Doctoral Dissertation

Urban Public Space Rehabilitation
and
Place Making in European Town

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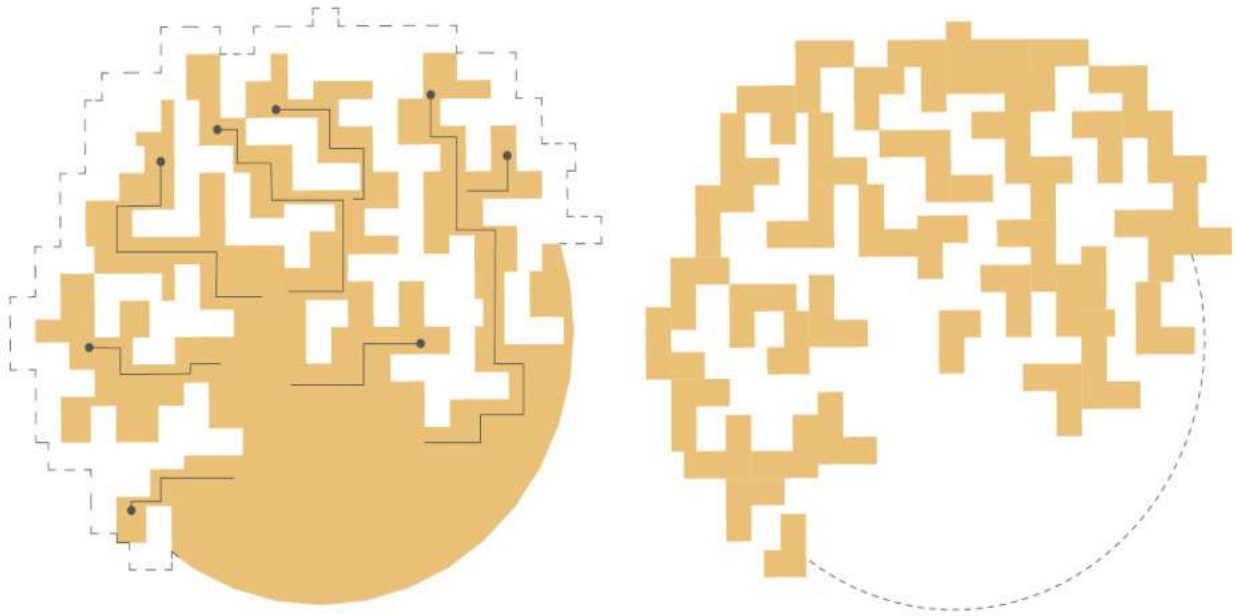

Figure 1: Illustration of urban texture and negative spaces, illustrated by author

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1.Topic introduction

1.1.Definition of the terms in title

The urbanization progress among the middle scale towns in Europe hasn't been as rapid as it is in the metropolises, which can been seen from the fact that the increase of urban population rate is not so significant as the rate in metropolises in the past two decades (Eurostat, 2016).

The middle and large scale town, in the context of Europe, generally refers to the towns that host over 100,000 population. According to the statistic result of 2018, it has been found that 31.6% of the European population lives in towns and suburbs and 39.9% lives in cities (Eurostat, 2020). This means nearly three quarters of the European population has been living in different scales of urban context. Despite the fact that, in general, the urban population has been steadily increasing in towns and rapidly increasing in metropolises, middle scale towns cannot always balance the migration and are loosing their permanent residents. The population moving out from middle scale towns towards metropolises becomes more than the one migrating towards them. The actual driver of this phenomenon can be found in social, economical and environmental aspects. The research reflects of the built environmental aspect of them. How does a town retain its active population with its appealing, sustainable and interactive built environment – public open spaces?

A common character of many middle (or even larger) scale towns in Europe is that they have their own historical memories, civilization based or nature based. Without being well publicized as the metropolises, they became less known but more potential on the showcase of Europe and the world. Single core based urban development is common in middle scale towns, most stories are told in the historical downtown, by the buildings, streets, squares, big or small public open spaces and natural landscapes. Consequently, urban built environment was taken as the approach of the research. Apart from an essential composition of the built environment – the buildings, the negative side of it, in terms of urban texture, is the public open space. In the context of European towns, public open space can refer to city squares, streets and other minor community spaces. In the previously defined urban context, the built environments of the towns have been developed along the history of their belonging town. The culture and history of Europe have left their clue and story in every corner of the continent, and became the existing streetscape and public squares from different time period. As time goes, the public spaces experiences layers of renew and re-adaptation. The research attempts to study the rehabilitation of public spaces in European town context and search for the suitable place making methods.

In which, the public spaces take into account the squares, streets and other minor community spaces (negative part of the urban texture). Subsequently, reflections are made base on the studies and practices.

1.2.Status of the topic

Many researchers and practitioners have developed methodologies and made researches on different aspects of urban public space renovation, rehabilitation or adaptive reuse corresponding to their object cities. In the Scandinavian countries, relatively more advanced concepts were created, and also practiced locally and in newer cities like the New York City. The concepts cover the topics of making new places, turning existing 'dead' public spaces lively and making use of the neglected spaces in the city. Methodologies of assessing existing public space, investigating for rehabilitation and researching according to specific topics (e.g. street greenery, lanes, visual quality, pedestrian use) were widely developed. As an example, the Public Space Public Life (PSPL) developed by Jan Gehl has been one of the most widely applied systematic methodology in public space evaluation among the worldwide researches and practices. In Denmark, the United States and other developed countries, this method can be found applied to the evaluation of public spaces in big cities and metropolises (Copenhagen, Helsingor, Los Angeles, New York City). Seeking for smaller scaled application of PSPL assessment, many cases can be found in Chinese towns and cities with long history (e.g. Minnan, Wuhan) (Xu, et al., 2018) (Zhao, et al., 2012), but in the context of Europe, it was more applied to cities with shorter civilization, documentation is rarely found in case of traditional historical towns (Gehlpeople).

1.3.Background of the research

The research thinks for the urban living of middle scale towns in the future, therefore, to a considerable extend, it stand from the residents' perspective. The main object of the research, as defined previously, is the public space in the context of middle scale towns. As the negative composition of the urban built environment, existing public spaces both form the structure of a town and fill in the voids created by buildings. Scaling as a town, the size and history of it subsequently determine that the city center have a different approach of public space evolution than the outer city.

1.4.Research gap

1.4.1. Middle scale towns haven' t been well exposed to the researchers

As discussed previously, plenty of diverse and systematic design theory and assessment discussing about advanced concepts and researches in pioneer cities exist and are being conducted. When searching for targeted theory and assessment for middle scale towns, the result is very limited. What is worth mentioning is that many towns in Japan were systematically sorted and summarized according to their urban planning approach and public space design method. Towns in Europe are doing local municipality or university based public space researches on multi topics, without being considered a category and extracting the common design methodology, though the historical and cultural background of the urban texture are many times common. Thus, the town scale characteristic public space design in the European context is worth being a common topic to think over as a whole.

1.4.2. Good opportunities with brownfield and built stocks

Along the complex history that took place in the continent of Europe, industry, force and family based land properties or building properties were left brownfield. They are valuable built stocks of a city or town. In the pioneer cities, the brownfield or built stock topic has been discussed, researched and practiced as wide and deep as possible. The adaptive reuse and rehabilitation strategies have been essential topic since the last century. But in the town scale context, this topic is still young. There are already increasing number of researchers and practitioners engaged to the reuse of brownfield and other built stock. Due to the scale of the settlement and the attribute of the built stock, the reuse projects weigh differently in towns than in larger cities. They are able to bear the load of providing refreshing layer of a towns' public character and strengthen or create the connectivity of it.

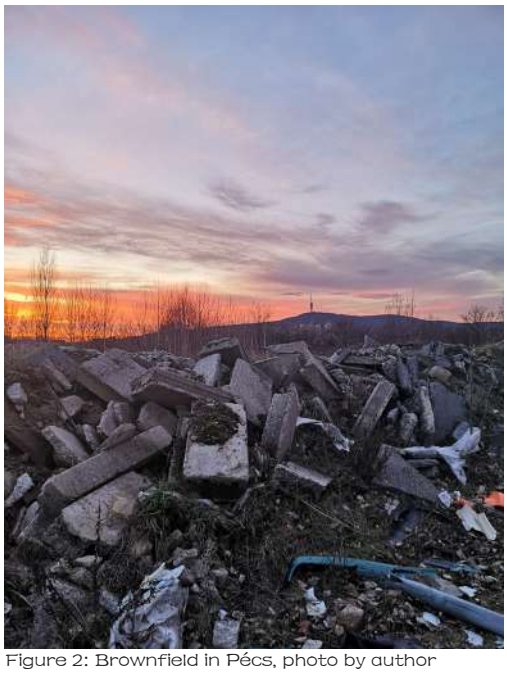


Figure 2: Brownfield in Pécs, photo by author

1.4.3. The unclear or missing concept of community living and neighborhood

Community living and neighborhood concept have long history in Asian culture. Thousands for years of community living developed successful neighborhood systems in Chinese settlements and influenced the neighboring nations for hundreds of years. Other parts of the world also developed different types of neighborhood in cluster, clan, village and more forms. This concept has also been increasingly tested or applied in the worldwide urban planning, public space design and architectural design practices. Yet, in the case of Hungary, community living or neighborhood concept was not inherent in the culture. There is only newly organized researchers in its capital city Budapest that concentrates on this topic. Though many people are establishing their daily life with their neighbors, the society and management is not working in community level. From both daily life service and urban resilient as revealed in pandemic point of view, it is worth trying implementing the community living and the sense of neighborhood in the public space revitalization designs and new projects in towns and cities.

1.4.4. Lack of public space network and the subsequent interaction

The general research involved to two topics about urban public space. One of them is the design of a single public space (single public space design), the other one is the planning of the organization of several co-operating public spaces (planning of public spaces). The concept of public space network refers to the structural arrangement of the planning public spaces that optimizes the classification, functions, visual quality and social ambient of different single public spaces within the planned district or neighborhood. The consideration of public space network has been involved in the process of district and neighborhood scale planning. Researches dealing with urban planning and public space design have intuitively involved this concept when discussing about the connectivity of public spaces and their functional complementality. In district level of larger cities and town scale, public space network has been increasingly involved into the general plan of the local municipality in China. But this concept has not been extracted as an specific part of the planning process commonly, only few researches had dealt with this topic specifically.

1.5.Value of the research

Among the European cities, many of them have benefited from the successful and valid connection and complementary functions of the diverse public spaces. In town scale, successful place making and connection build-up have led to stronger urban vitality. Therefore, the analysis of public space network concept from urban connectivity and vitality in European town scale is worth conducting as part of the common methodology of the town-scale public space design and place making.

In the design of the research itself, human centered perspective, solutions of society issues and environmental issues were taken cared about, in order to conduct theoretical conclusions that is constructive and contributing to the common well-being.

2. Methodology

2.1. Orientation

The research initiate with the city of Pécs, a middle scale town located in the South of Hungary. There are multiple reason for choosing Pécs, diverse urban public space evolution by the long history, open mined research background in the city, international and local blended residents and the fact that it is facing a steady decrease of its permanent resident for nearly three decade.

From the researches based on the city of Pécs, the general research extend its vision to wider range of similar towns and parts of a larger cities with similar potential or problem.

2.2. Topics to be covered

The general research is accessed via multiple sub-topics. Urban living, brownfield rehabilitation, place making, walkability, community, human behaviour, landscape and streetscape, urban resilience and architectural envelop are the concerned sub-topic that can be seen from the sub-researches.

2.3. Research structure

The general research is composed by sub-researches and design practices. In the sub researches, case study, literature review, system compose and observation are the four commonly used methodologies.

3. Sub-researches

-public space and urban living

Figure 3: Pattern on the manhole cover of Wudadao, photo by author

3.1.Wudadao historical district rehabilitation

3.1.1. Brief of the research

Cities and towns around the world have their own approach on dealing with their residents having their community in a heritage district, this may vary due to culture, religion, and the overall policy environment. In China, there are successful projects and failed ones. In the meantime, there are many examples regarding heritage building or public space which do not get enough attention. Local inhabitants either have good relationship with the renovated environment – it forms a successful rehabilitation, or see them as disturbing and useless. The reasons of failure and success need to be studied and experience absorbed. Chongqing Road in Tianjin, China, was studied as an important part of Wudadao historical district, mainly from the local community living point of view. It is either a successful solution or a development not yet perfect, depend on the aspects to judge.

The research covered the built environmental content of WuDaDao historical district and Chongqing Road, the protection method applied by the local municipality, local community living status, local housing, yet existing problems and the potentials.

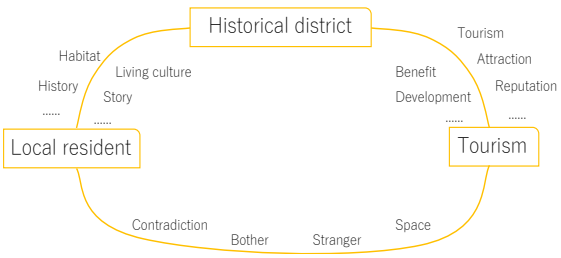


Figure 4: Relationship between historical district, local residents and tourism, illustrated by author

3.1.2. Background of the rehabilitated district

What is WuDaDao? Literally it means five avenues in Chinese, representing the historical concession district built since 1860 when the English people first started the concession. Involving English, French, Italian, German, Spanish and Japanese houses and offices, the district can be considered as a dictionary of that time. Known from a local guide, WuDaDao consists of twenty-three roads in total, although it is named after five of them. After all, it is always a residential zone with plenty of communities.

Since 2011, WuDaDao has been turned to an emphasized AAAA scenic area, classified by China National Tourism Administration. From then, for the majority of people, the district became firstly a tourist attraction, then the home of local residents. Chongqing Dao is one of the main roads in WuDaDao.

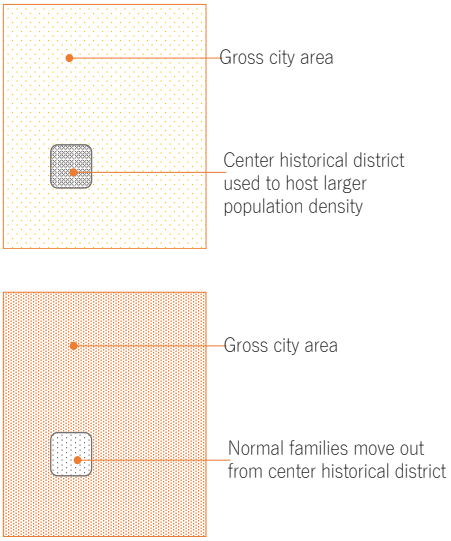


Figure 5: Illustration of population distribution in Tianjin, illustrated by author

However, at the time of Concession, it was divided into two separate roads called Edinburg Road and Cambridge Road. The sector between Hengyang Road and Yunnan Road involves school, hospital, office, houses of important persons, but mostly local residential housing, and this study focuses mainly on this area (674m long).

3.1.3. Housing typology and corresponding community public space

Residential buildings in WuDaDao district go in two directions. Single-family houses of important persons have become museums, studios and administration buildings. Others have kept their residential function. There are four types of residential buildings in the focused sector, apartment building over four stories, apartment building less than four stories (detached row houses), Lane houses and single yard houses. Respectively, the community public space corresponding to the apartment type refers to the sidewalk in front of it and the space between two apartment buildings; the detached row houses and single yard houses are the same situation as apartment, but they are located closer to community parks distributed in the district; lane houses nowadays contain more than one family along an inner lane, therefore, the lane itself becomes the most frequently accessed community space for the lane house residents.

3.1.4. Protection applied

The discipline of protection is based on the actual situation of Tianjin and 5 sets of regulations: Urban and Rural Planning Law of the People's Republic of China; Law of the People's Republic on the Protection of Cultural Relics; Regulations of Tianjin Municipality on Urban Planning; General Plan of Tianjin (2005-2020); Regulations on the Protection of Famous Towns and Villages in Famous Historical and Cultural Cities. Architecture, bike tour, public and private space, urban texture and natural environment are all concerned.

By 2016, a Push-Pull-Interaction-Service experimental project was done in WuDaDao. Besides the push and pull on finance, regulation and rearranging local residents, interactions and services were established too.

This can be the reason why signs like 'private house, no disturbance' are not visible on local private homes compare to the ones on many houses in the historical residential zones in Beijing (for instance, NanLuoGuXiang). All tourist activities including carriage tour by horse, bike tour, museum activities are completely authorized and controlled by Tianjin Municipal Ministry of Urban Construction. Services are designed not only for tourism, but also for residents of the district and the city. Two public hospitals and a private one can be found within the district, as well as a high school, five primary schools, at least four public kindergartens and a nursing home can be localized, according to my last visit.

On both sides of the 674meter long sector of Chongqing Road, eleven housing estates of different types can be found. These facts prove that the historical district is not simply an exhibition board for sightseeing, but fulfilled with lively living communities.

Many kinds of rules and regulations can be found on the street due to the protection of historical district. They are about cleaning, parking, classification of protection and restricting the neighbouring constructions. Figure 6 shows that on each gate of private owned property there is a metal plate of cleaning responsibility. There are three points to follow for the owners: cleaning the front yard including the space outside their gate; preparing containers for rubbish and put them into the designated official bins; cleaning snow in time. This is one of the interactivities regarding historical tourism development, community environment building and daily life of local inhabitant.As the first historical buildings listed to be protected, all protected units are marked with a stone plate (figure 9). An effective action is that a QR code was carved on each of them, and by scanning, visitors can directly receive the history and knowledge of that particular building, quietly without any other guide. Carriage tour with audio guide goes only one fixed and simplified route with the most characteristic and symbolic architecture. This action leaves far more freedom and private space for local inhabitant than the case of NanLuoGuXiang (a historical residential zone in Beijing).

Parking as one of the essential part of daily life and public space, is ensured, too. Although many of the row houses and single-family houses own a parking lot for themselves, there are free parking lots with registered number by streets for apartment residents and visitors. Only one side of the street allows parking, this ensures driving lanes in both directions.

Despite the possibility of parking on the street, many local residents choose to park their car close to their house. There are two reasons according to a local resident from Yuwen Lane (a small scale lane house community): it is closer to home; there is lack of parking lot if come back home late. Along the 674meter long sector of Chongqing Road, there are 120 parking lots, not including the private lots. Number of parking lots is adequate in the three-to-four-story residential context, but two facts make it untrue: the demand of parking lot is uneven along the street, and visitor consumers' vehicles occupy a good number of lots.

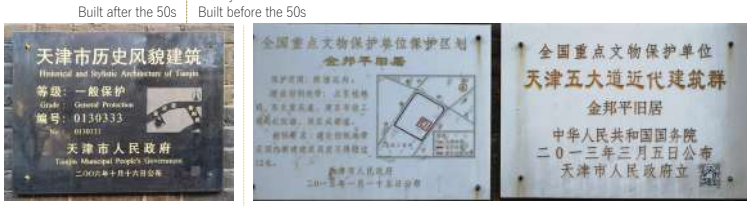
Figure 6: Photo of a private owned property, photo by author

Figure 7: Photo of Wudadao, photo resource: Sina blog id 老明

Apartment block (≥4 floors) | Lane house | Detached row house (≤4 floors) | Single family house

Figure 8: Photos of housing typology in Wudadao, photo by author

Brick-concrete Built after the 50s | Mainly brick or wood-brick Built before the 50s



A generally protected piece of architecture on Chongqing road | Jin Bangping's former house on Chongqing road (specially protected)

Figure 9: Photos of protection classification in Wudadao, photo by author

3.1.5. Classification

In 2006, Tianjin Municipal People's Government listed the protected architecture, and classify them by general, emphasized and specially protected. WuDaDao owns 390 of the total 746. Each of them was marked with a black stone plate (figure9), and few of them, which are specially protected, are marked with white marble plates. Take Jin Bangping's former house on Chongqing Road as an example (figure 9), there are two plate presenting the protection plan and regulation and the formal name and time when it was listed as protected. The protected object (red line in figure 9) means everything inside the yard fence, including the fence itself. The golden line shows the exact shape and position of the protected building itself. Blue line marks the construction-controlled area, which means new constructions in this area must not be higher than 12meters in this case. Jin Bangping's former house is now used as an office building for property business. The other three specially protected former houses on Chongqing Road are now used as residential houses and office for Tianjin Real Estate Group Co., LTD.
Not only protected buildings are classified, each block forms a community and every construction inside is classified as well.

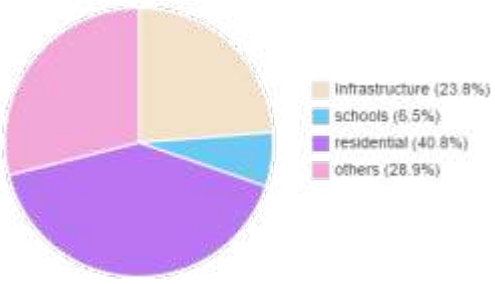


Figure 10: Land use of WuDaDao, illustrated by author based on Zhang, 2012

Figure 9 shows an example: a community on North side of Chongqing Road. The red mark refers to unmovable reliques, the orange ones are historical buildings, the yellow ones are traditional buildings.

Purple marks the normal buildings that co-work well with the traditional spirit, while blue refers to the opposite ones.

3.1.6. Communities in the district

It is clearly seen from the local infrastructures within WuDaDao that the whole district is a complete living zone involving many communities. Fifty-six communities are there in the district (figure 11). Community 16 and 18 are on the North side of the 674meter sector of Chongqing Road; 17 and 19 are on the South side. From the structural point of view, there are three types of load bearing system existing in WuDaDao: wood, wood-brick and brick-concrete. Basically, it depends on the time when the building was constructed.

In community 18, there are three types of residential housing: housing estate, detached row house and social housing.

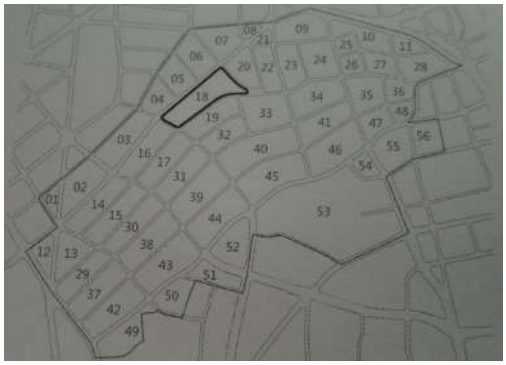


Figure 11: Community plan in Wudadao, picture from Baidu Tieba id hj9833

The housing estate consists of two detached apartment buildings made of wood and brick, so is the marked social housing built in 1937 and the detached row houses.

A community is divided into few Lis. Li means a housing estate nowadays. However, in the context of WuDaDao, Li can be one residential building, few rows of detached houses or a lane with a common yard/path. A Lane type exists in community 19, called Yuwen (figure 14).

Today, local people are using their houses in three ways: private home, private business and investments. Private business was mentioned before, according to which 70% of ground level flats on Chongqing Road are used as shops and service business. As for private home, what is worth mentioning that local inhabitants tend to bring every idea to make their life more comfortable and efficient. This includes creative legal ideas and dangerous illegal ones.

Figure 12: Photo of refurbished street retail in Wudadao, photo by author


Figure 13: Photo of commercial reuses in Wudadao, photo by author


Figure 14: Photo of lane community in Wudadao, photo by author

Figure 15: Street elevation of part of a street in Wudadao, illustrated by author

Two examples on South side of Chongqing Road (community 17 and 19) are presented (figure 11). It is visible in figure 14 that there is a mesh across the lane path. A resident said that it is for drying clothes, and every neighbor in the lane can use it. It works quite well, and smart. But indeed the construction is illegal considering plot line of each household. Besides, 'handmade' balconies are 'popular' among local self-service restoration of private houses, which is neither safe nor legal.

The way of investment includes property exchange and renting. Exchange is allowed, but as mentioned before, the process depends on type of property. To own a house or flat at Chongqing Road spares 1 million to 11 billion Chinese Yuan. The reason of the ginormous difference is partly price per square meter, which varies a lot by location, and partly house type. Unit price varies from 46 thousand Yuan per square meter to 90 thousand. Interiors, location, whether children can be involved into a good school, whether it is a semi-basement or a house, everything matters.

Another trend of investment is to rent. Owners either rent their house or flat for long term through common exchange agency, or register for an Airbnb account and make a private business. As interviewed, an Airbnb host made a commission business to manage short term room renting for local property owners. All the forty-six rooms for rent in the historical district have been refurbished to various extend. Problems are, as comment occurs, that illegal construction appears in a rate of one third, and more importantly, Airbnb is not yet a legal business in China.

Figure 16-19: Photos of reuses of housings in Wudadao, photo from Airbnb hosts at Wudadao

3.1.7. Summary

Local life gives the historical culture and heritage relics precious character: to be alive. Activities of local inhabitants prevent them to be a dead chapter of history. The focused sector of Chongqing Road and surrounding infrastructures ensured the good level of education, medical and exercise activities as well as other services for local inhabitants. The neighbouring infrastructures came partly from history, and partly by urban planning and policy. With the restriction by regulations and policies, all of them became the guarantee and foundation of life and work of local inhabitants, and the bridge between local inhabitants and local built heritage.

3.2. Co-living and three dimensional courtyard pattern

3.2.1. Courtyard approach of shared space design in architecture and public space design

Young adults, young pioneers and those people who have just started their careers face an critical problem, that is the housing. This is a question that many researchers and practitioners are searching and seeking for solutions. Additionally, it is more severe in migrant cities and major towns. Both emotional problems and affordability are the essential aspects of the problem.

Among the diverse psychological problems presented in the emotional aspect, isolation and loneliness are the main issues. More valid and convenient daily communication in community and neighborhood scale has to be promoted. On the other hand, the affordability of housing, especially in migrant cities and towns, has been decreasing constantly and enormously around the world. This not only effect the freshmen, housing (house and apartment) can be still far from affordable even if one has already worked for years. The society and industries have been developing in a way that the physical resources (the land and built stock) cannot balance the growth of the talents and migrating labor force. Which all examine the ability, sense of responsibility and the potential of architectural design and community design.

Co-living and co-housing are not only new topics to be researched in the 21st century, they have been existing as a housing model since the last century and engaged to solve the space and affordability by sharing and via means of community interaction. The existing successful projects stands mostly in major metropolises (e.g. Shanghai, London and the New York City).

The co-living approach has made considerably success as an option for the youth to settle their life and career with promising and efficient socializing. Localizing the co-living concept makes the mind-setting and life model of this solution more locality customized. This not only strengthens the local character of the implemented city or town from urban identity perspective, complies with the existing urban texture of the built environment, more importantly, it also follows the native model of daily life and lead the residents to the community life through the traditional life pattern of the region. Moreover, the inherited community texture, layout, congregating method and public space distribution are valuable information to be involved in the localization study.

China has the longest continuous history of civilization, hence, diverse model of community living. Consequently, the current existing community models were taken as examples to study for co-living's localization. Tulou, Longtang and Siheyuan are three models that owns the largest community residents currently. All the three models are based on courtyards. Among which, Tulou exists individually hosting the most population in a unit and has connection with one Tulou to another, Longtang exists in lanes, has the most regular street system and the highest population density, while Siheyuan exists in the largest possible scale in a quartier or more and subsequently with more complex functions. In this research, Siheyuan model was further taken into the localization.

Siheyuan and Huton are the two notions that form the traditional live pattern in Beijing and many other Northern cities of China.

Figure 20: Tulou, photo from internet

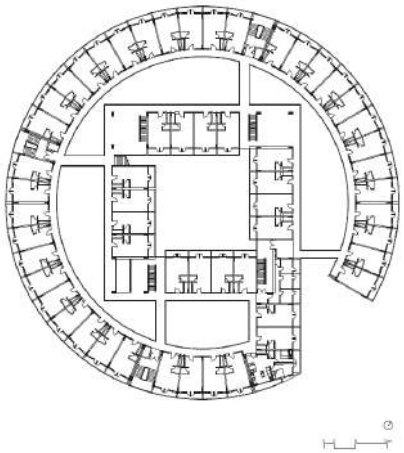


Figure 21: Tulou collective living by Liu Xiaodu

Figure 22, 23: Longtang (↑) and lane in Siheyuan based community (↓), photo from internet

Siheyuan represents the households and residential building as individual, and the Hutong represents the connections (public part of the negative space). This type of housing structure has regular overall shape. The regular urban texture may result from the rectangular courtyard houses – the Siheyuan. Interestingly, the names of the Hutongs – the lanes, are always named after their orientation or direction. In other word, if a lane is not exactly East–West or NorthSouth laid, its name indicates directly this information (For example, Yandai diagonal street 烟袋斜街). The connections and the orientations of the connections are extremely important in the Siheyuan and Hutong system.

Siheyuan is a type of living structure that is made up of courtyards and lanes. This type of yards are generally of more regular shape, hosting bigger (compare to the dimensions of the buildings) courtyards in the middle of the building components and therefore can form neat layout. Take Nanluoguxiang 南锣鼓巷 as an example, this square shaped historical zone consists of several lanes and Siheyuans (courtyards), and the lanes are generally perpendicular to each other. This zone is named as a lane, which demonstrates that the lane system is the core structure that connect all elements including the social activities as well, and make the households a community. What makes it special type of traditional living, is that in this kind of community model, residential, commercial, educational and even clinic functions are organically integrated through the connection of negative spaces into one pattern.

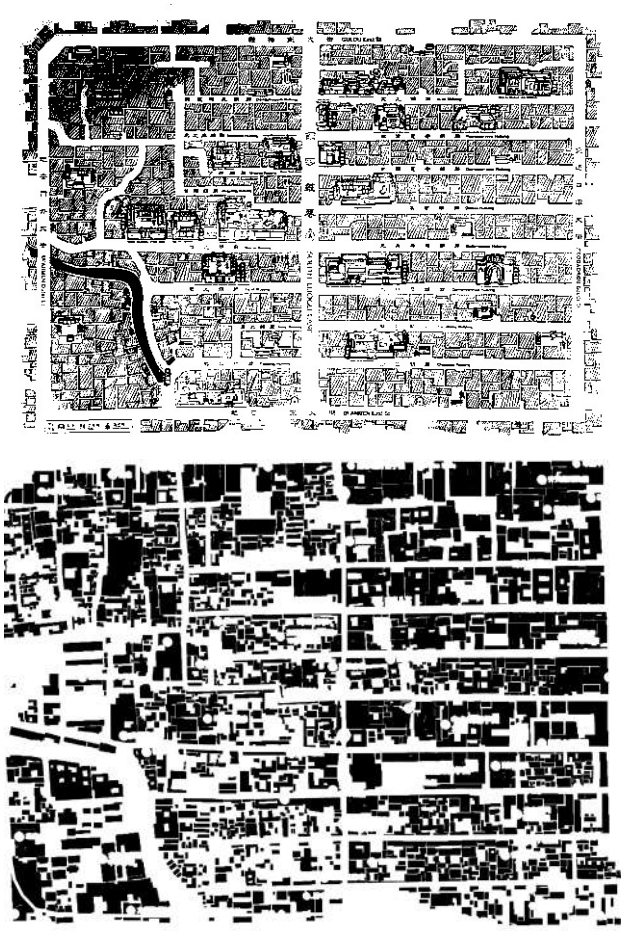


Figure 24–25: Nanluoguxiang property map (upper) and urban texture (lower), photo by author

3.2.2. Functional context

The design practice that applied the research topic is a residential zone at Qixia road in Shanghai. The urban context is developed with existing six-storey -high residential buildings, a high school, a metro station, public and private clinics, few high-rise commercial buildings and diverse small-scale retails. The site is on the South-West corner of the residential district, therefore, the situation becomes full of potential: the new construction can be either an ending or a starting. While the residential environment provides the quietness and peace to this area.

3.2.3. Concepting with three dimensional courtyards

Due to the aforementioned contextual advantages, the site has relatively complete neighboring infrastructures and services, thus, the community space to be designed could focus on the diverse community activity and place making based on three-dimensional courtyard arrangement. Figure 26 show the three initial three-dimensional courtyard concepts:

Residential area composed by the linear stacked residential units and shared functional units, meanwhile the linear structures enclose community courtyards for neighborhood socializing.

The stack of residential units and shared units, and the diverse leveled roof space could be utilized as community courtyards.

Several sub-residential complexes with respective community courtyards and connected to each other.

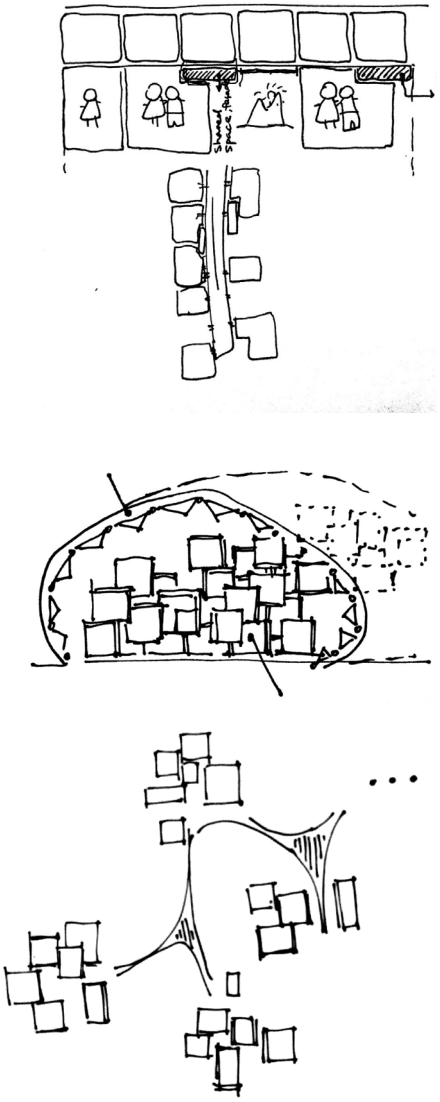


Figure 26: Conceptual illustrations, illustrated by author

3.2.4. Final solution and description of the community spaces

The aforementioned three approaches constructed the final solution of residential-community courtyard model. The linear structure was taken as the prior structure and construct complex frameworks of different heights and scales based on the orientation of the site. The level difference of each row of lanes generates accessible roofs that could be used and roof terrace and the connection between each lane.

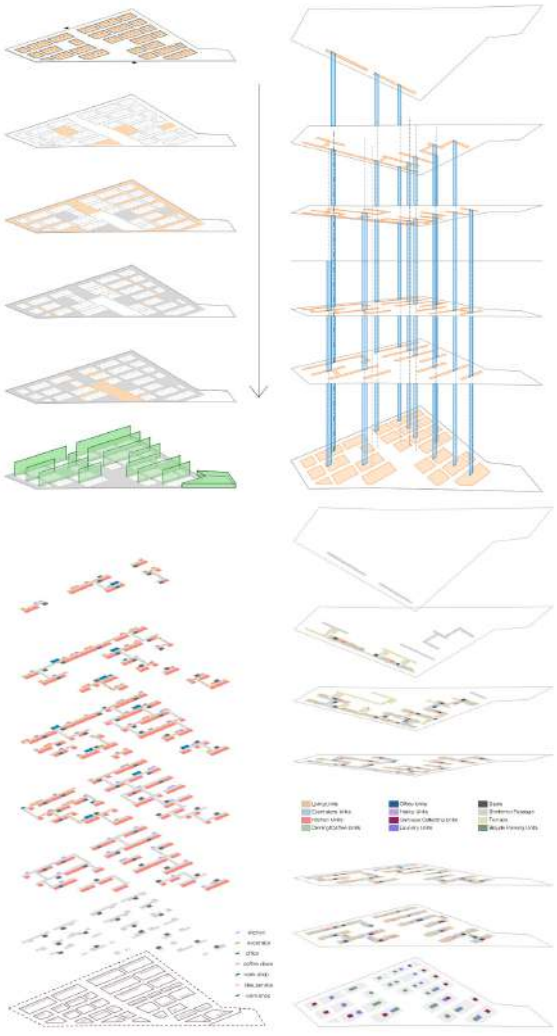
– Constructing public space network

The site was planned as a complex residential based neighborhood. There are two layers of layout structures, which are the ground level public space network and the shared community structure formed by the linear structure and function units. The public open spaces were developed into three layers: the primary traffic circulation, the minor paths with temporary parking option and the community squares of different ambient. In which, the community squares were planned into five courtyards and one main axis that connects all of them: one for open space leisure consuming (with tables, chairs and shadings), one for relaxing with benches, two for exercises and one for quiet green park.

– Co-living with three-dimensional courtyard

Co-living was delivered with the flexible composition of residential unit components and shared functional unit components. All the components can be placed either on the linear structures that connect two major lanes or towards South-East direction due to the climate character of the city (North is extremely unfriendly for living functions because of the high humidity).

Figure 27-31: 1.Site plan of the design, 2. Public spaces, 3. Vertical transportations, 4. Functional layout concept ①, 5. Functional layout concept ②, illustrated by author



Residential unit components include four types of loft units which were designed respectively for single or couple households; while the shared functional unit components include kitchen unit, laundry unit, computer room, office unit, gym unit, hobby unit, workshop unit, extra storage unit, dinning unit and service unit. The distribution of units has to be generally defined according to the accommodated households and the cooperation can be cross-level, thus the flexibility and community management were shown. The aforementioned connecting linear structures are the keystone elements forming the three-dimensional courtyard system, which serves both the connection between the residents living in two different lanes and the media of the most shared functions (e.g. the dinning units). With the flexible applied connection structure between each neighboring lanes, it is possible to reach all units without stepping out of the building complex.

– Sustainable consideration

The structure of unit components were designed based on the structure of shipping container for its modular installation and huge value in terms of industrial stock. Green facades were applied to the North side of all lane structures to utilize the thermal conditioning impact of greenery.

– Greenery design

The complex consists of two types of greenery: the quiet green park and the green facades. The quiet green park is located in the East corner of the site and was planned with six types of local friendly vegetation.

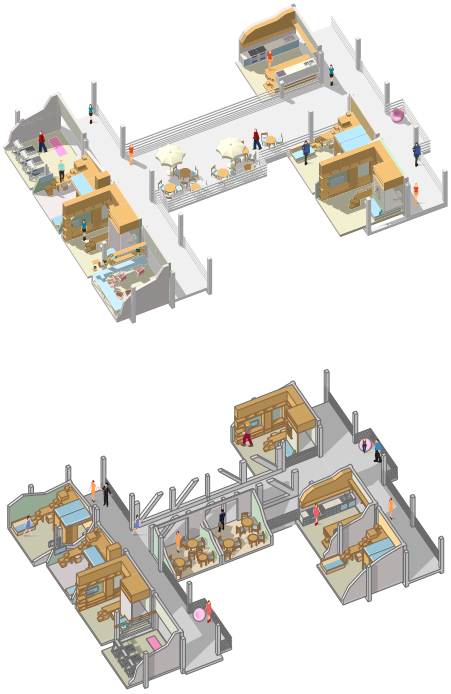


Figure 32, 33: Upper and lower level at a junction, illustrated by author

Figure 34: four types of housing units, illustrated by author

Relatively enclosed vegetation park works as a botanical garden with benches and vegetation corridors, so that it provides a quiet ambient that people keep distance with each other (in contrast with the other active public spaces, the park is rather passive). On the other hand, green facade is a type of vertical greenery that is attached to the facade structure with extra trellis. As the green facade was applied to all North faces of the lane structures, the planned site has the character of having a fully unit component side from the South perspective and fully greenery from the North perspective.

3.2.5 Conclusion and reflection

Traditional community pattern/model of a town or city is worth being redesigned and adapted to the new model of living. It localizes the architectural design and public spaces generated with the sense of cultural inheriting.

In small scale planning of community zone, public space network is still needed to radiate the community members, have different characters and serve different functions.

In the high density living context, designing towards vertical direction is unavoidable, while it does not mean that the traditional low-rise/flat community pattern becomes valueless. Instead, thinking and redesigning the pattern towards three dimensional creates more possibility of shared life in the future.

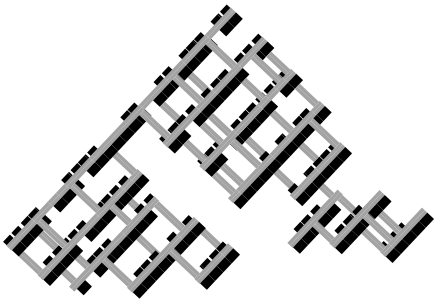


Figure 35: A possible urban texture, illustrated by author

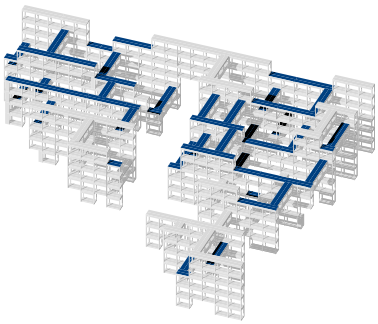


Figure 36: Roof terrace (blue), illustrated by author

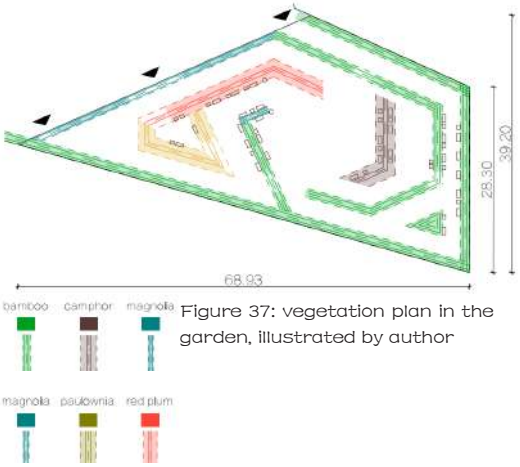


Figure 37: vegetation plan in the garden, illustrated by author

3.3. New household formed by multi families - Co-family

3.3.1. Introduction of the Concept

Emotional problems and affordability were concerned in the chapter about co-living. On the journey of conducting more design practices based on co-living concept, community space, public space and sharing, the concept of co-family came into being. Co-living deals with individual and community living, while the concept of co-housing is engaged to household-family-community pattern of living. The shared spaces generate more layers of semi-public spaces and public spaces. The concept of co-family was applied to a concept design of an affordable housing project, integrating the concept of adaptive reuse of abandoned infrastructure.

3.3.2. Adaptive reuse of the Gazometro in Rome – collective housing

-Gasometer

A gasholder, also known as gasometers, began to emerge in Britain in the Victorian time and served largely as its name suggests: it is a container of large capacity for the storage of gas from the nearby gasworks. The telescopic gasometer was invented in 1824, with the first example built in Leeds, giving gasworks hugely increased storage capacity. The frames are built with three tiers of hollow cylindrical columns and wrought iron riveted lattice girders, and were still in use at King's Cross (the largest gasometers in the UK) until 2001. The gasometers got prosperous across the world in the nineteenth century, by the early twentieth century they were a permanent fixture of the landscape.

Due to no longer needed developments in gas pipe technology, large number of gasometers have been demolished around the world, the left ones are experiencing two different stories. They are either left as a industrial monument or converted into other functions. A most successful case is the residential-commercial complex with four co-existing gasometers in Vienna designed by Jean Nouvel.

The Gazometro located on Via del Commercio in the South of Rome has run out of its functional life span, but yet unfinished with its physical life span. With its strong form and former functional character, the adaptive reuse part of the concept was thus generated as shown in the illustration. It blend the residential function into the existing structure of the Gazometro's structure. Finally, the beautiful and characteristic structure of the Gazometro was involved and shown on the facade of the co-family design.

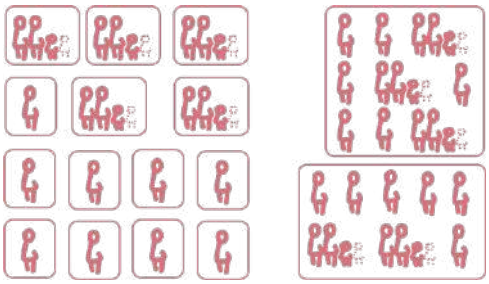


Figure 38: Co-family concept, illustrated by author

—The Gazometro and Co—family

The concept of co—family is briefly illustrated in the figure 39. Conventionally speaking, when talking about housing model and community model, people belongs to natural households formed by individual or more people, and the community communication or interaction steps further on a public level. From the actual operation point of view, people from the same household share the same private space locked with the same entrance. The designed collective living, however, did not break the existing families, but merged them into a bigger household that contains previously three to five minor families regarding the initial size. `This means, more minor families will live under the same roof, have less absolute private space, but own much more semi—private/semi—public space for daily life and more intuitive communication in the co—living process.

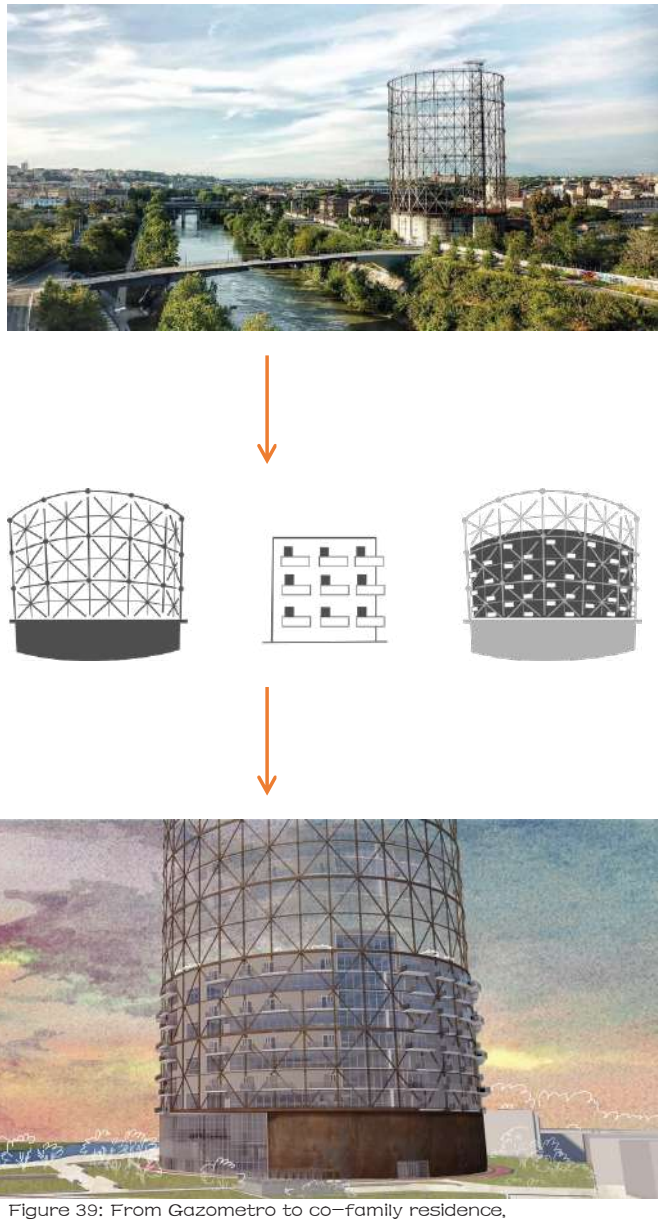


Figure 39: From Gazometro to co—family residence, illustrated by author

3.4. Community life model in adaptive reuse for residential purpose

The key feature of this sub-research is to supply the insufficient function of the existing bridge by means of adaptive reuse of the existing built environment from implanting community. Meanwhile, it cared about the solving the long term social issue by reusing.

3.4.1. Social issue and demand of adaptive reuse

The border between the United States and Mexico mainly goes along the river Rio Grando (in Spanish: Río Bravo del Norte). Along the border, there are several border accesses. The site is the border bridge at Eagle Pass (Eagle Pass International Bridge), where in the direction towards the US, large number of people got stuck and have to wait for their permission to pass. Increasing number of people get stuck, not being accepted by either the US or Mexico, they become asylum seekers (International Organization for Migration, 2020) (Seelke, 2020). This include two types of situations: 1) large number of migrants come from North America and want to reach the US seeking for the so called asylum, 2) people expelled from the US wait at the border to fulfill the time span and go back to the US, they become asylum seekers as well (Office of inspector General Department of Homeland, 2018) (Texas Department of Transportation, 2015). The stuck asylum seekers stay on the border bridge without humanity support, accommodation or management.

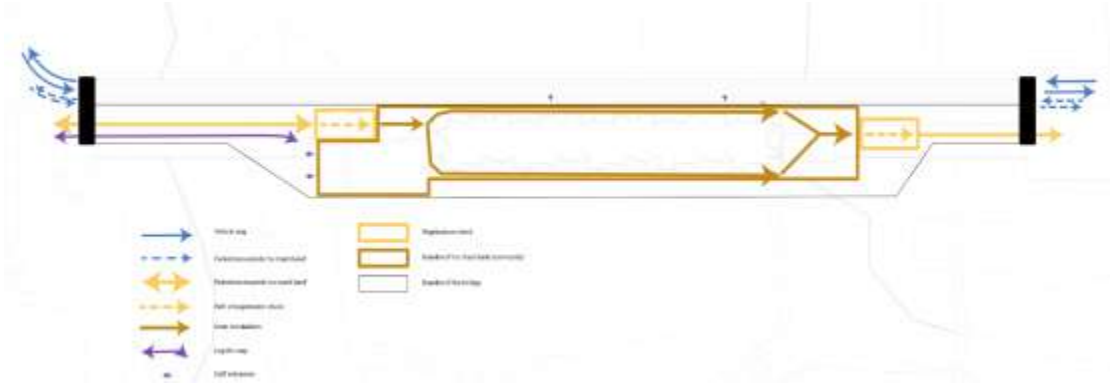
On the other hand, these people also cause traffic inefficiency passing the border.

3.4.2. Method of the re-design and three layers of public spaces

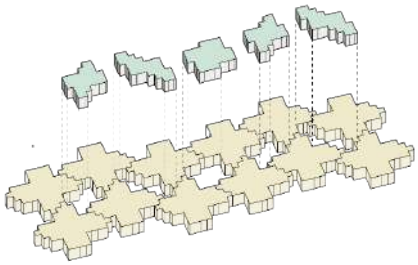
Consequently, the main point of redesigning the bridge is to use it also as a temporary residence. It is also true, that the fundamental skills and language that support the asylum seekers to live a basic life after entering the border is very important and essential. Therefore, the training regarding skills and language is very helpful in the further life and should be considered in the functional arrangement of the redesign.

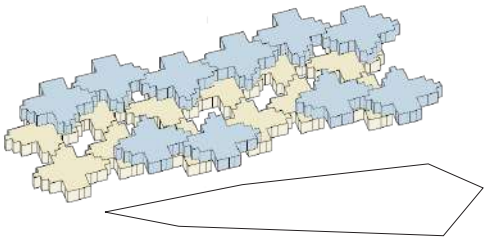
The designed bridge is a closed community with custom gates at both ends. Close to the ends, there are also indoor public spaces that provide multiple training and supporting functions (flexible training area, canteen, library, laundry, clinic, hobby rooms). The main flow of the bridge is shown in illustration, where the original vehicle lanes were moved aside with new structure and separate access. Considering the mobility and uncertainty of the temporary residents, community monitoring could intuitively make safer place and maximize the mutual aid and communication. In the design of community life model, the definition of minor neighborhoods and the whole community came from the classification of public spaces.

Figure 40: Border bridge: Eagle Pass International bridge, Photo from RODRÍGUEZ 2019



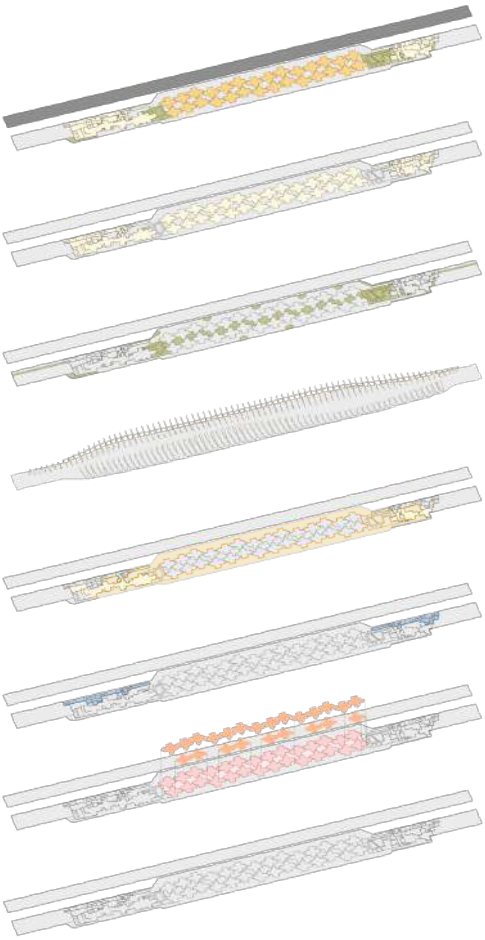
From the community space point of view, the most basic public open spaces are the share-limited courtyards shared by minor neighborhoods, further ones are the shared terrace formed by the roofs of the residence modules, where simple agriculture could be implemented for training as well as self-supplying. The most public open spaces are the parks located at both ends of the accommodation zone, which could host events and be used for exercising. Accordingly, from the accommodation point of view, capsule beds are the basic composition of a residence module, and further construct minor neighborhoods that share the courtyards. The minor neighborhoods form a community (a two-level complex consisting residence modules), as shown in the illustration.





– Summary of the sub-research

In the concepting process of adaptive reuse and public space making, the existing social issues have to be considered and solved with the best effort. Solving the problem in an active way is better than blocking and waiting. Public space and community space should bear the responsibility, from architecture perspective, to provide support and solution for both the built environment and the corresponding users.



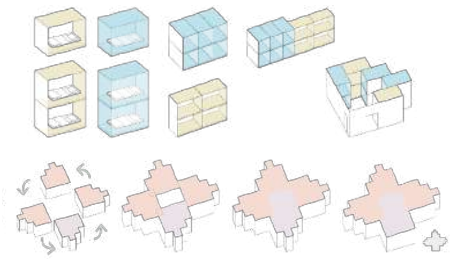


Figure 41-46: Illustrated by author, LU Chang and Shaha MAITEH
1. Mobility illustration
2. Bed units
3. Neighborhood units
4. Courtyards and neighborhood composition
5. Two-level community
6.Design analysis

3.5. Design, demand and human behavior

3.5.1. Background

Most people prefer to do what is convenient, mainstream, and trendy. Similarly, it is also true in picking up the living environment and building up a lifestyle. A neighborhood designed with well-connected streets and high awareness of destinations is supportive of different purposes of walking and activities (Liao et al., 2018). Through the transverse and vertical comparison studies on world-wide residential buildings and their local urban context, in which Hungary and China are the main objectives, it is visible that the layouts of living units, as well as the connection between households and their closest urban context (within 3–5 blocks), reflect the respective history of local living mode and custom. The research and reflections on the reason and process of how the above result came into being finally led to the consideration of the relationship between people's demand regarding residential issues and the corresponding architectural designs.

Designs and planning projects from Hungary and China are chosen to be the main research objects. There are four main reasons: 1) both of the two countries have a relatively longer independent history in their own continental context; 2) both of them had a highly proserous period that exported their own culture and influenced the neighboring nations; 3) both of them imported foreign culture and got influenced by the other part of the world especially in the last hundred years; 4)both of them are experiencing huge development and stands at a starting point of building sustainable city and lifestyle compare to the developed countries (e.g. Japan, The Netherlands and Danmark) at the present time.

Qian (2012) proposed that besides meeting the crucial demands, it is more important to generate a virtuous cycle with designs. The upgrading and iteration of design rely on the changes in people's demand and behavior closely (Feng, 2001). The possibility of forming a virtuous cycle with responsible and conscious design is analyzed by case studies involving designs and plannings changing people's behavior from Hungary and China.

3.5.2. Study about the two types of human demand

"People's demand" refers to a giant category. From the level of demand point of view, it can be distinguished as basic demands, psychological demands and self-fulfillment demands according to Maslow's hierarchy of needs. The basic demands are essential to keep the basic human lives, while the further ones perfect people's life and may be considered as desire as well. The demands regarding living in architectural and urban designing scale can be sorted in the same way: basic and further. As an example, visitor's behavior mental demand in a city park can be sorted by congenital and acquired (Liu, 2014).

From the living point of view, a basic demand is driven by human nature. For instance, the essentially of sleeping function and toilet in a house, apartment, or any kind of settlement is undoubted, because to sleep is human nature. Owning such functions is basic demand, but many different design approaches may come afterward to fill further demands, and the drivers may be custom, culture, trend and personal situation and desire.

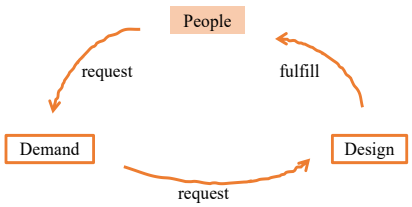


Figure 47: Existing loop of people, demand and design, illustrated by author

—Demand: Basic for living

The rigid demands driven by human nature is many times the starting point of a design and should be the centroid of the further demand and the design behind. The example of bedroom space mentioned above can be proof of this.

Many design procedures reflect the fact as well, from size designing point of view, the design of a corridor or a simple space to walk through may explain. It may be an easy and direct way to make the rough layout of a room by considering the minimal space that all the functions involved may need. Similarly, in the architectural and urban living context, there are rigid demands regarding size, functions involved, neighboring facilities, neighborhood, openings and other aspects that common residents care about, and therefore designers care about. The above aspects reflect equally on people from different part of the world on the basic level, which is human nature, but further preferences and desires may vary greatly.

—Demand: Acquired by custom and culture

The other type of demand is elastic regarding architecture and urban living. When there is the allowance for further demand or desire, pertinent designs come right afterward. Further demand and desire come from custom and culture, which reflect as habit and behavior. It is obvious that the further demand and the design behind is regional and culturally distinguished. Although the more contemporary the designs are, the less cultural differences they present, each design indicates clearly which era (time and place) it belongs to and whom it was designed for.

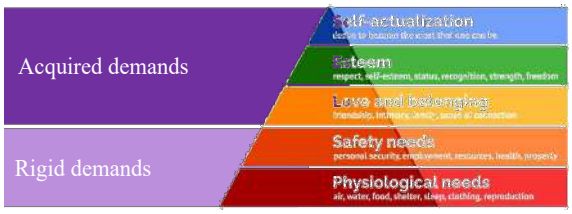


Figure 48: Maslow's hierarchy of need, picture partly from internet and re-organized by author

Viewing from the residential and urban living aspect, before the 1950s, Hungarian residents were used to living in single-family houses or detached row houses, and such houses made up a block which is the basic element of a city or a village. A piece of land generally equals to a household, no matter in a suburban situation that big blocks are enclosed and defined by street or tiny villages that apply a linear layout(figure).Parallelly, in the early 1900s, it is common for Chinese residents to live in yards under a gross community (Zhang, 2018). As a traditional European nation, Hungarian urban residents live in a block urban system, while Chinese urban residents live in a community and neighborhood concept. This fact makes one of the keys to the custom and cultural differences that drives further design and planing towards different directions.

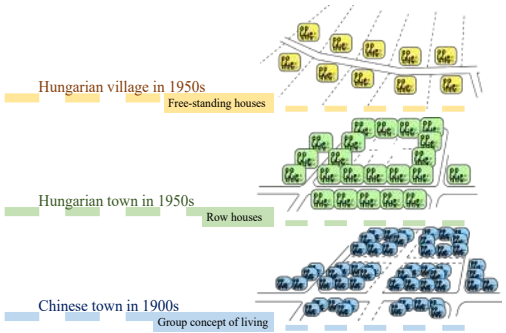


Figure 49: Community composition typology, illustrated by author

The habits of living either in the block system or in group concept result in forming the different contemporary pattern of living today, even in the future. Hungary, as a representative of middle European countries, has developed a residential design model in both rural and urban situation which is full of regional specialists, and such design model stands far apart from the Chinese approach (Qin, 2010). Figure 50 can express the significant difference. The different design approaches come from local residents' demands regarding social habit and inherent life mode, which are driven by regional culture and custom.

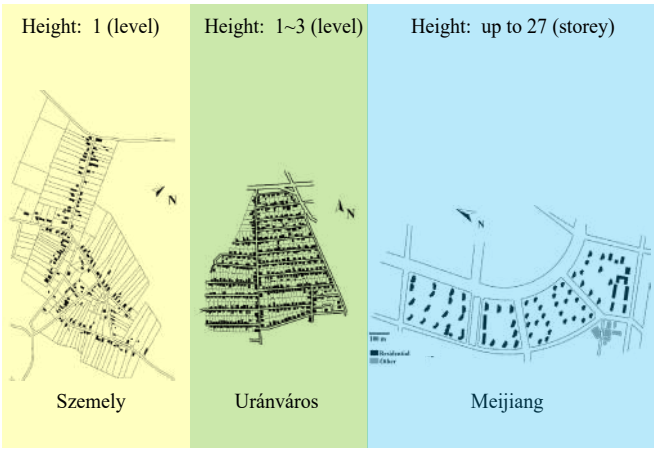


Figure 50: Urban texture typology, illustrated by author

3.5.3. Following the custom

In the case study regarding design and the inherent culture and custom, besides the aforementioned urban texture and life model case, four cases from both China and Hungary were analyzed in detail. These include the Hungarian Summer kitchen, circulation in Hungarian housing, side and front terrace of Hungarian house and bay window in Chinese context. They show both positive and negative aspect in terms of design following the custom and existing common solutions.

Figure 51: Summer kitchen, photo resource: Bámula tos ötletek a nyári konyha kialakításához! – Ketkes.com

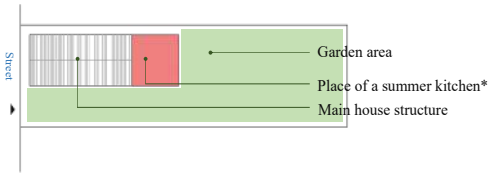


Figure 52: Illustration of summer kitchen, illustrated by author

In many cases, designs concerning people's demand are contributing and functioning well in practice, but it cannot be denied that some of them could not comply with the sustainable living strategy or procured improper habits against building up a resilient lifestyle. From architecture and public space design perspective, 'green' and 'sustainable' concepts were delivered in learning process and implemented in school works, but real projects demand far more than simple concepts.

Based on the case studies, it could be concluded that: conventional materials with unsustainablely embodied energy have been widely applied, which is deconstructive in energy usage reduction and emission; that part of people's habits raised by culture and previous designs, which are against the concept of building up sustainable urban environment and lifestyle, were many times unable to be corrected or optimized; once an irresponsible concept is built, it is likely to become a risk in the future because energy needs to be consumed and further actions will have to be taken to correct the built design to a sustainable standard.

3.5.4. Leading people's behavior

Similar to the previous section, case studies regarding design leading people's behavior were conducted. Four cases especially concerning public life were analyzed in detail: organized parking for shared bike in China, garbage bin planning in Japanese public space, flexible traffic lane in China and the adaptive reuse of Minyuan Stadium in the aforementioned district Wudadao in China. The interaction between design and demand runs in a constant cycle. A design comes after certain demands. Conversely, designs can lead impact back on demands. Besides public space design, Japan gives some positive examples of architectural design, such as the Maga Paper Building in 2000 Hanover EXPO (Ji et al., 2011), which shows strong respect for nature and brings back fresh and sustainable lifestyle to residents. Correspondingly, design affects consumers' mindset, behavior and preferences as well. The concepts imported from other lands or nations are also likely to have such impact on the locality.

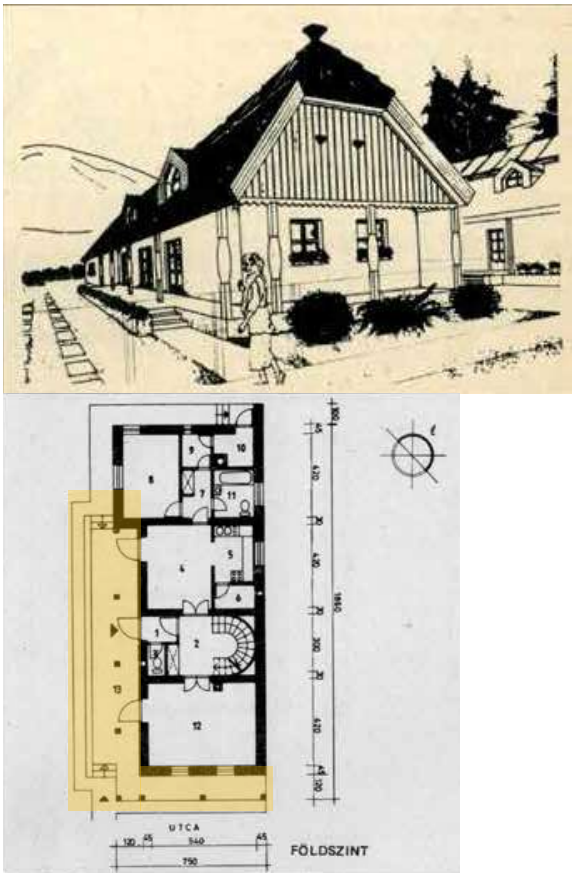


Figure 53, 54: Hungarian long house and its floor plan, Picture from Perényi Tamás: Családiház Tervek

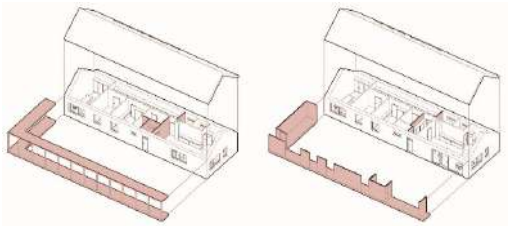


Figure 55: Long house expension design for Nemzeti Katalogus 2020, designed by Gyergyák János Szauter Daniella and author

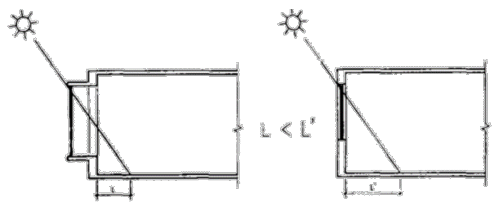


Figure 56: Bay window and natural light, illustrated by Zhang Hui and He Yi – Analysis on merits and defects of bay window

It is designs' ability and responsibility to form and iterate people's demand, habit, and behavior. Urban planning, architectural design and public space design shall discover people's unconscious behavior, and subsequently lead people's behavior and mindset for new designs, for example, the concept of intuitive design (Ren, 2010), which means to start with researches on people's habits and customs regarding living and mobility, and initiate the design with the combination of customs and the goal of building up sustainable neighborhoods.

Tim Pennigar proposed four steps to a good green design, it is the architects' responsibility to integrate up-to-date knowledge into designs (Snyder, 2008) instead of staying safe and 'not wrong'. Subsequently, the designs could be able to lead people's behavior step by step, therefore the lifestyle that conduces to building up sustainable neighborhoods can be expected.

Base on the case studies, it is worth believing that design, of different scales, with responsible approach and awareness of the existing problems, can have a deep impact on local residents' mindset. And it would likely to influence more widely in the global scope if there is a positive change regarding sustainability and people's behavior. Meanwhile, it shall be also aware of that irresponsible design can lead just oppositely.

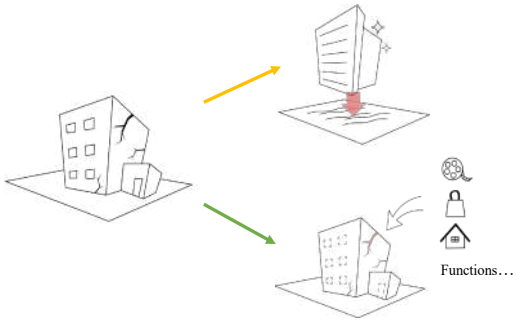


Figure 57: New building or adaptive reuse mindset, illustrated by author

3.5.5. Conclusion of the sub-research

The cases showed different compositions of urban public space and architectural design from both approaches – following the spirit of local custom and leading people's behavior and attitude via planning and design. Either of which takes people's demand into consideration and modifies with the change of the demand. Meantime, architectural design and public space design do have strong influences on leading people's behavior, and the leading can be positive or negative to the goal of building up sustainable living environment. So it is worthy to appeal to designers to involve a few details that are positive-leading in the designs and generate new demand which is align with sustainable lifestyle besides meeting the present demand. In consequence, people' s more resilient and sustainable lifestyle and way of thinking are to be expected. The role of architects and designers is so important that it can gradually matter the future behavior of a generation in a city, therefore being responsible and conscious when making decisions in the designing process shall be strongly appreciated.

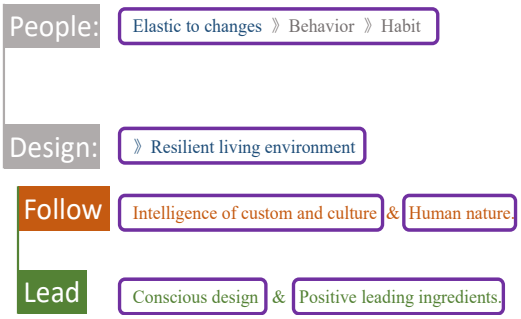


Figure 58: Summary of following and leading, illustrated by author

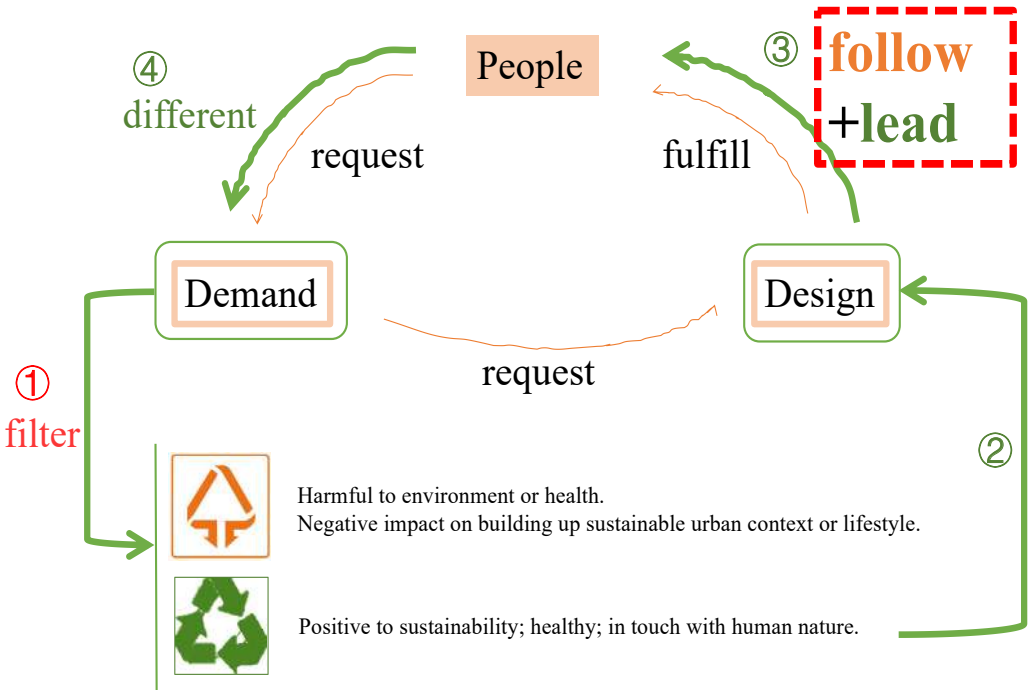


Figure 59: Virtuous loop of people, demand and design, Illustrated by author

3.6. Greenery intervention for pedestrian sidewalk and streetscape study at Korház Tér junction

3.6.1. The city of Pécs and its street public spaces

Central European countries have their characteristics in developing both capitals and mid-sized townships. In 2010, the city of Pécs, with its 155 thousand inhabitants living on 162.8 square kilometers in southern Hungary, had a chance to evolve. Pécs won the European Capital of Culture alongside Essen and Istanbul. Accordingly, a series of renovations and new constructions took place in the city as a benefit brought by the honorable title, including heritage restoration, street and public space improvement and new infrastructure installation. The multi-spot development and rehabilitation led to an increasing number of tourists, international students and more active local transportation. Subsequently, they brought up the urban vitality (BAMA, 2011) (Szabolcs, 2018). On the other hand, the number of permanent resident is steadily decreasing annually, which results enormously from the loss of young labors leaving the city for job opportunities and more interesting urban or metropolitan life. This fact raises the question of how can Pécs retain its active population with advanced life pattern and corresponding infrastructure. The research integrates the concepts of walkable city and green infrastructure (Retweeted, 2019), tries to understand the current status and character of the developed streets in Pécs and explore the possibility of enhancement through greenery intervention.

The city of Calgary planned green interventions to its 27 historical streets, in which supplementary tree planting is practically the major method assessed and applied to enhance the streetscape and boulevard walkability (University of Calgary, 2021).

A Green Alley Project was launched in 2019 in Calgary had the same aim while focusing on the downtown alleys (University of Calgary, 2019). Linyi upgraded one of its main roads, Yimeng Road, with green intervention and landscapes to strengthen its local cultural characteristic and biodiversity (Zhang et al., 2011). The two types of vertical greenery to building façades are green façade and living wall (Lin et al., 2019). The practice on the corner façade of Athenaeum Hotel and Pacha-Ther Driver in London showed successful intervention in historical districts in terms of optimizing the lines and tones of the street façade and providing cozy urban environment (Ivanova et al., 2020) (Virtudes and Manso, 2016). Both of them applied a coating set of plants to realize the green façade installation. A living wall was applied on a blank façade at Caixa Forum in Madrid to fulfill the remained blank façade with liveliness.

3.6.2. Methodology

The research used one of the key junctions of the Pécs, which is located along the medieval city wall. It is an initiating point of the later layers of urban development. A supportive research of the typical street composites in and around the historical downtown helped in understanding the formation of the local streets (Figure 61).

The chosen research area is the Korház Tér (hospital square)(Figure 60) and the street segments that directly connect to it. Located immediately outside the medieval city wall, the square hosts a historical mosque (Jakovali Hassan), a memorial sculpture for Ibrahim Pecsevi, some 3–5 level high brick buildings from the recent hundred years (hospital, office, residential and retail function), a busy ring road connecting the radically extending streets towards the newer layers of the city and an important bus transit station.

With the building character of both historical settlement and the recent hundred years, the chosen area can be generalized as typical in the Central European township development context.

The assessment of the character and attributes of the chosen area focused on the existing greenery and pedestrian walk habits (routes and preferences). The assessments of existing greenery include species, type of installation and area measurement, both qualitative definition and quantitative measures were applied. Whereas, the area measurement was assessed both horizontally and vertically.

Figure 60: Target junction at Kórház tér, illustrated by author

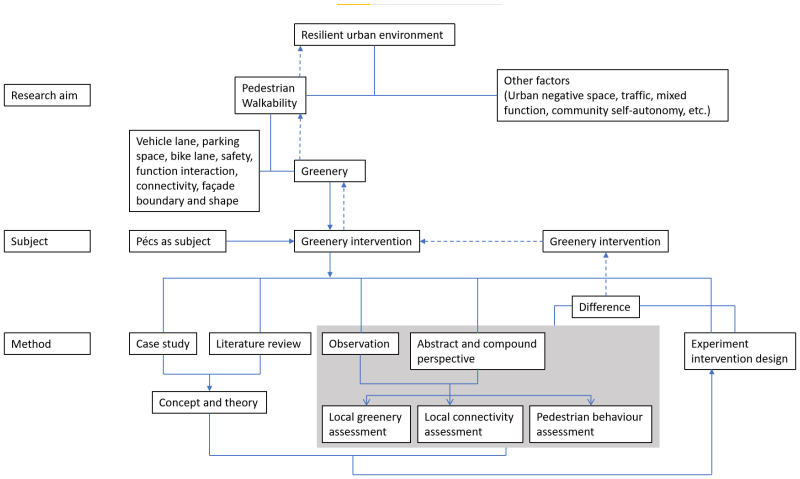


Figure 61: Methodology of the sub-research, illustrated by author

To measure them with pedestrian perception, the horizontal area refers to the area of greenery under eye level shown on floorplan, while the vertical area refers to the area of greenery that is visible at eye level. Subsequently, the pedestrian behavior and sidewalk connectivity at the Kórház Tér intersection were studied, with the position and size of greenery taken into account.

The pedestrian behavior data was collected by observation study and photo documentation made on different days during daytime. By tracking pedestrians at non-rush hours, morning peak and evening peak hours, comprehensive pedestrian behavior information could be recorded.

Base on the photo documentations, the moving paths and waiting spots of both pedestrians and cyclists were plotted to the site map for reference. The map tracked the route preference of local pedestrian and other pedestrian way users (non-motor vehicles). Additionally, the conclusion regarding pedestrian behavior was illustrated to describe different pedestrians' positions on the various sections of sidewalks.

Connectivity assessment was carried out with GIS tool. The assessment includes the Korház Tér, the adjoining cross and all greenery within the pedestrian sidewalks. This part of the assessment was expected to find the least used areas of those sidewalks for the possibility of greenery intervention with the least impact on local pedestrians' initial behavior. The assessed results are used for the further sidewalk greenery improvement plan and produce the promoted series of data.

The current situation and the accordingly proposed situation are subsequently compared and the suggested impact of the green intervention is concluded.

3.6.3. Result

3.6.3.1. Vegetation classification

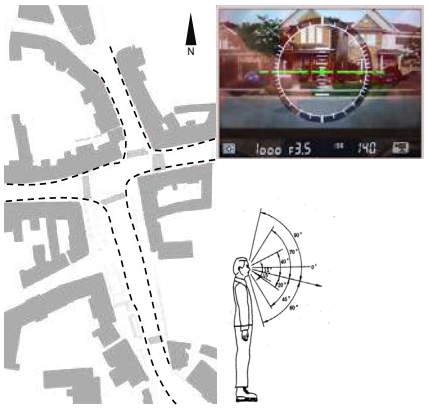
The existing greenery at Kórház tér intersection is classified into five main categories according to their shape and character regarding the streetscape surface: trees, bushes, pots, wall covering greenery, ground covering greenery. The dominant tree types existing in the Kórház tér are Acer, Ash and Platanus. Additionally, among the existing trees, two old pine trees exist in the middle of a sidewalk in free-standing position as part of the city's heritage protection practice.

3.6.3.2. Horizontal assessment

The horizontal assessment of pedestrian way greenery was designed to define the position and quantity of the existing greenery. The existing greenery was plotted into the base map in accordance with the classified groups (Figure 62). The result provides the percentage of each type of greenery (as categorized in the classification) in relation to the overall greenery in the site. From the maps, each type of greenery was quantified, the area was calculated.

The horizontal area data were composited to produce the ratio data for further quantitative comparison analysis.

Figure 62, 63: Illustrated by author
1. Classification of the greenery at the junction
2. Horizontal assessment result regarding the classified typology



Type of Greenery	Area of greenery on top view	Area of greenery on ground floor	Greenery top view/ Sidewalk	Greenery type / total greenery area	Greenery ground/ Sidewalk
	㎡	㎡	%	%	%
Tree	1071.83	96.58	21.68%	18.25%	1.95%
Pot	11.40	11.40	0.23%	2.15%	0.23%
Bush	250.88	215.59	5.08%	40.73%	4.36%
Wall creeper	26.49	0.00	0.54%	0.00%	0.00%
Ground greenery	205.72	205.72	4.16%	38.87%	4.16%

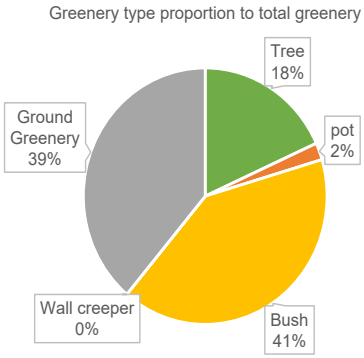


Figure 64–66:
Illustrated by author:
1. Merged horizontal greenery
2. Area table of the horizontal assessment
3. Proportion of greenery from horizontal assessment

The ratio data include of each type of greenery on top view compared to the gross sidewalk area, each type of greenery area by the total greenery area and each type of greenery area on the ground surface by the gross sidewalk area (Figure 64, 65). Ground greenery and bushes have approximately the same proportion in the horizontal point of view, and together they occupy 79.6% of total greenery. Both types are below the eye level.

3.6.3.3. Vertical assessment

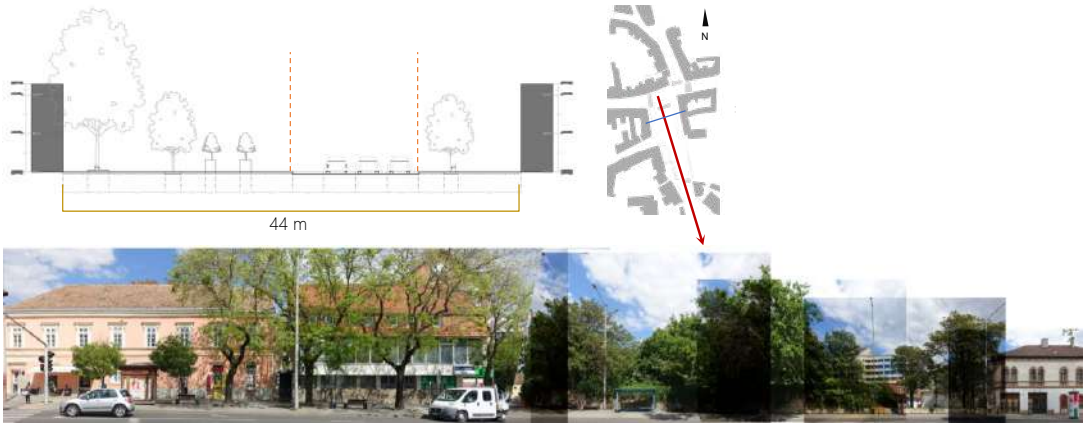
The vertical assessment intends to define the greenery categories that are visible on elevation view and their respective quantity. To align with the core research concept (the human perception), the street elevation views were conducted with digital photographs instead of elevation drawings.

The street elevation photographs were taken along the pedestrian paths of the sidewalk, and the digital leveling gauge embedded in the camera ensured the unified perspective at a defined eye level (1.7 meters high from pedestrian pavement level). Camera was used to record digital photographs. The street elevation merging process was done with script, Figure 73 shows the result diagram with the traced greenery out of the elevations.

Because of the street parking and the narrow sidewalks at Hungária street and Ferencesek street, these two segments are not applicable for the local scenario of street greenery. There is no greenery on these two segments on ground level or on street elevations. Therefore, more advanced greenery installations are suggested in further researches.

Quantitative assessment was produced to achieve the exact ratios of the greenery in the gross perceived elevation. With the help of the analysis script, the area of each type of greenery and the gross elevation can be calculated (Figure 74). The street elevations on Hungária street and Ferencesek street were excluded from the calculation because of the absence of street greenery.

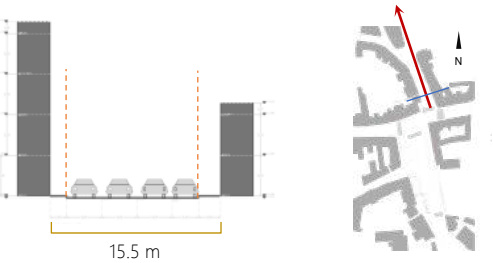
From the vertical point of view, it is concluded that the assessed segments at Alkotmány street (with 2.3% greenery coverage on each side), Hungária street and Ferencesek street (with 0% greenery) are short in greenery coverage compare to the situations along Rákóczi street (32.9% and 41.9%). On the other hand, there is strong potential for adding greenery diversity to improve the pedestrian experience.



Rákóczi Street Elevation – East sidewalk →

Rákóczi Street Elevation – West sidewalk ←

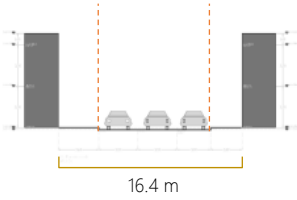
Figure 67–69: Rákóczi Street sample section and street elevations, illustrated by author

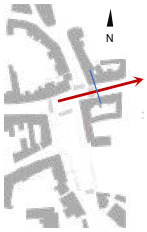


Alkotmány Street Elevation – East sidewalk ←

Alkotmány Street Elevation – West sidewalk →

Figure 70: Alkotmány Street sample section and street elevations, illustrated by author

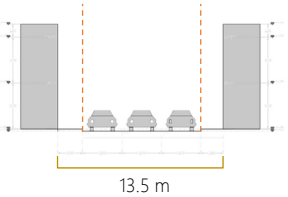




Ferencesek Street Elevation – North sidewalk ↑

Ferencesek Street Elevation – South sidewalk ↑

Figure 71: Ferencesek Street sample section and street elevations, illustrated by author

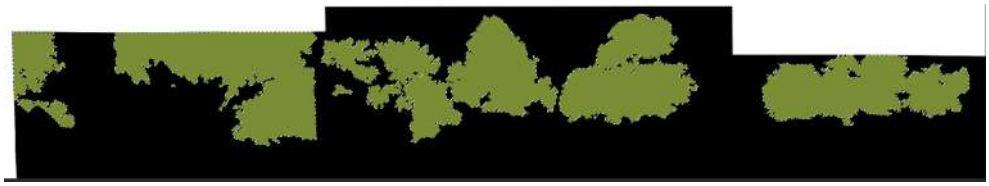


Hungaria Street Elevation – South sidewalk ↑

Hungaria Street Elevation – North sidewalk ↑

Figure 72: Hungaria Street sample section and street elevations, illustrated by author

Rákóczi Street Elevation – East sidewalk ↑



Rákóczi Street Elevation – West sidewalk ↑

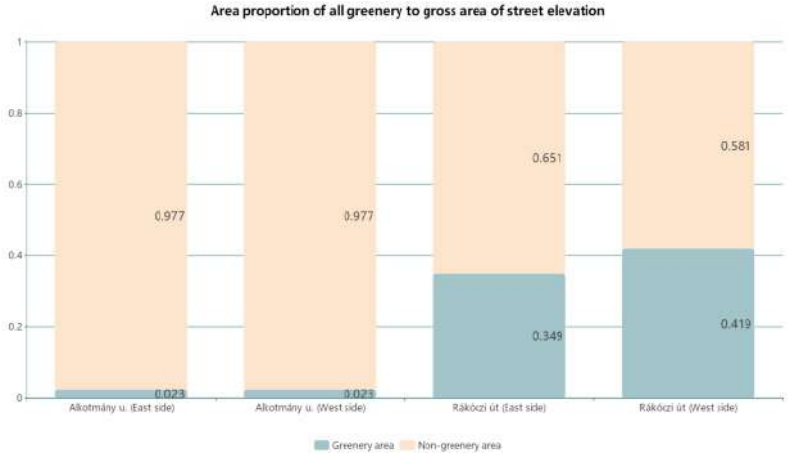
Alkotmány Street Elevation – East sidewalk ↑

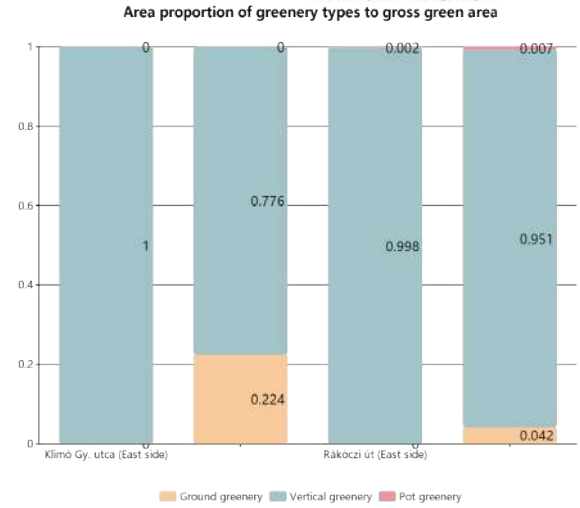
Alkotmány Street Elevation – West sidewalk ↑

Data collected from above mentioned method:			Proportion calculated for further analysis:	
Elevation	Type of green	Elevation area in Photoshop	Proportion to elevation	Proportion to all green
Alkotmany East side	over all	46234532	1	/
	all green	1056841	0.023	1
	vertical	819942	0.018	0.776
	ground	236899	0.005	0.224
Rakoczi West side	over all	51215106	1	/
	all green	17891788	0.349	1
	vertical	17018431	0.332	0.951
	ground	755358	0.015	0.042
	pot	117999	0.002	0.007
Rakoczi East side	over all	86506240	1	/
	all green	36250685	0.419	1
	pot	81469	0.001	0.002
	vertical	36169216	0.418	0.998
Alkotmany West side	over all	72261638	1	/
	all green	1653422	0.023	1
	vertical	1653422	0.023	1

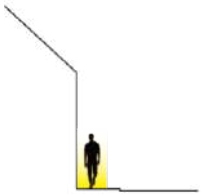
Figure 73, 74: Illustrated by author
1. Extracted greenery on street elevation
2. Table of vertical perceived greenery

Figure 75–77: Illustrated by author
1. Pedestrian hot spots
2. Chart of existing greenery in vertical perception
3. Local pedestrian and slow traffic preference

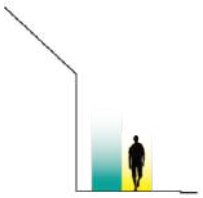




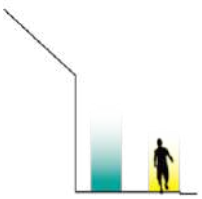
Walking - Jogging



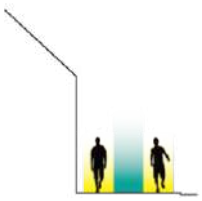
-Narrow way
-No greenery
-In danger of traffic



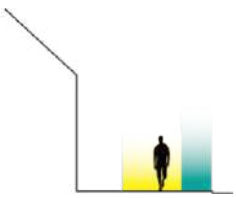
-Wide way
-Greenery in the middle
-In danger of traffic



-Wide way
-Greenery in the middle
-In danger of traffic



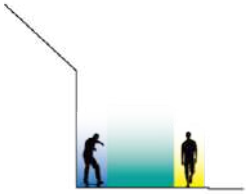
-Wide way
-Greenery in the middle
-In danger of traffic
-Different decision due to walk and jogging



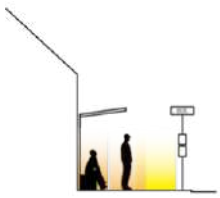
-Wide way
-Greenery on the outer side
-Pedestrian -traffic buffer

Walking - Cycling

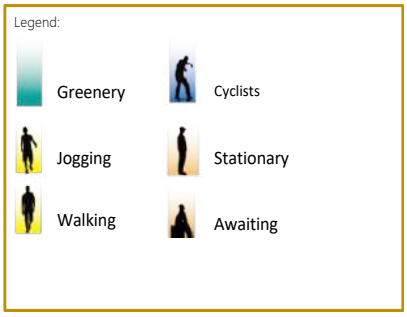
-Narrow way
-No greenery
-In danger of traffic
-Cyclists tend to move in outer sidewalk or on vehicle lane



-Wide way
-Wide greenery in the middle
-In danger of traffic
- Cyclists tend to move in outer sidewalk or on vehicle lane



-Wide way
- No greenery
-In danger of traffic



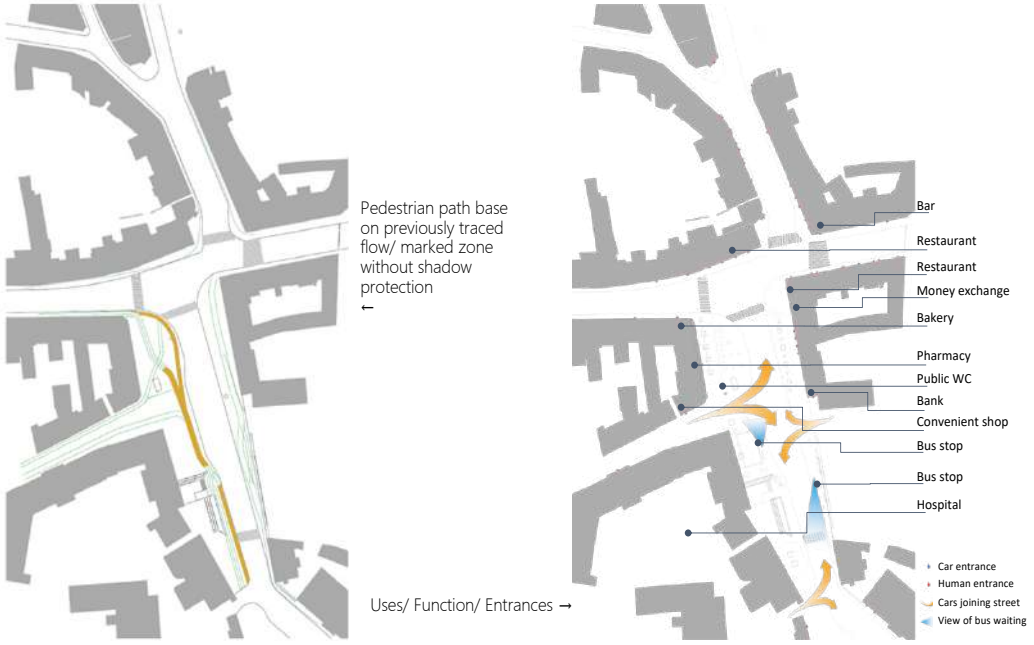


Figure 78–80: Illustrated by author and Shaha Maiteh
1. Pedestrian path preference
2. Visual access
3. Hot spot based on the current connections

3.6.3.4. Pedestrian and connectivity study

The pedestrian behaviour study explains how people use pedestrian pathways (Figure 78). Local pedestrians tend to move on the inner side of a sidewalk to avoid traffics while in summer times pedestrians tend to move along the southern side of the sidewalk for a shaded area, but when the street greenery is wide enough to block the sight, pedestrians walk near the outer edge, however, cyclists' and joggers are using it in the exactly opposite way. Parallelly, many individuals walk on the part of the sidewalk closer to greenery rather than to the drive lane or the buildings. This can be a result of local pedestrians' desire to street greenery and the subconsciousness of being away from the hidden danger caused by the traffic.

3.6.3.5. Potential of green intervention

As part of the research process, an experimental greenery intervention plan was proposed. The proposed greenery intervention was expected to relieve the problems exposed by the assessments with the consideration of the local pedestrian behaviour and the connectivity analysis. The research found that, there are many problems in the site: 1)lack of greenery at particular segments, 2) lack of greenery diversity in terms of their form, 3)low rate of greenery below eye level, 4)lack of buffer zone between pedestrian and vehicle traffic, 5)weak pedestrian and vehicle visual safety. Substantially, the buffer zone between car lanes and the pedestrian way is missing and necessary in many places, bush row is one of the solutions granting visual safety.

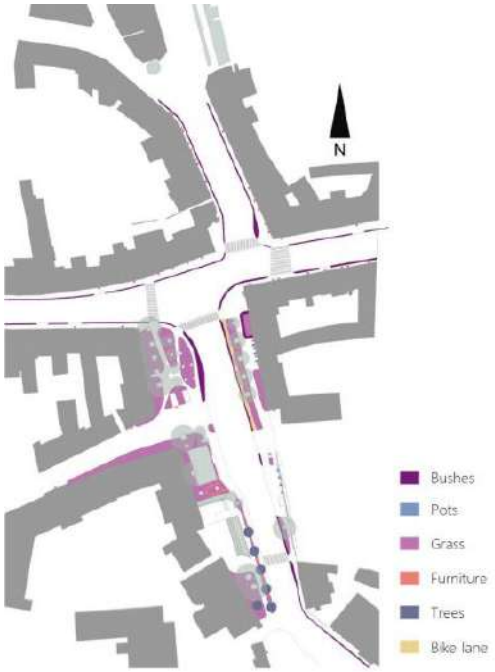
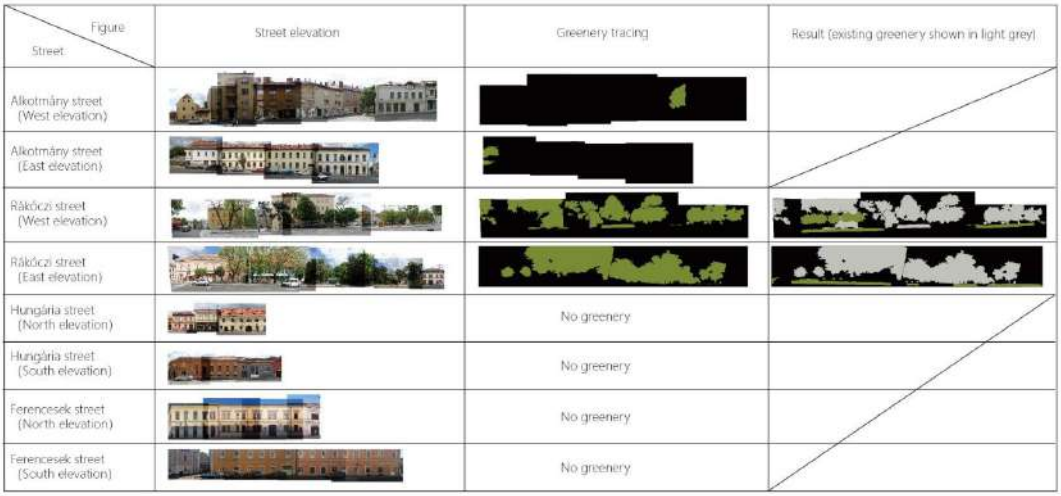


Figure 81–83: Illustrated by author
1. Proposed improvement on plan
2. Comparison of horizontal perception
3. Comperison of vertial perception

Type of Greenery	Area of greenery on top view	Area of greenery on ground floor	Greenery top view/ Sidewalk	Greenery type / total greenery area	Greenery ground/ Sidewalk	Type of Greenery	Area of greenery on top view	Area of greenery on ground floor	Greenery top view/ Sidewalk	Greenery type / total greenery area	Greenery ground/ Sidewalk
	m2	m2	%	%	%		m2	m2	%	%	%
Tree	1071.8253	96.58	21.68	68.43	1.95	Tree	1147.4193	108.34	21.07	35.51	1.99
pot	11.4015	11.4015	0.23	0.73	0.23	pot	19.4015	19.4015	0.36	0.60	0.36
Bush	250.8779	215.5944	5.08	16.02	4.36	Bush	1057.7302	1022.4467	19.42	32.73	18.77
Wall creeper	26.4887	0	0.54	1.69	0	Wall creeper	26.4887	0	0.49	0.82	0.00
Ground greenery	205.7203	205.7203	4.16	13.13	4.16	Ground Greenery	980.254	980.254	18.00	30.34	18.00



3.6.4. Summary of the sub-research

In the boundary of the study area, the presence of street greenery varies largely. Alkotmany street and Korhaz square host different green coverage, while Hungaria street and Ferencesek street do not host any greenery. Compare to Alkotmany street and Korhaz square, which have wider sidewalks, the narrow sidewalks on the studied segments of Hungaria street and Ferencesek street are less potential to apply conventional vegetation to provide street greenery. Therefore, innovative design and advanced green concepts will be necessary.

The city of Pécs has the ambition and potential in constructing green urban environment which is more walkable and liveable. The research took the example case of Korház tér to proof it from greenery intervention perspective. This could contribute to the improvement of streetscape and urban open public spaces, thus retain and absorb active population in the city.

The research practice and concept is helpful in wider urban public space assessments under the frame of green urban development. Thanks to the urban development characters of Pécs (scale, history, urban structure and building types), the concluded potential of green intervention is also expected to work in other Central European townships of similar scale.

Vertical green intervention is proved to have strong potential to achieve significant enhancement to the greenery upgrade, which is valuable for further aspects, for instance, urban visual quality, microclimate, buildings' thermal performance (Zhang et al., 2019)(Wong et al., 2010). Considering the wider sidewalks, conventional greenery elements have the ability to make significant enhancement from both horizontal and vertical perspectives. On the other hand, the narrower sidewalks eager for efficient street greenery, where vertical landscape solutions fit more.

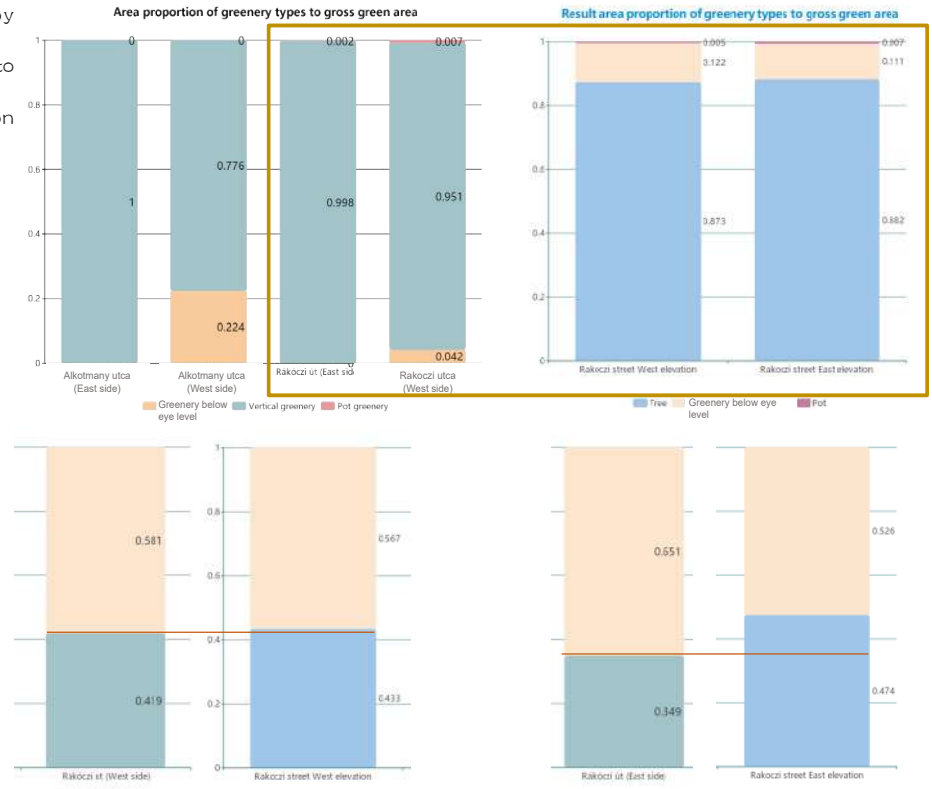


Figure84, 85: Illustrated by author
1. Changes on the proportion to the gross green area
2. Changes on the proportion to the over all elevation

3.7. Community living and the built stock: neglected facades

3.7.1. Neglected facades

In the progress of urban development, different theories, concepts and trends driven by the demands of people and led by the desire periodically occur and participate in the construction of the urban built environment of today. The world is shifting its vision of development towards a fully sustainable goal, and the in the European context, cities and towns have started the shifting plan for decades. The re-planning and reuse of urban built stock (buildings and negative spaces) have been critically concerned. Re-designs, reconstructions and renovations of urban built stock have never stopped in the history. The reasons of strengthening the quality of built stock show the development of urban planning theory, briefly, from renovation of the important pieces, to the benefit of preventing urban sprawl and to the common wealth of the world sustainable development in terms of both physical and spiritual manner. Checking the maps, the built stock of horizontal plain is exposed, while the vertical elements are not dominant. This part of the sub-research reflected on the vertical aspect of built stock, which is the adaptive reuse and revitalization of the neglected facade. The value of the neglected facade in terms of community space and housing solution is discussed through a concept design proposal.

3.7.2. Case of garage building

Tensioned urban built environment and life pace increase the stress and depression of people. This is true in many metropolises and being the truth for the rapidly developing migrant towns. The sub-research took San Francisco in the United States as an example due to its developed city structure and streetscape, limited community space and housing problem driven by the over populated labor force. The potential of blank and neglected facades in the case of San Francisco is reflected by mainly two forms: the gaps between two buildings and the concrete facades of the garage buildings. The gap situation forms narrow gray urban spaces. While the garage facades are strongly potential to further action for the upgrade of urban environment quality: by the year of 2019, there are eight garage buildings run by the governmental agency SFMTA (San Francisco Municipal Transportation Agency), each having a full perimeter ranging from around 100 meter to 400 meter. Garage buildings can be found in settlements of variable scales around the world, the application mainly appears in two types of situations: in the city center where urban environment has been developed and underground parking cannot sufficiently solve the parking demand; in outer space of a city and attached to a designated building (widely applied in Japan and Malaysia and, in many cases, the residential buildings). The garage buildings in San Francisco belong to the first type and are located in and around the center zone (figure 86). The adaptive reuse and revitalization projects of garage buildings around the world were referenced (figure 87-89).

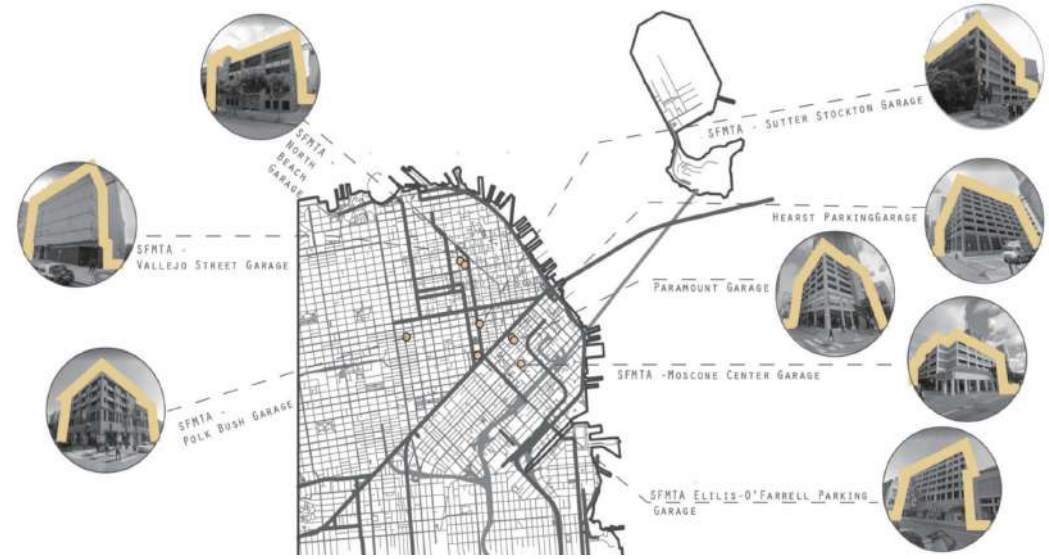


Figure 86: Garages run by San Francisco government, illustrated by author

Figure 87: Broadway autopark apartments, designed by Sheldon Architecture

Figure 88: 84.51 Centre office building, designed by Gensler

These future-proof parking garages can easily morph into offices or housing, https://www.fastcompany.com/

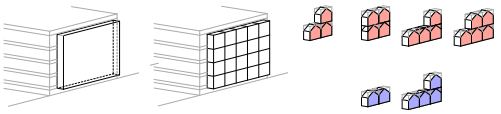


Figure 89: Conceptural morphology of the design practice, illustrated by author

3.7.3. Potential and advantages of garage facade installation

The garage buildings were designed in regular shapes with repeated openings, and the modular layout provides more efficient and wider possibilities for the design and implementation of the facade installations, especially the modular unit designs. The locations of garage buildings are naturally at the corners next to the prosperous center and sub-centers, which makes them the site choice weight in gold.

3.7.4. The designed modular community system

The community design targeted to the garage facade was designed to be a modularized community system, which has strong ability in repeating and could be widely applied on the regular designed garage facade (or other neglected surfaces). In the same time, modularized arrangement is friendly to the users in terms of perceiving and understanding the structure and layouts. The modular community system consists of housing units and public shared functional units. The vertical transportation, however, relies on the garage system.

The general cross-sectional forms of the housing units and the shared public units refer to the form and orientation of the local houses. The forms were realized by modular system initiating with precast elements of 600-millimeter depth, which construct the modular walls, slabs and roofs. The graphical table shows the composition method and results of the elements.

The design of the units took into account the household typologies that have demand regarding innovative housing and community living concept (single, accompany, couple and small household with children). The public shared units, on the other hand, applied the same logic for their form: the interior functions include dinning, reading, working, gym and activity room. A terrace is designed on top of each shared units to assure outdoor spaces. For the overall accessibility of the pubic functions, the shared units need to be firstly arranged on the garage facade in a diagonal direction with a outer staircase connecting all of the public terraces. After the shared units, the housing units could be placed due to the actual demand. The sample floor plans and section present how a segment of the garage facade could be planned.

3.7.5. Summary of the sub-research

The sub-research and practice design delivered the concept of revitalizing and reusing the urban gray facade spaces, meanwhile easing the issue of community living and social cohesion, by means of innovative and adaptive reuse of the garage building facades. Urban gray facade spaces or neglected vertical surfaces of its kind are valuable in the exploration regarding public space and community space development, so that the urban vitality could be increased and the neglected potential and unsafe space could be reduced.

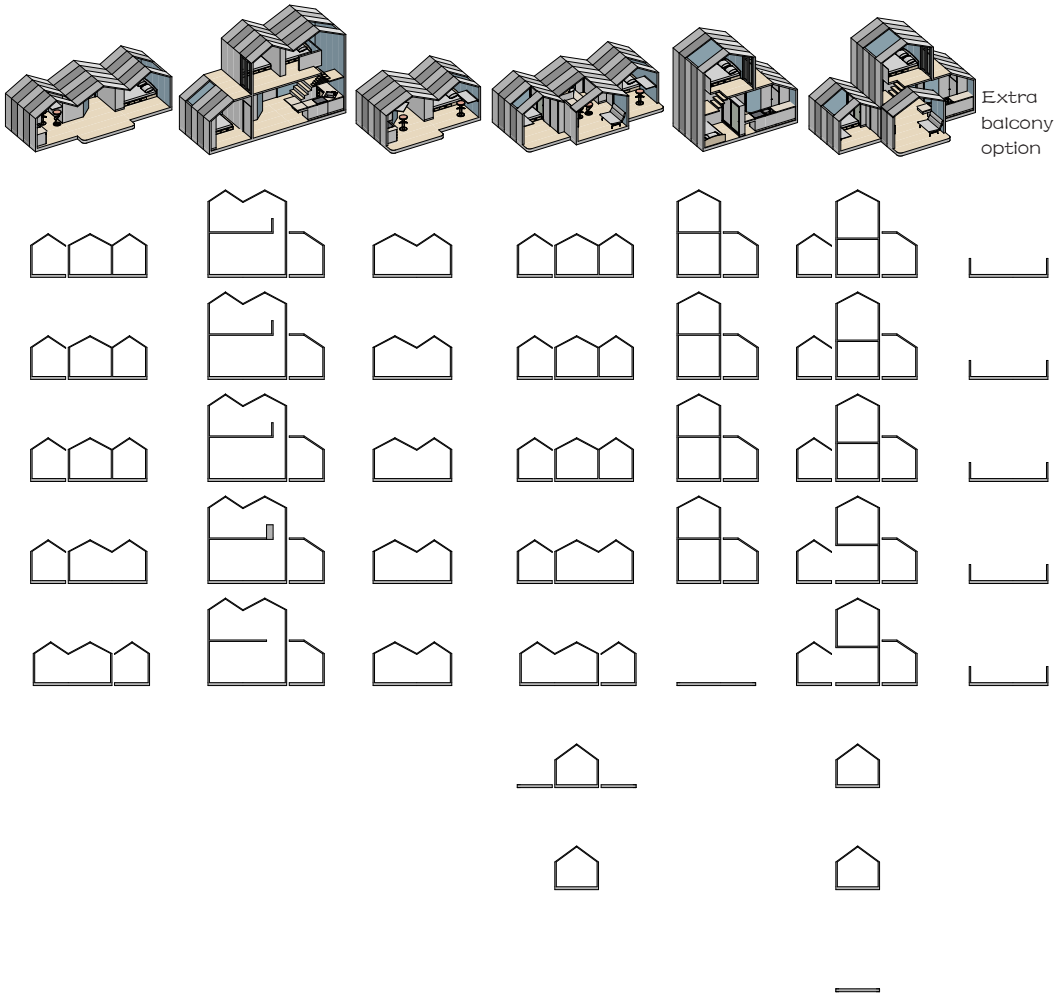


Figure 90: Housing unit typology and modular compositions, Illustrated by author, Lu Chang and Shaha Maiteh

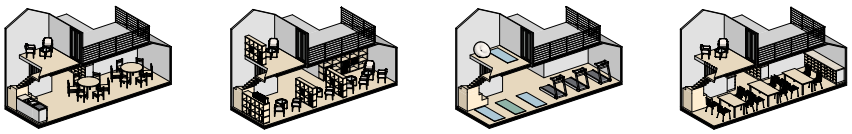


Figure 91: Public shared units, Illustrated by author

Figure 92, 93: Illustrated by author, Lu Chang and Shaha Maiteh
1. Example section and floor plans
2. Example facade view

3.8. Greenery intervention and the stock urban public space

3.8.1. Greenery intervention

In urban context, vegetation is an objective existence, while correspondingly, the concept of greenery is part of human perception of vegetation. It is an essential part of green development for any kind of settlement. Talking about urban public spaces, the objective vegetation serves as the manner of reaching the green and resilient physical result, while greenery is the measure what people see and feel when using and crossing an urban public space.

Many historical cities in Europe, and in Asia as well, has a common situation, that is fact that the quantity and quality of greenery show wave form following the radius from city center to the outer skirt. The historical cores are protected as how they were with both the built environment (buildings, squares, streets, street furniture) and the nature elements (water elements, vegetation, characteristic animals), therefore, a center area has more chance to inherit the low density and green-built-balanced urban atmosphere from the history. Moving outward from the historical area, wait is waiting is the result of the development of the modern time. Industrial revolution brings the revolutionary changes in people's demand of work and life, yet the modern theories of urban planning. The streetscape, the building style and the squares were developed in a way that fit better the life mod with higher population density and work intensity. Greenery became less dominant in the urban context, while living comfort became less guaranteed due to the fact that the apartment quality in the 1950s in Central Europe. Further in the outer skirt of the settlement, the ratio of greenery in the urban context again raises, due to more advanced planning concept and relatively lower population density.

This is true for most historical cities or towns in Europe and East and South Asia (e.g. Lisbon, Prague, Ljubljana, Bratislava, Budapest, Pécs, Xi'an, Qingdao, Dali, Kuala Lumpur, Penang, Kyoto).

Preventing urban sprawl and refining the existing built environment, the rehabilitation of the urban stock (buildings and the negative spaces) has been the agreed answer for the present and near future. In the sub-researches, studies about the urban heritage and brownfield stock was discussed in its value to the urban continuity and public space making, and so is the potential of green intervention to the existing streetscape in European town context. This part of the research searches for the greenery intervention's value and potential to the urban community spaces, more specifically, the vertical greenery on building facade.

3.8.2. Methodology

The sub-research rises from an urban public open space perspective, aims to discover the potential and capability of vertical greenery on building facades and produces the fundamental study for the green and carbon-neutral development of both existing city fabric of Pécs and its new district under planning. The sub-research sets its base on the literature review that covers three topics: international prosperous case study examples, theoretical categorizations of vertical greenery applications, Hungarian panel house and the theoretical and practical state of vertical greenery on building facade in the Hungarian context. The practitioners' experience and theory knowledge are further used to be analyzed in Pécs city context.

Different data that include close observation, photograph documentation and mapping of panel house estates in Pécs were collected. Following the research of building facades were the analysis in relation to the applicability of vertical greenery. The analysis was based on the coupling of the existing international theory achievements of vertical greenery and the existing building facades of city Pécs. Whereas, the coupling was based on two key aspects of understanding: the building's own performance benefiting its residents and the urban environment that it sits in. The sub-research gives recommendation on the optimization of the future community district development designed supporting to carbon-neutrality theme.

3.8.3. Reviewing vertical greenery on building facade

Vertical greenery is generally defined as the greenery on the vertical faces of buildings or other installations with vegetation material. The paper focuses on the vertical greenery on the building facade (VGF).

Urban vertical greenery on building facades has been categorized with a different focus and for different purposes into techniques of installation, function, vegetation typology application and aesthetics.

3.8.3.1. Installation technique

The vertical greenery applied on the building facade is generally distinguished as facade greenery (FG) and living wall (LW), based on the collaboration method of vegetation and facade. Haukun Lin (2019) and more researchers produced a more detailed category, in which FG is further sorted as direct, indirect and indirect at a transitional space according to the actual mean of attaching to the facade wall. The main character of which is that the growth of vegetation is supported by the structure installed on the facade wall while rooting in a container installed at the bottom. Accordingly, the applied vegetation is dominated by the creeper plants.

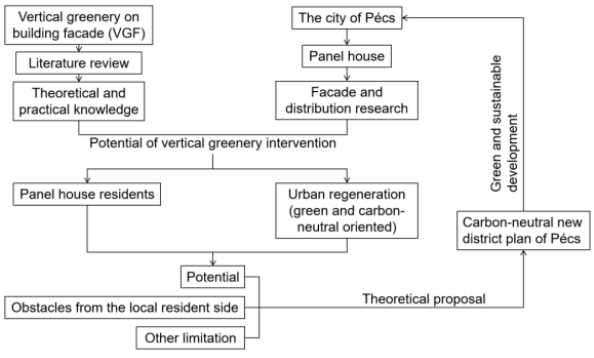


Figure 94: Methodology of the sub-research. Illustrated by author

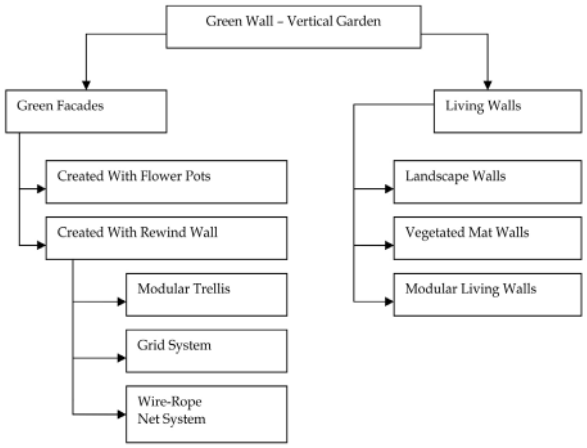


Figure 95: Vertical greenery's typology
Resource: Yeh 2012, Greenroof organization 2008, www.landscapeurbanism.blogspot.com 2013, www.landscape-design-advisor.com 2013, Köhler 2008 https://www.intechopen.com/chapters/45441

On the other hand, LW is sorted as soil container system, substrate module system and felt system in accordance with the attaching method to the facade wall. The main character of which is a much closer collaboration between the greenery and the facade wall, because the roots of vegetation are attached to the wall in a surface manner, thus there is a wider choice of applied vegetation than FG （Lin, Xiao, Lu, & Musso, 2019). Similarly, other researchers Lin, Xiao, Lu, & Musso categorized the vertical greenery on facades into cable wire system, wire mesh system and pocket system, where the first two types belong to FG, while the third type belongs to LW (Tong, 2014). However, Susan Loh categorized FG's construction into modular trellis panel system, modular trellis, grid system and wire-rope net system ((Loh, 2008).

3.8.3.2. Functions of VGF

Vertical greenery on building facades (VGF) has proved to have multi-beneficial to urban enrichment and the building itself.

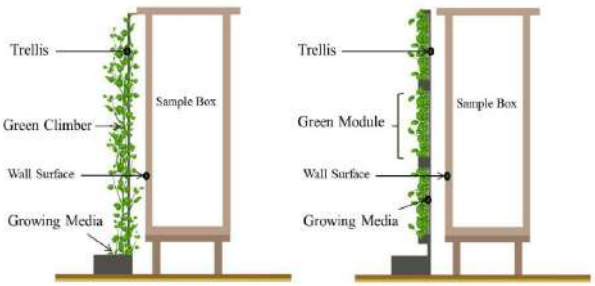


Figure 96: Green facade and living wall Resource: https://www.researchgate.net/figure/Green-facade-Left-and-living-wall-Right_fig1_280918106

The commonly analyzed functions are related to the thermal performance of the building （N.H, et al., 2010), air quality, microclimate, urban heat island (Mecca, 2019), urban biodiversity (Freed, et al., 2008) and ease of noise and light pollution (Timur & Karaca, 2013) (Renterghem, Hornikx, Forssen, & Botteldoorena, 2013). From an aesthetic point of view, besides the visual quality of new facades, vertical greenery intervention is also introduced to fix the visual blemishes on existing facades, and thus regenerate the performance facades (BASDOGAN & ÇIG, 2016) (Freed, et al., 2008). Parallelly, the social value of VGF has also been proved, The application of VGF has an indirect effect on social safety by reducing violence and crime (Tong, 2014).

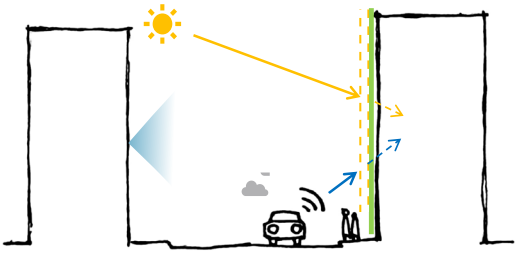


Figure 97: Environmental functional illustration of VGF, Illustrated by author

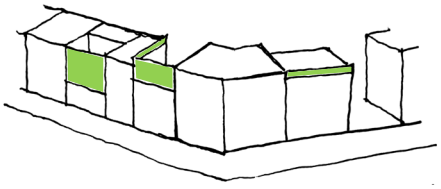


Figure 98: Streetscape functional illustration of VGF, Illustrated by author

Figure 99: Social functional illustration of VGF, Illustrated by author

Meanwhile, several papers demonstrated that both FG and LW have a positive impact on easing stress and raising work efficiency, which is an advantage to people's physical and mental health (Sheweka & Magdy, 2011) (Butkovich, Graves, Mckay, & Slopack, 2008).

3.8.3.3. Type of vegetation

The interaction scheme of vertical greenery and building facade determines significantly the suitable vegetation type, for instance, whether it has to be a creeper type or none. This result in, that LW systems hold a wider range of applicable vegetation and it is more suitable for large continuous surfaces. Besides the conventional vegetation for greenery, crop application in VGF is also discussed by researchers. Balcony, curtain wall and wall attached planting are the three most common methods of building–agriculture collaboration (Shi, 2016). The crop's character of vegetation, in general, provides competitive functions and impacts as conventional VGF, while moreover, scientifically planned crop facade is able to provide the local residents with food, and as a result, save the cost of transport and add value to the building itself.

3.4.3.4 Visual aesthetics

VGF plays a notable role in both building and urban street scale. In building scale, VGF is generally composed of points, lines and surfaces. Zhang Xiaokang and Che Fengyi categorized VGF's character and expressions in respective ambient (Zhang, 2011) (Che, 2013). These composition methods function in vertical greenery intervention as well. On an urban street scale, individual VGF produces favourable visual qualities to the street. It acts as a vertical complement to the streetscape and solves the inharmonious blemish of a street elevation.

Ana Virtudes and Maria Manso categorized VGF's application strategy in urban design and on a street scale (Virtudes & Manso, 2016). Base on their research the main functions in terms of urban design are; first, normalizing the building heights; second, fixing the building's alignments along the street; third, masking blank walls,and fourth, strengthening the sense of intimacy within blocks. Cases show that VGF increases the building envelope's quality in a more human–philic manner.

3.8.4.VGF oriented urban public space quality in Pécs

The city of Pécs is a mid–to–large scaled township located in southern Hungary. Its thriving history traced back to the early Roman time. Through the thousands of years of evolution, a few architecture and street typologies exist between the medieval city wall (contour of the historical downtown) and the city outskirt. The scale of streets and squares within the medieval city wall was kept. Except for the heritage buildings from the early Christian time the Turkish Empire time, structures inside the medieval city wall are composed of traditional multi–storey buildings similar to the Central European style with hundreds of years' history, restored buildings and new buildings designed in a way that fits into the existing tone of the district. Outside the medieval city wall, there are four dominant types of buildings; first, 3–4 storey high brick houses (apartment building or business–residential combined), second, 4– 6 or 11 storey high panel houses, third, single–family houses, and fourth, a series of cultural buildings constructed around 2010 when Pécs won the European Cultural Capital.

They are connected to their adjoining streets and public open spaces with respective characters. Brick houses of 3–4 storeys form row houses that directly connect to the pedestrian passage of the street, it is observed that no or limited greenery exists in between. Several panel houses form the apartment estate and exist in groups or clustered. Some of them are connected directly to the pedestrian passage of the main street, while others lay in a street block in a free-standing manner with a few garden infrastructures co-existing. Single-family houses are either free-standing on the plot keeping a buffer garden from the street or aligned directly with the street elevation with no setback connected front facades. However, New cultural buildings keep a well-planned front or side green open space from the pedestrian passage.

3.8.4.1 Panel house

Panel house is an apartment construction system imported from the Soviets in the 1920s (EX ANTE 2021, 2021). It reached its peak between the 1950s–1980s. In the city of Pécs, the land of Hungary, and even in Central European countries, panel house occupies a considerable ratio of residential building stock (Holló, 2020). As a type of precast apartment building, panel houses are designed with a few generations of construction systems and morphology. They are constructed with concrete-insulation composite panels and have a relatively fixed apartment layout. Therefore, compare to the conventional 3–4 storey high brick houses, panel houses are more efficient in planning and construction, which fit the Hungarian national condition and the housing demand at that time.

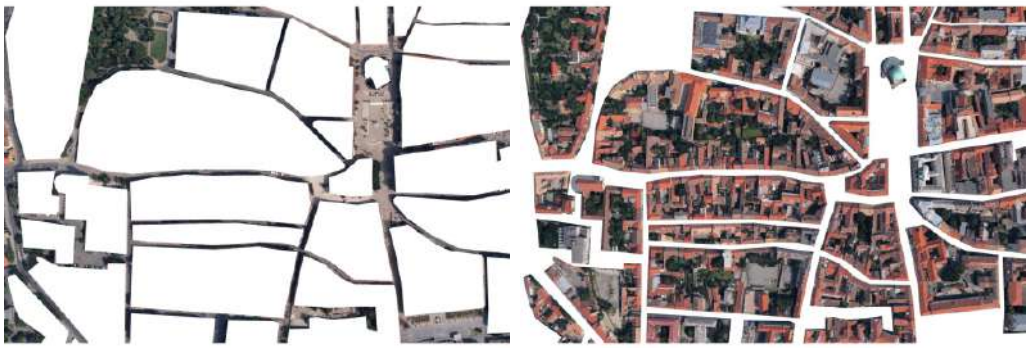


Figure 100: Negative space and block texture of downtown Pécs, Map resource from Google Map

Figure 101, 102: Panel house apartment buildings in Pécs, Photos by author

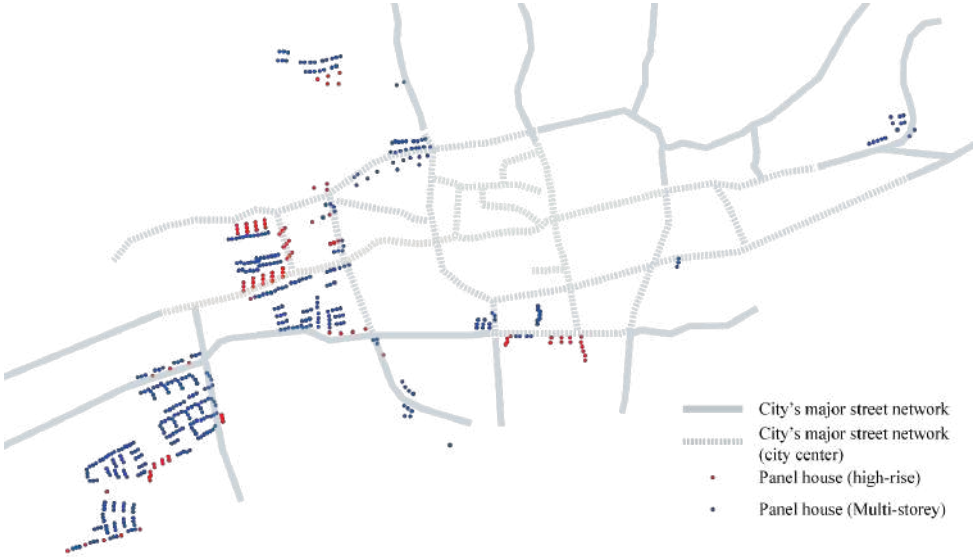


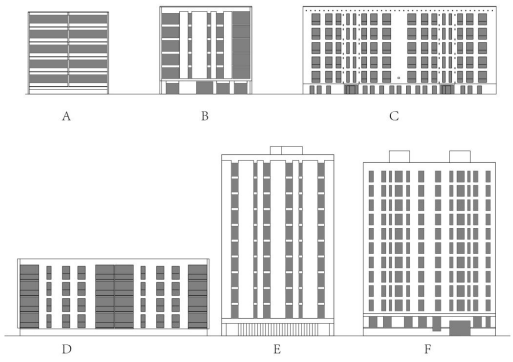
Figure 103: Mapping panel house apartments in Pécs, Illustrated by author

Taking into account the urban rehabilitation, urban facade regeneration, urban green surface, urban facade fabric, and the comfort measure of buildings themselves, multi-storey (4-6 storeys) and high-rise (11 storeys) panel houses are the subject of the research of vertical greenery intervention to facades of Pécs. The distribution and facade composition of panel houses were conducted for analysis.

3.8.4.2 Panel house facade analysis

The panel houses can be divided into a multi-storey apartment building and high-rise apartment building according to the height; while concerning the building composition, there are building with single staircase, double staircase and triple staircase compositions. Observation of the research shows that the facades of panel houses in the same area tend to be plastered with similar colours or compositions. Light grey, light yellow and blue-green is the most common colour of the plaster used on the facades. Concerning the form of openings, living rooms and bedrooms usually have double-hinged windows, and balconies can be categorized into three types: open corridor, 3-side small open balcony for a single room, semi-open balcony for living room. The diversity of balcony forms provide more collaboration possibilities for vertical greenery intervention to panel house facades.

Base on the study of panel house facade models in Pécs (Figure 104) the opening ratio (gross window and balcony area per gross facade area) can be carried out. The result shows that multi-storey panel houses have an opening ratio (35%-47%), and for high-rise panel houses the ratio is (22%-30%).



	Opening Ratio	Solid Ratio	Type
A	43%	57%	Multi-Storey
B	47%	53%	Multi-Storey
C	35%	65%	Multi-Storey
D	46%	54%	Multi-Storey
E	22%	78%	High-rise
F	30%	70%	High-rise

Figure 104: Panel house apartment building facade samples and opening ratios, Illustrated by author and Shaha Maiteh

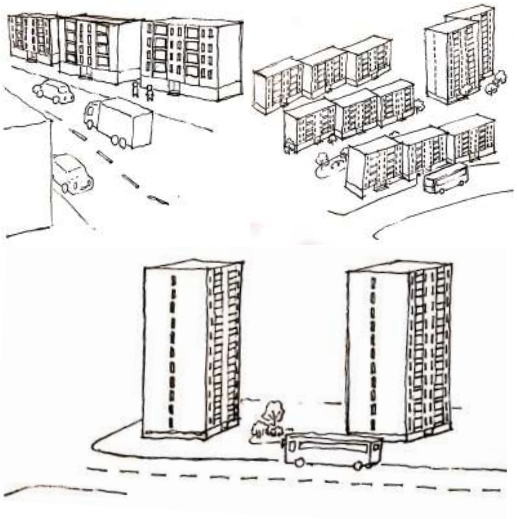
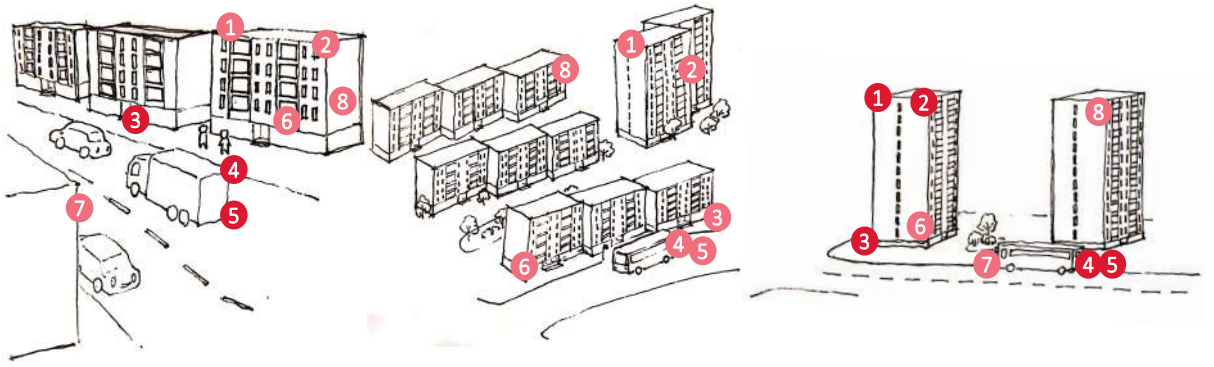


Figure 105: Panel house apartment building co-exist with each other, Illustrated by author



1. Sun exposure
2. Over heated
3. Buffer missing
4. Traffic noise
5. Breathable particle
6. No visual blocking
7. glow and glare
8. Inadequate thermal protection

Figure 106: Existing problems caused by the facades, illustrated by author

The rest part is plaster surface and, if applicable, other surfaces for the ground floor. The plastered part is precast concrete panels with integrated thermal insulation. In accordance with the year of construction, different panel systems were applied, where the thickness of wall composition ranges from 19–27 cm (Holló, 2020). It can also be calculated that the area ratio for the potential of vertical green intervention is (53%–78%). Base on the fundamental theory of VGF, the value of vertical greenery intervention to panel houses, for the living environment (promotion of noise reduction, thermal conditioning and quality of public space), can be seen.

A panel house can be located mainly in two types of urban environments, First, in between a group of panel house buildings, second, along the main streets forming their street elevations. Grass and trees were planned in between the buildings in a panel house group, which is beneficial in consideration of greenery and local biodiversity. However, as a result of the panel wall composition, thickness and technique, the thermal and acoustic performance of panel house apartments are not ideal.

In winters, inadequate thermal insulation and district heating lead to high energy consumption and living expense. On the other hand, based on in-situ observation, the rate of air-conditioner ownership is low among panel houses, which lead to an unsatisfied summer experience (especially for the residents living in higher levels) during the summer, when the air temperature is 32–38 ℃ . The panel houses along the main streets (for instance, Hungária street, József Attila street and Komlói way), however, lack corresponding greenery protection from the street. Not only the higher storeys but the whole building is exposed to the motor traffic and pollution. Without the greenery buffer, the residents are not protected in terms of sun exposure, noise, glaze, wind, particulate matter and thermal conditioning.

3.8.4.3 Panel house facade greenery intervention and carbon-neutral based new town development

From building an individual point of view, through the induction of the theories of other researchers, it can be concluded that vertical greenery intervention is helpful for the problems that panel house residents are facing. With proper and careful treatment of the existing panel walls, it is practical that the intervention will not lead to the failure of the facade. On the other hand, the vision of vertical greenery intervention on panel houses can be commonly and widely applied. Mapping analysis of the distribution of panel houses in Pécs shows that panel houses are widely distributed in the spacious area from outside the medieval city wall to the outskirt of the city, all appear in groups and numerously distributed along the main streets (Figure 103). Their locations are not overlapping with the existing development and rehabilitation cores of the city, but the wide distribution, considerable number and strong repeatability are worth further study and strategy of vertical greenery intervention and adaptive regeneration. Consider the VGF's supplementary and recovery effect to urban and street, the promotion to the quality of a building's adjoining public open space and the stress easing and calm effect to the pedestrian, vertical greenery intervention to facades in Pécs has considerable potential in generally promoting the local living experience, moving experience and social experience.

Additionally, not only the vertical greenery intervention can benefit the built environment of city Pécs, but it is also beneficial to apply diverse VGF to the planning of its carbon-neutral new district development. The VGF, as discussed and summarized, helps produce interior comfort and harmonious public open space.

3.8.4.4 Limitations in context of Hungary

The limitations are explained in two perspectives, practical solution of eligible plant and dissenting opinions from the resident side. Located in Central Europe, the continental climate brings Hungary hot summer (up to 42 ℃) and cold winter (−29 ℃ the lowest) (Climate Change Post, 2021). Therefore, there is a challenge choosing suitable vegetation that is active throughout the year. The practitioners in Hungary are applying different structure systems and vegetation to fulfil the bloom span and make it function through the year. On the other hand, there have been domestic dissenting opinions for a long. Residents' misinterpretations of VGF obstruct the smooth implementation of VGF planning. The miss-interpretations include; first, the vegetation's growing brunches will lead to the failure of the facade; second, the internal walls will be moisturized; third, unpleasant creatures (for instance, insects) will get into the house, fourth, the intervention and management will be expensive, and fifth the supporting structure of VGF may raise the opportunity of burglary. The above-mentioned miss-interpretations of VGF is achieved by witnessing failure cases, while residents are still required to be more explained with the practical facts about the system.

5. Summary of the sub-research

It can be concluded, that in the context of Pécs city, VGF can be a competitive and highly potential tool for green and sustainable development. This is applicable both as an intervention to the existing city fabric, and the carbon-neutral district under planning. The potential of vertical greenery intervention to the panel house types of building is analyzed. The research shows a significant potential in high rise buildings with building height greater than 5 storeys, due to it's greater building facade area that could accommodate vertical greenery . Further more the research would suggest future research in regard of the load bearing capacity of existing buildings, and an in-depth analysis of the buildings' physical conditions. The intervention is expected to have considerablely positive effect on the livability of the local residents and, in meantime, the quality of urban environment because of its contribution regarding urban walkability and the quality of public open space.

Due to the wide distribution, numerous amount and repeatability, panel house is worth being considered as a breakthrough point for the city's green and sustainable rehabilitation.

Communication and understanding between decision-makers, practitioners and stakeholders will be inevitable to eliminate the miss-perceptions and promote efficient and friendly VGF practices.

Further researches on the VGF's potential on green and sustainable development of Pécs as a united strategy (intervention and part of new development) need to follow. These include the VGF's application on new residential and commercial architectural design and its intervention to the built environment in the relevant brownfield. Physical and visual stimulation is therefore necessary.

3.9. Urban rehabilitation, revitalization and connectivity through public space making

3.9.1. Background

This part of the general research sought for the impact of the urban public space making generated from heritage adaptive reuse on urban rehabilitation. The ultimate goal in this topic is the rehabilitation of the sample town: Pécs, Hungary. Whereas, the sub-research approached from the public space making and adaptive reuse perspective, which has connection with three sub-topics: heritage and brownfield, their adaptive reuse and the upgrade of urban life.

Briefly talking about the rich heritage and brownfield resources of Pécs and the action opportunities: It has a population of 150 thousand (2019) within its 162 km2 area. Nowadays, the city of Pécs is considered a cultural city with a rich history of built heritage. However, during the mid 19th century Pécs was a significant industrial center for Hungary (Haffner, 2014). Winning the European Capital of Culture in 2010 (together with Essen and Istanbul) provided the opportunity for Pécs to boost its development in numerous fields, including the quality of urban living.

Since 2010, the number of tourists has been rising annually, while on the other hand, the number of local inhabitants has been annually decreasing (City population, 2020). The influencing factors, in addition to economic and employment aspects, are derived from the uncompetitive urban vitality and liveability. Since 2000, Pécs has utilized numerous opportunities in the regeneration and adaptive reuse of historical and industrial built heritage. These historical roles were carried out by the implementation of adaptive reuse to create an optimal impact on local urban vitality using different approaches.

3.9.2. Three dimensions

Tettye Park, Cella Septihora and the Zsolnay Cultural Quarter (Zsolnay Kulturális Negyed) are the three most significant rehabilitation projects forming the triangular shape around the center square of Pécs, the Széchenyi Tér. Tettye Park is a representative of the town' s heritage adaptive reuse as an urban public open space, Cella Septihora is a successful and organized project of heritage revitalization, and the Zsolnay Cultural Quarter is a successful rehabilitation of a local industrial brownfield. The research studied the context, history, reuses and the current use by the citizens as an urban public open space. Besides the research on the individual projects, their effect in the urban life and built environment scale was also taken into account. The conclusions are expressed through three dimensions: urban connectivity, district vitality and urban habitat.

3.9.2.1. Urban connectivity

Over the past decades, and especially since 2000, the development of Pécs has been largely based on the EKF programme (Europa Kultiralis Fovaros, European Cultural Capital). EKF acted not only as coordinator of the programme itself but also set the goals for the city's development. A series of rehabilitation and reconstruction projects were generated under the EKF programme at historical sites throughout Pécs (totalling around 61 sites) that were adapted to create various functions and ambiances based on their orientation (Varjú, 2008).

The historical sites (ranging from the Early Christian Age to the industrial age) are inside the historical downtown (the city centre), in the buffer zone, and around the outer fringe of the urban area. After their respective adaptive reuse, they generated positive impacts to the entire city of Pécs. From the urban continuity point of view, the impacts can be seen from two aspects: 1) the connection between the ruin itself and the surrounding area and the historical downtown became more adhesive, 2) the connection between the newly created heritage sites also became more cohesive.

The Tettye Ruin (the ruin of the summer palace) had existed in the city as a religious property (both physically and mentally) over a long period in history. In recent history, it became a popular hiking and sightseeing destination of the city due to the heritage site and the adjacent botanical garden. The stream that flows from the ruin area towards the city centre had long been utilised by traditional leather glove manufacturers in the area and initiatives by the authorities to create new industry in the area never eventuated. These circumstances represent the existing conditions of the Tettye Ruin area with respect to the connection with the inhabitants of Pécs. The adaptive reuse and the corresponding multi-functional area design, as previously described, oriented towards local inhabitants' daily life, as well as towards multi-age group and multi-purpose functions, enhanced the connection between the heritage site and the city center (instead of only being seen as a hiking destination). In addition, the value of the site was especially increased for those living nearby.

The planned and implemented three layers of terraces are visible from the downtown and, because of the landscape of Pécs, they are also visible from the other side of the city, which formed a visual connection on a metropolitan scale. The three terraces serve the local inhabitants as well as tourists visiting the area. Therefore they become landscape and scene to each other. This adaptive rejuvenation project promoted cohesion, adhesion and continuity of the city through the perception by the inhabitants of Tettye, the inhabitants of Pécs in general and tourists.

The design of the walking route connecting the Tettye ruins area, and the downtown, as well as the renovation of the ruin itself, not only provided a connection between Tettye and the city center but also other adaptive projects at various other heritage sites. For example, an essential part of the EKF programme, was the adaptive reuse and rehabilitation projects of the Cella Septihora and Zsolnay Cultural Quarter that provided further daily functionality and cultural destinations in their respective area and the inhabitants of Pécs through the following two perspectives: 1) the heritage of Early Christian history and culture via contemporary architectural language, 2) adaptive reuse and revitalization of brownfield areas left from the industrial era. Pedestrian and vehicle routes, public transportation and sightseeing train routes were developed to connect these areas. The triangle formed by the three sites (Tettye Ruins, Cella Septihora and the Zsolnay Cultural Quarter) formed a constructive foundation for the macro urban continuity of Pécs.

3.9.2.2. District vitality

Pécs has been transformed from an industrial city to a tourist city. In addition to the long history and culture of the city, it has carried out successful heritage-building-based adaptive reuse projects to inject new vitality into the transformation of the city. For example, the Cella Spetichora Visitor Centre in Pécs is the museum and reception space for the UN World Heritage site: The Pécs (Sopianae) Early Christian Cemetery (UNESCO, 2000). It provides not only the showcase of the historical culture of the city for tourists but also a venue for locals to hold various activities, for example, small scale gatherings and wedding ceremonies. Moreover, this project attracts economic activity and enhances local people's sense of acknowledgement and identification towards their city(Bachman, Virág,2010).
Urban vitality is the raw power and energy within a city by Landry in 2000. It also refers to the urban spatial structures and their influence on urban activities, which can represent the features of the urban spatial structure and a measure of the activity of residents(Aytac et al.,2016). In terms of the urban form characteristics, urban vitality embodies three factors: 1) great accessibility among neighbourhood quarters, 2) a large range of liveability regarding building construction and architectural patterns, 3) the interspersion of appropriate and practical functions. The overall goal of the Tettye district design tender was to rehabilitate the entire Tettye area and to create a popular destination for both locals and tourists. It is comprised of the regeneration of the Tettye park, constructing the Havihegy panoramic promenade, in other words, developing the public space and pedestrian route with urban green spaces. It helped in enhancing the connection between the city centre and the Tettye area.

Becoming an exclusive public green space, the rehabilitation project of Tettye managed to connect the districts of Pécs and due to the fascinating landscape and accessibility, it has become a part of local daily life. In addition, the reuse of the remains of the Renaissance summer palace combined with the panoramic natural landscape demonstrates the unique charm and cultural landscape value of the area, which in turn creates business and tourism opportunities. In addition to the clear functional separation, Tettye's triple terrace design has demonstrated another character with its multi-function. The complex functional community spaces accommodate different social groups and ages and help to enhance the extent of residents' activities.

Cella Septihora and the Zsolnay Cultural Quarter also play significant roles in stimulating the promotion of the city's vitality, bringing additional economic and educational benefits. The Cella Septihora Visitor Center, in particular, has brought vitality to the city's tourism economy with many tourists on cruises on the Danube River taking a day trip to visit this UNESCO site. The Zsolnay area serves as a sightseeing spot due to its industrial heritage character and also houses the Faculty of Arts of the University of Pécs, therefore having an educational role. From these cases, it can be observed that the renewal of the heritage buildings in Pécs gives differing opportunities to urban residents, tourists, the education industry, and urban fabric. The reuse of heritage plays a catalytic and integrated role in the city (Versaci,2016). It promotes the renewal of public space and the restoration of historical monuments, the development of cultural undertakings, and an improvement in the quality of the residents' living environment, balances the society and space, and also revitalizes the whole city.

3.9.2.3. Urban habitat

Acceptable practices of urban heritage conservation can inspire inclusive and holistic approaches to urban development and lay the foundations for "fit-for-purpose" planning tools and legal frameworks (United Nations, 2017). The heritage protection and rehabilitation at the Tettye area was set to be an experimental site of Pécs. At present, it has hybrid functions and quality public space to blend multi-community groups. The built heritage provides intermedia for local citizens to identify the city's history and culture. The urban environment, the protection of built heritage, greenery and community relationships are essential indicators regarding the living environment of the local inhabitants – the inhabitation.

The whole Tettye area has residential, religious and locally scaled commercial functions; meanwhile, it is also filled with plenty of long-term and relatively stable private properties. As a result, it is an area of potential with stable and peaceful low-density residences. Apart from the historical downtown which is dominated by old apartments and southern Pécs which is dominated by blocks of apartments, the most dominant housing type in Tettye is detached houses, in which inhabitants with relatively higher living standards reside. In the tender document of the design of Tettye Park and the surrounding area, besides the previously mentioned promotion of Tettye Park and the adjacent public space, social interaction, entertainment and the promotion of culture were also set as important goals. And all of these led to positive effects after their implementation.

In addition to tourists, the series of rehabilitation has also attracted inhabitants within its district, and therefore facilitating multiple effects: 1) It brought the local Tettye inhabitants optimized and organized venues for activities which are suitable for multi-resident groups; 2) The tourists attracted to the district widen the social interaction of the local inhabitants; therefore the level of activities also increases; 3) the vitality of Tettye and that of the entire city complement each other, which leads to the activities related to both the commercial and cultural aspects that has become more active with broader engagement and connections.

On the other hand, the planned and implemented connection (led by the previously mentioned walking route) cements the physical and mental connection between the district's residential function and inter-communal life. Agoston Square is one of the gateways from the city centre of Pécs to the Tettye area, from where visitors are able to reach the Tettye Park on the hill to the North. Three options are provided to reach the destination Park, among which Tettye Street and Vince Street lead to the lower end of the Park, while Felsőhavi Street leads to the Church of Our Lady of the Snows where the panorama of Pécs is visible, and from there the Havi-Hegy walking route leads to the contemporarily reused Renaissance ruin of Tettye (the first terrace). The completed rehabilitation of Tettye Park has become an essential public green zone and provides both the local inhabitants and broader citizens a multi-functional venue. It covers both communal and cultural functions, holds various outdoor activities with its adaptive space and provides meaningful entertainment and relaxation for people of every age group.

3.9.3. Summary of the sub-research

From the dimensions of the inhabitation environment, district vitality and urban continuity, the paper has elaborated on the essential role that the adaptive reuse of built heritage plays in urban rehabilitation and its potential in regard to the development of urban sustainability. The adaptive reuse of heritage buildings in the process of transforming from an industrial city into a cultural tourism oriented sustainable city has become the engine for the renewal and development in the city of Pécs. The adaptive reuse of heritage buildings is the cultural, social, and economic tangible assets of the city, which reflect the city's inclusiveness and potential for cultural and economic development. This can be reflected in the following two aspects.

On one hand, Tettye Park is used as a comprehensive urban green space in Pécs, with the reused remains of the Renaissance era holiday villa as a symbol in the Park. It is protecting historical ruins and creating a multifaceted space for the public. The Park provides a public place for outdoor activities for different age groups. Their daily life integrates the city's past culture, which makes the city's modern life and historical space interactive. It will also increase the sense of identity of inhabitants from different age groups towards the city. On the other hand, Tettye Park in connection with the Havihegy panoramic corridor presents the integration of urban time, space and the natural environment, and is embedded in the space-time structure of urban growth. This design strategy greatly increases the visitor's interest and provides a perfect place for a better understanding of the city.

In conclusion, under the dual background of climate change and rapid technological development in the contemporary era, sustainability and low carbon would be the goals of future urban renewal (Yung et al.,2012). Cities face a more modern process of rehabilitation all over the world. Adaptive reuse of heritage buildings' ability in extending the life cycle of buildings and reducing waste and resource consumption in the demolition process is greatly appreciated. Moreover, protecting urban heritage and culture while reducing carbon emissions is a significant character in future urban rehabilitation.

Figure 107: The spatial relationship between Tettye historical downtown and other sites of Pécs, Illustrated by author

3.10. Triangular symbiosis between people, street animals and the existing urban public space

3.10.1. Introduction to the topic

This part of the practice research discusses the presence of a significant number of street animals in the urban public spaces of towns and cities. This is evident in various cities and towns around the world, where the predominant species and diversity of street animals varies according to location, climate and culture. In the European context, there are approximately 120 million stray animals, and the main groups of these are dogs and cats. However, this practice applies the term "street" animals rather than "stray" animals, because, in addition to abandonment–induced straying, many cities and towns around the world also host a situation which is the long–term symbiosis between animals that are free in their own right (e.g., birds and other atypical pets) and urban populations.

3.10.2. Background of the practice

The location of this practice was set in India, due to its well challenging number and variety of street animals. At the same time, it cannot be overlooked that the density of urban population and street use in India is very high, which results in a high level of interaction and symbiosis between people and street animals in the streets and other types of urban public spaces in a town or city. The expression "stray animals" turns to be particularly inappropriate in light of the animal species existing in the urban public spaces of Indian cities, while "street animals" are more appropriate. The known street animals that interact with pedestrians on the streets and in various urban public spaces in Indian cities and towns include, but are not limited to, cows, monkeys, dogs, and cats, with cows being the most characteristic and dominant.

3.10.3. Problem statement

Observations in terms of human interactions and attitudes towards these animals reveal that:

Figure 108: Local concerns regarding street animals, illustrated by author

Both locals and tourists interact with the street animals, but with different attitudes. Due to the adoration of the cow led by one of the dominant religions in India, it has a higher status as one of the users in the urban public space, and the cows on the sidewalks as well as on the vehicle lanes are not driven away, but live in equal symbiosis with the human users. Other animals are also fed and have interaction with tourists and locals, but the monkeys, because of their intelligence, are special and they appear in small groups.

In the process of interaction, large amount of peeling and packages are inevitably involved. Instead of staying and waiting for the feeding to be completed and then cleaning up before leaving, people tend to offer food and then leave the place. This behavior generates a significant proportion of the overall street garbage.

The current problems can be summarized as follows:
– Street animals are not effectively sheltered;
– Animals occupy all corners of the urban public space, thus affecting the efficiency of the urban public space;
– Pedestrian feeding behavior generates a large amount of street litter;
– Subsequent street clutter.

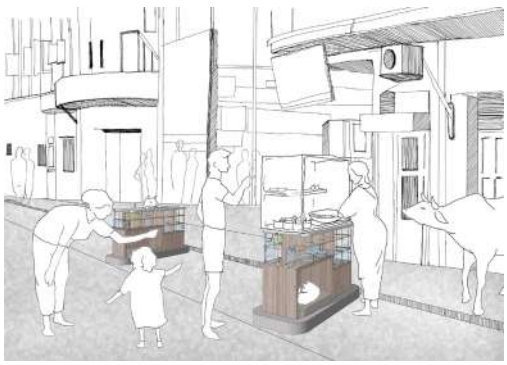
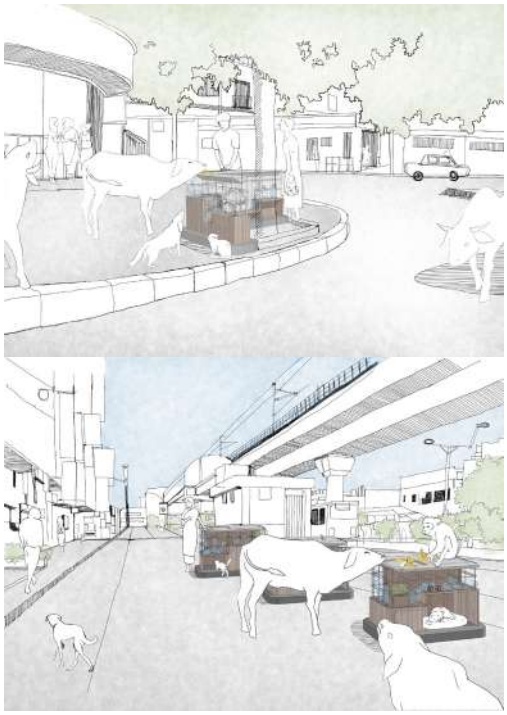


Figure 109–111: Potential of usage, illustrated by author and LI Xiaonan

3.10.4. Result and conclusion

The author's opinion is that: it is better to divert rather than blocking. The design can be considered as a hub for street animals that can be replicated in large numbers and adapted to various types of urban public spaces. This is not only applicable to Indian cities and towns with a wide variety of street animals, but it is also worth introducing in other parts of the world the idea of designing and intervening in urban public spaces in a way that transforms the way people and animals interact through guidance. It provides shelter for small street animals, more unified gathering points for animals, and centralized feeding points. At the same time, temporary storage for the generated garbage is designed to facilitate recycling. The practice answers to the topic of urban street animals from the perspective of the triangular symbiosis between people, street animals and the existing urban public space.



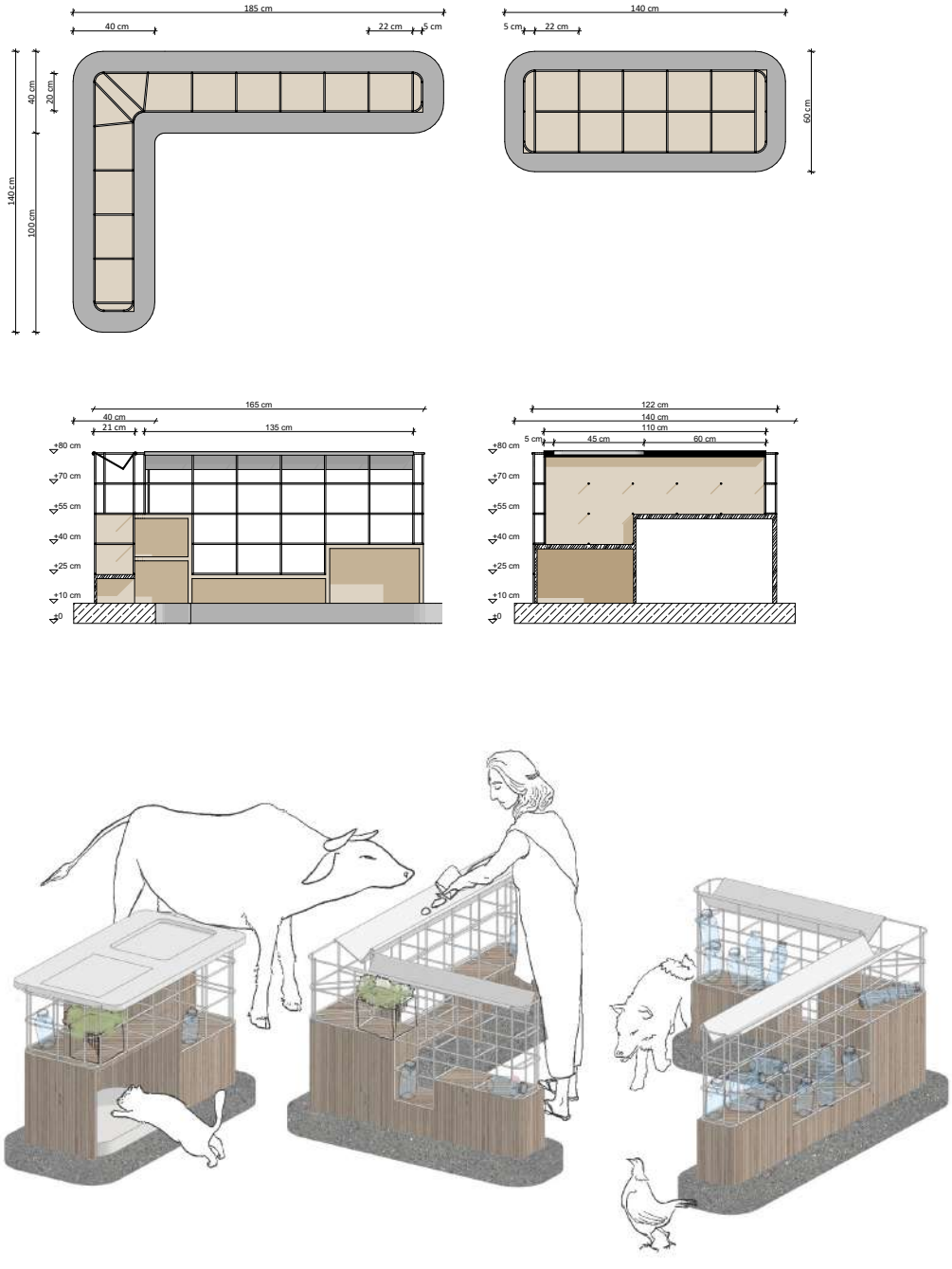


Figure 112, 113: Illustrated by author and LI Xiaonan
1. Plan and section of the street animal hub
2. Overview of the street animal hub

4. Summary in theories

The sub-researches discussed several aspects led by the general topic of public space rehabilitation and place making of European town. This include the reflection of the rehabilitation and revitalization based on urban built stock, the use of local traditional living model, the community participation and a community concept: co-family. From other perspective, the sub-researches respond to the public space design for community, public space network design, brownfield rehabilitation, green space making, resilient design in terms of people' s lifestyle, urban walkability, building up the concept of community and neighborhood and the micro and macro planning from the pandemic and disaster-resilient perspective.

– Public space design for community

Except for the sub–research discussing about the urban continuity and sidewalk streetscape, all the other sub–researches reflected on the community living model as a prior goal of public space design.

The public space revitalization research in Roissypole concluded that active interaction between people and the venue ensures the vitality of an urban public space. In the context of residential dominant area, the combination of attractive commercial activities (for example the markets), leisure zone and daily sport supporting installations could be a proper solution against the decline of the designed public space for long term.

The border bridge adaptive reuse concluded that, for residential purpose, community spaces planned for different level of publicity could be applied for the respective sharing purposes and functions (within the defined groups of minor community or used by all bridge citizens). The respective public spaces function as the congregation of different groups of people, so that the rapid communications and harmonious temporary border bridge life could be ensured.

The discussion about rethinking and developing local traditional community model and urban texture in three dimensional (realizing it in higher architectural complex) expressed the benefits of the application of traditional life model in contemporary architectural and public space design theory. Abstracting the essences of a town's local traditional community model or urban texture is helpful in building up the residents' understanding of sustainable new lifestyle with a familiar media.

The study of the adaptive reuse of urban built stock – the neglected facade – discussed the potential of urban neglected facades in generating community spaces in crowed urban context and provide further approach for affordable solution of housing problem. Vertical community spaces could be therefore born utilizing the gray faces of the town, and turn the previously neglected but location–valuable places into active urban public spaces.

The research on the optimization of community space through the vertical greenery intervention to the urban built stock – existing buildings – matched the advantages of vertical greenery on building facade and the existing problems of panel apartment buildings in the case town Pécs. This part of the general research confirmed the benefit of green intervention to urban built stock, especially with the vertical faces. Both living wall and green facade could be the solution for upgrading the living comfort of the apartment buildings and moreover mitigating the urban public open space towards a more human–phic, bio–diverse, streetscape–appealing and social friendly direction.

The summary of the observation of Wudadao inspired and proved that community participation is an essential tool to achieve the sense of group identity of a district and the belonging urban public spaces. It is a precious experience to learn for both new planning and rehabilitation of existing neighborhood or quarter. Sustainability is achieved by social, economy and environmental factors, while the topic of urban public space design has direct relationship with at least two of them: the social and environmental factors. As a physical environmental tool in the urban context, public space design is responsible for ensuring its social impact on the maximized effected group of people.

– Public space network design

Being a embedded topic of district and neighborhood scale planning, public space network design shows its existence intuitively. Summarizing from the sub-researches, there are four sub-researches covering the topic of public space network design.
The theory of rethinking and designing a town's local community model and urban texture in three dimensional towards higher architectural complex and neighborhood brings in the local inherent public space network, which contains the intelligence of the history and culture, yet complies with the existing local lifestyle. The intelligence developed from history and culture should always be the precious reference and tool for the future planning.

Through the review of theories and practices of disaster-resilient place making, it can be concluded that the logical location and functional configuration of public spaces in the district or neighborhood can largely enhance the resilience of the area against disaster. More specifically, in the public space network design process, the areal distribution, publicity, identity of nature or manufacture and the served functions need to be defined.

The discussion on strengthening urban continuity of a town talks about utilizing the value of the built heritage and brownfield and subsequently generating public spaces that meet the contemporary urban life. It presented the macro vision of urban continuity and connectivity strengthened by the rehabilitation of built heritage and brownfield. The generated public spaces shall be designed into different functions and social qualities, so that they complement each other from the macro urban planning perspective.

As discussed in the previous topic, the planning of the public spaces of the reused border bridge presented its classification of publicity. From planning process point of view, the classification of public spaces shows the organization logic and helps defining the distribution of different public spaces. While from users' point of view, it provides clear perception for people to understand the neighborhood with taking less effort.

– Brownfield rehabilitation

As a type of urban built stock and resource, brownfield lives problematically as remaining of the industrial and commercial property, but it becomes valuable and potential when being planned for new life. The rehabilitation of brownfield include the adaptive reuse of the building part and the exterior spaces. The general research discusses about the reuse of brownfield for urban public space purpose, and subsequently the rehabilitation impact.

The design of a gasometer transformed community living apartment, where the concept of co-family was introduced, was an attempt to the adaptive reuse of an industrial stock, the Gazometro. Blending the gasometer with the current problem of housing issue, the industrial stock presented another face and value to the city and its residents.

The sub-research about urban continuity also reflected on the adaptive reuse of brownfield as a valuable urban built stock. The generated public spaces became part of the key destinations of the town, which strengthened urban continuity and set positive place making samples for the up-coming public space designs as new hot spots.

– Green space making

The sub-researches discussed about green space making through three main perspectives: rethinking the new neighborhood with local traditional urban texture in vertical way, green intervention to the urban built stock and the responsible design leading green lifestyle. The second perspective, which is the greenery intervention, were discussed due to two types of urban built stock: the existing streetscape and the building stock. The third perspective reflects on the general lifestyle which involves green both as nature and as the healthy and advanced outlook on life, it overlaps with the following topic, thus will be summarized in the next section.

Traditional urban texture and community model contains the intelligence inherited from the history and culture, this includes not only the life pattern, but also the intelligence of co-existing with nature and using nature as a tool to protect us. Thus, taking into account the local traditional urban texture and community model inspires the place making with rich intelligence that complies with the local environment and local identity.

Greenery intervention to the urban built stock was proved to be effective in terms of enhancing the adjoining public spaces' visual quality and social quality, and also the living comfort of the intervened building itself. According to the discussed means of intervention, vertical greenery shows strong potential in the upgrading of the existing urban public spaces. Intervening on building facades currently presents difficulties in the implementation, due to the conflict of stakeholders, but it is also shown that the concerns are mainly miss-understandings to the imagined problems of facade greenery and are able to be resolved by communication.

Therefore, further consideration about intervening the urban built stock with greenery, especially on the vertical faces, shall be promoted.

– Resilient design in terms of people's lifestyle

The concept of resilient design in terms of people's lifestyle includes the practical lifestyle (what do people do and how to do it) and the mindset revolution. This was mainly discussed in the sub-research of design, demand and human behavior, while the clue of the concept can be found in every sub-research that discussed about reusing and intervening the urban built stock. The concept also responds to the responsibility of public space design, planning of public spaces and architectural design. Responsible design and planning should be able to follow the intelligence of the local culture and lead the behavior of the users to form healthy and sustainable lifestyle, also known as the green lifestyle. It is also an indispensable element in the resilient design to beware of the people's mindset: building up the sense of adaptive reuse in daily life. The sub-researches demonstrated how people are able to use the rehabilitated urban built stock and the benefits that intervention could make it. This is another value of conducting positive and sustainable leading design and planning.

– Urban walkability

The topic of urban walkability covers many elements, in which, pedestrian sidewalk, streetscape, pedestrian safety and greenery were discussed in the sub-researches. According to the case study in Pécs, it can be seen that, based on comprehensive local pedestrian flow study, greenery intervention has the ability to optimize the visual quality, social quality and safety for the walkability. On the other hand, ensuring optimized walkability is helpful for concreting the urban continuity and urban image from pedestrian perspective. It is also suggested, that the traditional community model and pattern of historical center could work as valuable references to deliver human-phic and human-centered urban image, which contribute to the optimization of urban walkability.

– Building up the concept of community and neighborhood

The traditional town and village texture of a settlement and its culture determines the living model of the locality. As described in the research gap, in the context of the Central European nations (e.g. Hungary), urban texture does not show the intention of community or neighborhood formation. With the increasingly further and wider researches and practices around the world, and also discussed and proved in the aforementioned sub-researches, building up the sense and concept of community and neighborhood in the existing and newly planned residential area generates more benefits than keeping the households individual in terms of organization and activities.
The study on the community model in adaptive reuse presented that diverse scales of community generate multiple possibilities of community living and increases the overall resilience against emergency and disaster by means of effective services and communications offered by the members. The concept of co-family raised in the sub-research also discussed about the congregated relationship between different households and families.
The sub-research on Wudadao district presented the value of community living in district management and congregation of the residents. Thus, it is worth being considered to include the concept of community and neighborhood in the rehabilitation of existing urban public spaces, and planning new urban public spaces with the purpose of tightening the relationship between the citizens.

– Micro and macro planning from the pandemic and disaster-resilient perspective

In the context of the general research, the micro and macro planning respectively refer to the aforementioned two concepts: single public space design and the planing of the public space network. The review of in-pandemic and post-pandemic public space design in urban scale revealed that reserving urban negative spaces (parks, squares and other minor community spaces), enhancing community participation in neighborhood design and promoting community management are the essential methods of creating disaster-resilient urban environment by means of public space making.

5. Thesis

Thesis I.

Urban public spaces work as a whole, which does not matter the scale of the referred settlement, whether it is a town or a major city. The urban public spaces need interaction with each other and are directly in relation with the continuity of the urban texture.

The above concepts should be also consciously presented in the inter-neighborhood scale planning. Ensuring the functional mix, complementarity, interactivity and continuity of the segments of the district, and harmonize the space experiential quality, the public space network should be constructed.

Thesis II.

Much more concerns are necessary and worth being taken into account the vertical surfaces: Building facades are the envelop of the building and meantime the envelop of the urban public space. They affect the urban life quality from multi-dimension (visual experience and immersive experience). A set of responsibly and inclusive facade acts as protection of both the building itself and the adjacent public space, and meantime the conditioner of the public space in terms of microclimate, biodiversity, psychological environment and social performance. Building facade design and community public space could form tighter connection due to their unbreakable relationship from the perspective of both design process and urban landscape composition.

Thesis III.

Besides the single urban public space design, the general organization of urban public spaces can be considered as planning of urban public spaces based on contemporary living models. The urban public space planning should consider the advantages and disadvantages (positive and negative characters) of the existing residential model of the referred town or city, maximize the community participation, follow the essential characters and filter the parts harmful to the healthy development of the community.

Design has to be responsible to lead human behavior for more resilient lifestyle. Individual urban public space design influences people' s behavior and subsequently their mindset of what urban public space can serve and how to use it by its function provided, its architectural presentation and the intuitive leading details. On the other hand, urban public space planning deals with more macro scale of the public space network, which presents its responsibility via logical and inclusive functional arrangements, welcoming guidance, aligned design language and active interactions.

Thesis IV.

Constantly active spaces become durable spaces, enduring activeness is guaranteed by pedestrian flow and functional place-making that attracts people to stay.

Thesis V.

Local traditional community model or urban texture shall be involved into the contemporary living model and housing solutions. The traditional models can no longer bear the contemporary and future living density in either cities or middle scale towns, yet they should not be excluded from the concepting of residential and community designs. Redeveloping the local traditional community model or urban texture towards vertical manner has the ability to develop contemporary and future living model with more local customized urban identification and comply with the local residents' mindset of how living should be. The latter advantage is helpful in gently leading people towards more sustainable and healthy lifestyle while preserving the inherent cultural identity of the town.

Dimensional upgrade of the essence and advantages (the social aspects and the parts that can co-work with the future concepts) of the traditional community model develops the community space along vertical axis. With healthy and carbon-neutral as goal and criterion, urban public space design that is three dimensional, life quality targeted, complying with the intelligence of the local traditional block texture shows characteristic community space planning that does not break away the character of local living model. It helps keeping the local character in newly planned districts and inherit local culture style.

Thesis VI.

To construct a neighborhood where the architecture part and the public space part (negative space) functions and coordinates well with each other, the two parts need to form and develop each other. Urban public spaces not only exist as the voids between buildings, they are able to construct sustainable, healthy, cohesive and visionary public space network(s) that contribute more to the urban life for both city and town scale settlement from an macro perspective.

6. Applying thesis in projects

6.1. Rehabilitation of former military camp in Pécs - from urban texture to public

6.1.1. Introduction

As discussed in the sub-researches and the theoretical summary, single public open space design and the planning and organizing of public space system are playing increasingly important role in multi dimensions of a city's sustainability by increasing both social and environmental resilience[1]. The research and design practice deal with a brownfield, which is a former military camp (site of a barrack) in a town-scaled city, Pécs, located in the south of Hungary. One of the visions of the city's green development is to construct a new carbon-neutral district performed as the rehabilitation of the brownfield located in the East skirt of the city.

Being an advanced and experimental carbon-neutral district project, the concepts and theories to be applied was complex but clear.

6.1.2. Location defining due to spatial planning of the city

The City of Pécs lives on its long history and rich culture, which provided the city with clear urban texture and structure. Inside the Medieval city wall enclosing the historical downtown, exists several built heritages, the most significant ones are located around the Dóm Square, Széchenyi Square, Barbican Square, Szinház Square or at the Medieval wall and Király Street. Most of them had experienced rehabilitation or reuse in the past 20 years, which enable them to comply with the contemporary life and functional demands. There are also few heritages from the Roman time outside the Medieval wall, while the majority are the more modern urban texture developed in the 19th and 20th century.

The brownfield, as described previously, was a barrack site. In the past 15 years, the field has not been reused or planned with new functions and was left abandoned. Today, there are two multi story buildings and few free standing single story small buildings standing on the field with their premier structures and walls.

Standing on the green development vision of the city of Pécs in the recent years, green and sustainable lifestyle and the researches on the new industries have been the leading goals in the urban planning practice and researches. The rehabilitation of the barrack brownfield is undoubtedly part of the city's green development, and so is the re-planning that complies with the contemporary and future green and healthy life value. The barrack brownfield rehabilitation has its fundamental goal, which is to implement sustainable planning through the adaptive reuse of the barrack brownfield, and realize the carbon-neutral life of the planned district.

6.1.3. Analysis of function planning and emphasis

From the location character point of view, the site is located at the east end of the city of Pécs, on the motor way connecting to the capital city Budapest. This character makes the project a potential landmark of the city, because it will be the first mega scaled landmark coming into the sight when entering the city by motor vehicles (and by bicycles as planned in the future), and simultaneously the last one when leaving the city. Therefore, an overall welcoming preface and rhythm of voids created by the public open spaces will be decisive.

From the functional connection point of view, based on the urban planning level analysis by the team, the barrack brownfield is suitable to be planned as another sub-center congregating commercial, residential and new industries apart from the historical downtown. Its building functions and the public space functional capacity should be able to load the social, work and entertainment demands of the citizens inhabiting in the East part of the city. Meantime, they should attract citizens from wider range through the supplementary social and work functions of the city center.

Consequently, the existing city center and the sub-center transformed from the barrack brownfield complement each other in terms of functions and space ambient. The public space system in the rehabilitated brownfield could be introduced to the existing series of major public spaces in the city, and therefore enrich the diversity of the city's urban public space. Moreover, this could result in the further strengthening of the urban continuity and connectivity.

From the conditions of habitation point of view, local urban texture should be taken into account as a reference to the planned brownfield district.This include quarter scale, building form, street dimension and public space typology. Neighborhood concept was introduced into the rehabilitation by means of community spaces presented in the form of public spaces. The barrack brownfield should be planned as a district with the aforementioned series of public open spaces that hosts the hardware comprising green community and leading sustainable lifestyle. neighborhood

The main attributes of the district to be rehabilitated from the barrack brownfield (simplified as 'the district') were defined as sub center of the city and research friendly. Undoubtedly, residential function will be also dominant, so that the district restrains its active population. The three key definitions of the carbon-neutral district comply with the current character of the city's land use, the multi-polar vision of the city and the demand of research based new industry. The research team studied the possibilities and design principles of the district planning in three dimensions: urban planning scale, public open space planning scale and building design scale.

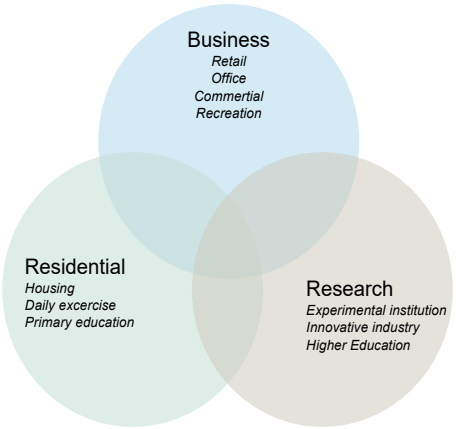


Figure 114: Dominant functions in each block/ quarter, Illustrated by author

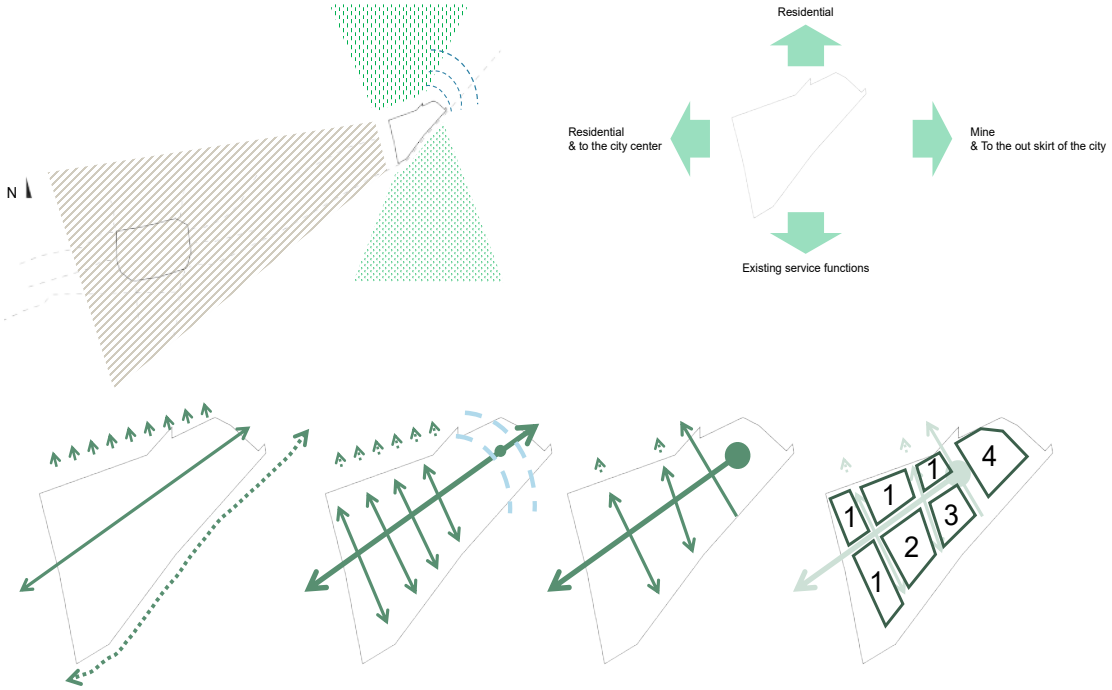


Figure 115–117: Illustrated by author
1. Spatial relation in urban scale
2. Functional relation in urban context
3. Connectivity morphology in the district and functional plan (1: residential, 2: business/commercial, 3: research and new industrial, 4: urban farm and sport park)

6.1.4. District planning and the main character brought by public space design

– Urban texture

The quarter texture of the planned district was gained by the reference of the urban texture of Pécs and other cities and towns in Hungary. The fundamental dimensions of squares and streets were sourced from the well visited main squares and streets of the city. This makes it easier for the local residents to perceive the sense of belonging and strengthens the urban cultural and architectural identity.

– Building form – public space envelop

The facade of buildings are at the same time the envelop of public open spaces. The planned buildings were developed and reformed from the traditional European blocks to coordinate with the public spaces and subsequently project the concept of neighborhood sub-spaces, which concretes the sense of community belonging and emphasizes the community privacy of part of the tip spaces of the overall public space network.

– Resilient urban public space

The realization of urban resilience in means of public space design was considered. This includes the sustainability of daily urban life and the resilience against unexpected issues (disasters). Based on the concept of negative space planning of the district, different kinds of public spaces were distributed with the buildings, and special public spaces were designed for each main functional blocks. These special public spaces ("in-block squares") serves as event venues of the respectively targeted main function (commercial, residential and research industrial), and meantime produces resilience against emergencies. It is both building to public space and public space to building approach.

– Microclimate

The concept 'building facade is meantime the envelop of public spaces' contribute also in the way that the form and greenery design on building facade are able to construct three-dimensional and immersive public space experience and landscape greenery.

This also promotes the guarantee and harmony of biodiversity and public space microclimate.

The public spaces were planned with drainage system on the surface of pedestrian zone though out the entire planned district. This includes the pedestrian zones in the axis spaces, in-block squares, pocket squares and connecting linear spaces. Besides solving the drainage, by means of constantly flowing water, the heat circulation could be promoted and therefore the microclimate could be adjusted.

– Public space network

The diverse public spaces in the district cover the brownfield in form of network. In the meantime, different types of public spaces were classified before the layout design process, which created the axis space serving all citizens, in-block squares, and the community/ neighborhood space at the tips of the network in form of pocket square. The connecting elements: the linear spaces, are considered as a type of public space to be designed in the network.

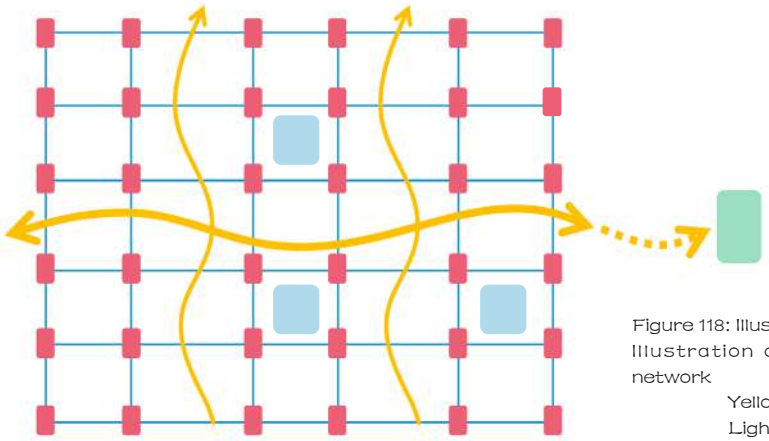


Figure 118: Illustrated by author
Illustration of the planned public space network
Yellow arrows: Axis spaces
Light blue: In-block squares
Red: Pocket parks
Blue lines: Linear spaces
Green: Urban farm and spart park

Figure 119–122: Illustrated by author
1. Public space typology implemented in site
2. Connectivity analysis
3. Table of the publicity of the public spaces
4. Table of the attributes of the public spaces

Main axises	Pocket squares (business & research)	Pocket squares (residential)
Sport & cultural park	Linear spaces (business & research)	Linear spaces (residential)
In-block squares		

<table>
<tr>
<td>  </td>
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<td>  </td>
<td>  </td>
<td></td>
</tr>
<tr>
<td>Main axis</td>
<td>Pocket squre in business block</td>
<td>Pocket squre in residential block</td>
<td>Linear space in business block</td>
<td>Linear space in residential block</td>
<td>In-block square</td>
</tr>
<tr>
<td rowspan="2">- abusolute public for all citizens
- wide open space
- public event eligible
- sectional functions (central park/ event square/ retail/ ...)
- recreational/ leisure/ open/ multi-theme ambient
- accessible by pedestrian/ bike/ internal green traffic/ emergency vehicle</td>
<td>- abusolute public for all citizens
- recreational ambient</td>
<td>- mainly open to residents of this area
- leisure ambient with different themes (play ground/ pond/ tiny sport/ tree grids/ ...)</td>
<td>- abusolute public for all citizens
- recreational ambient</td>
<td>- mainly open to residents of this area
- leisure ambient with different themes (play ground/ pond/ tiny sport/ tree grids/ ...)</td>
<td rowspan="2">- attribute align with the block it belongs to (business/ residential/ industrial)
- Business block: brick paved fully open square for commercial shows/ events
- Residential block: children's playground + a spatial mesh for climbing
- Industrial block: brick paved fully open square for company/ researchers' activities</td>
</tr>
<tr>
<td colspan="2">- more enclosed open space
- accessible by pedestrian/ bike</td>
<td colspan="2">- strip open space
- accessible by pedestrian/ bike/ emergency vehicle</td>
</tr>
</table>

6.1.5. The public space network

– Axis public space

Axis public space is the primary public space structure of the district, which bears the major pedestrian and other slow traffic (with bicycle, scooter, skating and other motor-free options). In the meantime, it serves as the main venue of daily retails and social activities, as well as the largest negative space in the district that can respond to disasters. One main axis in East-West direction and two secondary axis perpendicular to the main one construct the axis system. The West end of the main axis point at the main access to the district, which links to the historical downtown. The East end of the main axis, on the other hand, connects to the experimental urban farm and the sport park in the East part of the district. An entrance park was planned at the West end of the main axis, while along the central of the axis, the middle and East section were designed into islands of single-storey retails in the form of park. Two large squares are kept at the junctions of axis, which provides general view of the district and are able to host comprehensive events. Secondary axis are designed to be wedge shape opening towards the junction with the main axis, in form of continuous long park. This realizes the visual focus and the congregation of show traffic towards the junction square.

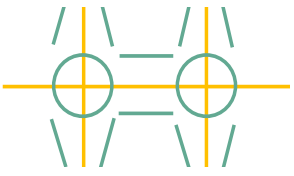


Figure 123: Abstract of the axis space, illustrated by author

The commercial interconnectivity and the interaction between the function of ground floor and the slow traffic were considered in the design of the axis cross section. The planned vertical greenery on the common envelop of the building and the public space (building facade) functions in multiple aspects: in visual aspect, vertical greenery largely and efficiently increases the visible area of greenery for human eyes, which strengthens the perception of greenery; in psychological aspect, as discussed in the sub-research, larger surface of greenery decreases peoples stress and tension, and subsequently it conditions the social ambient of the public space; in environment aspect, it guarantees the biodiversity, meanwhile co-operates with the drainage system designed on the surface of pedestrian ways on both edges of the axis public space to adjust the microclimate for the pedestrian and for the overall performance of the public space and the district.

From the two edges towards the central of the axis, the following main elements were designed: pedestrian and retail interaction zone, green belt with bicycle parking, slow traffic lane, central park in strip island form. The central park consists of buffer greenery (from the slow traffic), landscape greenery, retail chalets and the chalet-front interaction terrace. In the perpendicular direction of the central park (also the main axis), pedestrian paths were arranged for the connection of the two sides of the park. On the Southern side of the main axis, a motor vehicle lane was planned for emergencies in the non-motor-vehicle district.

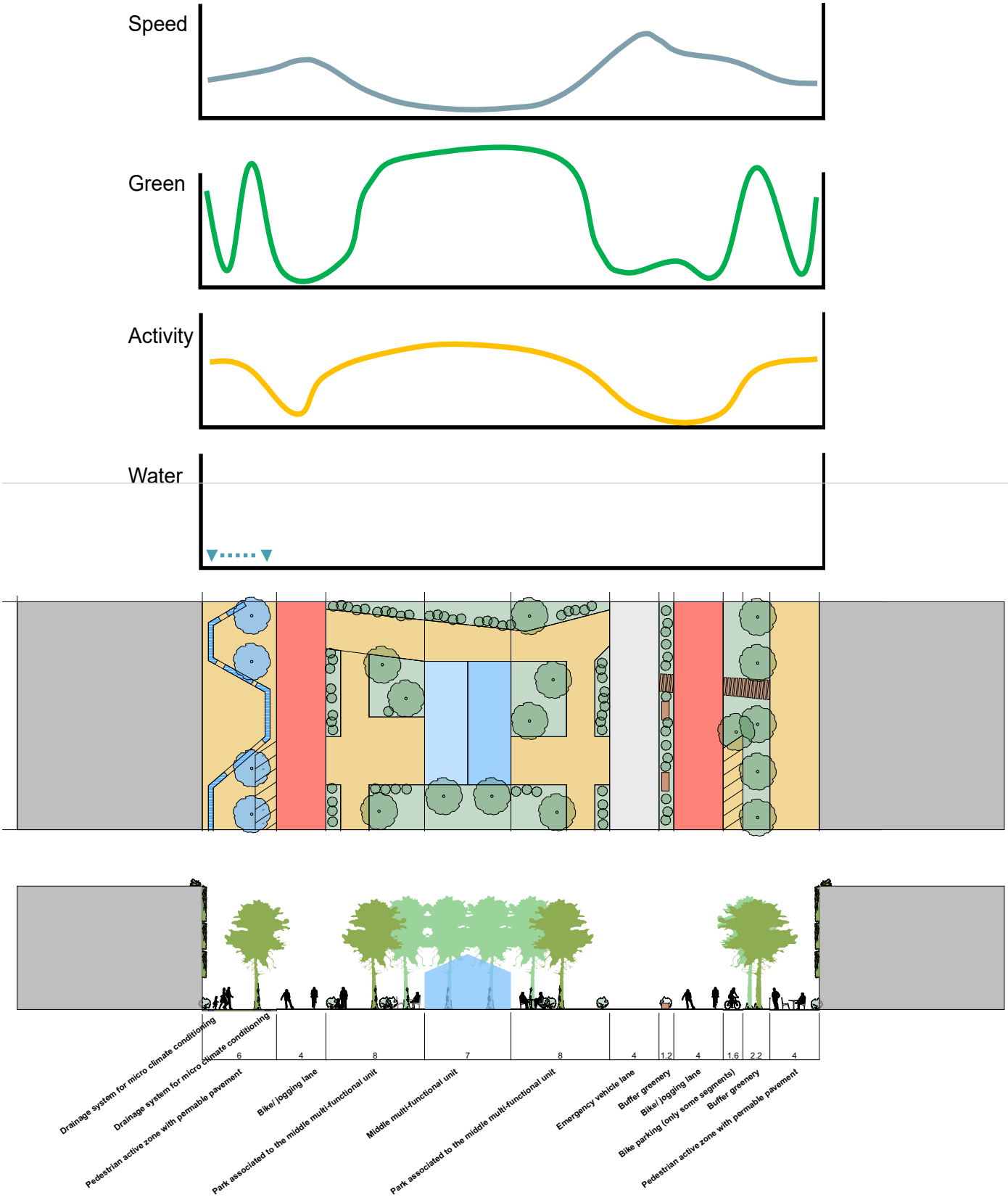


Figure 124: Analysis of different elements according to a section of the axis space, illustrated by author

– In–block squares

The next level of public space is the in–block squares located respectively in the three main functional blocks. There is a in–block square working as the center of the quarter/block of the residential block, the research/new industrial block and commercial/business block. They were designed into different functions and environmental characters to serve with clear target, and work as back–up (secondary) negative spaces to respond to the emergencies or host special events.

– In–block square in the residential block

The planned district is a comprehensive district with completed employment and residential related function, therefore, the defining of resident group need to involve the demand of multiple household types and different age groups.

In the consideration of the ambient of the in–block square, leisure and vitality has to be parallelly presenting. Because of the general public space network design of the entire planned district, different public spaces complement each other in terms of function and specialists. This resulted in the fact that the in–block square in residential block does not bear the responsibility of hosting large scale congregating events, therefore, the square was divided into five sections and designed with targeted facilities for different groups of people. Moreover, series connection components to avoid use segregation.

A North–South direction axis was designed into the in–block square with water surface through out the square (connected with the aforementioned drainage system). The buffer trees along the linear type of public spaces and the planned facade greenery work as green envelops of the in–block square as well.

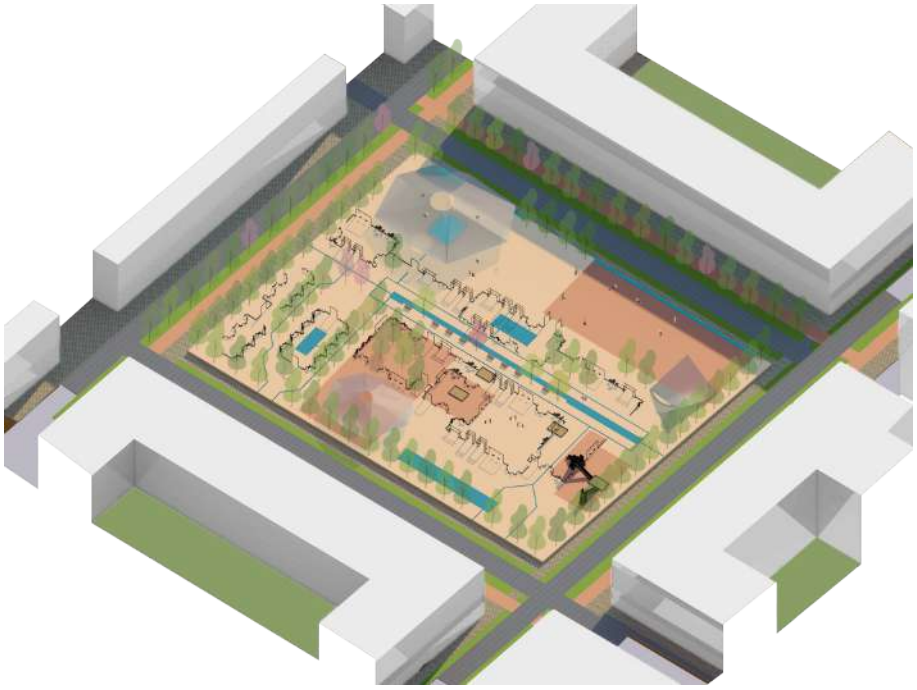


Figure 125: Axonometric view of the residential in–block square, illustrated by author

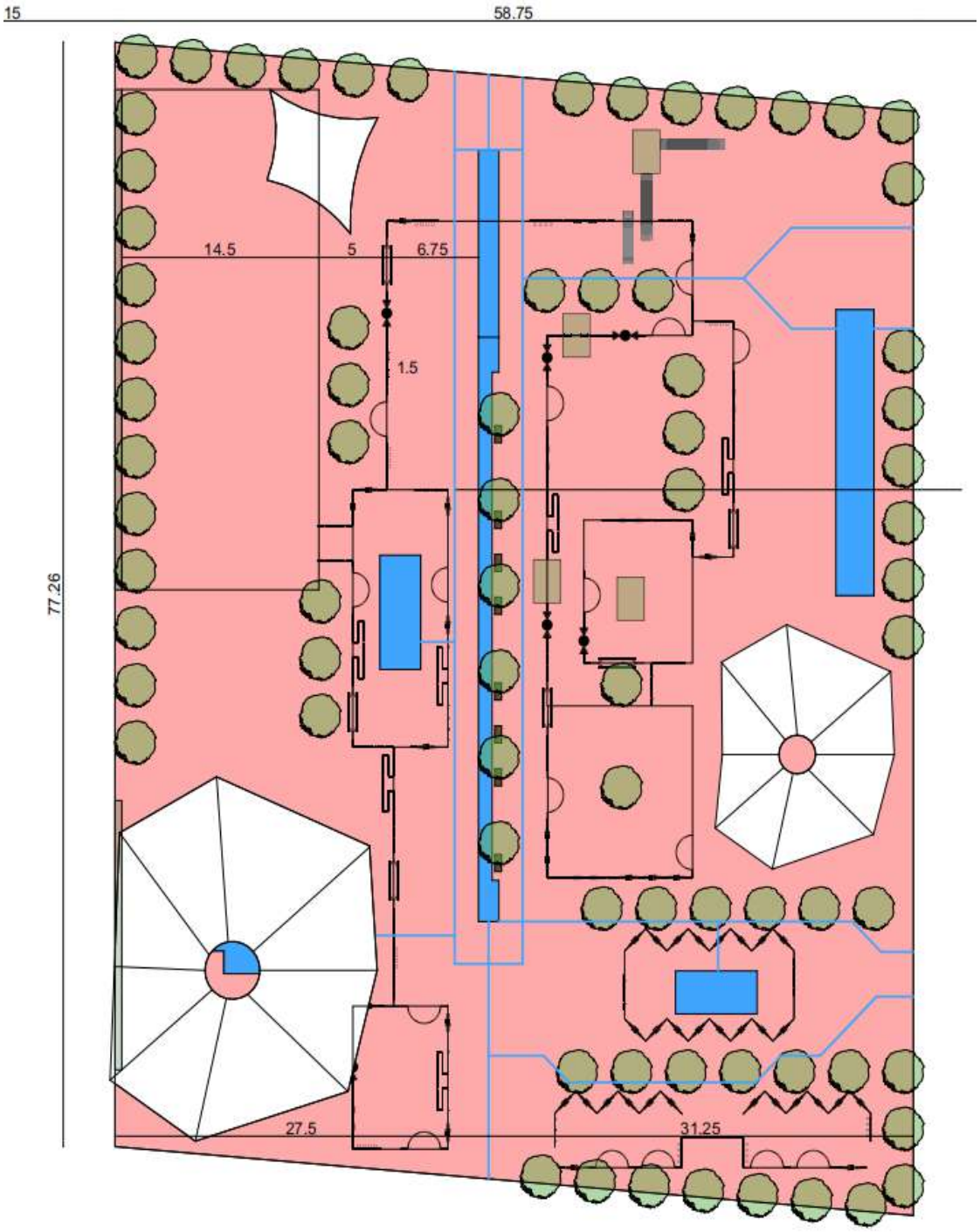
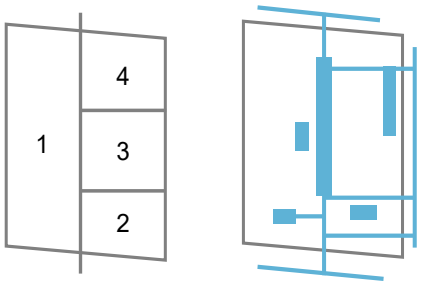


Figure 126: Plan of the residential in-block square, illustrated by author

The prior sectioning was based on age groups to avoid use and experience conflict. The West side and the South side lies the zone for young adults' activities, North side and middle part are respectively for young children and teenagers. Another layer of sectioning is about static and active zone, which is presented by the functions of the series connection components. A skateboard field was designed in the West active section, as well as a mesh structure as a transition towards the static section. The mesh structure can be used for climbing and relaxing, and tables and chairs were provided for consuming under the mesh structure. In the South static/quiet zone, public desks for conversations, work and study were arranged by means of the series connected components. In the North side, young children' s playground and the facilities for parents to monitor and chat were design also in means of the series connected components. In the middle part, a second lower mesh structure was designed for teenagers to climb and play.

The series connecting components are made up with modularized functional facilities. They connect each other and cover the core area of the in-block square. Coordinating with the trees and water system, they construct a very important part of the function and landscape of the in-block square. The components consist of three types of exercising facilities, two types of benches for group conversations, two types of desk and chairs, swing component and special playground components. The composition is defined based on the age group zoning.



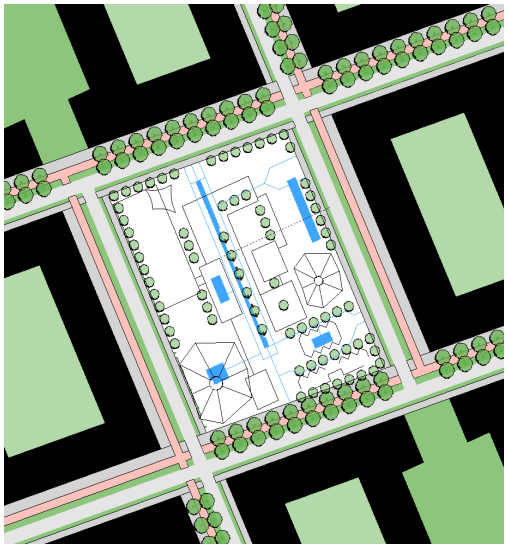


Figure 127–129: Illustrated by author
1. Zoning by age group:
1: Adults activities
2: Adults conversation and working
3: Teenagers activities
4: Young kids activities
2. Water system (connected to the overall drainage system)
3. Plan of the residential in-block square with connection to the context

– In-block square in the research and new industrial zone

This in-block square is located in the center of the block in the East part of the district, where research and new industry dominant. As a result, the main users of the square are the research employees. This area has relatively higher demand of day time working experience. It is necessary to strengthen the quality of work place through public space design. Thus the functional consideration was focused on the supplement of working environment and the quality improvement. Practically it is presented through the design of the composition of modular multi-functional flexible open work place and a park in the middle with the same module. Seeing from another perspective, the in-block square was design into two layers: the wet land on the ground surface and the wood platform above it.

The lifted wood platform is permeable, and with the penetrated water and step-free ground surface, the wet land below could be preserved. This design brings the benefit of making special ecological environment and increasing the water penetration through the ground surface.

The main body of the platform was composed by modular platforms in two meters by two meters. The module arrangement includes the open office part and the green park as well. The sliding panels attached to the open office platform modules could realize the flexible arrangement of space size to comply with different kinds of needs (group discussion, meeting or individual work). Greenery of half modular size is distributed on the outer contour of the office platform. While the park half surrounded by the office platform was designed to be green dominant and equipped with few leisure and exercising facilities for the employees to relax.

Figure 130: In-block square at research/new industrial block, illustrated by author and Lu Chang

Figure 131: Plan of the in-block square at research/new industrial block, Illustrated by author and Lu Chang

Apart from the access from the office platform, the park is open fully to the North linear space as the main access to the in-block square.

– In-block square in the commercial block

Being different from the residential and the research/new industrial blocks, the commercial/business block does not have solid and defined functional demand regarding the in-block square, yet it requires more possibilities and higher congregating ability. Concerning this character, the solution was to design the main body of the square in graphical design manner, and transforming part of the graphics into three dimensional as benches or stage for different event or activities. The patterns of a few kinds of sport fields (e.g. swimming, tennis, badminton, basketball) were re-scaled to produce lively patterns for the square.

The re-scaled patterns and basic geometry shapes constructed the graphical design on the ground surface. Besides transforming part of the shapes into three-dimensional, part of the other graphics were turned into ground surface vegetation and water surface to increase the vitality of the physical environment. The major greenery that effects the square comes from the vertical greenery on the adjacent building facades and the greenery belonging to the connected linear type of public space.

Figure 132: In-block square at business/ commertial block, Illustrated by author and Lu Chang

Figure 133: Plan of the in-block square at business/commercial block, illustrated by author and Lu Chang

– Pocket squares

The application of pocket squares aimed at: On one hand, realizing the community autonomous management of the minor public spaces by users from different functional quarters/blocks, and meantime increase the sense of belonging; on the other hand, further sharing the daily activities at the main public spaces (axis spaces and in-block squares) and increasing the active zones of the planned district, which also means avoiding the polarized difference between the hot spot zones and the normal corridor spaces. The pocket squares in the planned district were distributed in between the buildings, and they act as tip spaces of the public space network. Based on the functional differentiation between quarters/blocks, two types of pocket squares were designed, and respectively applied to the community greenery landscape space and the casual landscape space that could coordinate with the commercial environment.

The 'community greenery landscape' type of pocket square lay in between part of the residential buildings. Greenery and pond landscape are the dominant elements. Traffic was weakened, and walking is promoted. The greenery design took into account the vertical greenery on the adjacent buildings' facades, and constructed immersive greenery landscape. Pond and island landscape in North-South direction lays in the middle and the water is connected to the aforementioned drainage system. On the East and West sides, vegetation were distributed in grid, of which, half side is trees and the other half is low bushes, in order to coordinate with the facade greenery to protect the buildings from sunset glazing.

The casual landscape in the business and research/new industrial quarter/block. The existence of ground floor retails makes the public spaces require more flexibility and vitality than the ones in the residential dominant blocks as well as closer connection to the buildings. A stream flows in North-South direction crossing the pocket park and is connected to the drainage system. The water axis is similar to the pond landscape in the residential pocket park, which forms the basic visual character of the general pocket park design. Towards the East and West side of the park are the pedestrian zone and the front yard of the ground floor retails, which is used to release the vitality of the retails.

– Linear public space – the streets

The linear public spaces are essential elements that form the connection between buildings and public spaces, and between different public spaces. Serving as connecting element, their public functions do not dominant, but the connection function is indispensable. The strip shape does not serve as main venue for activities, but benches for temporary conversation and relax were still planned along the buffer greenery belt. The arrangement from cross-section point of view comes from the axis spaces, excluding the central strip park. This is helpful in the coordination of the overall passage planning (for pedestrian, slow traffic, ground floor retail accessibility, green buffer and emergency lane) and the joints of different public spaces.

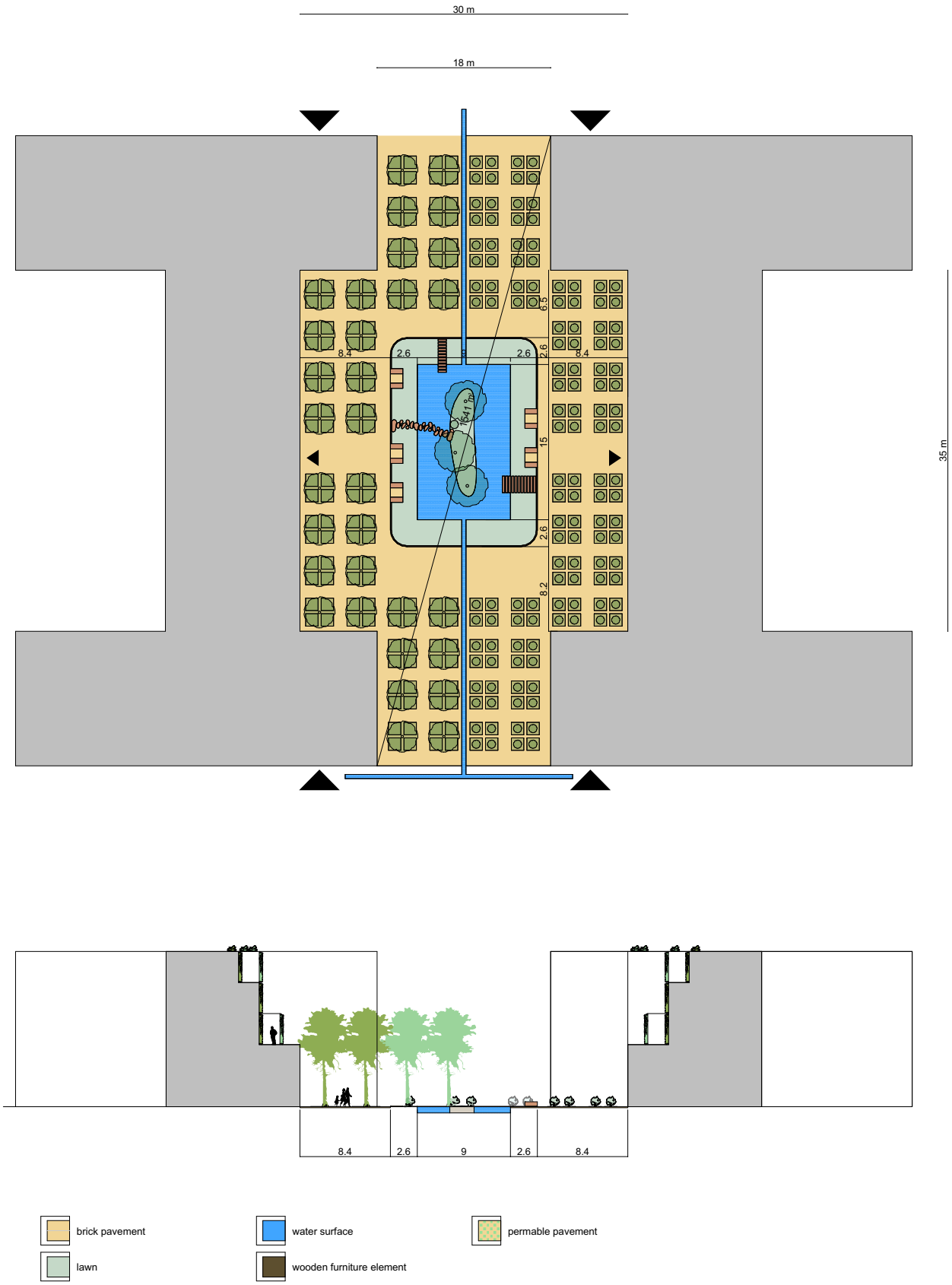


Figure 134: Plan of the pocket parks at residential block, Illustrated by author

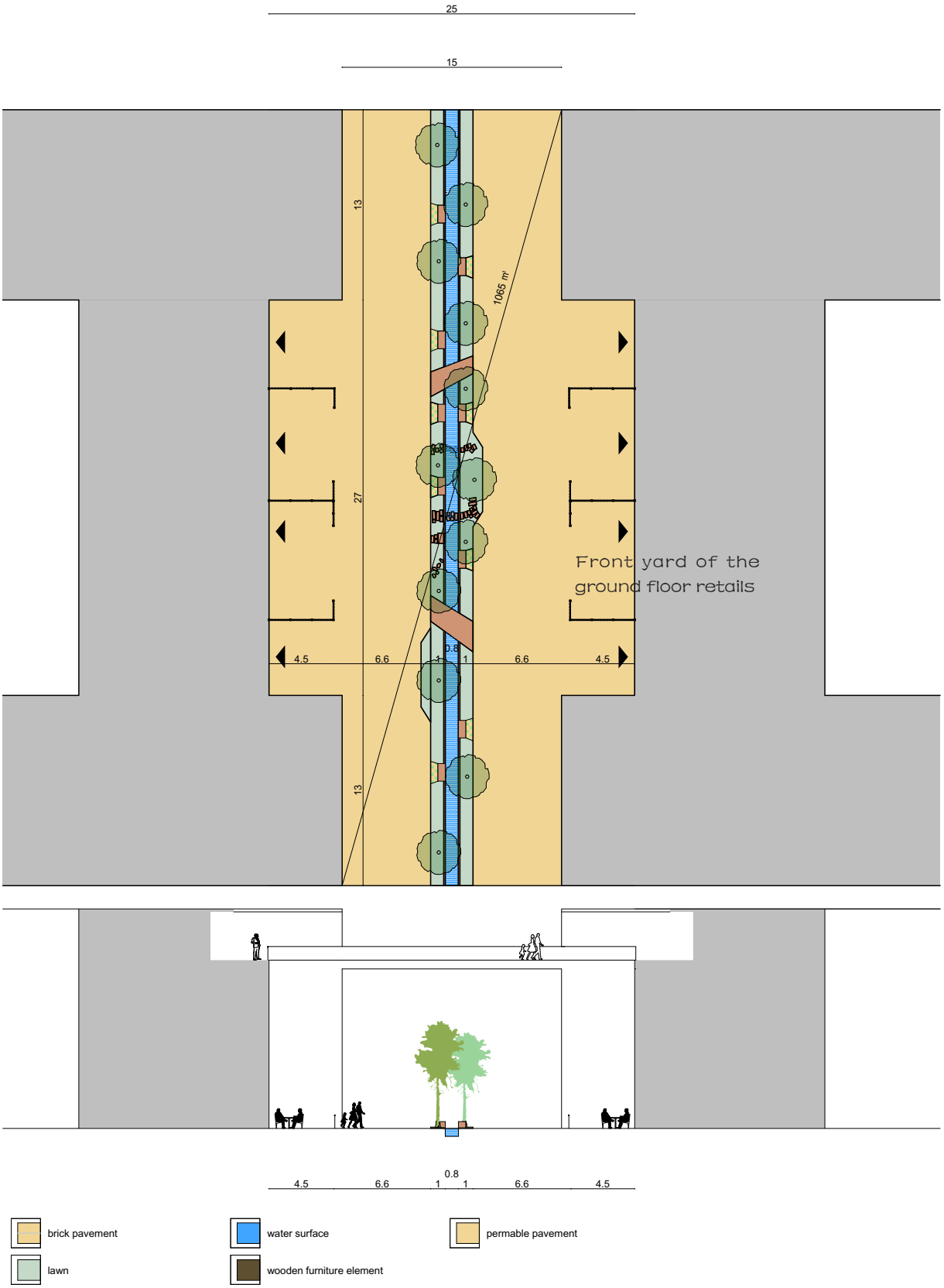


Figure 135: Plan of the pocket parks at business/commercial block, illustrated by author

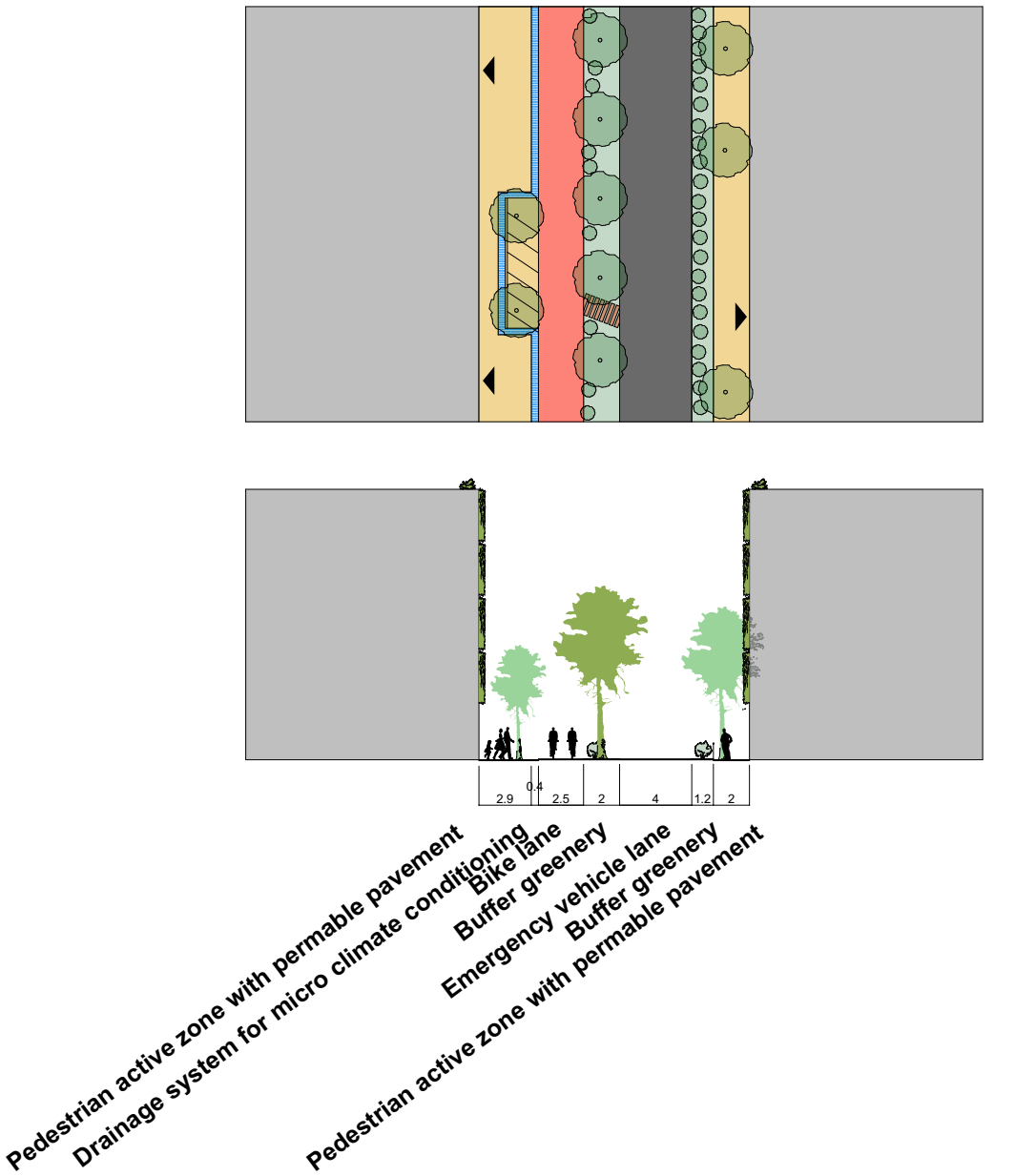


Figure 136: Plan of the linear public spaces, illustrated by author

Figure 137: View of the linear public spaces, Illustrated by author

6.1.6. Sustainability and summary

The project, as a rehabilitation of a barrack brownfield in the city of Pécs, will be finalized and accomplished with the effective combination of the overall spatial planning, building design and public space network. Green urbanism is the urban development strategy of Pécs, carbon-neutral is the main goal of the project, while the design initiated with human-centered concept fulfills the entire planning process.

The general design tried to deliver its understanding of sustainability through three major perspectives: humanistic concern, urban built environment and economy of the new industry. In the dissertation, the overall spatial planning, planning of public space network and the design of single public spaces were explained. They delivered the response to the sustainability in different aspects.

In the overall spatial planning, the revitalization and rehabilitation of the barrack brownfield is a response to the sustainability itself, in urban (town) scale.

Figure 138: Residents' view in the residential in-block square, illustrated by author

This is delivered mainly in humanistic concern and urban built environment: complying with the conclusions of the sub-research of design, demand and human behaviour, the adaptive reuse and rehabilitation of local built environment has the ability to change the mindset of people regarding their opinion of completely new elements and reusing existing resources, and subsequently inspire broader implementation of sustainable lifestyle and mindset; the soil of military or industrial land are detoxified in different extend, so the detoxification of the soil of the barrack brownfield, as an essential step of the rehabilitation, will have qualitative contribution to the development of the urban built environment. In the meantime, the launch of this district enriches the functional diversity of the East part of Pécs and increases the local economy and land use diversity, by means of functional planning and structural planning of the internal space of the brownfield district concluded from the existing functions in the surrounding and the urban connectivity. The new industry, engaged to the researching and carbon-neutral development, could bring new possibilities to the sustainable oriented urban development.

The comprehensive planning of the public space network is part of the significant design of the barrack brownfield district. It is based on humanistic concern and reasonable dispatching of functional spaces. In which, humanistic concern (in this case it could be similar to human-centered concept) is existing through out the design process. This include two facts: highlighting people's use experience and mindset building in the daily use; and the resilience of responding to special situations (diverse big events and emergencies). It strengthens the sustainability of the district from social perspective.

On the other hand, the reasonable dispatching of functional spaces refers to the realization of complementality and specialization of the typology, function and size of the public spaces in different corners of the district by means of public space network. With the coordination of the above, the compatibility of the entire public space system does not decrease, but increase. Besides, the comprehensive planning of the water drainage system, greenery and passage system interconnects the circulation of all sub-public-spaces, so that the public spaces in the district could actively balance with each other.

The design of single public spaces, as described previously, was categorized into four major types and further distinguished in to two minor types due to the functional attributes. The greenery, paving and water drainage system were adjusted based on the different functional block/quarter. The designs were built up on the respect to the fundamental local urban texture and the leading towards sustainable lifestyle, which results in perceivable urban identity and sustainable human behaviour and mindset.

Figure 139: Axis publix space from main entrance side, illustrated by author

6.2. Public space revitalization at Roissypole

As in thesis, durable public space requires pedestrian vitality, which also means interactive and healthy functions that restrain the pedestrian flow.

6.2.1. Introduction

Roissypole is a small district attached to the Paris–Charles de Gaulle Airport (CDG) in France. It bears the residential, service and traveler flow in between the airport Terminal 1 to 3 and the connecting railway Réseau Express Régional (RER). It is equipped with developed traffic access (vehicle lane around and railway transit). The existing public space enclosed by the vehicle traffic was made up with trees and grass land that required more maintenance, but it was not practically used by neither the local residents nor the travelers are using the space. It can be concluded that the existing public space was not efficiently used and needed to be thoroughly upgraded to fulfill the responsibility of vitalizing its neighborhood.

6.2.2. Solving the problem with re-construction of functional public space

To generate and maintain vitality of the district, the upgrading of the existing pubic space has to be a durable space, which means that it is necessary to retain the visitors (residents and travelers). Attracting people to use the space and subsequently keeping the visitor for certain amount of time instead of passing away are the goal of the revitalization design. Social quality of public spaces contributes fundamentally to the quality of individual lives and society as a whole.

Active participation can be used to generate the sense of identification and increase satisfaction [6]. The solution was to reconstruct the public space from function perspective. Specifically speaking, to provide diverse and flexible time-consuming functions that retain the visitors to stay and healthy relaxing function for both local residents to regularly use it and travelers to use as a relaxing program.
The public space covered the area from the existing grass land on the West, over the railway station, and until the blank bitumen paved space. Market, panorama platform and jogging ramp were the three main functions applied respectively to the three sections of the planning area. Complying with the site character (dimensions and the existing station building), The functions were put in the order of market – panorama platform – jogging ramp, to realize the transition from commercial active zone to healthy quite zone. They present as a public space union and three different public spaces with separated functions.

6.2.3. Three levels of market place

The market zone is highlighted in the overall public space revitalization design due to its congregating function and potential active pedestrian flow. A three dimensional market was designed with three levels of platforms (ground level, middle level and top level). The ground level and the top level were installed with retail chalets to strengthen the identity of traditional market place that belongs to the local cultural character. Chalets stack in rows along the longitudinal direction of the market zone. The middle level platforms were designed as connections between the North and South wings of the market, and as a result, a three dimensional market place with convenient interconnection were created.

6.2.4. Greenery penetration into the market space

Besides the three dimensional market platforms, the landscape greenery integrated to the market place were also designed to penetrate all levels. The higher level greenery was realized by having "fromage" hollow shapes on the platform to welcome the trees on the ground level. Benches were designed around the hollows to utilize the shadows and greenery. This part of the landscape greenery design strengthened the three dimensional market concept by integrating penetrating greenery to the designed built environment.

Figure 140: Existing greenery and three layers of market place integrated, illustrated by author, He Honghao and Lu Chang

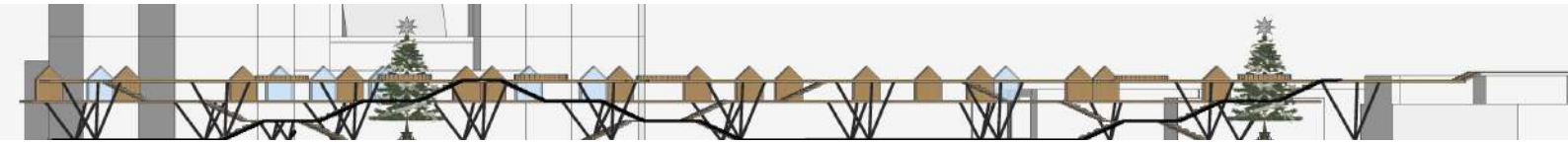


Figure 141: Illustrative longitudinal elevation view of the martket place segment, Illustrated by author, He Honghao and Lu Chang

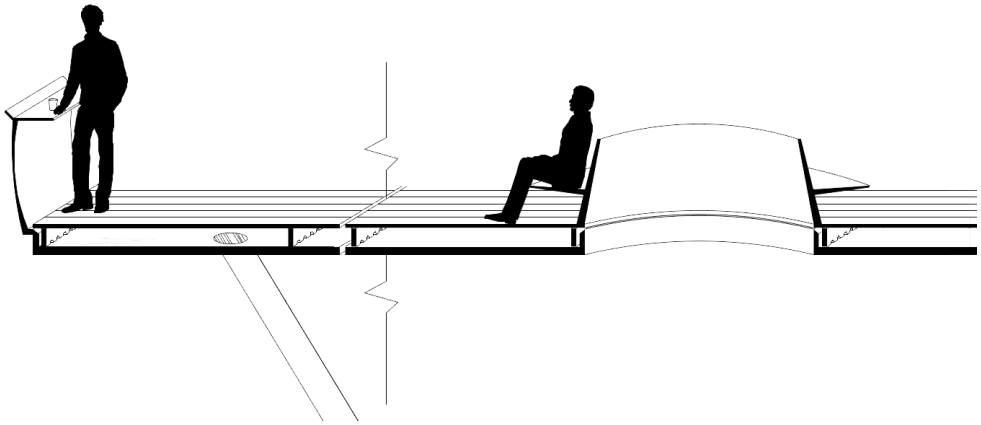


Figure 142: Sample section of market platform, Illustrated by author, He Honghao and Lu Chang

6.2.5. Platform and user interaction

The market platforms were designed both in general form and their structural possibility, so that they could serve creative pubic space, comfortable comsuming environment and meantime sustainable water collection strategy.

The consuming area is located along the edges of the highest platform where chalets do not exist. A ring of table was created with a height that people can stand and consume for a short period of time. The reason of designing the consuming area without sitting option, is that, on one hand, the airport travelers occupy the majority of the active users, mobility and short period fast cosuming is more dominant, on the other hand, sitting option was implemented along the center line of the platform to form a slower paced core of the market platform.

The seats are located around the hollows that were designed for the greenery penetration, in order to reach the closest co-relation between time enjoying and nature.

The slab of the platform was designed into double layer: load-bearing slab and wooden deck. The wooden deck enables water to penetrate, so that the floor surface gets efficiently drained and the water could be central collected towards the pipe attached in the supporting column structures.

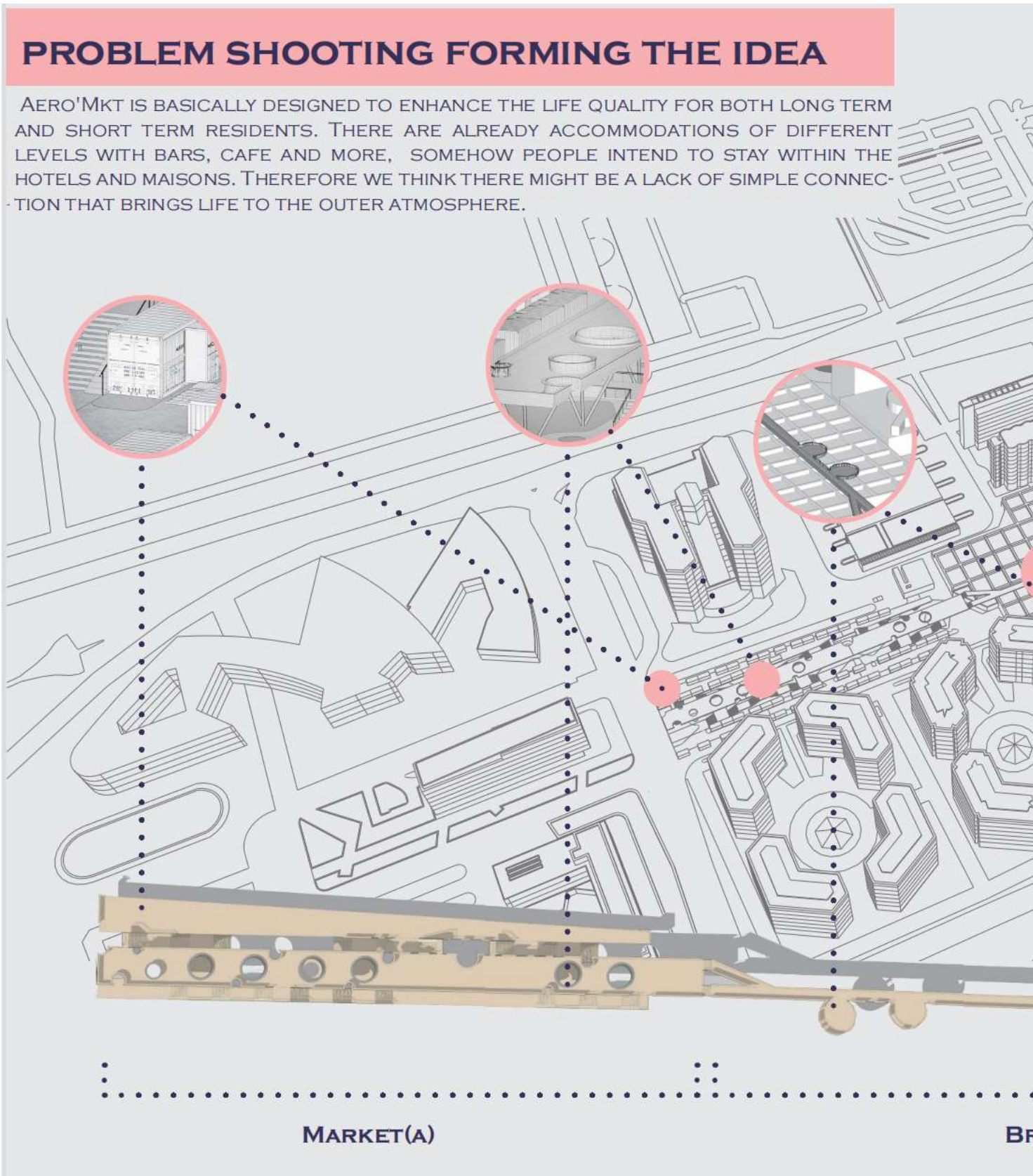
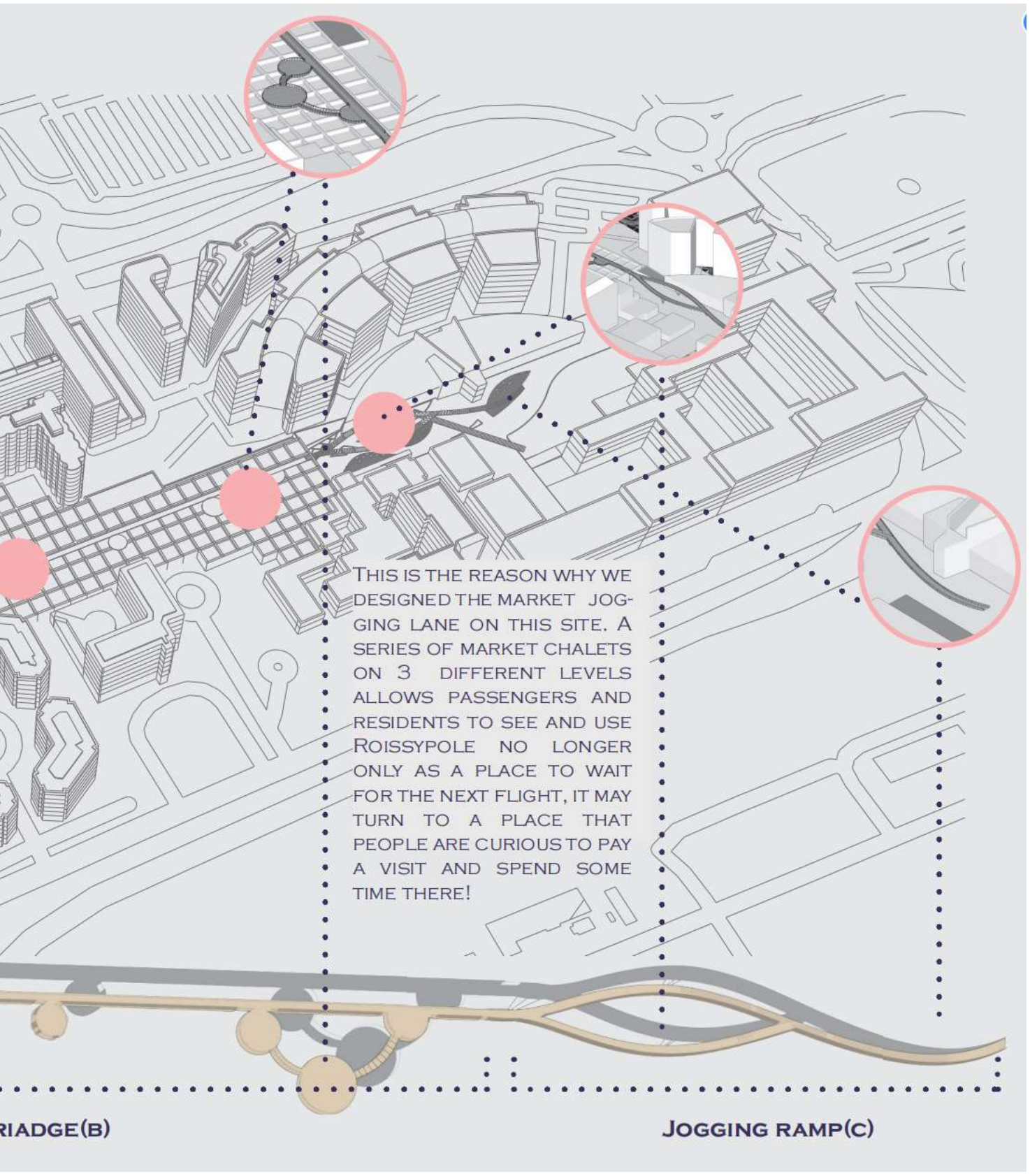


Figure 143: Comprehensive analysis of the designed structure, illustrated by author, He Honghao and Lu Chang


This is the reason why we designed the market jogging lane on this site. A series of market chalets on 3 different levels allows passengers and residents to see and use Roissypole no longer only as a place to wait for the next flight, it may turn to a place that people are curious to pay a visit and spend some time there!
RIADGE(B)
JOGGING RAMP(C)

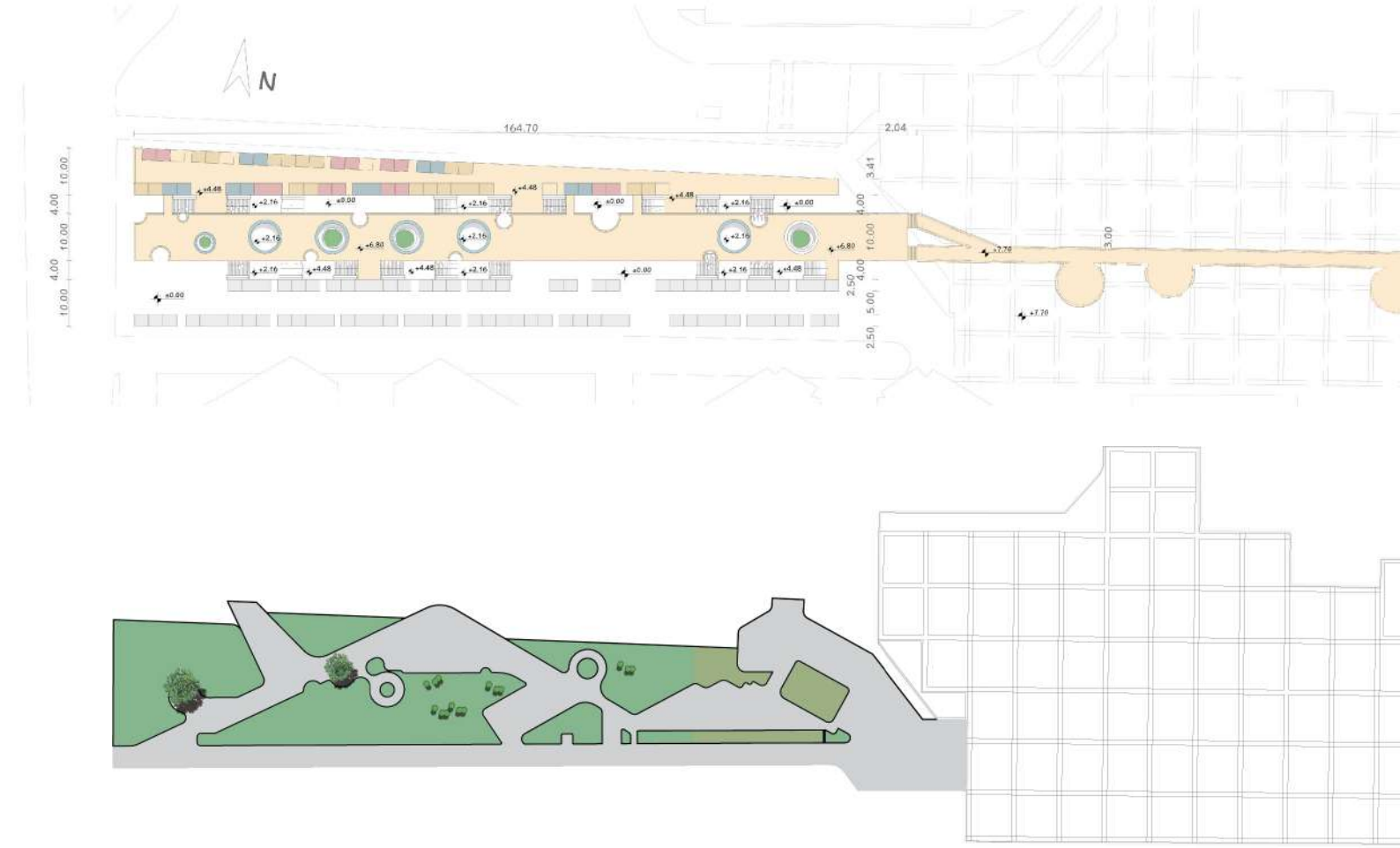
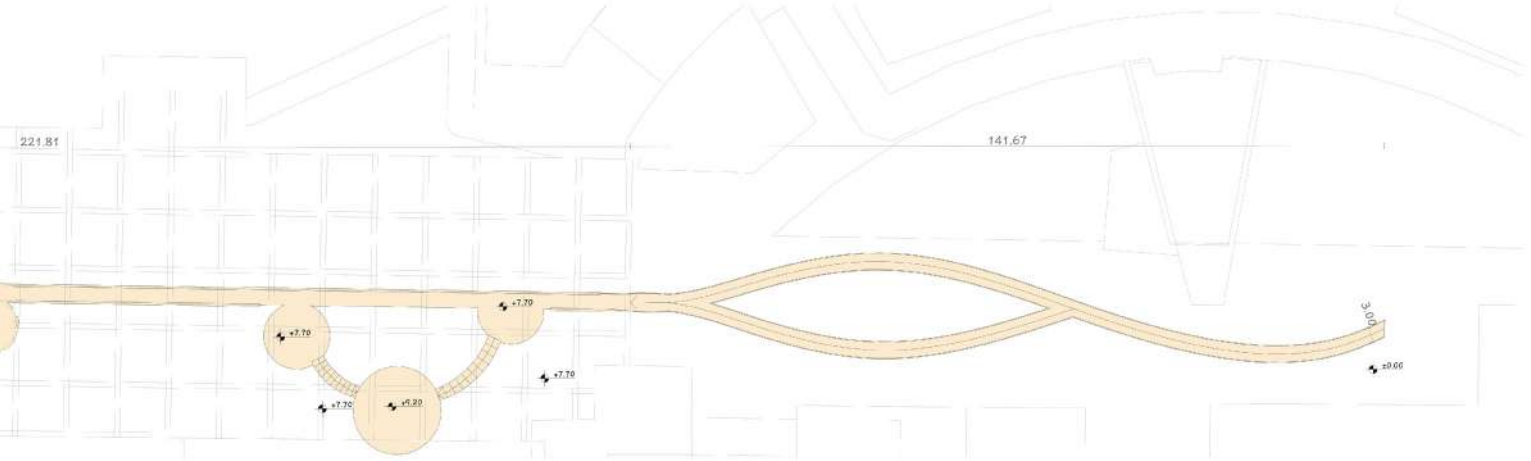


Figure 144,145: Illustrated by author, He Honghao and Lu Chang
1. General floor plan
2. Landscape plan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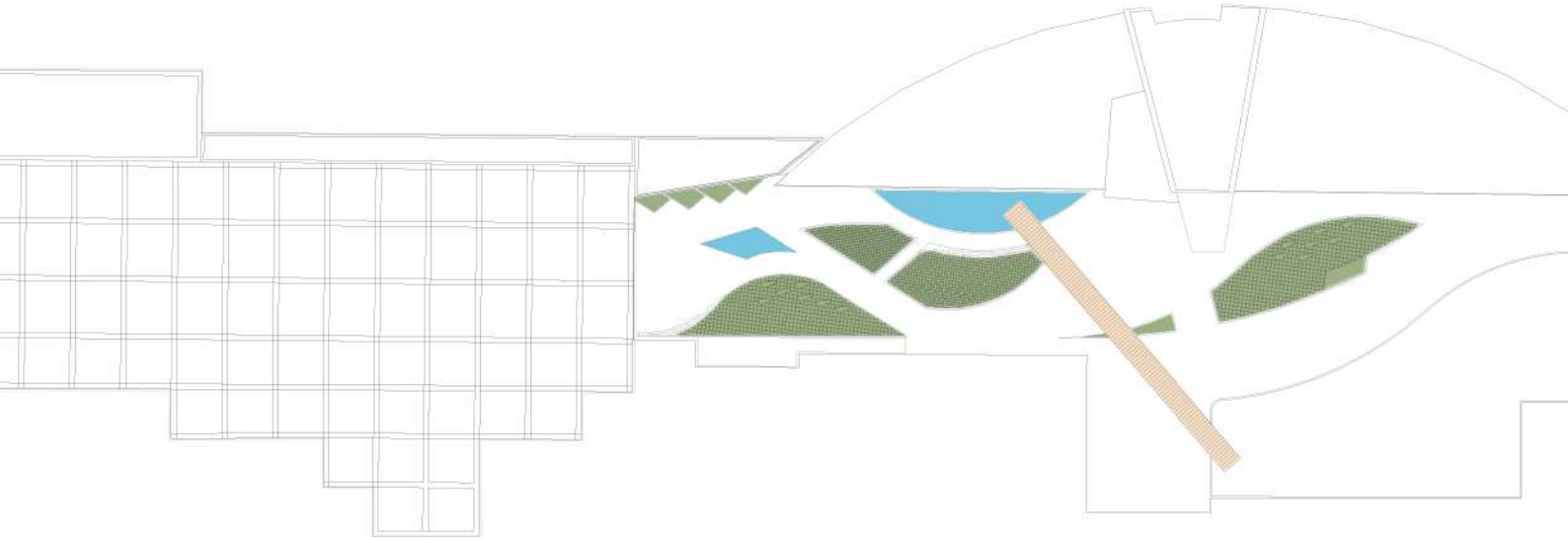
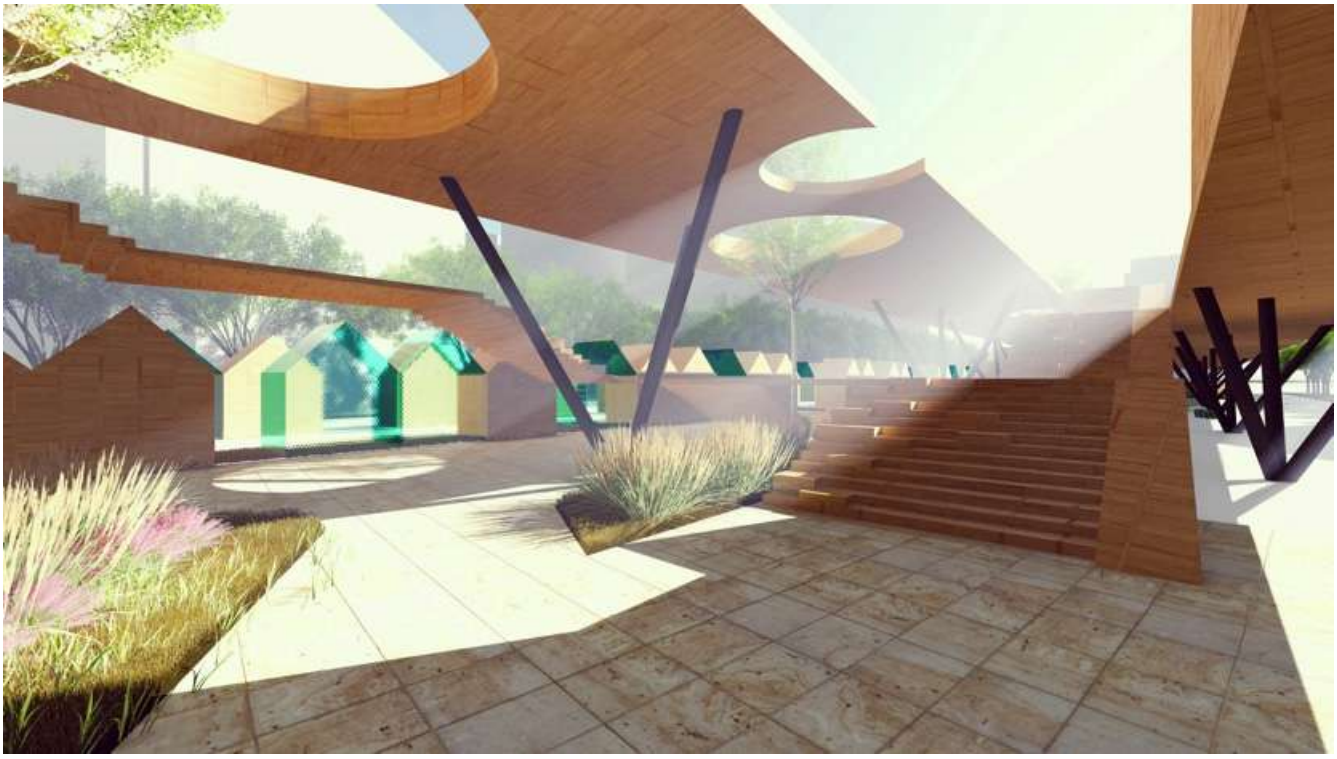


Figure 146, 147: Over view of the market place part (up: chalet option, down: container option), illustrated by author and design team



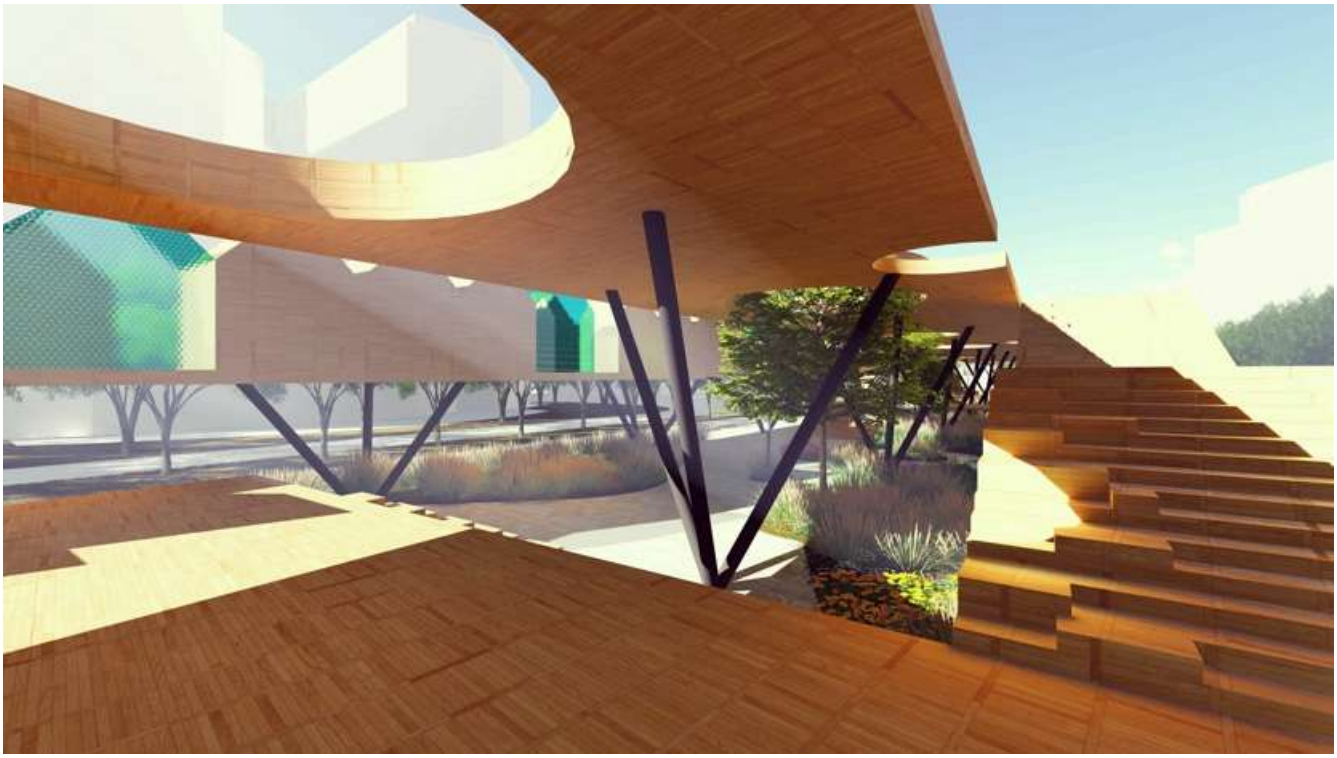


Figure 148, 149: illustrated by author and design team
1. Ground level of the market place
2. Middle platform of the market place

6.3. Public space revitalization at Budapest Town Hall

1. Town hall park to be rehabilitated

The design is an rehabilitation of the public space at the North-East open yard of the Budapest town hall. The existing open space could be considered as a combination of parking square (belonging to the town hall), "town hall square", pop-up park for temporary installations and exhibitions including a tree-lane promenade. The general space could not be simply considered as a square or a park of any kind due to its functional space of multi-degree. The functions existing in the current space and environment is diverse and interesting for local citizens, but indeed it cannot be avoided that there exists elements that do not comply with the contemporary and future use, experience demand and value. Thus, as part of the urban public space network, as well as a enormously visited urban public space, this area deserves a rehabilitation design,which refers to: 1) the adaptive rehabilitation in both ecological and humanistic dimensions, 2) the renewal of the attribute of the space, 3) the rehabilitation of the overall space of the designated site.

2. Character defining

The characters of the designated public space were sorted into two types: internal environment and external connections.

2.1. Internal environment characters

The internal environment characters are delivered in physical environment and social use.

- Physical environment

The designated area includes the entire open yard behind the town hall building (the main body) and two small courtyard fully enclosed by the town hall building. The main body is half enclosed by the town hall building. To be precise, all edges of the space, except for the North-East edge, are enclosed, while the open edge lies by one of the busiest "ring" street in the city: the Károly körút. The three facades directly connected to the designated design area have generally white plastered facade surface with Baroque -styled layout and ornaments, thus they are worth being considered as import characters in the overall rehabilitation design. The main facade facing Károly körút, however, has a segment of modern facade in the middle of the whole length. Modern openings and layout were implemented in this segment, which was applied at a different era in the history. This segment has obviously different attribute than the Baroque -styled segments. At present, this could be a disadvantage due to the disharmony. But considering the methods of renewing building facades and the conclusion: "facades are envelopes of both the building and the adjacent public open spaces", it could be treated as an opportunity as well.

In the meantime, a segment of historic city wall lies across the site diagonally, adding historical and educational value to the site. The city wall does not show itself on the ground surface, instead, it exists in the shallow earth beneath the ground surface, and requires preservation, respect and attention. This fact provides the design concept with a given approach.

– Social use

The site' s value regarding social life is delivered as following: existing as an urban public space in the backyard of town hall, the spirits it carries and the activities that citizens expect are full of clear specialist. The logic is the same as that the ont square of a church, urban green land or other special public spaces having their respective characteristic activities and ambient. The designated design area (especially the main body) bears the demands of the citizens for daily urban life, information and education. In this background, the main objective of the rehabilitation of the "public space behind the city hall" becomes clear.

The site's connections and linkages with the surrounding area, the urban public spaces network, the urban destinations, the existing roads and public space axes with the adjacent street space, the closely related public transport connections and the associated green linkages should all be taken into account in the concept.

2. Problem analysis

2.1. Parking place in the existing "town hall square"

The outdoor parking area, mainly used by the town hall, currently occupies a huge proportion of space in the site, and inevitably uses large area of impermeable paving, thus the area is greatly exposed to the sun. This prevents the infiltration of water below the surface and prevents the respiration of the soil, and therefore natural microclimate regulation, consequently, it leads to worse local microclimate and local urban ecology that is poor and unsuitable for people. For the renewed urban public space, the rigid demand for parking, considering the function and ambient, necessitates an additional search for a substitution location, paving and organization.

2.2. Building facade

As mentioned above, the condition of the facade of the town hall, which is directly linked to the area of public space rehabilitation, is not perfect. The main problem arises on the long facade facing the main road, where a clearly incongruous segment of the modern office facade appears right in the middle of two baroque facades. It is expected that this incongruous section of elevation could be transformed from a flaw into an opportunity, and try to preserve the existing wall in the rehabilitation rather than just demolish and rebuild it because of cosmetic issues, because such thinking itself is contrary to the concept of sustainability and the modern theory of architectural synthesis. To take advantage of this opportunity, it can be an important element of the vertical orientation of the unified design language of the overall rehabilitation design, as a unique and interesting update of this 'distinctive' facade segment.

On the other hand, the Merlin Theatre in the southern part of the site, although not in need of regeneration, has a blank northern facade facing the main part of the site compared to the more distinctive facade in the East–West direction, which needs to be taken into account in the general rehabilitation plan.

2.3. Making use of the value of the site

The site's location and value for connectivity in the city is not fully exploited in the existing public space. The proximity to a number of major, popular public spaces in the city and the close proximity to a variety of public transportations make it worthwhile to explore the public function of this site in more depth. This should be coordinated with the existing functions of other popular public spaces in the vicinity, the character of the space attached to the town hall and the accessibility of the site.

3. Important features and their opportunities

3.1 The historic city wall

As previously mentioned, a segment of the historic city wall runs diagonally across the rehabilitation site under a shallow surface, the valuable element needs to be preserved and presented to the world. The fact that it is located behind the town hall reinforces this decision. From the point of view of the site plan, this section of the wall divides the site into two areas, East and West, which can be taken into account in the functional and spatial design. In combination with the idea of highlighting its interactive and educational significance, it provides the basis for a space depth (as opposed to plain) on the site, which allows for a renewed public space that is not confined to the landscape design of only the surface.

3.2. The ground floor corridor of the town hall building

The layout of the ground floor of the building around the rehabilitation site was found to be suitable for a new leisure commercial development that fits in with the public space, taking into account the plan of the town hall. The organisation of the public space based on the integration with the building function allows for the consolidation of the commercial function activity of the site close to the building area.

3.3. The landscape language of the "Pop–up Park"

In addition to the temporary installations that have been replaced, the existing pop–up park also has a number of bubble–shaped green landscapes that have been designed to be spread out over a long strip of street frontage. Located in a dense area of public transport and urban destinations, especially at the stops of the Airport Express, the pop–up park could even be considered one of the city's exhibition parks to the world visitors. Its design language can be drawn upon and respected by the design of the renewal, while at the same time stimulating the public's affection for the original park.

3.4. Tree lane promenade

A well–maintained tree lane promenade exists behind the flash park, which is currently well visited and well used, and is mainly used for sporadic recreational walks due to its distance from the footpath and the isolation by the pop–up park.

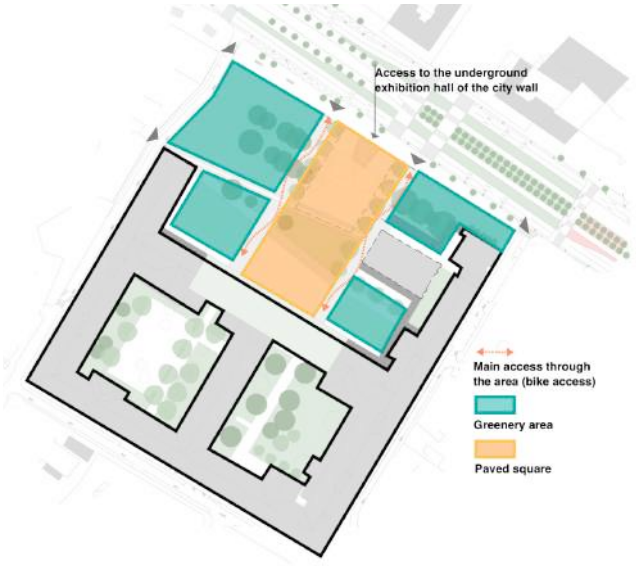


Figure 150: Space attribute, illustrated by author and design team

Based on the quality of the trees, they are worthy of being retained and the original pleasant scale of the area makes it worthwhile to retain its recreational walking attributes in the regeneration plan. However, the re-organisation of the greenery will shift the proportion of paving and overall ambience.

Additionally, considering the green landscape of the main road, the greenery component of the rehabilitation plan should echo the greenery outside the designated site.

3.5. The two inner courtyards enclosed by the town hall building

The town hall building, in addition to the main space that half encloses the regeneration site, has two internal courtyards that are nearly square in shape. They are more private and need to be renewed for more pleasant parks for internal use and practical functions.

They are also good destiny for the car parking that was originally placed outside. However, they still need to be well connected and interconnected with the town hall building and the public open space outside.

4. Forming and expressing the concepts

4.1. Transforming of the "Park"

The main components of the rehabilitation site was a car park, a tree lane promenade and a pop-up park, with the exception of the pop-up park, the rest were defined as the town hall square. In the rehabilitation concept it is expected to give the public the impression of a "park" with both park and square concepts, but one that is pleasant, rich in possibilities and eco-friendly.

4.2. The organisation of functions

In terms of the organisation of functions, the original functions will be retained in various forms and relocated to replacement spaces. For example, the car park formerly used by the town hall has been relocated to the internal courtyard of the town hall building, with sufficient greenery and permeable paving to create a more eco-friendly and pleasant outdoor space. The area formerly occupied by the car park has been integrated into the overall public open space plan, with a gallery forecourt, a gathering space and a walking-relaxing space. The former pop-up park has also been integrated into the recreational areas of the site, in symbiosis with the greenery.

Figure 151: Functional spaces, illustrated by author and design team

Generally, the northern and southern parts of the site have a leisure theme, while the middle is a flat site medium created for various gathering events. The northern end near the metro station hosts leisurely walks and pop-up exhibitions, while the permeable paving in the north-west can be used to evolve into a linked platform in conjunction with the ground floor retail of the town hall building. The southern corner, however, forms a relatively enclosed forecourt connected to the gallery planned to the south side of the building, providing a quieter atmosphere than the other areas. At the access point to the main zebra crossing on the East side, a passage is designed to enter the underground exhibition area, which is dedicated to the display and education related to the historic city wall.

4.3. Bi-axis

There are two axes crossing each other. The two axes can be understood as spatial and historical expressions respectively. One of them is in perpendicular direction of the main street, pointing to the Modach Imre square on the opposite side of the street, forming a cross axis with the main road and reinforcing the connection role of the existing main zebra crossing. Formally it reinforces the sense of ritual of the urban public space at the town hall and the weight of the axial gathering activity space. At the same time, it highlights the large vertical greenery applied to fix the facade at the end of the axis. The other axis starts from the northern end of the park, along the underground city wall, and points to the originally blank facade of the former Merlin Theatre.

This facade has been designed with vertical greenery accordingly.

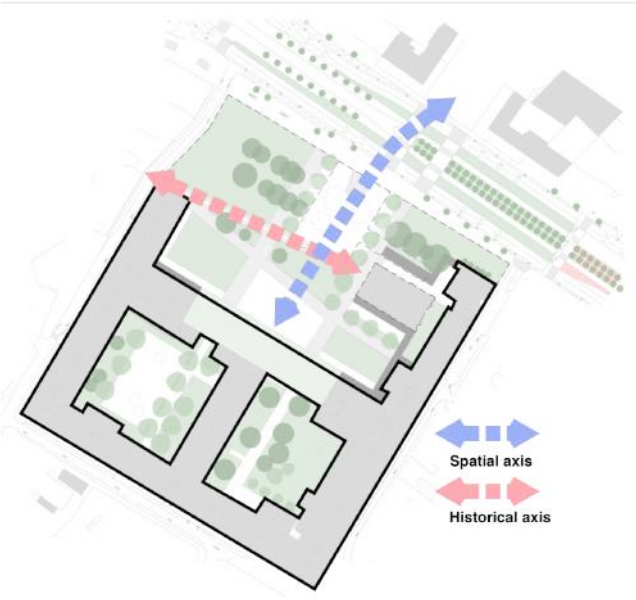


Figure 152: The two axes, illustrated by author and design team

It can be interpreted as a secondary axis, highlighting the presence and orientation of the underground walls from a historical perspective. This also draws attention to the history of the building and leads to the eastern entrance of the underground space designed for the exhibition of the wall and its history.

4.4. Organisation of greenery and biological care

The site's rehabilitation plan is greatly weighted towards green urbanism, pleasant spaces and eco-friendly green design. More than 50% of the surface area has been designed as green areas. At the same time, different types of greenery are planned for the ground surfaces, spaces and vertical surfaces. These take the form of lawns, free trees on lawns, trees in hard paving area, small-scale shrubs, vertical greenery on walls and permeable paving combined with grass.

The original tree gallery has been retained and its surface has been replaced with lawn for recreational use, which is closer to nature. In the previously mentioned blank facade of the theatre and the modern segment of the town hall building that is clearly standing out from the baroque facade on either side, living wall and green facade structures are applied respectively. By increasing the visual green surface through the green surface in the vertical direction, strengthening the green city, giving back the ecological diversity of the city and strengthening the ecosystem's autonomous regulation, the urban life experience could be upgraded in the rehabilitated site.

4.5. The expression and inner meaning of the historic city wall

The external expression of the wall is presented through the secondary axis of the park and the submerged underground gallery on the main axis. The secondary axis uses two types of hard paving to represent the position and thickness of the wall. The subterranean exhibition hall, on the other hand, is accessed by a tunnel entrance on the east side and provides a historical and educational view of the protected wall and its associated history in the underground space.

4.6. Space diversity and multi-dimensional layers

Space diversity is delivered by the zoning separation and combination of gathering-friendly and leisure-friendly spaces in the rehabilitated site. Gathering-friendly spaces refer to the hard-paved spaces in the middle, which create spaces for medium to large gatherings, as well as for daily street activities and temporary exhibitions that require hard base.

Figure 153, 154: Green facade at the town hall facade and the living wall at Merlin theatre facade, technique drawing by the design team

The leisure-friendly spaces refer to the predominantly green surfaces on the north and south sides, which provide more natural places for everyday leisure and can also be used for different kinds of installation exhibitions.

The multi-dimensional layer is reflected in the rehabilitation plan's enhancement of underground space, ground surface and vertical spaces. The overall rehabilitation plan is divided into a subterranean level, a surface level, and an upper level that is extended by vertical greenery.

4.7. Vitality as an urban public space

As a potential key urban public space, it is expected that the rehabilitated town hall park will play an important part in the effective public space network. Leveraging its town hall context and ecologically caring urban experience, it could play a different role than other destinations such as the surrounding parks and squares. This rehabilitation does not add new destinations to the existing system of urban public spaces, but rather it is an iteration of an existing urban space at the intersection of public transport and various functions, in line with urban identity, accessibility expectations and future sustainable urban development.

5. Summary

Generally, this is a project that integrates and rehabilitates a space that has not been given the attention it deserves in the existing urban public space system. It updates and upgrades this town hall park in terms of both urban connectivity and its own qualities. The design of the rehabilitation applies part of the thesis of this paper, which are:
-Firstly, the design identifies the public space of the site as an integral part of the urban public space system, defining the role and responsibility of public space in the city.
-Secondly, the design intends to complement and differentiate the function and ambience of the public space from other existing urban public spaces in the immediate neighbourhood in order to achieve a multi-polar network of public spaces.
-Thirdly, the design language of the target site renewed the relevant vertical surfaces in a series of ways, mainly to enhance the visual experience of the public, the experience of use, the return of ecological diversity and the autonomous regulation of the microclimate by nature.
-Last but not the least, the space is given as many functional possibilities as possible, expanding the groups and frequency of use, enhancing the vitality of the space and making it a lasting and active urban public space.

In addition, the presence and focus of the ancient city wall, together with the depth of the greenery, gives the regeneration plan a double dimension of history and space. The expansion of the user groups adds a third dimension of breadth in the form of people.

Figure 155,156: by the design team
1. Overview of the rehabilitated town hall park
2. General site plan focusing on the greenery

7. Conclusion

The dissertation presented the research concerning the urban public space rehabilitation and place making in European town by means of sub-researches and corresponding design practices. Public space is people' s common home outside their own house or apartment, it is also one of the stages that present the details of urban healthy and sustainable ambient. Therefore, the sub-research part of the general research initiates from both people (as micro perspective) and urban (as macro perspective), and involved several topics. It tried to discover the actions that could be taken onto the existing streets, squares, and the potential community and neighborhood space in the urban context. The results were further extracted into theories and concepts that worth being considered as part of the process of public space design and, further more, urban planning.

The numerous built stock (as defined in the introduction chapter) deserves delicacy utilization and rehabilitation. And the scope of urban public space requires more generalized understanding (for example as explained in the sub-research, the facade of stock building should be understood also as the envelop of public space and therefore be utilized more efficiently to both interior and exterior performance). In terms of the practical planning of the reuse and rehabilitation of public spaces, the interaction between functions and human activities should be considered, because only constant use and stay of people can bring vitality to the public space and make it durable. On the other hand, the planning of the interaction between multi-spot public spaces should be considered together with the design of single public space, to construct the complementation between the public spaces instead of perfectly fulfilling all the demand of the nearby users in the public space.

Generating more destinations in the urban context to mobilize the user for a stronger mobility and urban connectivity is an significant advantage of planning a public space network.

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9. Publications

9.1. Published Journal Article

1. Inspiration of the potential of a typical residential area – a practice design study at Roissypole

LU Chang, HE Honghao, ZHAO Tianyu, BORSOS Ágnes, GYERGYÁK János
Journal title: Pollack Periodica
Print ISSN: 1788–1994
Online ISSN: 1788–3911
Publication year: 2021
Volume: 16
Issue: 1
Pages: 157–161
DOI: https://doi.org/10.1556/606.2020.00175

2. A Study on the Impact of Design and Planning on Custom, Culture and Living Environment

ZHAO Tianyu, GYERGYÁK János
Book series: Advances in Science, Technology & Innovation (ASTI)
Electronic ISSN: 2522–8722
Print ISSN: 2522–8714
Journal title: Resilient and Responsible Smart Cities
ISBN: 978–3–030–86499–6
Publication year: 2022
Issue: 2022
Volume: 2
Pages: 267–278
DOI: 10.1007/978–3–030–86499–6_23

3. The role and potential of adaptive reuse of heritage buildings in the multi–dimensional upgrade of the mid–Europe township–Pécs, Hungary as an example

LIU Shaha, ZHAO Tianyu
Book series: Advances in Science, Technology & Innovation (ASTI)
Electronic ISSN: 2522–8722

9.2. Published Conference proceeding

1. 300 CC Co-living & It's Co-Living Apartment for young people in Beijing

ZHAO Tianyu, LU Chang
14th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2018

2. Relationship between urban rehabilitation of built heritage and local inhabitants, Case study on Chongqing Road, Tianjin

ZHAO Tianyu, GYERGYÁK János
The 6th International Academic Conference on Places and Technologies Conference Proceedings, 2019

3. Micro-Apartment and Co-living design approach

ZHAO Tianyu, Shaha Mazen MAITEH, LU Chang
Interdisciplinary Doctoral Conference 2019 Conference proceedings, 2019
ISBN: 978-963-429-378-1

4. Inspiration of the potential of a typical residential area – a practice design study at Roissypole

ZHAO Tianyu, HE Honghao, LU Chang, GYERGYÁK János
15th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2019

5. Experimental study on fragmented greenery and the pedestrian way's efficiency of use in the city of Pecs

ZHAO Tianyu, MAITEH Shaha, LU Chang, BORSOS Ágnes, GYERGYÁK János
The City and Complexity:Life, Design and Commerce in the Built Environment Conference Proceedings, 2020

6. Enhancing Eagle Pass – Piedras Negrass International Bridge design to function as temporary accommodation facility for asylum seekers

Shaha Mazen MAITEH, ZHAO Tianyu, LU Chang
The 7th International Academic Conference on Places and Technologies Conference Proceedings, 2020

7. Strengthen walkability by pedestrian way: The fragmented greenery approach ZHAO Tianyu, Shaha Mazen MAITEH, LU Chang

16th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2020

8. Case study of neglected façades and their adaptive reuse

ZHAO Tianyu, Shaha Mazen MAITEH, LU Chang
16th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2020

9. Rethinking modern housing crisis in metropolitan cities: the case of San Francisco

Shaha Mazen MAITEH, ZHAO Tianyu, LU Chang
Interdisciplinary Doctoral Conference 2020 Conference proceedings, 2020

10. The role and potential of adaptive reuse of heritage buildings in the multi-dimensional upgrade of the mid-Europe township-Pécs, Hungary as an example

LIU Shaha, ZHAO Tianyu
Cities' Identity Through Architecture and Arts 2020 Conference Proceedings, 2020

11. Green intervention to apartment building as part of its adaptive reuse

ZHAO Tianyu, Shaha Mazen MAITEH, GEYGYÁK János, ZOLTÁN Erzsébet Szeréna
The 5th Green Urbanism Conference Proceedings, 2021

12. Carbon–neutral district planning in central–european township context

TŐKE Máté, Shaha Mazen MAITEH, ZHAO Tianyu, VARJÚ Kata, PAÁRI Péter, MOLNÁR Eszter, GYERGYÁK János
17th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2021

13. Towards more responsible architecture: a design case and applied principles for carbon neutral development

VARJÚ Kata, Shaha Mazen MAITEH, ZHAO Tianyu, PAÁRI Péter, GYERGYÁK János
17th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2021

14. Open public space design principles as a tool to carbon–neutral cities

ZHAO Tianyu, Shaha Mazen MAITEH, LU Chang, TŐKE Máté, VARJÚ Kata, PAÁRI Péter, GYERGYÁK János
17th MIKLÓS IVÁNYI INTERNATIONAL PHD & DLA SYMPOSIUM Conference Abstract Book, 2021