Urban Green Loop

Landscape Planning and Design for Beijing's
Third Ring Road Interchange Spaces

PROJECT STATEMENT

Beijing has the highest number of interchanges in China, built along the city's expressway network. The interchanges along Beijing's Third Ring Road are located between the second ring greenway and the first green isolation belt, closely linking their auxiliary spaces to the city's structure and green system. While these interchanges alleviate traffic pressure, they also fragment urban space, functions and ecology, turning their auxiliary spaces into negative urban areas. With modern urban development shifting from expansion to optimization, the focus on interchange auxiliary spaces has intensified. Beijing is gradually changing its policy direction to activate these underutilized spaces.
This project comprehensively explores the auxiliary spaces of interchanges along Beijing's Third Ring Road, analyzing their development and summarizing their spatial types. Based on current issues, we propose universally applicable linear and nodal renewal strategies for these spaces and select the auxiliary spaces of five distinct typical interchanges as demonstration sites for landscape improvement.
Through these planning and design updates, this 48.3 km grey infrastructure will be transformed into an urban green loop, integrated into the city's green space system, revitalizing the city and meeting public needs. The proposed strategy toolbox will also guide updates for other interchange auxiliary spaces.

PROJECT NARRATIVE AND CONTENTS

BACKGROUND AND OBJECTIVES

Interchanges are essential infrastructure measures to address urban traffic congestion. While they alleviate traffic pressure, they also fragment urban space, amenity and ecology. Due to pollution, safety hazards and often lacking pedestrian systems, the auxiliary spaces of interchanges are becoming negative grey spaces in the city.
Beijing, with the highest number of interchanges in China, faces particularly prominent issues. In recent years, as urban development shifts from expansion to optimization, Beijing has recognized the potential of interchange auxiliary spaces. New policy directions encourage "enhancing urban repair and adhering to 'leaving space for green,'" aiming to activate these spaces.
The vast number of Beijing's interchanges were built as part of the city's rapid transit network. The Third Ring Road interchanges, spanning 48.3 kilometers with 48 interchanges, lie between the second ring greenway and the first green isolation belt. Based on their traffic functionality and forms, they can be classified into eight types. Their auxiliary spaces are closely linked with the city's structure and green system. The continuous spatial characteristics and grid-like structure of these spaces provide the potential to integrate various spaces and functions, transforming them into a continuous green landscape network within the green space system. Additionally, the diverse forms of auxiliary spaces along the Third Ring Road offer more than 200,000 square meters of usable area, presenting significant potential for spatial transformation.
Currently, the auxiliary spaces of Third Ring Road interchanges are primarily unused or serve as transportation and municipal service facilities, with some poorly utilized green spaces. These spaces can address the urban residents' demand for public spaces to some extent.
The forms and conditions of interchange auxiliary spaces are complex, differing from ordinary two-dimensional road spaces. Utilizing landscape intervention methods for planning and design to make rational use of these spaces is crucial for unlocking urban space potential and stimulating urban public vitality.
This project aims to propose a series of models and strategies for the landscape development of interchange auxiliary spaces. Taking the auxiliary spaces along Beijing's Third Ring Road as an example, we first conducted an overall planning of the loop, proposing a series of nodal and linear renewal strategies. Based on this, we selected the auxiliary spaces of five typical interchanges with different forms along the ring as demonstration sites and applied various strategic tools for landscape development. The goal is to transform the entire linear grey infrastructure into green space, providing a reference for renewing other interchange auxiliary spaces.

METHODS

(1) Strategy Toolbox for Linear Spaces

For the linear spaces along Beijing's Third Ring Road interchanges, we have classified them into five types based on the nature of adjacent land use and pedestrian accessibility: roads adjacent to buildings, roads adjacent to green spaces, elevated road sections where pedestrians can pass underneath, elevated road sections where pedestrians cannot pass underneath and elevated road sections where pedestrians can walk on the bridge deck. To address existing issues of accessibility, amenity, ecology and security, we propose a strategy toolbox consisting of twelve linear space strategies. These strategies can be combined and applied to different types of linear spaces.

(2) Strategy Toolbox for Nodal Spaces

For the nodal spaces along Beijing's Third Ring Road interchanges, we have classified them into two categories based on traffic functionality: stack interchanges and separated Interchanges. Stack interchanges can be further divided into standard shapes: diamond interchanges, cloverleaf interchanges, partial cloverleaf interchanges, directional interchanges, trumpet interchanges, roundabout interchanges and hybrid interchanges. To address the current deficiencies in accessibility, amenity, ecology, and security, we propose forty nodal space strategy tools. These tools can be flexibly combined and tailored to suit the unique needs of different nodal spaces.

(3) Demonstration Sites

Based on the completion of the strategy toolboxes for linear and nodal spaces and the overall ring road planning, we have selected five typical interchanges of different forms for the pilot design of auxiliary spaces: Fenzhongsi Interchange, Jimen Interchange, Hangtian Interchange, Suzhou Interchange and Lize Interchange.

At Jimen Interchange, the renewal efforts aim to improve amenity and accessibility. The Hangtian Interchange project primarily targets the optimization of amenity. The Suzhou Interchange updates prioritize safety and functionality enhancements, while the Lize Interchange and the Fenzhongsi Interchange emphasize both ecological and functional optimizations.

Each site has utilized a tailored combination of the strategy toolboxes, resulting in unique and distinctive landscape outcomes.

CONCLUSION AND SIGNIFICANCE

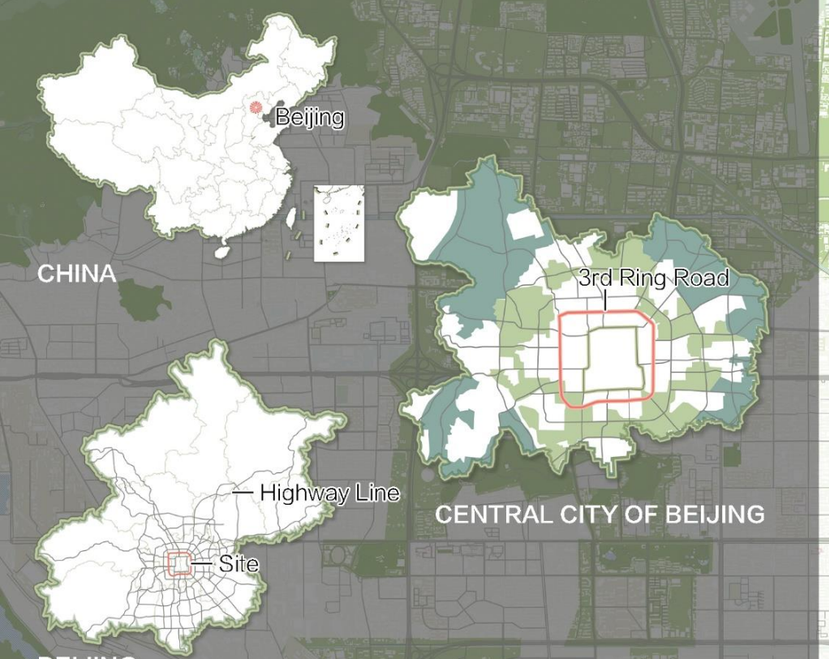
This project addresses the existing issues in the auxiliary spaces of Beijing's Third Ring Road interchanges by proposing a series of linear and nodal strategies. Through pilot designs, these strategies have been applied to the landscape renewal of five interchange auxiliary spaces. The strategy toolbox developed in this project holds universal value and can serve as a reference for the models, strategies and specific designs of landscape construction in other interchange auxiliary spaces.

Through landscape planning and design research on the auxiliary spaces of Beijing's Third Ring Road interchanges, this project supplements urban green spaces and public areas, repairs the ecological environment and urban relationships, and introduces green elements to the city's negative grey infrastructure spaces. The project aims to transform these spaces into a systematic, multifunctional loop of interchange parks integrated into the urban green space system, serving as a significant catalyst for Beijing's urban renewal.

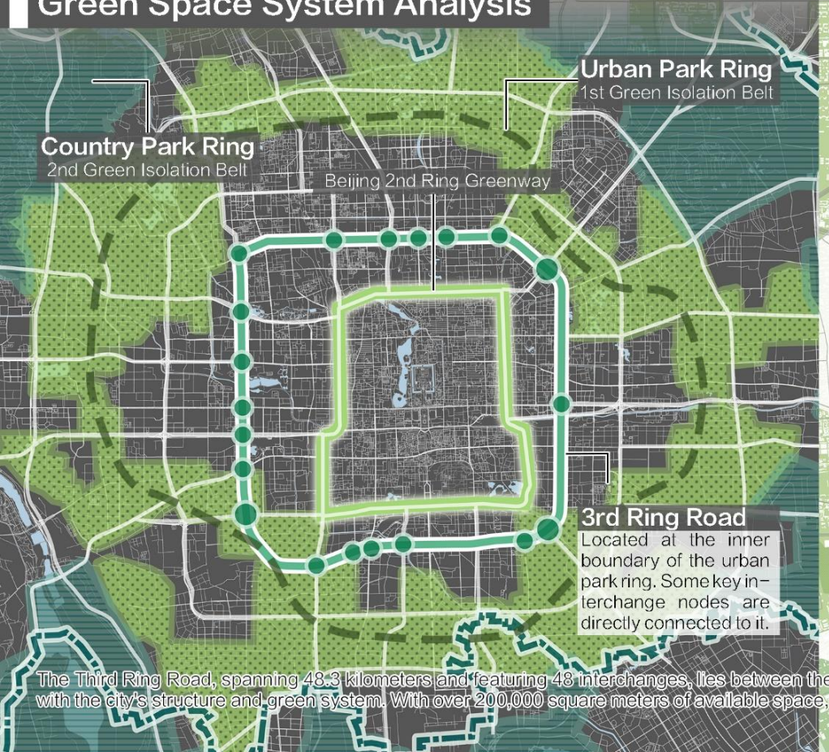
Urban Green Loop

Landscape Planning and Design for Beijing's Third Ring Road Interchange Spaces

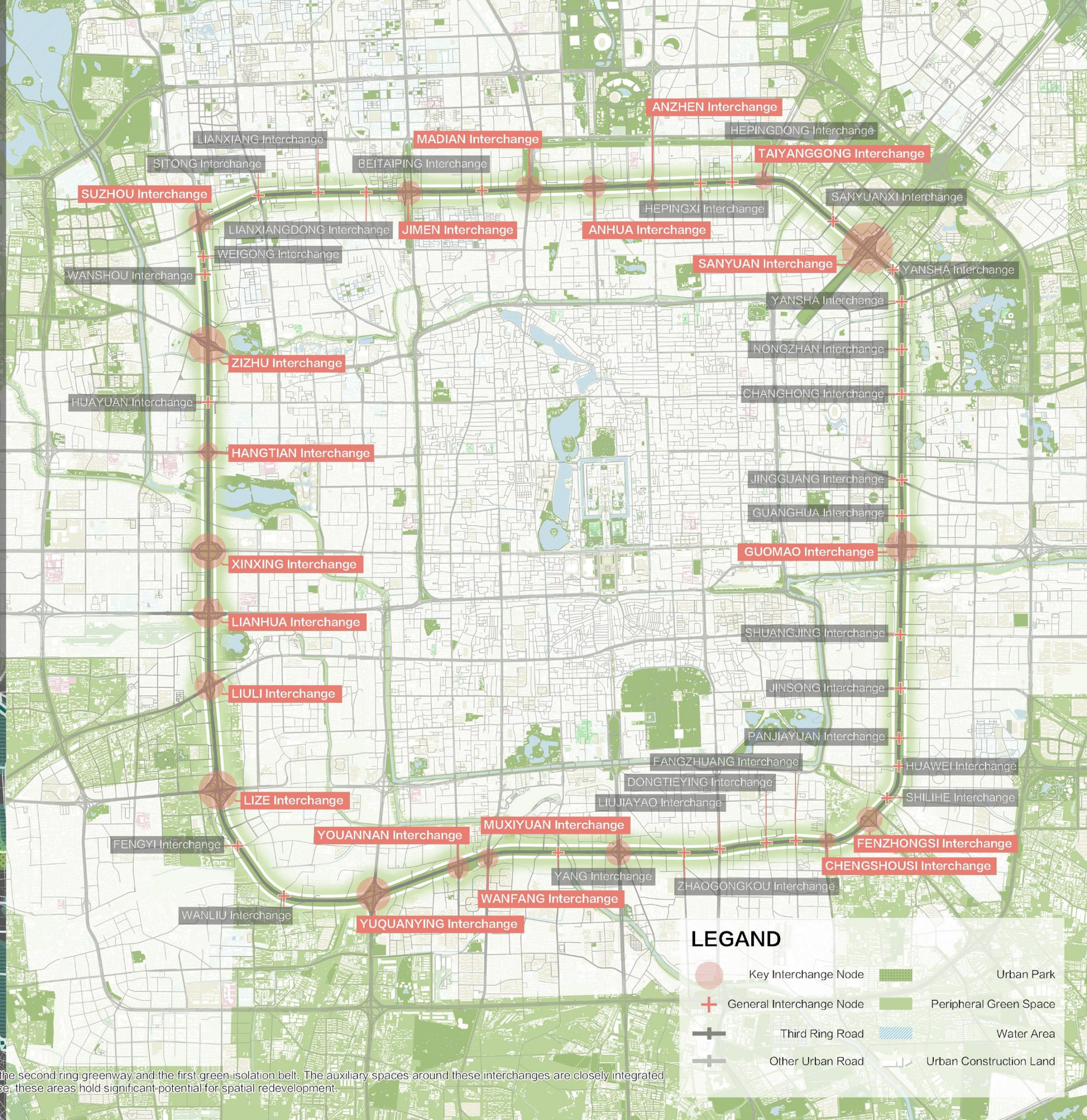
Locational Analysis



Green Space System Analysis

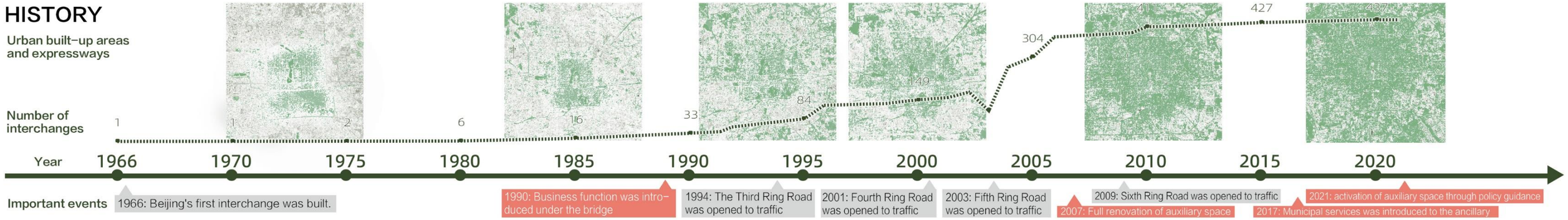


The Third Ring Road, spanning 48.3 kilometers and featuring 48 interchanges, lies between the second ring greenway and the first green isolation belt. The auxiliary spaces around these interchanges are closely integrated with the city's structure and green system. With over 200,000 square meters of available space, these areas hold significant potential for spatial redevelopment.



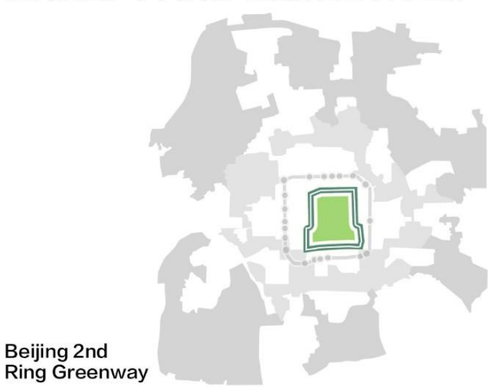
BACKGROUND AND OBJECTIVES

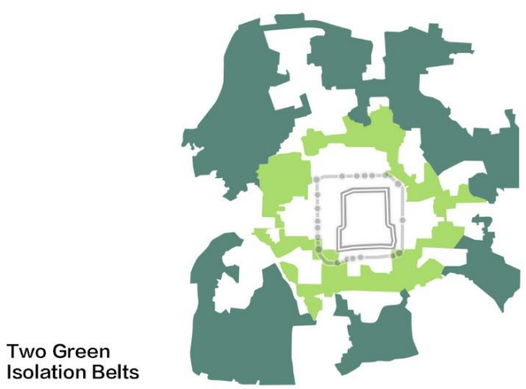
HISTORY

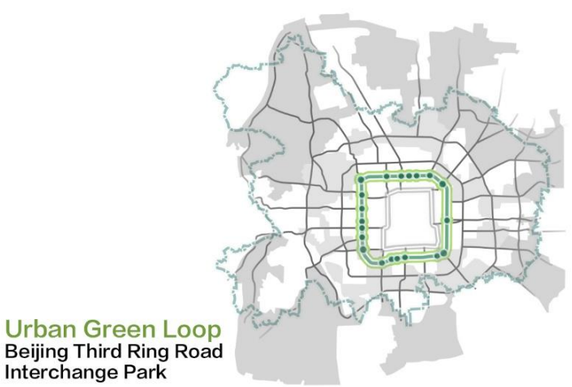


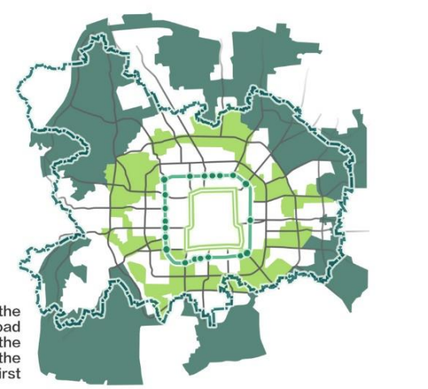
CURRENT UTILIZATION STATUS OF INTERCHANGE SPACES

CONCEPT AND OBJECTIVES





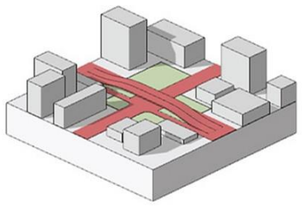




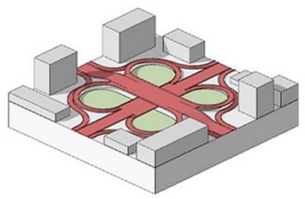
ANALYSIS AND PROBLEMS

TYPES OF INTERCHANGES

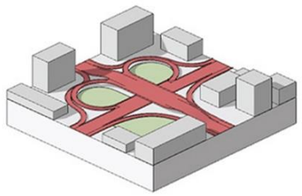
Diamond Interchange



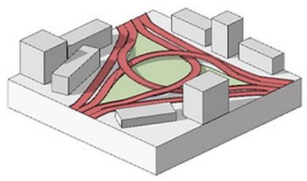
Cloverleaf Interchange



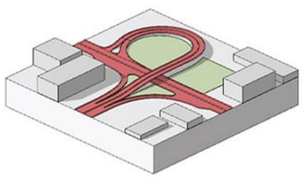
Partial Cloverleaf Interchange



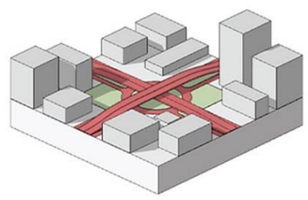
Directional Interchange



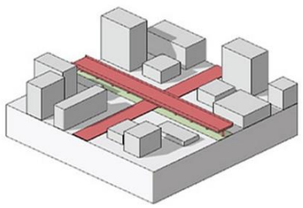
Trumpet Interchange



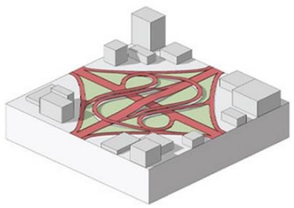
Roundabout Interchange



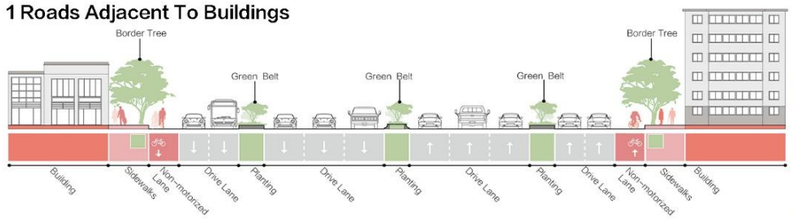
Separated Interchange



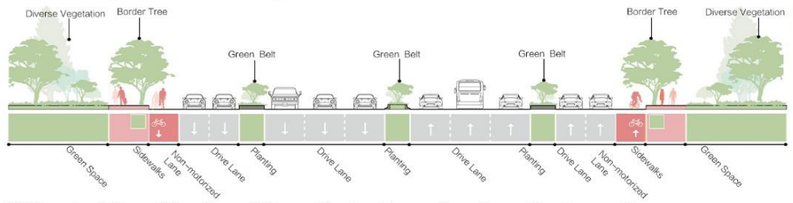
Hybrid Interchange



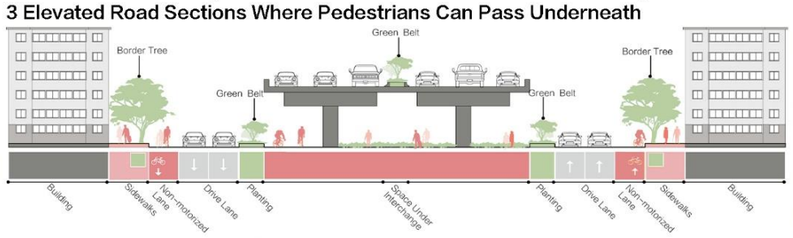
1 Roads Adjacent To Buildings



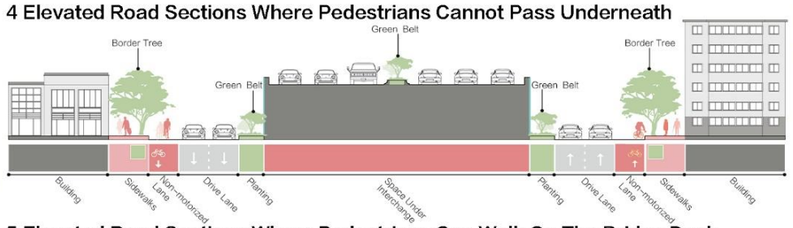
2 Roads Adjacent to Green Spaces



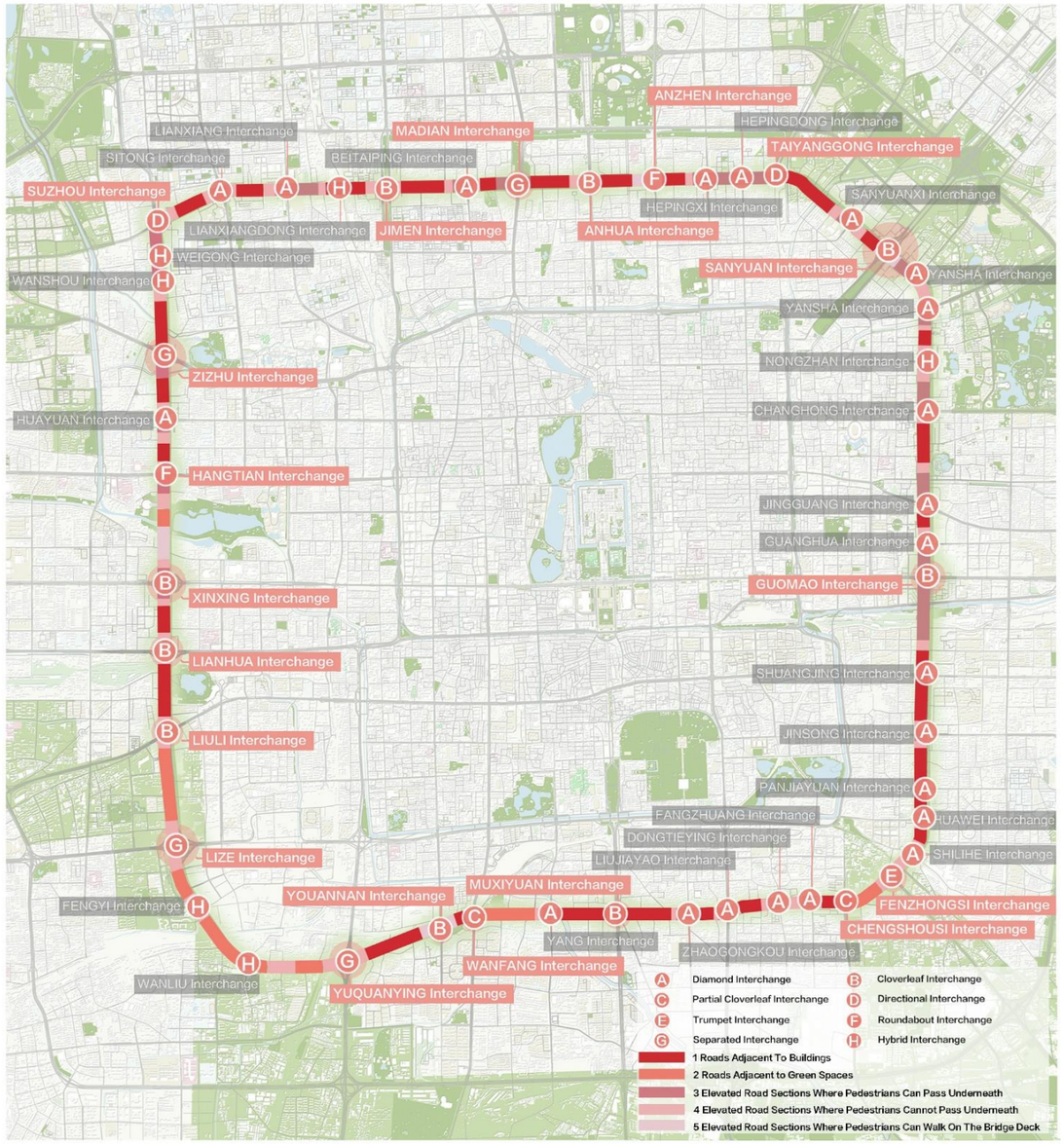
3 Elevated Road Sections Where Pedestrians Can Pass Underneath



4 Elevated Road Sections Where Pedestrians Cannot Pass Underneath



5 Elevated Road Sections Where Pedestrians Can Walk On The Bridge Deck

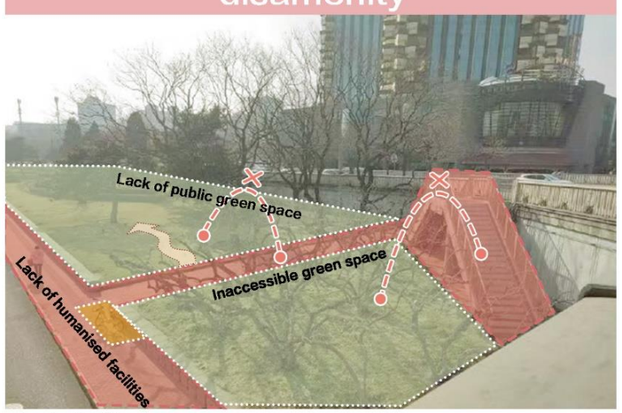


CURRENT ISSUES

inaccessibility

- The auxiliary spaces under the interchanges are not interconnected.
- Most green spaces within the auxiliary areas are inaccessible.
- The auxiliary spaces are isolated from public activities.

disamenity

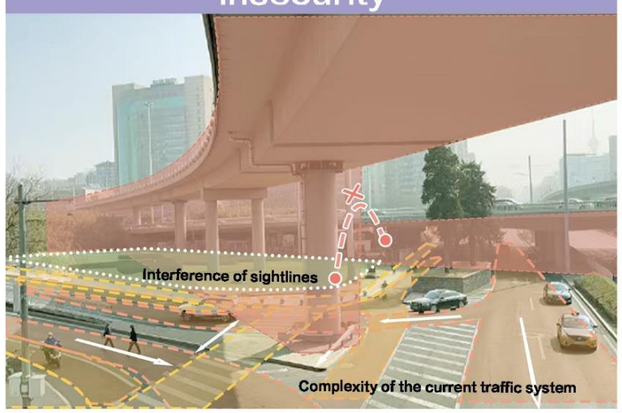


- Lack of public green space.
- Lack of humanised facilities.
- Serious noise pollution.
- Poor light environment.

ecological disharmony

- Single plant community.
- The wind conditions at the site are turbulent.
- The drainage system for the interchanges relies too heavily on artificial methods.

insecurity



- The threat of motorized vehicles to pedestrians and non-motorized traffic.
- Interference of sightlines between motorized vehicles on the interchanges and pedestrians moving around the green space.
- Cramped space at the interchanges, poor visibility and a sense of unease.

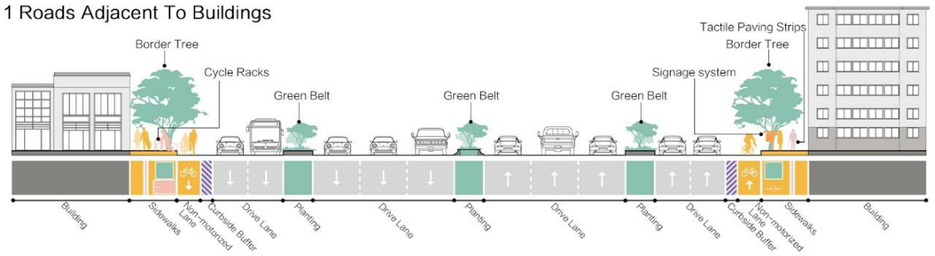
STRATEGY Ⅰ : LINEAR

PROBLEMS--LINEAR STRATEGY

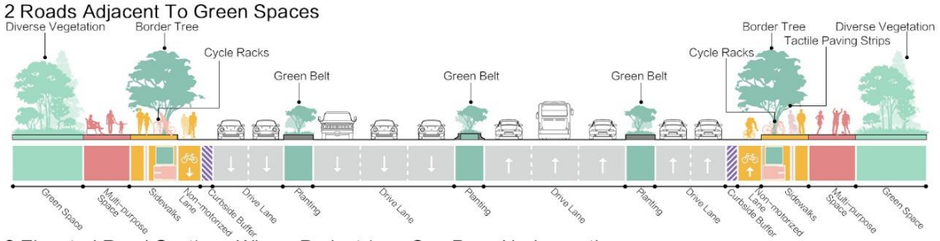
Inaccessibility	Disamenity	Ecological Disharmony	Insecurity
Sidewalks (width≥3.5m) and Non-motorized Lane (width≥1.8m)	Multi-purpose Space	Vertical Greening	Separation Facilities
Stereo Access Facility	Accessible Features	Diverse Vegetation	Pedestrian Crossings
Signage System	Cycle Racks	Planting	Warning Sign

TYPICAL ROAD PROFILE PATTERNS

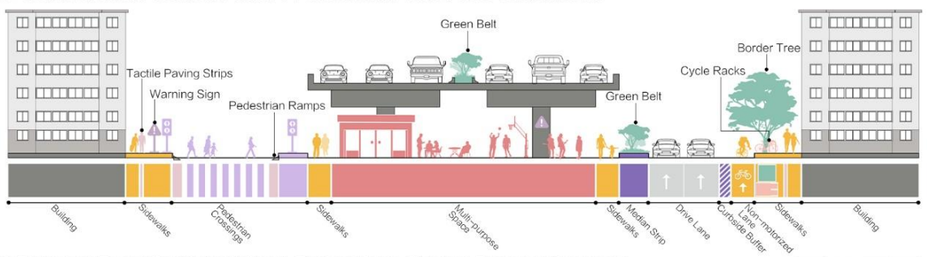
1 Roads Adjacent To Buildings



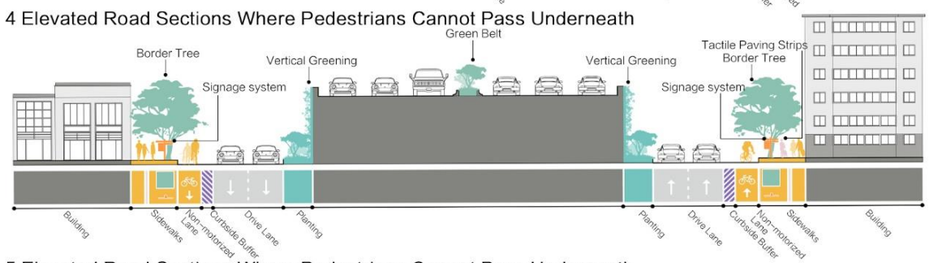
2 Roads Adjacent To Green Spaces



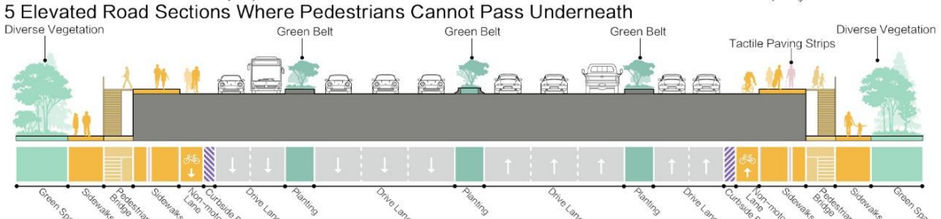
3 Elevated Road Sections Where Pedestrians Can Pass Underneath



4 Elevated Road Sections Where Pedestrians Cannot Pass Underneath

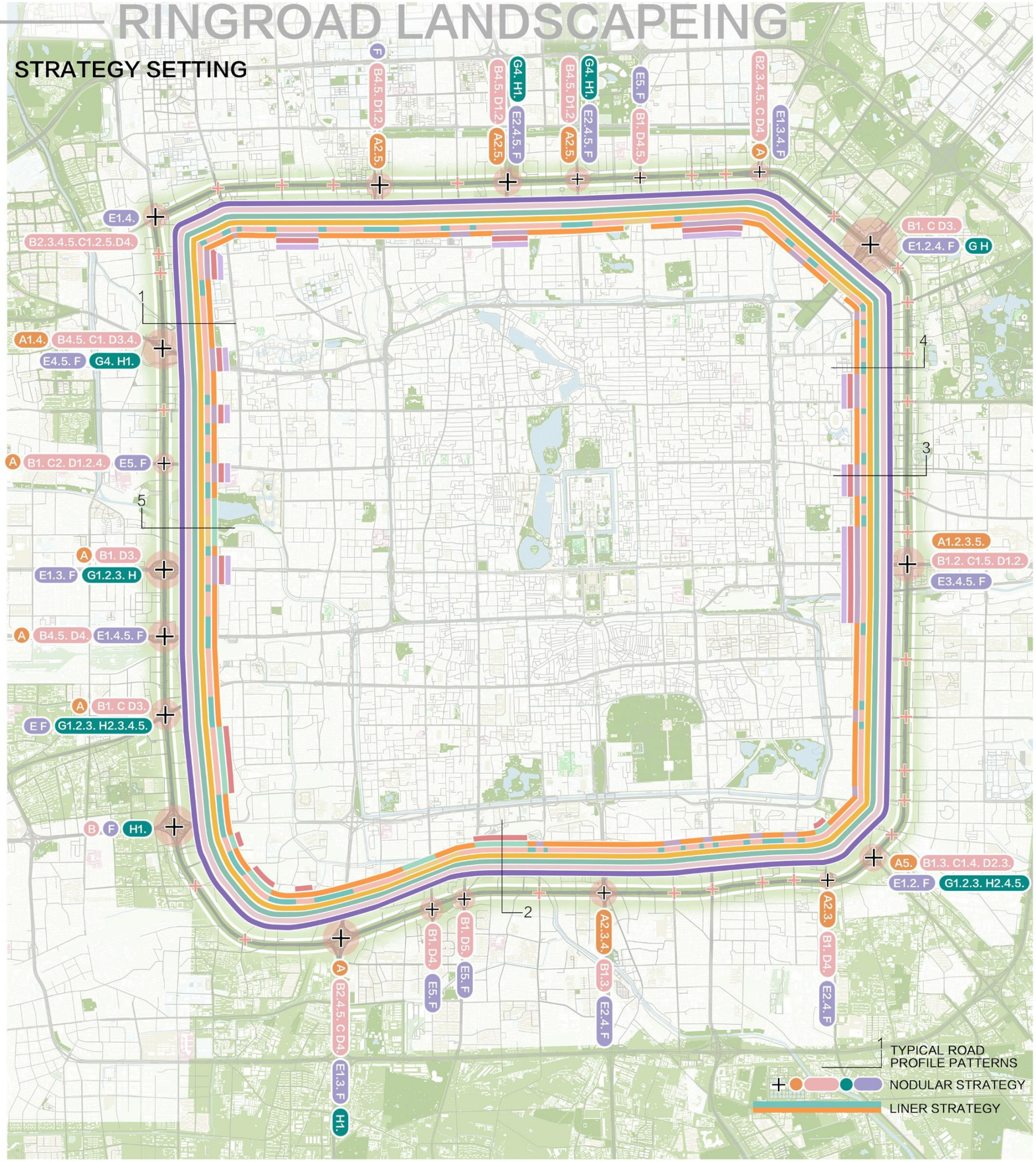


5 Elevated Road Sections Where Pedestrians Cannot Pass Underneath



RINGROAD LANDSCAPEING

STRATEGY SETTING



STRATEGY Ⅱ： NODAL —— INTERCHANGE UTILIZATION

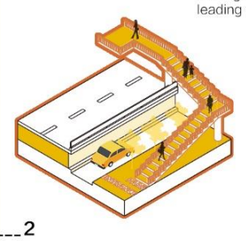
PROBLEMS--NODAL STRATEGY

INACCESSIBILITY

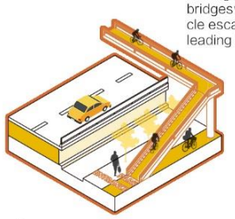
A Inaccessibility

1 Addressing the entrances by widening, highlighting the park entrances and adding plazas

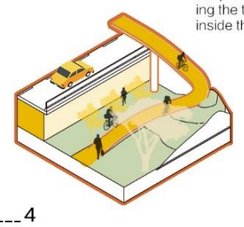
2 Adding bridges leading to parks



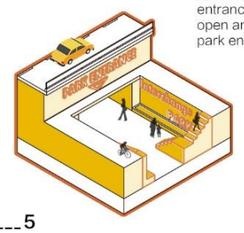
3 Adding bicycle bridges with bicycle escalators leading to parks



4 Constructing rampsincorporating the terrain inside the park



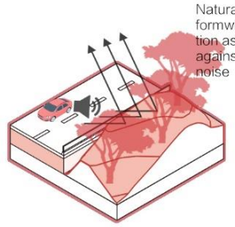
5 Transforming the underpass entrances to open and bright park entrances



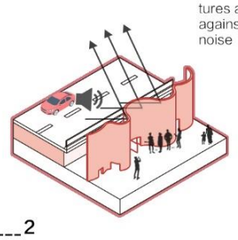
DISAMENITY

B Traffic Noise

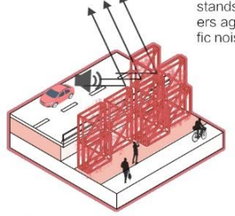
1 Natural land formwithvegetation as barriers against traffic noise



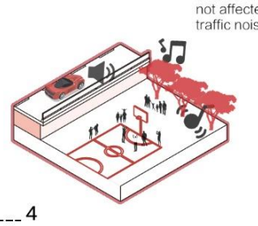
2 Artificial structures as barriers against traffic noise



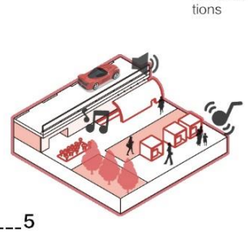
3 Artificial plant stands as barriers against traffic noise



4 Setting loud events which are not affected by traffic noise

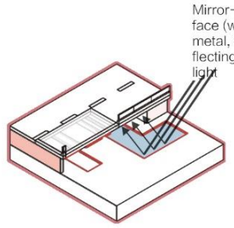


5 Setting sound interactive installations

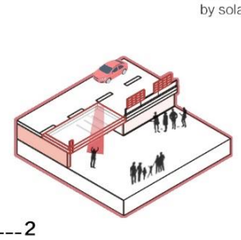


C Lack of Light

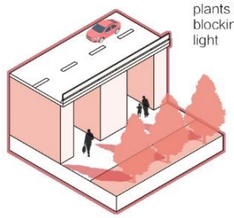
1 Mirror-like surface (water, metal, etc) reflecting natural light



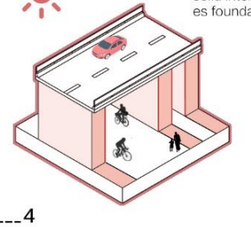
2 Artificial lighting by solar energy



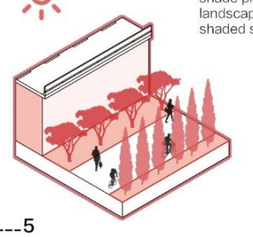
3 Preventing plants from blocking natural light



4 Reducing the solid interchanges foundation

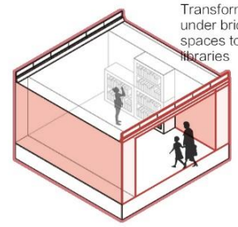


5 Proper use of shade plants to landscaping the shaded spaces

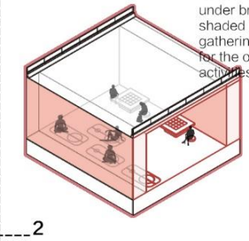


D Inactivity

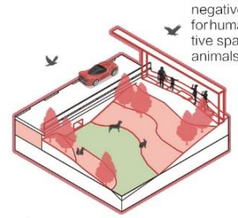
1 Transforming under bridge spaces to mobile libraries



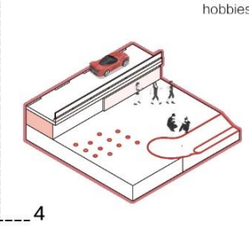
2 Transforming under bridge shaded spaces to gathering spaces for the older's activities



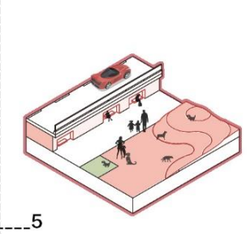
3 Transforming negative spaces forhumantopositive spaces for animals



4 Setting special venues for niche hobbies activities



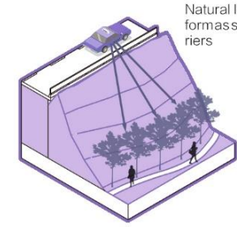
5 Dog parks



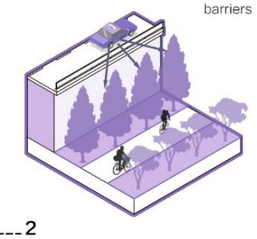
INSECURITY

E Mutual Interference

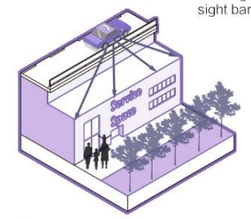
1 Natural land formassightbarriers



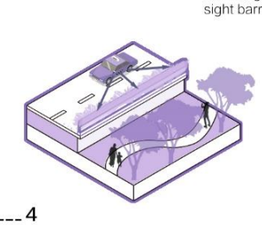
2 Plants as sight barriers



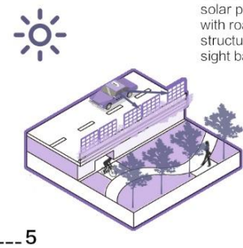
3 Buildings as sight barriers



4 Roadsidevegetation hedges as sight barriers

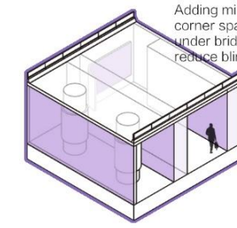


5 Combining solar panels with roadside structures as sight barriers

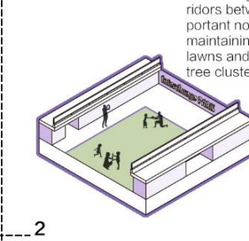


F Danger Perception

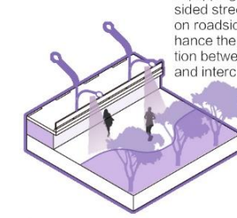
1 Adding mirrors in corner spaces under bridges to reduce blind spots



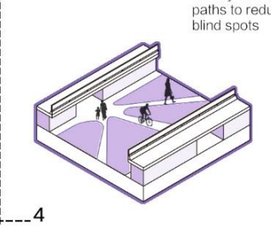
2 Preservingviewcorridors between important nodes by maintaining open lawns and reducing tree clusters



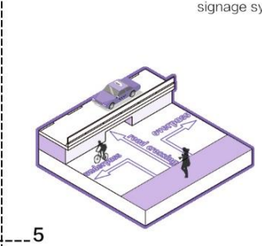
3 Equipping double sided streetlights on roadside to enhance the connection between park and interchanges



4 Reducing unnecessary winding paths to reduce blind spots



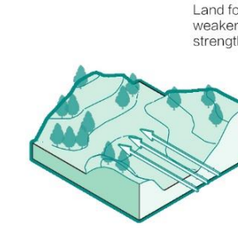
5 Traffic security signage systems



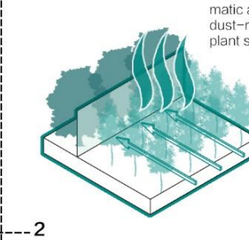
ECOLOGICAL DISHARMONY

G Uncontrolled Wind

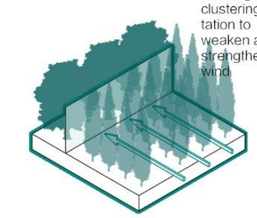
1 Land form to weaken and strengthen wind



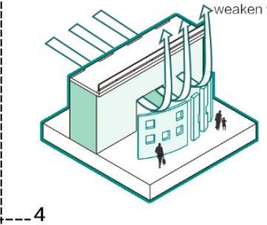
2 Selecting aromatic and dust-reducing plant species



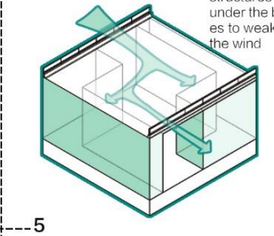
3 Planting special clusteringvegetation to weaken and strengthen wind



4 Setting artificial structures to weaken wind

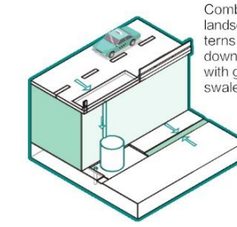


5 Modifying the structures under the bridges to weaken the wind

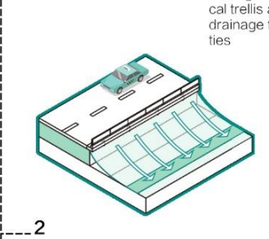


H Lack of Water Management

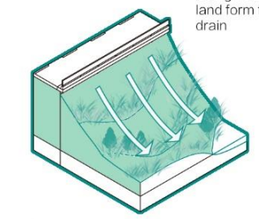
1 Combining landscapingcisterns under downspouts with grassed swales



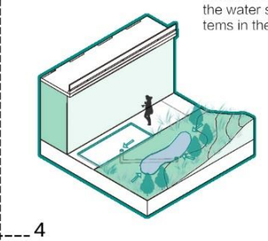
2 Setting ecological trellis as drainage facilities



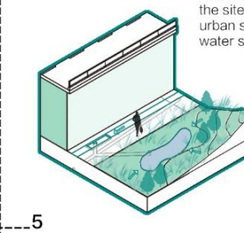
3 Using natural land form to drain



4 Interconnecting the water systems in the site



5 Connecting water systems in the site with urban storm water systems



DEMONSTRATION SITE 1:

JIMEN INTERCHANGE

Accessibility

- Extend the bridge deck to improve the pedestrian system.
- Pedestrian underpasses connect the auxiliary spaces of the interchange.

Amenity

- Add sports facilities and pet-friendly areas based on residents' needs.
- The renovated space under the interchange structure will serve as a community social and recreational space.

Basic Information

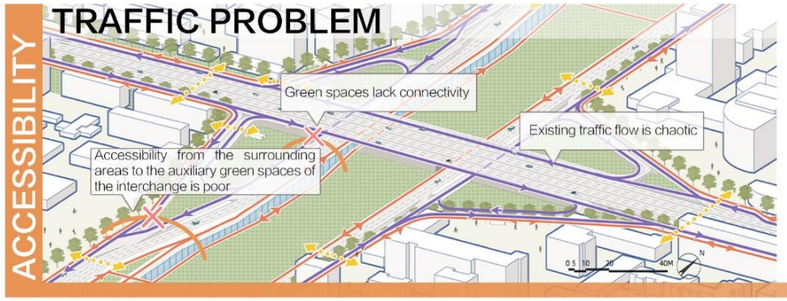
Name: Jimen Interchange

Type : Cloverleaf Interchange

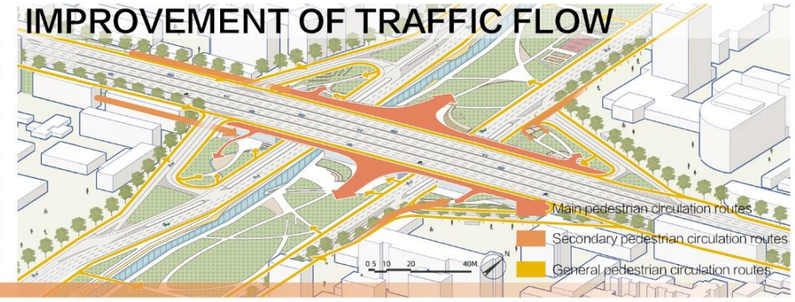
Location: Northwest

ACCESSIBILITY

TRAFFIC PROBLEM

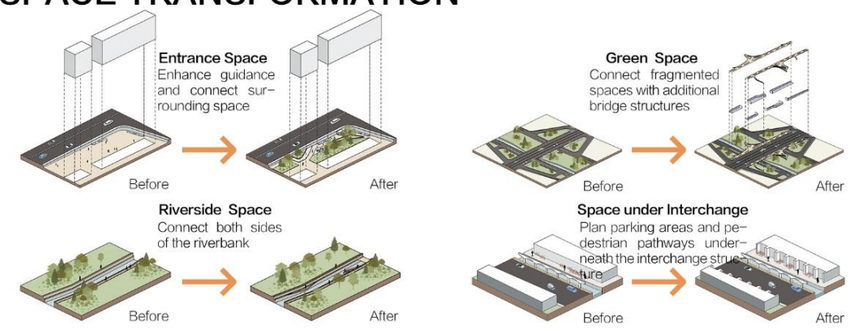


IMPROVEMENT OF TRAFFIC FLOW

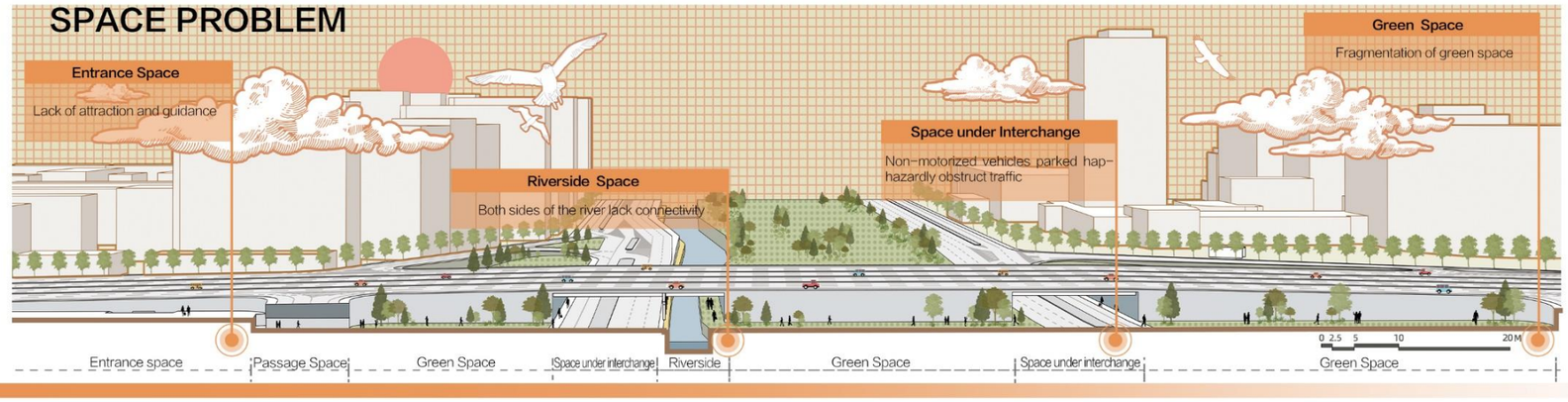


ACCESSIBILITY

SPACE TRANSFORMATION

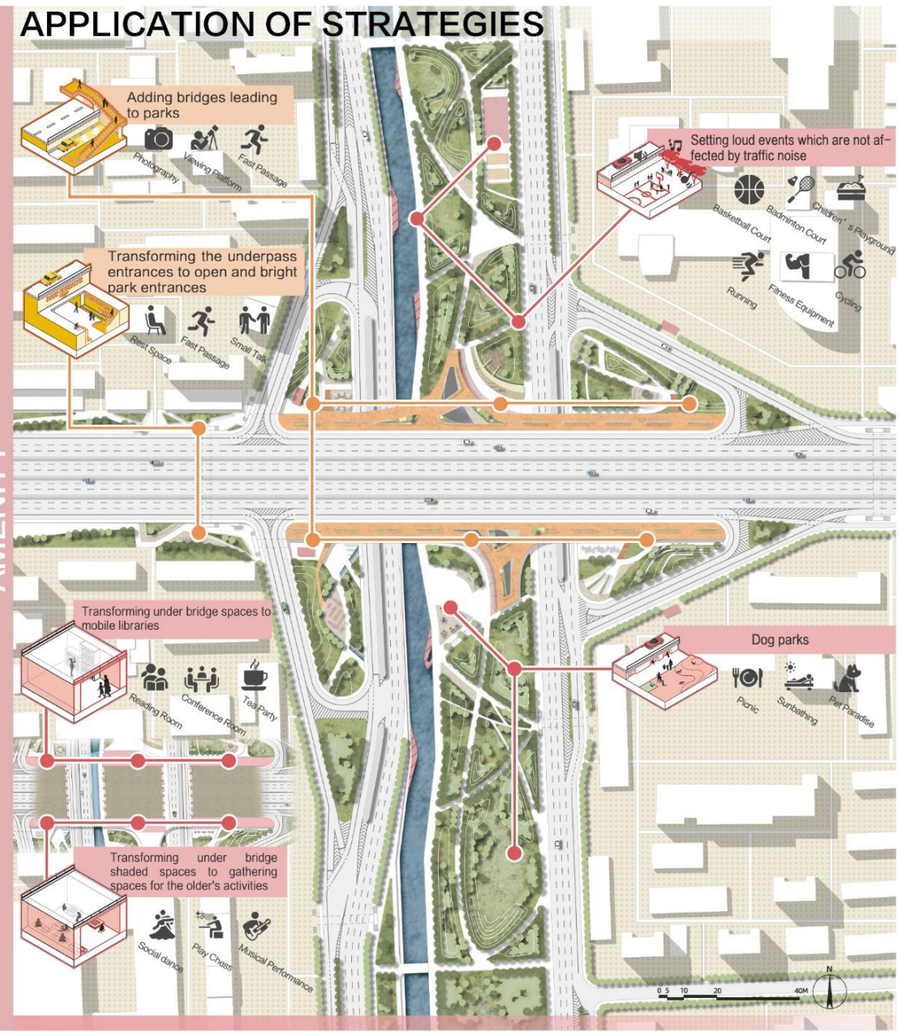


SPACE PROBLEM

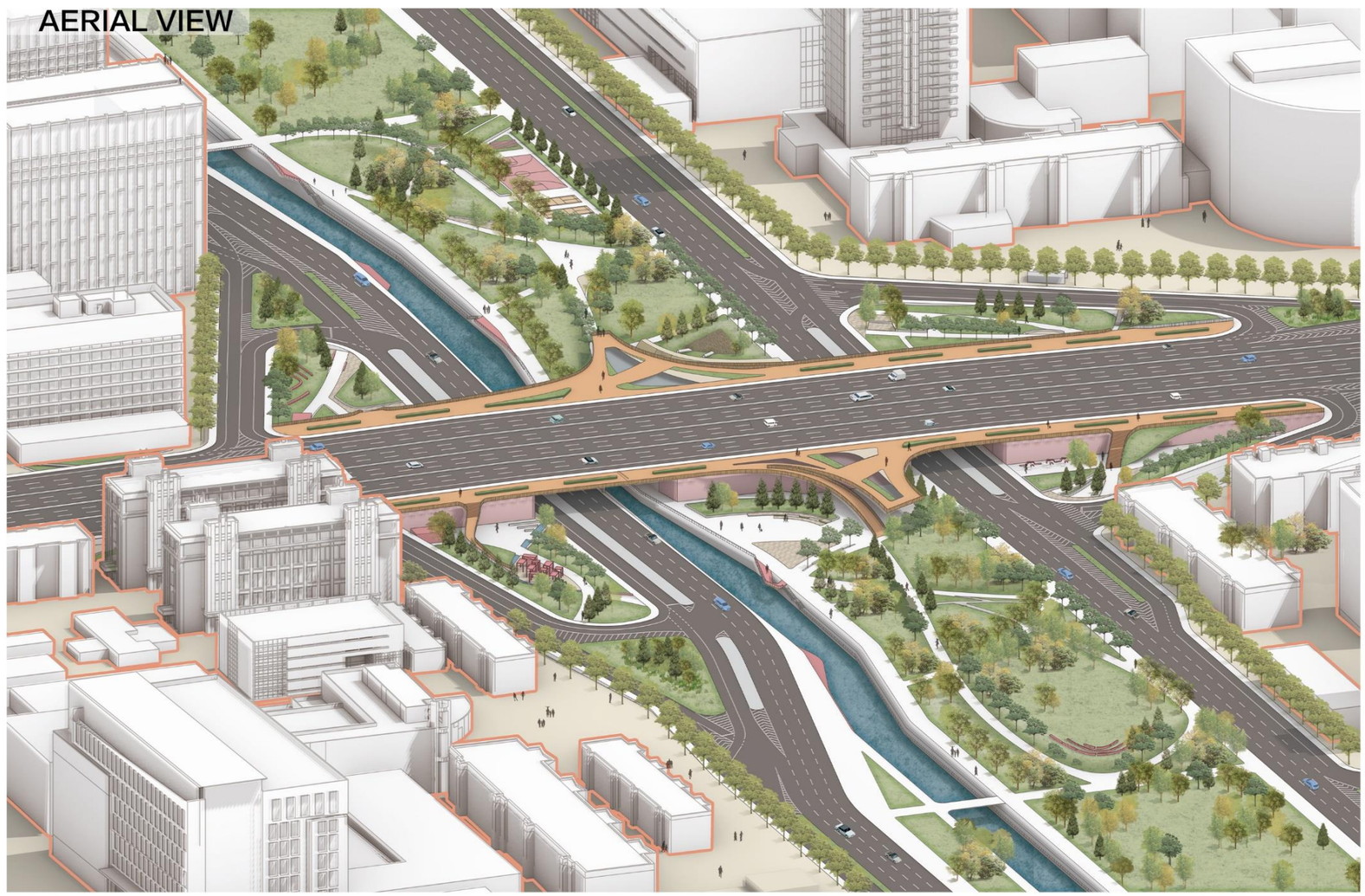


AMENITY

APPLICATION OF STRATEGIES



AERIAL VIEW



DEMONSTRATION SITE 2:

LIZE INTERCHANGE

Amenity

- Improve the acoustic environment of interchange auxiliary spaces to reduce noise disturbance.
- Create vibrant public spaces based on soundscape design.

Ecology

- Add stormwater facilities for stormwater management.
- Reuse purified stormwater for irrigation and landscape water features.

Basic Information

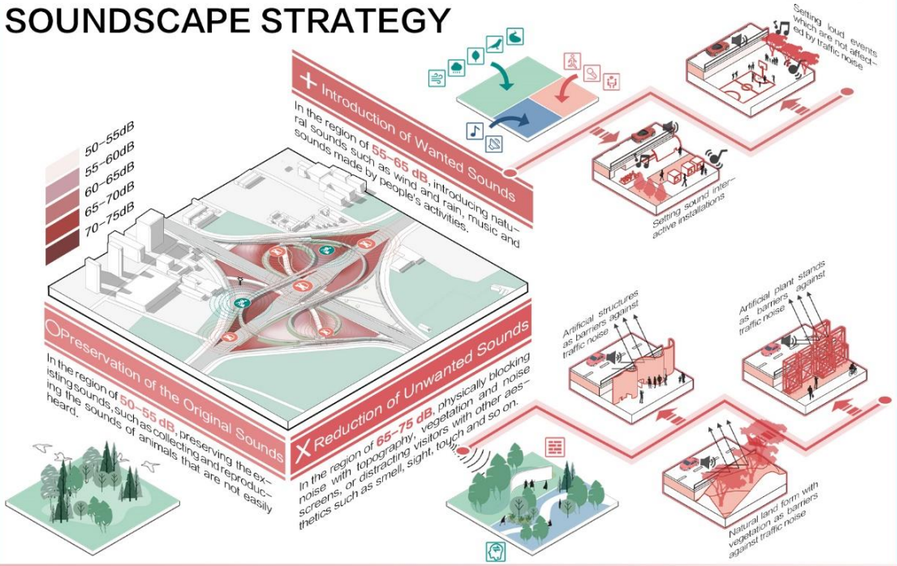
Name: Lize Interchange

Type : Hybrid Interchange

Location: Southwest

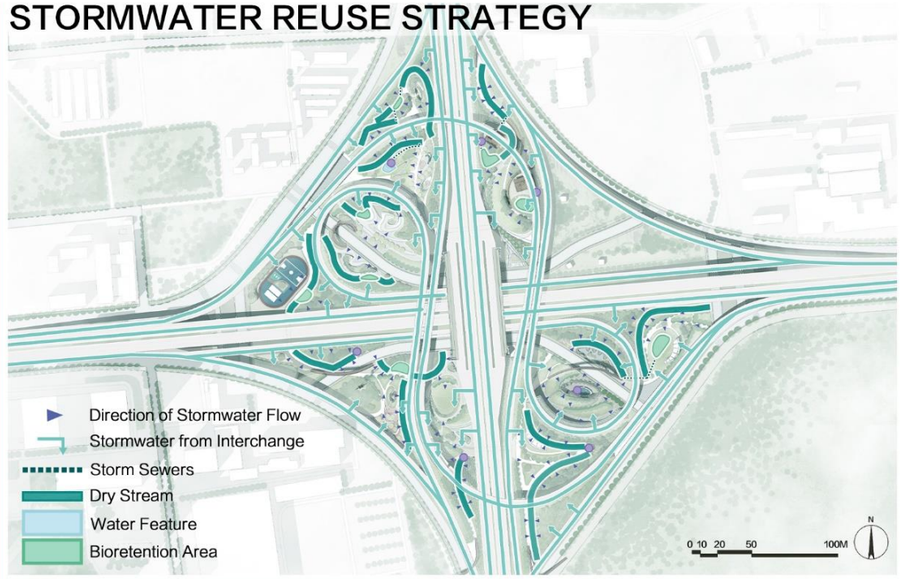
AMENITY

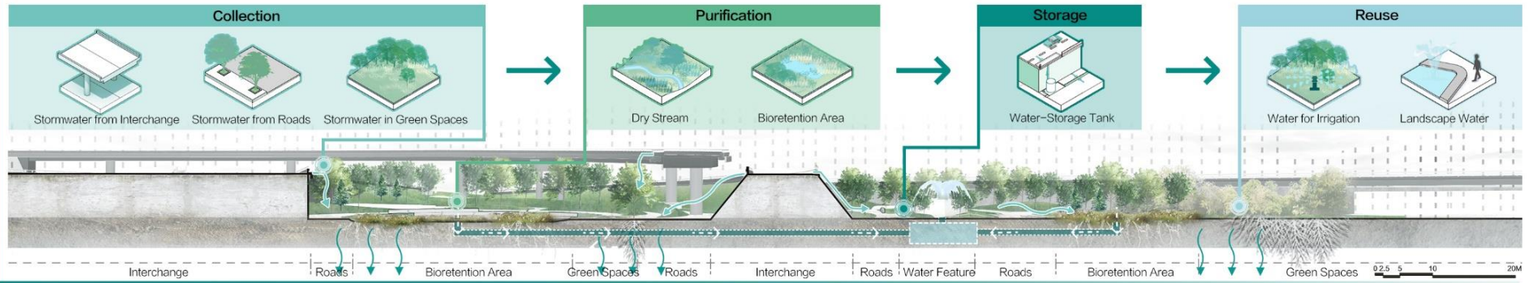
SOUNDSCAPE STRATEGY



ECOLOGY

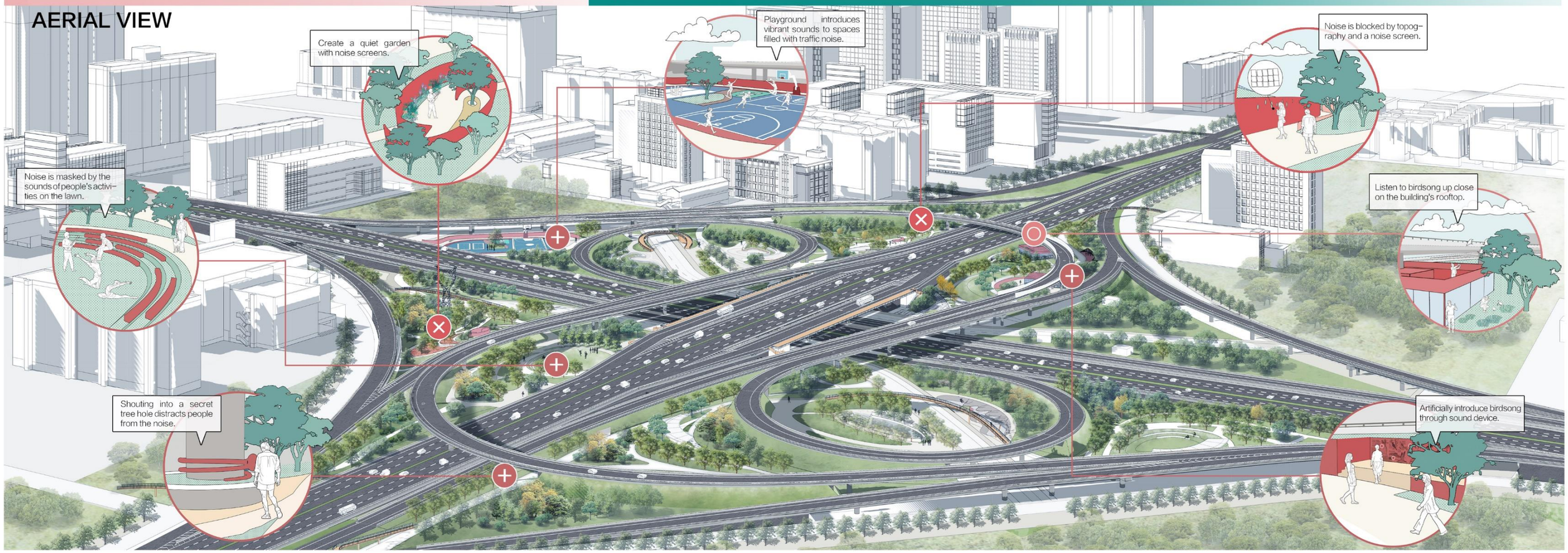
STORMWATER REUSE STRATEGY





RENDERINGS

AERIAL VIEW



DEMONSTRATION SITE 3:

SUZHOU INTERCHANGE

Security

- Separate pedestrian and vehicular traffic to ensure safety.
- Connect interchange auxiliary spaces with pedestrian bridges and underground passages.

Amenity

- Enhance the acoustic and lighting environment under the interchange through a series of measures.
- Add sports facilities and skateboarding areas based on the needs of surrounding users.

Basic Information

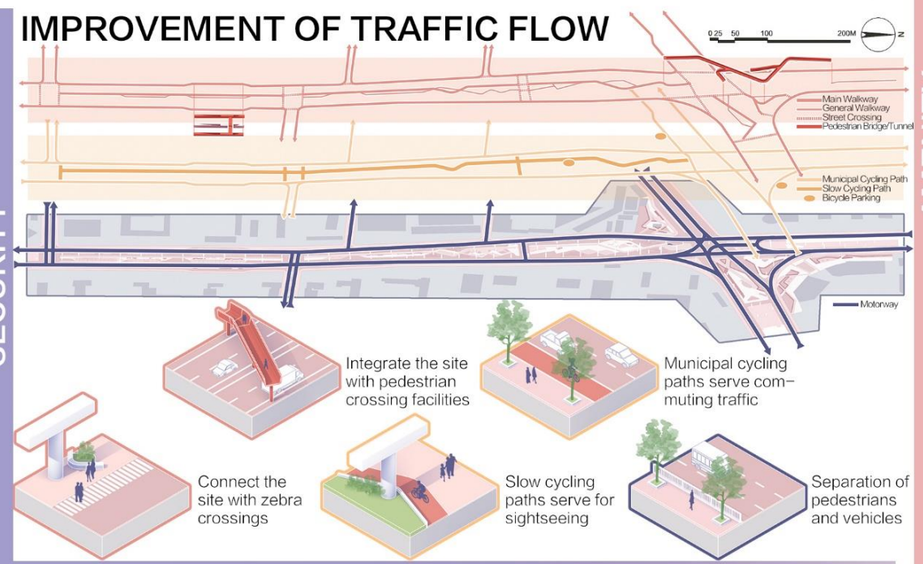
Name: Suzhou Interchange

Type : Directional Interchange

Location: Northwest

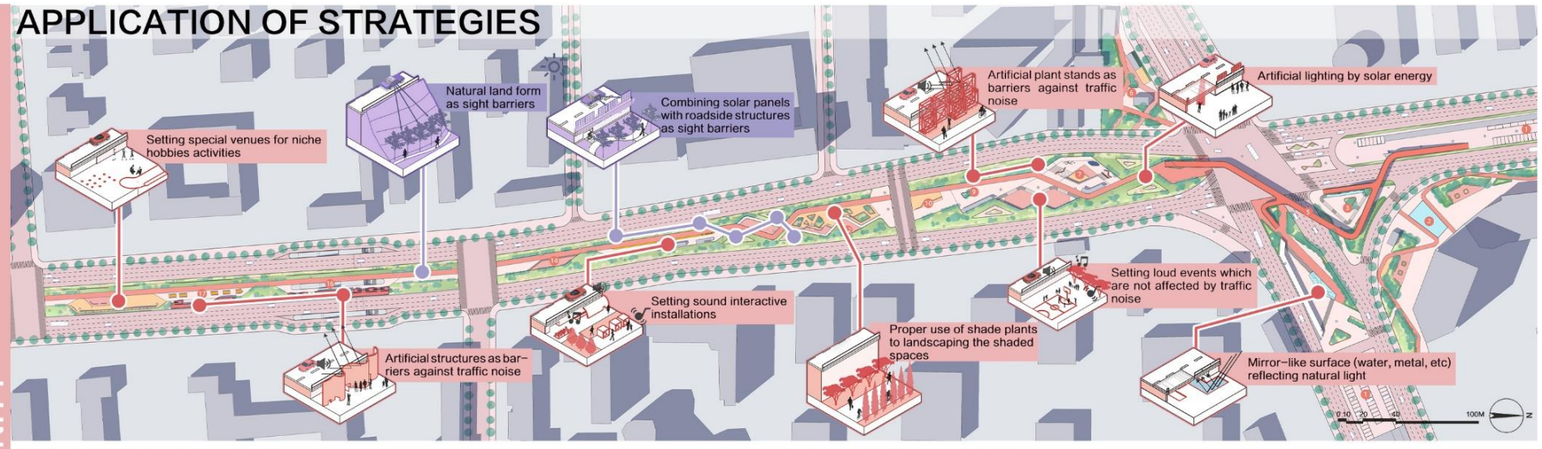
SECURITY

IMPROVEMENT OF TRAFFIC FLOW



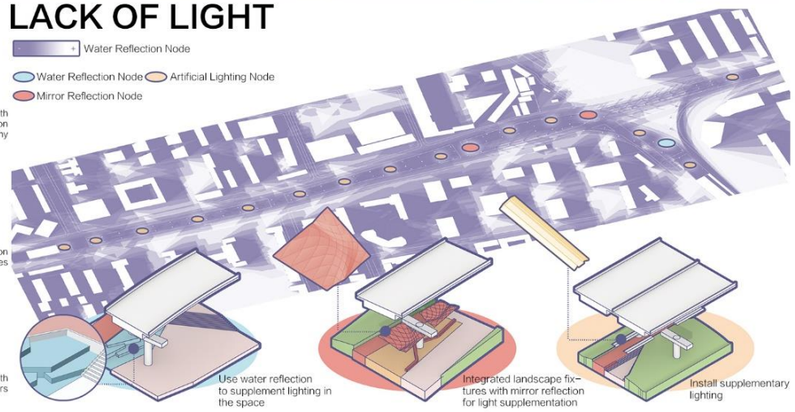
AMENITY

APPLICATION OF STRATEGIES



TRAFFIC NOISE

LACK OF LIGHT



AERIAL VIEW

DEMONSTRATION SITE 4:
HANGTIAN INTERCHANGE

Amenity

- Create multiple '1.5-level spaces' between green areas, roundabout spaces, and second-level pedestrian bridges to provide a foundation for functional integration.
- The functional spaces incorporated into the site allow for various public activities and social interactions, meeting the public space needs of urban residents.

Basic Information

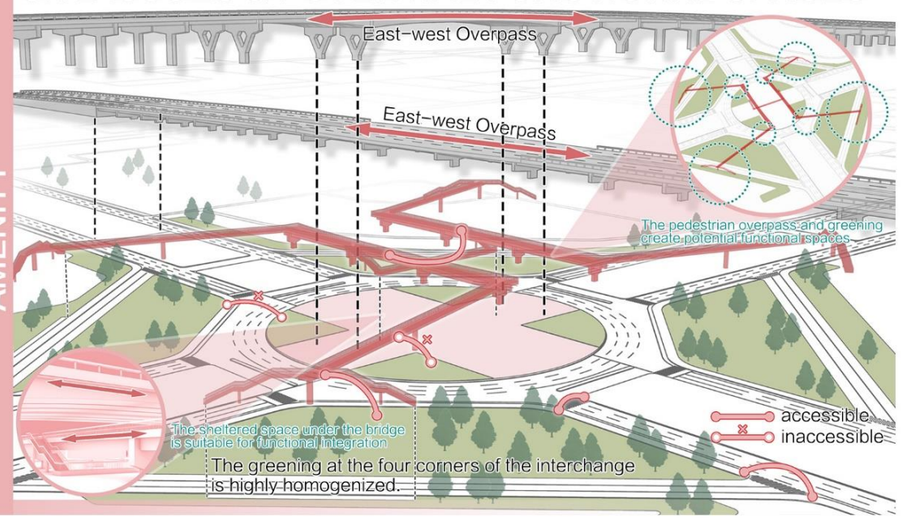
Name: Hangtian Interchange

Type: Roundabout Interchang

Location: West

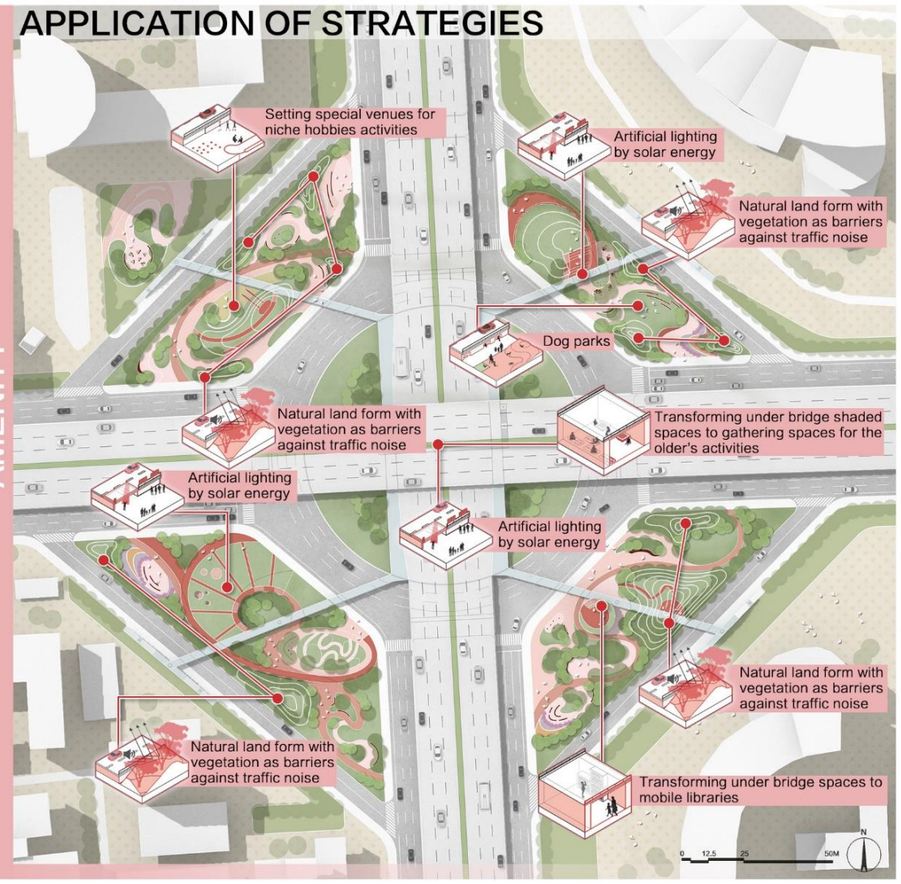
AMENITY

SITE ISSUES & POTENTIAL FUNCTIONAL SPACES



AMENITY

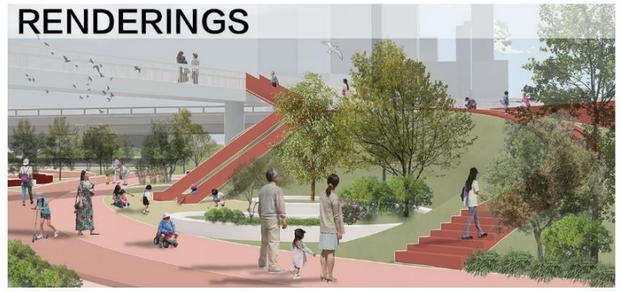
APPLICATION OF STRATEGIES



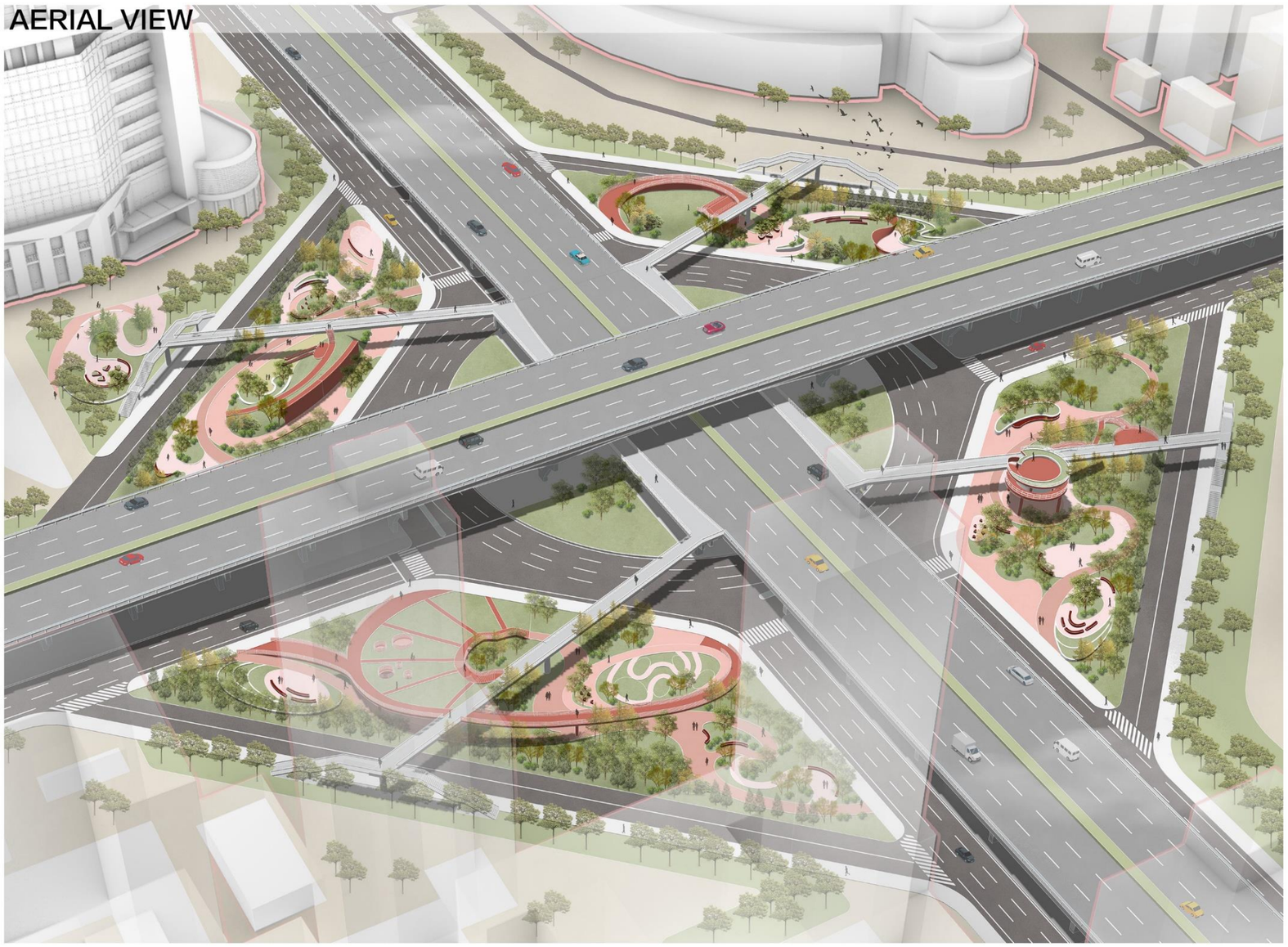
AMENITY

UNLOCKING POTENTIAL SPACES & INTEGRATING FUNCTIONS

RENDERINGS



AERIAL VIEW



DEMONSTRATION SITE 5:

FENZHONGSI INTERCHANGE

Ecology

- Enhance wind environment and create water sources.
- Establish spot shelters for animals along green corridors.

Amenity

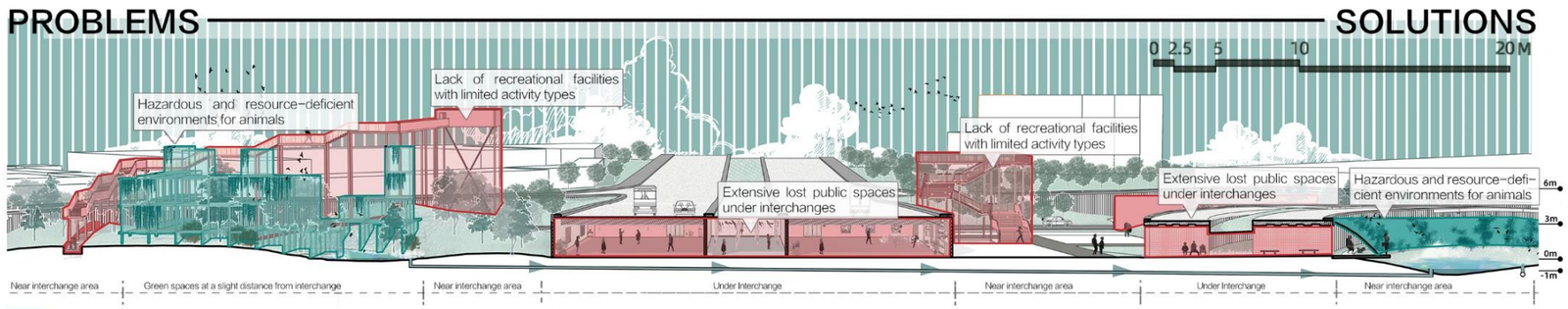
- Create an educational green space for close observation of urban wildlife.
- Create excellent observation and photography nodes for bird enthusiasts.

Basic Information

Name: Fenzhongsi Interchange

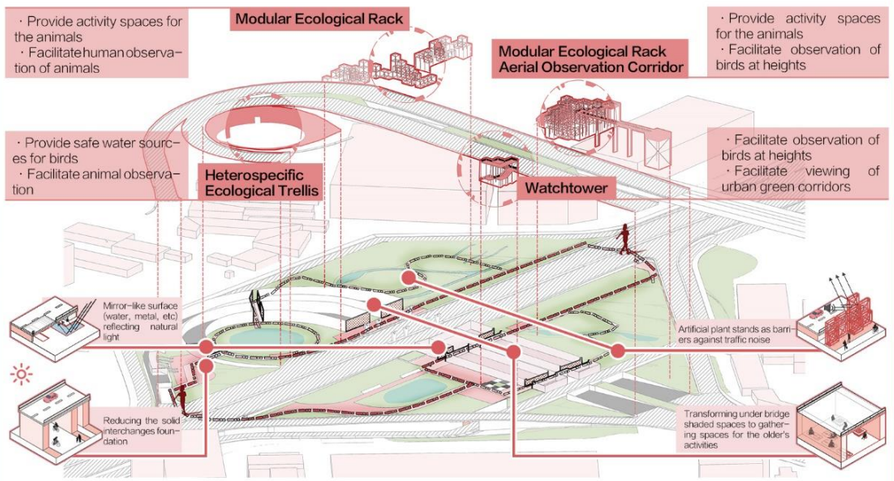
Type : Trumpet Interchange

Location: Southeast



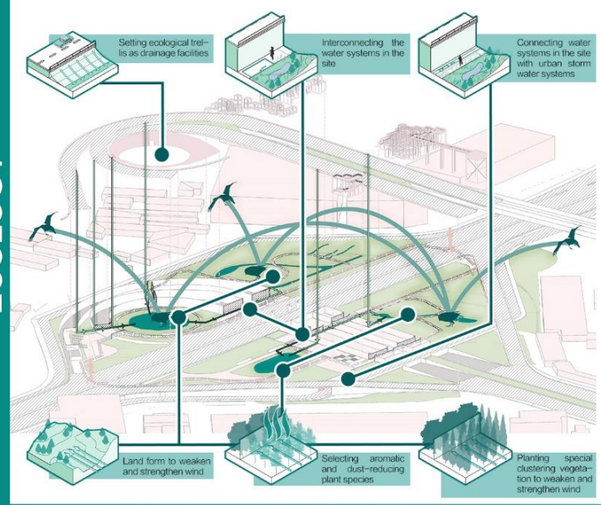
TRANSFORMATION AND REORGANIZATION

AMENITY



ANIMAL ADAPTIVE REMODELING

ECOLOGY

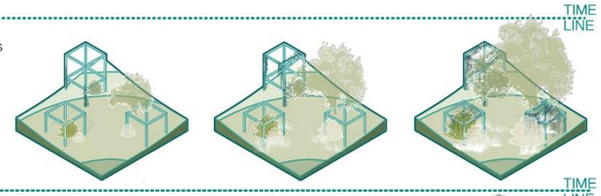


Animal activity area
· Dispersed on the gentle slope of the lawn
· With 1-2 story ecological frameworks as structures
· Tall trees complemented by dense shrubs

Pennisetum alopecuroides — *Jasminum nudiflorum*

Pinus bungeana — *Platanus acerifolia*

TIME LINE

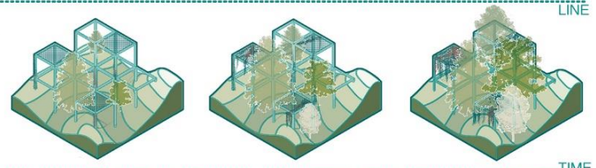


Animal nesting area
· Clustered on varied terrain
· With 2-3 story ecological frameworks as structures
· Dense, tall trees

Campsis grandiflora — *Juniperus chinensis*

Cedrus deodara — *Populus x canadensis*

TIME LINE

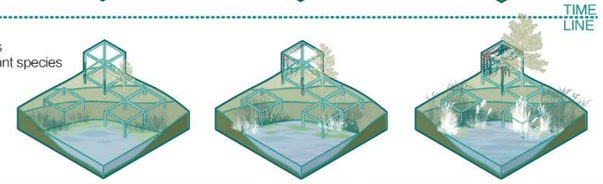


Animal foraging area
· Clustered around the water source
· With 1-2 story ecological frameworks as structures
· Food-source plants supplemented by water-tolerant species

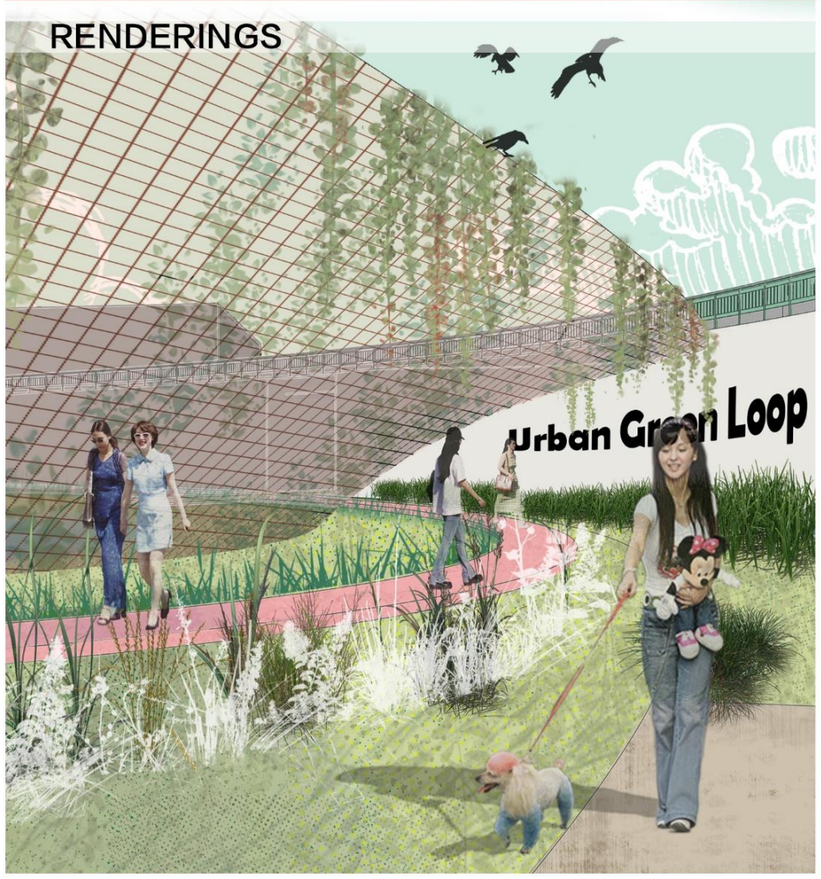
Typha orientalis — *Phragmites australis*

Malus x micromalus — *Triadica sebifera*

TIME LINE



RENDERINGS



SIGNIFICANCE

A loop of interchange parks will be incorporated into the urban green space system

A continuous **48.3-km** urban green loop will emerge

48 interchanges
will transform into attractive interchange parks

Over 20 ha of urban grey spaces
will be repurposed into public open spaces

A strategy toolbox for renovating interchange auxiliary spaces will be promoted

This strategy toolbox addresses **4 aspects** of enhancing interchange auxiliary spaces:
accessibility, amenity, ecology and security

12 linear strategies will direct
the renovation of interchange auxiliary linear spaces

40 nodal strategies will guide
the update of interchange auxiliary nodal spaces