

FROM PLANAR TO VERTICAL NEIGHBOURHOOD

Reviving Neighbourhood Cohesion Through Reinterpretation of Beijing Hutong

Master Thesis at Chalmers School of Architecture | Architecture and Urban Design | June 2017

Author: Le Song | Examiner: Jonas Lundberg | Tutor: Kengo Skorick

Dedicated to my grandfathers for their courage and love, may they rest in piece.....

Thank you....

to my family for their unconditional support

to residents in Hutong for their welcoming attitude, patience and sharing life stories

to my dear girlfriend Fan Jie for being there during the rough time

to my friends for their critiques and help

to Kengo for the guidance and time spend with us during the year

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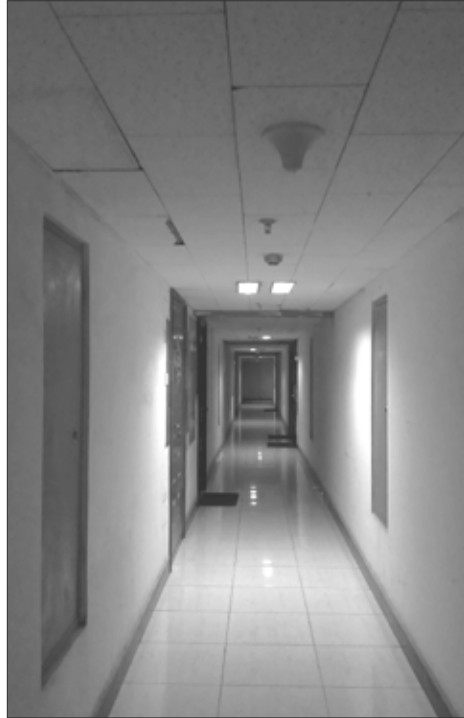
INTRODUCTION

The Misunderstanding of Social Well-Being as the Matter of Living Standard

Introduction - Student Background



According to field research and literature, residents in Hutong perceive the district as a apartment which contributes to higher level of utilizing public space and therefore stronger social interaction which leads to the feeling of integration and social well-being.



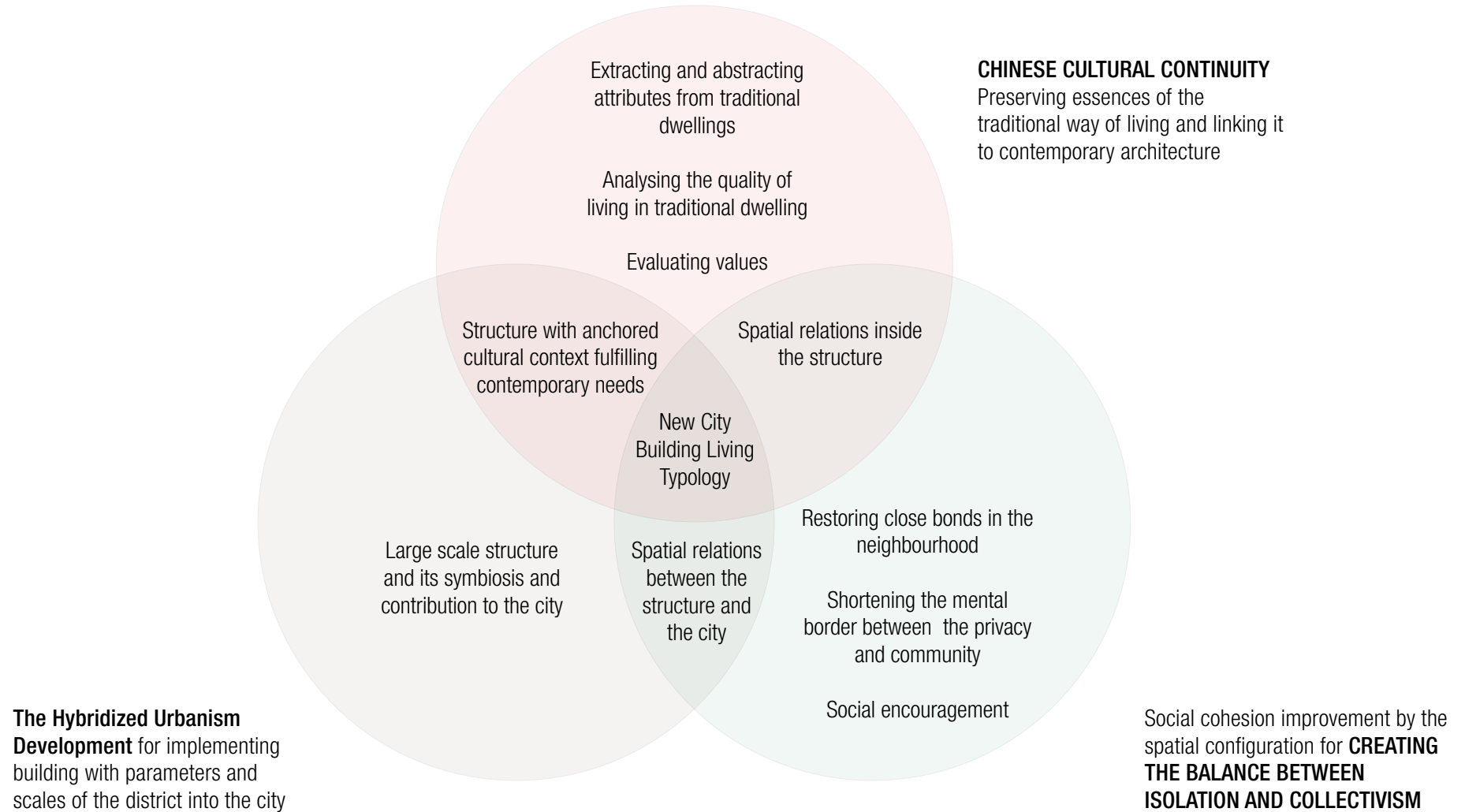
However most of contemporary housing projects behaves like vertical isolated islands. Despite of higher living standard, residents feel the lack of communication and safety, caused by spatial configuration which alienates residents from each other.



The project aims for restoring social well-being in contemporary housing units by reinterpreting spatial qualities from Hutong areas and contribute to stronger neighbourhood cohesion by creating the perception of district behaving as apartment.

Linking the Essence of Vernacular Typology with Contemporary Housing to Increase Neighbourhood Cohesion

Introduction - Discourse



From Understanding Spatial Qualities in Hutong by Field Research to Iterative Design Application

Introduction - The Method and Limitations

The Thesis aims to firstly understand elements influencing neighbourhood cohesion in vernacular dwelling in China by the field research, interview with residents living in Hutong and interview with residents who lived in Hutong and then moved the contemporary housing units in order to get relevant feedback on comparing two different housing typologies and its difference in influencing social interaction.

The result from research has been applied into iterative design process, where next generation of the design variation is informed by mistakes and knowledge gained from previous one.

The main focus is iterative design process, the final design does not represent the finished proposal, but more rather the stop in the iterative design process. The Thesis does not include structural design.

Abstract

The purpose of this research is to fight against isolation and over-industrial society appearing nowadays in China and worldwide by stimulating neighbourhood cohesion. This will be done by redefining spatial relations and softening transitions between the city, structure and retreats inspired by spatial relations in Beijing lane street -- Hutong. It is to increase the level of privatization of public space and therefore the chance of face to face meeting will be increased. According studies from former professor Herman Hertzberger, the urban planner Jan Gehl and the field study from Hutong, having the opportunity to meet face to face will shorten the mental distance and ignite neighbourhood spirit. The thesis project has been divided into the prototypical phase (movement organisation), analytical phase (Hutong neighbourhood case study) and the design application of gained knowledge.

The prototypical phase consists of physical and visual interaction evaluation, vertical connection design and the contextual application of the design. In order to increase the physical interaction chance, which conducts to lesser feeling of being isolated and increases the chance of informal meeting the diagram with fixed number of spaces and variable communication order between them has been made. To increase gradual transition between the public area and apartment, which conducts to lesser hesitation of using spaces outside the private area, spaces have been divided into four groups with different levels of publicity. In order to increase the vertical neighbourhood cohesion the project does not work with typical floor typology, instead the helix organization of the building has been developed to reduce floor to floor isolation. In order to behave and justify the existence of a vertical district the context where city cannot grow horizontally anymore has been chosen. The design has been implemented into the context around Gullbergsmotet traffic junction to link separated neighbourhood by utilizing the residual infrastructural space. By doing this large scale architecture does not behave anymore like a obstruction, but rather the extension of city environment enabling gradual changing of privacy on the contextual level.

The analyse phase focuses on understanding the complex relationships

According the study higher social well-being than gated communities. From the study trip and interviews the diagrammatic analyse has been created illustrating combination of factors which resulted in the knit neighbourhood environment. The design priorities is based on factors which affects the neighbourhood environment the most. From the analyse the earthy feeling, the scarcity of space, infill addition and high density has been prioritized. The earthy feeling is understood as a necessity of having the exterior environment right outside the apartment and closeness to the street. The scarcity of the space and infill addition is understood as a ability to motivate resident to privatize public areas, therefore creates movement overlap which conducts to social interaction.

The final phase involves rethinking the prototypical vertical neighbourhood through the key parameters obtained from the Hutong analysis. The range of FAR and number of families needed to populate a courtyard in order to conduct neighbourhood life has been listed. To be able to provide the exterior environment for every courtyard, the Fibonacci sequence is used to reach the maximum density and daylight exposure. To increase the Hutong feeling and manifest the concept, the site near Beijing Train Station has been chosen. The area has been chosen according same parameters as Gullbergsmotet, traffic junction separating the future green belt from residential area and administration area. In order to increase the environment next to noisy traffic junction, the natural landscape connecting the green belt and courtyard houses has been introduced. Depending on the context, the landscape shifts into the street with courtyard houses, greenbelt or urban fabric.

Through the design of a prototypical model of vertical neighbourhood, analysis of the rich Hutong typology, and further development of the vertical neighbourhood following the Hutong model, this research aims to make a compelling case of the possibility for a new approach towards vertical development in an increasingly complex urban environment.



Imagine living in the space where your neighbours are as close as the family.
Imagine living in the downtown with your own garden and piece of sky.



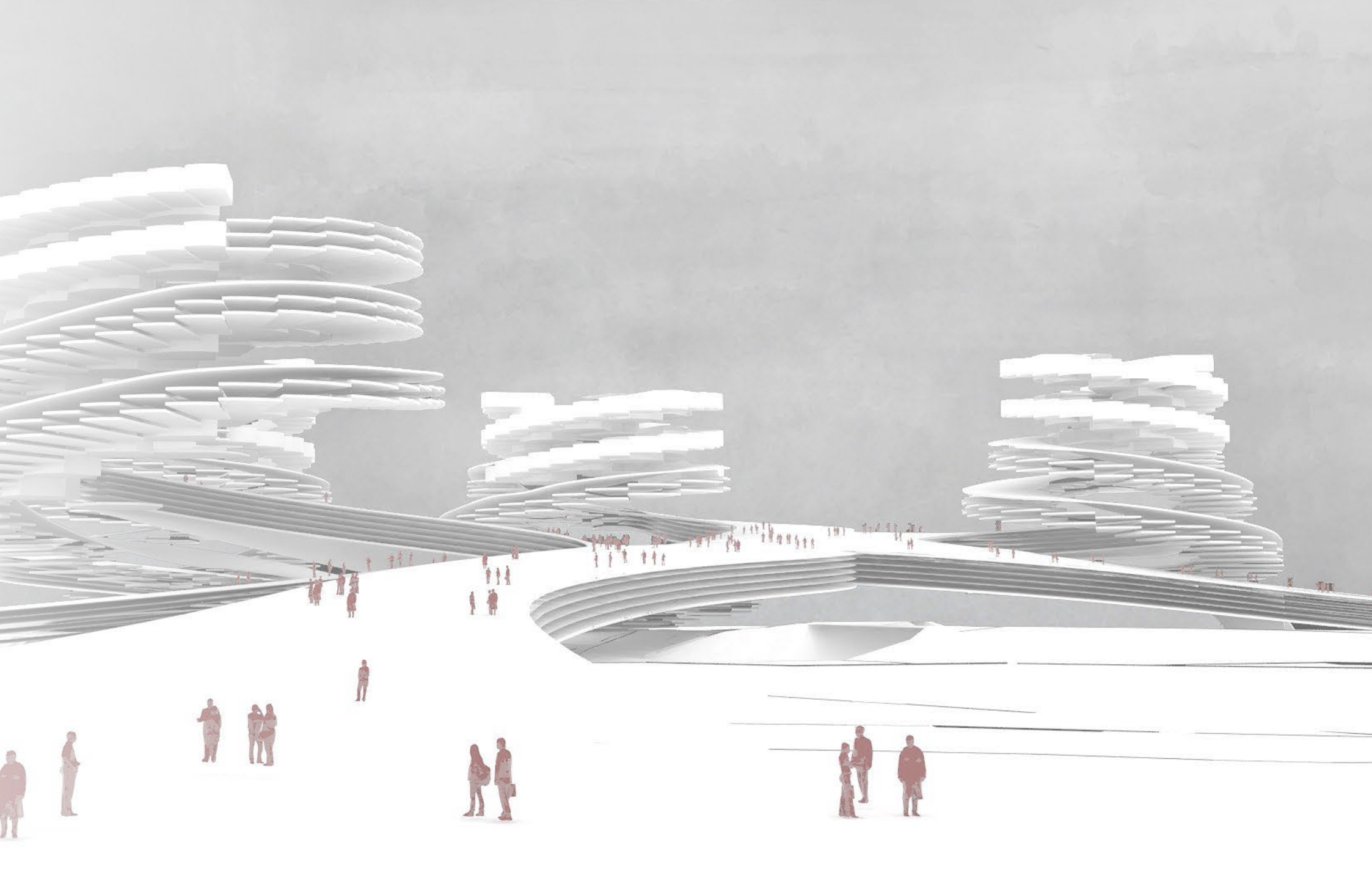


Imagine the building with parks and streets replacing dark corridors and entrance halls.



THE PROTOTYPICAL PHASE





Increasing Physical Interaction Through Evaluating Movement Configuration in the Space

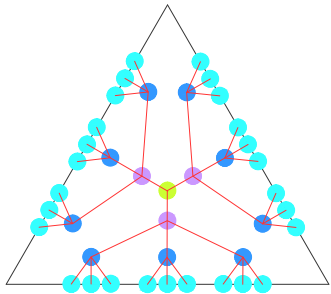
Prototypical Phase I

In order to increase the physical interaction chance, which conducts to lesser feeling of being isolated and increases the chance of informal meeting the diagram with fixed number of spaces and variable communication order between them has been made.

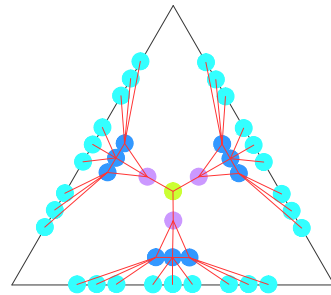
To increase gradual transition between the public area and apartment, which conducts to lesser hesitation of using spaces outside the private area, spaces have been divided into four groups with different levels of publicity.

- Public area - garden, vertical connection
- Semi public area - communal room
- Semi private area - living room
- Private area - apartment
- Movement of residents

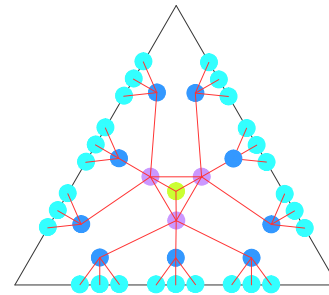
Configuration A



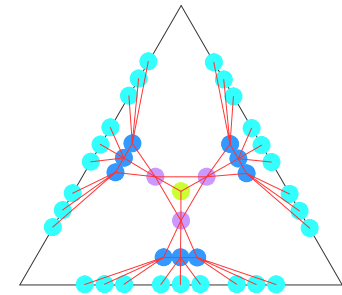
Configuration B



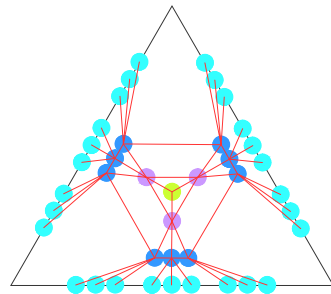
Configuration C



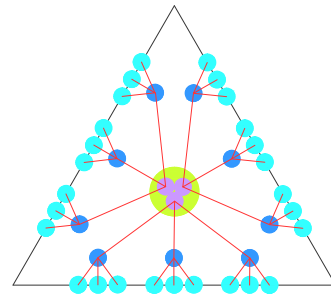
Configuration D



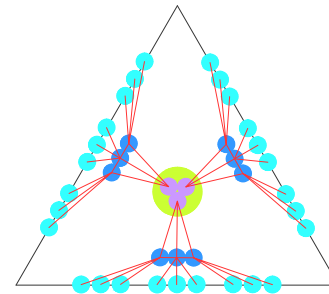
Configuration E



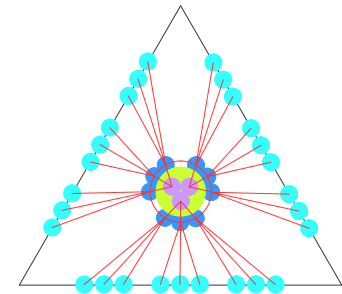
Configuration F



Configuration G



Configuration H



Increasing Physical Interaction Through Evaluating Movement Configuration in the Space

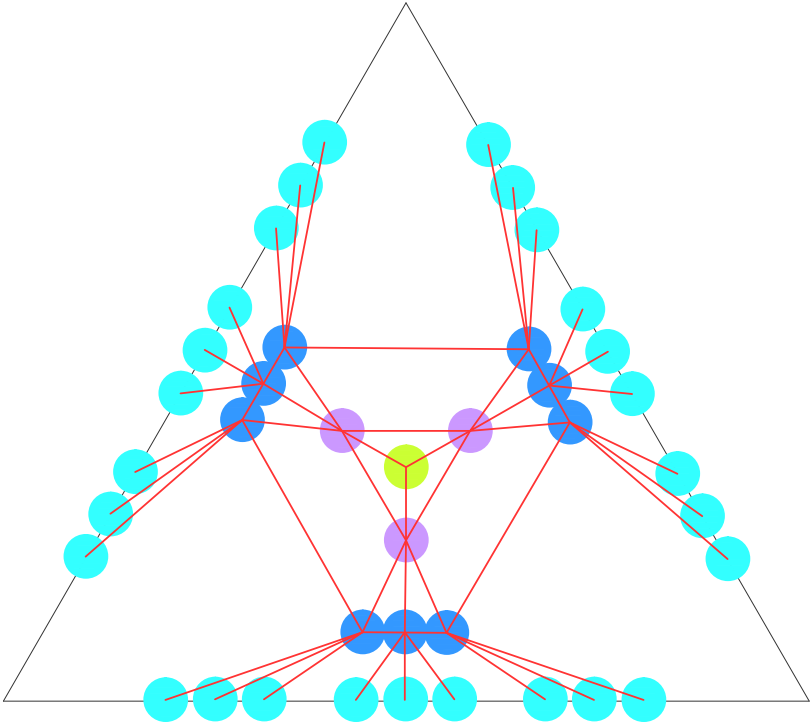
Prototypical Phase I - Outcome

The Configuration E representing layer within the layer method showed most promising numbers in term of physical interaction between residents. The configuration allows fast access to the public area representing the garden and vertical

connection and at the same time offers side connections between shared spaces conducting to neighbour visit and visual interaction between clusters.

Movement Configuration E

	Informal meeting chance (Number of people)	Intuitive reading of space
● (Cyan)	1	
● (Blue)	27	Medium
● (Purple)	27	Medium
● (Yellow)	27	High



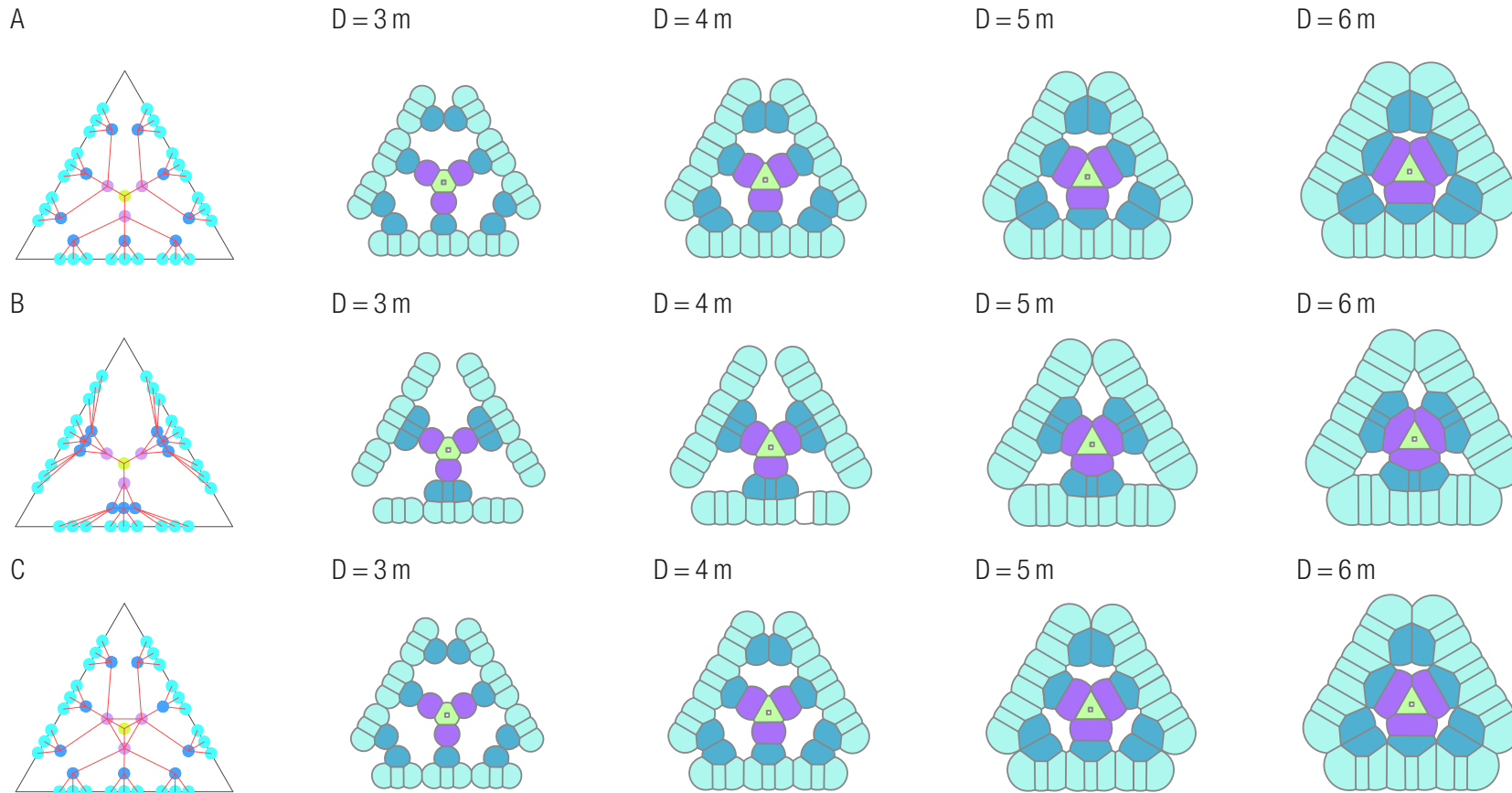
Blurring Borders Between Spaces by Reducing Corridor Length, Creating Accommodating Shared Spaces Through Changing Proportions

Prototypical Phase II

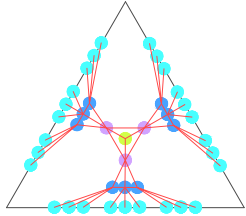
To increase the feeling of continuity between spaces the decision of having minimum corridor length separating areas from each other has been made. The feeling of continuity contributes to blurring of the

threshold between spaces, this spatial quality encourages residents to populate space outside the apartment, therefore increases the chance of social life.

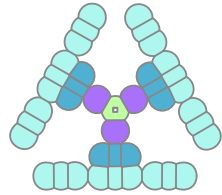
Further more, the proportion between each area has been evaluated during the process in order to provide right ratio between private and shared areas.



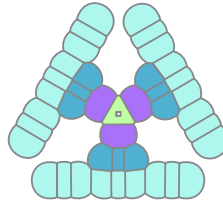
D



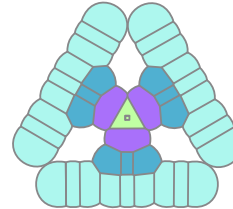
D = 3 m



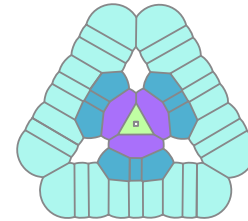
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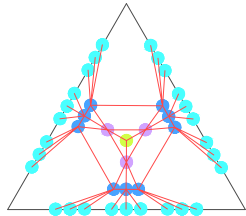
D = 5 m



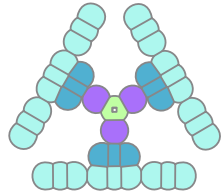
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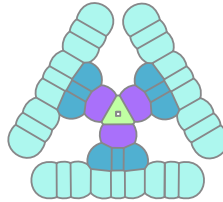
E



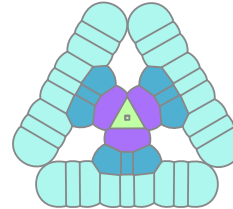
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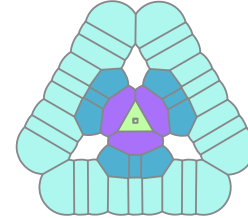
D = 4 m



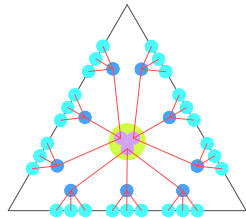
D = 5 m



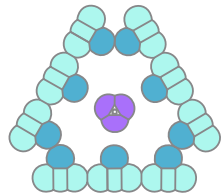
D = 6 m



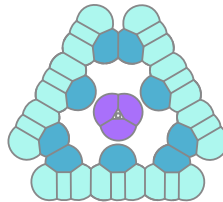
F



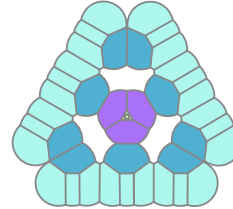
D = 3 m



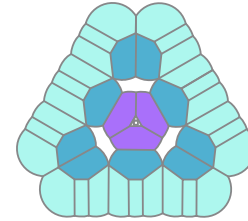
D = 4 m



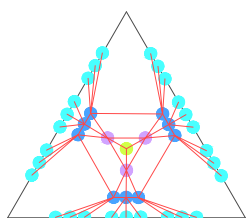
D = 5 m



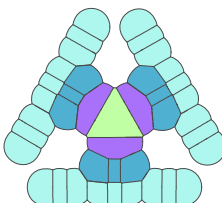
D = 6 m



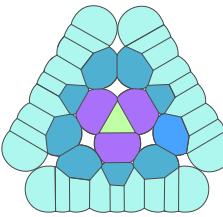
G



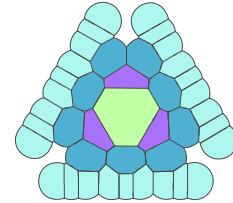
D = 4 m, 5 m, 6 m, 7 m



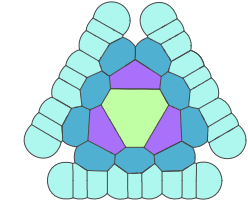
D = 4,5 m



D = 4 m, 4,5 m, 5 m, 7,5 m



D = 4 m, 4,2 m, 5,5 m, 7,5 m



Blurring Borders Between Spaces by Reducing Corridor Length, Creating Accommodating Shared Spaces Through Changing Proportions

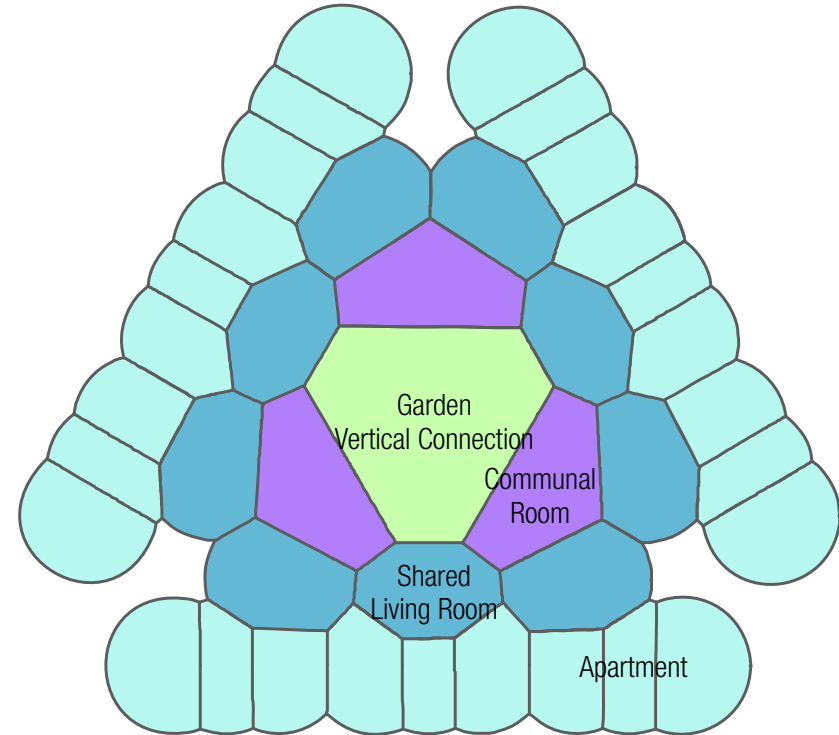
Prototypical Phase II - Outcome

With the average floor area per capita of 34 m² in Beijing (55 m² in Sweden) apartments become unnecessarily large and independent from the rest of the building. Therefore the need and will to populate spaces outside the apartments has been limited even with well design shared space.

Therefore the most private space has been reduced to 27 m² per capita. The missing floor area in private area has been transformed into shared areas to motivate and create social interaction environment. Corridors has been reduced to minimum to allow fluent transition between spaces.

Area Configuration G

D [m]	Average Area [m ²]	Total Area [m ²]	Corridor Length
4 m	27 m ²	720 m ²	3 m
4,2 m	40 m ²	364 m ²	
5,5 m	50 m ²	150 m ²	
7,5 m	128 m ²		
○	16 m ²	48 m ²	

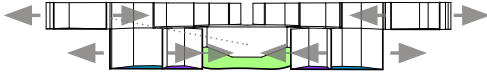
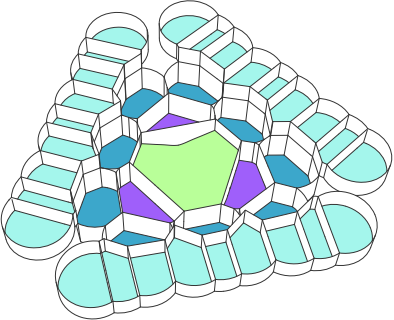


Improving Vertical Interaction and Visual Contact Between Residents Through Studying Space Organization Diagram

Prototypical Phase III

To enhance social interaction between residents and feeling of continuity in vertical direction between each floors and offer filtered visual connection to shared spaces in order to create the sense of presence to avoid isolation, 3D space organization program has been conducted.

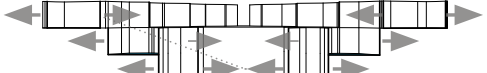
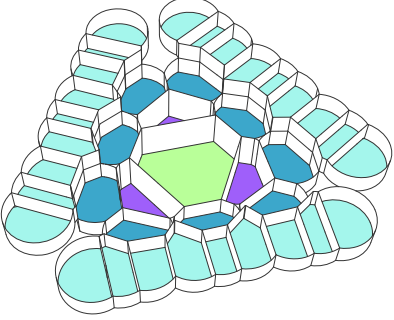
Space Organization A



	●	●	●	●	○
●	66	0	0	33	100
●	0	33	75	50	100
●	0	75	100	100	0
●	33	50	100		0

Number of Levels: 2
 Space Variation: 3 types
 Height of Spaces: 3 m; 4,5 m; 7,5
 Total Height: 7,5 m

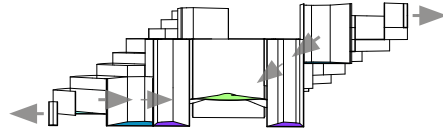
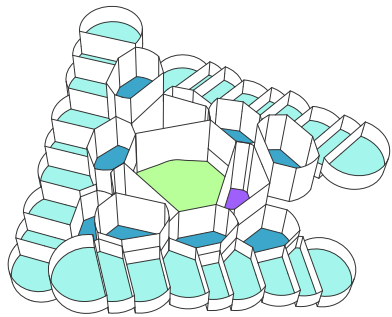
Space Organization B



	●	●	●	●	○
●	66	0	0	16	100
●	0	33	37	25	100
●	0	75	100	100	100
●	0	25	100		100

Number of Levels: 3
 Space Variation: 2 types
 Height of Spaces: 3 m; 9 m
 Total Height: 9 m

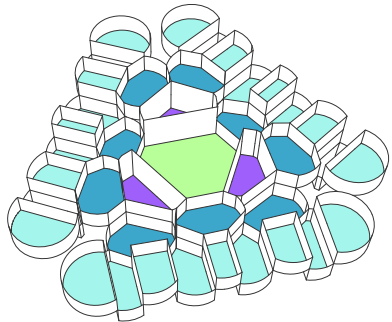
Space Organization C



	●	●	●	●	○
●	0	100	50	25	100
●	50	0	75	30	100
●	0	75	100	50	0
●	12	25	50		25

Number of Levels: 3
 Space Variation: 3 types
 Height of Spaces: 3 m; 6 m; 11 m
 Total Height: 16 m

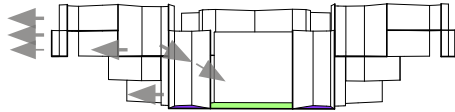
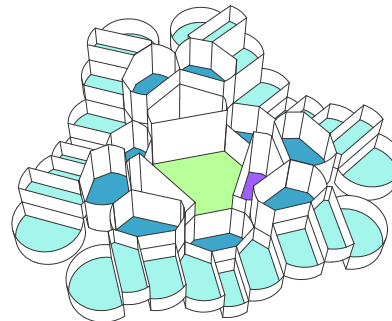
Space Organization D



	●	●	●	●	○
●	0	55	22	25	100
●	50	0	75	30	100
●	0	75	100	100	0
●	25	45	100		33

Number of Levels: 2
 Space Variation: 2 types
 Height of Spaces: 3 m; 6 m
 Total Height: 6 m

Space Organization E



	●	●	●	●	○
●	0	0	66	37	100
●	0	75	100	30	100
●	0	75	100	60	100
●	37	70	100		50

Number of Levels: 4
 Space Variation: 3 types
 Height of Spaces: 3 m; 6 m; 11 m
 Total Height: 14 m

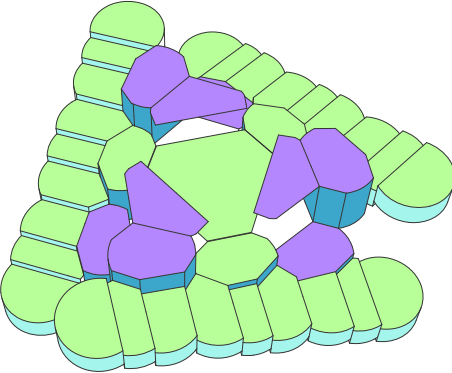
Improving Vertical Interaction and Visual Contact Between Residents Through Studying Space Organization Diagram

Prototypical Phase III - Outcome

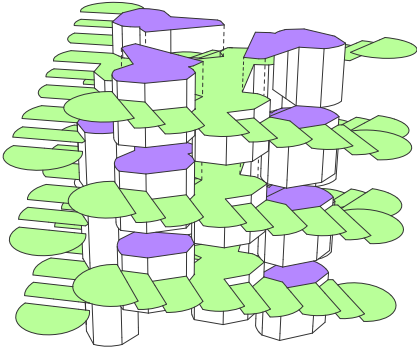
In order to increase the vertical neighbourhood cohesion the project does not work with typical floor typology, instead the helix organization of the building has been developed to reduce floor to floor isolation.

The Helix method comes from modified configuration C. The Configuration offers the most spatial variation ranging from exterior open space, to high ceiling semi covered space to high ceiling covered space

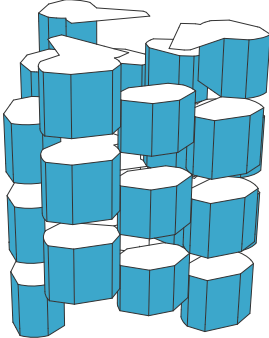
to low ceiling private space. This gradual spatial transition conducts again to blurring the threshold between private and public, between interior and exterior.



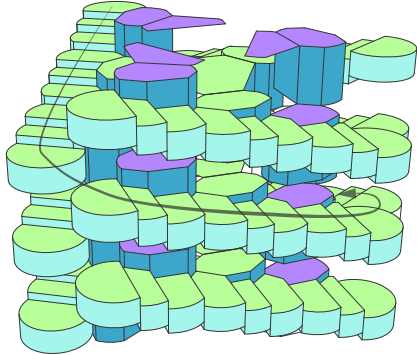
The Modified Configuration C
The Helix Method



Continuous garden creating uninterrupted transition between the urban street, building and residents from each floor



Living rooms offers the visual interaction between neighbours



Three interweaving helix's with the cross point in the middle

Justifying the Existence of Vertical District Through Creating District Bridging Gaps in the City

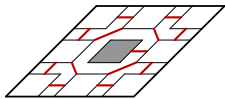
Prototypical Phase IV - Structure as a Bridge and Landscape

In order to behave and justify the existence of a vertical district the context where city cannot grow horizontally anymore has been chosen. The design has been implemented into the context

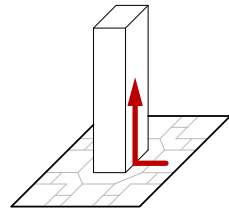
around Gullbergsmotet traffic junction to link separated neighbourhood by utilizing the residual infrastructural space. By doing this large scale architecture does not behave anymore like an obstruction, but rather the

extension of city environment enabling gradual changing of privacy on the contextual level.

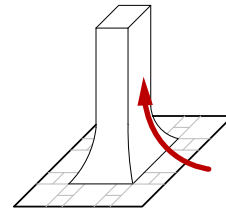
District with low number of connections gets isolated.



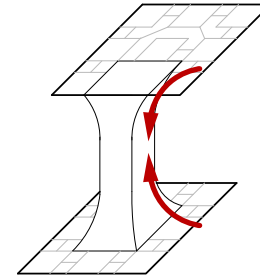
The sharp turn creates the choke point between districts around and vertical district.



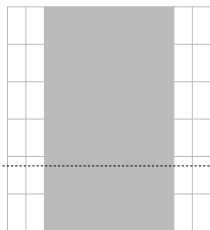
Gradual rising provides smoother transition, however with the dead end.



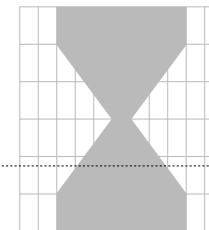
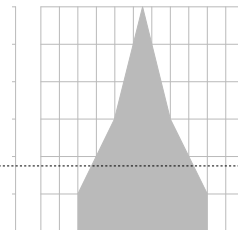
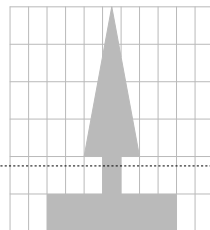
City has no ends. Continuity is created by connecting two separated part of the city



The fluidity of transition between districts



Choke point
Street level



Justifying the Existence of Vertical District Through Creating District Bridging Gaps in the City

Prototypical Phase IV - Site Analysis Gullbergsmotet

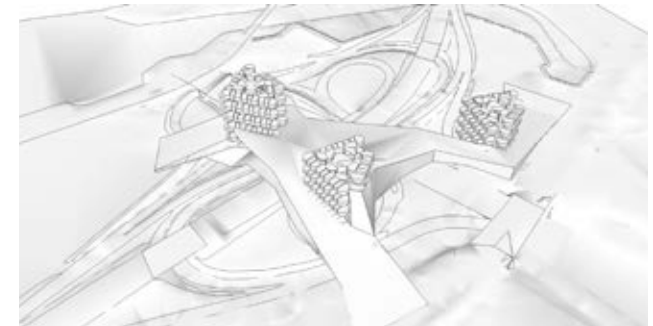
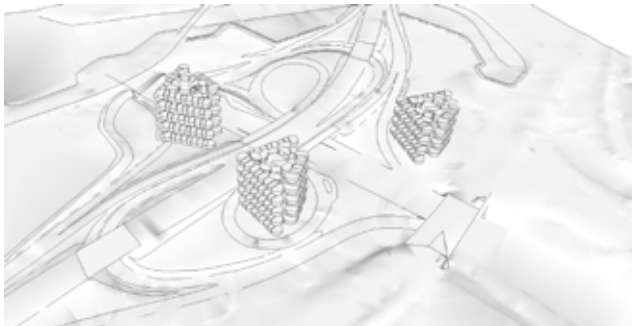
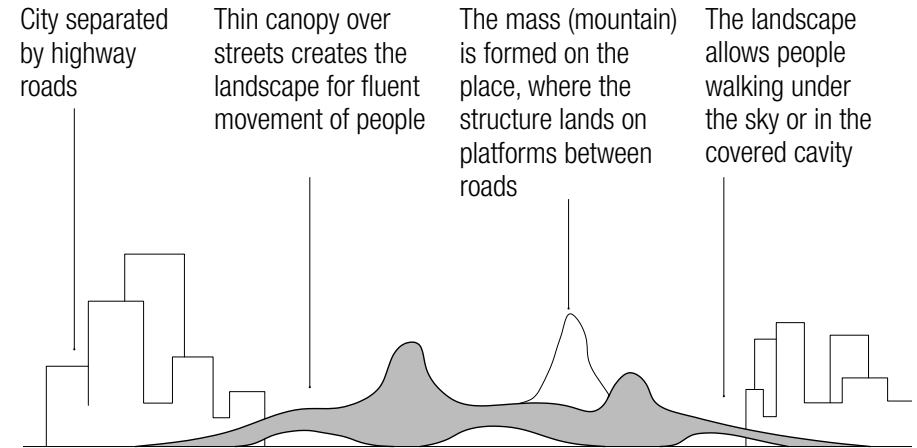
In order to test the theory, the traffic junction has been chosen as a manifest of the concept. The Master plan for Gullbergsmotet show future densification of the area. However the traffic junction will still act as a border between the city. The design will serve as a additional district built on the top of traffic wasteland in order to join the city together.



Justifying the Existence of Vertical District Through Creating District Bridging Gaps in the City

Prototypical Phase IV - Contextual Design Concept

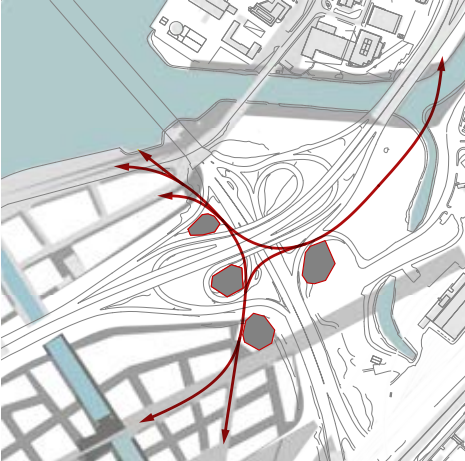
The structure behaves as a landscape. The landscape turns into steep verticality gradually. This gradual transition provides the sense of continuity and wholeness. The landscape allows free movement until certain point, the only limitation is the inclination of the hill.



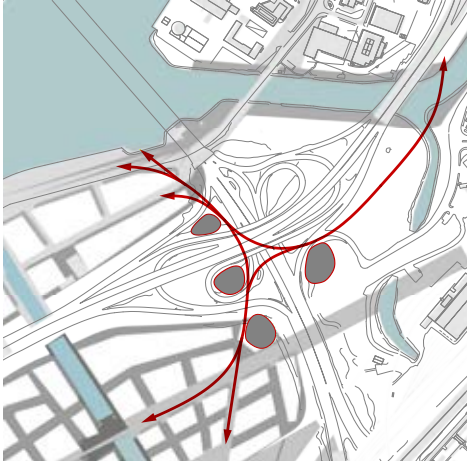
By stretching cells and connecting them together, the landscape and connection between structures has been formed. Interior is divided into small cells (apartments), medium cells (terraced office spaces) and large cells (continuous interior landscape).

Justifying the Existence of Vertical District Through Creating District Bridging Gaps in the City

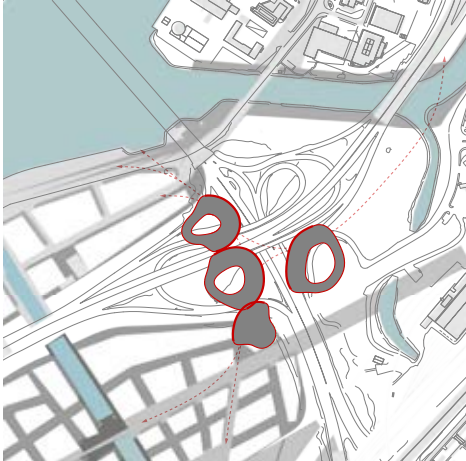
Prototypical Phase IV - Contextual Design Concept



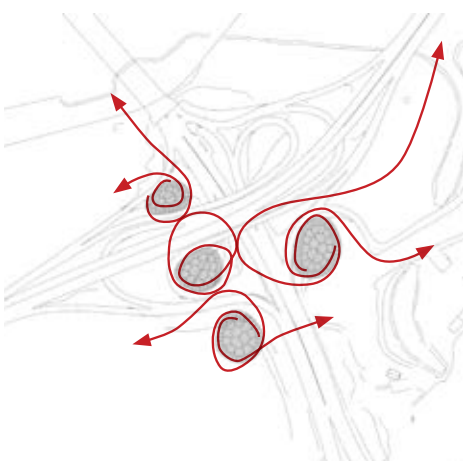
Utilizing the traffic wasteland for structure landing.



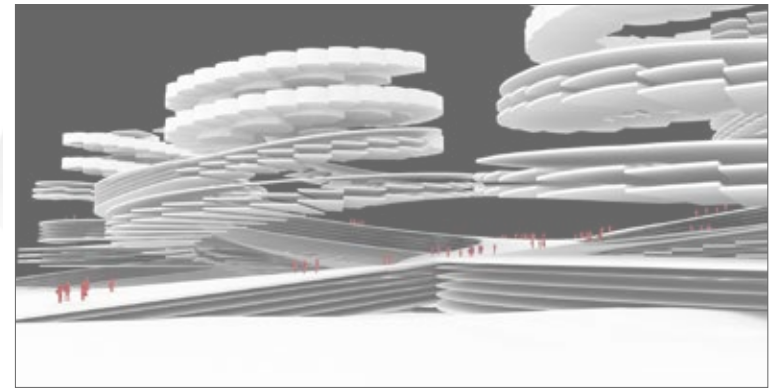
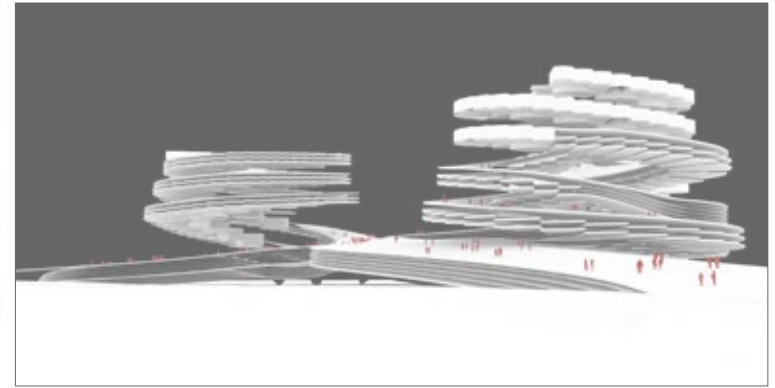
Adjusting the shape according the site.

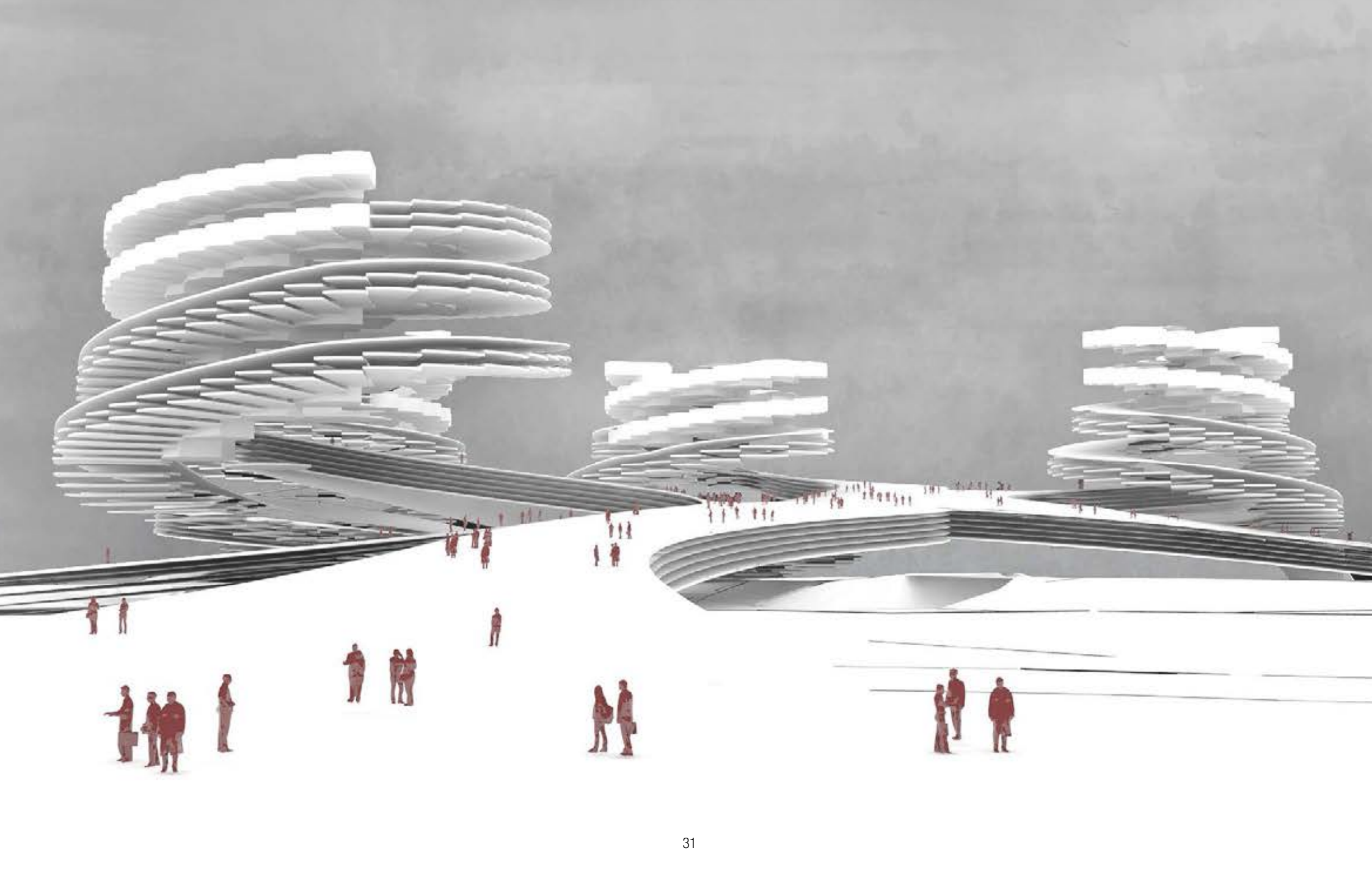


Connecting structures by stretching cells.

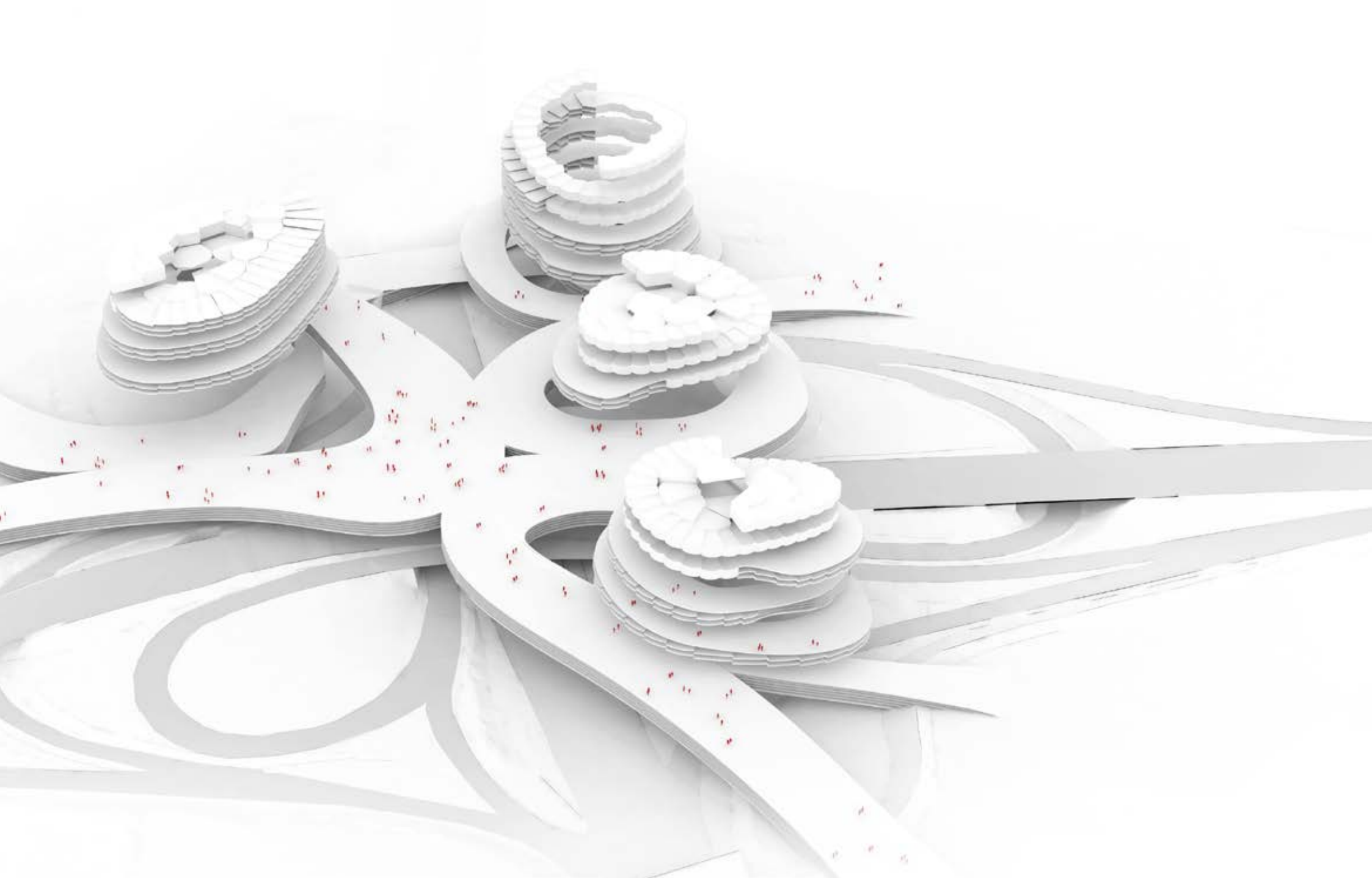


Unspringing the helix in order to connect different parts of the city.



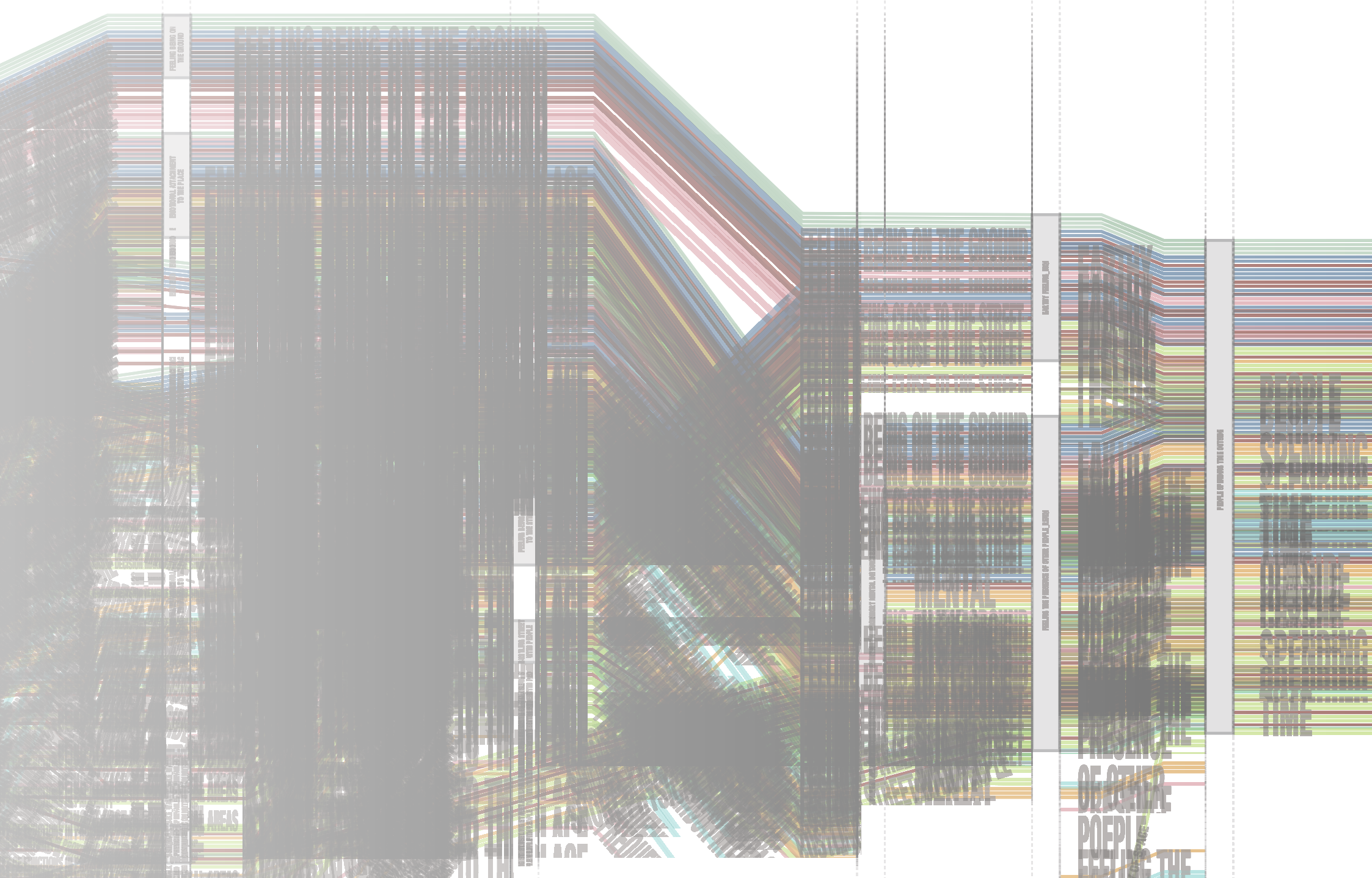








THE ANALYTICAL PHASE



FEELING BEING ON THE GROUND

PERSONAL ATTACHMENT TO THE PLACE

FEELING BEING ON THE GROUND

FEELING BEING ON THE GROUND

FEELING BEING ON THE GROUND

FEELING BEING ON THE GROUND

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FEELING BEING ON THE GROUND

The History of Hutong and Its Evolution

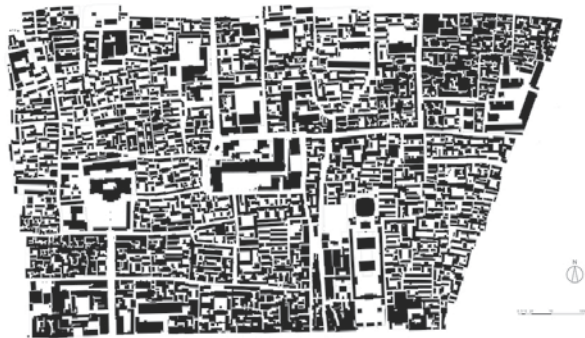
Analytical Phase I

Hutong, Chinese lane streets were originally filled with single family courtyard houses - Siheyuan. Shortly after 1950, when China moved towards to industrial transition, the

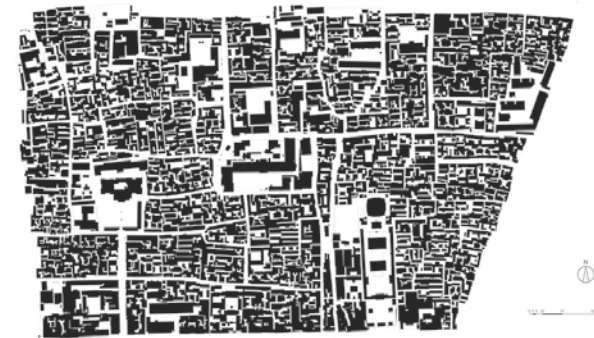
mass urbanisation occurred in order to fill the demand of labour for factories. As a result a housing shortage occurred. In order to accommodate incoming workers, courtyard

houses has been divided into multi family dwelling. Due to lack of toilet and kitchen, new illegal courtyard infill has been added. From there new living style emerged - village in city.

Before industrial transition

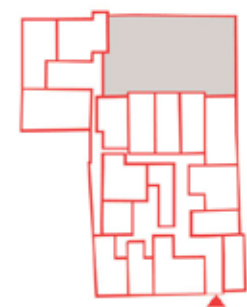
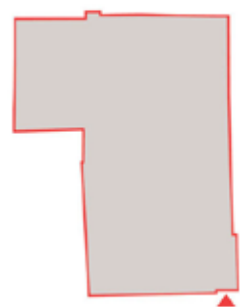


After industrial transition



FAR 0,50 - 0,65

FAR 0,65 - 0,80



Original structure

Inhabited by single extended family

After 1950 the single family house has been divided into multi family dwelling with new illegal additions.

The space for the original owner was reduced.

Values Contributing to Knit Neighbourhood

Analytical Phase II

According interviews with residents, people living in Hutong perceive the district as their apartment. This phenomena is increased by the fact that the entrance to kitchen is mostly from courtyard. Every time when residents

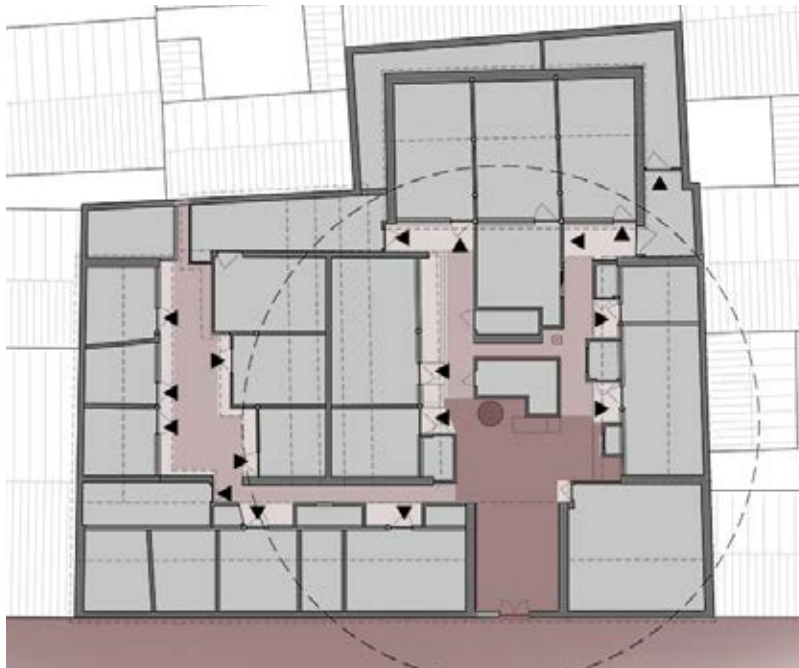
pass courtyard in order to get to the kitchen, the feeling that courtyard is part of apartment is increased. Due to having central toilet on the street, residents share movement and functional overlap on local street level, which

make them feel that the whole street is the apartment. As a result people walk on the street in pyjamas without hesitation and the street itself become extended living room. Finally by having small scale commerce

street the clash between residents living in the street, people passing and vendor is created, which forms the tight bond on district level.

Private

Public



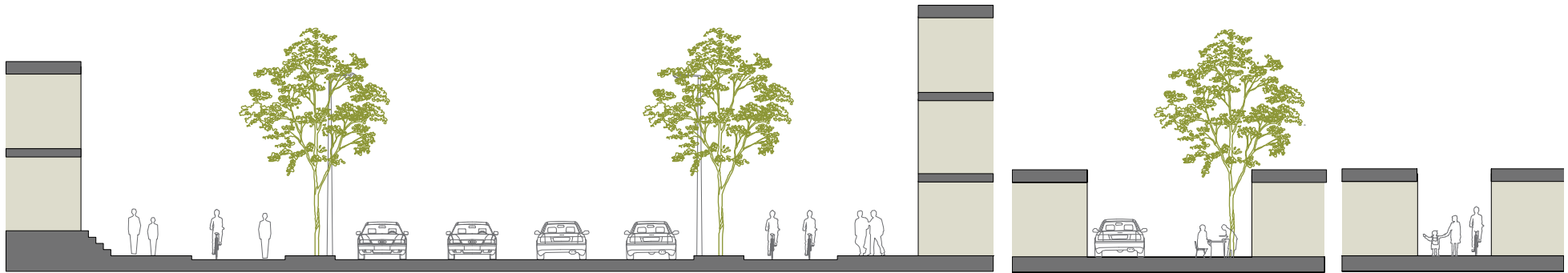
Entrance pockets together with access to the kitchen from outside increases speed of the privatization of public space



This privatization continues to the side street and main streets with decreasing tendency - hierarchy in customization of the public space.

Values Contributing to Knit Neighbourhood

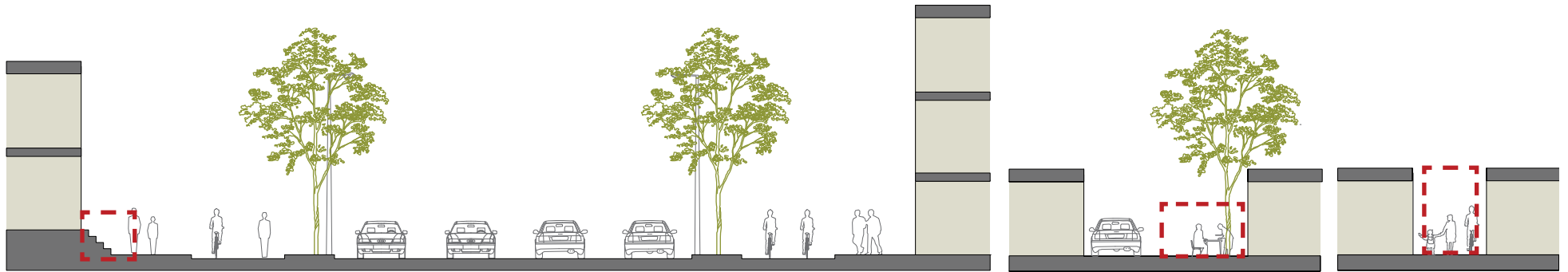
Analytical Phase II - Space Hierarchy and Gradual Transition



The environment and street proportion changes gradually. Comparing to sharp change from main street to gated community apartment, Hutong spatial organization provides time to acclimatize.

Values Contributing to Knit Neighbourhood

Analytical Phase II - Ability to Privatise the Public Space



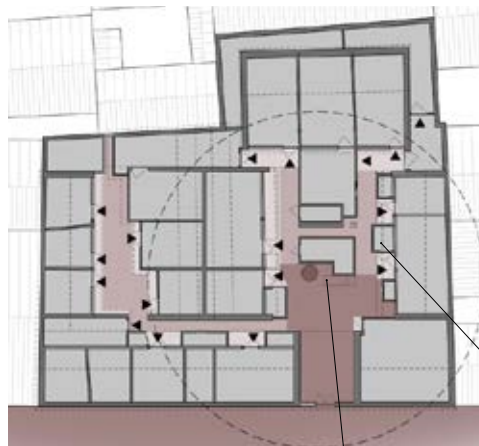
The ability to privatise public space fades gradually. Main street with low ability.



Side street with medium ability.

Values Contributing to Knit Neighbourhood

Analytical Phase II - Movement, Functional Overlap and Scarcity of Private space



Movement and Functional Overlap - Courtyard scale

Due to functional and movement overlap in various scales the neighbourhood cohesion has been snowballed. Spaces and function organization allows residents to meet close neighbours, residents from next courtyard house and from next street on daily basis in natural way, during caring on primary functions (cooking, going to bathroom, shopping)



Movement and Functional Overlap - District scale

The scarcity of the private interior space caused high density living in Hutong areas and proximity to neighbours. Comparing to isolated corridor in residential building, courtyard is always combination of smells from cooking and voices coming out from apartments. These phenomena creates environment where neighbours are not alienated anymore and the sense of belonging to a bigger society is created.



Historically, shortly after 1950 only few basin were available for the whole courtyard. Movement was formed around the basin.



Since the courtyard house was originally for one family, additional kitchen accessible from courtyard and street has been added.



The lane street share public toilet. One start to consider street as a corridor in apartment due to walking down to the toilet in pyjama repeatedly.



Few streets together share market street. Due to the sharing scale, customers and vendors know each other personally.

Values Contributing to Knit Neighbourhood

Analytical Phase II - Steps and Entrance Configuration

According to the Dutch architect and architecture professor Herman Hertzberger, the entry porch and space around is one of the most important spaces in terms of social life. It is the place where inside clashes with outside, where private clashes with public. It is the place in between where the most richest interaction can occur.

In Hutong, little stairs and entrance configurations allow various ways to populate. From chess playing, dining, selling goods to playground for children or simply a place to sit to observe street life.



When the space can serve as store front, bench and storage, urban space becomes rich.



Entrance as garage, covered playground and porch.

Values Contributing to Knit Neighbourhood

Analytical Phase II - DiQi, Earthy Feeling

According to responses from interviews, residents living in Hutong value the most its earthy feeling (DiQi) and sense of presence of another people around (RenQi). Earthy feeling can be explained as being in touch with exterior environment. In Hutong earthy feeling is created by having a solid ground and piece of sky right behind the apartment - proximity, by using same natural material in interior and exterior - grey brick and wood and by its proximity to the street.



Values Contributing to Knit Neighbourhood

Analytical Phase II - Small Scale Commerce and RenQi

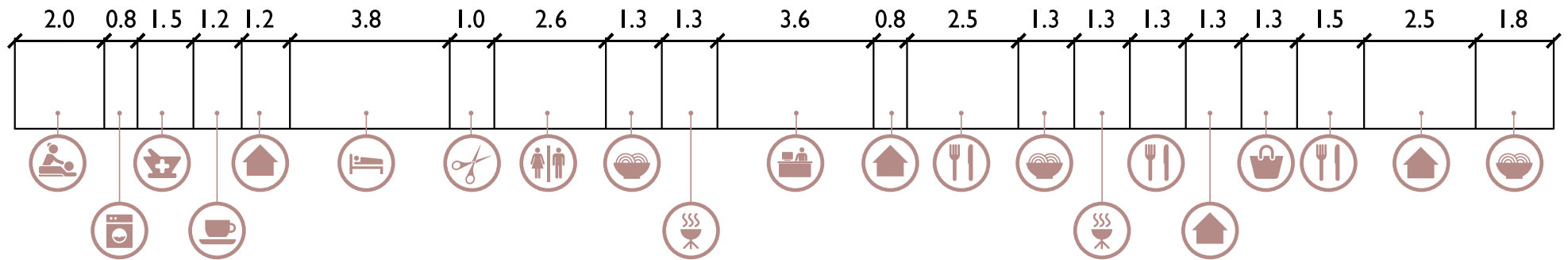
Ren Qi can be explained as feeling the presence of other people comes from proximity, phenomena such as sound and smell, and dense small scale commerce, where bustling street life is occurring. In

“Contesting Spatial Modernity in Late-Socialist China” Li Zhang describes renqi as derived not only from the density of people in a given place but also from a state of being at ease in a space that is capable

mingling everyday living experience. This contributes to the diversity both in commercial and shared functions, which encourages to completing daily tasks on foot in a district and to higher chance

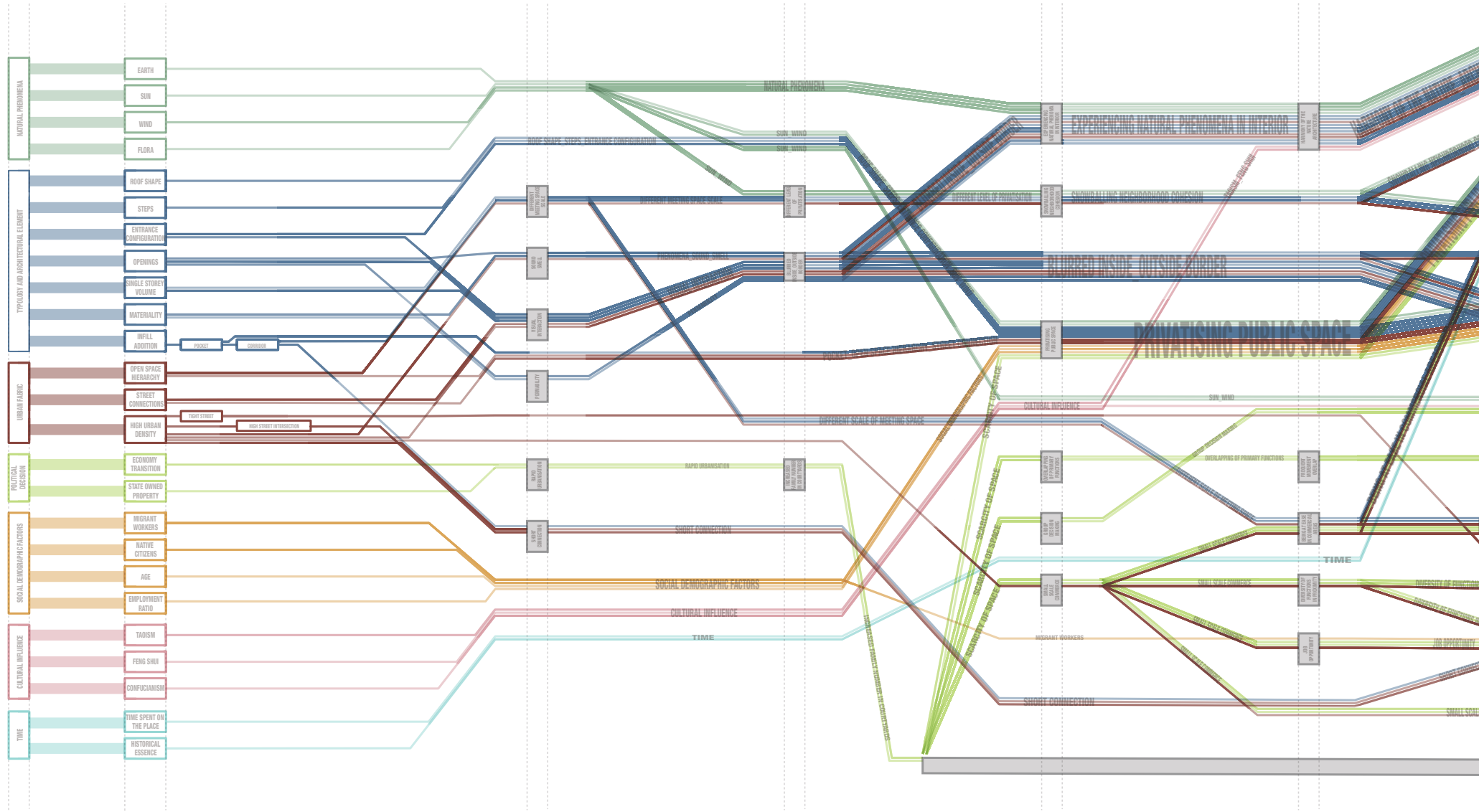
meeting neighbours. Furthermore, small scale commerce enhances relationship between vendors and residents, due to the fact that small scale commerce is usually run by the owner.

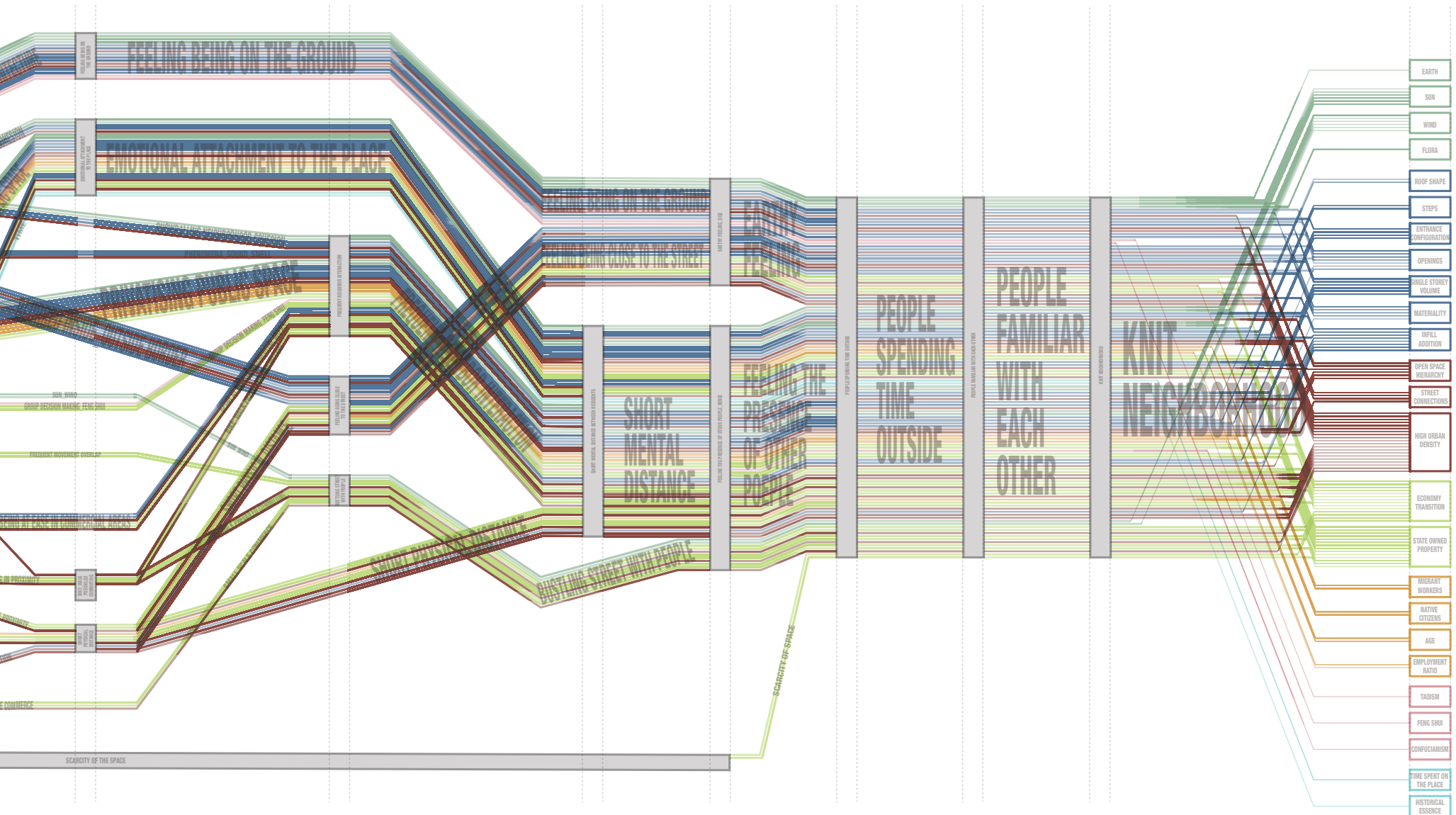
The Density of the Commerce on 35 m Long Street Front



The Summary Diagram Illustrating Combination of Elements

Analytical Phase III - Diagram Summarizing Elements and Its Combinations Leading to Knit Neighbourhood in Hutong





The image is a blurred architectural rendering. In the foreground, a road with multiple lanes is shown with motion blur, suggesting a fast-moving vehicle. The road is bordered by a concrete wall. In the middle ground, a multi-level, terraced building structure is visible, featuring various levels and platforms, some of which are topped with greenery. The building has a complex, stepped design. The background is a bright, hazy sky. The overall image has a soft, out-of-focus quality.

THE DESIGN APPLICATION



Densifying and Connecting Beijing by Utilizing Residual Infrastructural Spaces

The Design Application I - Site Context

The site has been chosen to manifest the design concept of a vertical district reconnecting the urban fabric together. The site is located in Beijing, next to the Beijing Railroad Station. The city is divided

divided by traffic rings circling around The Forbidden City. Each traffic ring represents 500 m of the infrastructural wasteland. The only way to cross the boundary is by subway tunnels or narrow bridges. Neither

them can be considered as appropriate city environment for people, it is merely a emergency solution. The Project aspires to provide fluent flow of people between separated areas by building the district

above infrastructural wasteland to create missing piece of city environment.

Civic and cargo railroad

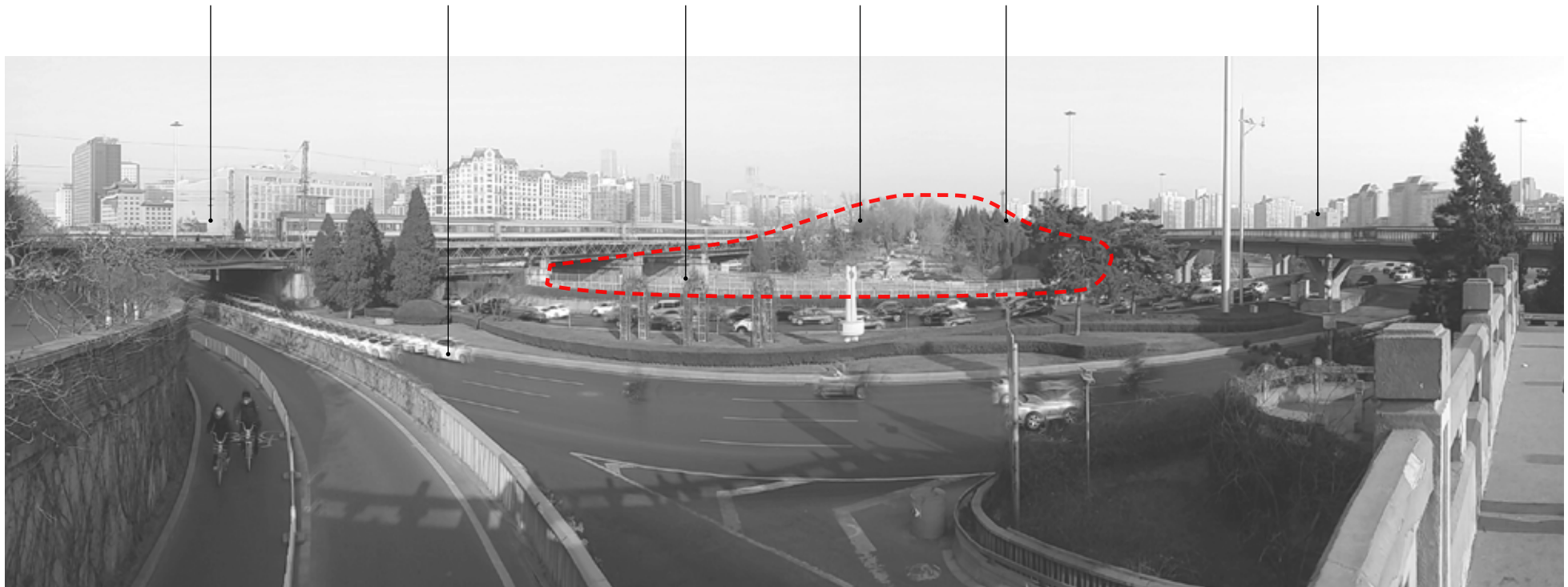
Second Beijing traffic ring

Formal city moat

Future green belt

The site

Traffic bridge

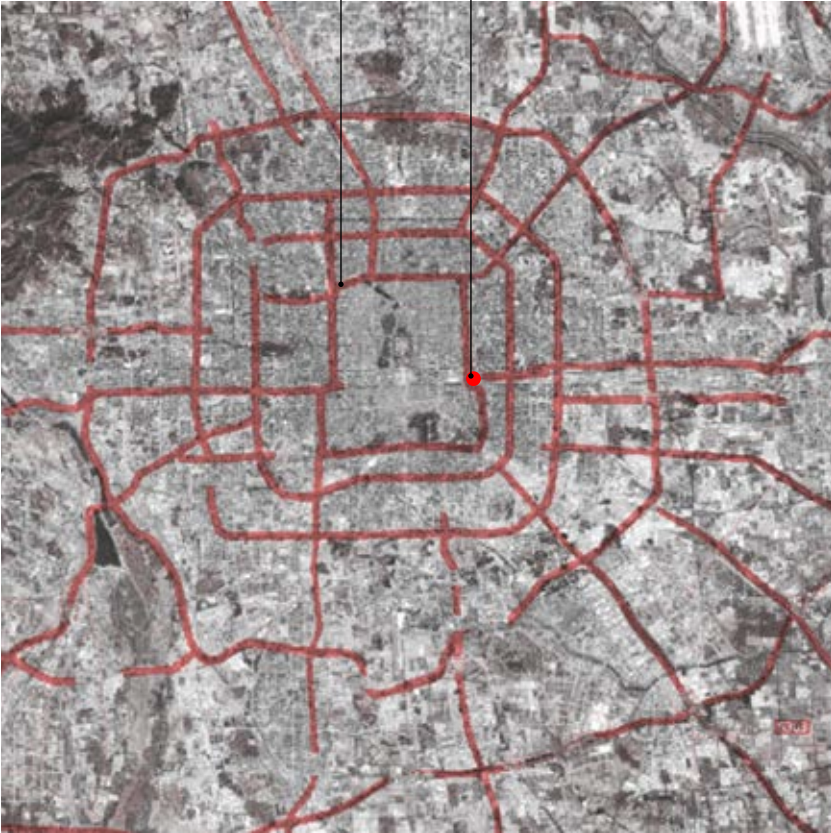


Densifying and Connecting Beijing by Utilizing Residual Infrastructural Spaces

The Design Application I - Site Context

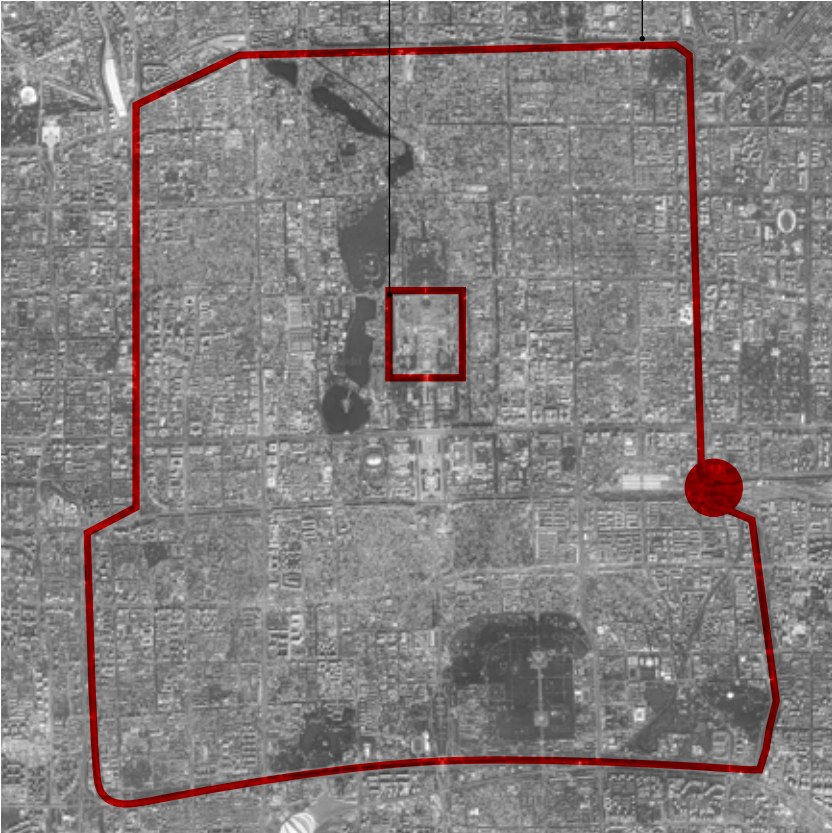
The second traffic ring

The site location



The moat of Forbidden City
The first ring

The Old City
Formal city moat



Densifying and Connecting Beijing by Utilizing Residual Infrastructural Spaces

The Design Application I - Site Context

Beijing Train Station

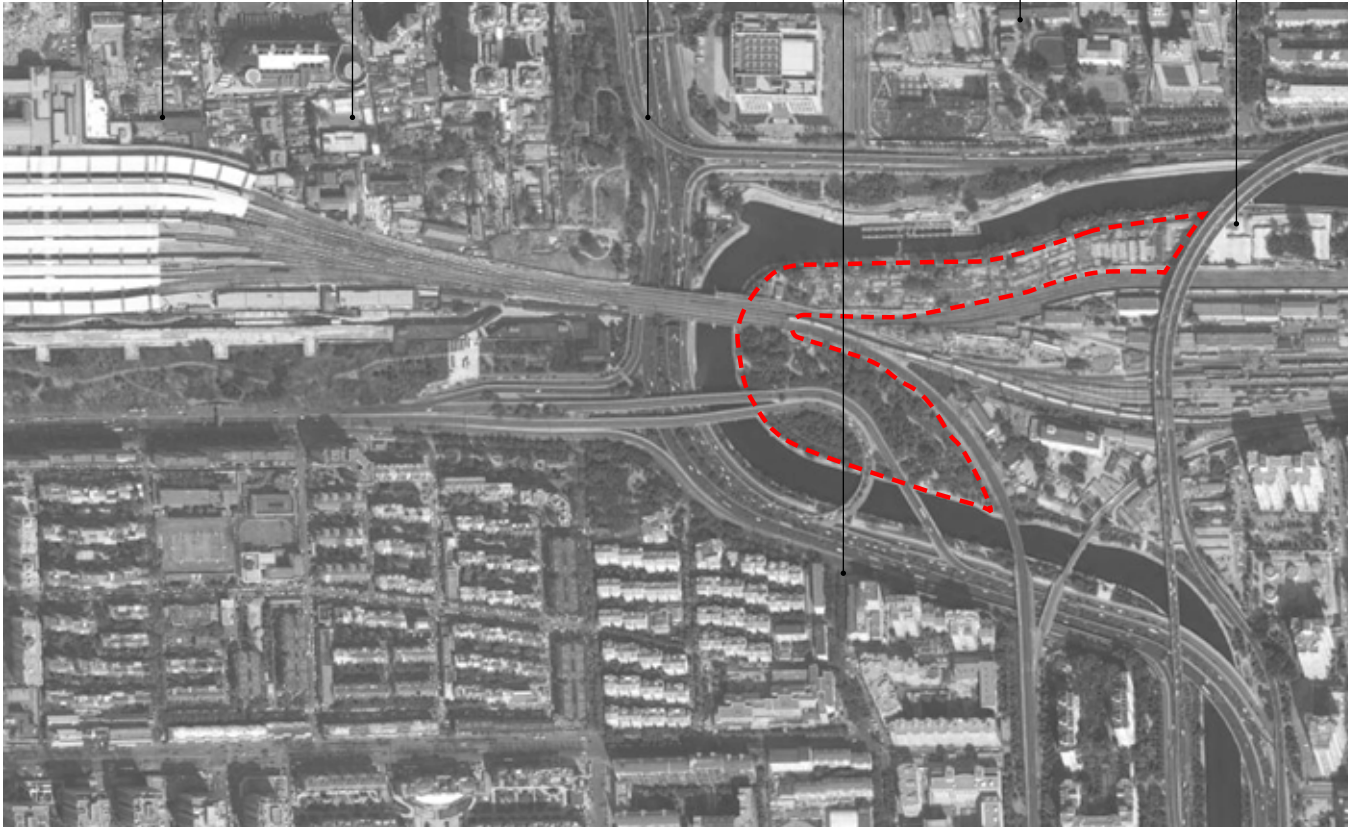
The Old City

The second traffic ring

Residential area

Office area

Future green belt



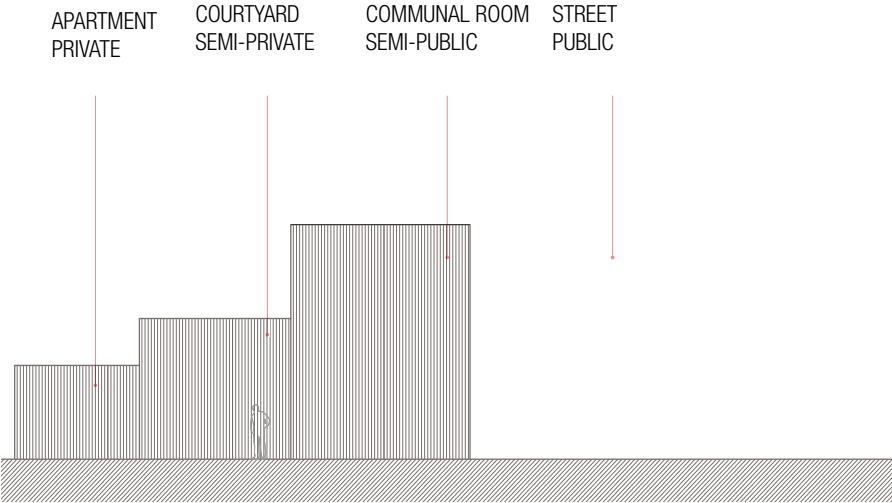
Shifting the Spatial Sequence for Creating Earthy Feeling

The Design Application II - Modified Hutong Spatial Sequence

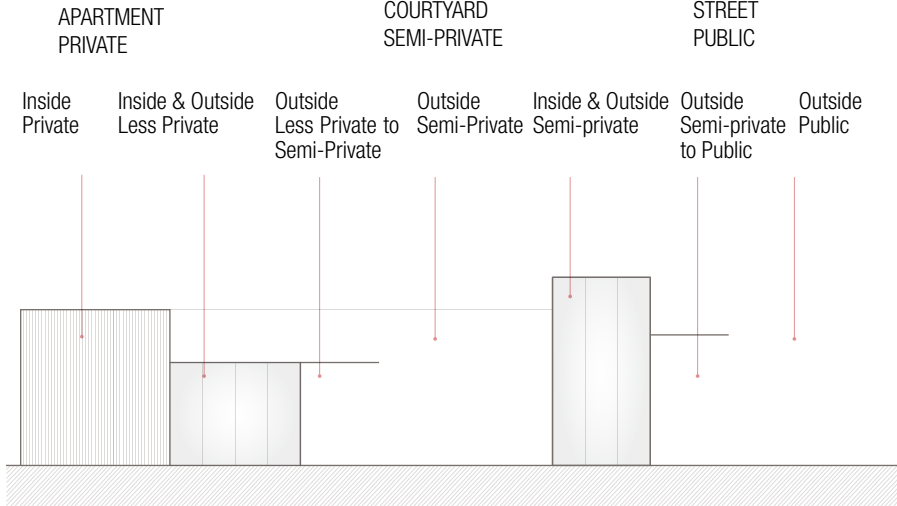
According to the study, residents in Hutong value the most the earthy feeling - being in touch with exterior environment. The proximity and easy access to the street and exterior environment showed as a great motivation for utilizing spaces outside the

private area. The new spatial sequence is base of motivation by contrasts, where interior and exterior space shifts frequently, so every covered space has direct access to outside environment.

The prototypical sequence - linear gradual space changing, exterior space accessible only from communal room.



The design application sequence - motivation by contrasts, every covered space has direct access to exterior.



Increasing Courtyard Diversity and Daylight Exposure by Changing Courtyard Shape

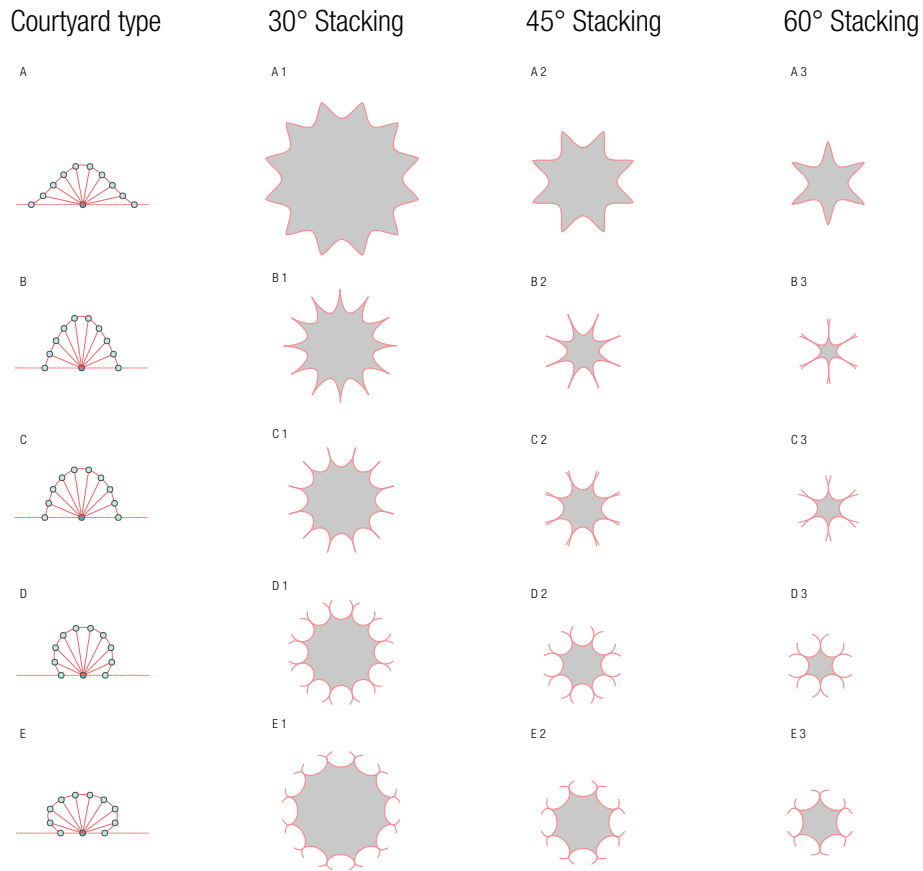
The Design Application III - Courtyard Diversity, Earthy Feeling

According to the field research, the street front in Hutong area varies in functions depending on the location of the courtyard house. More commercial street front occurs on the busy

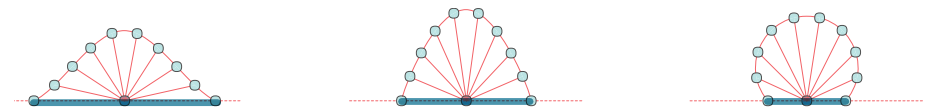
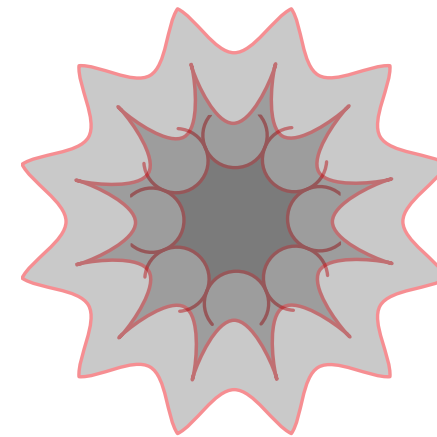
street and more residential based street front occurs on side streets. Also the size of courtyard houses varies depending on the topography and street pattern.

In the design, longer street front are placed at the bottom where larger commercial activity is expected and shared spaces for courtyard neighbours are needed to be placed. The

length of the street front are shortened in upper levels due to reducing commercial activity. Only shared spaces are occurring. The density of apartment remain unchanged.



Stacking courtyard houses with various length of street front in order to respond to different activities and preserve daylight in courtyards. The density of apartments has not been changed, only proportion between street front and apartments changes.



Main street level street front
High commercial activity
Medium community activity

Side street level street front
Medium commercial activity
Medium community activity

Living street level street front
Low commercial activity
High community activity

Increasing Courtyard Diversity and Daylight Exposure by Changing Courtyard Shape

The Design Application III - Courtyard Physical and Visual Interaction re-evaluation

FIXED RULES:

Number of Family: 10

The Height of Unit: 5,5 m

Number of Family: 10

The Height of Unit: 5,5 m

Floor Area Per Unit: 25 m²


Total Unit Curve Length: 47,7 m

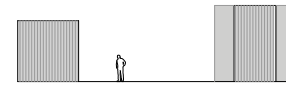
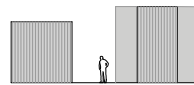
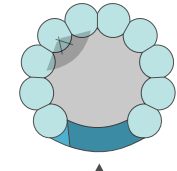
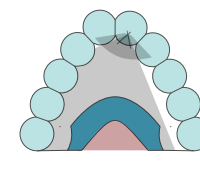
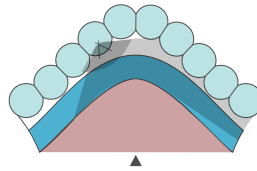
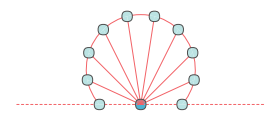
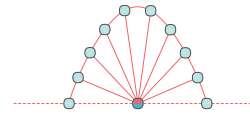
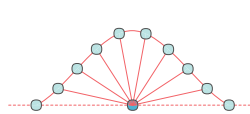
LENGEND:

Apartment: 

Waste Space: 

Shared Space: 

Field of View: 



EVALUATED CRITERIA

Covered Shared and Covered Private Ratio:

173 m² : 250 m² (0,70)

76 m² : 250 m² (0,30)

50 m² : 250 m² (0,20)

Event Distribution of the Floor Area in Units:

100 %

100 %

100 %

Possibility of the Privatization (> 3 m in Front):

20 %

80 %

100 %

Physical Meeting Chance:

50 %

80 %

100 %

Visual Interaction with Another Unit (Best Result)

40 %

60 %

100 %

Convenion Visual Interaction (Field of view 60°)

0 %

40 %

30 %

Visual Interaction with Shared Space:

70 %

90 %

98 %

Waste Space:

273 m²

34,50 m²

0 m²

Creating Opportunity for Privatizing Public Space and Movement Overlap Through Functional Overlap and Different Scale of Privacy

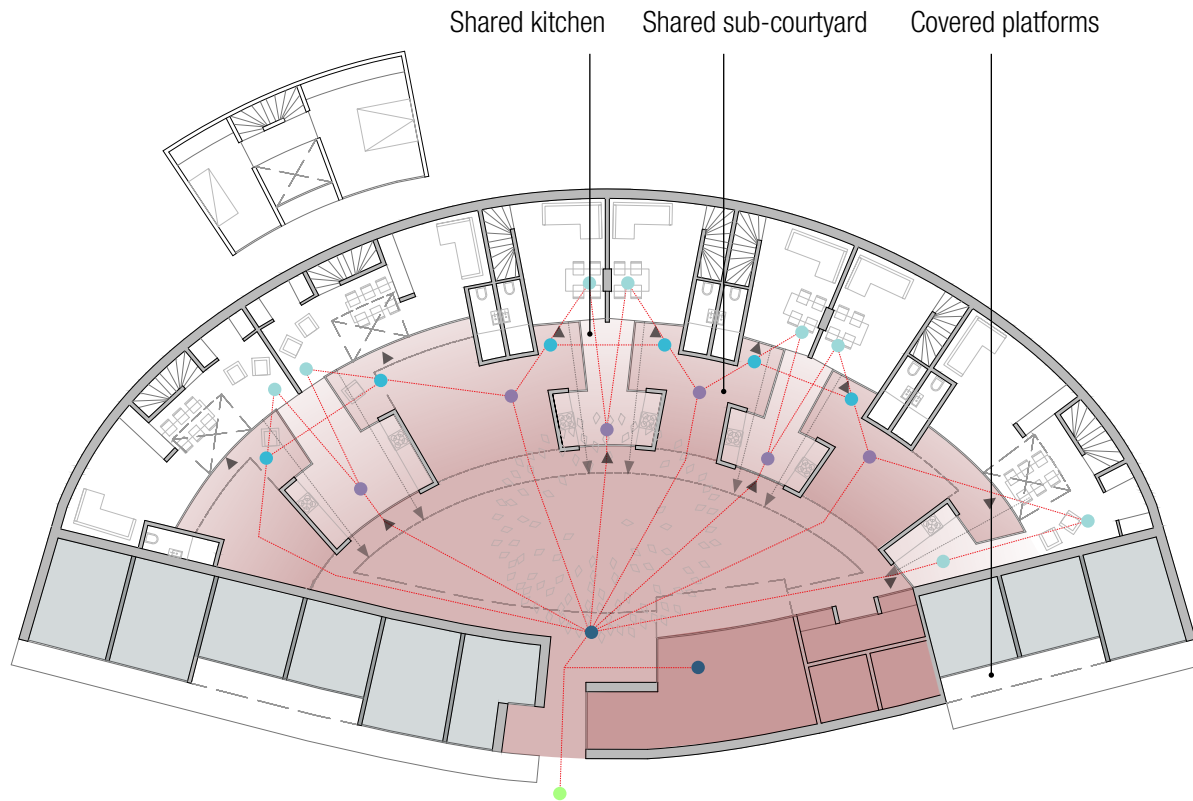
The Design Application IV - Snowballing the Neighbourhood Social Interaction

In order to create the population richness like in Hutong, each courtyard house offers living for single family, nuclear family, extended family and migrant workers. The size and

the possibility of expansion varies depending on the apartment type. The courtyard provides different level of privatization created by entrance pockets and shared sub-courtyards

The street front offers covered shared space (playroom, laundry, library and senior room) facing to the courtyard allowing grow of communal activities during winter time.

Shared kitchen serves as the filter to more private areas allowing blurred views inside.



Beijing Household Composition:

Single Family:	15,4 %
Two Person Family:	16 %
Nuclear Family:	47 %
Nuclear Family 4 person and more:	22 %
Migrant Workers:	36 %

Legend:

Private Area	█	Shared Area:	█
Private Outside:	█	Shared Private Area:	█
Privacy Gradient:			
	Private		Shared

Entrance: ▲
Diffused Vision: →

Average Living Area Per Capita:	32 m ²
Average Living Area Per Capita in the Design:	25 m ²

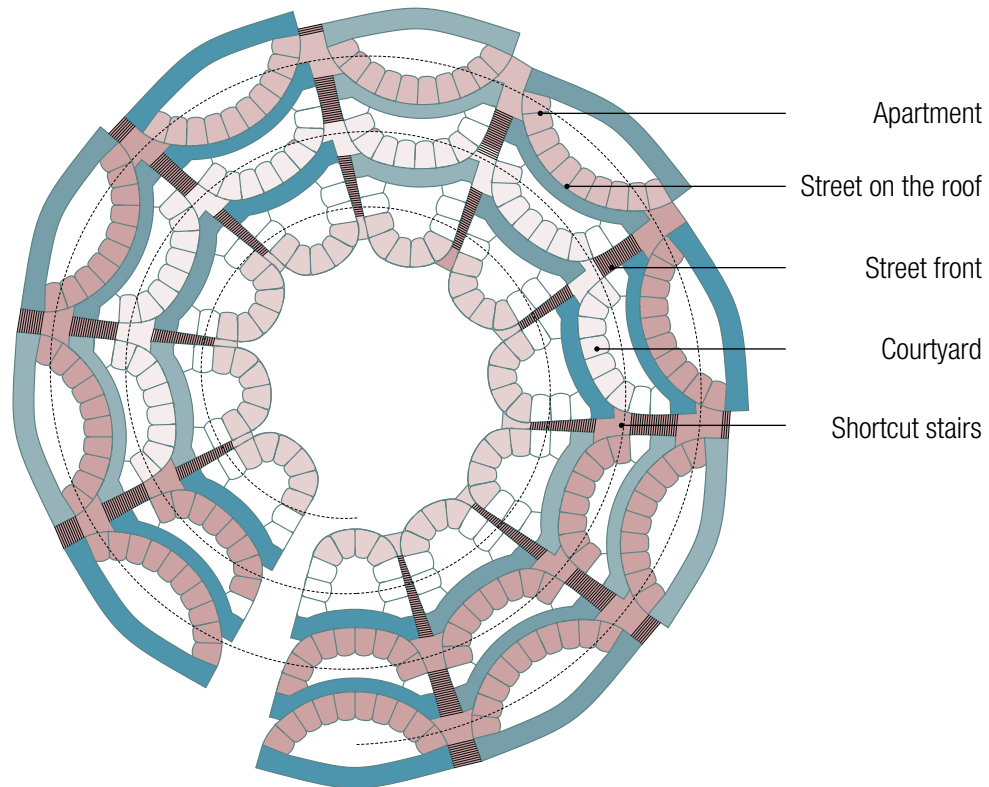
Applying Helix Method for Improving Vertical Connection Between Residents

The Design Application V - Vertical Continuity

In order to enhance vertical continuity, the helix method has been used from prototypical phase. The movement overlap and neighbourhood cohesion on building level

is reached by changing the street environment and sharing covered common room between courtyards. According interview, residents have different preference on the favourite

street and the possibility to be able to comfortably shift environment depending on the mood is highly valued.



Bustling street life



Local commercial alley



Hutong park



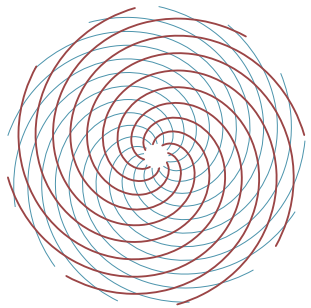
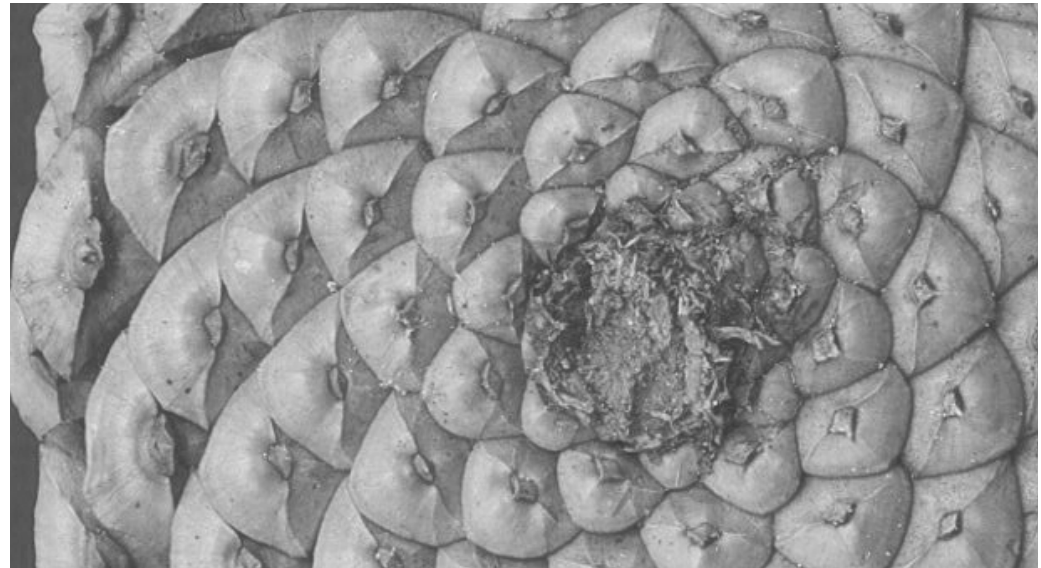
Residential street



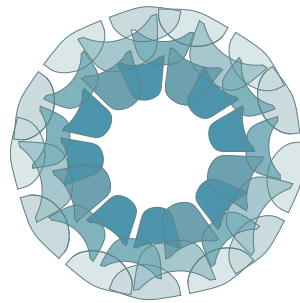
Maximizing the Density and Daylight Exposure by Introducing Fibonacci Sequence

The Design Application VI - Increasing Density While Preserving Daylight by Applying Natural Principle

In order to increase density yet preserving daylight exposure in courtyards, natural principle of Fibonacci sequence has been applied. The pine cone or petals are formed in the configuration with maximum space efficiency yet offering daylight exposure. The final version of design creates the density of 2,5x higher than the same area in Hutong.



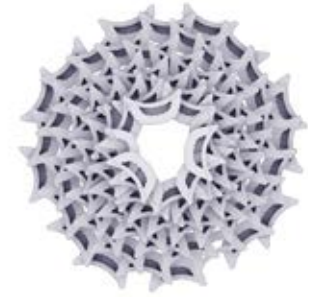
The diagrammatic expression of Fibonacci sequence



Test design by utilizing existing courtyards



Simplification of the unit



Modulation to courtyards

Adjusting the Footprint According the Site

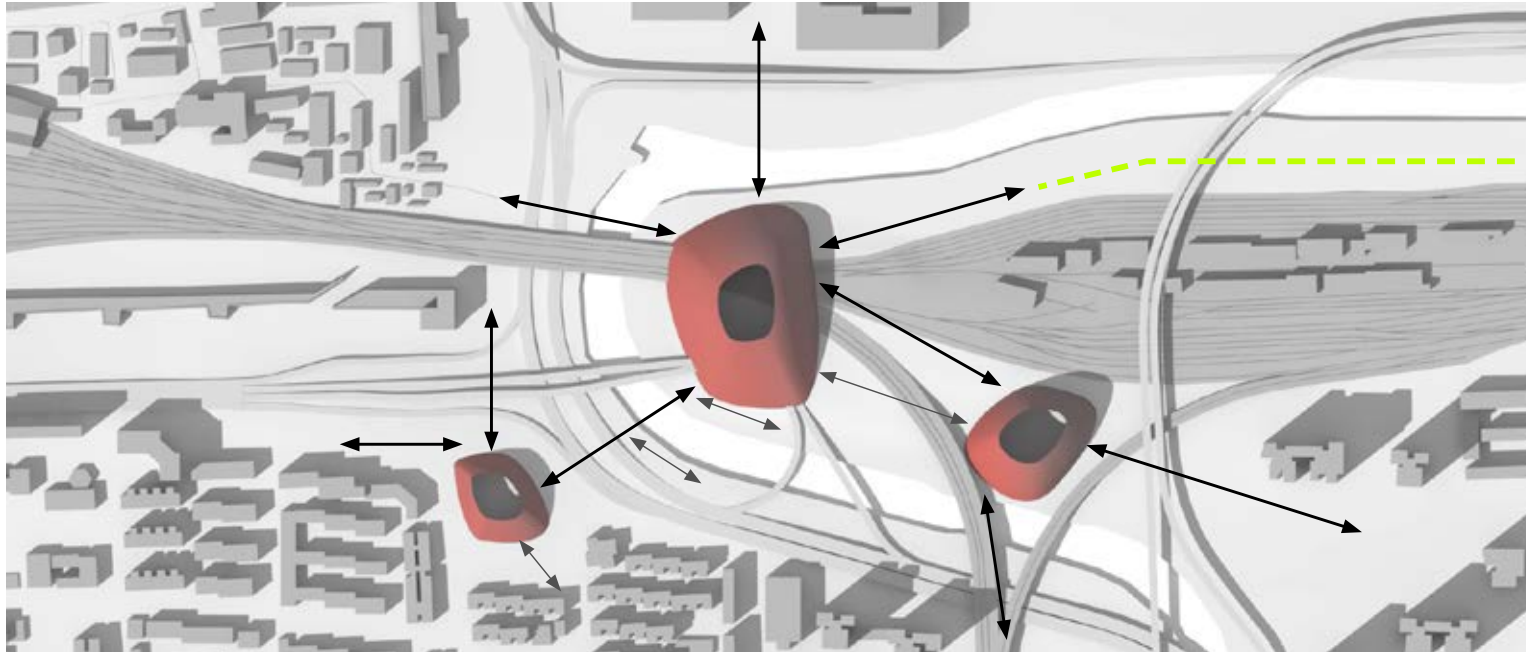
The Design Application VII - Responding to the Needs of City

In order to increase daylight exposure, the north facing side has been minimized. While rounded spiral creates the infinite continuation, the polygonal footprint has been

used to create the definite length of street to frame the scale within the spiral. Primary connections provides the access to future green belt along the river from any direction.

Legend:

-  Primary connection
-  Secondary connection
-  Green belt



Creating Linear Inclination Through Counter Weighting Golden Spiral Exponential Expression by the Mass

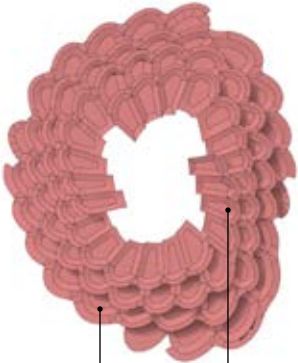
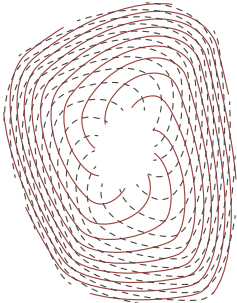
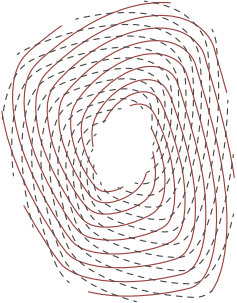
The Design Application VIII - Courtyard Diversity and Ramp Inclination

Fibonacci sequence derived from golden spiral has exponential tendency. If applied to the cone shaped building, the inclination will gradually rise towards to the peak. In order to preserve identical inclination, the shape of structure has been modified to counter the gradual inclination tendency. Therefore the peak of the structure is rounded.

The diversity of courtyard houses and diversity in lengths of street front comes from previous design study. Courtyards close to the main street have longer street front to accommodate shared community spaces and small scale commerce. Courtyards in upper floors contain only shared spaces in the street front, therefore it is shorter.

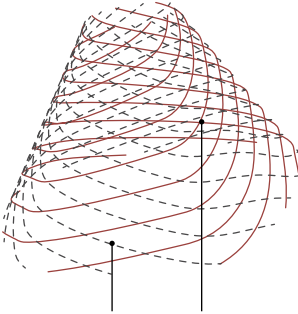
Creating Linear Inclination Through Counter Weighting Golden Spiral Exponential Expression by the Mass

The Design Application VIII - Courtyard Diversity and Ramp Inclination

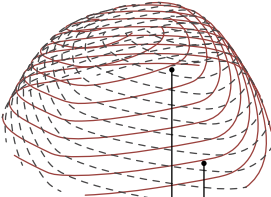


Larger courtyard with longer street front

Courtyard with shorter street front



Low inclination area Steep inclination area



Same inclination ratio



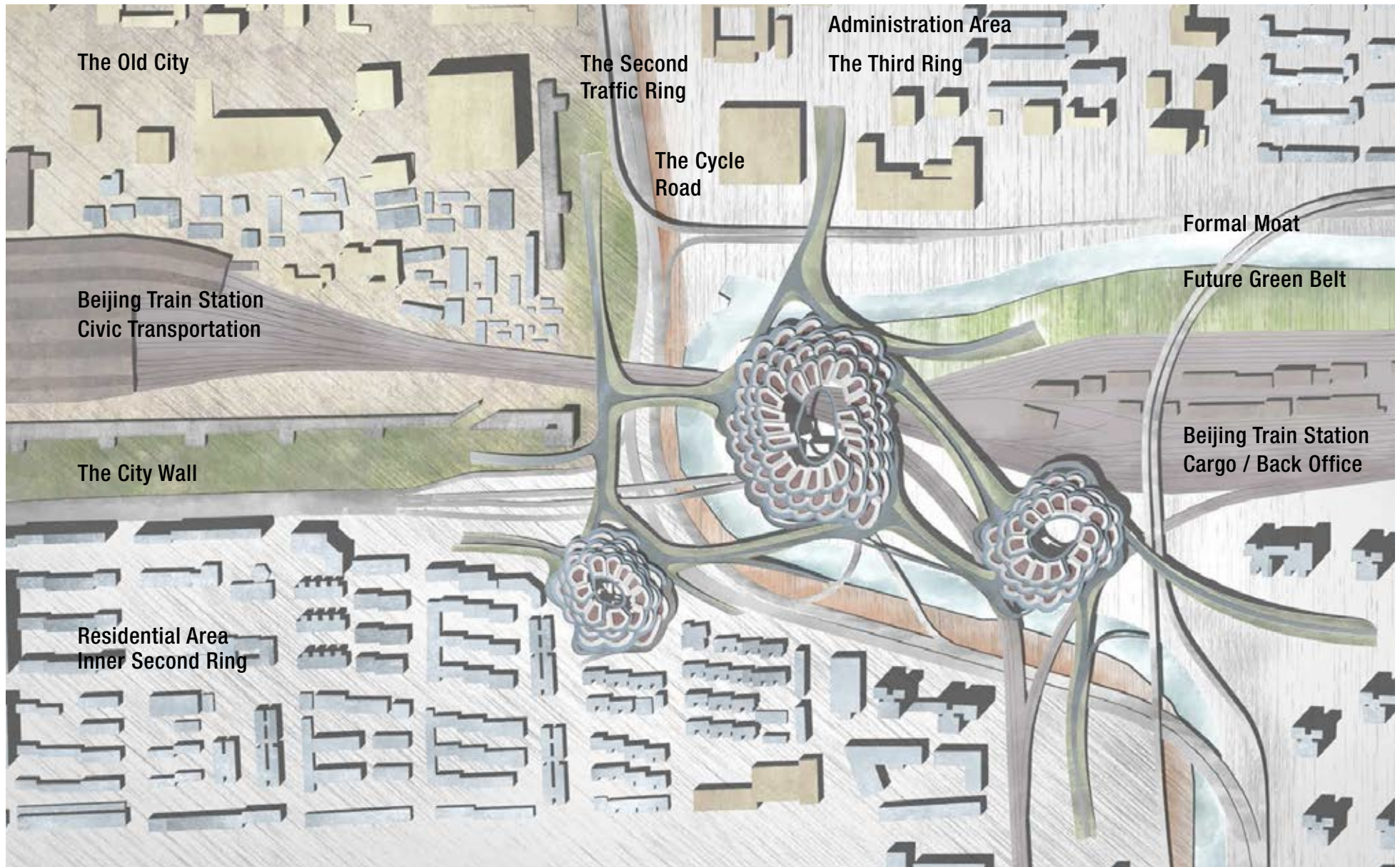
Enhancing the Living Environment Through Urban Landscape

The Design Application IX - The Site plan

Hutong used to be once filled with tree lines and greeneries, which did not survive to modern days due to widening infrastructures. Design aspires to retrieve piece of nature back to the city. In order to improve living environment above infrastructural wastelands, the natural landscape connecting park next to the city wall with green belt along the river has

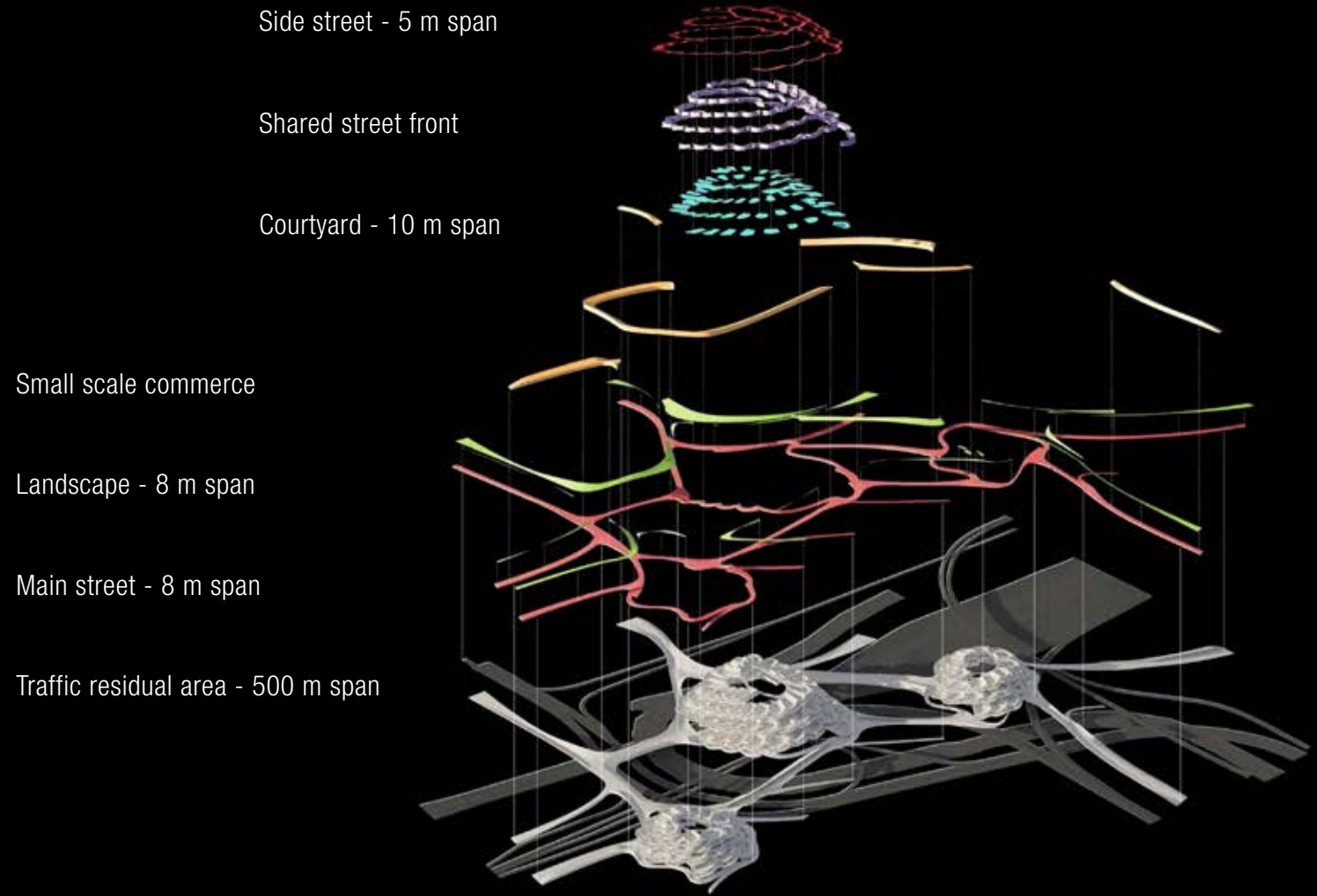
been created. The landscape houses small amenities hidden in the scenery. To suppress bridge feeling, handrails are replaced by rising hills embracing the path.





Space Hierarchy and Gradual Environment Transition Through Street Proportion Changing

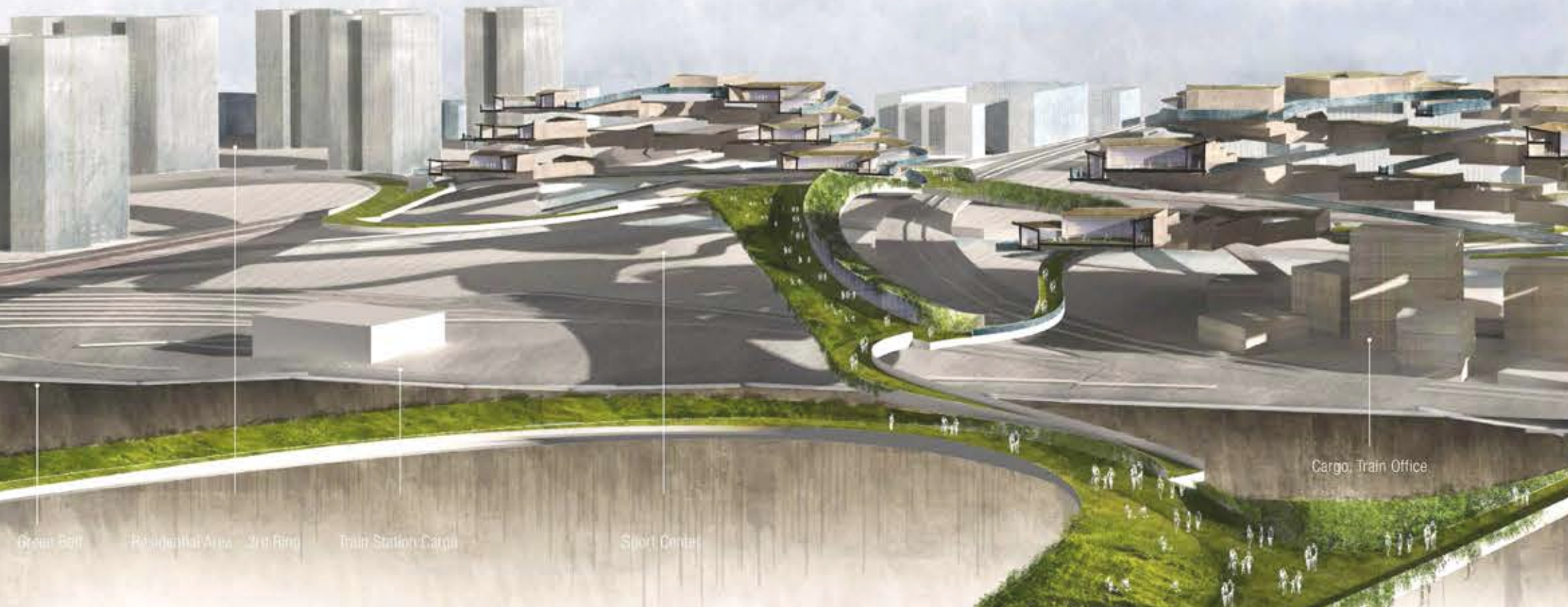
The Design Application VIII



Utilizing Inner Structure Space for Creating Autonomous World

The Design Application X - When Hutong Reach Its Spatial Limits

Despite of Hutong spatial qualities, there are spatial requirements of modern time, which small scale Hutong cannot fulfill. For those the inner space has been reserved. Walking in, there is another world waiting to be explored. Depending on the location, the space can be arranged as cargo and train back office, larger market or sport area.



Green Belt

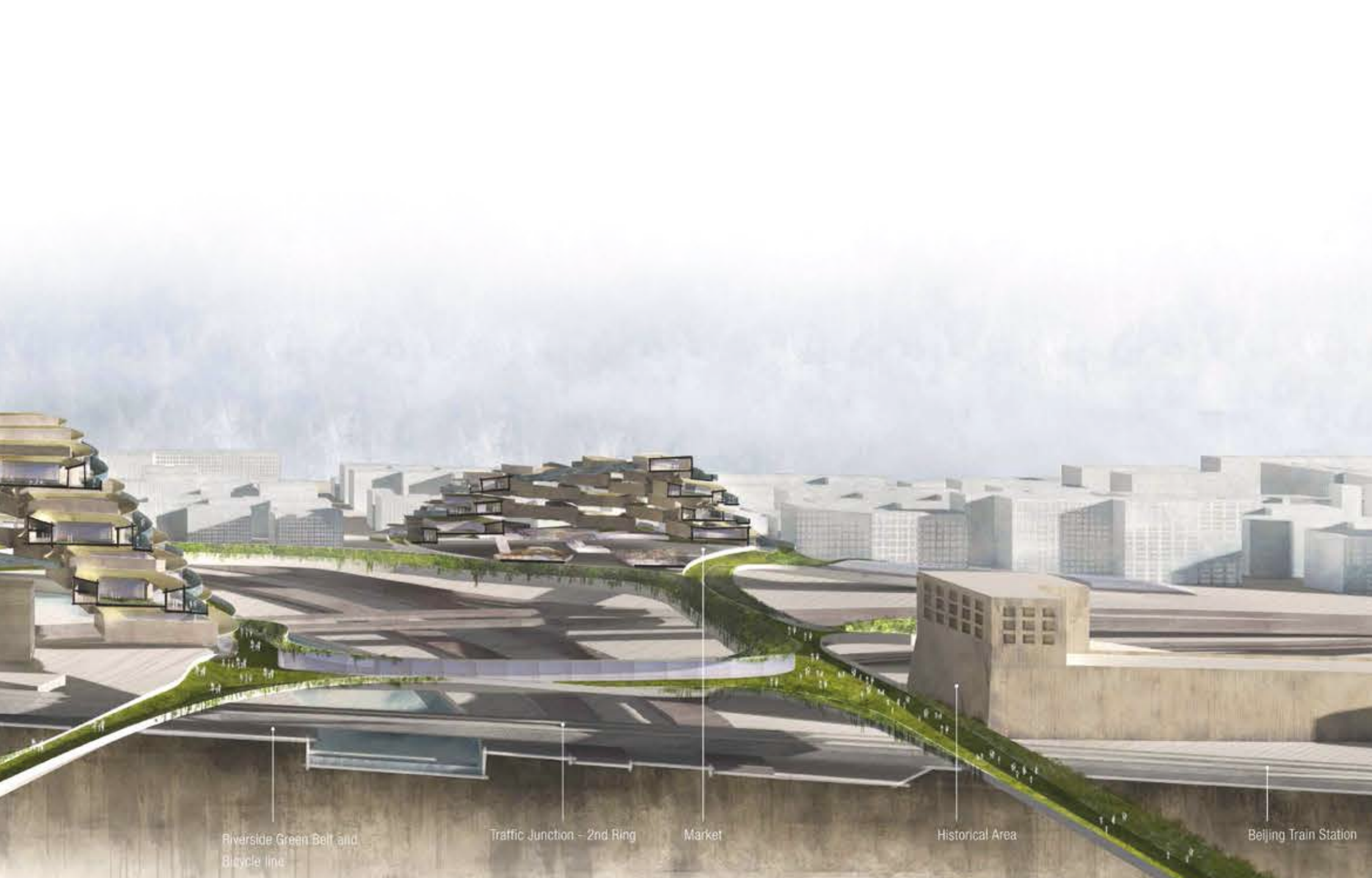
Residential Area

2nd Ring

Train Station Cargo

Sport Center

Cargo, Train Office



Riverside Green Belt and
Bicycle line

Traffic Junction - 2nd Ring

Market

Historical Area

Beijing Train Station

Motivating Privatization of Public Space Through Pockets and Stairs

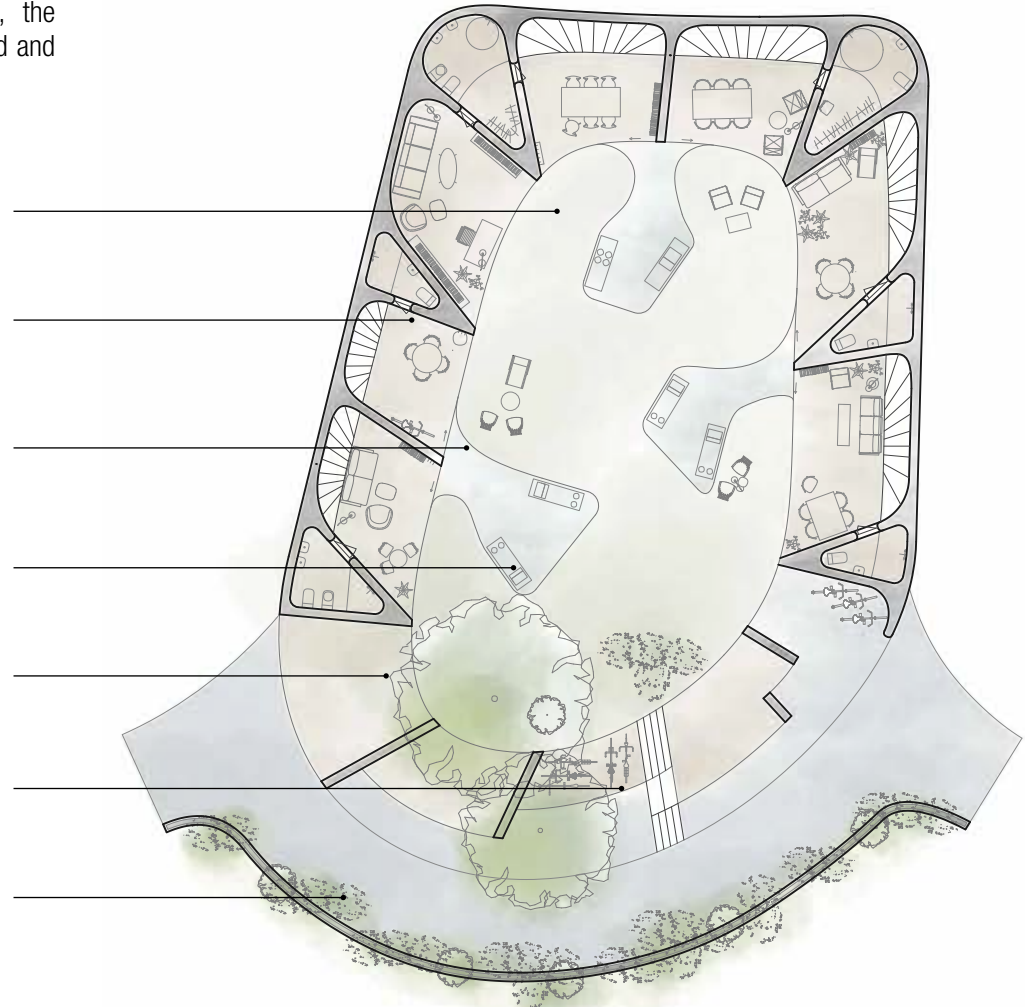
The Design Application XI - Different Level of Privatization

According the research due to non linear streets in Hutong with pockets and stairs in the front door, the possibility to customize the image of street by residents has been created.

The design follows the same principle and inspired by previous design process, the different level of privacy in the courtyard and on the street has been created.

Ground floor

- Entrance pocket shared by two families
- Apartments for different family pattern inspired by Beijing household statistic
- Fold able neck for merging pockets during the summer
- Shared kitchen space as filter to more private living area
- Small scale commerce and shared spaces
- Street pockets with stair allowing planting the tree
- 400 mm thick concrete handrail with 200 mm wide soil gap for planting vegetation



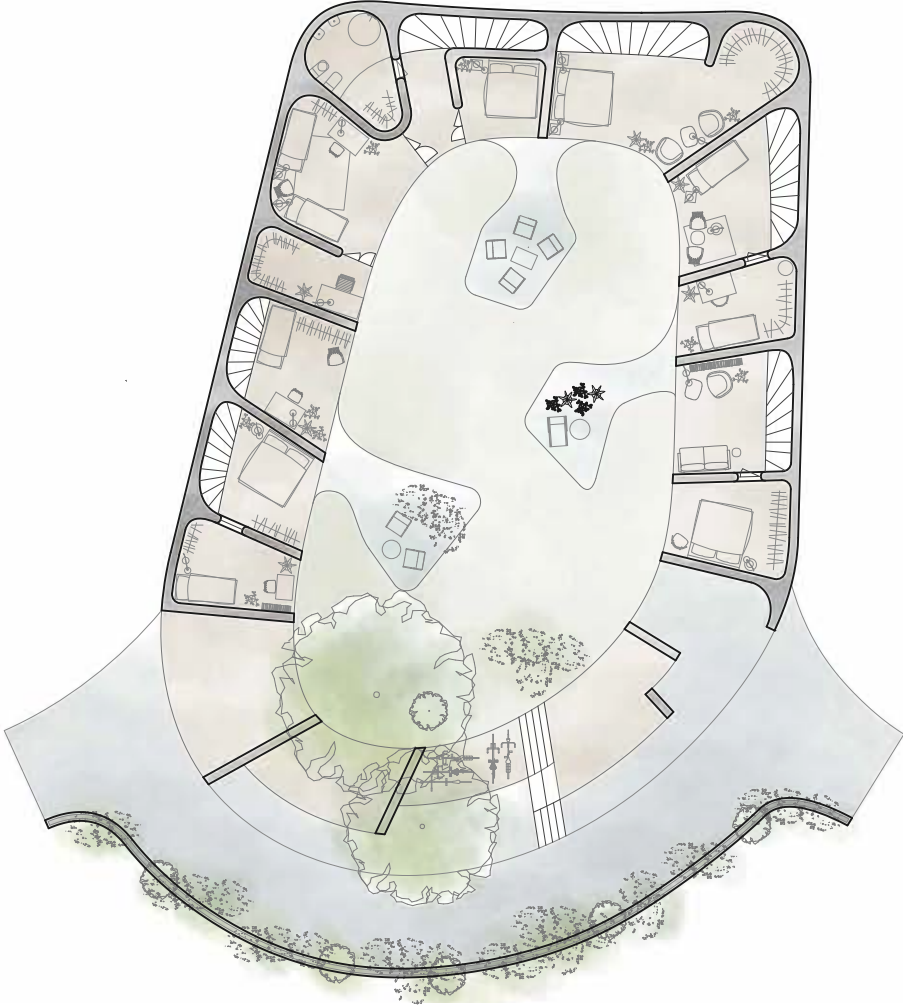
Retrieving Hutong Natural Appearance Through

The Design Application XII - Restoring the Purpose of Courtyard as a Garden

Courtyards was once a garden space offering the serenity and natural invasion in dense urban environment. Due to illegal additions, the area for greenery was reduced.

The design follows FAR 0,6 - 0,65 to allow living in the courtyard and reserve spaces for greenery.

Second floor



From Infrastructural Chaos to Courtyard Serenity

The Design Application XIII - From Uncrossed able Traffic Obstruction



From Infrastructural Chaos to Courtyard Serenity

The Design Application XIII - To Urban Landscape Connecting Districts Together



From Infrastructural Chaos to Courtyard Serenity

The Design Application XIII - To More Quiet Side Streets Where Sitting Outside Can Be Joy Again



From Infrastructural Chaos to Courtyard Serenity

The Design Application XIII - To the Serenity Inside the Courtyard



Bibliography

Deyong, Sarah Jinyong. *The Creative Simulacrum in Architecture: Mega-structure 1953 - 1972*. Princeton University, Dissertations Publishing, 2008.

Fujimoto, Sou. *Primitive Future: Contemporary Architect's Concept Series #1*. JAPAN: INAX-Shuppan, 2008.

Gehl, Jan. *Cities for People*. Island Press, 2010.

Ishigami, Junya. *Another Scale Of Architecture*. JAPAN: Seigensha, 2011.

Jeaneneret, Charles Édouard - Le Corbusier. *The Athens Charter*. STUDIO; First edition, 1973.

Koolhaas, Rem & Mau, Bruce. *Bigness or The Problem of Large, S, M, L, XL*. PUBLISHER: The Monacelli Press, 1995.

Liu, Ying & Awotona, Adenrele. *The Traditional Courtyard House in China, The Formation and Transition*. Stockholm, Sweden, Royal Institute of Technology, 1996.

www.architecturalrecord.com. Meyer, Michael. *The Death and Life of Old Beijing*. July 19, 2008.

www.megastructure-reloaded.org. Friedman Yona. *Works and Biography*

www.standardarchitecture.cn. *Micro Yuan'er, Beijing*. December 2015

www.youtube.com. Aga Khan Architecture Award. *Micro Yuan'er Children's Library and Art Centre - China*. May 9, 2016.

www.youtube.com. Nishida, Osamu & Nakagawa, Erika. *Yokohama Apartments*. August 15, 2016.

www.youtube.com. Wang Shu. *Contribution of Culture to Achieve Sustainable Cities*. August 26, 2013.

Xu, Anqi & Xia Yan. *The Changes in Mainland Chinese Families During the Social Transition: A Critical Analysis*, NEBRASKA: Faculty Publications, Department of Child, Youth, and Family Studies, 2014

Li Zhang. *Contesting Spatial Modernity in Late-Socialist China*,

Adriana Sandoval Akers. *NEIGHBORHOOD DESIGN AND PUBLIC LIFE: LESSONS FROM BEIJING'S HUTONG AND SUPER-BLOCKS*, B.A. in Urban Studies, Barnard College, Columbia University
New York, NY (2009)

Planning Energy Efficient and Livable Cities, Knowledge Series 022/14

Xiaoxi Hui. *Housing, Urban Renewal and Socio-Spatial Integration*, Delft University of Technology, Faculty of Architecture, Department of Urbanism. 1 October 2012

Ying Liu and Adenrele Awotona. *The Traditional Courtyard House in China: Its Formation and Transition*

Clifton R Emery, Shali Wu, Ramesh Raghavan. *The Hutong effect: informal social control and community psychology in Beijing*. Published Online First 2 September 2014

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