and comfortable transport experiences is the key to develop public transport and attract private vehicle drivers to convert their travel mode. The detailed solutions this paper proposes are: develop Bus Rapid Transit system by using dedicated lanes during the whole transits, adding two more loading doors for buses, using ramps instead of steps to bridge bus and platform, fare charged prior to boarding, and easy approaching bus stop locations; restrict other vehicles from bus lanes the whole day; construct underground pedestrian systems as a way to add metro entrances and exits; metro railways be built in as deep as three or four stories; use bilayer or wider compartments of trains at rush hours; improve service facilities for (disabled) passengers; passenger loading and unloading at two different sides of the train body; encourage people to bike or walk by first providing them safe road and convenient parking facilities, and pleasant environments like green spaces along the routes; zoning parking spaces by sizes of vehicles to increase parking capacity; flexible parking and charging system; integrated road planning and land use planning.

In waste management section, this paper proposes that improving and enhancing waste assortment processing ability is the foundation for waste management. And creating a system that influence people to behave correctly is the tool. This author believes that the soul of waste management is respect nature. So the first and foremost thing it requires us is to be aware and responsible for rational productions and consumptions. The next step management should be characterized by accessibility and service of the system. Educative information is the key in accomplishing behavioral changes as waste management involves everyone. For waste management in office buildings, this paper proposes collaborating property owners and waste pickers. Properties plan spaces for putting recyclable office waste, and waste pickers collect them regularly during the day. The recyclable waste can thus be positively and timely cycled. As for food waste, a separate
transmission pipeline system with vacuum bags for packing food waste in the pipe is suggested to connect to food waste collection vehicles at the other end of the pipe outside of the office building, the method of which is to prevent second pollution caused by the exposure to air of the waste.

In green spaces section, considering the importance of diversified green spaces and the real conditions at many working places that “strong real estate interests and political forces that dominate urban space today” (Barthel, Parker & Ernstson, 2015, p. 8) this paper proposes to open up small-scale patches green spaces as much as possible within the built up areas. It also recommends formulating legal items to regulate the areas of green spaces matched to the real estates in order to promote its planning. The green infrastructures not only help employees to release working pressure, but more importantly they enhance resilience of the city.

In the energy saving building section, this paper has three proposals. First, build or retrofit green roof – besides the environmental benefits it brings, green roof is also a place for cultural exchange and communication. Second, install auto-induction solar panels above windows – at the same time of sun shading for people who work beside windows, they absorb solar energy and can be used as the energy supply of the whole building so that all people who work in it can benefit from that. Third, use human body temperature as an energy source for warm water supplies in washrooms of the building.

These four aspects are some parts of the city infrastructures that are crucial to the resilience of a city. In the age of human induced climate change, greenhouse gas emissions can be a crucial point in assessing a city’s sustainability (Sachs, 2015). The efficiencies of energy system, transportation system, waste management system and green infrastructure of a city are all related to its greenhouse gas emissions. Only if we reduce our ecological footprints can we make the city green. And only if we make the city resilient and green can we ensure the city develop in a sustainable way.

Above all issues and proposals toward building a sustainable city, this author insists on believing and emphasizing the “relationship” – the interdependent relationship between man and nature. Nature provides everything human needs, and people should respect and revere it. With a respectful mind to manage our natural resources and social resources, we can develop on the right path. Otherwise, no remedies or “no new technology can buy us the time” (Crumley, 2000, p. 206) to repair what the right relationship has to maintain.

The limitation of this paper is that questionnaires actually could be designed better. Some questions could be asked with more objectivity and be more complete; choices of three questions in city-wide questionnaire could be designed by the degrees of participants’ agreements, so the analysis could be more accurate (#7: choices on reasons of congestion, #12 choices of the efforts and attempts government can make in developing public transportation by using spaces above and under ground, #16, choices of the reasons why the city is not doing well in waste assortment); the question “whether bus lanes should restrict other vehicles during the whole day” actually means other vehicles are restricted on bus lanes, and buses are restricted on other lanes (current situation is that buses can run on any lanes); the question on constructing underground waste transmission pipeline actually contains two sub-questions, and the answer to the them might be opposite. So, design in survey questions in future studies need to be much more considerate and thoughtful.
This paper discusses a lot in transportation while not addressing a lot on the other three aspects. This is because there are several transportation modes and transportation is more of a city-level issue. The other three aspects are only discussed at the office community level, as the paper is designed to discuss from employees’ perspective. If household levels are to be included, such as household waste and residential building retrofit, the research must wait for another time.

To write four aspects might be much too ambitious and make it difficult for me to deal with theory, method, data, results and interpretation adequately, especially in a constrained time of about only two months. To just keep transportation and abandon the other three is also a good choice. My worry is that as far as the academic research ability is concerned, up until now, I am not clear how to deal with questionnaires and interviews as they are designed in containing four aspects. I don’t know if I am allowed to just simply delete the other three aspects and modify the descriptions to the questionnaires like the number of single choice questions and multiple choices questions. So I choose to be honest and keep the integrity of the research data. The three aspects that are not discussed as thoroughly as transportation, which might restrict the paper to have the best quality, will be further studied in my future research.

7 Acknowledgement

I sincerely thank and appreciate my respected supervisor Carole L. Crumley who gave me guidance, and encouraged me to achieve scientific quality, independence and personal responsibility of this research project. She also emphasized the importance of research map, and the transparency of how the questionnaires were devised and given. All of them are important to this research and any other studies of mine in the future.

I am grateful and appreciated for my respected evaluator Paul Sinclair who gave me relevant comments and scientific review of the research, which are all wonderful, valuable and precious to me. All the issues that Paul pointed out were my confusions and struggles in this project. If I could be given more time, know more about sustainability issues, read more books and papers, and proficient in English, I would be able to perfect my project.

I am grateful for Professor Stephan Barthel who provided me valuable literature on green spaces. I appreciate that I could enjoy and absorb the wisdom of researchers like him, the fruits of years of work of his.

I am thankful and appreciated for my thesis coordinator Åsa Frisk who is always a very friendly, patient, considerate, smiling and wonderful helper.

I appreciate my study counselor Amanda Johnson for giving me administrative help on this paper.

I am thankful for Cecilia Mark-Herbert for giving us lectures on writing a research proposal.

I am thankful for my friend Yanning Dong who provided me learning material of writing a research proposal. The literature on Underground Pedestrian Systems she provided me was very useful.
I am thankful for my friend Gang Wei who discussed with me the possibilities of the assumptions from civil engineering perspective, and the discussion on CBD-wide questionnaire.

I am thankful for my friend Na Xiu who briefed me the history of green spaces.

I appreciate for my classmate Kaely Dekker who told me six key words of literature on transportation.

I am thankful for the interview respondents of their time and rich social experiences, observations of the city and society, smart and smooth expressions of their true feelings, opinions and attitudes. I am also grateful for the involvements of questionnaires participants and their time, opinions and suggestions. The data is the analysis basis of this research. I am also proud that they are willing to accept the inconveniences caused by the construction work in the process of change if it will happen someday.

Thank Uppsala University for offering me an opportunity to study at here. I learned that vision and worldview are life-long important for my devotion to the career of sustainable development.

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### 9 Appendixes

#### 9.1 Appendix1: Questionnaire city-wide

Build a working environment that has an interdependent relationship between man and nature.
1. What is your gender? (Single choice)  
   Male;  
   Female

2. What is your field of working? (Single choice)  
   Sales, customer service, marketing;  
   Finance, human resource, administration;  
   Project, quality;  
   IT, Internet, communication;  
   Real estate, construction, property management;  
   Finance, insurance;  
   Merchandise, trading, transportation, logistic;  
   Manufacture, production;  
   Media, printing, art, design;  
   Consulting, legal;  
   Education, research;  
   Service industry;  
   Energy, environmental protection, agriculture;  
   Self-employed;  
   Civil servant;  
   Others (please remark)____

3. How do you rate the overall degree of comfort of your indoor and outdoor working environment? (Single choice)  
   Very uncomfortable;  
   Uncomfortable;  
   So-so;  
   Comfortable;  
   Very comfortable;  
   Others (please remark)____

4. What is (are) your means of commuting? (Multiple choices)  
   Walk;  
   Bike, electric bike, (3-wheel) motorbike;  
   Bus;  
   Metro;  
   Private vehicle;  
   Official car;  
   Taxi;  
   App (buses or taxies operated by privately owned companies);  
   Others (please remark)____

5. What is/are the reason(s) for your choice(s) of means of commuting? (Multiple choices)  
   Safe  
   Time guarantee;
Good infrastructure;
Cheap price;
Green, environmentally friendly;
Fast and convenient;
Have private space;
Others (please remark)____

6. Do you often encounter traffic jams when you commute? (Single choice)
   Yes;
   No

7. In your opinion, what is/are the reason(s) for traffic jams? (Multiple choices)
   (This question follows if participants choose “yes” in question 6)
   Large population;
   Large number of cars;
   Pedestrians do not obey traffic regulations;
   Drivers do not obey traffic regulations;
   Unreasonable road planning;
   Bus route distributions are not wide and meticulous;
   Necessity of commuting across districts;
   Police on duty on the frequently congested roads at rush hours are insufficient;
   Basic infrastructures and services of urban construction need to be improved, e.g. pipelines for rain discharge are not smooth; the speed and efficiency of snow clearing are not high;
   Others (please remark)____

8. What is your single journey commuting duration? (Single choice)
   Within 30 minutes;
   30-45 minutes;
   45 minutes to 1 hour;
   1-1.5 hour;
   1.5-2 hours;
   2-3 hours;
   Others (please remark)____

9. If you choose public transport for commuting, what is your ideal single journey duration? (Single choice)
   Within 30 minutes;
   30-45 minutes;
   45 minutes to 1 hour;
   1-1.5 hour;
   Others (please remark)____

10. Do you agree that other vehicles should be restricted from bus lanes the whole day? (Single choice)
    Yes;
    No, because (please remark)____
11. How do you describe the ticket prices of public transport? (Single choice)
   Very cheap;
   Cheap;
   So-so;
   Expensive;
   Very expensive;
   Others (please remark)____

12. What efforts and attempts do you think the government can make by using spaces above ground
    and under ground to develop public transportation? (Multiple choices)
   Cableway transport;
   Build multilayer viaducts;
   Transport on the river;
   Bilayer compartments of subway;
   Three- or four-story metro rails;
   Increase the number of entrances and exits of metro;
   Tunnel transport;
   Others (please remark)____

13. If the methods described in question 12 are feasible after environmental and technical
    assessments, the construction will affect your daily transportation and life. Are you still willing
    to sacrifice your degree of comfort temporarily for the great development of public
    transportation, and the benefits brought by reducing using private vehicles? (Single choice)
    Yes;
    No, because (please remark)____

14. The advantages of not using garbage baskets and garbage bags are to reduce using
    non-biodegradable materials and hence alleviating environmental pollution. If there are clean,
    esthetic waste assortment facilities with clear instructions in the rest area in your office, are you
    willing to dispose of waste there correctly, but not throw it in the garbage basket beside your
    desk? (Single choice)
    Yes;
    No, because (please remark)____

15. What is the city’s performance on correctly and finely sort waste? (Single choice)
    Very bad;
    Bad;
    So-so;
    Good;
    Very good;
    Do not know

16. What do you think the reason(s) is/are that we do not sort waste correctly and finely? (Multiple
    choices)
    (This question follows if participants choose “Very bad” “Bad” or “So-so” in question 15)
The processing ability of waste management plants in the city is not strong enough;
Lack of clean and esthetic waste assortment facilities;
Short of clear instructions to the citizens of how to sort;
Lack of education;
Lack of propaganda;
Lack of supervision;
No incentive or punishment measures;
No such kind of traditional habits;
No such kind of social moral atmosphere;
No such kind of awareness;
Others (please remark)____

17. Set up underground waste transmission system. Transmit unrecyclable waste in vacuum packages to incineration plants through underground pipes. The methane and heat generated by incineration can be energy supplies to public transport vehicles or buildings. Do you think this method is feasible? Are you willing to accept the inconveniences brought to you in the process of change? (Single choice)
Yes;
No, because (please remark)____

18. What do you think the sizes of green spaces around the place where you work? (Single choice)
Very large;
Large;
So-so;
Small;
Very small;
No green spaces

19. What is the degree of influence on your mood and working efficiency by the amounts of green spaces around the place where you work? (Single choice)
Very big;
Very small;
No influence

20. If your employer claim or rent a piece of green space, and employees could plant or garden there at non-working hours, keep biodiversity and enhance urban resilience. Do you think this can increase your sense of commitment to your employer? (Single choice)
Yes,
No, because (please remark)____

21. Are you willing to work in an energy saving office building that use natural resources to the largest extent? E.g. green roof – a place to relax and rest, alleviate fatigue and pressure; use natural light scientifically to the largest extend; install auto-induction solar panels above windows – at the time of sun shading, they collect solar energy for (part of) the energy supply of the whole building; collect human body temperature by using the office building ventilation system and heat a converter where there are water in it and pump the water up as (part of) the
warm water supply to washrooms in the office building. (Single choice)
Yes,
No, because (please remark)____;
This does not have too much relation with me;
It will not be realized

22. For the suggestions and designs on transportation, waste management, green spaces and energy saving building said above, what do you think the reason(s) is/are if they are hard to or not able to be realized? (Multiple choices)
It will bring many inconveniences to people’s daily lives;
Technically infeasible;
Relevant stakeholders need to make big investments or have great economic losses;
Lack of unified coordination and cooperation among related executive bureaus;
No one is willing to take the lead;
People are not aware that the cost for the destructions of ecological environment we need to pay is far more than that of for improving infrastructures;
Others (please remark)____

23. If you would like to have a further interview or if you hope to receive the survey results, please leave your contact method(s). (Multiple choices)
Email____;
Other methods____

9.2 Appendix 2: Questionnaire CBD-wide
Transform CBD in Beijing from a traditional business function district into a sustainable and ecological-humane interdependent district.

1. What is your overall impression toward the CBD, what do you like? (Multiple choices)
   Sense of success psychologically;
   There is a concentration of “white-collar” employees;
   Good geological location, convenient transportation;
   Good working environment;
   Comfortable, and high level;
   Others (please remark)____

2. What you do not like? (Multiple choices)
   Traffic jams;
   Traffic flow limitations in metro, longer time for transport;
   It has not many green spaces;
   Human indifference;
   High consumptions;
   The indoor environments of office buildings need to be improved;
   No special dislikes;
   Others (please remark)____
3. What is/are your means of commuting? (Multiple choices)
   - Bus;
   - Metro;
   - Taxi;
   - App (buses or taxies operated by privately owned companies);
   - Private vehicle;
   - Bike;
   - Others (please remark)____

4. What is/are the reason(s) of your choices of means of commuting? (Multiple choices)
   - Safe;
   - Time guarantee;
   - Good infrastructure;
   - Cheap ticket prices;
   - Green, environmentally friendly;
   - Fast and convenient;
   - Others (please remark)____

5. If you choose public transport for commuting, what is the single journey duration you can accept? (Single choice)
   - Within 30 minutes;
   - Within an hour;
   - 1-2 hours;
   - 2-3 hours;
   - More than 3 hours;
   - Others (please remark)____

6. What is/are the reason(s) for traffic jams? (Multiple choices)
   - Large population;
   - Big range of commuting;
   - Necessity of commuting across districts;
   - Unreasonable road planning;
   - Bus routes are insufficient;
   - Others (please remark)____

7. As a CBD commuter who takes private vehicle, what do you care about most? (Multiple choices)
   - Parking spaces
   - Parking fees
   - Others (please remark)____

8. What is the price range you can accept if you park in CBD? (Single choice)
   - RMB 2-5 per hour;
   - RMB 6-10 per hour;
   - RMB 11-15 per hour;
   - RMB 16-20 per hour;
Within RMB 1500 per month;
Within RMB 1800 per month;
Within RMB 2000 per month;
Others (please remark)____

9. Where will you choose to park? (Single choice)
   - At the edge of CBD, and transfer to public transportation or walk to office;
   - Parking lot in my office building;
   - Other parking lot with cheaper fees in CBD;
   - Others (please remark)____

10. If you choose to park somewhere in CBD with relative cheaper prices, how many minutes of walk can you accept to get to your office? (Single choice)
    - Within 5 minutes;
    - 6-10 minutes;
    - 10-15 minutes;
    - Others (please remark)____

11. When you choose to get a lift from others, which one do you think is more important: guarantee of safe travel responsibilities, or satisfaction of travel to destination? (Single choice)
    - Safe travel responsibilities;
    - Satisfaction of travel to destination;
    - I have supplements (please remark)____

12. What methods do you think can be used to encourage CBD commuters to take public transportation and reduce driving private vehicles? (Multiple choices)
    - Add more routes;
    - Increase departing frequencies;
    - Reduce the number of bus stops;
    - Others (please remark)____

13. From public transport stations to your office, will you choose to take free shuttle bus in the CBD? (Single choice)
    - Yes;
    - No;
    - It depends;
    - Others (please remark)____

14. How do you deal with the recyclable waste like paper products, newspaper, and magazine? (Single choice)
    - Sell them;
    - Throw them away;
    - Others (please remark)____

15. If there are facilities for collecting recyclable office waste like paper product, ink box and cartridge on the same floor as your office, are you willing to put the waste at the special area?
16. If it has clean and esthetic waste assortment facilities, would you like to dispose of waste correctly and finely? (Single choice)
   Yes;
   No;
   It will not be effectively used after a period of time

17. We do not sort waste correctly and finely currently, what do you think the reasons are? (Multiple choices)
   Lack of propaganda and education;
   Root cause – the processing ability of waste management plants is not strong enough;
   Lack of supervision;
   No incentive or award measures;
   Others (please remark)____

18. What do you think of the sizes of green spaces in the CBD? (Single choice)
   Large;
   Small;
   Very small

19. Do you think the amount of green spaces is important to your working life? (Single choice)
   Yes;
   No;
   Does not matter too much

20. Is it important to you to have a rest at green spaces area after lunch or when you feel tired in a working day? (Single choice)
   Yes;
   No;
   Does not matter too much

21. What kind of green spaces do you like? (Multiple choices)
   Central park with vast amount of green space;
   Make use of every single space among different buildings;
   A combination of both for the above two choices;
   Not only green spaces, but also diversity;
   Have labels to introduce the varieties;
   Others (please remark)____

22. If your employer claims or rents a piece of land and employees could plant or garden there during non-working hours, will that increase your sense of commitment to your employer? (Single choice)
   Yes (because)____;
23. If your office building or other office buildings around yours have green roof, will you relax there when you have a rest to relieve pressure? (Single choice)
   Yes (because)____;
   No (because)____

24. Does natural light in your office important to you? Can natural light raise your working efficiency? (Single choice)
   Yes;
   No;
   Does not matter too much

25. Is it important to you to be able to work in an energy saving building that uses natural resources as the energy supplies? (Single choice)
   Yes;
   No;
   Does not matter too much

26. Do you think the larger extent the connections between basic infrastructures in your working area is better for you? E.g. supermarket, urban vegetable greenhouse, shopping mall, and you could shop during lunch break to save your time after work? (Single choice)
   Yes;
   No;
   Does not matter too much;
   Others (please remark)____

27. What is/are your opinion(s) on establishing public kindergarten in the CBD for your conveniences to send off and pick up you kid? (Multiple choice)
   Only a choice;
   It depends on my means of commuting;
   Needed;
   Not needed;
   Others (please remark)____

28. What is your opinion on the function of CBD? (Single choice)
   It is fine to just have traditional business function;
   Need diversity;
   It is good to have diversity, but that does not have any influence on my job selection or my life;
   Others (please remark)____;

29. What is your gender? (Single choice)
   Male;
   Female

30. If you would like to have further interview or hope to receive the survey results, please leave
your contact method(s). (Multiple choices)
   Email____;
   Other method____

9.3 Appendix 3: Interview guide

1. What is your occupation?

2. How long have you been working in the CBD?

3. What is your general impression of the whole environment physically and spiritually in the CBD? What you like? What you do not like?

4. What is your opinion about the transportation?
   2) Could you specifically list the problems of public transportation that you think need to be improved by their degree of importance and urgency?
   3) What reason(s) do you think is /are that the metro/bus is crowded?
   4) What good public transportation practices from other cities in the country or abroad do you think we could borrow either in CBD level or city level?
   5) Driving-parking—When parking in the CBD as a commuter, what do you care about the most? Is it convenient to park? How about the fees? What price do you think is reasonable to you? Do you park your car at the edge of the CBD and then transfer to public transportation and /or walk to your office? Or do you park in your office building? Or do you park somewhere else in the CBD with cheaper parking fees? What is the distance/minutes you can accept if you park at the edge of the CBD and then commute or walk to your office? How long does it usually take you to drive to work/go home?
   6) Can parking by sizes of cars in office buildings make a difference to commuting drivers? This is mainly for zoning more parking spaces for small/economic size cars so more cars can be parked there to reduce parking price and improve parking capacity.
   7) Commute bus within the CBD—What is the frequency? Are they on time? Routes cover the whole district?
   8) Do you prefer other means of transportation like biking or walking? Other than the distance between your home and office that restricts you to bike or walk, what other conditions and environments would you like to have but currently we do not have?
   9) Do you have something else that you think are important but I haven’t covered?

5. What is your opinion on waste management?
   1) Do you find the waste in your office is correctly and finely sorted?
   2) How do you deal with recyclable waste: paper products like paper, magazine, newspaper and packing? How do you deal with batteries and other small appliance office supplies? How do you deal with bottles? Do you throw them away or collect and sell them periodically (with other colleagues)?
   3) Do you observe how the canteens deal with their food waste? Do you pack your lunch
residue or throw it away?

4) Would you mind if your recyclable waste like paper product can be put at a certain place on the same floor as your office and are collected by waste management staff every day (but you can put there whenever you have enough to put) but not sell them? What is the distance you can accept to walk to this place? Or do you prefer there is a comprehensive detailed but neat and clean and aesthetic dustbin in your office rest room?

5) When speaking about waste, what is your impression? Dirty and keep away from it, or is it an industry?

6) If there are clean and esthetic facilities with clear waste assortment information, does that impel you to behave correctly?

7) Do you think the propaganda and education enough for waste assortment? What form of education do you prefer to have in order to know the waste management rules?

8) Do you have something else that you think are important but I haven’t covered?

6. What is your opinion about green spaces in the CBD?
   1) What do you think the sizes of green spaces in the CBD?
   2) What kinds of roles do you think it plays in your working life? Are you willing to regularly go into it when you are free say after lunch? Would you like to approach it when you have obstacles in your work?
   3) Do you like to have the central park type green spaces that has relatively larger sizes or you prefer to have as much as possible among different office buildings?
   4) Do you prefer green spaces with grass only or a diversity of plants? If you are free to involve in managing green spaces, would you like to plant there during your free time? Or you think it is the gardeners’ jobs?
   5) There is a high density of high-rises in the CBD and the land prices are high, do you think green spaces are very important to you? Do you think it realistic to be involved in the management of the green spaces if your company can claim or rent a piece of green space/land as a kind of employee welfare?
   6) Do you have something else that you think are important but I haven’t covered?

7. What is your opinion on energy saving buildings?
   1) Do you like the green roof idea in your office building? Would you like to have breaks on green roof during your working day?
   2) If (part of) the energy supplies of the office building use natural resources, will that make a difference to you? For example, use ventilation system to collect human body temperature to heat a converter with water in it, and pump the water up as warm water supplies in the washrooms of your office building?
   3) Install auto-induction solar panels above windows – at the time of sun shading, they absorb solar energy as one of energy supply sources for the whole building. Do you think it feasible? If not, what do you think we should do to make use of natural light or solar energy?
   4) Do you have any other ideas for energy saving buildings?

8. Do you have to buy food after work every day? If so, how long it usually takes before you could start cooking at home?
   If moderate sizes of vegetable greenhouses are opened in your working area within walking distance, will you buy there? In these green houses, vegetables are planted in movable facilities
like tram rails, the heights and angles of the rails can be adjusted, spraying is used as the irrigation method, which saves water efficiently, both rails moving and spraying are controlled by computer systems so that all vegetables can receive sunlight and water evenly, the roof are moveable. People who work in the CBD can buy fresh vegetable or half processed dishes there during their lunch break time or after work. A lot of time in buying food after work and cooking will be saved. It is fun and healthy as well. Would you like to consume in this way? If so, what is the walking distance you can accept? Or do you have any other ideas that you would like to have for your conveniences in this regard in the CBD?

9. Do you send your child to kindergarten or primary school before you go to work? Is it convenient and close to where you live, or you have to travel for long way? How much time it takes you every day to send your child to school and pick him/her up after school? What is your opinion on introducing public kindergarten and primary school in the CBD? Introduction of public kindergarten and primary school can provide affordable education to children of those moderately paid employees. It is also convenient for parents to take care of their children by sending them to kindergarten or school before work in the morning, and pick them up after work.

10. Do you think it is fine for the CBD to have the traditional function only, or do you prefer a diversified and socially, environmentally and economically balanced CBD? Do you believe a sustainable CBD will contribute to your commitment to your employer?

11. What kind of working environment do you like to have both of indoor and outdoor?