

**“Auto”-Mobile Beijing:**  
A Bicycle Network for a Renewed “Bicycle Kingdom”

by

August Liau

B.A. Architecture, 2005

University of California at Berkeley

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE

AT THE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEBRUARY 2011

© 2011 August Liau. All rights reserved.

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and  
electronic copies of this thesis document in whole or in part in any medium now known or  
hereafter created.

Signature of Author .....

Department of Architecture  
January 14, 2011

Certified by .....

Andrew Scott  
Associate Professor of Architecture

Accepted by .....

Takehiko Nagakura  
Associate Professor of Design and Computation  
Chair of the Department Committee on Graduate Students



**Thesis Committee:**

Andrew Scott, Thesis Advisor  
Associate Professor of Architecture  
Department of Architecture, Massachusetts Institute of Technology

Eran Ben-Joseph, Reader  
Associate Professor of Landscape Architecture and Planning  
Department of Urban Studies and Planning, Massachusetts Institute of Technology

Yung Ho Chang, Reader  
Professor of Architecture, Former Head of the Department  
Department of Architecture, Massachusetts Institute of Technology





# **“Auto”-Mobile Beijing: A Bicycle Network for a Renewed “Bicycle Kingdom”**

by

August Liao

*Submitted to the Department of Architecture on January 14, 2011 in partial fulfillment of the requirements for the Degree of Master of Architecture.*

## **ABSTRACT**

This thesis intends to be a catalyst for a renewed bicycle culture in Beijing, the capital of the former “Bicycle Kingdom”. Beijing, only 15 years ago had more bicycles than any other city in the world, has in recent years undergone a drastic shift to become a city consumed by cars and highways, producing disruptive voids in the traditional small-scale fabric of the city that once made the old city unique. It has also produced the worst traffic in the world as well as some of the worst air pollution problems that any city has ever seen. This ironic shift from a city dependent on the most sustainable form of transit to one that is gridlocked by the form that is the least sustainable is what the thesis will critique. Recognizing that this shift is largely attributed to the changing culture of the citizens as they gain higher economic status, the thesis will attempt to create a project which creates a counter-culture to the current trend toward motor vehicles. It will target the population of the white-collar working class as its main audience, as they are the ones which are setting the trends of contemporary transportation in Beijing. The thesis proposes a new building typology for the city - a bicycle transit center which will occupy the void space produced by the highways. The center will provide an ‘oasis’ in the city, a place which promotes a lifestyle of wellness and sustainability centered around the daily bicycle commute - a lifestyle antithetical to that of the motor vehicle. The driving concept is “auto”-mobile lifestyle, derived from the literal meaning of the word for “bicycle” in Chinese: zi 自 (“auto/self”) xing 行 (“mobile/sufficient”) che 車 (“vehicle”).

Thesis supervisor: Andrew Scott

Title: Associate Professor of Architecture





# 自行北京

“AUTO”-MOBILE BEIJING:

A Prototype Bicycle Center to Revive the Former “Bicycle Kingdom”

## **Acknowledgements:**

I would like to give thanks to the many who contributed to the development of the thesis.

First, to my committee and faculty at MIT.

Thank you Andrew Scott for guiding me through the thesis process, and most importantly, for truly believing in it.

Thank you Eran Ben-Joseph for your always-positive reinforcement and expertise that you brought to the project.

Yung Ho Chang, for being a true inspiration for me on this thesis topic and guiding me as an architectural thinker in the context of Beijing. Each meeting with you left me even more inspired and motivated than before. Thank you for making me feel welcome in your city.

A special thanks to Dennis Frenchman for your involvement on the project and inventive suggestions.

Thank you Jan Wampler for your guidance and support while I was first developing the thesis topic.

Thank you to the critics Joel Lamere and Nick Gelpi for your instructive comments at the final review.

Thank you to all my classmates for your support and comradery.

Thank you Cynthia Ting, Chee Chui, Dennis Cheung, Natalie Wong, Justin Chen, Christine Chang, Rita Sio, Najiyah Edun, Nathan Prevendar for your contributions to the project, however large or small. There are many others who contributed to it that I am grateful for as well. It would not have gotten as far without you.

To my friends Mandy Yeung and Kathy Kim for literally being there for me during the graduate school process. To Jennifer Chou and Glen Chua for keeping me level-headed throughout my thesis year. Also to many other friends who did the same. Thank you Chai Pattamasattayasonthi and Brandon Miller for your supportive friendship as well.

A great thank you to my cousin Daniel Yin in Beijing for your hospitality. You made the research that went into this thesis possible, and showed me insights to the city which I would not have otherwise gained on my own.

Finally, to my family for your love and full support on all that I do.

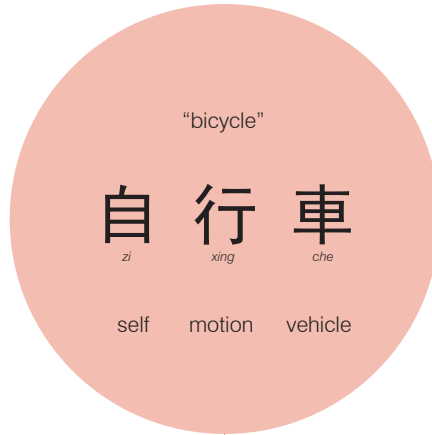


## CONTENTS

Abstract	5
Acknowledgements	8
<i>The History of the Bicycle in Beijing and China</i>	12
<i>The Bicycle vs. the Automobile in Beijing, Beijing's Ring Road Expansion</i>	14
<i>Thesis Agenda</i>	18
Research	21
Discourse	22
Beijing Urban Fabric and Transportation Analysis	32
Program and Site	45
Site Analysis and Proposal	46
Platforms for the Thesis Program	54
Architectural Proposal	75
A Prototype Bicycle Center to Revive the Former "Bicycle Kingdom"	76
Bibliography	119



In 1896, the modern term for "bicycle" in the Chinese language first appears. It is pronounced "zi xing che". The three words literally translate to 'self' 'motion' 'vehicle'. Inherent in the meaning of this term is sustainability - it describes a vehicle from which the motion is powered completely by oneself. It is this idea of sustainability which this thesis wishes to expand to the larger scale of the city, seeing this project as a step toward a city in which the energy for mobility is self-supplied by its individuals.



1866:  
A Chinese official named Bichun travels to Europe and returns to China with reports of a "cycling device", referring to the velocipede



1870s - 1880s:  
European and American expatriates introduce the first bicycles to China.  
  
The Chinese locals are puzzled by it, as expressed in an illustrated cartoon produced at the time.



1890s - 1900s:  
Western-educated Chinese first start riding the bicycle. Bicycles are purchased by the Chinese elite, viewed as objects representing progressiveness and modernity. Bicycles begin appearing in newspaper ads.



1930s:  
Chinese domestic production of the bicycle begins, producing 10,000 bicycles per year. The price of the bicycle decreases and allows it to reach wider audiences.

1845      1860      1875      1890      1905      1920



# The History of the Bicycle in Beijing and China



**1949:**  
The Communist Party is founded. It perceives the bicycle as an essential component to providing mobility to its socialist society. The bicycle industry receives government financial support, urban planning policies prioritize the bicycle, and cyclists receive government subsidies.

Bicycle use grows at an unprecedented rate.



**1978:**  
Deng Xiaoping publicly states that owning a bicycle is one of the three signs of wealth (alongside a sewing machine and a watch). He claims that the country's goal is to have one "Flying Pigeon" brand bicycle in every household.



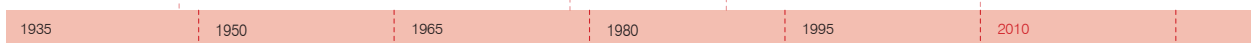
**1990s:**  
Beijing reaches its peak number of bicycles at 11 million. It has more bicycles than any other city in the world. 8 of every 10 residents in Beijing rides a bicycle.

China is dubbed "the Bicycle Kingdom"



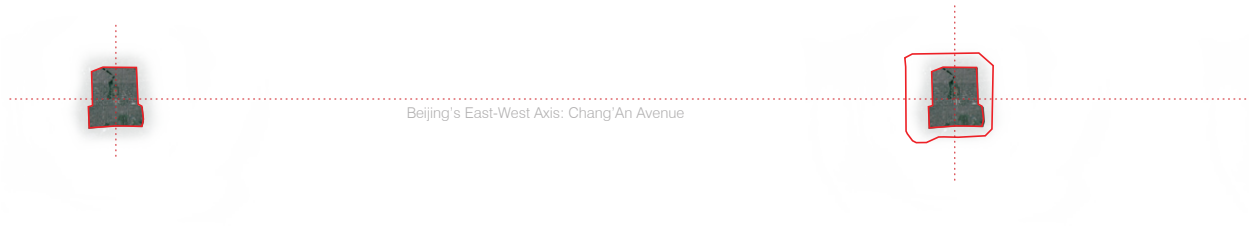
**2010:**  
Beijing's bicycle count plummets to 4 million and continues to decline, while the number of automobiles is at its highest and continues to grow exponentially. Now only 2 of every 10 residents rides a bicycle.

Beijing adopts the "Green Movement" plan, which aims to increase bicycle usage to 25% by 2015.

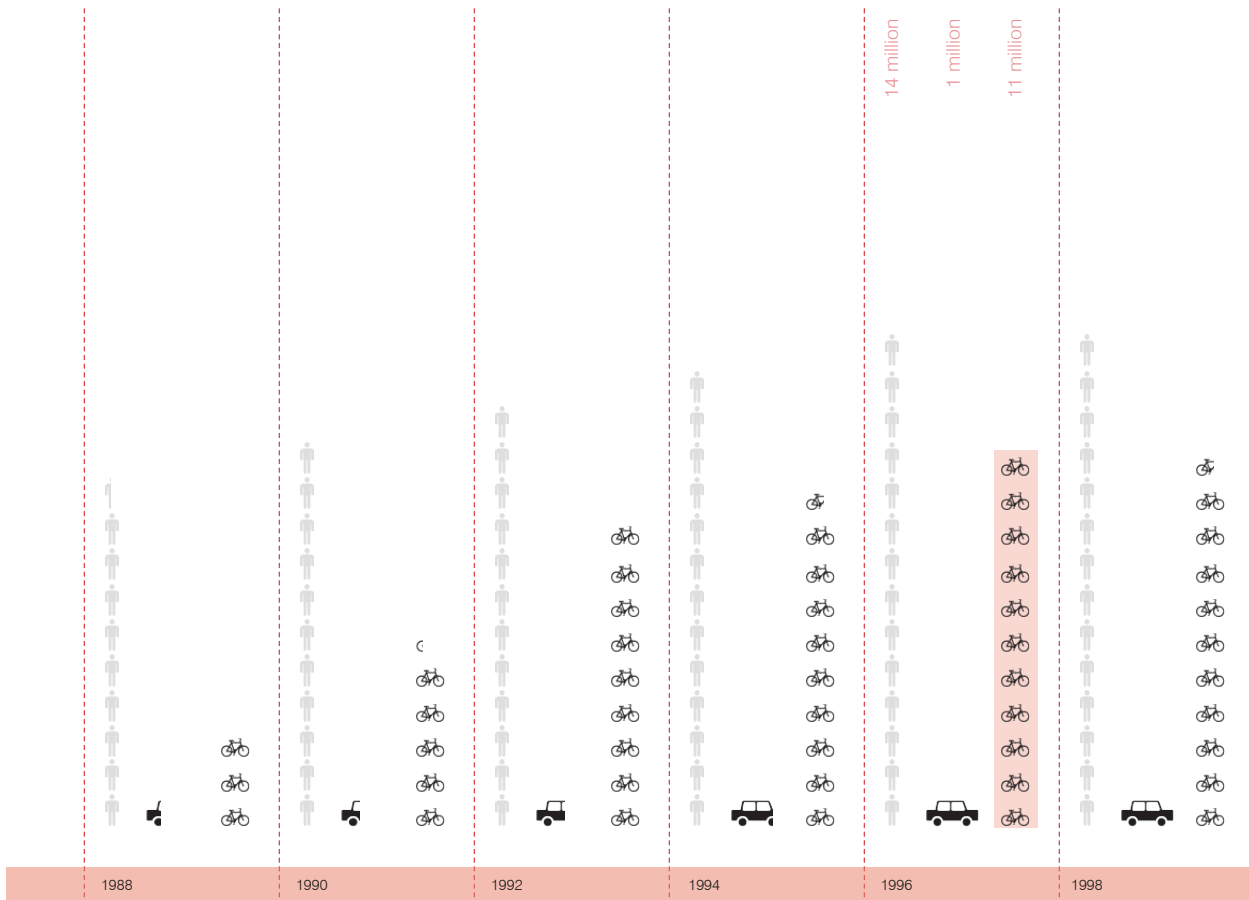


1988 :  
Beijing's "Second" ring  
road complete

1997 :  
Beijing's "Third" ring  
road complete



= 1 million people    = 1 million bicycles    = 1 million automobiles

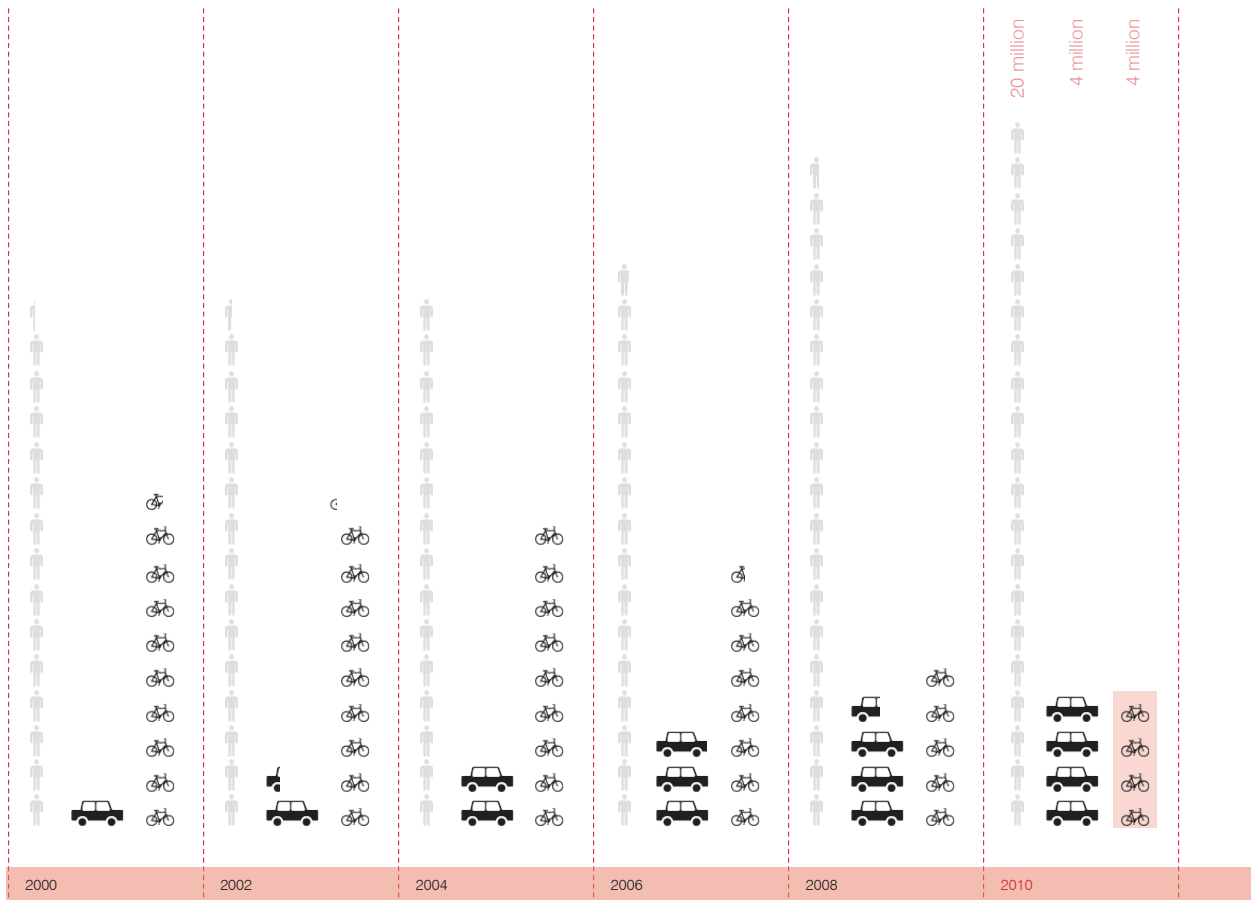
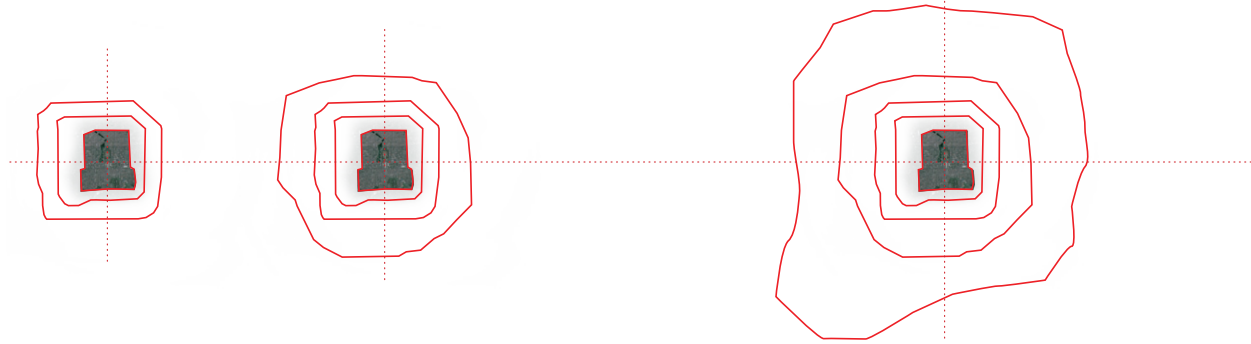


# The Bicycle vs. The Automobile in Beijing, Beijing's Ring Road Expansion

2001 :  
Beijing's "Fourth" ring road complete

2003 :  
Beijing's "Fifth" ring road complete

2009 :  
Beijing's "Sixth" ring road complete





Beijing 15 years ago, 1996/1997

(Source: [http://www.treehugger.com/files/2006/06/china\\_keep\\_them\\_1.php](http://www.treehugger.com/files/2006/06/china_keep_them_1.php))



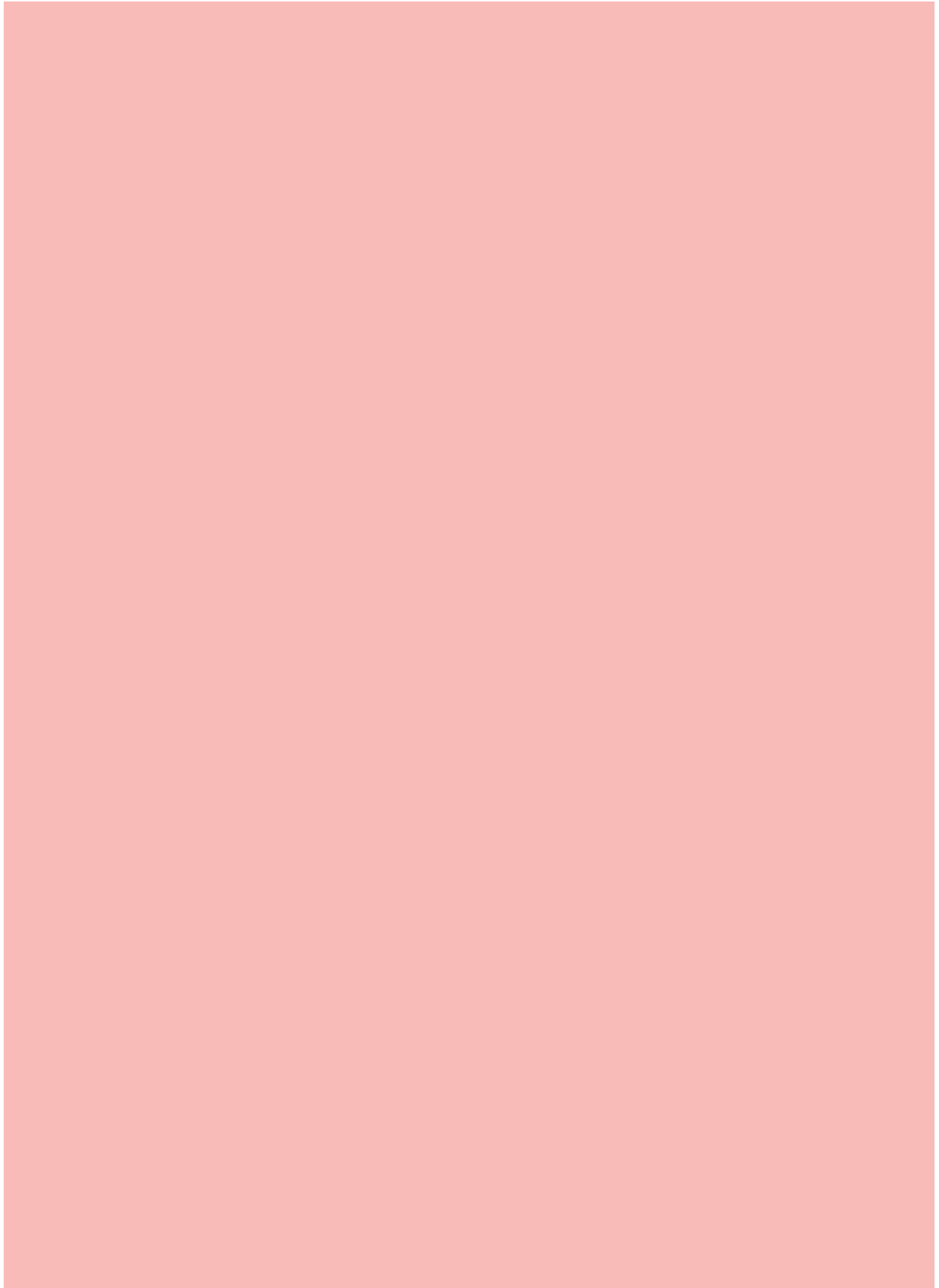
Beijing Today, 2010/2011

(Source: [http://www.worldnavigator.info/data/gallery/00000002/Beijing\\_traffic.jpg](http://www.worldnavigator.info/data/gallery/00000002/Beijing_traffic.jpg))



(Source: <http://yalecirclek.com/china.php>)

*2010, Beijing is at a critical “crossroads” in its transportation and urban future. If it continues down its current path, the city’s congestion and pollution problems will worsen, and the urban fabric which made Beijing a unique and lively place will become completely erased. The bicycle, once synonymous with Beijing, must make a return to cultural and infrastructural prominence to save the city from itself. The thesis will be a prototypical project which will serve this agenda.*





## RESEARCH

## Discourse

### I. Introduction

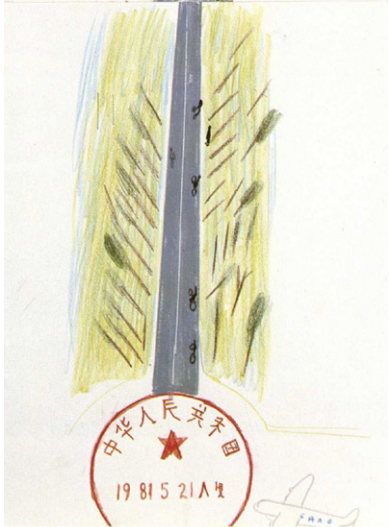
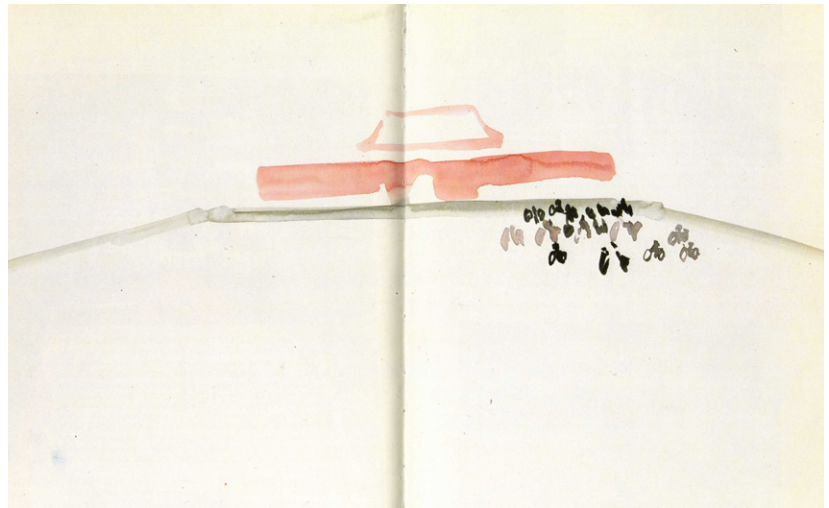
"Bicycles, bicycles, bicycles." This is how the artist David Hockney described the series of photos he took on a trip to China in 1981.<sup>1</sup> In the watercolor and pastel drawings he produced on the trip, the figure of the bicycle appears so repeatedly that it becomes the basic scale-figure in his art. During the 1980s, China was known as the "Bicycle Kingdom", and for good reason. Half a billion bicycles roamed the country's streets during that time. In the capital city of Beijing, 5.4 million of its 9 million residents rode bicycles on a daily basis. Deng Xiaoping, the Paramount leader of China from 1978 to the early 1990s, promised during China's economic reform era that there would be one "Flying Pigeon" (brand name) bicycle in every household. He equated the bicycle to wealth, stating that it was one of the three household items essential to a wealthy family, along with the sewing machine and watch.<sup>2</sup> By 1991, there were 11 million bikes in Beijing, more than any other city in the world. The economic reform which was initiated by Deng worked extremely well in terms of bringing China new wealth, as witnessed in China's massive building boom and rising middle class at a scale unprecedented in the world.

By the mid-1990's this growth had begun to translate into the rise of the automobile, simultaneously resulting in the decline of the bicycle, as citizens with new wealth had begun to see the car as the modern mode of transportation. Between 1995 and 2005, bicycle use had declined by 35%, while automobile ownership doubled.<sup>3</sup>

<sup>1</sup> Spender, Stephen & Hockney, David. *China diary*. London: Thames and Hudson, 1982. pp. 19.

<sup>2</sup> Campanella, Thomas J. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. New York: Princeton Architectural Press, 2008. pp. 220.

<sup>3</sup> Campanella, Thomas J. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. New York: Princeton Architectural Press, 2008. pp. 221.



(Source: Images on this page by David Hockney. Spender, Stephen & Hockney, David. China diary. London: Thames and Hudson, 1982.)



(Sources, left to right:

[http://www.chinadaily.com.cn/china/2007-05/28/content\\_881248.htm](http://www.chinadaily.com.cn/china/2007-05/28/content_881248.htm)

[http://www.chinadaily.com.cn/china/2007-05/28/content\\_881248.htm](http://www.chinadaily.com.cn/china/2007-05/28/content_881248.htm)

<http://www.thebeijinger.com/newsletter>)

## II. The Rise of the Automobile in Beijing and Growth of the Ring Road System

The traffic statistics in Beijing are unparalleled. 1800 cars are added to Beijing's streets a day, which translates to three-quarters of a million per year. The normal "rush hour" period, which may last three or four hours in metropolitan areas of the United States, lasts for a total of eleven in Beijing.<sup>4</sup> In other words, for nearly half of one day, Beijing's major highways and arterials are moving at bumper-to-bumper speeds. The municipal government thus far has addressed traffic issues only by expanding the road systems, and this has had direct impacts on bicycle use. The most immediate way the city is making room for automobile traffic has been to reduce or even eliminate bicycle lanes which were put in place during the beginning of the Reform Era. The city has also physically widened major thoroughfares, removing entire parts of the city in the process. Each time roads have been widened, new traffic engulfs it, a classic case of an increased supply creating more demand. This phenomenon has then further led the city to expand outward, consuming more land and building more roadways. Thomas Campanella describes this as "equivalent to a dog chasing its own tail."<sup>5</sup>

This scope of expansion is expressed most clearly in the growth of the concentric 8-lane ring roads which encircle the city and structure the entire city's fabric. The ring roads are essentially freeways (i.e. no traffic lights) which are organized concentrically in the city. At

<sup>4</sup> Campanella, Thomas J. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. New York: Princeton Architectural Press, 2008. pp. 17.

<sup>5</sup> Campanella, Thomas J. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. New York: Princeton Architectural Press, 2008. pp. 222.



(Sources, left to right:

<http://www.water-powered-engines.com/emissions.html>

<http://www.beijingolympicsfan.com/2007/10/28/grey-skies-over-beijing/>

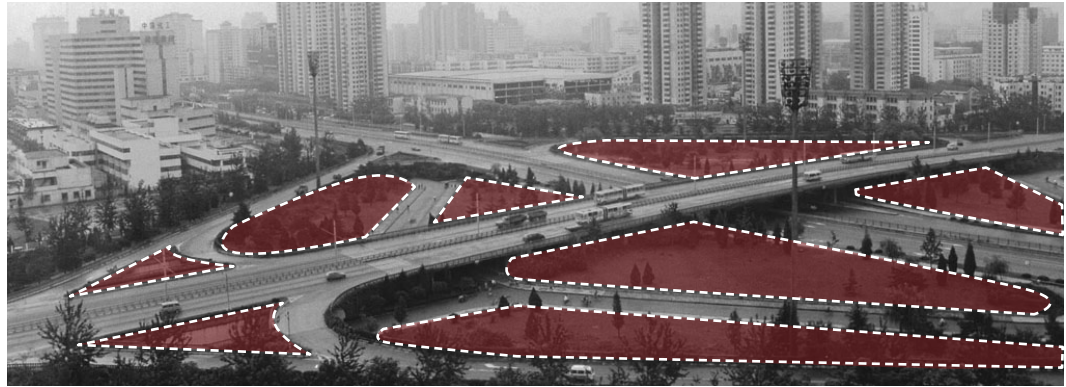
[http://marketplace.publicradio.org/display/web/2007/09/06/china\\_pollution/](http://marketplace.publicradio.org/display/web/2007/09/06/china_pollution/))

the center of the ring roads is the Forbidden City, the palace which was built for the Ming Dynasty emperors. Currently there are a total of five ring roads, named the “Second” Ring Road through the “Sixth” Ring Road. The “First” ring road refers to the old tram lines which encircled the center of the city, now which have become a collection of surface streets. The Sixth Ring Road was completed in early 2010, having a radius on average of 22 kilometers measured from the center of Beijing. Nine more expressways cross this set of ring roads in radial directions. It is estimated that a quarter of all traffic occurs within the Second Ring Road, and half of all traffic occurs within the Third Ring Road. The government is planning strategies to create more core areas in suburbs and satellite towns to share the functions which are currently concentrated in the city center.<sup>6</sup> This solution, however, will inevitably lead to more traffic, as the city sprawls out, making workers travel back and forth between one node to another. An outward expansion will only mean longer driving distances. Currently, a seventh ring road is under consideration. The radius of this highway would be so large as to serve as a regional highway rather than a municipal one.

### III. Sustainability: Health, Wealth, Time, and the Environment

The bicycle is the most sustainable form of transit. If we define the term “sustainable” to

<sup>6</sup> “City’s circles cause traffic troubles.” chinadaily.com. China Daily, 4 Feb. 2004. 7 Mar. 2010



Voids produced by roadway interchanges are wasted space at some of the city's most expensive land

speak about efficiency - using the least amount of resources for the most productive effect, the bicycle goes beyond being sustainable just in the environmental sense, but in terms of personal health, conservation of wealth, and conservation of time as well.

#### a. Air Quality

There is no doubt that Beijing faces problems of environmental sustainability, and that this is largely attributed to the automobile. In 1995, Beijing air became the most polluted of the world's cities, and although urban factories were a large contributing factor at the time, the rise of the automobile has kept Beijing among the top 20 in the world for air pollution even after the relocation of most of the factories to areas outside of Beijing.<sup>7</sup>

The type of pollution that automobiles emit contains nitrogen oxides which degrade the atmospheric ozone, contributing to global warming. Additionally, cars also produce ground-level ozone, which is damaging to the lungs. Today it is estimated that 35% of the total air pollution in Beijing is caused by automobile emissions. An even larger percentage is contributed by construction, much of this which is road infrastructure, parking lots and garages, which require demolition of existing fabric to allow space for them. In this light, the impact of the automobile on the environment is even more vast.

<sup>7</sup> "Beijing Pollution: Facts and Figures." news.bbc.co.uk. BBC News. 11 Aug. 2008, 7 Mar. 2010.

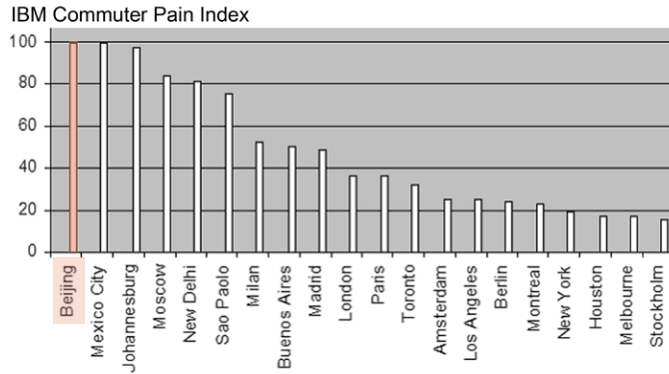


Chart from IBM's "Commuter Pain Index" study, 2010

(Sources, left to right:

<http://www-03.ibm.com/press/us/en/pressrelease/32017.wss>

<http://www.hollywoodcelebgossips.com/2009/10/13/a-beautiful-samaritan-female-taxi-driver-in-beijing-pictures/>)

## b. Spatial Consumption

The resource most perceptibly consumed by the automobile is space. The automobile requires more than 11 times the same spatial footprint per person as the bicycle. This assumes the statistic that on car typically carries on average 1.2 persons. This also is considering a static condition where the cars are still and lined adjacent to each other. In order to accommodate their movement, this number must be multiplied hundreds of times. The sheer volume of space the vehicle needs in order to travel quickly makes it much less efficient than the bicycle. Furthermore, the speed and radii in which automobiles need to turn is significantly larger than that of the bicycle, and therefore, this produces a wide array of wasted spaces, as exemplified by the large loops of onramps and exits of the major highway networks of Beijing which encircle large unusable and undesirable spaces. This is often referred to as "trash space", alluding to its wastefulness.

## c. Personal Costs

It can be argued that the greatest costs occur at the scale of the individual, where the different conditions produced by different commute modes affect one's daily life. This is another scale

at which the advantages of bicycling become clear. On June of 2010, IBM released a "Global Commuter Pain Study", which surveys motorists from twenty cities with questions related to commute time and stress related to driving. Of the twenty cities, Beijing was rated as the worst for driving, with a "Commuter Pain" rating of 99 out of 100, with 100 being the most "onerous".<sup>8</sup>

The average time for commuting by car in Beijing is 62 minutes, which is more than any other city in the world. Bus trips are only slightly less time-consuming, at 58 minutes. Commute by bicycle, on the other hand, takes only half the amount of time. Stress from commuting is also the highest of all the cities, which manifests as a cacophony of horn sounds on the city's streets.<sup>9</sup>

In addition, China has become the nation for the highest growth of obesity rates. This can be linked to the proliferation of the automobile lifestyle.

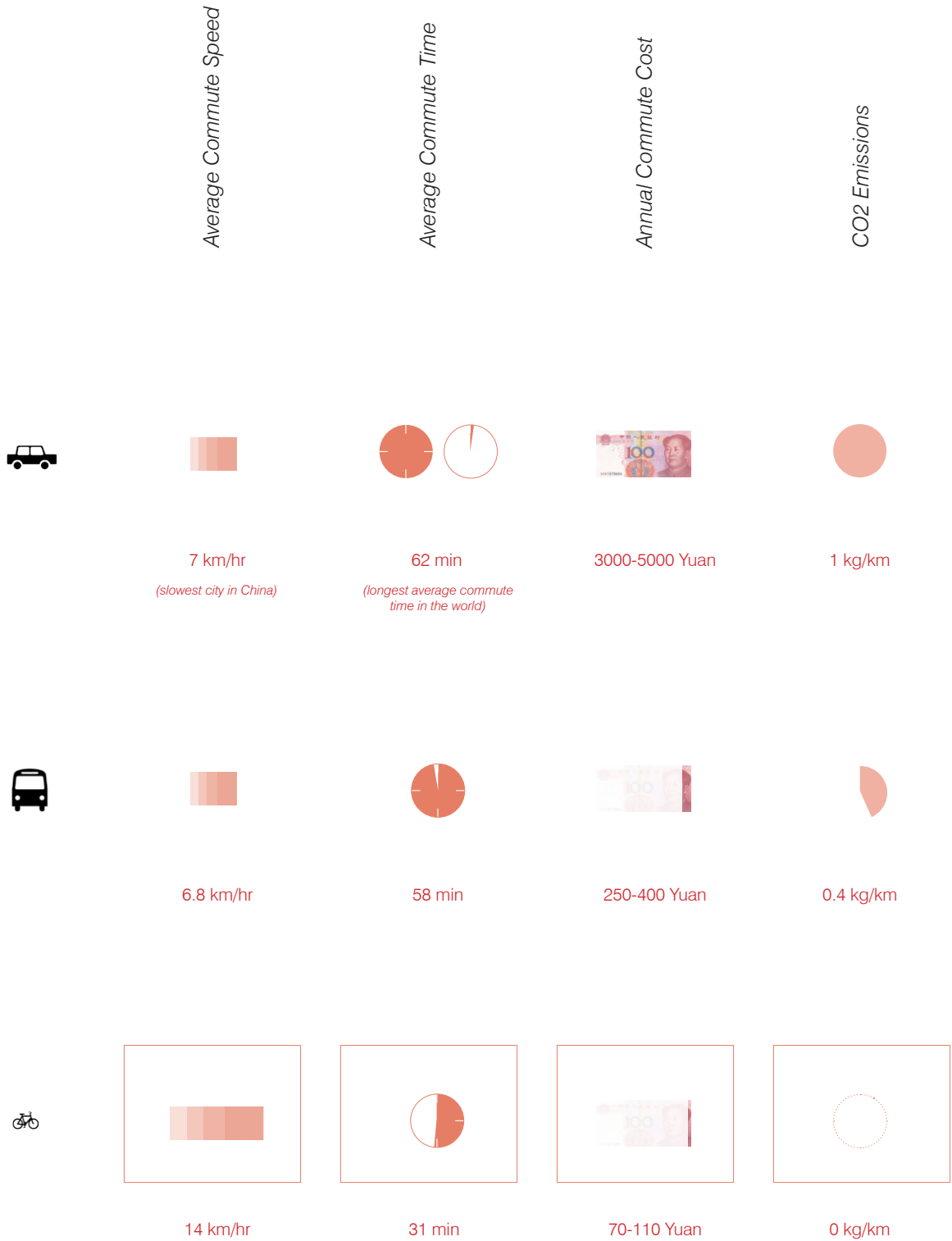
<sup>8</sup> "IBM Global Commuter Pain Study Reveals Traffic Crisis in Key International Cities." <http://www-03.ibm.com/press/us/en/pressrelease/32017.wss>. IBM. 30 June, 2010.

<sup>9</sup> "IBM Global Commuter Pain Study Reveals Traffic Crisis in Key International Cities." <http://www-03.ibm.com/press/us/en/pressrelease/32017.wss>. IBM. 30 June, 2010.





(Sources, left to right:  
[http://www.wallcoo.net/human/ngm\\_beijing\\_sights/html/wallpaper2.html](http://www.wallcoo.net/human/ngm_beijing_sights/html/wallpaper2.html)  
<http://www.cbsnews.com/stories/2007/01/19/business/main2373740.shtml>)



# Comparisons of Various Transportation Forms in Beijing



## **Beijing Urban Fabric and Transportation Analysis**

### I. Two Divided Types

The motor vehicle has drastically changed the urban fabric of Beijing. The once ubiquitous small-scale courtyard house neighborhoods (*hutong alleys*), are swiftly being demolished and replaced by mega-blocks of tall residential highrises, encircled by expanses of privatized open space and parking on the ground below. Ironically, the amount of open space is being increased yet real useage of these spaces is decreasing. This trend represents a new lifestyle fueled by (and fueling) the motor vehicle, as these “communities” are privatized spaces which are best driven to and from rather than traversed through.

Such transformations have been at the center of many debates, as they have caused the destruction of old patterns of living, yet have been a solution for providing modern living facilities to many new residents. The major criticism of the destruction of the hutong alleys is that a sense of community in Beijing is disappearing along with them. The way in which the low-rise structures are densely packed allows for proximity to neighbors and to daily activities, creating an environment communal ownership of the public alley spaces where residents traverse. Since the Communist Era, these courtyard houses have been infilled so much that they have now become poor places to live by modern standards. Although these houses do need replacement, they are valuable as a typology of Beijing housing. This type of housing is unique to Beijing, and therefore its loss would be a loss to the culture of the city. It would be useful to Beijing to not necessarily consider the preservation of all the existing hutongs, but rather the preservation of their typology, encouraging new ways to generate this type of small-scale, tight-knit housing which facilitates true neighborhoods and communities.

(Sources, left to right:  
<http://www.gadling.com/2007/08/10/chinese-buffet-part-6-hutong-hostel-and-great-wall-hike/>  
<http://www.trekearth.com/gallery/photo655015.htm>  
<http://www.beijingrealestates.com/VirtualFortuneCentre.htm>  
<http://kereta.info/beijing-trip-efficient-transportation/>)



Typical hutong alley fabric

Typical highrise tower fabric



Satellite image of a typical Beijing transect



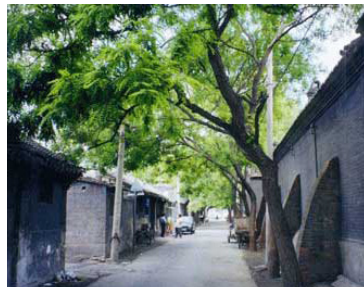
Figure-ground of a typical Beijing transect

## II. The Bicycle's Advantage in Beijing

The reality of Beijing's recent urban transformations is a condition in which low, tight-knit fabric is juxtaposed with clusters of large-scale, tower-typology private developments. In this condition, only the bicycle is able to negotiate both. The bicycle is able to penetrate the narrow winding alleys of the hutongs where the car cannot, while also being able to traverse the large block perimeters surrounding the highrise compounds which would be taxing for the pedestrian to walk around. The bicycle has the clear advantage of being the fastest form of transit in both situations, and in the case of the hutong typology, it helps to showcase the advantage of having a smaller network of streets which can be cut across, as opposed to the fenced-in mega-blocks which must be traveled around.

Therefore, if the bicycle were to become a prominent form of transit, it would justify the existence of both of these types of fabric relatively equally, rather than biasing one as the automobile does with the highrise typology. If both typologies are equally justified, this would give reason for the hutong typology to continue to thrive.

(Sources, left to right:  
<http://en.beijing2008.cn/spectators/beijing/tourism/list/n214258081.shtml>)





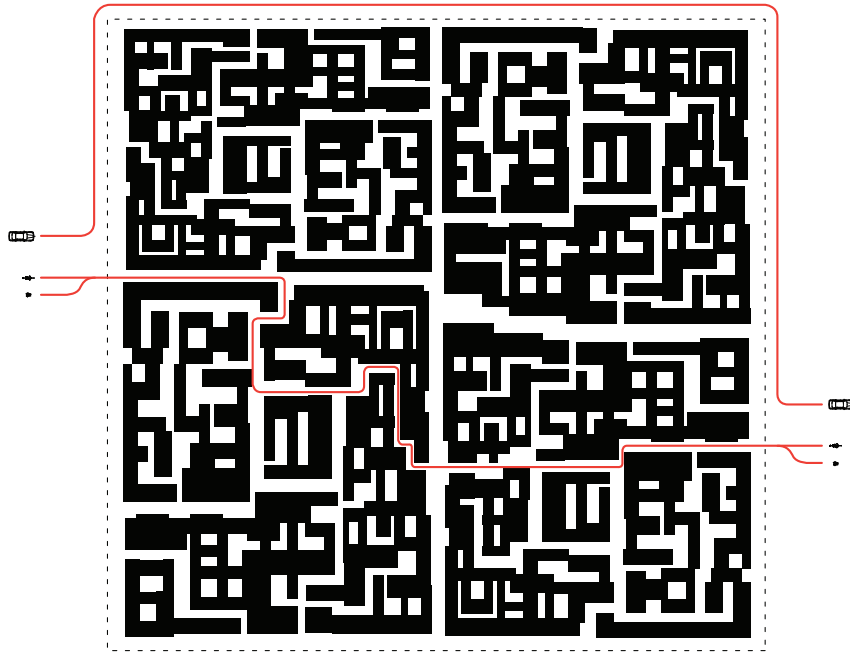


Figure-ground of a typical hutong block

### Hutong block

Car:	3 min
Bicycle:	2 min
Pedestrian:	7 min

Bicycles are able to negotiate the small alleys which cars cannot, allowing them a distinct advantage in these areas of Beijing.



(Source: <http://www.bikebeijing.com/tours/index.htm>)

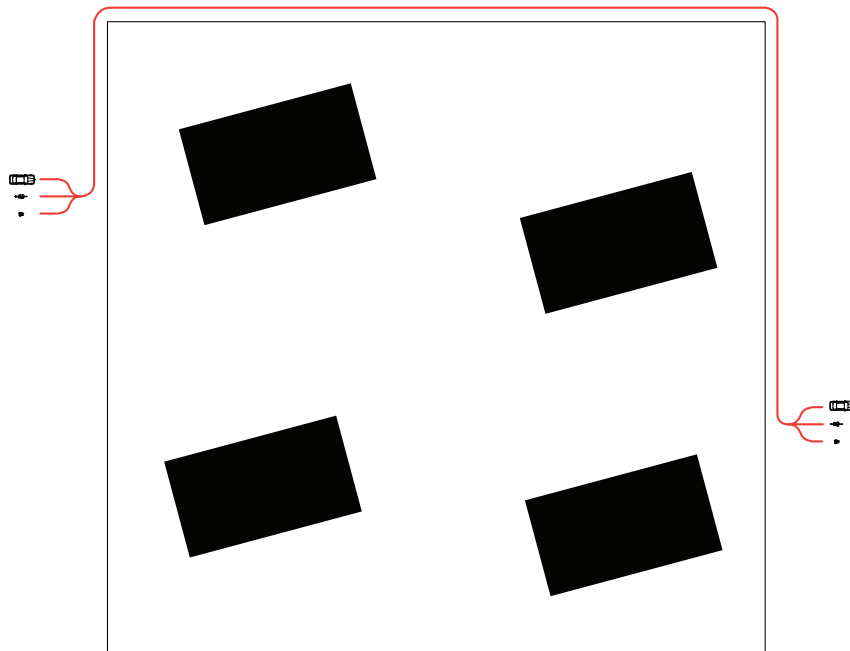


Figure-ground of a typical highrise block

### Highrise block

Car:	3 min
Bicycle:	3 min
Pedestrian:	12 min

Bicycles can easily traverse the larger distances that are more cumbersome for the pedestrian. On large roads, bicycles in Beijing travel just as fast if not faster than the cars which are slowed by traffic.



(Source: <http://www.beijingholiday.com/great-wall-tour/beijing-cycling-tour-with-great-wall.html>)

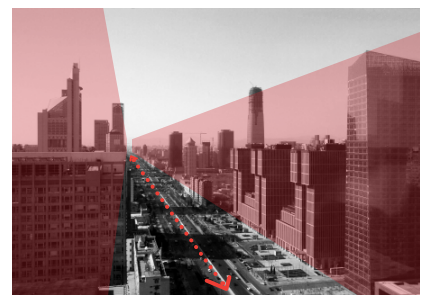
### III. Beijing's Density Patterns

Beijing as a metropolis is peculiar in its development pattern. Whereas a city such as New York has slow transitioning gradients of density punctuated by concentrated *clusters* of extremely high density, Beijing is organized into general levels of density based on proximity to the physical city center, which is then punctuated by linear *corridors* of density located along its ring roads. Where these ring roads intersect with its large avenues is then where development is most concentrated. This further emphasises the dominance of the ring road structure in Beijing's urban development pattern, and is what makes the city unique, as Beijing not only has highways running through the central city, but it's development is deliberately concentrated around these urban highways. This is in high contrast to Manhattan, where the highways which line the perimeter of the island are less dense than areas toward the center of the island.



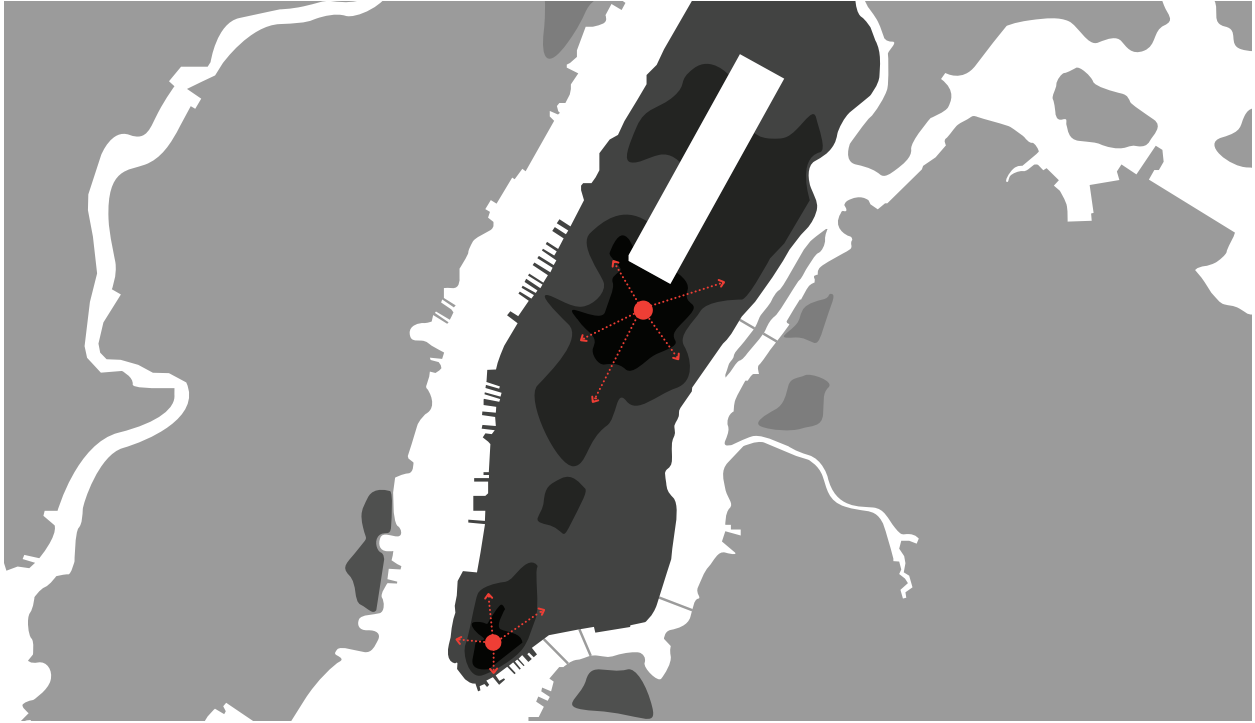
Manhattan Density Pattern - cluster

vs.

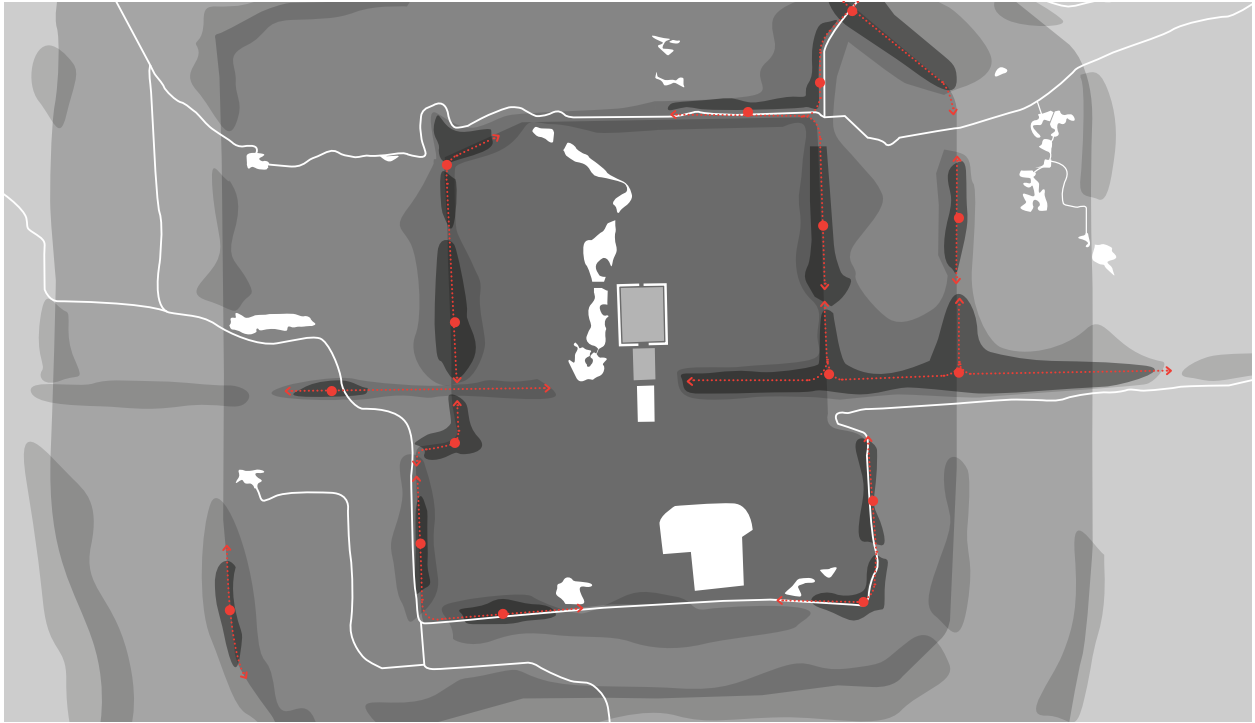


Beijing Density Pattern - corridor





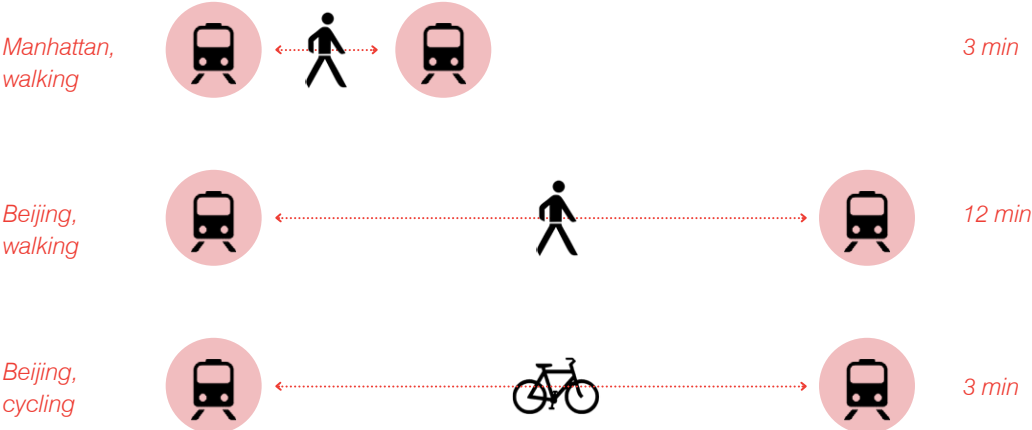
Manhattan Density Pattern - polycentrically distributed. (Diagram shows rough building floor area density spread.)



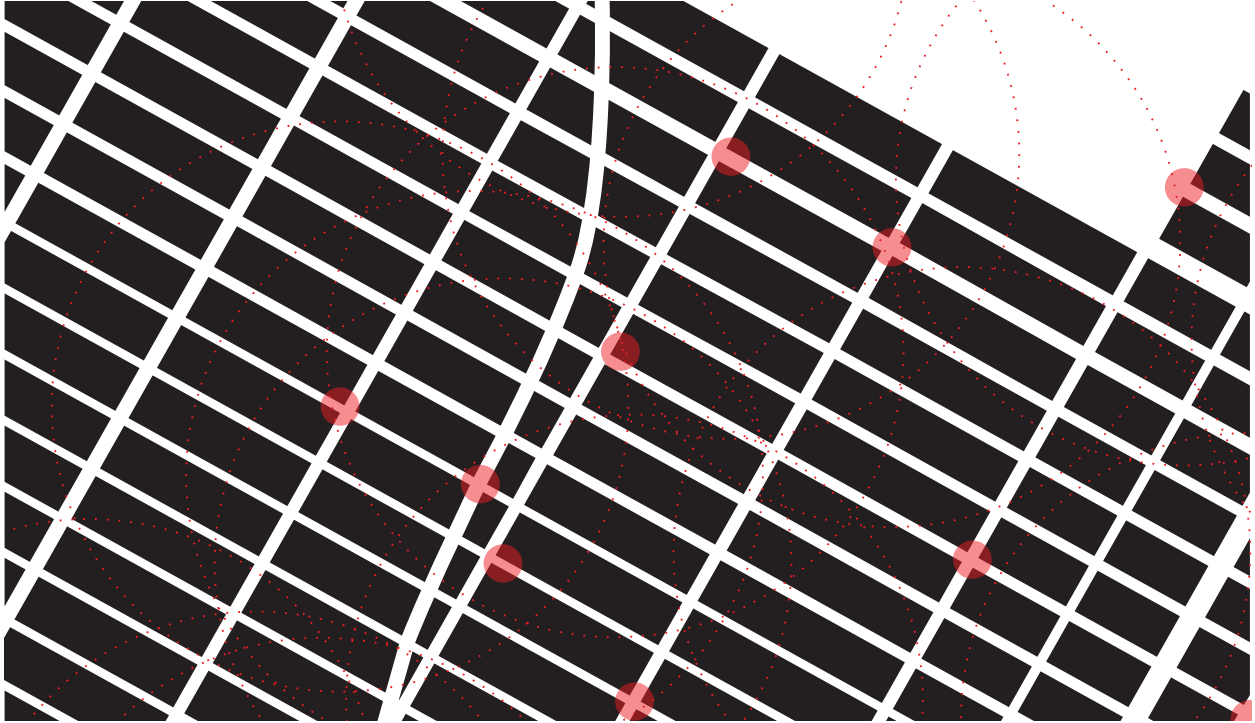
Beijing Density Pattern - linearly distributed. (Diagram shows rough building floor area density spread.)

IV. Beijing Walkability and Subway Station Density Analysis

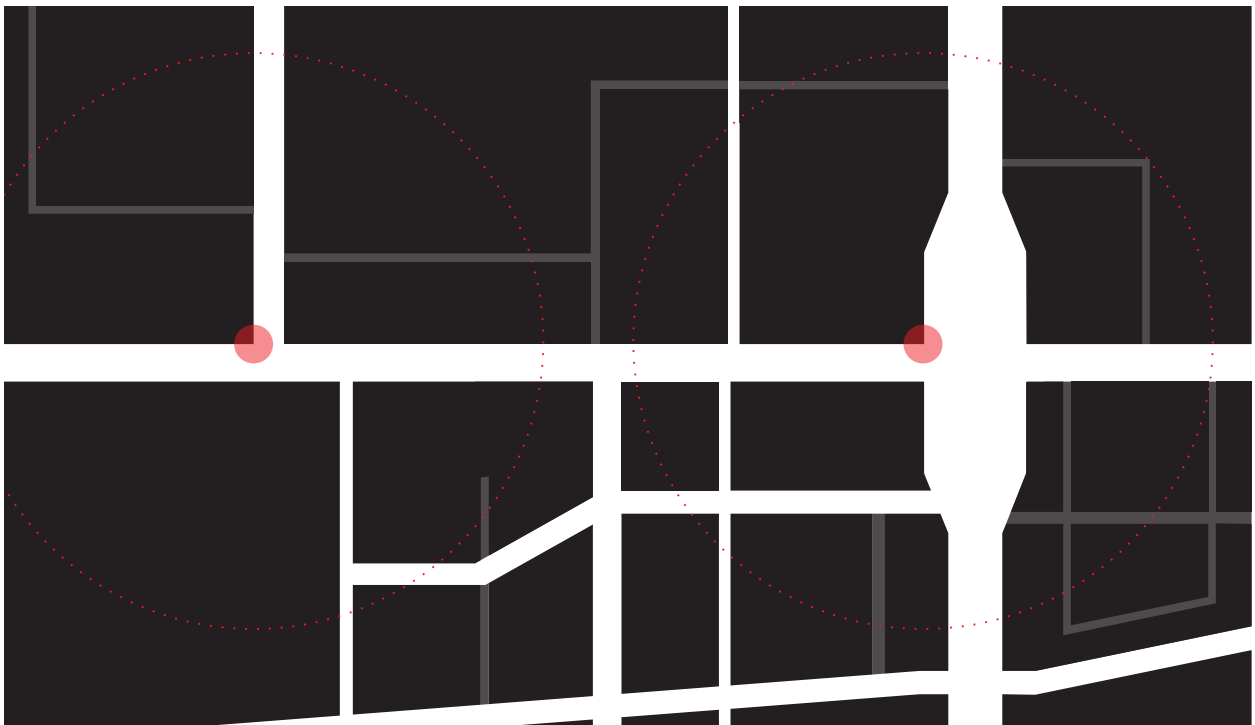
Beijing's blocks are enormous by Western city standards - one average block in Beijing's city center can easily hold 12 Manhattan blocks or more within it. It's streets are expectedly much wider - 52 meters wide at it's largest avenues when compared to Manhattan's 20 meter wide Broadway. Therefore, walking in Beijing is a more onerous task, as in it's block system, there is much less linear frontage of retail and ammenties, and larger perimeters to walk around to get to a specific destination. In addition, Beijing's subway stations are over a 10-minute walk apart from each other, whereas in Manhattan, there may be 3 to 5 subway stations within just a 5-minute walking radius. Public buses infill where there are gaps in the subway system, but are subject to Beijing's poor traffic conditions. Considering these two factors, the bicycle becomes a useful tool to overcome the inconveniences of distance and time in Beijing.



Subway station proximity comparisons



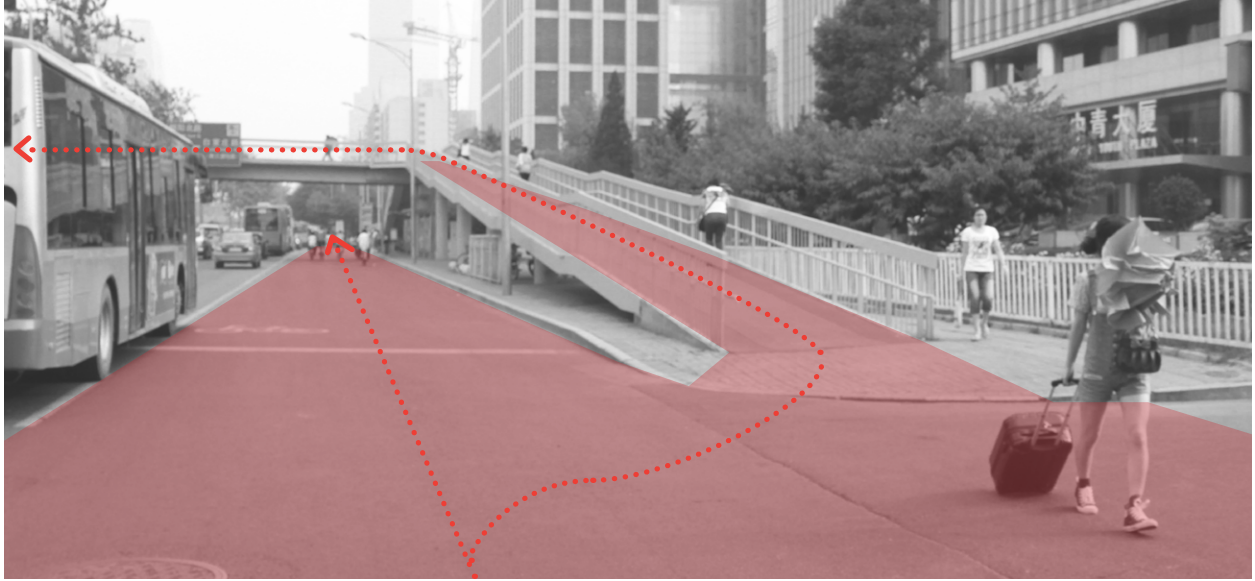
Manhattan Density Pattern - polycentrally distributed. (Diagram shows rough building floor area density spread.)



Beijing Density Pattern - linearly distributed. (Diagram shows rough building floor area density spread.)

## V. Beijing's Existing Bicycle Infrastructure

Beijing's streets were planned for bicycles. Street planning and design both during the Communist Era under Mao Zedong and then later during the Reform Era under Deng Xiaoping prioritized the bicycle. Initially it was perceived as the perfect vehicle for achieving mobility in the socialist society. Later, it was perceived as an object which represented wealth. In the 1980s and 1990s, Beijing was considered the greatest bicycle city in the world. Bicycle lanes were over six meters wide, shaded by trees for sun and rain protection. There were shallow ramps to facilitate crossing of wider streets by bike. The topography of Beijing is very flat as well. As economic reform brought greater wealth to the country, the China sought to modernize itself following the automobile-oriented model of the United States, and now the most extensive bicycle infrastructure in the world is being reduced in order to widen lanes for car traffic. The existing bicycle infrastructure is becoming an untapped resource, with fewer and fewer users. Beijing's bicycle culture must become prevalent again in order to validate the existence of this great infrastructure.



Typical bike lane and ramp at a Ring Road.



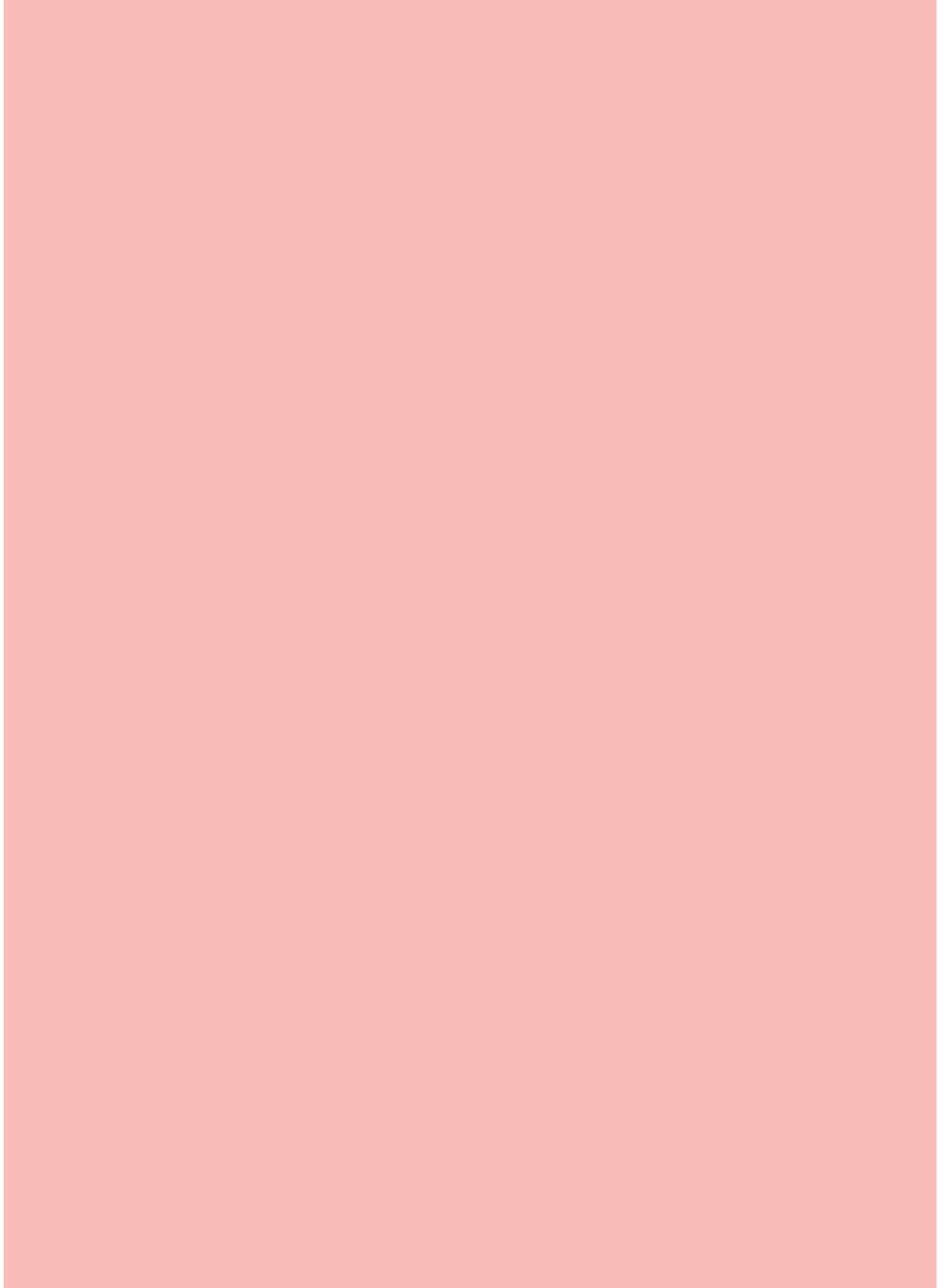
Typical bike traffic signal.



Typical tree-covered bike lane on medium-width streets.



*The bicycle has clear advantages in Beijing, and the people are well aware of them. The reason that they continue to choose cars is because they see the automobile as part of a modern lifestyle which they can now afford. Just as the bicycle itself is being constantly reinvented for modern-day use, the culture of the bicycle needs to be reinvented in Beijing in order for it to compete with the car.*





## PROGRAM AND SITE

## **Site Analysis and Proposal**

### I. Beijing's "Bridges"

Beijing's ring road system and criss-crossing avenues create a unique condition of evenly distributed "bridges" in the city. At the points where the ring roads intersect the large avenues running east-west or north-south, the ring road is typically elevated off of the ground to create a "bridge" or (as they are officially named). The ring road typically has a large set of looped ramps to allow cars to exit and enter to and from the avenue.

These bridges are an key element to understanding the structure of Beijing, as they are nodes of intensified development. The tallest office buildings and residential complexes are typically clustered around these bridges to take advantage of the crossing of these large motorways. There is also typically a subway station as well a bus hub located at each of these "bridges". Therefore, these "bridges" are key nodes in the city understood by the city's residents as hotspots of activity as well as navigational tools when getting around the city. Taxi customers will most often tell the driver what bridge they are going to, and then proceed to tell them the building name.

Naturally, these bridges are where automobile congestion is the worst, as they are the only points of access between the elevated ring roads and the surface streets. The crossing of bus, pedestrian, and bicycles on the surface streets also means that the flow of any of these modes must wait for the other to pass before getting across the "bridge" intersection and on their way.

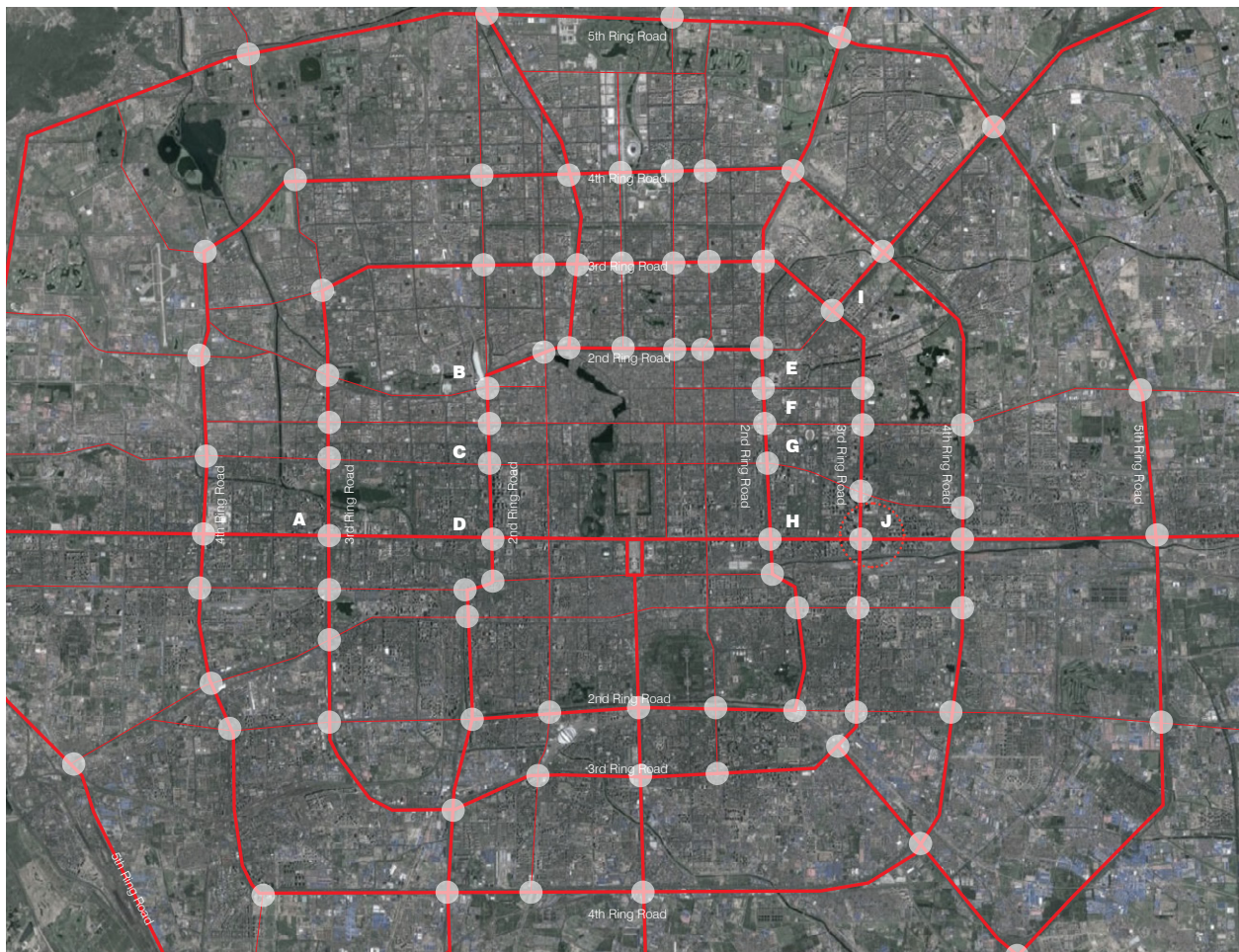
It is at these intense nodes that this thesis proposes to be the ideal project site. The thesis will propose an architectural intervention at a single site as a prototype for development of similar sites across Beijing.



(Source: <http://www.daylife.com/photo/0boi1TL8UD7f9>)

Guomao Qiao ("World Trade *Bridge*")

*Beijing's "bridge" system results in massive amounts of waste space. Ironically, these occur at the busiest and most densely built points in the city. The thesis will capitalize on this condition to transform these unused spaces into prototypical centers for new bicycle facilities and programs, integrated into these key points of activity. They will then become a network overlaid on top of Beijing's existing road network.*



Map of Beijing's "Bridges" - each white circle represents a highway overpass where a major avenue meets a Ring Road

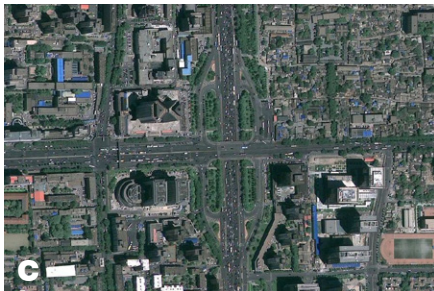




A  
Xinxing Qiao



B  
Xizhimen Qiao



C  
Fuchengmen Qiao



D  
Fuxingmen Qiao



E  
Dongzhimen Qiao



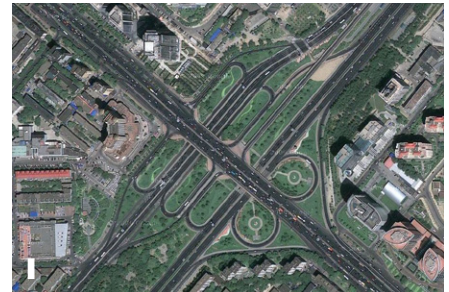
F  
Dongsishitiao Qiao



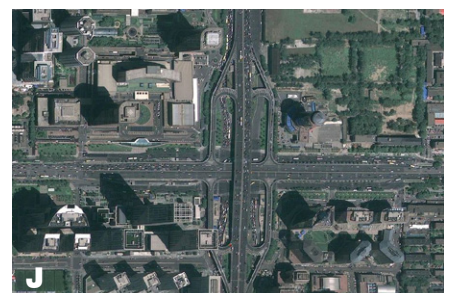
G  
Chaoyangmen Qiao



H  
Jianguomen Qiao



I  
Sanyuan Qiao



J  
Guomao Qiao (Beijing CBD)

## II. Site / Prototypical site - Guomao Bridge

Guomao Bridge is the site of choice for the thesis. It will be treated as a specific site as well as a prototypical site which will serve to show how the various 'bridges' in Beijing can be developed. The Guomao Bridge is unique because it is the origin point of Beijing's Central Business District, which has been under intensive development in recent years. It handles the interchange between the eastern portion of the Third Ring Road and Jianguo Road / Chang'an Avenue, the major East-West axis which connects this location to Tiananmen Gate. Development spreads in each of the cardinal directions from Guomao Bridge. It is also the location of a subway transfer station between two of Beijing's busiest lines, as well as a major bus transfer station.

Therefore, Guomao Bridge is a prime hub of activity for businesspeople as well as for the general public, allowing for the largest audience possible for the project. It also provides the opportunity to take advantage of various public transit options on the site to supplement bicycle transportation and strengthen its usefulness.

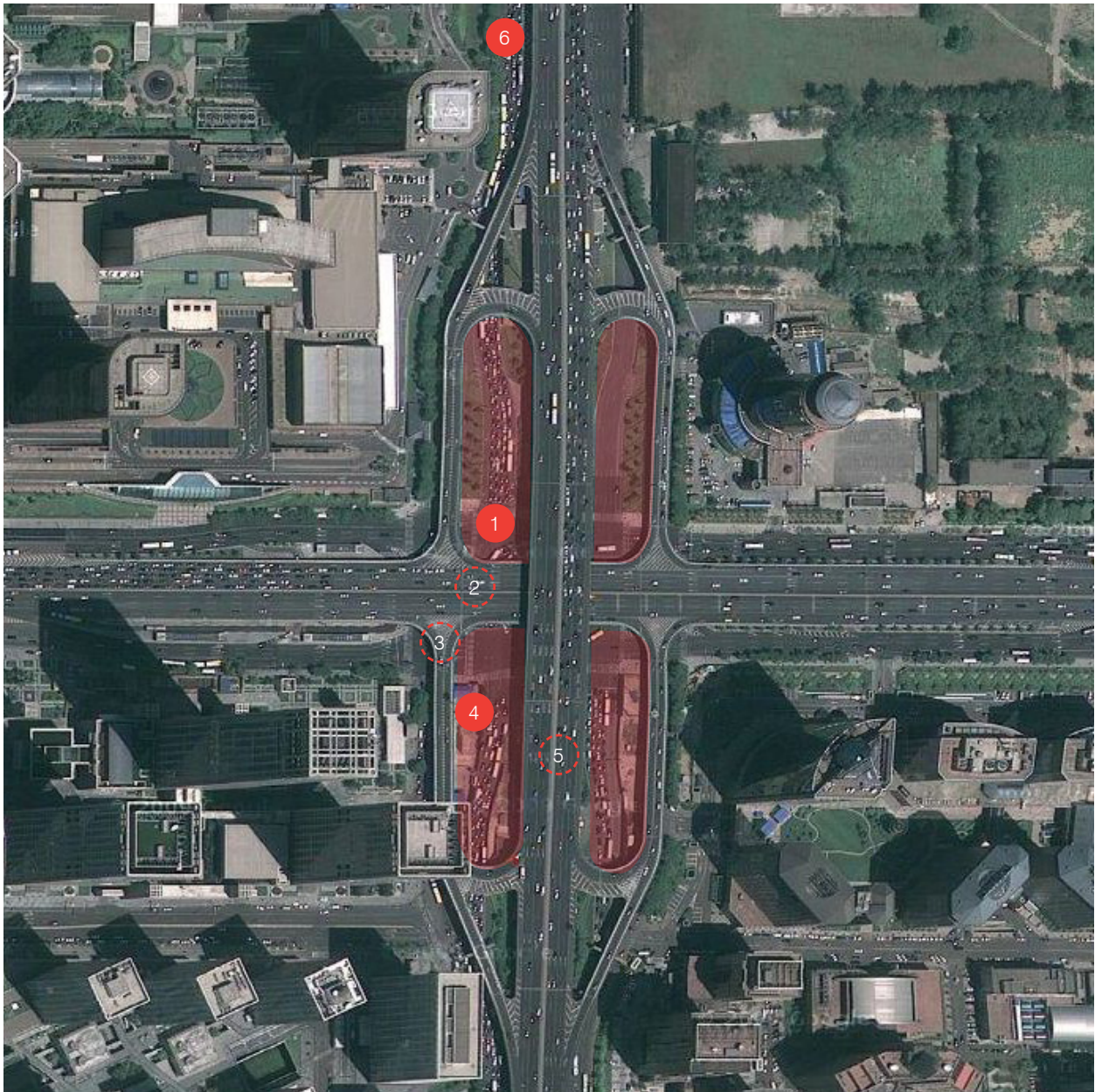
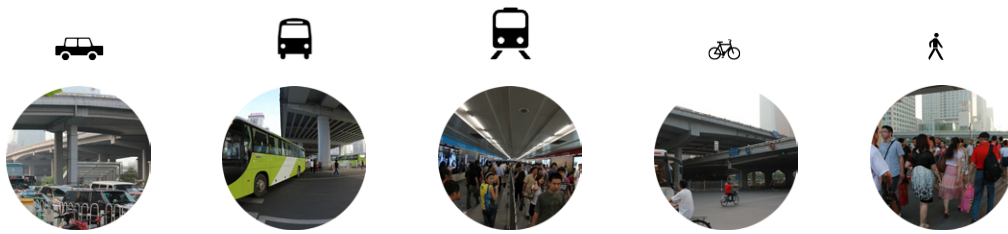
Guomao Bridge, like the many other bridges of Beijing, ironically has a large amount of empty space below it, even though it is a central hub of transit and business activity. This space has the potential of becoming some of the most valuable real estate in the city. This thesis intends to capture this space and maximize its value via the bicycle.

Not only does this bridge offer much open space on the ground, but there is also a large amount of space in the vertical dimension underneath its elevated platforms. Volumetrically speaking, it offers a large amount of space for intervention.



The void spaces of Guomao Qiao ("World Trade *Bridge*").  
Model at Beijing Planning Exhibition Hall.





Site conditions, Guomao Bridge at Beijing's CBD - a busy crossing point of multiple forms of transit





Waste space at Guomao Bridge. Photos by author.

## **Platforms for the Thesis Program**

### I. Beijing's Green Movement Plan

The city government of Beijing has begun to understand the problems which are rising out from its transportation system, and is finally promoting planning policies to increase bicycle use. In March of 2010, Beijing instituted the "Green Movement Plan", an initiative with the goal of increasing the current usage ratio of bicycles from 19.7% to 25% by 2015.<sup>10</sup> Part of this plan will be to create a bike-hire scheme, similar to systems such as Paris's Velib as well as many others in Europe and North America.

The thesis will take this plan as a platform for the project. The plan indicates that the government is now interested in the promotion of bicycling, therefore providing a opportunity for an architectural proposal which would be supplemental to this plan, or possibly incorporated into it. Thus far the Green Movement Plan only calls for a bike-hire scheme, which addresses a quantitative need, but does not yet address Beijing's current cultural stigmas toward cycling versus driving. This is where an additional project needs to occur - to provide an additional "facility" which will catalyze a shift in the culture, which is what this thesis will try to accomplish.

Furthermore, the thesis will expand upon the bike-hire scheme by designing the architectural program to be fully integrated into this idea from a lifestyle point of view. Specifically, it will ask: how can the lifestyle needs of the white-collar commuters become part of a larger rental system? It will propose to go beyond bicycle rental and have the commute center include suit, suitcase, laptop rental as well. The building will therefore become a bicycle commuter's rental center.





北京當局希望到2015年能有20萬輛以自行車為主要交通工具。(法新社)

# 北京 重塑自行車文化

Pedalling around Beijing is a daily struggle for retired Dai Haijing, with more than four million cars clogging the streets of the Chinese capital, but she remains faithful to her two-wheeler.

在北京騎自行車是退休人士戴海靜每天必修的「苦行」，因為有超過400萬輛汽車塞滿首都街道，但她依然忠於自己的兩輪車。

Dai is a member of Friends of Nature, a non-governmental organisation which advocates clean public transport, especially over short distances. For Dai, pedal power is the perfect solution for Beijing, but drivers do not agree.

戴海靜是「自然之友」成員，該組織致力於使用乾淨的公共運輸，特別是短距離時。在戴看來，自行車是北京的完美解答，但汽車駕駛人不同意。

In the 1980s, as China launched its pivotal economic reforms, eight out of every 10 Beijingers used bicycles as their primary mode of transport. Today, that rate has dropped to less than two out of 10.

1980年代，中國展開重要的經濟改革時，北京市每10個人裡有8人以自行車為主要交通工具。今天，這個比率已降不到二成。

Once commonplace images of thousands of cyclists ringing their bells at Beijing intersections have been replaced by mammoth traffic jams and baring horns, as the city's increasingly affluent middle classes embrace the auto.

成千上萬自行車騎士在北京十字路口被車陣堵得無從發聲，隨著愈來愈富裕的北京中產階級擁抱汽車，這個景象已與交通大打結和響亮喇叭的汽車聯名取代。

With road congestion and air pollution ever worsening, local officials are trying to revitalise Beijing's once-thriving bicycle culture by offering a share-hire scheme, similar to those seen in Europe.

由於道路擁擠和空氣污染日益惡化，地方官員正企圖重新營造盛極一時的北京自行車文化，提出類似歐洲的自行車租賃計畫。

Beijing is a perfect city for cyclists because it's flat, even if searing summer temperatures and icy winters can make riding a bit trying at times.

北京是自行車騎士的理想城市，因為北京地勢平坦，即使夏天氣溫灼人，冬季寒冷冰凍，騎車有時變得有點艱難。

Then in early January, the city adopted the "Green Movement" plan, with the goal of putting nearly a quarter of the city's 17-million-strong population on bicycles by 2015, against 19.7 percent currently.

今年1月初，市府實施「綠色出行」計畫，目標是使北京1700萬人口的將近四分之一在2015年時騎自行車，目前比例為19.7%。

The bike-hire scheme, launched in early March, is part of that plan. Users apply for a swipe card, which they can use to access bicycles at neighbourhood kiosks near subway stations and key residential buildings.

這項計畫的一部分，使用者申請磁卡後，可在地鐵站及主要住宅大樓附近租賃站租用自行車。

The first 20 hours of use are free. After that, a fee of 200 yuan must be paid to get another card.

前20小時租車免費，之後須付200元人民幣取得新卡。



北京一處自行車租賃站停滿了大量自行車。(法新社)

however far from won. Previous bicycle-hire schemes failed, and in a fast-growing China, cars are more than a means of transport — they are a status symbol and a sign of economic success.

但自行車的戰鬥計畫還沒贏。過去在成長快速的中國，汽車不止是交通工具，也是地位象徵和象徵成功的標誌。

The battle of the bikes is however far from won. Previous bicycle-hire schemes failed, and in a fast-growing China, cars are more than a means of transport — they are a status symbol and a sign of economic success.

By 2015, authorities say they hope to have about 1,000 kiosks offering 50,000 bikes for rent.

當局說，到2015年希望能有約1000個租賃站提供5萬輛自行車讓人租用。

**詞解**

- 1 mode of transport 交通工具
- 2 revitalise 重振、復興
- 3 trying 痛苦的、難熬的

# 巴黎 推銷公用自行車

Paris wants to nearly double its network of bicycle paths and open up routes to the suburbs under a new plan unveiled recently by Socialist Mayor Bertrand Delanoë.

根據社會黨市長貝特朗德蘭最近宣布的新計畫，巴黎將把自行車道網

總增加一倍，並開放通往郊區的路線。

Delanoë turned the city of lights into a city that bikes when he introduced the "Velib" bicycle rental scheme in 2007, providing residents and tourists with an eco-friendly mode of transport to cut down car use.

戴拉諾2007年引進「Velib」自行車租賃計畫，提供市民及遊客環保的交通工具，減少汽車的使用，把「光之城」變成「單車之城」。

Paris city council will soon vote on increasing the number of bicycle paths, from the current 440 kilometres to 700 kilometres, by 2014.

巴黎市議會不久將進行表決，在2014年把自行車道從目前的440公里延長為700公里。

Under the plan, cyclists will be allowed to whizz both ways down one-way streets that have a speed limit of 30 kilometres per hour and 1,000 new bicycle parking spots will be built.

根據計畫，自行車騎士可在限速30公里的單行道雙向行進，並將興建1000個自行車停車位。



有人在租賃站租用自行車。(網路圖片)

Ten new entry points will be created for cyclists from the suburbs who want to pedal into the city.

市府將興建10個新入口，供想騎車進市區的郊區自行車騎士使用。

A citizens' association however roared with scepticism to the plan.

「這些措施有的從2002年就決定的，卻一直沒實施。」鼓吹輕便單車環境的協會成員杜魯瓦說。

"We are happy to see that a bike plan is finally emerging, but it really lacks ambition," said Green politician Sylvain Garel.

"We want bicycles to become the prime mode of transport for Parisians and visitors to the city."

「我們很讚賞新自行車計畫終於出現，但它在雄心壯志。」綠黨政治人士賈爾說：「我們希望自行車成為巴黎人和遊客的主要交通工具。」

The push by Paris authorities to make way for pedal power in the city has not been without its share of problems.

巴黎當局推動在都市讓路給自行車，並不是沒有發生問題。

Last year, the city was forced to replace the entire fleet of 20,000 bicycles from its rental



巴黎公用自行車停放在街角華人租車處。(法新社)

Article announcing Beijing's Green Movement Plan (World Journal, July 2010)

10 "Beijing Re-evaluates the Significance of Bicycle Culture" (translation). World Journal. 11 July, 2010.



A bicycle collector's club gathering



Rising popularity of folding bikes

## II. The Bicycle's Changing Role in Beijing

The changing role of the bicycle in Beijing is strictly related to the changing economic status of its population. Beijing's middle class white-collar working population is growing rapidly. This is the group which is buying the cars and using them in lieu of the bicycle for their commute. Although the bicycle is rapidly declining as a tool for daily use, it is not fully disappearing. This same white-collar working population in fact is the group which keeps the bicycle alive, but simply in a different form - recreation. The interest in mountain biking, road biking for sport, collecting classic bikes, as well as trick biking are gaining momentum as hobbies of this population. In fact, many of these middle class families often have two or more bicycles per household, using them for recreational rides or for exercise. The bicycle is turning into an object for play rather than an object for function. The question will be, how can these trends be tapped into to make the bicycle become both in Beijing?

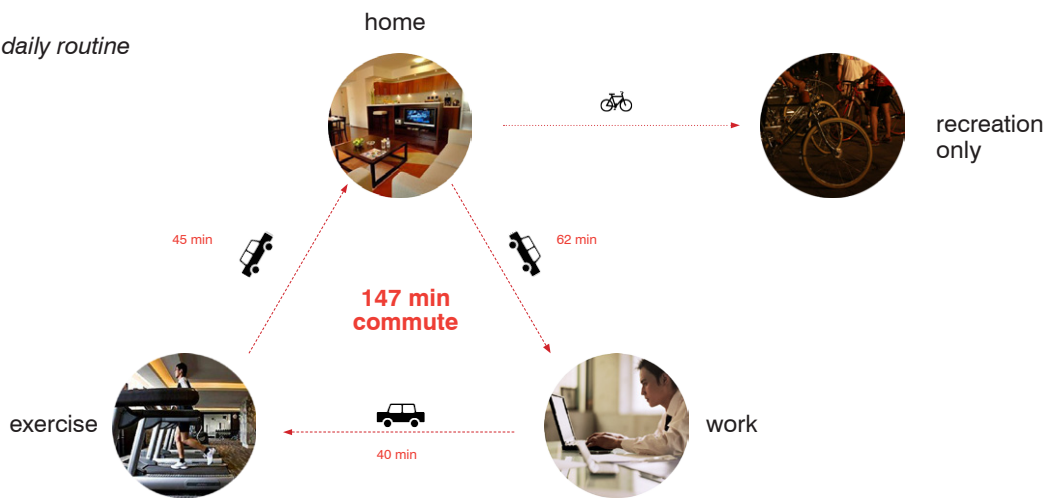
## III. The Target Audience

The thesis will look into ways to tap into these popular cultures to generate a set of programs to encourage commuting by bike. The specific target audience of this thesis will be the growing white-collar, middle and upper-middle class of Beijing. This is the population making the biggest impact in vehicle growth and bicycle decline, and is also the population which is generating a new type of bicycle culture in Beijing.

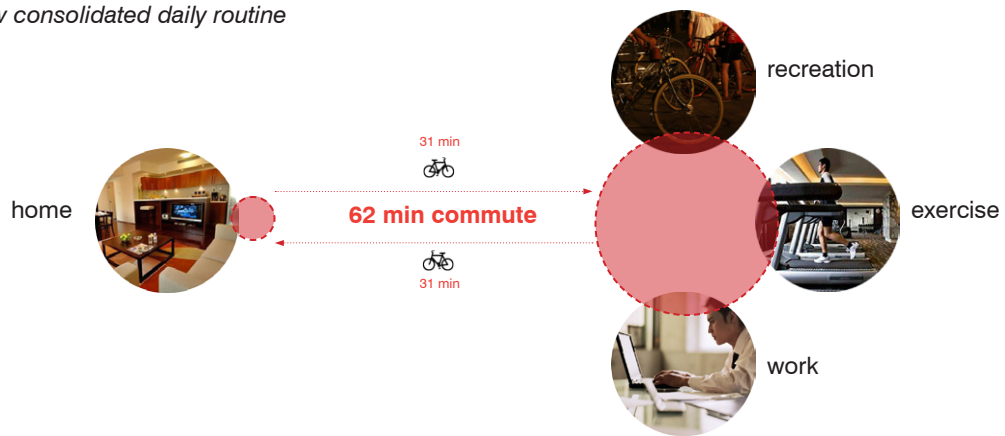
Target Audience:  
Beijing's White Collar  
Working Class



current daily routine



new consolidated daily routine



#### IV. Programmatic Proposal

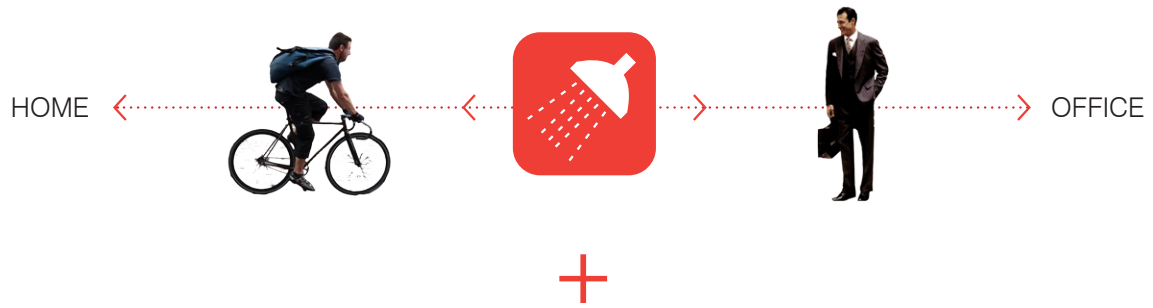
##### a. Program Concept

In order to determine an effective program for an intervention which would induce a commute shift from car to bike, both a need as well as a psychological desire for it must be created. In other words, practical issues as well as cultural issues are both necessary to be overcome.

For the target audience of white-collar workers in this project, the practical issue as to why they do not commute by bicycle rather than car is that bicycling does not allow them to look presentable for work. The physical work of bicycling and exposure to the outside environment is not conducive with customs of proper dress and presentability for work in a commercial office environment. The cultural reason that this group does not cycle to work is that they believe that cycling is an outdated form of transportation to be used only for those who cannot afford to buy an automobile.

To address these issues, the thesis will propose a bicycle commute/wellness center. That is, it will provide a built facility for the target audience of white-collar workers to park their bicycles securely and shower/change for work, but will go beyond this to make it into a communal node with various supporting programs to promote bicycling not just as a mode of transportation, but as a lifestyle. Therefore, it will take the basic requirement of a shower/locker space as a starting point to create a wellness center which these commuters can use for daily exercise, informal meetings, refreshment, relaxation, and provide spaces for them to come together over shared interests in relation to cycling.

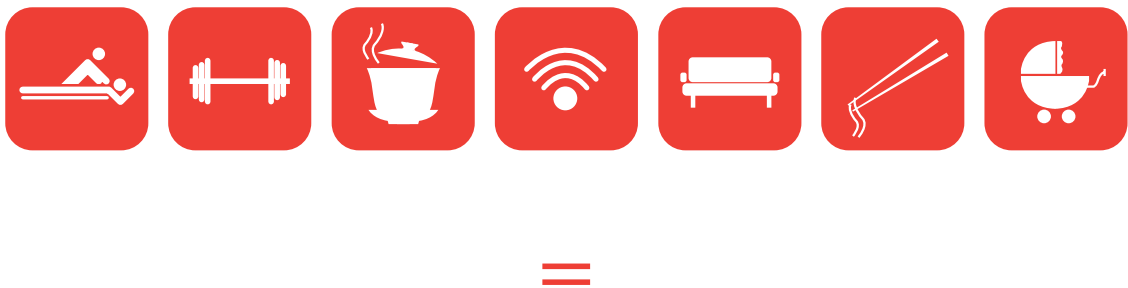
The fundamental practical programmatic need:



Programmatic needs related to cycling:



Programmatic needs related to a commuter's lifestyle:



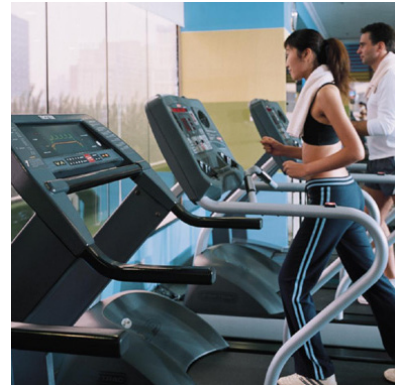
[ A COMMUNAL WELLNESS CENTER FOR BICYCLING COMMUTERS ]

#### b. Breathing new life into old Beijing programs

The thesis looks to traditional programs of daily life of Beijing in order to inform new programs for the bicycle center. Many programs which created a convenient, healthy, and communal lifestyle have been on the decline due to the rise of the car. These include the traditional Beijing bathhouse, corner barbers, bicycle repairmen, vendors, bicycle couriers, and most notably, small-scale public spaces where people gather for informal activities such as tai-chi, dancing, and performances. These programs used to be common and were reinforced by the bicycle's ability to carry people rapidly through small spaces and quick stops.

The thesis proposes that the wellness center bring back these programs in modern form, and rebrand their image to what the middle and upper class in Beijing desires - an image of luxury and exclusivity. The wellness center will therefore be a membership-based prototype initially, attracting the wealthier people to participate, and creating desire in the other economic classes to follow. The center will provide all the comforts and conveniences that existed as part of common Beijing life, and brand it as something exclusive and special. Over time as the network grows, these programs will naturally become the norm, along with bicycle commuting.





Old concept of wellness:

Traditional communal bathhouses of Beijing

(Source: <http://www.chinaexpat.com/2008/08/04/five-un-olympic-activities.html/>)

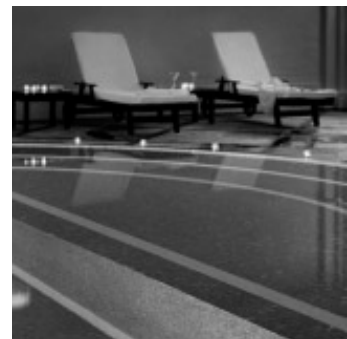
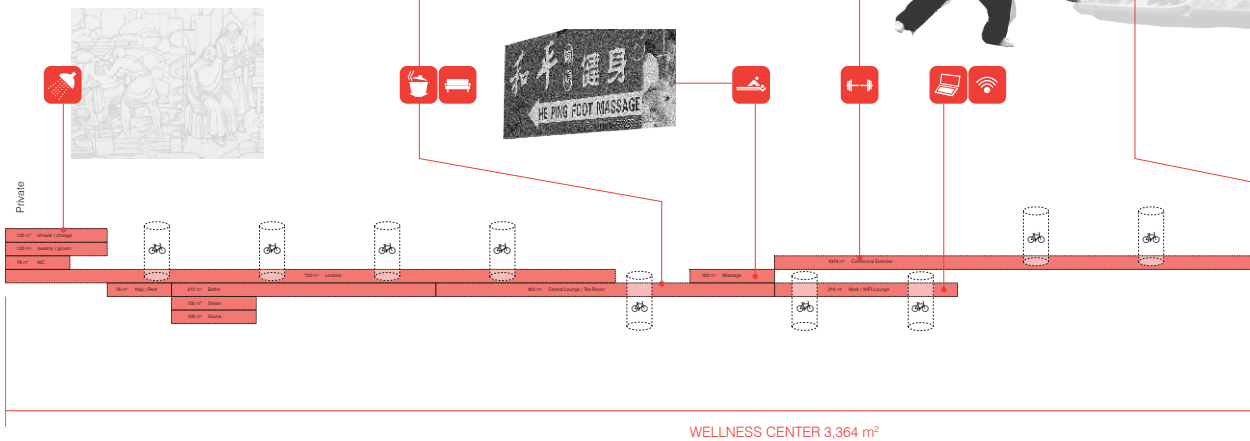
New concept of wellness:

Exclusive fitness centers

(Source: <http://www.ritzcarlton.com/en/Properties/Beijing/Spa/FitnessCenter.htm>)

*Can continuities between traditional programs and new programs in Beijing be established?*

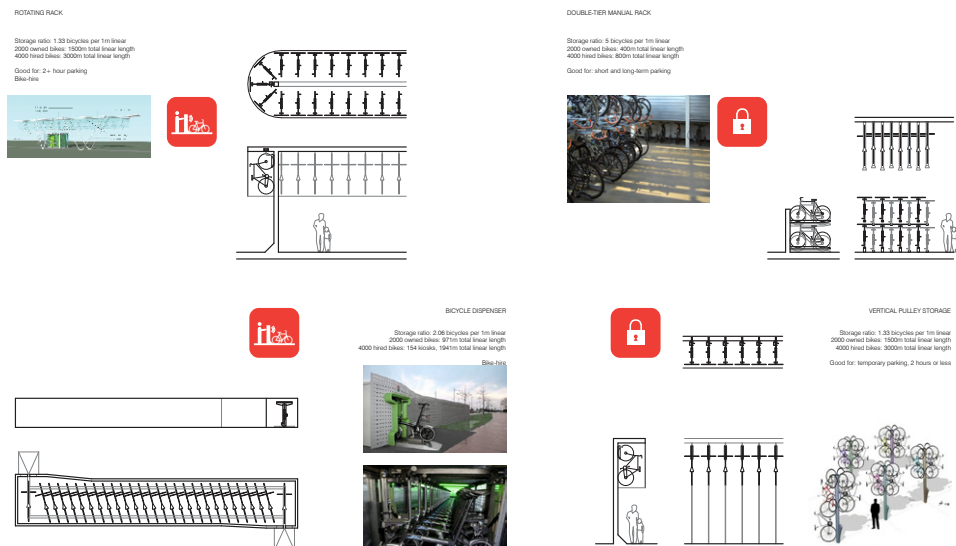
## TRADITIONAL PROGRAMS





## V. Storage Analysis

In addition to programs for the wellness center, storage of bicycles will be an equally significant component of this new building typology. Per the Green Movement Plan which targets 25% bicycle usage in the city by 2015, there will need to be approximately storage for 7000 bicycles at the Guomao Bridge site alone. Due to this large number that needs to be accommodated, various forms of storage must be explored for their density and accessibility. The main storage typology chosen for the thesis is the bicycle tower, which can store 200 bicycles per tower, which amounts to 35 towers over the site.

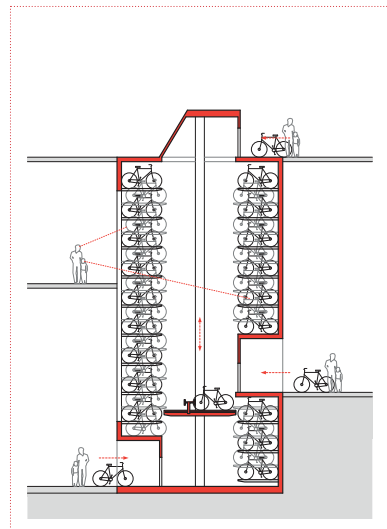
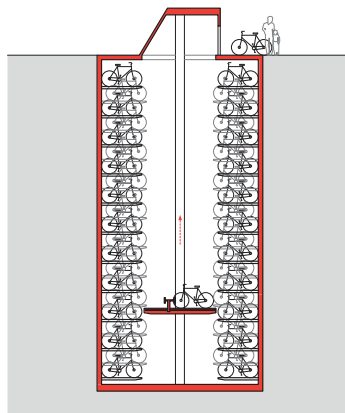
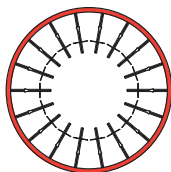
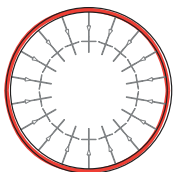


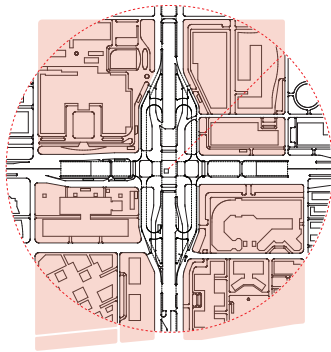
In order to make the bike tower perform more than just storage, the thesis proposes that it be lifted out of the ground and have multiple access points at various levels. This will allow the tower to integrate into vertically stacked programs. The intention is also to make the tower a spectacle which will become part of the experience of the new bicycle center.

BICYCLE STORAGE TOWER

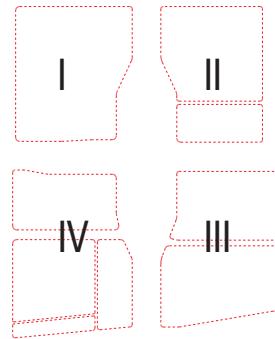
Storage ratio: 200 bicycles per 7m dia. x 15 m high tower  
 2000 covered bikes, 10 levels  
 4000 total bikes, 20 levels

Good for 24-hour parking, long-term storage





Major developments within 5-minute walking radius (400m)



Four zones of nearby development



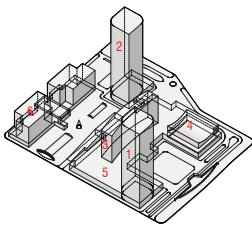
BEIJING'S GOAL BETWEEN 2010 TO 2015:  
INCREASE BICYCLE USAGE

EXISTING, 2010 **19%** → **25%** FUTURE, 2015  
of the population

### Bicycle Commute Center Storage and Bike-Hire Requirements Analysis of Guomao Bridge Area

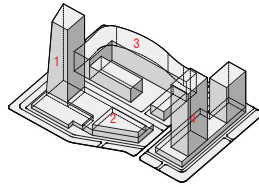
TOTAL AREAS	AREA PER PERSON	TOTAL PERSONS	GROSS BICYCLES TO ACCOMMODATE
Commercial: 751,000 m <sup>2</sup>	20 m <sup>2</sup> /employee	37,550 employees	9,388 for commuters
Residential: 236,300 m <sup>2</sup>	110 m <sup>2</sup> /avg. household of 2 commuting residents	4,296 commuting residents	1,074 for commuting residents
Hospitality: 285,400 m <sup>2</sup>	30 m <sup>2</sup> /avg. room of 1.6 guests	15,221 guests	3,806 for guests
Retail: 189,900 m <sup>2</sup>	3.84 m <sup>2</sup> /shopper in one day	49,453 shoppers daily	12,364 for shoppers daily
Ephemeral Program: 70,100 m <sup>2</sup>	6 m <sup>2</sup> /visitor in one day	11,683 visitors daily	2,921 for visitors daily

**118,203**  
people



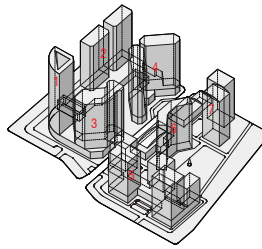
I

- 1 Beijing World Trade Center Tower 1  
39 floors  
Commercial: 39 flr x 2000 m<sup>2</sup>/flr = 78,000 m<sup>2</sup>
- 2 Beijing World Trade Center Tower 2  
39 floors  
Commercial: 39 flr x 2000 m<sup>2</sup>/flr = 78,000 m<sup>2</sup>
- 3 China World Hotel  
13 floors  
Hospitality: 17 flr x 2900 m<sup>2</sup>/flr = 44,200 m<sup>2</sup>  
Ephemeral Program: 1 flr = 6,000 m<sup>2</sup>
- 4 China World Exhibition Hall  
1 floor  
Ephemeral Program: 10,000 m<sup>2</sup>
- 5 China World Mall  
3 floors  
Retail: 60,000 m<sup>2</sup>
- 6 Traders Hotel  
12 floors  
Hospitality: 11 flr x 5400 m<sup>2</sup>/flr = 59,400 m<sup>2</sup>  
Ephemeral Program: 1 flr = 6,200 m<sup>2</sup>/flr



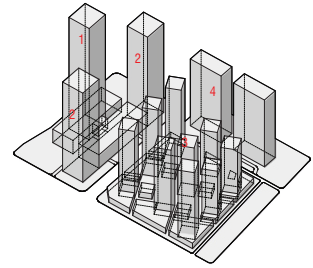
II

- 1 Future mixed-use tower  
24 floors  
Commercial: 20 flr x 1900 m<sup>2</sup>/flr = 38,000 m<sup>2</sup>  
Hospitality: 14 flr x 1900 m<sup>2</sup>/flr = 26,600 m<sup>2</sup>
- 2 Future mixed-use development  
6 floors  
Retail: 3 flr x 11100 m<sup>2</sup>/flr = 33,300 m<sup>2</sup>/  
Ephemeral Program: 3 flr x 11100 m<sup>2</sup>/flr = 33,300 m<sup>2</sup>
- 3 Future mixed-use development  
11 floors  
Commercial: 7 flr x 12000 m<sup>2</sup>/flr = 84,000 m<sup>2</sup>  
Retail: 4 flr x 12000 m<sup>2</sup>/flr = 48,000 m<sup>2</sup>
- 4 Future mixed-use development  
22 floors each avg. (2 towers)  
Commercial: 18 flr x 1800 avg. m<sup>2</sup>/flr = 32,400 m<sup>2</sup>  
Retail: 4 flr x 1800 avg. m<sup>2</sup>/flr = 7,200 m<sup>2</sup>



III

- 1 China Merchants Tower  
32 floors  
Commercial: 29 flr x 1600 m<sup>2</sup>/flr = 44,200 m<sup>2</sup>  
Retail: 3 flr x 1600 m<sup>2</sup>/flr = 4,800 m<sup>2</sup>
- 2 Mapletree House towers  
24 floors each (2 towers)  
Commercial: 48 flr x 1150 m<sup>2</sup>/flr = 55,200 m<sup>2</sup>
- 3 Beijing Exchange Tower  
26 floors  
Hospitality: 24 flr x 2500 m<sup>2</sup>/flr = 60,000 m<sup>2</sup>  
Ephemeral Program: 2 flr x 2500 m<sup>2</sup>/flr = 5,000 m<sup>2</sup>
- 4 The Ascott Beijing  
26 floors each (2 towers)  
Hospitality: 28 flr x 1400 m<sup>2</sup>/flr = 39,200 m<sup>2</sup>  
Residential: 30 flr x 1400 m<sup>2</sup>/flr = 42,000 m<sup>2</sup>  
Ephemeral Program: 4 flr x 1400 m<sup>2</sup>/flr = 5,600 m<sup>2</sup>
- 5 Raise Plaza towers  
20 floors each avg. (5 towers)  
Commercial: 74 flr x 700 avg. m<sup>2</sup>/flr = 51,000 m<sup>2</sup>  
Hospitality: 20 flr x 700 avg. m<sup>2</sup>/flr = 14,000 m<sup>2</sup>  
Retail: 6 flr x 700 avg. m<sup>2</sup>/flr = 4,200 m<sup>2</sup>
- 6 China Aviation Tower & Exhibition Hall  
23 floors  
Commercial: 23 flr x 1400 m<sup>2</sup>/flr = 32,300 m<sup>2</sup>  
Ephemeral Program: 4,000 m<sup>2</sup>
- 7 Residential towers



IV

- 1 Yintai Center Tower 1  
62 floors  
Hospitality: 24 flr x 1750 m<sup>2</sup>/flr = 42,000 m<sup>2</sup>  
Residential: 38 flr x 1750 m<sup>2</sup>/flr = 66,500 m<sup>2</sup>
- 2 Yintai Center twin towers  
45 floors each  
Commercial: 90 flr x 1750 m<sup>2</sup>/flr = 157,500 m<sup>2</sup>
- 3 Jianwai SOHO residential development  
24 floors each avg. (9 towers)  
Residential: 180 flr x 500 m<sup>2</sup> = 90,000 m<sup>2</sup>  
Retail: 36 flr x 500 m<sup>2</sup> = 18,000 m<sup>2</sup>
- 4 Jianwai SOHO twin towers  
32 floors each (2 towers)  
Commercial: 56 flr x 1800 m<sup>2</sup>/flr = 100,800 m<sup>2</sup>  
Retail: 8 flr x 1800 m<sup>2</sup>/flr = 14,400 m<sup>2</sup>

SUBTRACTING FACTORS

- 15% office vacancy rate - 15% telecommute
- 816 park bikes at home - 15% housing vacancy rate - 15% telecommute
- ... - 50% hotel-provided bicycles
- 80% overlap with other programs and short-term stay considerations
- 80% overlap with other programs and short-term stay considerations

ACTUAL BICYCLES TO ACCOMMODATE

- 6,572
- 181
- = 1,903
- 2,472
- 584

BICYCLE TYPE SPLIT TO PROVIDE: OWNED VS. HIRED

- 40% Owned: 2,630      60% Hired: 3,943
- 0% Owned: 0          100% Hired: 181
- 0% Owned: 0          100% Hired: 1,903
- 40% Owned: 989      60% Hired: 1,483
- 10% Owned: 58        90% Hired: 526

3,676 owned bikes      4,018 rental bikes

## VI. A Kit of Parts for the Creation of a Network

The initial approach to the project was to generate a 'kit of parts', a set of urban instruments which would be inserted into the city and create a networked system to facilitate bicycle transit. The kit of parts will occur at three scales: street furniture, urban transit node, and bicycle / community center. These three scales are necessary for the system to be able to address the programmatic needs of cycling in various conditions of the city. The smaller scales will provide intermediate support, while the large scale will act as a hub of concentrated bicycle activity, located at key traffic locations in the city. The original site chosen to test this kit of parts was the Dongzhimen area of Beijing, as it incorporated a part of a highrise business district and a contrasting neighborhood of low hutong housing.

The intent of the project will not be to fully design a complete bicycle network, but will instead focus on producing this kit of parts of architectures which are geared toward providing programs and experiences to provide incentives for the choice of bicycle transit on an individual level. The goal will be to satisfy commuter needs which are lacking, and to generate a new excitement for cycling which currently does not exist. The hope is that this strategy will trigger a bottom-up urban planning effect in which the city will recognize a new growing trend of cycling and provide resources to further it.





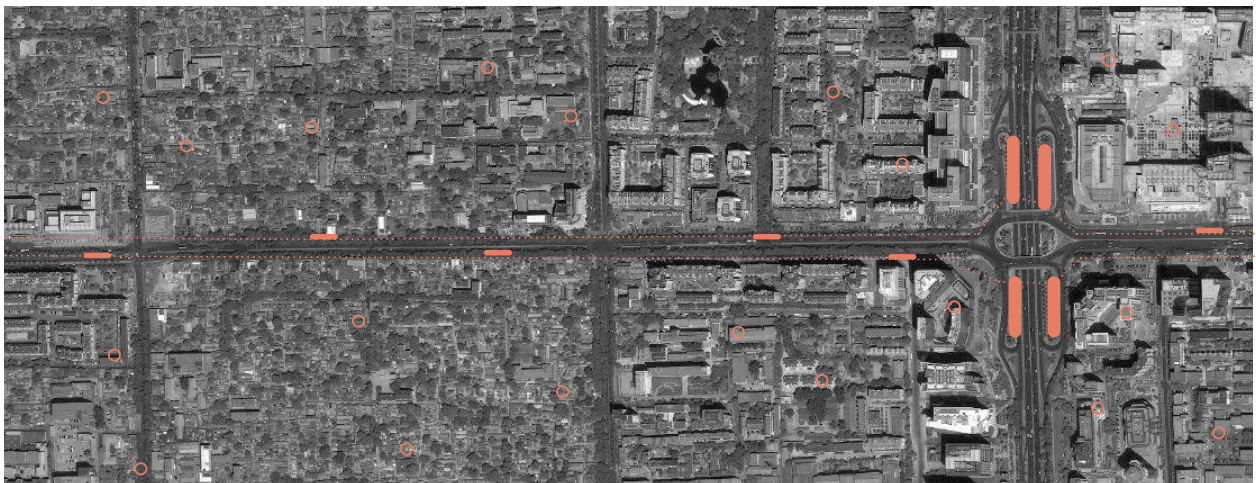
*a. street furniture - narrow alleys*



*b. urban transit node - bus station*



*c. bicycle community center - interstitial spaces underneath the highways*



Schematic map of a distributed "kit of parts"

#### Part a - Street furniture

This scale will accommodate the very basic needs of bicycles - secure locking and simple shelter. It will also provide maps and information for user reference. Furthermore, this would be designed as a modular system, which could be expanded or reduced based on the amount of available space and the demand for spaces.

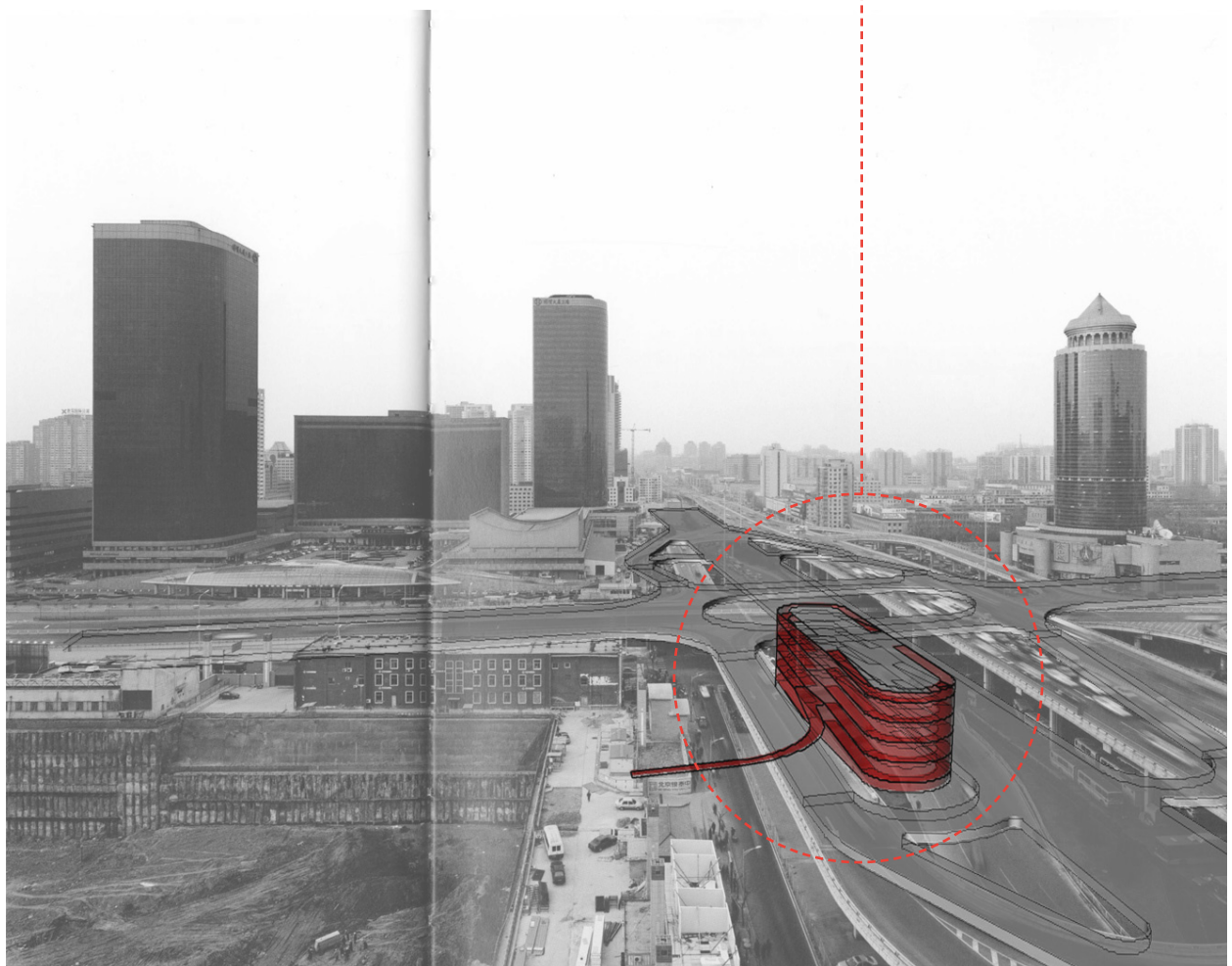
#### Part b - Urban Transit Node

This scale will combine bicycle transit with other forms of transit such as the Bus Rapid Transit lines which exist in Beijing. The design exercise imagines a bus shelter which incorporates an animated method for storing bicycles. It simultaneously incorporates lockers, seating, vending, digital information, advertising, and shelter all into one modular system. The idea is that one consistent construction method be set up to make this object adaptable to different sites yet recognizable as part of a larger system of nodes. It also incorporates a rotating bicycle storage system as a method for aestheticising the bicycles and making them iconic in the city.

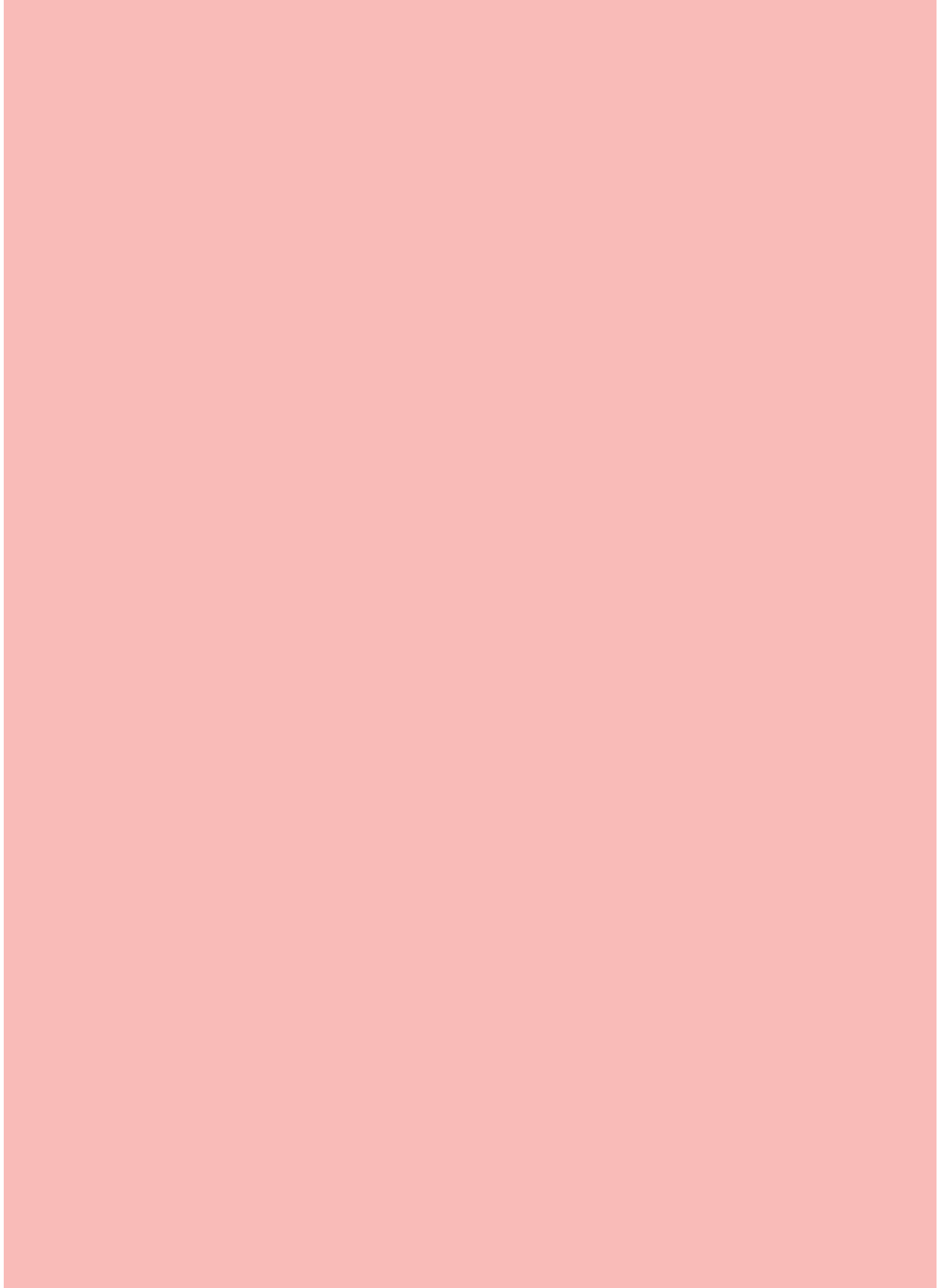


### Part c - Urban Cycle Center Prototype

This will be the focus of the thesis proposal as described by the program and site analyses prior, and is described architecturally in the section that follows.



C



# ARCHITECTURAL PROPOSAL

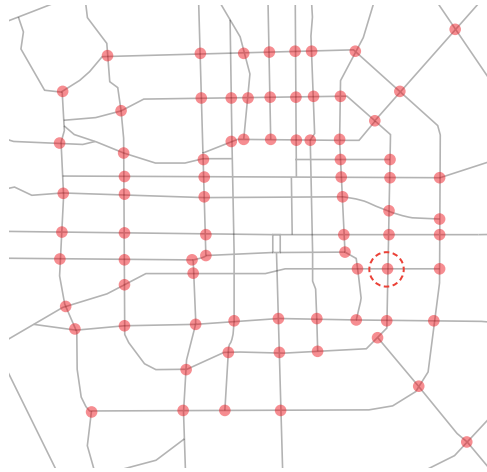


## **A Prototype Bicycle Center to Revive the Former “Bicycle Kingdom”**

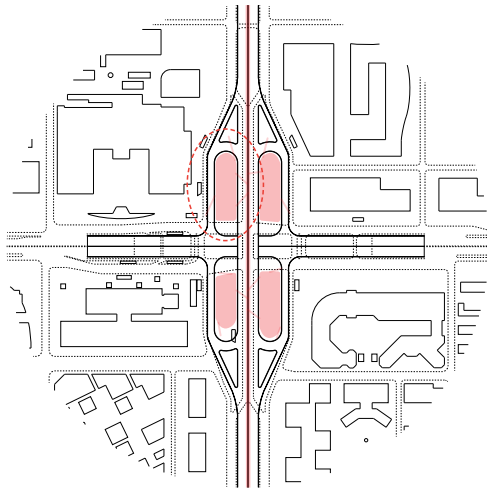
### I. A building prototype as part of a city-wide network

The architectural proposal of the thesis is a prototypical bicycle center, which is conceived as the basic programmatic component to create a greater network in Beijing. The bicycle center can take on the form of a “village”, infilling the multiple void spaces which typically exist in any of Beijing’s roadway interchanges, and can expand to a city-wide system, connecting where people live to their workplaces, which are all concentrated along these roadway interchange nodes in the city.

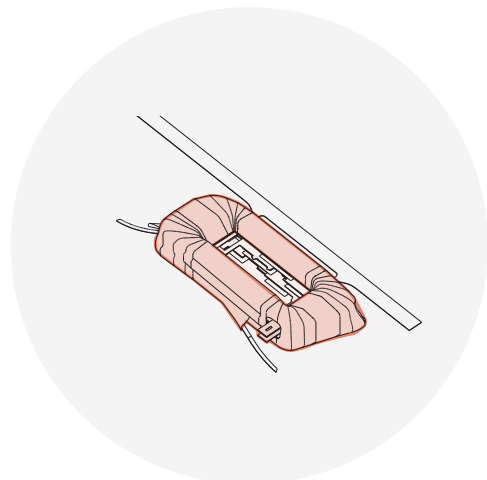
In order for this typology to be replicated at various sites in the city to create this larger network, it will be a modular system which is made of components which can be easily adaptable to various site conditions. The thesis will develop a building system of key components which can be fit to any of Beijing’s “bridges” and function at full capacity.



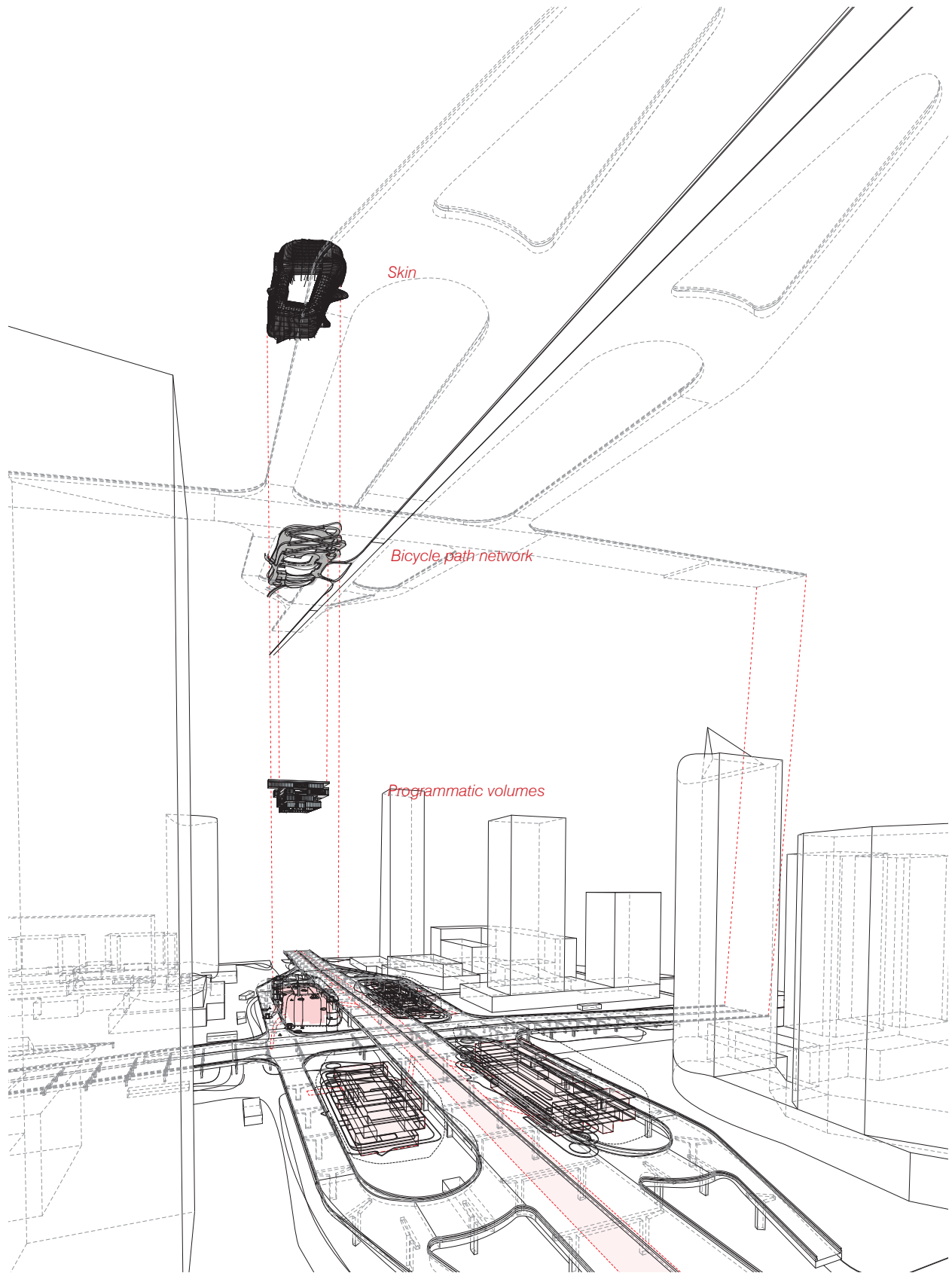
City-wide network



"Village" condition



Bicycle Center



Exploded perspective line drawing of prototype at Guomao Bridge site

## II. The Bicycle Center

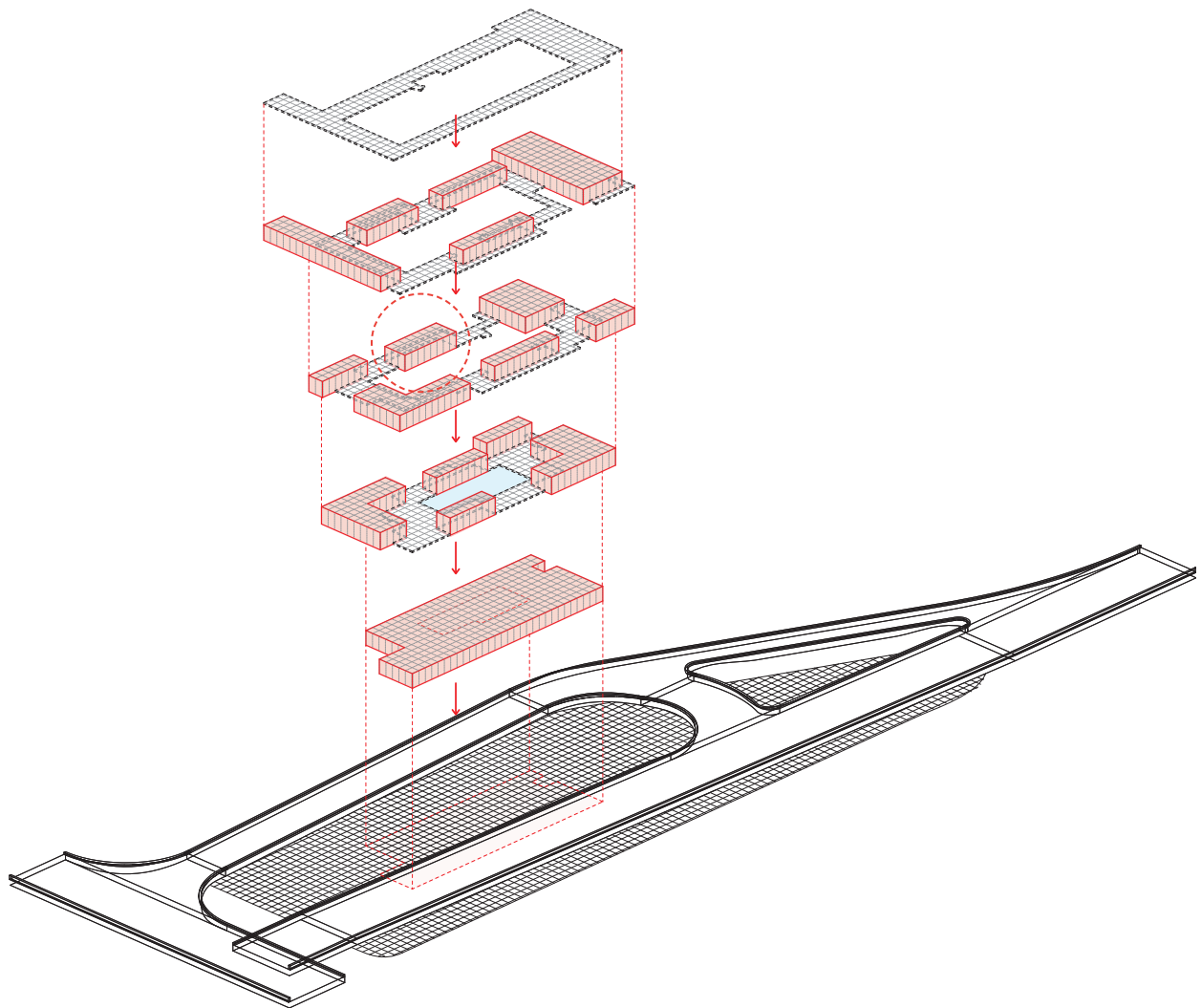
### a. Key Components

The bicycle center itself will be composed of three key parts: the programmatic volumes at its core, a surrounding bicycle path network, and a protective skin.

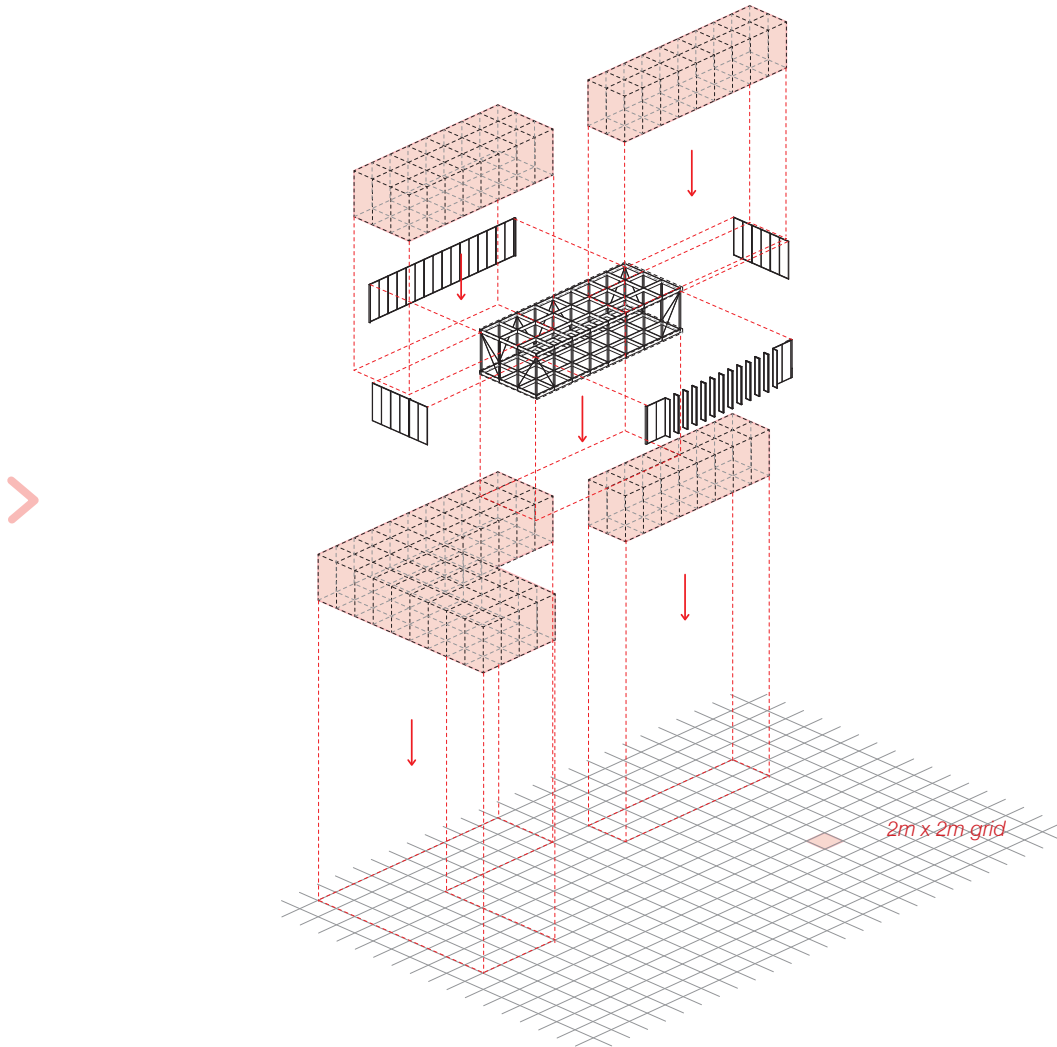
The programmatic volumes hold not only the programs described in the previous sections, but also create an “oasis”, a place in the busy city for refuge and retreat.

The bicycle path network surrounds the programs and services it, and connects to the larger system of Beijing’s streets and existing bicycle paths as well as an elevated “bicycle highway” suspended underneath the “Bridge”.

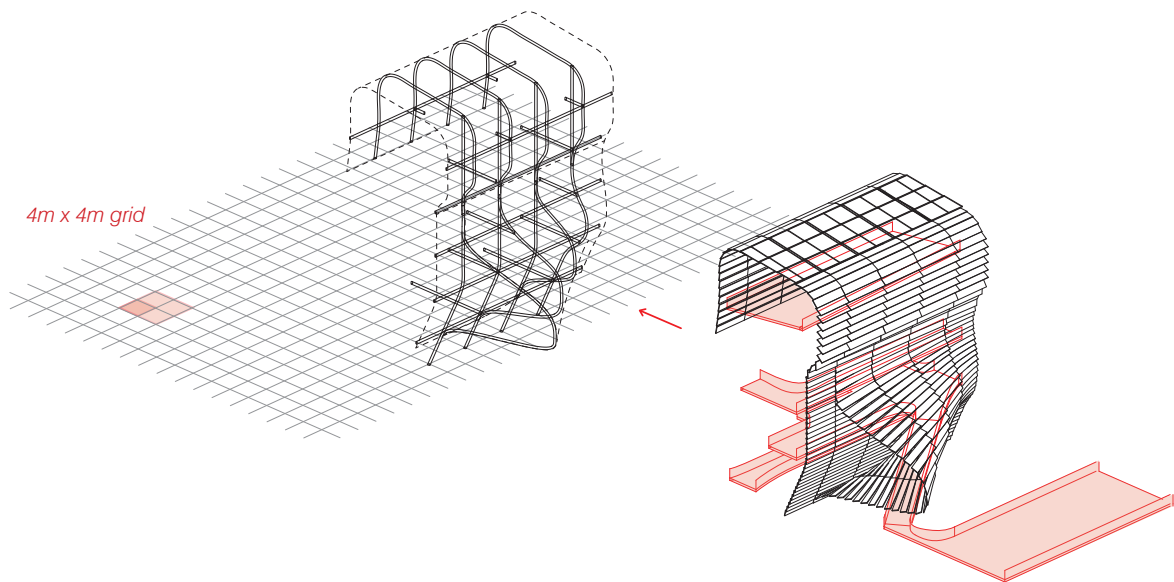
The skin serves as a protective surface against the hectic site. It also serves as a generator for energy for the bicycle center, in line with the “auto”-mobile concept of self-sustainment. Finally, it handles bicycle storage for the center.



Axonometric diagram - modular stacking of all program volumes



Axonometric diagram - local stacking at one program volume showing structural grid and facade plug-in components

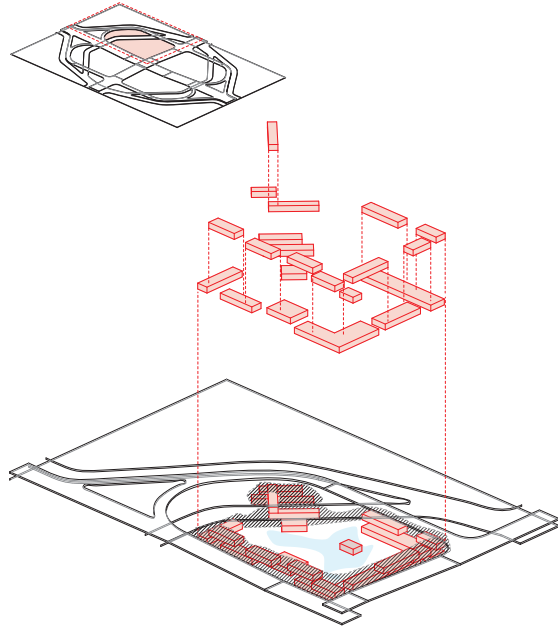


Axonometric diagram - skin assembly showing structural ribs, facade components, and relationship to bike path system

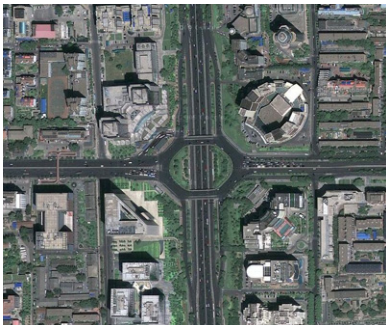




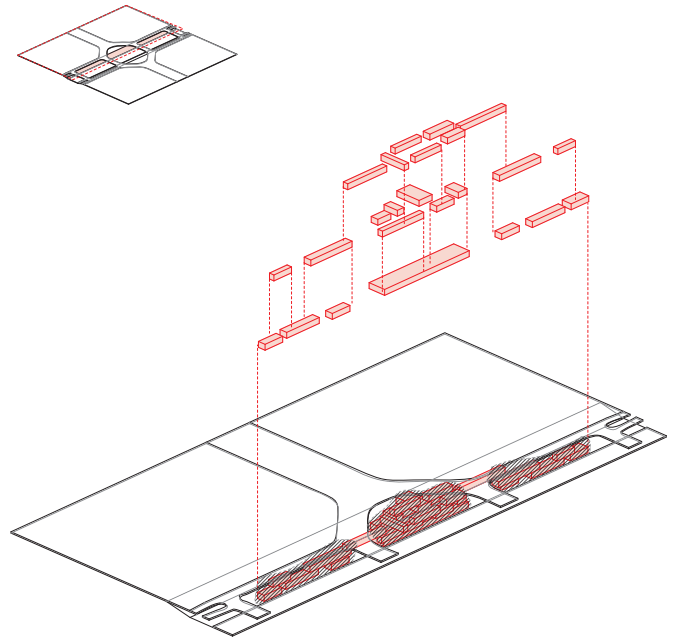
Xining Qiao/Bridge



Large park-like configuration



Dongsishitiao Qiao/Bridge



Linear configuration

#### b. The "Oasis"

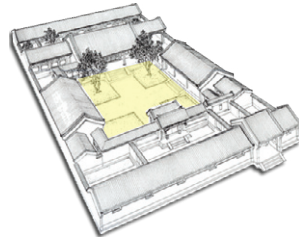
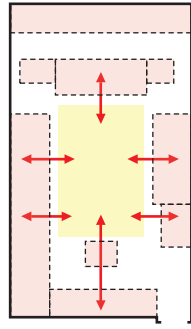
As a counterpoint to the swirling highways which surround the project site, the thesis proposes an "oasis" as the core concept of its programmatic environment. The intent is to create a place in the city for refuge and leisure away from automobiles and busy streets, which is still in close proximity to the city itself.

The thesis takes reference from Beijing and Chinese concepts of spaces of refuge and leisure in order to produce an "oasis" environment suitable for Beijing.

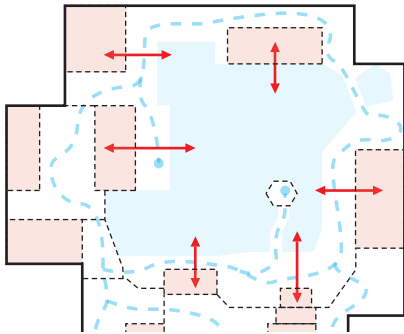
The first is the *siheyuan*, or the Beijing courtyard house, in which the rooms of the house face inward toward a central courtyard. The result is a protected outdoor "room" which is extremely quiet, open to daylight, and private.

The second is the Chinese garden. These are spaces of leisure and rest, typically dominated by a body of water in the center. A meandering pathway circumvents the body of water, serving to connect various programs with the elements of the garden, providing unique views at every turn, and various scales of interior and exterior spaces. There is also an inwardness to the garden.

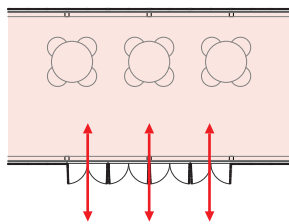
The third is a device subsidiary to both of the previous types, which is the Chinese folding screen door. It mitigates between interior and exterior space, and the repetitiveness and directionality of it emphasizes views and connections between inside and out.



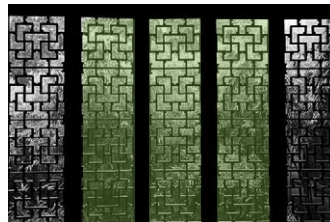
*siheyuan*  
(Beijing courtyard house)



Chinese garden



Chinese folding screen door



### c. Energy and Material Cycles

Conceptually, the building is a self-sustaining system, setting an example for an “auto”-mobile lifestyle, a term derived from the etymology of “bicycle” in Chinese, which literally means “self-mobile vehicle”. Therefore the skin is designed as not only a protective system, but one which produces energy for the bicycle center. It will do this in a highly visible manner, allowing these systems to become a spectacle of their own workings, much like the way a bicycle’s working parts are exposed and even aestheticized. These energy cycles will become part of the new cycling experience that the thesis is attempting to create for Beijing.

In addition to photovoltaics on the uppermost portions of the skin, there will be microturbines embedded along the sides of the skin which generate energy through air suction that is created by passing vehicles. The skin will bulge out to meet the highway to maximize its exposure to the moving air, as well as to expose this process of energy collection to the cars on the highway which are generating it.

Materials were chosen based on a concept about the process of cars and bikes, that discarded automobile parts should make up the skin of this building, in order to make a statement about a new transportation shift back to bicycles, and to take advantage of Beijing’s large amount of taxicabs which have been replaced since the 2008 Olympic Games held in the city.



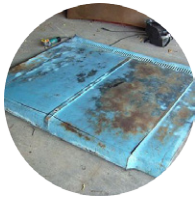
1 - Photovoltaics



2 - Microturbines



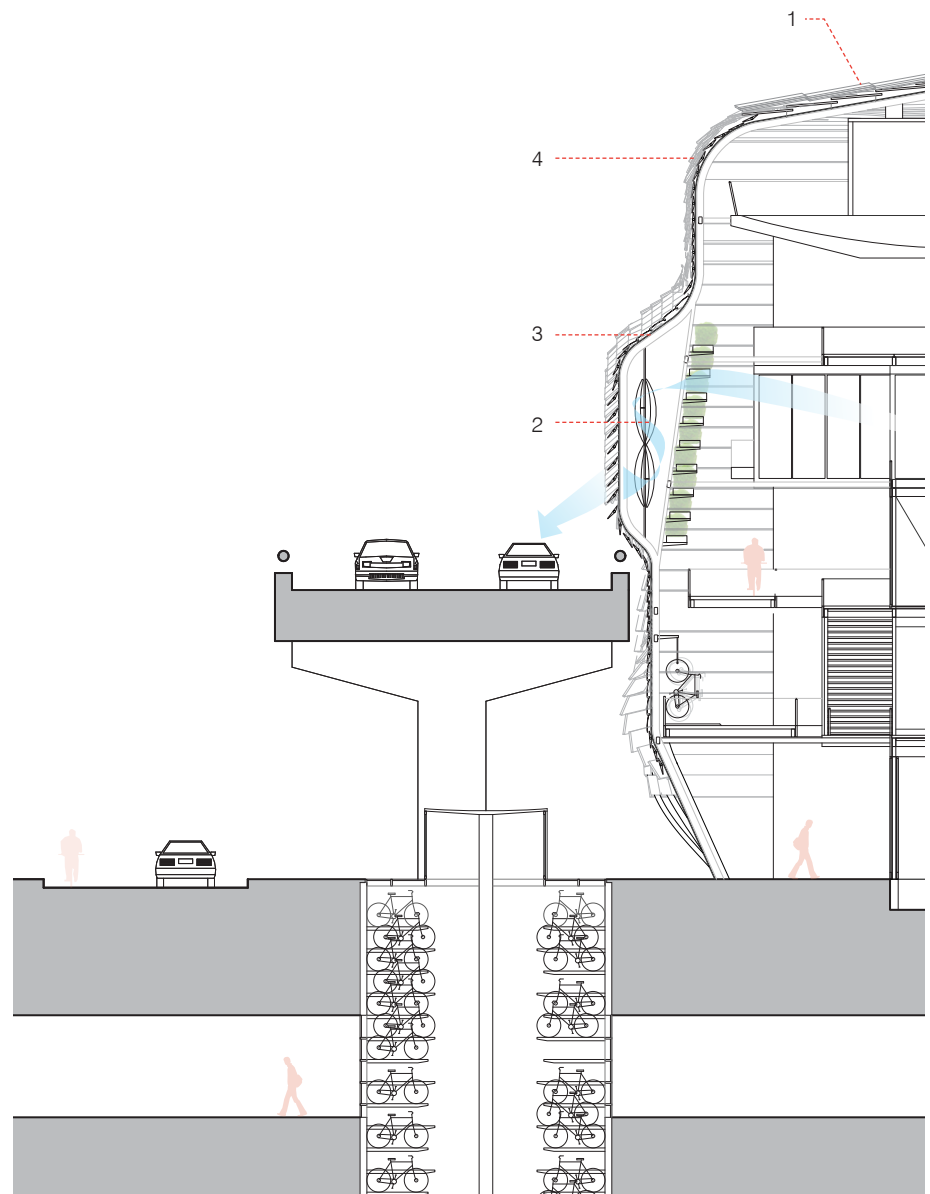
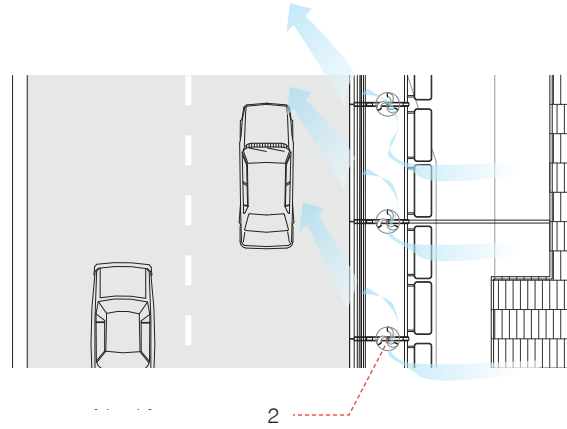
Beijing's Discarded Taxis



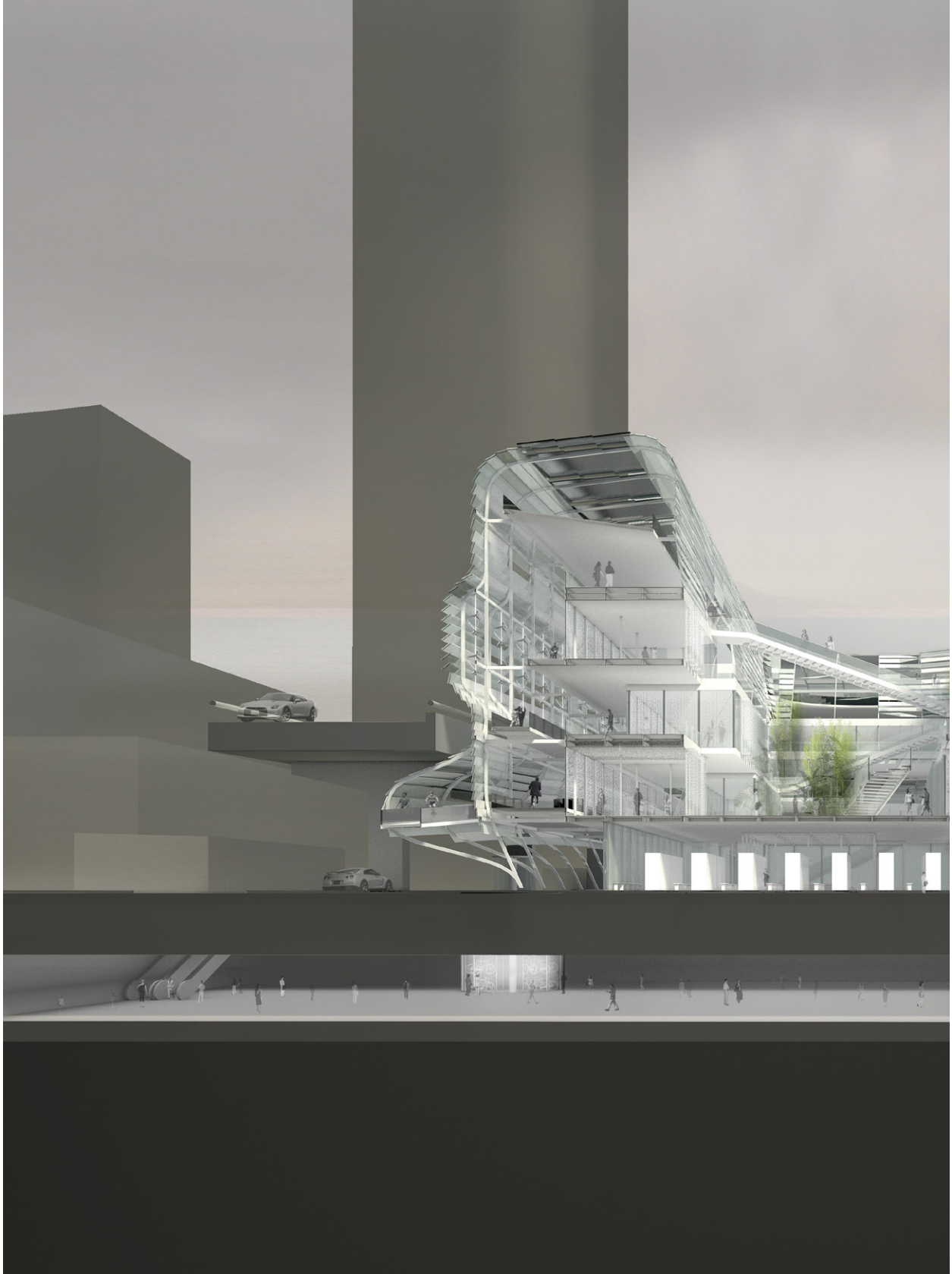
3 - Recycled Car Sheet Metal



4 - Recycled Car Glass

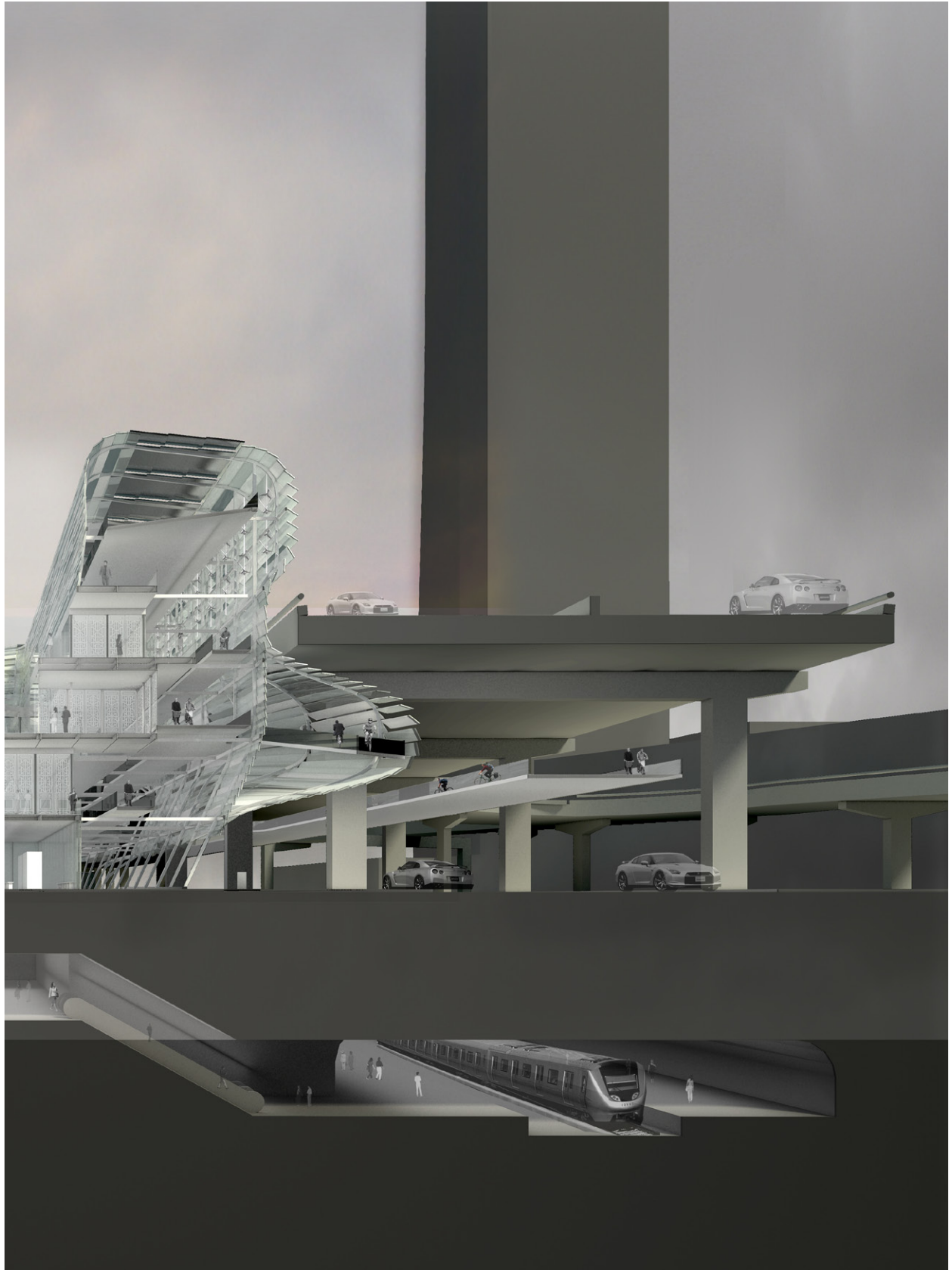


Enlarged Section - Not To Scale (NTS)

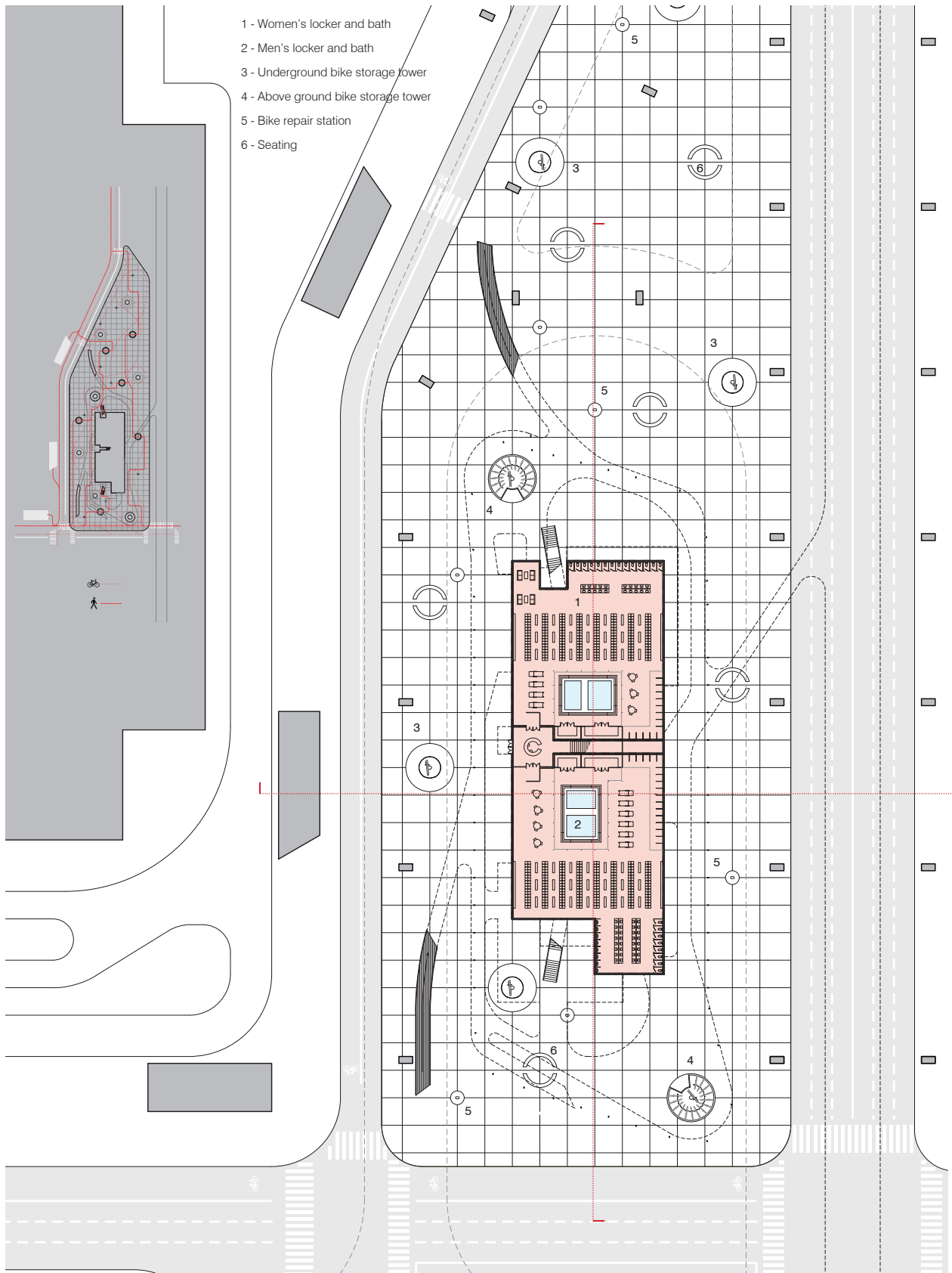


Sectional Perspective

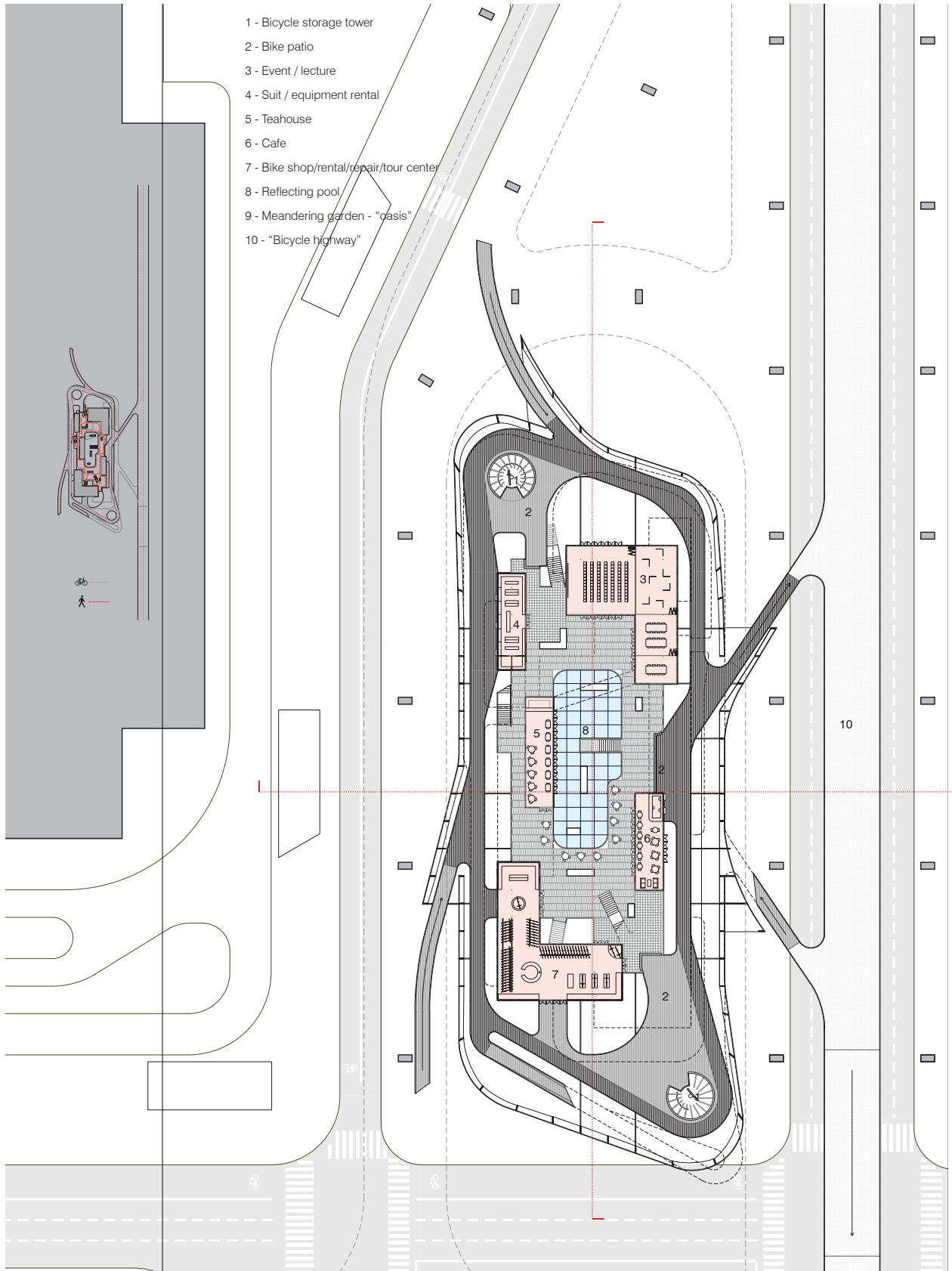




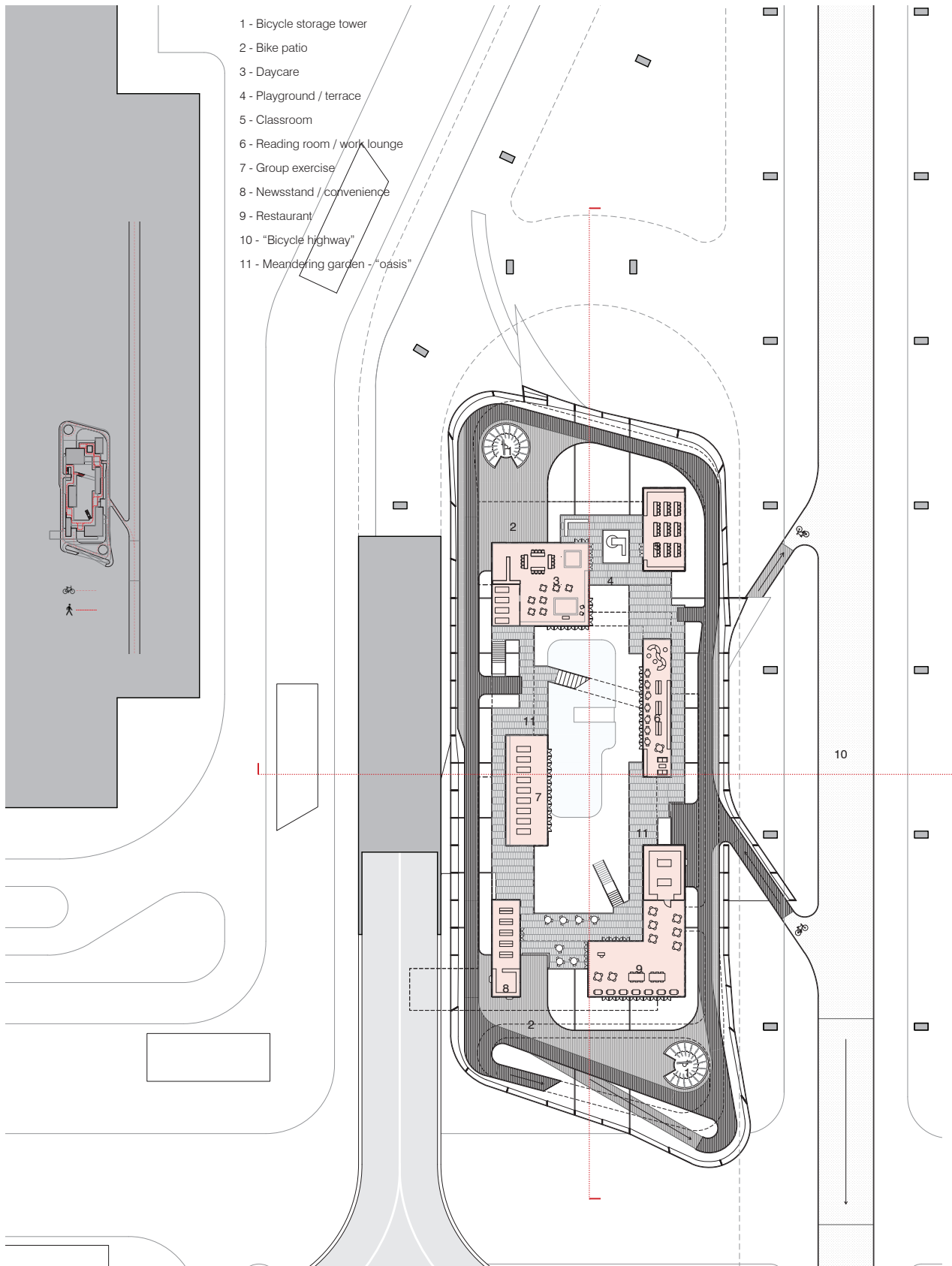




Ground Level Plan - "Bike Plaza"



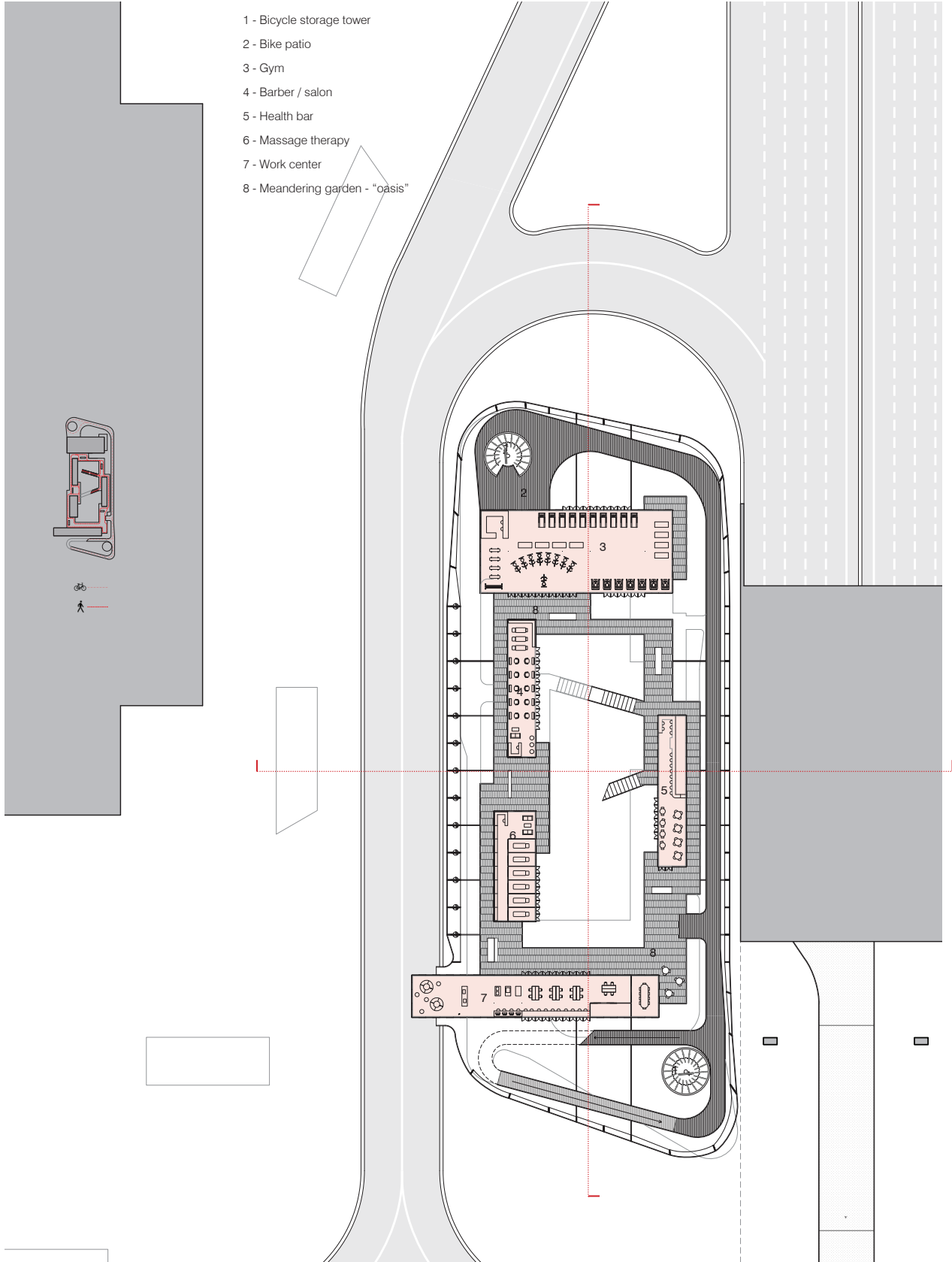
Second Level Plan



- 1 - Bicycle storage tower
- 2 - Bike patio
- 3 - Daycare
- 4 - Playground / terrace
- 5 - Classroom
- 6 - Reading room / work lounge
- 7 - Group exercise
- 8 - Newsstand / convenience
- 9 - Restaurant
- 10 - "Bicycle highway"
- 11 - Meandering garden - "oasis"

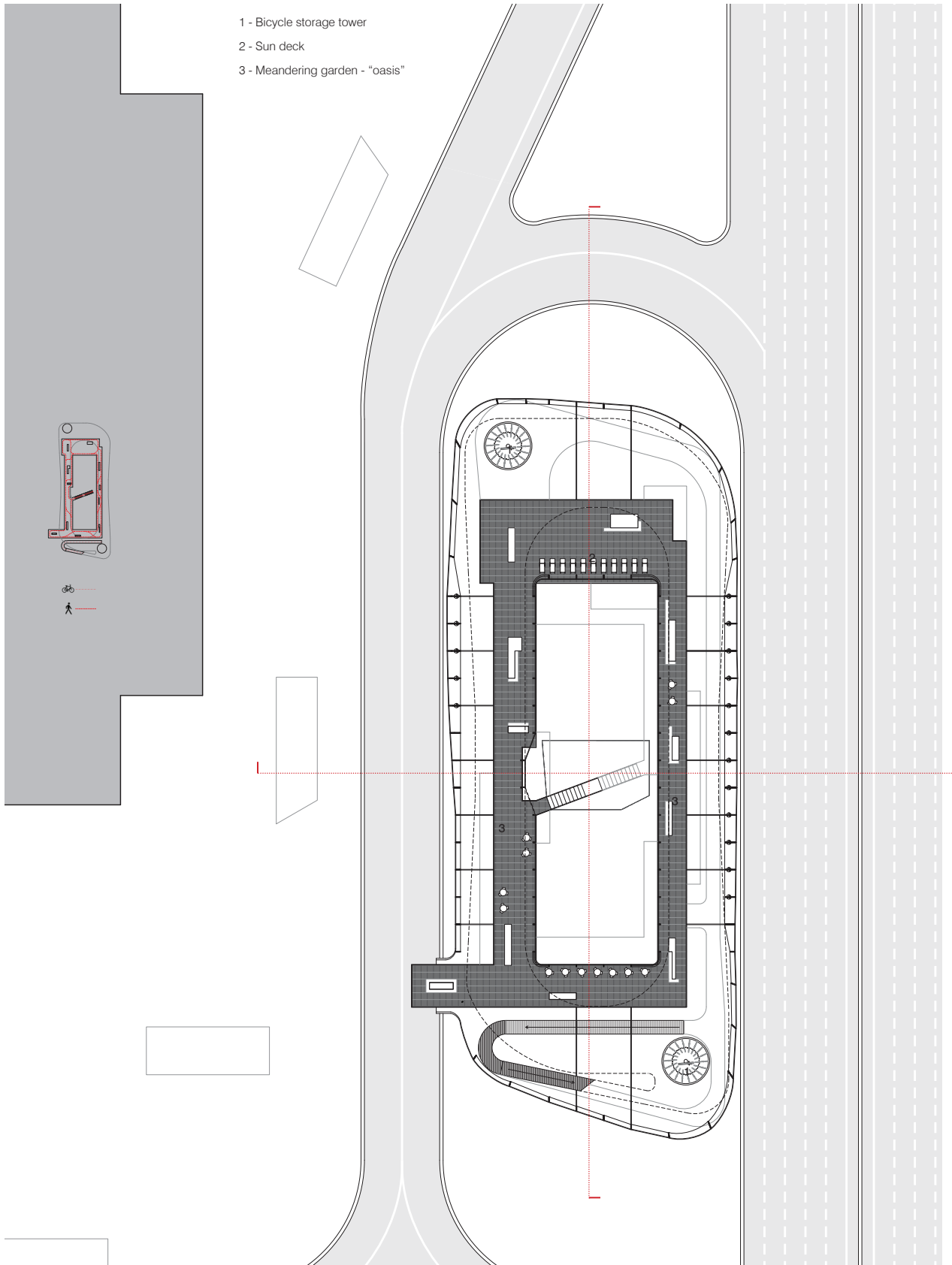
Third Level Plan

- 1 - Bicycle storage tower
- 2 - Bike patio
- 3 - Gym
- 4 - Barber / salon
- 5 - Health bar
- 6 - Massage therapy
- 7 - Work center
- 8 - Meandering garden - "oasis"



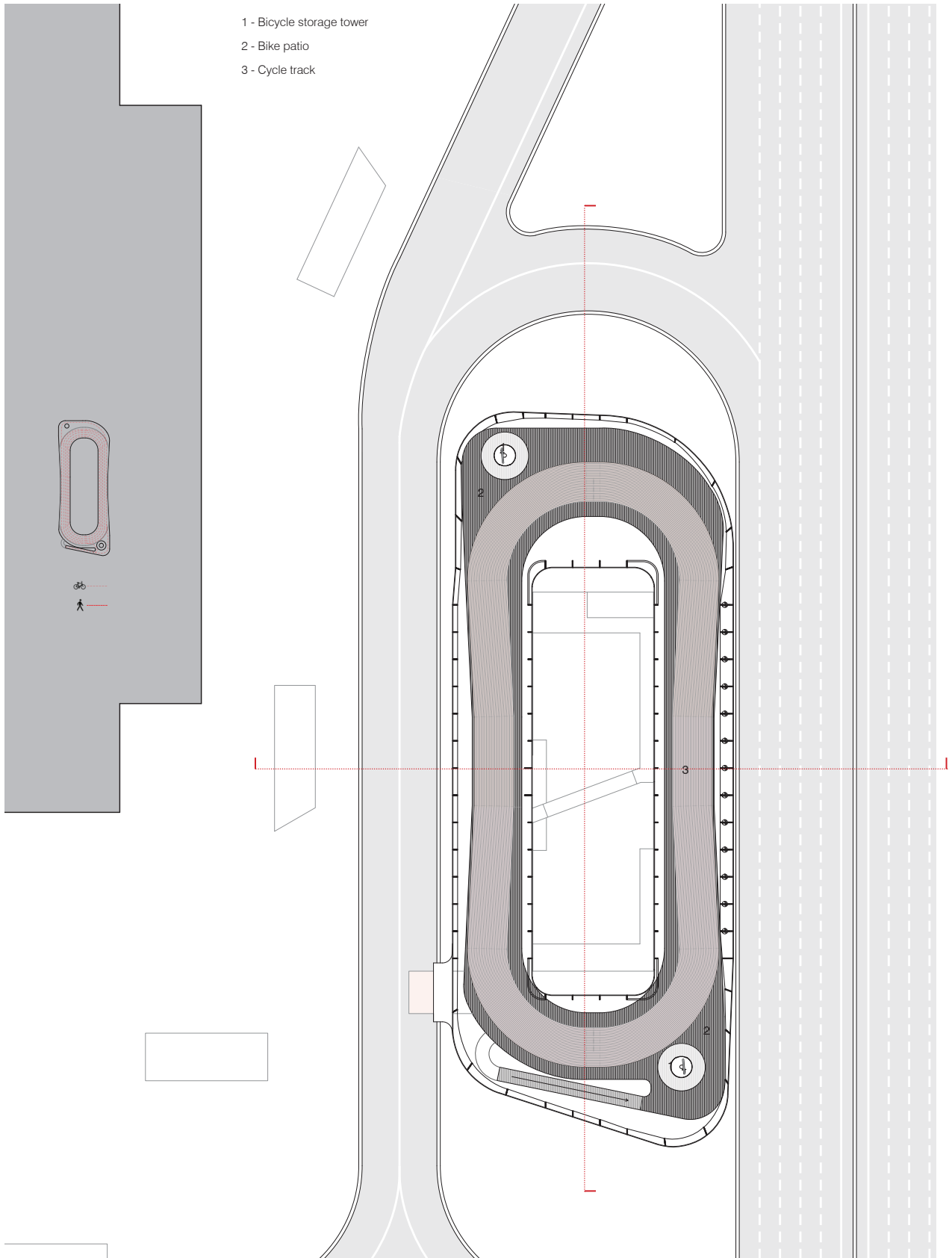
Fourth Level Plan

- 1 - Bicycle storage tower
- 2 - Sun deck
- 3 - Meandering garden - "oasis"

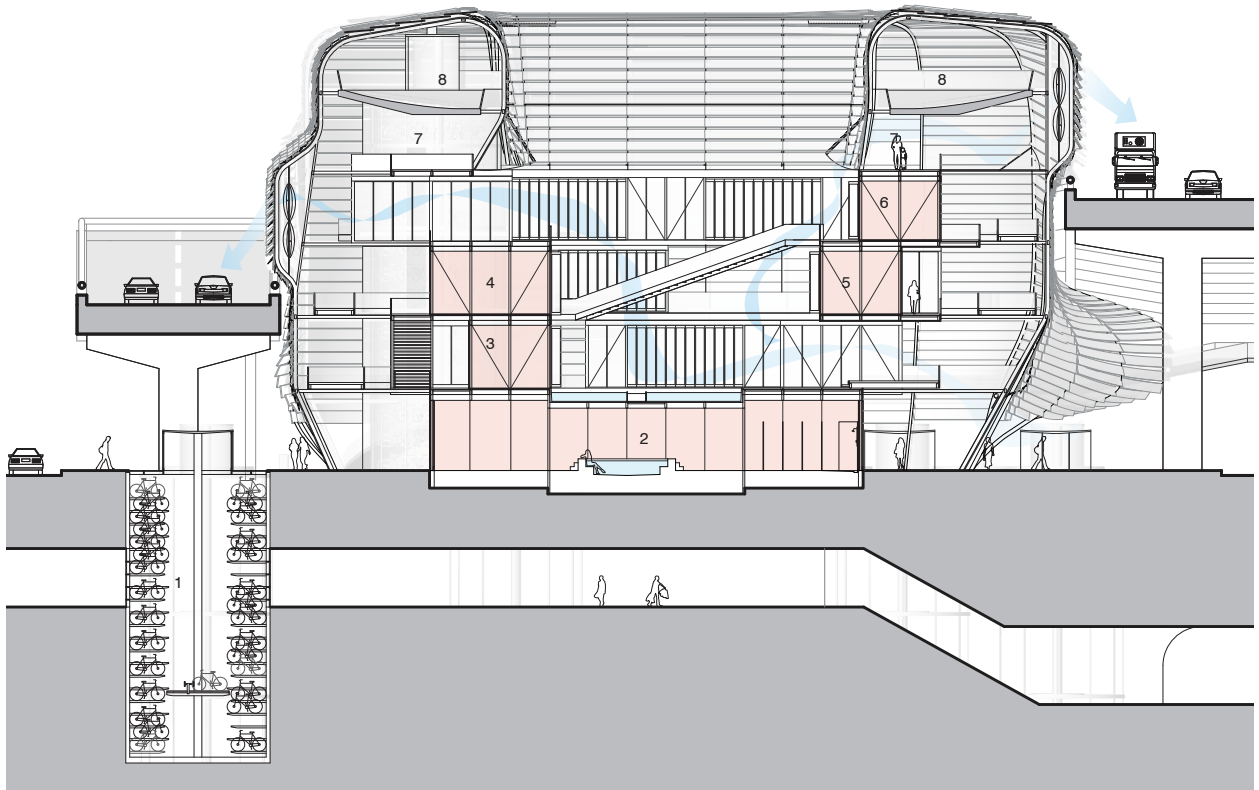


Fifth Level Plan - Rooftop promenade

- 1 - Bicycle storage tower
- 2 - Bike patio
- 3 - Cycle track



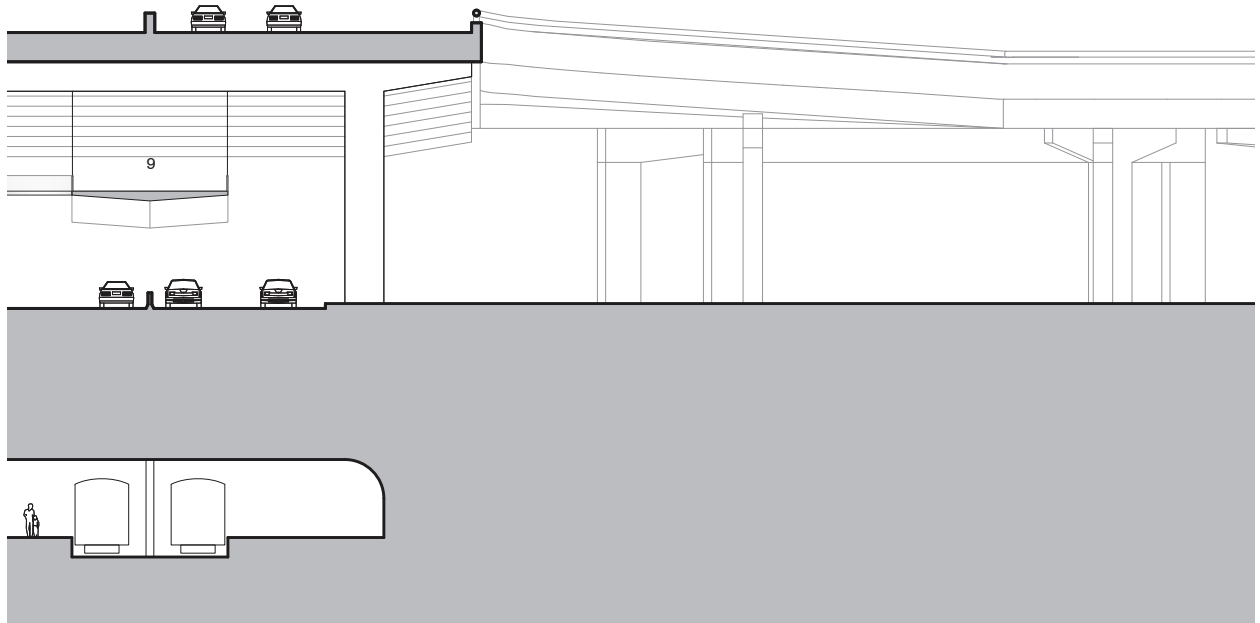
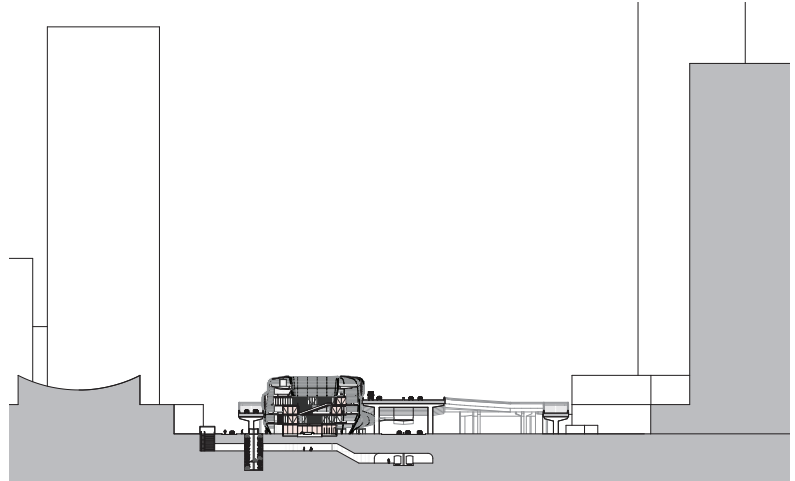
Sixth Level Plan - Cycle track

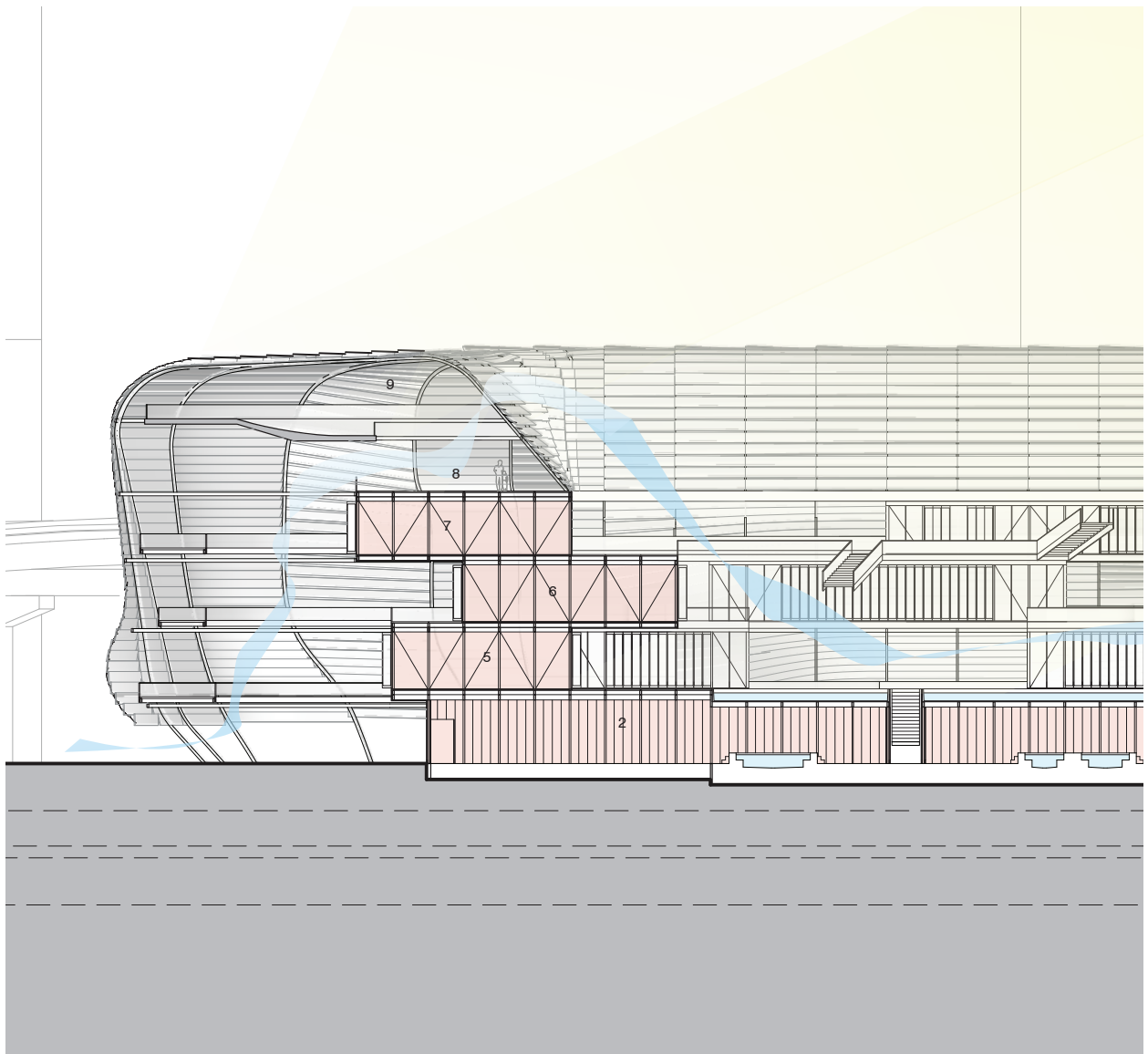


Transverse Section



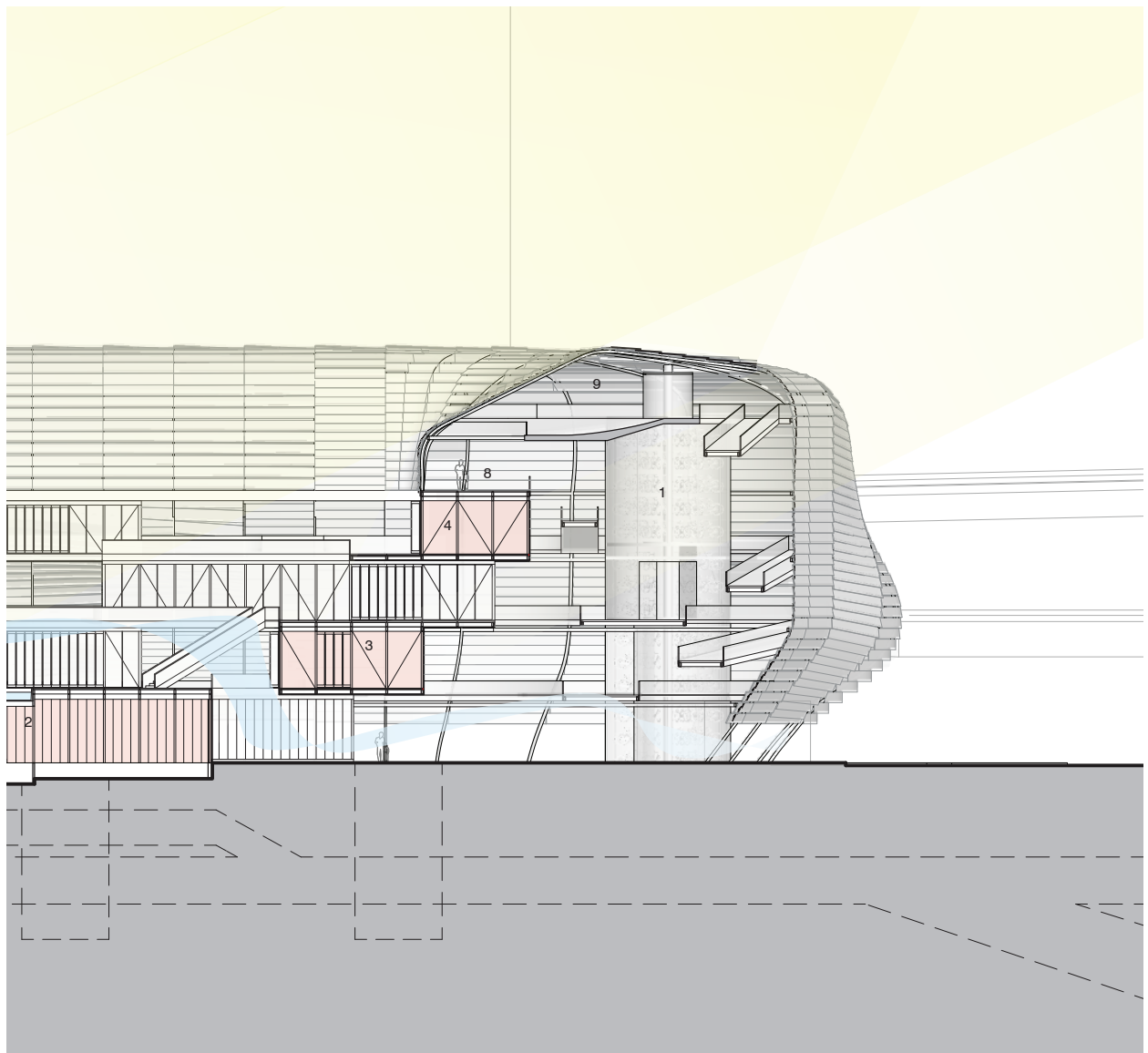
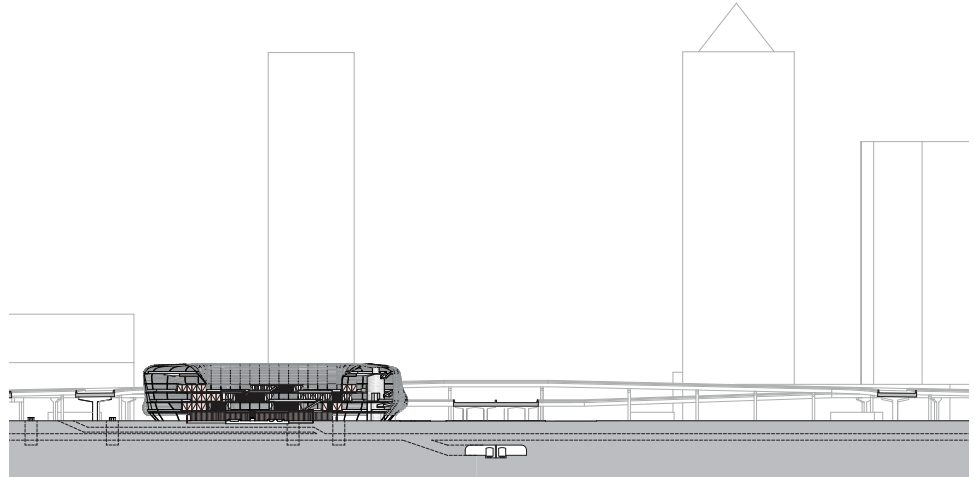
- 1 - Underground bicycle storage tower
- 2 - Locker room / bathing space
- 3 - Teahouse
- 4 - Group exercise room
- 5 - Reading room / work lounge
- 6 - Health bar
- 7 - Roof deck / promenade
- 8 - Cycle track
- 9 - "Bicycle highway"





Longitudinal Section

- 1 - Above ground bicycle storage tower
- 2 - Locker room / bathing space
- 3 - Bike shop / repair / tour center
- 4 - Work center
- 5 - Event / lecture
- 6 - Daycare
- 7 - Gym
- 8 - Cycle track
- 9 - "Bicycle highway"





View of open lower level, facade above and connecting ramps







View of center "oasis"







View of "oasis" from within the teahouse







View of communal bathing area and lockers underneath the translucent skylight of the reflecting pool above

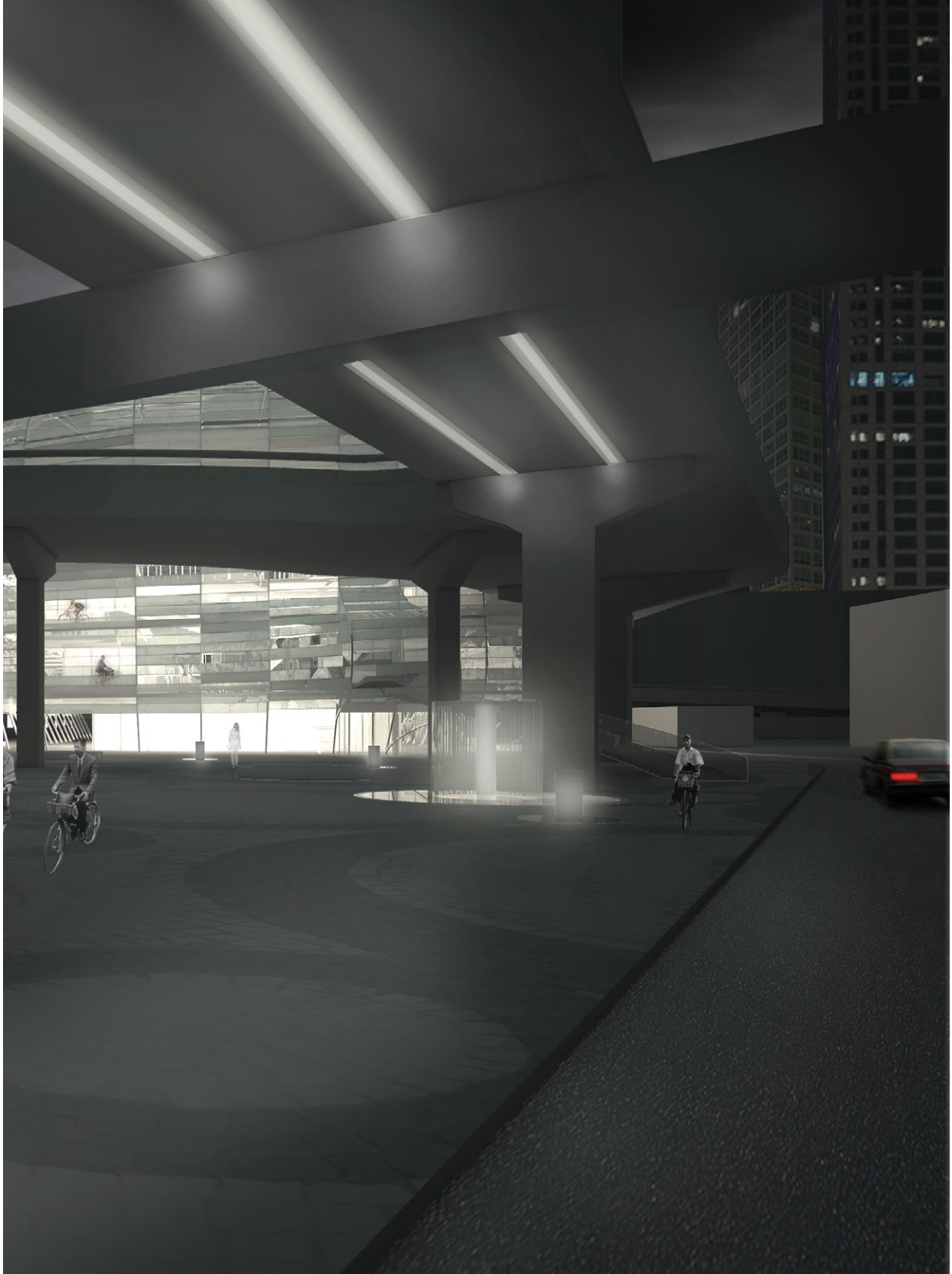


View of bicycle path and a "bike-thru" service window interface





Evening view of "bike plaza"

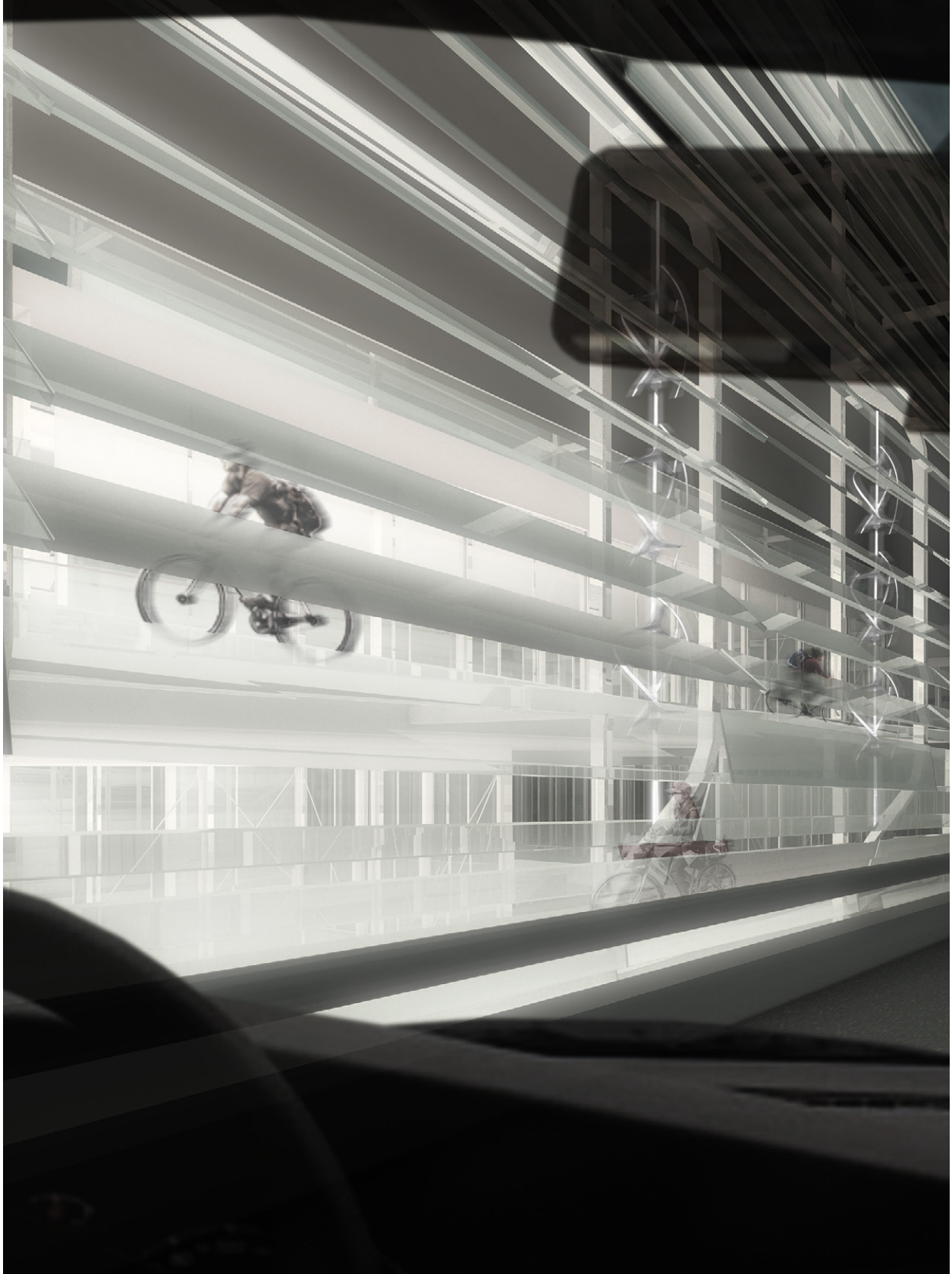




View from highway of the bicycle center during typical evening traffic at Guomao Bridge



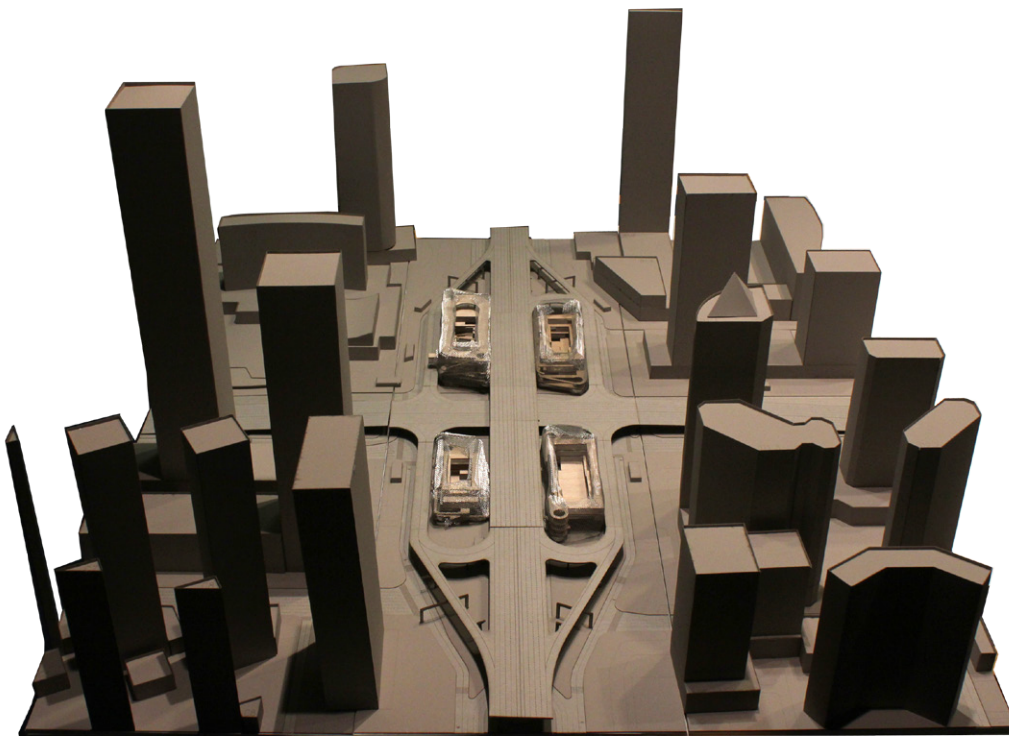




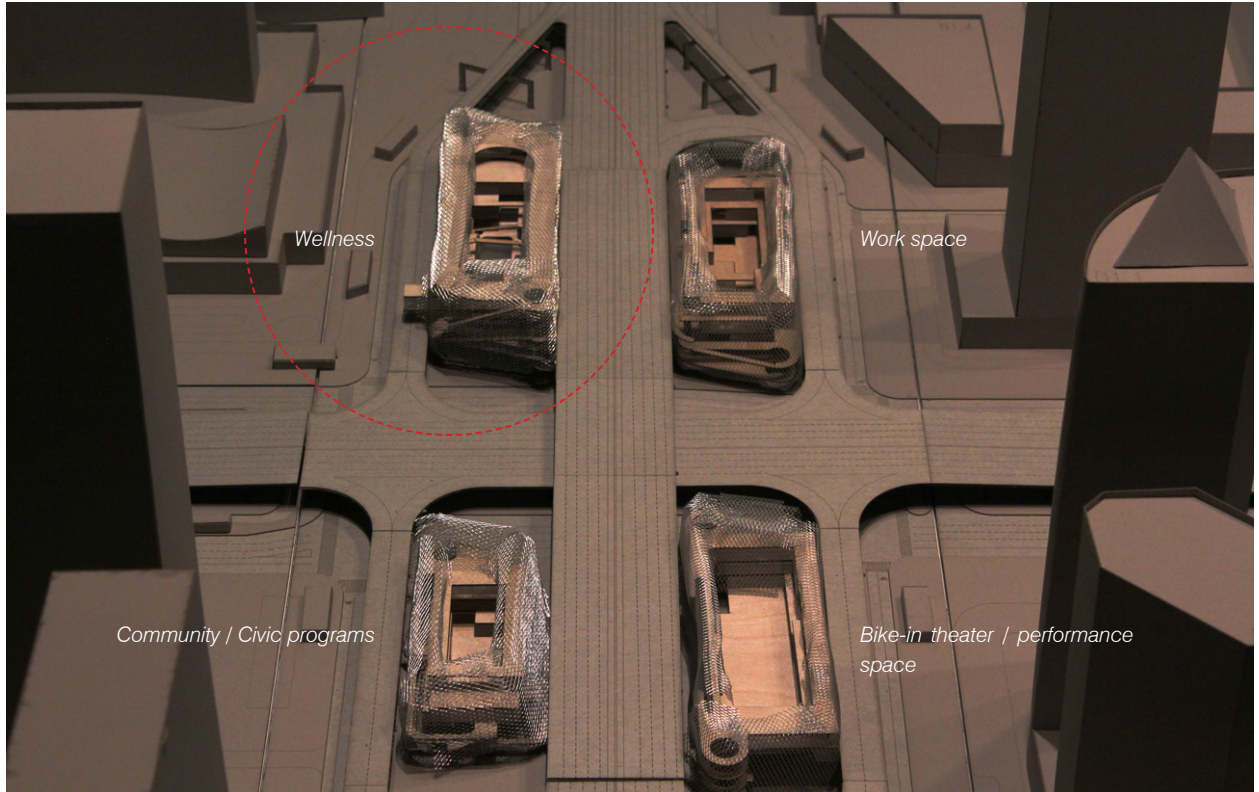
Evening view of performative skin (microturbines), and the work lounge protruding over the offramp



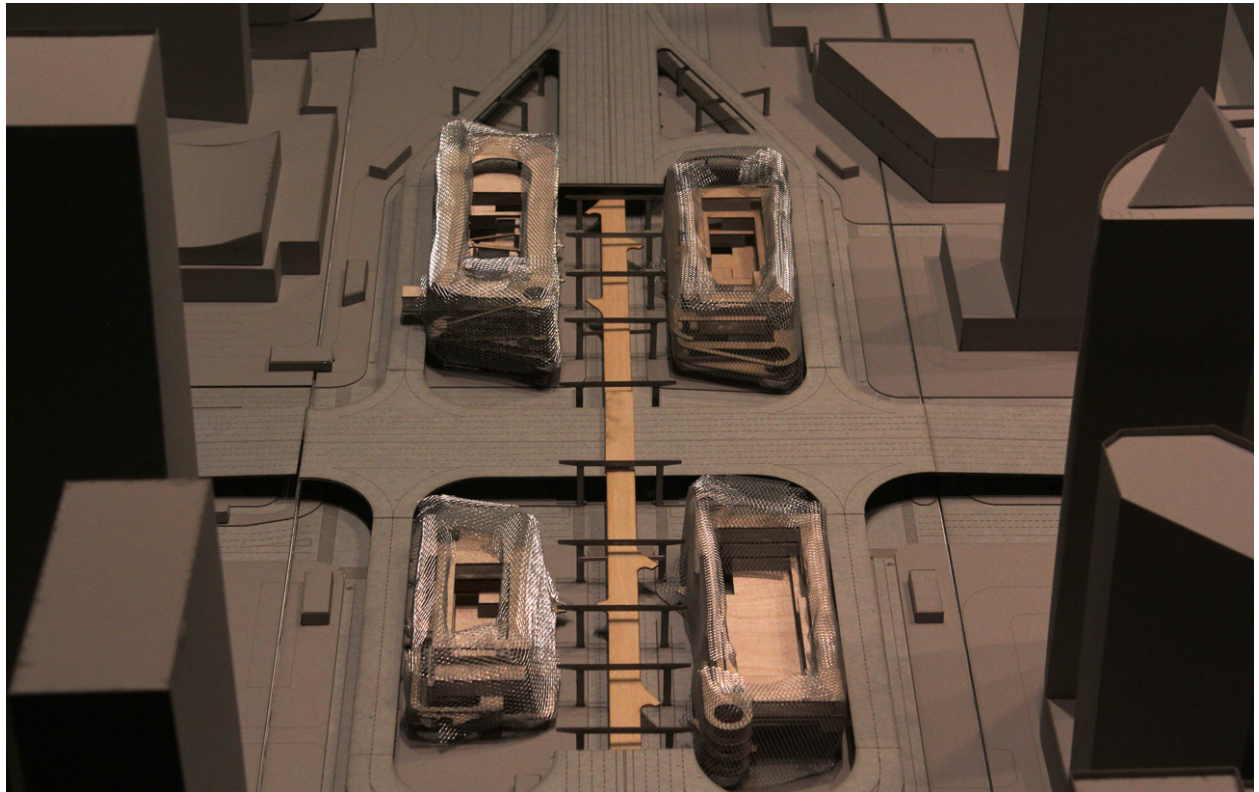




Site model showing "village" condition

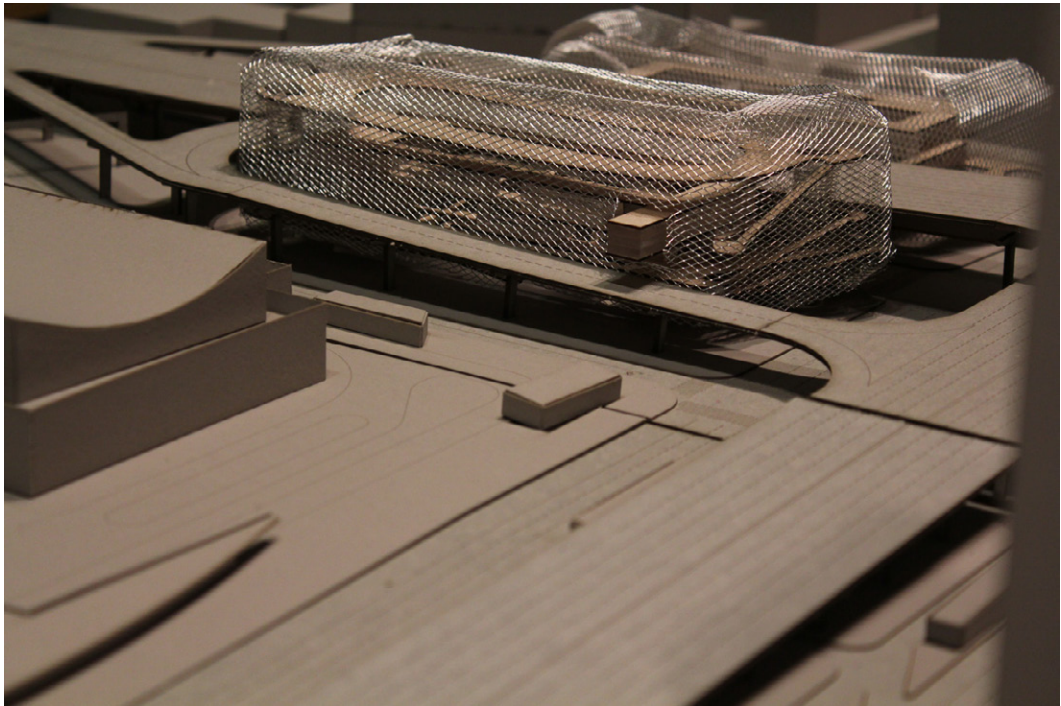


Four distinct programmatic entities



Suspended "bicycle highway" exposed





Prototype bicycle center in context

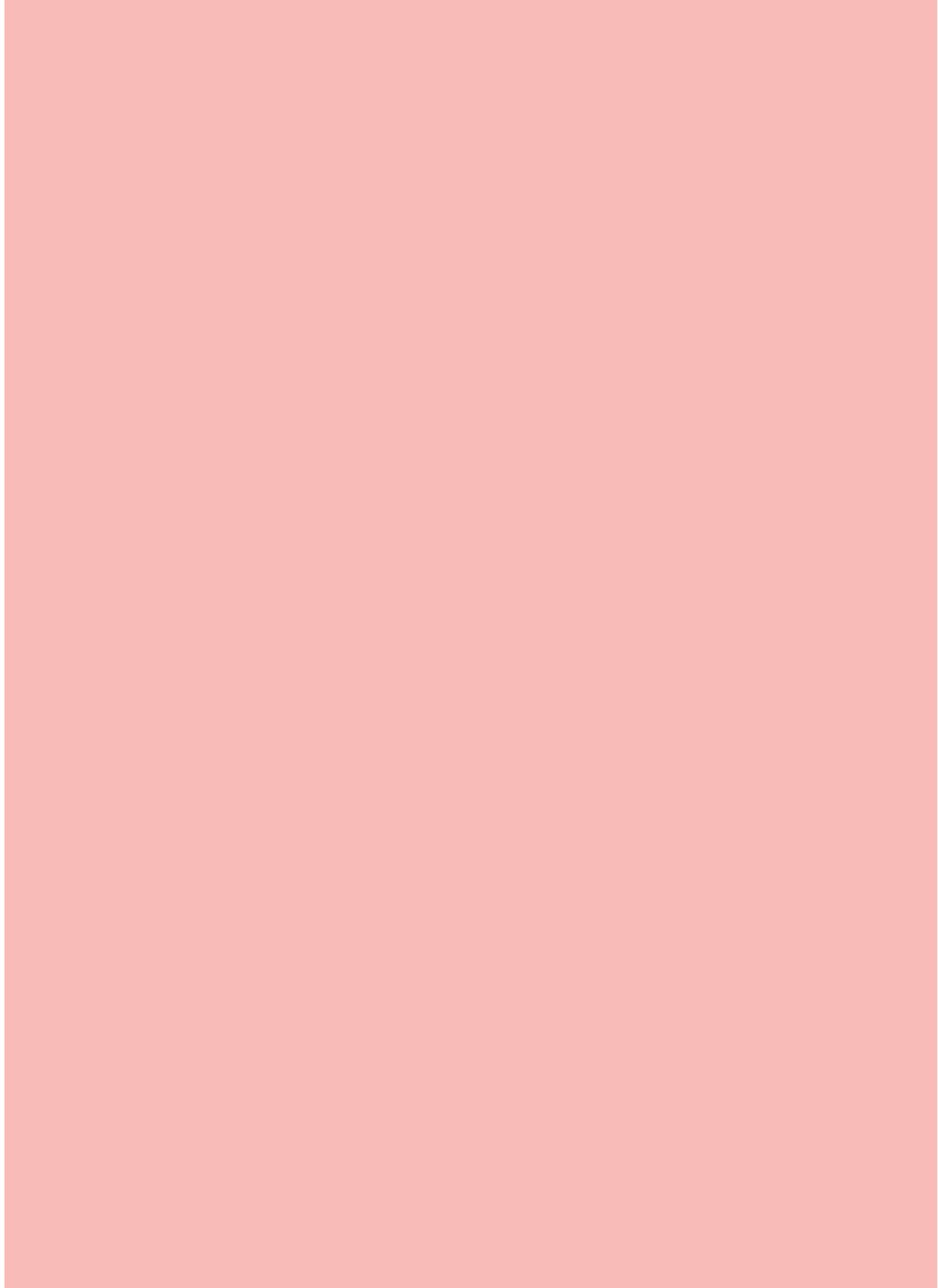


Skin is less transparent during day



Interior volumes reveal themselves in the evening





## BIBLIOGRAPHY

Books:

Burdett, Ricky & Sudjic, Deyan. *The Endless City*. London: Phaidon Press Inc., 2007.

Campanella, Thomas J. *The Concrete Dragon: China's Urban Revolution and What It Means for the World*. New York: Princeton Architectural Press, 2008.

Carlo, Santoro & Claudio Greco. *Beijing: The New City*. Milan: Skira Editore, 2008.

Chung, Chuihua Judy, Jeffrey Inaba, Rem Koolhaas and Sze Tsung Leong. *Great Leap Forward / Harvard Design School Project on the City*. Cambridge, MA: Harvard Design School, 2001.

Edelman, Frederic. In *The Chinese City: Perspectives on the Transmutation of an Empire*. New York: Actar Publications, 2008.

Forester, John. *Bicycle Transportation, Second Edition: A Handbook for Cycling Transportation Engineers*. Cambridge, MA: The MIT Press, 2004.

Friedmann, John. *China's Urban Transition*. Minneapolis : University of Minnesota Press, 2005.

Goethe-Institut China. *Beijing Parkour*. Shanghai: SDX Joint Publishing Company, 2009.

Gutierrez & Portefaix. *Yung Ho Chang / Atelier Feichangjianzhu: A Chinese Practice*. New York: Map Book Publishers, 2003.

Keswick, Maggie. *The Chinese Garden*. London: Rizzoli, 1978.

Koolhaas, Rem. *Content*. New York: Taschen, 2004.

Tezenas, Ambroise. *Beijing: theatre of the people*. Stockport, England: Dewi Lewis Publishing, 2006.

Van Susteren, Arjen. *Metropolitan World Atlas*. Amsterdam: Uitgeverij, 2004.

Vockler, Kai & Lucklow, Dirk. *Peking Shanghai Shenzhen: Cities of the 21st Century*. New York: Campus Verlag, 2000.

Liang, Sicheng, edited by Wilma Fairbank. *A pictorial history of Chinese architecture :a study of the development of its structural system and the evolution of its types*. Cambridge, MA: MIT Press, 1984.

Spender, Stephen & Hockney, David. *China diary*. London: Thames and Hudson, 1982.

Online sources:

City of Copenhagen. "Bicycle Account 2006". Copenhagen: City of Cyclists. 2006. <http://www.kk.dk/cityofcyclists.aspx>. 23 February, 2010.

City of Muenster. "Bicycling as Mode of Transportation in Muenster, Germany. <http://www.geo.sunysb.edu/bicycle-muenster/index.html>. 5 March, 2010.

McClure, Geoff. "Honk, Which Way Are You Going, China?". 3 July, 2008. <http://www.theage.com.au/news/sport/honk-which-way-you-going-china/2008/07/02/1214950849930.html>. 12, March 2010.

"The Copenhagen Wheel." [senseable.mit.edu/Copenhagenwheel/press.html](http://senseable.mit.edu/Copenhagenwheel/press.html). Senseable Cities Lab. n.d. 7 Mar. 2010.

"GreenWheel." [mobile.mit.edu/greenwheel](http://mobile.mit.edu/greenwheel). Mobile Experience Lab. n.d. 7 Mar. 2010.

"11 Most Bicycle Friendly Cities." [virgin-vacations.com](http://virgin-vacations.com). Virgin Vacations. n.d. 7 Mar. 2010.

"Redhook Design Competition." [ffud.org/rhfinals/index.html](http://ffud.org/rhfinals/index.html). Forum for Urban Design. n.d. 7 Mar. 2010.

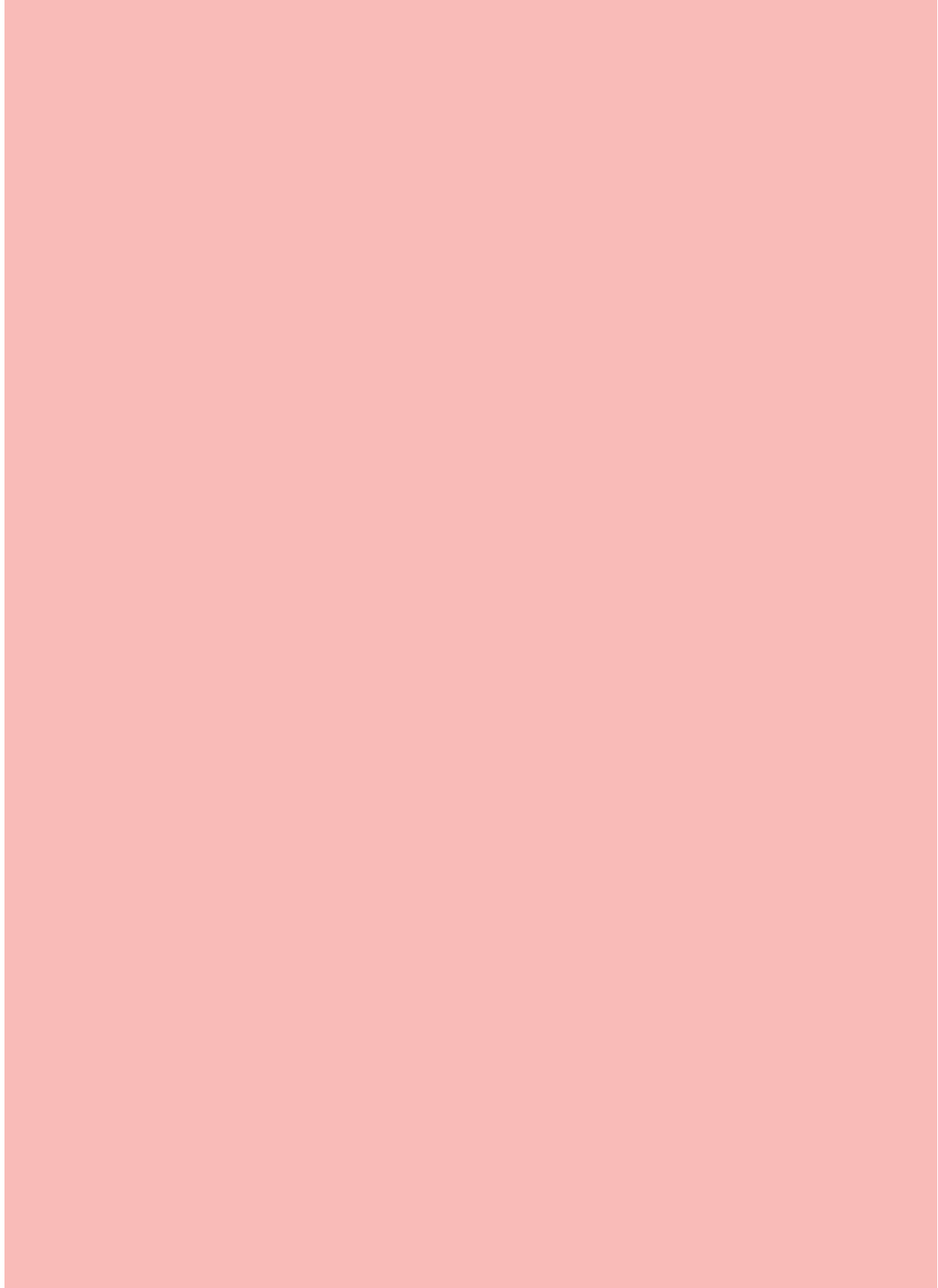
Beijing Subway." [wikipedia.org](http://wikipedia.org). Wikipedia. 7 Mar. 2010. 7 Mar. 2010.

"The Revival of Bicycles in Beijing." [english.cctv.com](http://english.cctv.com). CCTV.com. 28 Jan. 2010. 7 Mar. 2010.

"City's circles cause traffic troubles." [chinadaily.com](http://chinadaily.com). China Daily. 4 Feb. 2004. 7 Mar. 2010

Film:

Beijing Bicycle. Dir. Xiaoshuai Wang. Perfs. Ling Cui, Shun Zhou. Tartan Pictures, 2001.



END