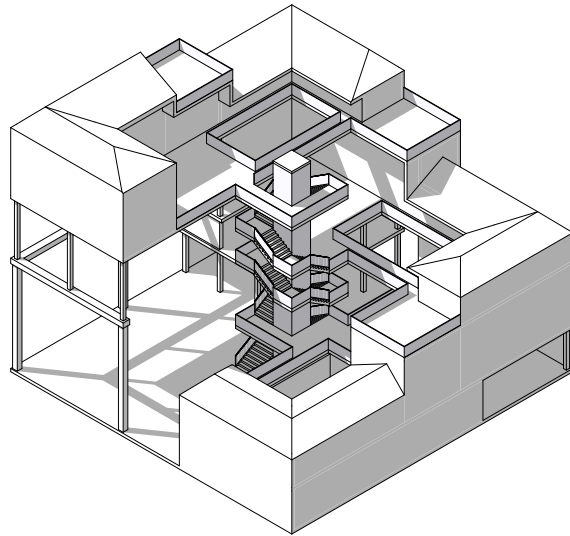


COURTYARD+ HOUSING



Master Studio
SS 2016/17

AUTHORS

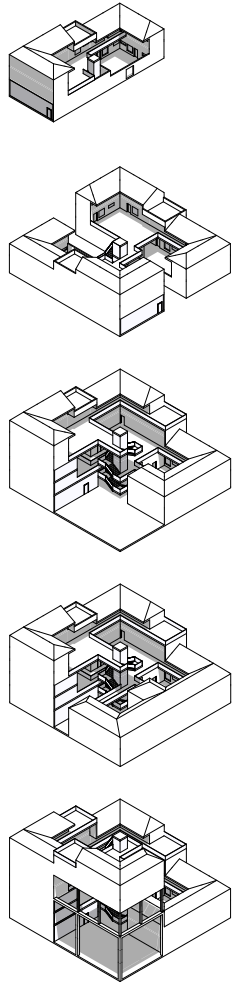
Gerald Mörth, BSc
Alexandra Petrova, BSc
Thomas Simon, BSc

Master Studio “Suzhou” - SS 2016/17
Ass.Prof. Dipl.-Ing. Dr.techn. Wolfgang Dokonal

TU Graz
Institut für Städtebau
Rechbauerstraße 12/II
A-8010 Graz

Courtyard+ housing

SUZHOU, CHINA



THE NEW SIHEYUAN

„Courtyard+ housing“ is an urbanistic concept based on the idea of translating the advantages of traditional chinese dwellings into dense modern housing.

A re-interpretation of the naturally grown courtyard structure into a modern communal structure of semi-public spaces that provide for access and basic services.

It is a less of an architectural design than a specific spatial strategy that puts a focus on elaborating how most of the qualities of the current housing situation can sustainably be transferred into a future modernized district with an even higher density of population.

The Courtyard+ housing is a conceptual modular system that is applicable in various situations within Changmen and can serve a series of functions, it may be constructed in a bandwidth of heights, densities and for different purposes as needed. It incorporates housing as well as many public functions of the city.

ANALYSIS & RESEARCH

SUZHOU

“Sugin is a very large and noble city... They have enormous quantities of silk. They live from trade and crafts. [...] There are important merchants and very rich inhabitants. The city is so large that it measures approximately forty miles around the periphery [...] And, You would say that most likely there are six thousand stone bridges in that city, under which a galley or two could easily pass.”

- Marco Polo



Location of Suzhou in China

SUZHOU, CHINA

Suzhou is situated in Jiangsu province, between Nanjing and Shanghai. It is a city in the delta, a city of water enclosed between the Tai Hu Lake, the Yellow Sea and the Great River Yangtsekiang. Suzhou is and always has been subject to the unexpected changes and wanderings of the water.

The site reveals the extraordinary determination of mankind to transform difficult natural conditions into more favourable ones by means of controlling the waters. The work undertaken in Suzhou included changing the rivers' course, draining the marshes, building a large canal supplemented by a highly regular system of perpendicular secondary canals.

Suzhou, the end of the famous Silk Road, most famous cultural centre of the south, contains the most and best-preserved gardens in the entire country and is an attraction for Chinese and international tourists alike.



Nantang

Changzhou

Jiangsekiang

Wuxi

Suzhou

Shanghai

Tai Hu Lake

Huzhou

Yellow Sea

Jianxing

Hangzhou Bay

Hangzhou

Location of Suzhou in Shanghai Area

Shaoxing

Ningbo

Zhoushan



Changmen District

CHANGMEN DISTRICT

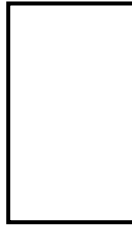
Changmen District in the city center of Suzhou is a densely populated and predominantly poorer neighbourhood currently facing overageing and structural deterioration. It is owed to the quarter's density that there is literally no room for car traffic and so scooters or walking is how people get around. Unlike in other Chinese cities the medieval town core has survived China's economic boom in large parts, only the odd high-rise building sprouting amongs the traditional houses, which provides for a very characteristic environment in one of the most prominent areas of town.

The pattern of traditional courtyard houses changed a lot over time. The inhabitants of Changmen have successively been adding auxiliary buildings, roofings and temporary structures, changing the texture of the district beyond recognition and slowly diminishing open spaces:

The courtyards that still exist today are only a shadow of the many green spaces that used to loosen up the town fabric, many now being used as storage. However this shortage of space pushed people to move certain domestic activities out of their own space into the streets and the fact that people always live between inside and outside contributes a lot to the unique imagery of Changmen district, where private and public melt into each other.

Washing, cooking, working in the streets people have established a loose community that permanently is in a state of exchange in the streets.





enclosing wall



trad. courtyard house



current structure

Successive change of open space usage over time

QUALITIES OF HOUSING

While analysing the housing situation a variety of features appeared to be amazingly modern local phenomena that needed to be preserved, irrespective of the obvious problematic short-comings of the district that directly concern living quality of the inhabitants. The analytical paper „Space Syntax“ sums up research of the rich diversity of spatial consequences of the district’s texture and an exploration of means for further playing to the strenghts of the given complex arrangements of multi-purpose yards, alleys and street-widenings, pocket spaces and buildings.

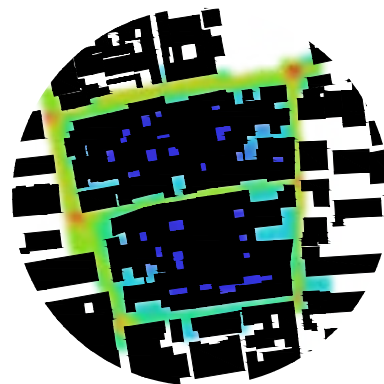
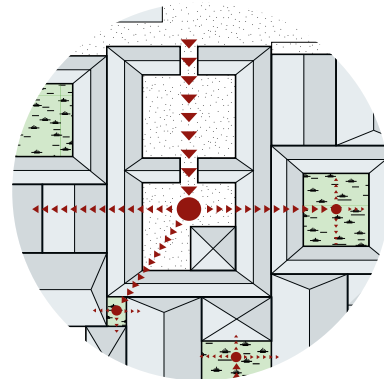
Changmen is organized in blocks of traditional courtyard houses devided by a nar-row network of streets. The courtyard houses consist of a wall and several buildings centered around a private courtyard and they stand wall-to-wall, hence the blocks are more or less enclosed towards the streets. The formerly larger open spaces (private gardens) within the buildings have been re-used in a totally different way. They are currently more of an array of small patios and atriums due to the successive construction of small side buildings and act less like an open space but as functional extension of living space for the people.

The courtyards provide for light, storage and most importantly for horizontal and vertical access to the many multi-party flats - often enough by passing through courtyards of adjacent houses (penetrating the former ‚walls‘) and even other people’s flats. In Changmen most flats are not entirely private and the concept of performing domestic activities on the outside of the little personal space people have available has further increased the blur between private and public, sometimes completely eradicating the thresholds. Population density in the area partly is so high, because sharing certain facilities and extending the private space into the public for domestic activities yields a maximum of accommodations.

Neither the streets nor the once private courtyards are distinguishable private space - or public space, respectively.

Most spaces act as intimate semi-public shared spaces for certain groups of people. Coming from the street they almost function like an informal ‚filtering system‘ from the outside of the blocks into the private rooms and mostly just work because of the subtle signals, such as the way space is used more privately (by less people) and visual relations.

Changmen district is organised in a unique system of access. The way the streetnetwork „naturally“ filters who enters certain neighborhoods through subtle visual and spatial changes. More prominent areas are inherently more frequented than e.g. side-alleys leading up to homes or even the more private courtyards.





House in Changmen, Suzhou

CONCEPTS FOR CONSOLIDATION

Taking up the qualities of the current situation and the pristine courtyard house structure of Chengmen it is imperative to implement these essential elements of town in any future development: The dense structure with open spaces of a selected semi-publicity, the use of these spaces as common areas and lastly the characteristic netting of streets and squares are integral part of the district's identity.

In the progress of modernization augmenting the housing situation and consolidating building mass will need to bear in mind that these qualities can't be lost, but need to be made part of the very concept that acts as a recipe for developing the district. At the same time it is necessary to curb the many negative effects of the poor and densely populated district, such as the m²/person ratio, the sanitary situation and overall structural quality in the process in order to create a modern housing environment. However, picking up some of these down sides proved a chance for diminishing other negative effects that would come with economic upswing and so the super-density, the use of open space for commonly shared domestic activity, the lack of a car connection and the overall tiny flat sizes may be used as a means for dampening the gentrification effects, ensuring that an influx of new people integrates into the district in a good mixture of old and new inhabitants and does not just take it over.

Tending to the needs of the poorer and elderly population aids in creating subtle growth and housing density while preserving the districts identity. Hence, new constructions will be re-interpretations and translations of the current building stock, bearing all that in mind.

The recipe for the development is a balance between conservation and intervention and will start subtly by enhancing the low-density center through refurbishment over time, supplementing it with new structures where needed and consolidating building mass in the rim areas. The newly built structures, the courtyard+ housing must bring all the

qualities of the district into the future, introducing a sensible mixture of different people to the quarter, with high accessibility also for the elderly and the handicapped. The housing standard be modernized by densifying the area, maintaining the grown structure of courtyards and establishing a new courtyard house typology - a modern communal structure of semi-public spaces that provide for access and basic services.

THE HISTORICAL SIHEYUAN

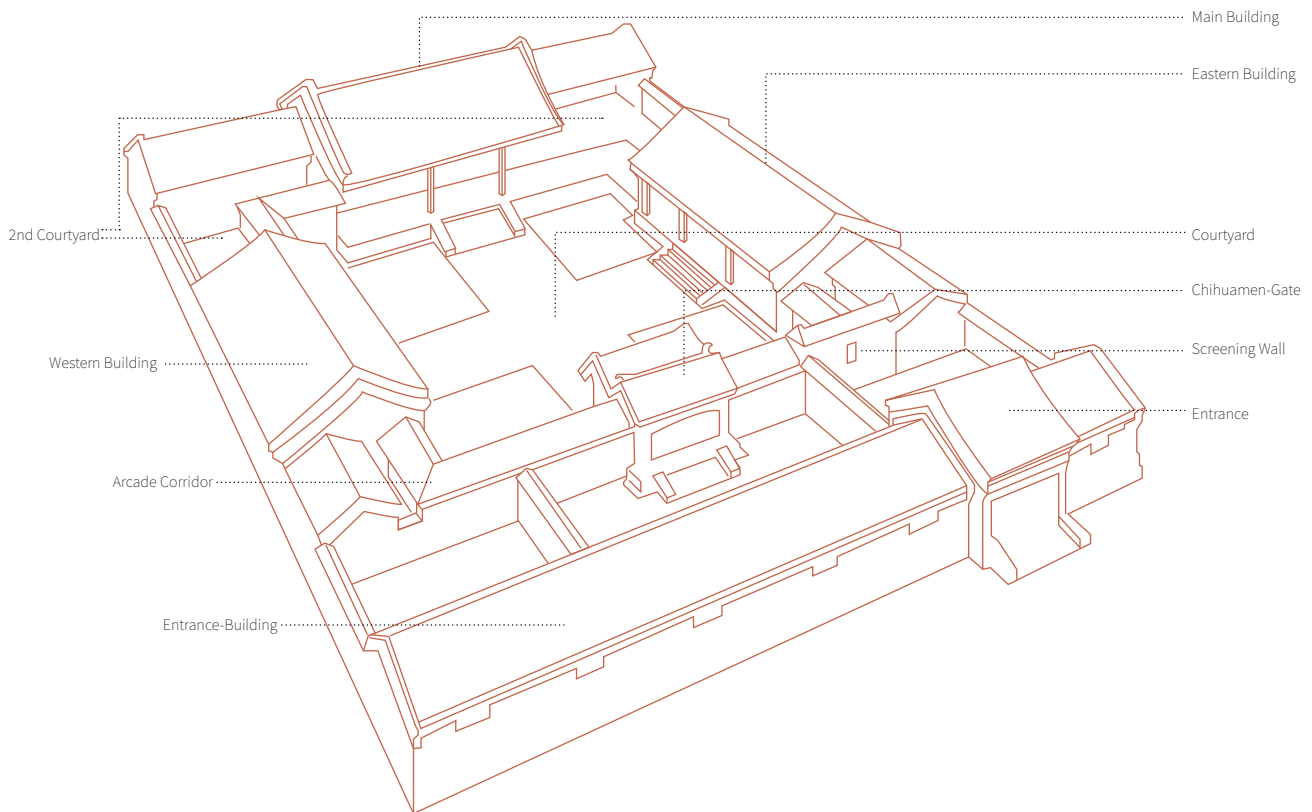
Historically the Siheyuan was a very common type of residence throughout China. The name literally means „a courtyard surrounded by four buildings“.

Different shapes can be found with regional characteristics, the least common denominator however is its general structure: The Siheyuan consists of a wall enclosing the family's space against the outside, with several buildings or groups of buildings of different functions arranged around the central yard, which was the „green room“ that the inhabitants shared, all openings facing the inside.

The yard provided physical discreteness of all houses and for their respective inhabitants - the members of the family - it meant light and private green within dense urban structures. Wealthier people extended this structure to larger dimensions with more yards of variable function and publicity and additional buildings.

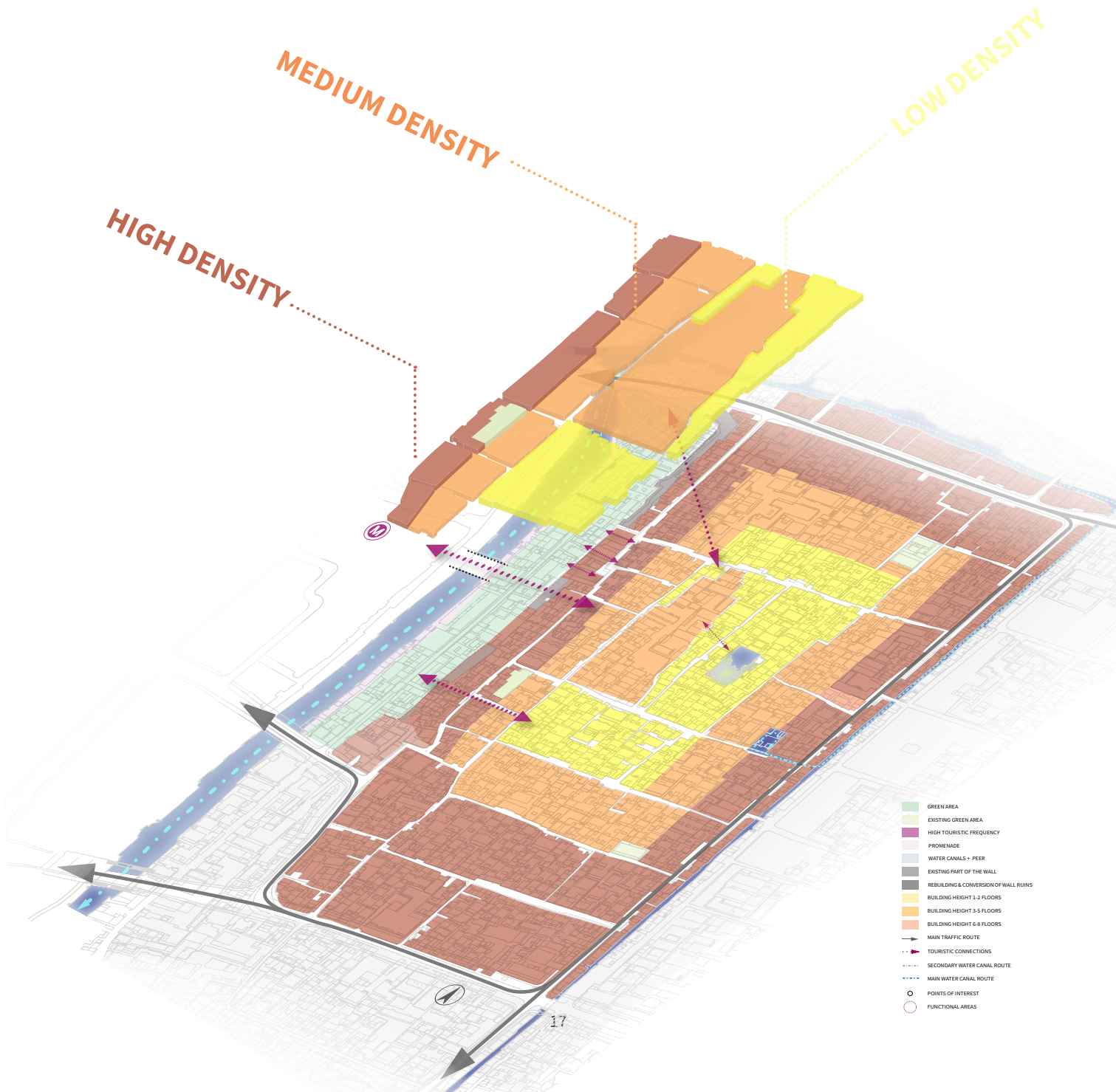
Originally a spacious one-family estate the Siheyuans are being occupied by many families today, often with less than 10m² per family in one room that serves as a bedroom, dining hall and living room with furniture which can be stowed away.





A traditional Siheyuan - an archetype of the chinese courtyard house

HOUSING STRATEGIES



HIGH DENSITY

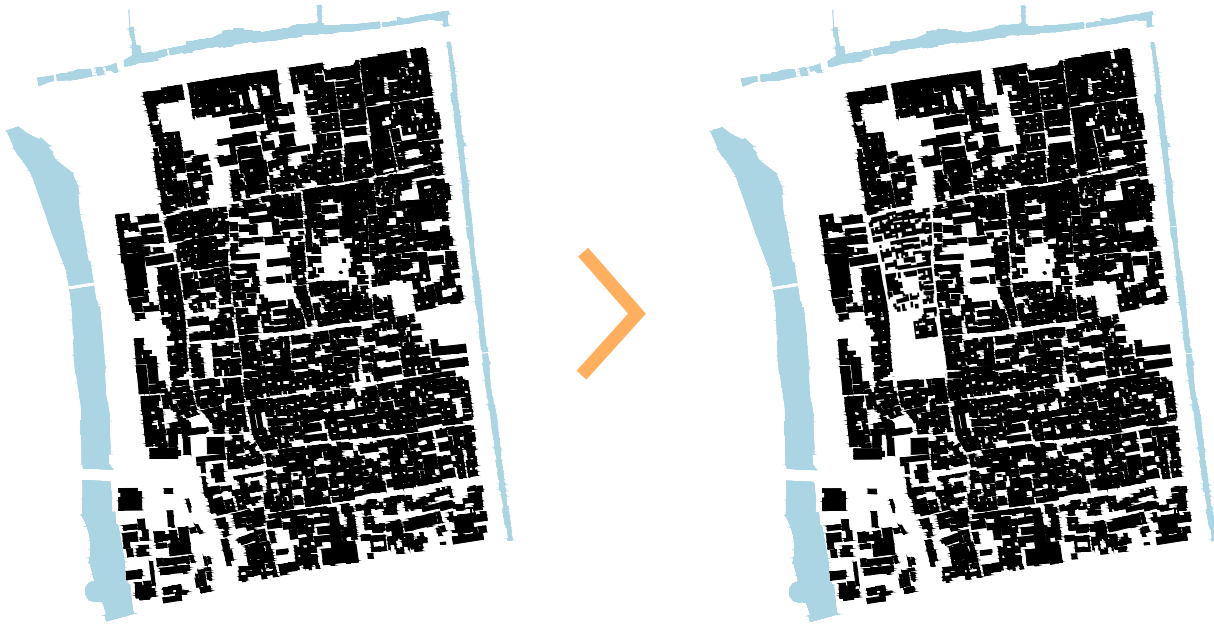
MEDIUM DENSITY

LOW DENSITY

- GREEN AREA
- EXISTING GREEN AREA
- HIGH TOURISTIC FREQUENCY
- PROMENADE
- WATER CANALS + PEER
- EXISTING PART OF THE WALL
- REBUILDING & CONVERSION OF WALL RUINS
- BUILDING HEIGHT 1-2 FLOORS
- BUILDING HEIGHT 3-5 FLOORS
- BUILDING HEIGHT 6-8 FLOORS
- MAIN TRAFFIC ROUTE
- TOURISTIC CONNECTIONS
- SECONDARY WATER CANAL ROUTE
- MAIN WATER CANAL ROUTE
- POINTS OF INTEREST
- FUNCTIONAL AREAS

LOW DENSITY HOUSING

In the low density housing areas (yellow) the old town will be renovated and refurbished in order to preserve general aesthetics, such as the roof landscape and the historical town structure. Building heights of max. 2 floors limit the re-densification to horizontal means, therefore space needs to be generated by clearing out auxiliary buildings in the courtyards and introducing a variety of functions available to the adjacent flats. The demolition of high-rise buildings from the 1970ies and ruinous houses will bring a relocation of migrant workers about, but the construction of courtyard+ buildings should provide for a return of those families rooted in the area.



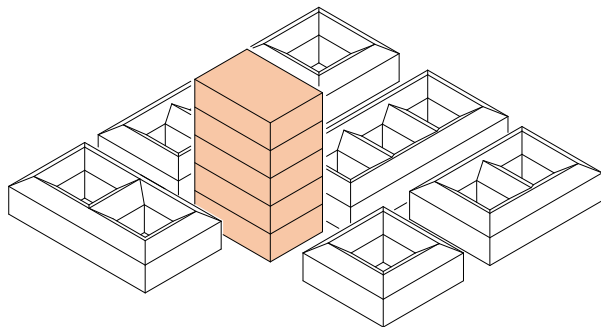
District's building structure before and after renovation (ltr.)



Courtyards before and after renovation (ltr.)

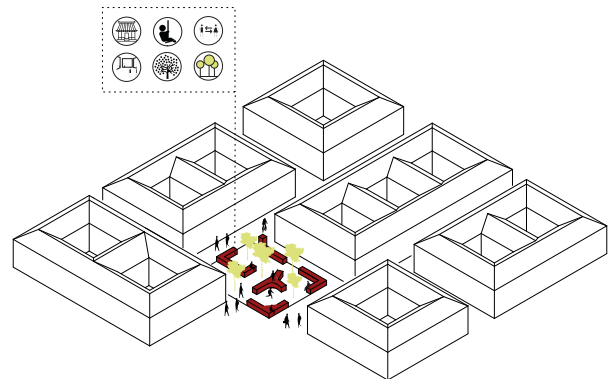


Pocket Spaces before and after renovation (ltr.)



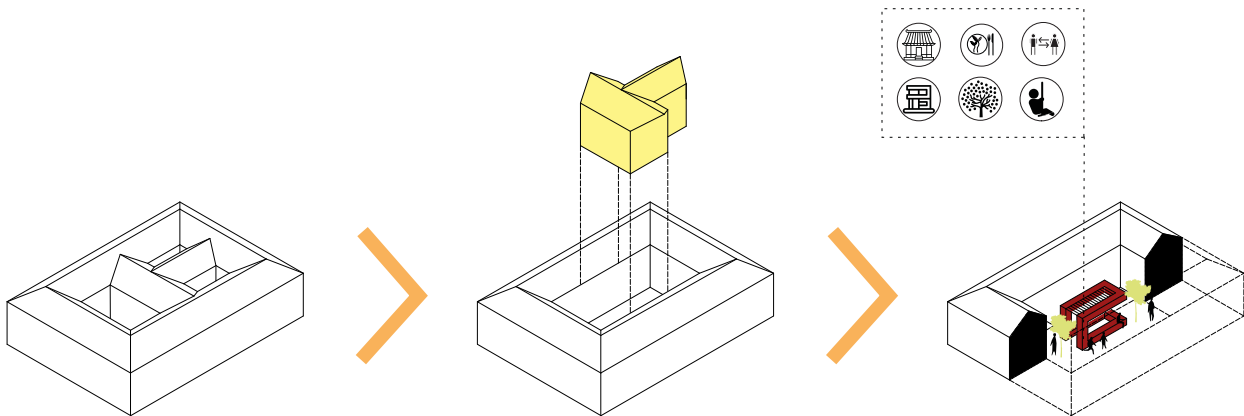
NEW POCKETS GARDENS

Acquired space helps improving the living quality within the blocks. Pocket parks with public services center around everyday life, such as authorities and communal functions, small scale commerce, health services, etc.



SHARED FACILITIES

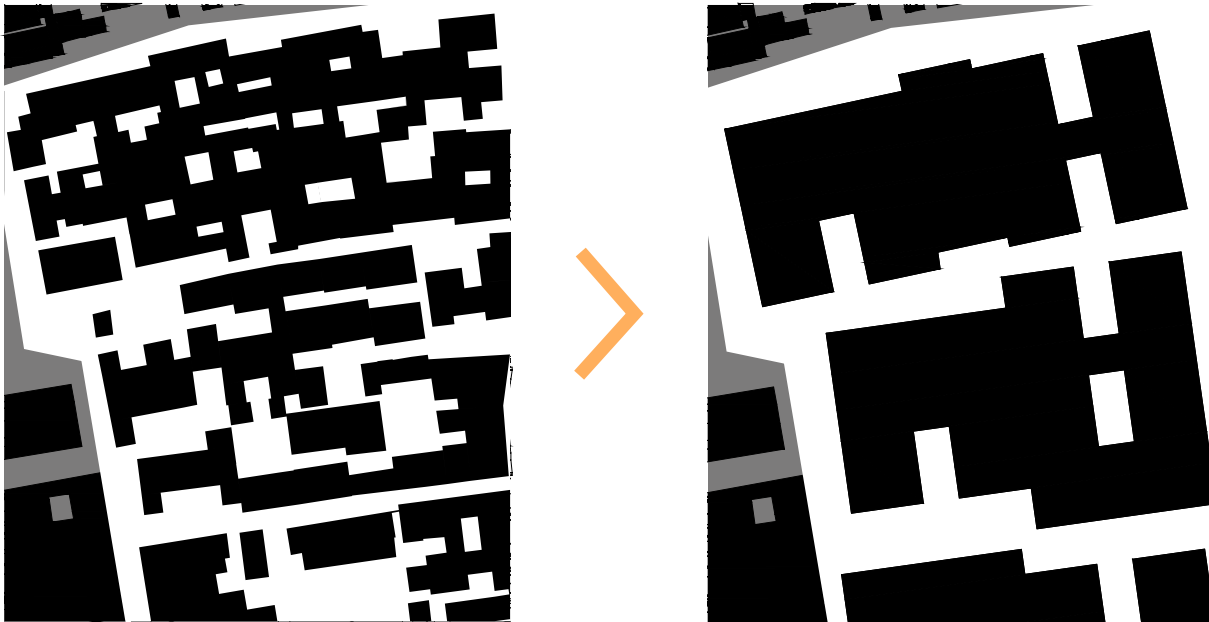
On a smaller scale the clearing makes room for facilities, such as washhouse and kitchen shared amongst the neighborhood. The flats around these clusters are generally small and vary in size so inhabitants of all classes mingle around each yard and the area will not immediately be overly gentrified.



MEDIUM DENSITY HOUSING

As for medium density areas „Courtyard+ housing“ comes in lower and less consolidated structure - the concept adapts to lower densities in many variations, offering very similar qualities as the higher versions. With 3 to 5 floors building mass in these areas is significantly lower. The reduced height allows for a good visual transition between high-rise areas and the low density old town center. However, this density can also be achieved with higher buildings and may work with modules of up to 7 or 8 floors.

In medium density areas buildings will accumulate into looser arrangements. Due to the space offer these areas will face an increased tourist frequency and the presence of a larger public in the open spaces due to a greater offer in public services, commercial and touristic facilities.



District's building structure after renovation (l.) and after construction (r.)

HIGH DENSITY HOUSING

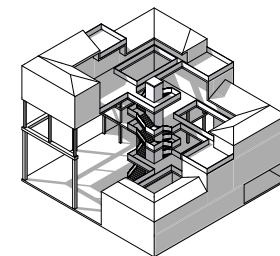
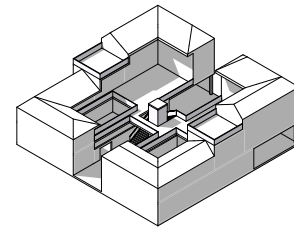
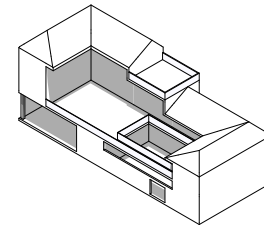
„Courtyard+ housing“ is based on the idea of translating the advantages of traditional Chinese dwellings into dense modern housing - a reinterpretation of the naturally grown courtyard structure into a modern communal structure of semi-public spaces that provide for access and basic services. It is a less of an architectural design than a specific spatial strategy that puts a focus on elaborating how most of the qualities of the current housing situation can sustainably be transferred into a future modernized district with an even higher density of population.

The Courtyard+ house is a conceptual modular system that is applicable in various situations within Changmen and can serve a series of functions, it may be constructed in a bandwidth of heights, densities and for different purposes as needed. It incorporates housing as well as many public functions of the city.

In order to reach reasonable housing density it is imperative the buildings will have to be 5 to 8 floors high in the outer rim area (dark orange) while the central areas will feature a lower skyline and hence, less density. In order to preserve the general aesthetics of the old town, capturing the element of concealment and surprise implies that the scale and use of courtyards and connecting alleys remains similar to the city as built. In creating this very basic „urban brick“ the key element of the Courtyard+ house therefore remains the courtyard with its function as an area for lighting, social encounter, recreation and access. Clustered around the yard are several housing units of varying sizes, forming diverse neighborhoods which share household facilities, meeting zones and a common identity amongst each other. In order to achieve a closer relationship to Changmen as it is built the Module consists of three storeys with two courtyards on two separate floors. It may be arranged and combined horizontally as well as vertically, yielding a variation of multi-level neighborhoods connected by bridges, stairs and elevators. It is in this way that the translation of intricate

arrays of narrow and deeply characteristic spaces forms a path through this new structure, made up of numerous such modules, hence bringing the concept of the complex network of Suzhou's streets and its visual relations in a third dimension.

When combined into larger structures resembling current housing blocks in size, the inclination in height and the atrium further improve the lighting situation for the lower floors. In stacking this module with careful consideration of the lighting of the lower areas building height can rise up to 8 floors.



COURTYARD+

The goals of the Courtyard+ housing project are to

MAINTAIN:

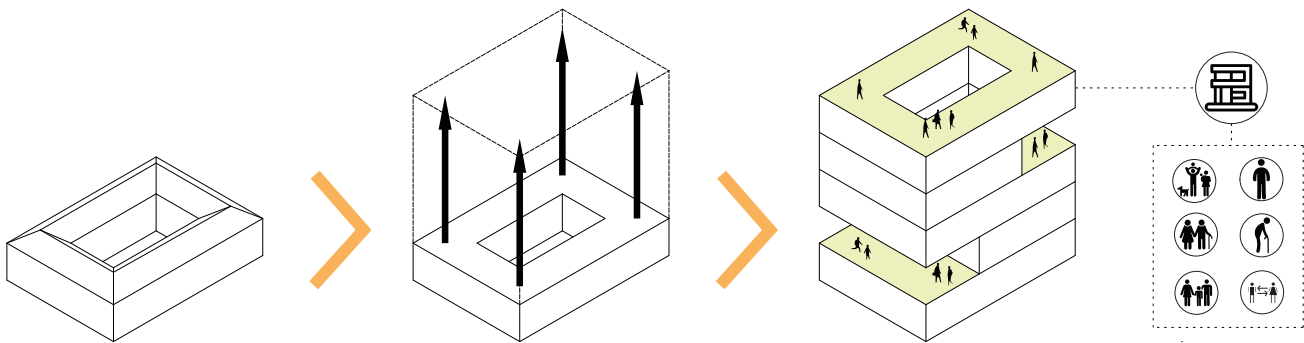
- old town structure and the complex roof landscape
- current density wherever possible
- essence of grown structure of courtyards

AVOID:

- excessive gentrification & segregation

INTRODUCE:

- high density in the rim areas
- a sensible mixture of different people to the quarter
- housing with high accessibility (elderly & handicapped)
- modernized housing standard
- the essence of Changmen into verticality



New multi-storey "Courtyard + housing"

THE NEW CHINESE SIHEYUAN

Courtyard+ housing
SUZHOU, CHINA



COURTYARD+ HOUSING

The modular base structure of the new Siheyuan allows for a widely adaptable application in creating buildings and building blocks and eventually a whole city district.

The possible variations of how flats may fit into the modules are nearly endless, growing with the numerous possible ways of combining modules. The importance of equal access to light and outdoor common space imposes somewhat of a limit though, reducing the number of layouts for the single buildings to a reasonable number.

It was therefore meaningful to develop a set of buildings from the base module abiding by these simple parameters and to demonstrate that the qualities of Changmen district can be translated into denser housing and eventually into modern multi storey structures.

Different heights and densities are represented by the five modules below.

Learning from the old town lighting shafts in the form of atriums help to get light deeper into the floor plans and the lower levels and ensure that quality housing is possible on the every floor. The atrium principle also is key to the versatile application of the modules, because it makes it possible to arrange several blocks in roughs without the need for inbetween space - all of the lighting happens through the inner courtyards. In this way it is even possible to build houses with four sides enclosed, if access is possible.

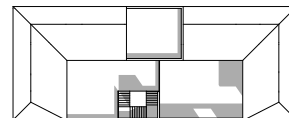
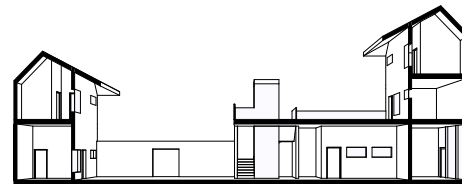
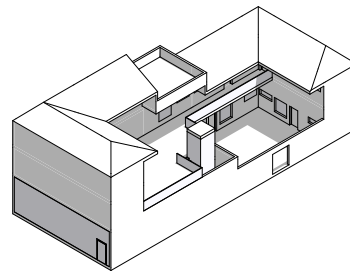
At the same time the openings on different levels of the building modules will form a great variety of spaces - open, enclosed and roofed - which can serve as zones of encounter, pathways between different buildings or even little city squares. In this way a similarly unique pattern can be created to renew the atmosphere of Changmen and give it a new, but somehow still well-known face.

BASIC MODULE

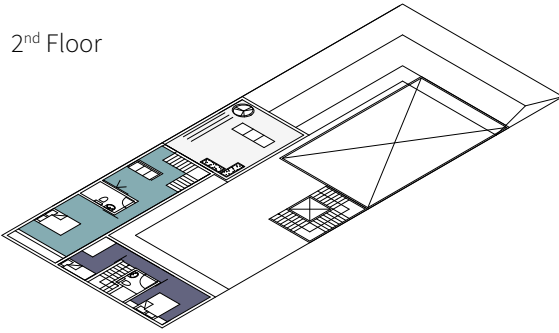
The base module is the smallest unit and acts like an urban brick.

It can be stacked and arranged in many ways and will always create a similarly detailed small-scale space for the inhabitants with:

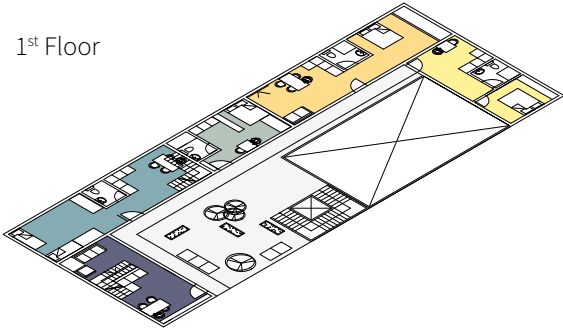
- Two courtyards - access, light and space
- Direct access to the courtyard for every flat
- Mixed flat sizes from 20m² - 90m²



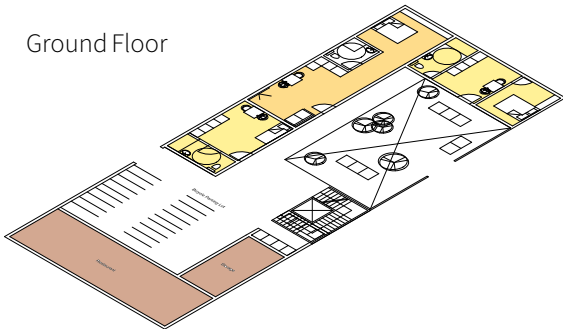
2nd Floor

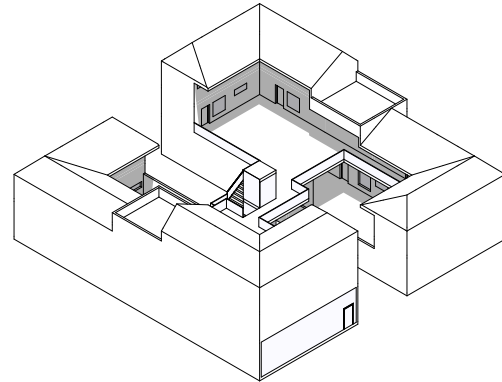


1st Floor



Ground Floor

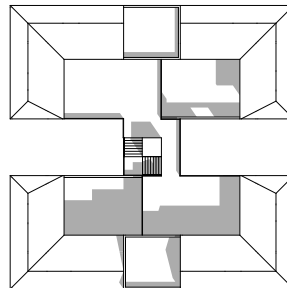
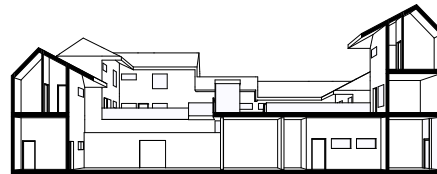




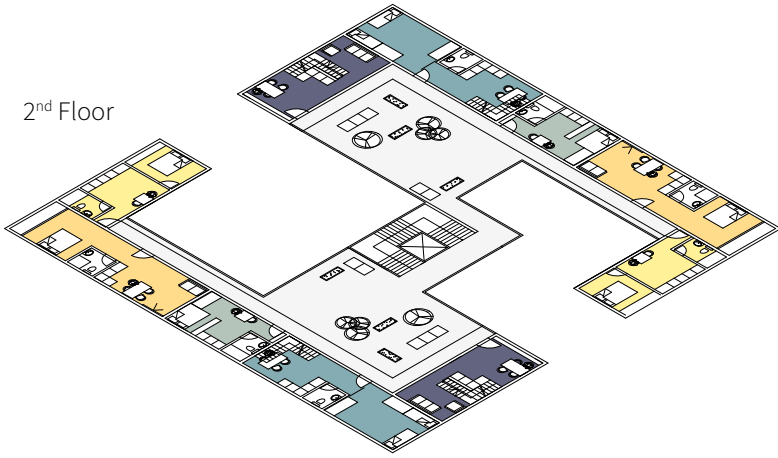
2/3-FLOOR LIGHT DENSITY

The basic module can be mirrored and grouped in a number of variations to form low rise housing blocks. Space in-between can form alleys, pocket squares or may be used for further small flats or services.

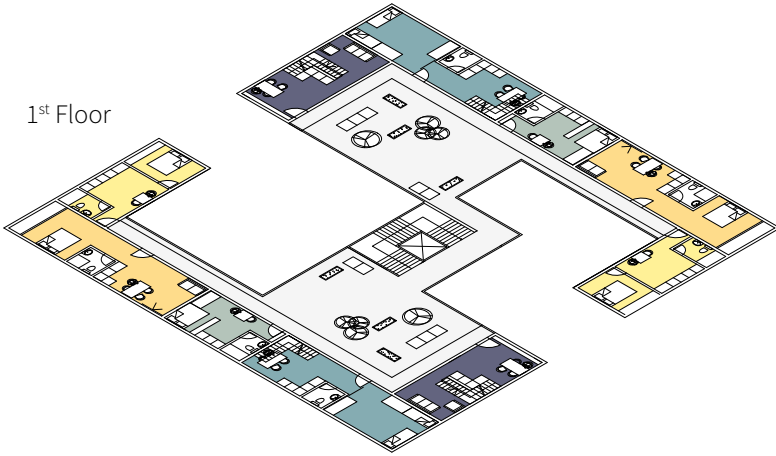
- Auxiliary buildings possible
- Spacing between modules defines possible functions



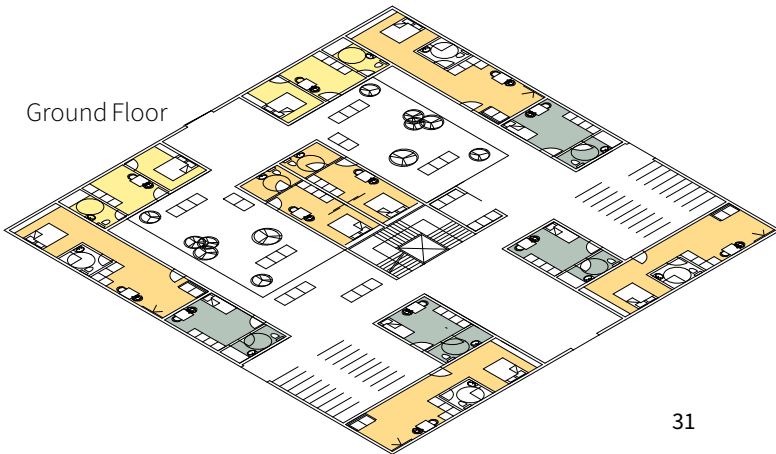
2nd Floor

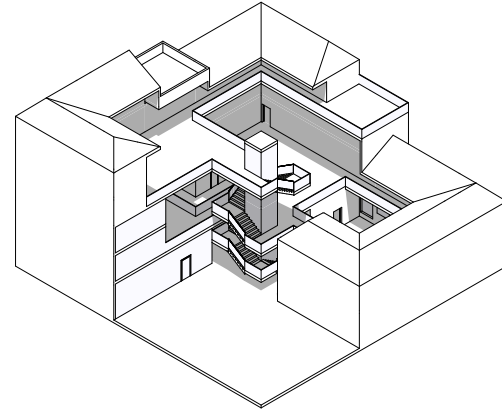


1st Floor



Ground Floor

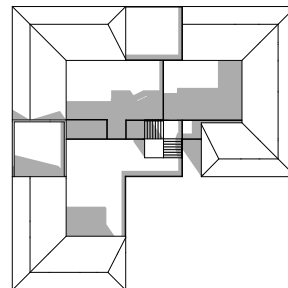
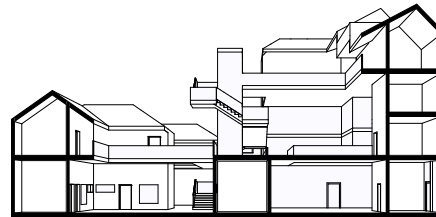




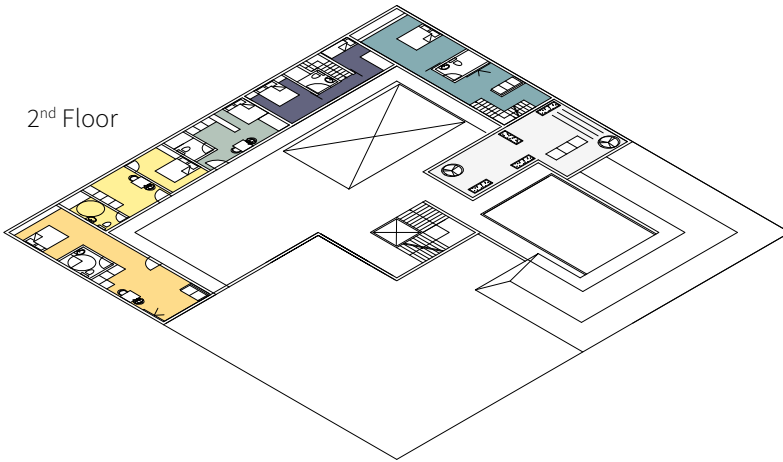
4/5-FLOOR MEDIUM DENSITY

Inclining to 5 floors this module variation features a large space in the groundfloor and could be part of a greater square or park if mirrored. It is very well lit and highly accessible from all sides.

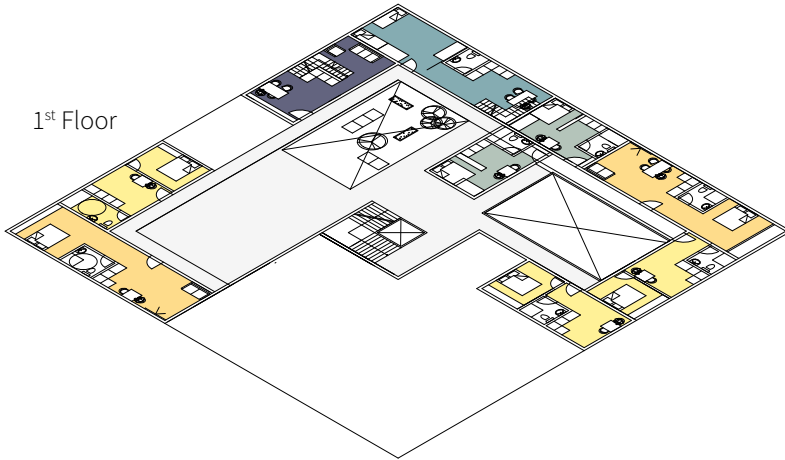
- Auxiliary buildings possible
- Large open space



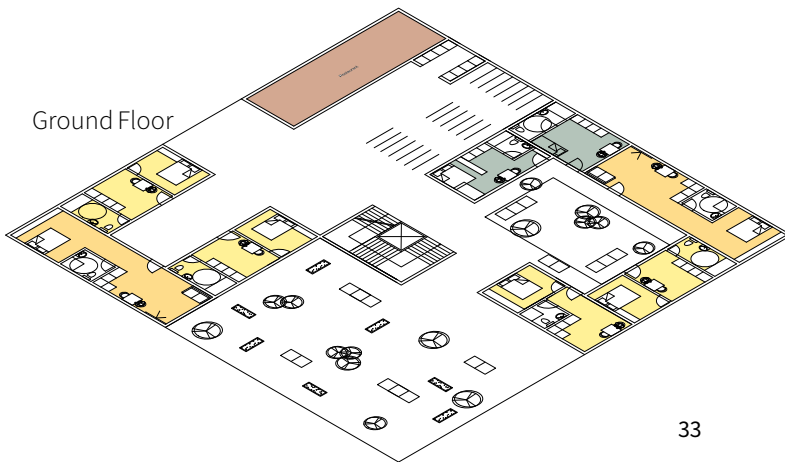
2nd Floor

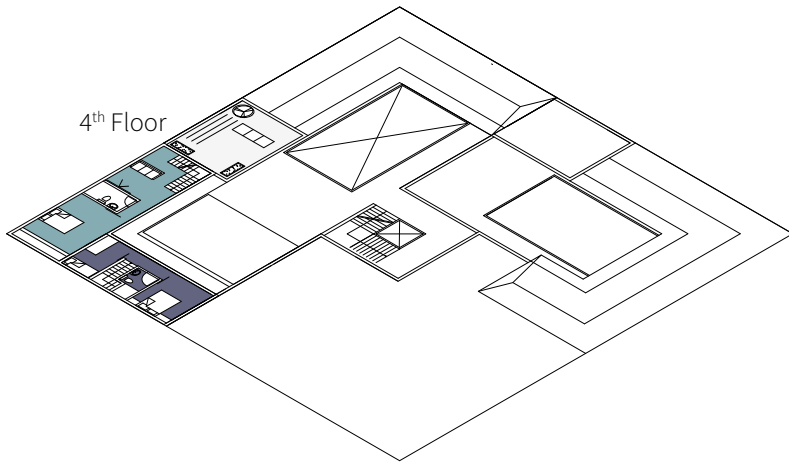


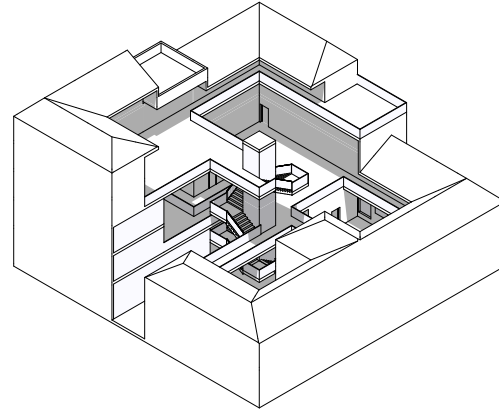
1st Floor



Ground Floor



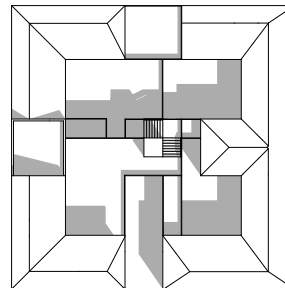
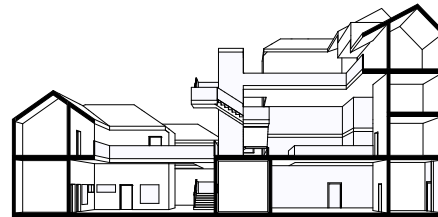




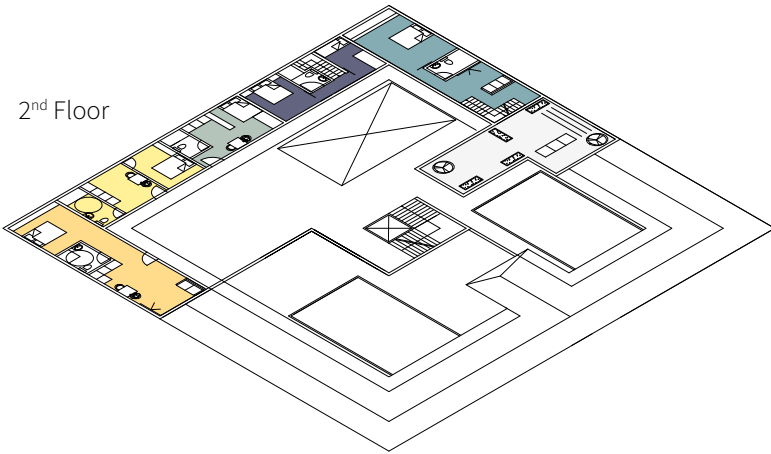
4/5-FLOOR HIGH DENSITY

This variant is a suggestion constructed for rim areas with high building mass requirements. It features a maximum of flats and may be accessed from the ground as well as through side entries on different levels.

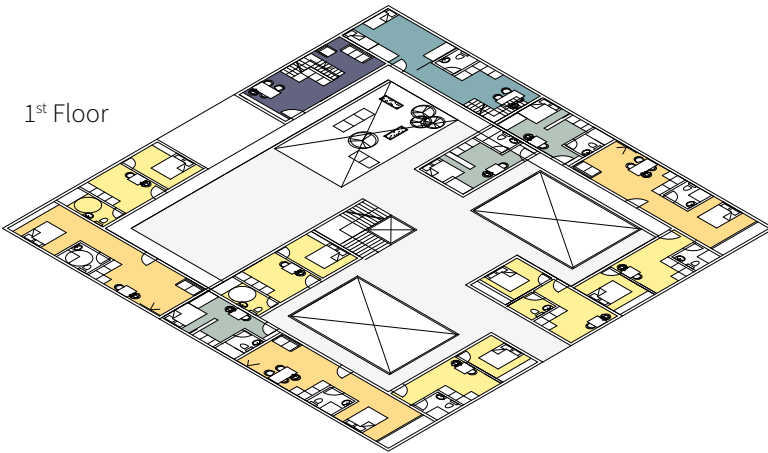
Possible connections include entry from adjacent buildings on any level, introducing a change of function from private courtyard to pocket space for the respective courtyards.



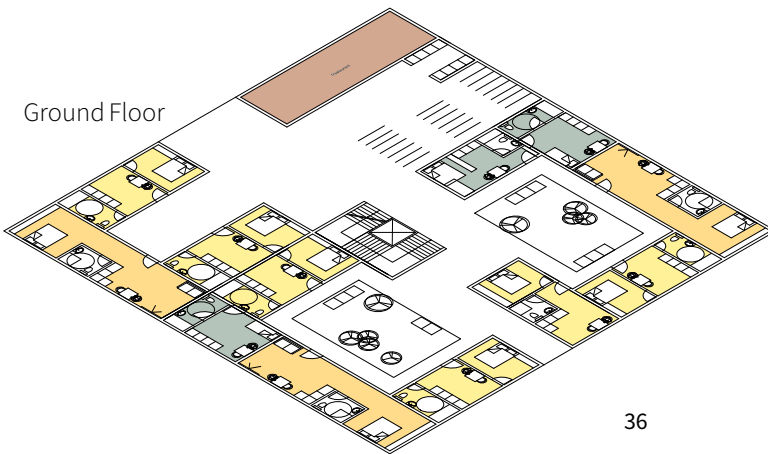
2nd Floor



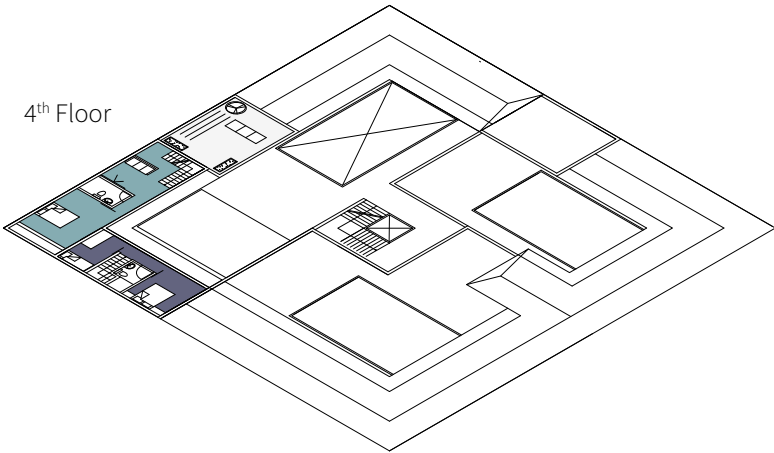
1st Floor



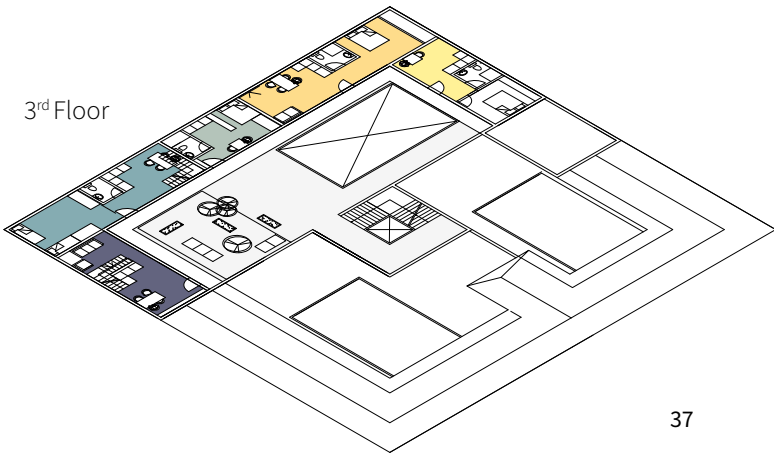
Ground Floor



4th Floor



3rd Floor

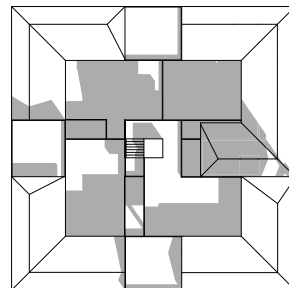
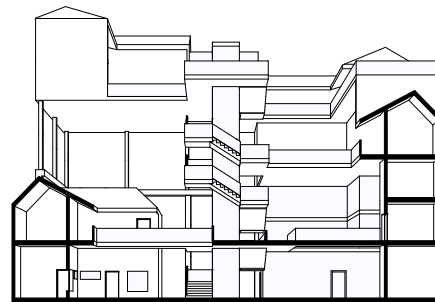
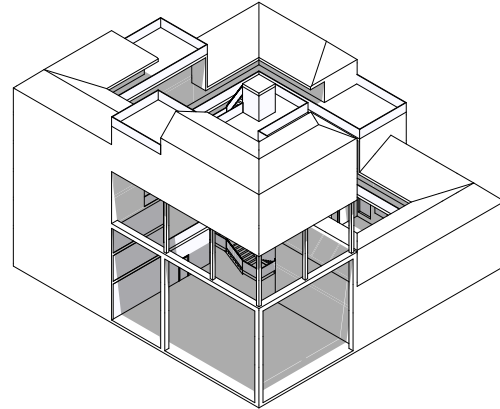


7/8-FLOOR HIGH DENSITY

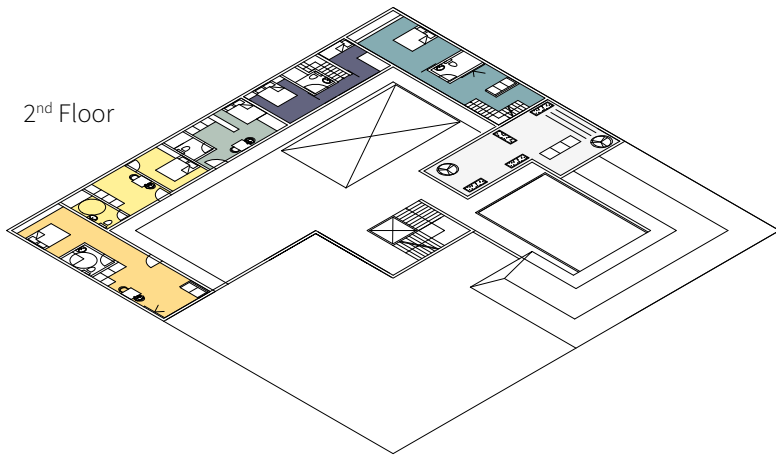
The 8-floor building features an open space with a roof in the ground floor.

It is the densest variant, but due to the necessity of lighting in the lower levels it is only slightly more dense than the lower 5-floor buildings.

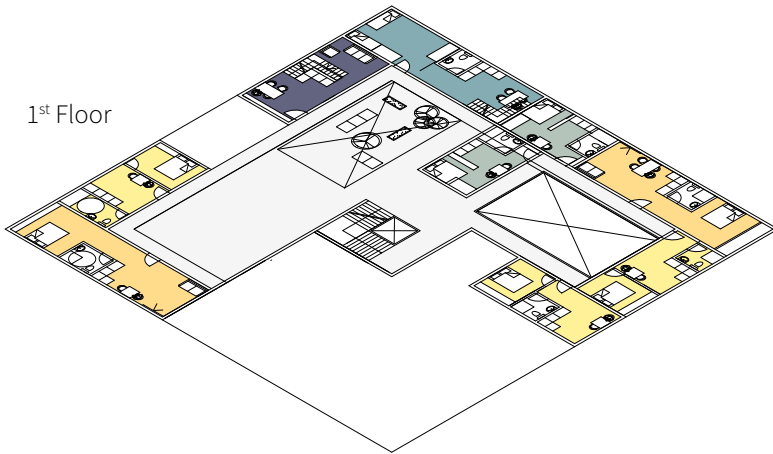
Further consolidation of housing space could certainly be achieved by cutting on the qualities of the flats in the lower floors, however these considerations are not part of this project.



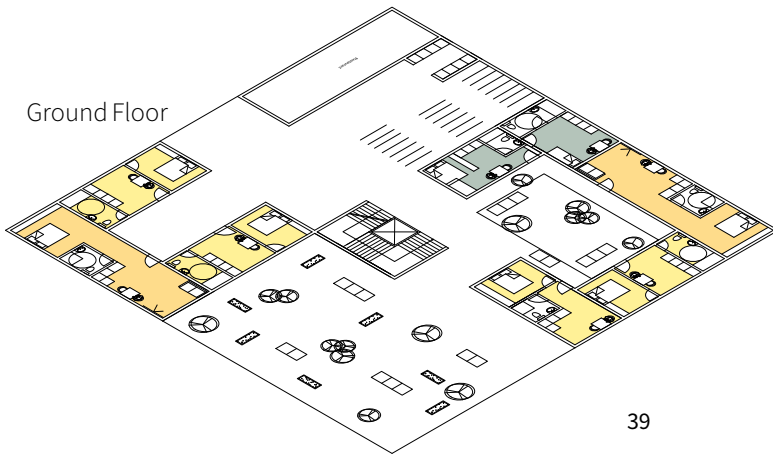
2nd Floor



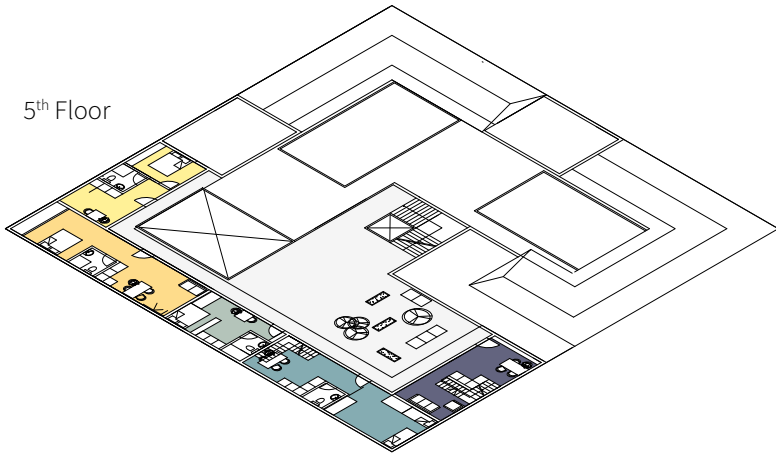
1st Floor



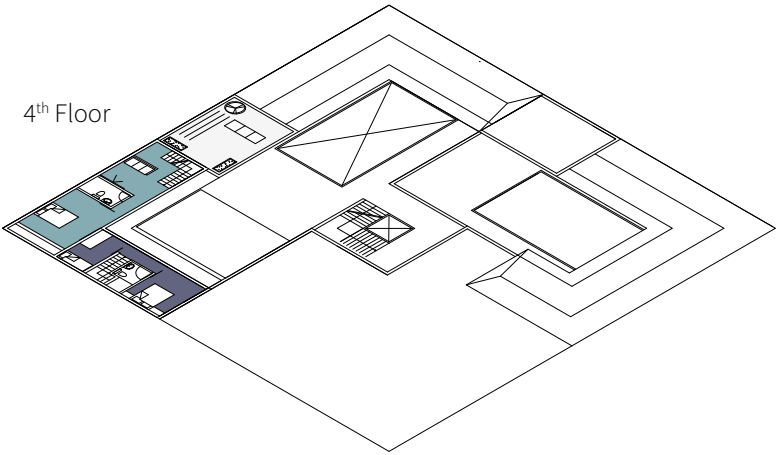
Ground Floor



5th Floor



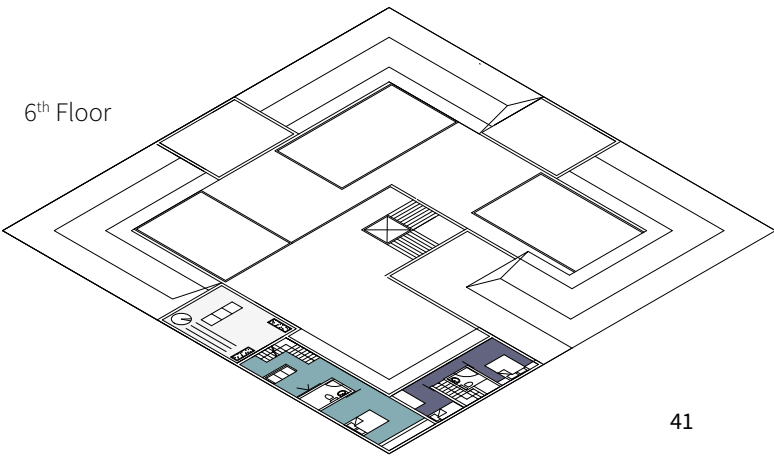
4th Floor



3rd Floor



6th Floor



URBAN STRUCTURE

Creating a variety of adaptable environments with very different spatial qualities is essential. The Courtyard+house schematic can be aligned in many different layouts which ultimately never cease to yield new spaces, chains of courtyards and narrow streets, dense housing or other functions for the inhabitants of the city.

Arranged in closed blocks the open zones of combined modules in the ground floors can work as an autarch secondary network of connections. By crossing through the blocks' very individually designable access zones it is possible to experience alleys, squares and even connection streets of lower hierarchy, making it possible for people to cross through blocks. As any street they may be lined by commercial areas, seating arrangements, food courts and the like wherever lighting allows for more prominent applications. Areas that lie underneath other housing units in the higher buildings are eligible for storage of bicycles and electronic vehicles or may function well as a roofed indoor space.

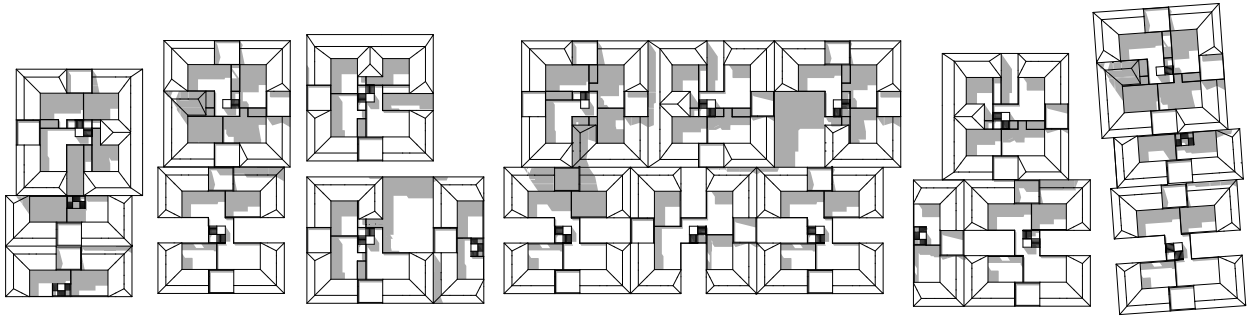


COURTYARD STRUCTURE

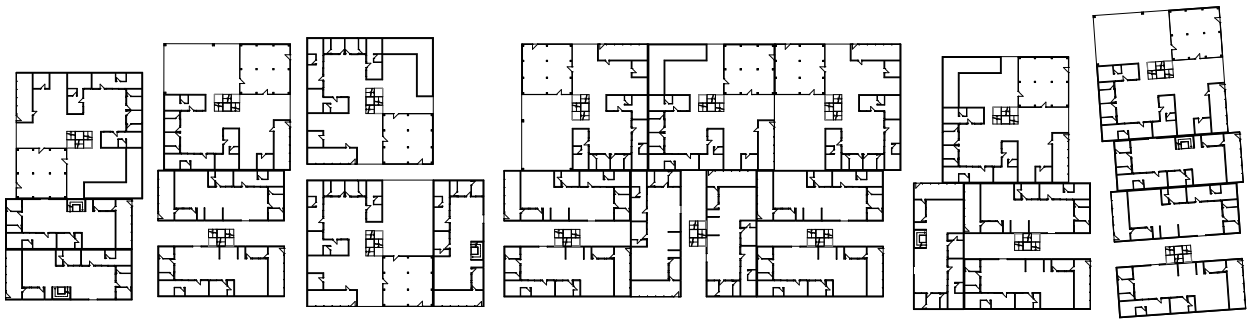
The relationships between the courtyards of any module or building are manifold and are not limited to the group of people sharing the specific space on one floor. Since all structures are multi-storey buildings there are always at least two courtyards that share a common identity - in a similar way as the single family would share an identity in the traditional chinese Siheyuan.



Changmen District - Section North-South

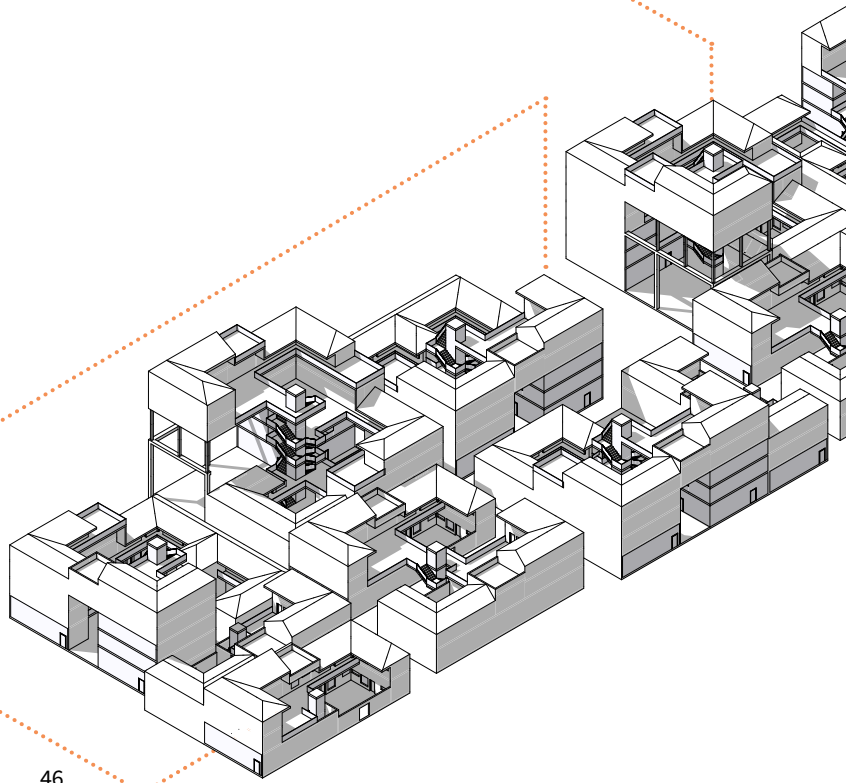
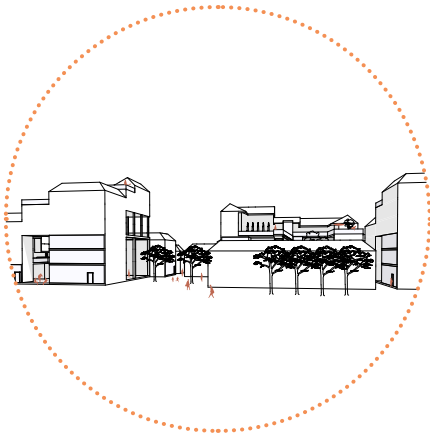
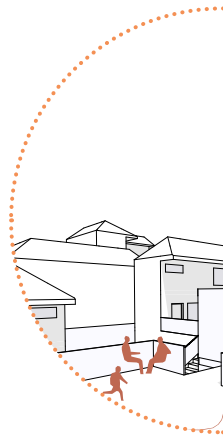
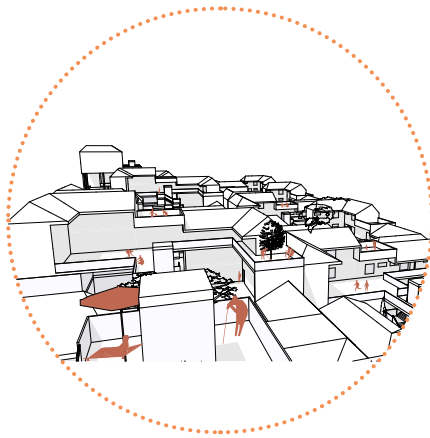


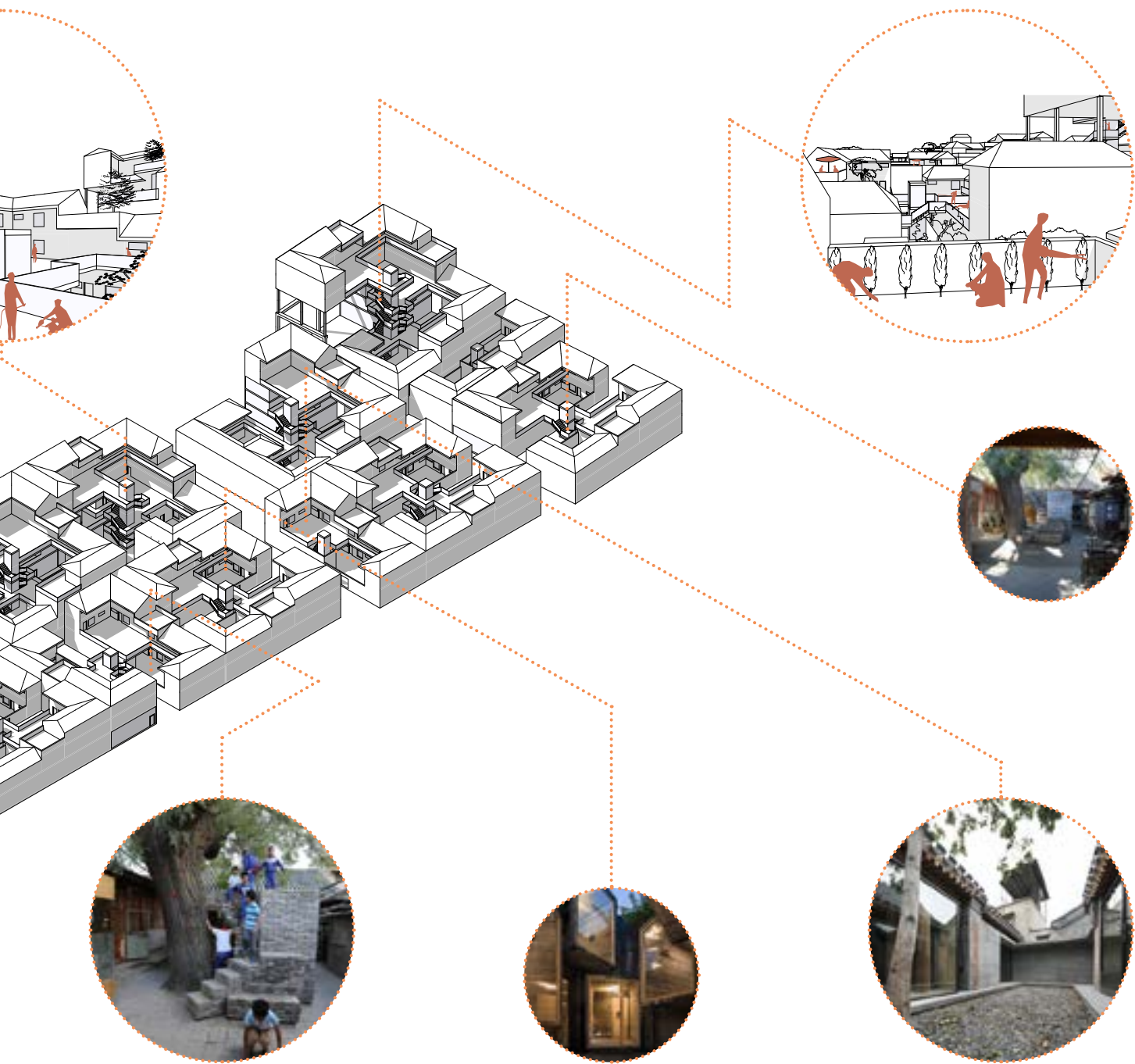
Changmen District - Roof and Courtyard Landscape



Changmen District - Connections on Street Level







VIEWS & IMPRESSIONS

The aesthetic claim of designing a systemic strategy capable of recreating the visual complexity, the very specific (and incredibly diverse) visual depth and the general spatial feeling of the old town demanded for the implementation of the formal language of Changmeng's houses.

Mainly acting on an urban level of development the project has not solved all architectural details to the very end, nevertheless some features are being portrayed as integral pieces of the newly built parts of the town's identity. As an example, the sloped roof landscape, is not only a great sight from afar, it is traditionally also a very important part of daily life for the people in the rainy East of China, where social life in the narrow streets happens below the roofs in the street whenever it rains. It is therefore an integral part of the urban design for the town, because it not only serves as a formal shaping of the environment, but also as an important part of the spatial experience in the city - the offer of space and inside-outside literally changing with the weather.