

Reformatting the Agglomeration's Edge: Elements of Urban Design in Dagū Revitalization

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1 ABSTRACT

This paper discusses an urban design case in which the elements of urban fabric and their relationship are repaired in order for regeneration of brown field in Dagū, Tianjin, China. It starts with the typological study on the elements including ecological system, architectural context and existing neighbourhoods, which often are merely the discard of rapid urban renewal. In order to preserve the existing communities and reuse the brown field, the design work is to provide: 1) healthy relationship between original and new communities; 2) good public space; 3) vibrant urban life in existing places; 4) connection with Old Town and CBD; 5) environment free from chemical pollution. The idea is to reformat the old and new agglomeration's edge based on a circular public space which is organized by the existing elements. The design strategy follows the issues on ecology, community and factory. Firstly, industrial reservoirs and canals are preserved to provide open space in the neighbourhoods. The reservoirs are made use of to develop lakeside public space and the canals as ecological corridors define several clusters. Secondly, to ensure the continuity of the memory of the locals, the original communities and villages are encouraged to grow spontaneously, but not sprawling. This falls into two strategies, with green belts define the limit for the village development, and new communities merged with the old ones to help compensate for public facilities and open spaces. Thirdly, industrial heritage is preserved as a park for later development. It creates pedestrian links between the city and nature and helps cleaning the polluted land as well, bringing citizens and tourists together while keeping resilience for future commercial renovation. Green and public space acts as a buffer zone between different urban fabrics so that all the identical agglomerations can be merged and can share a structural view corridor. Also, various types of the interaction between people and the nature around the green belt are comparatively studied and applied to detailed design, including waterfront cultural center, riverside parks, and the public spaces around the northern living communities.

2 INTRODUCTION

2.1 Dagū: An Isolated Island

Tianjin, a mega-city with 15 million people, has China's most ambitious CBD Yujiapu under construction near its port Tanggu, which is 3km away from the Tanggu Old Town. Looking at the ravishing urban planning model for the next booming center of China, one does not notice an inarticulate site between Tanggu Old Town and Yujiapu CBD. Here at the site, Dagū, one sees a dilapidated village with 3000 villagers who ferry daily to Tanggu Old Town, a river which isolates Dagū with developing areas, quite a few chemical factories which are to be relocated. While distance from the village Daliangzi to the old town is no more than 1km, this village is still falling into decay. Based on the Spatial Structure of Tianjin, Dagū serves as a cluster of service function near several important clusters and it is on the main axis of Tanggu's central area, connecting Tanggu's past and future. However, Dagū has been designated to no clear position despite its important location.

2.2 Dagū in the Metamorphosis of Tanggu

It took almost a century before the historic agglomeration of Dagū, which once was the core of Tanggu with its polar industry and shipping lane, became an isolated place. After a 100-year development, Daliangzi Growth Agglomeration, one of the cores of historic Tanggu back in 1930s, becomes the edge of the urban agglomerations because its being separated by the Haihe River and limited by the chemical factories (Fig. 1). Because of the chemical factories, the site has monolithic industry and industrial pollution, with poor connection to the city in regard to the transportation. From the two sections of Tanggu, one can tell that the Haihe river and chemical factories separate the site from outside, giving it a sudden variation from neighboring spaces (Fig. 2). The connection between the site and its surroundings is so loose that sharp contradiction can be perceived. While the chemical industries influence the site so profoundly, there are only three connections between our site and the surroundings.

Analysis on Tanggu's economy shows that Dagū lacks reasonable industrial layout. Yujiapu CBD will have 28% land use percentage for office and much of the residential function is undertaken by its neighbouring Xiangluowan Business District, whose percentage of land use for residence is 41%. However, the functional layout of Dagū has not been related to these neighbouring districts.

Daliangzi village and its surrounding brownfield is now ignored by the city's general plan. At the same time, people are wondering what can be done after the relocation of chemical factories on the site and what will the new CBD bring to Dagū.

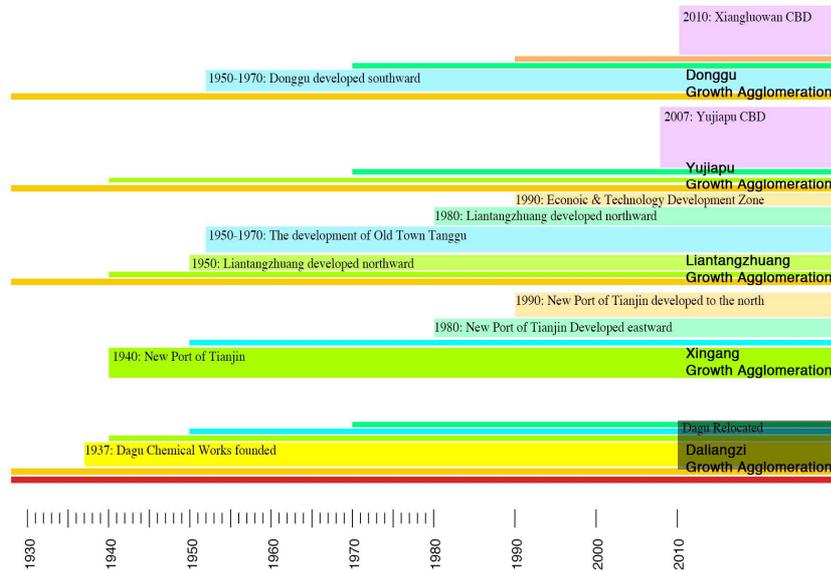


Fig. 1: The Metamorphosis of Tanggu: Growth Process of Five Agglomerations.

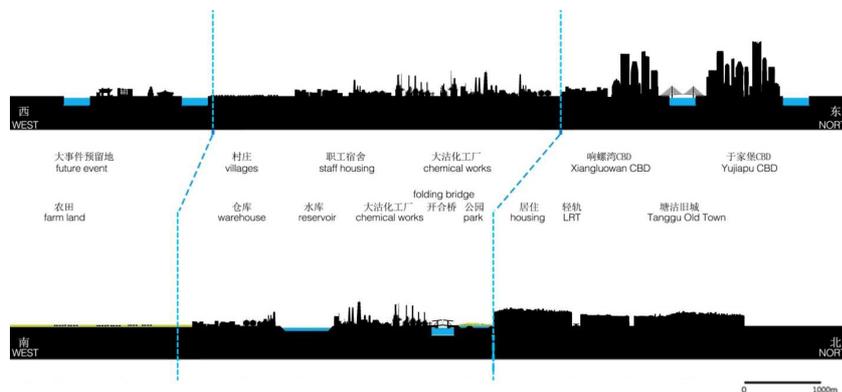


Fig. 2: Sections of Tanggu.

3 LITERATURE REVIEW AND CASE STUDY

In his article *A City Is Not A Tree*, C. Alexander (1965) proposed a way of thinking from hierarchy of the city, in which the elements of a city can be organized into tree structure or semi-lattice structure. According to G. Hack (2009), the elements that give structure to the urban area differ depending upon scale. Some urban design cases give a clue of how various elements can be organized into structures in different scales. For regional structure, D. Burnham's Plan for Chicago exemplifies how the region is envisioned with the arterial system including major transit lines, regional infrastructure and protected lands, which remain almost unchanged after 100 years. In the cases of Ontario Greenbelt of Toronto, Regional Plan of Vancouver and Regional Plan Hanoi, we can see how ecological and river corridors shape the urban form. For sector scale, green spaces act as buffer zones between communities so that a network connects distributed different function. Such structure can be found in Milton Keynes and Modi'in New Town in Israel, which creates corridors for community life with existing geomorphology and water bodies. For architectural scale, elements such as existing infrastructure and buildings can create three-dimensional structure, as in the cases of Sejong City PAT and Makuhari Messe. By applying design strategy with utopian paradigm, new towns

such as Shanghai Anting New Town and Qingdao Sino - German Ecopark achieve picturesque background. However, it is paradoxical that they lack good space for individual perception. The agglomerations in these new towns are alienated from their existing contexts and differentiated with long distance between each other.

4 DISSECTING THE URBAN DESIGN ELEMENTS OF DAGU

4.1 Ecological Elements

Ecological system is one of the most important elements to control the morphology of a city, as the urban agglomerations are mostly defined by ecological elements such as river, farmland and woods. Ecological elements are literally important for Tanggu, not only because the agglomerations of this city are separated by several ecological elements, but also because the metamorphosis of different parts is well recorded by the soft boundary which controls the shaping process. Ecological system also plays an important role in Tanggu, especially the water system including natural water system, reservoir and canals. It is testimony to both the geography of the port region and the interactions between nature and industry. So it is the concept of urban design in the site Dagou to respect the ecological background of Tanggu.

Plenty water elements can be found in Dagou site. Although most of the water system is made for industrial purpose rather than typical aesthetic value, some of the waterfront spaces have a very good view. In the process of planning for Dagou, the ecological system can still be used as a guide in separating the whole site into smaller, controllable parts, and offering flexible boundary for different agglomerations. At the same time, instead of copying the form of ecological system of Tanggu, the edge is reformatted when multiple function is added to the green belt, which makes it a loop garden providing leisure spaces for the residents.

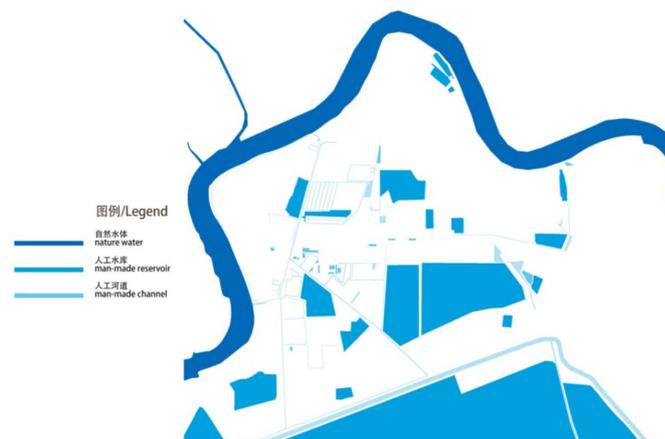


Fig. 3: The Urban Design Elements of Dagou: Water Elements in Dagou site.

4.2 Architectural Context

The urban fabric of the site is marked with informal and autonomous characteristics of factories and communities. Clusters of Dagou Chemical Works with many industrial buildings accommodate diversity of architectural typology for potential renovation. Original pattern of factories and communities is formed as a result of the interaction between hydrogeological transition and industrial layout, which authentically reflects the logic of the growth process of the site. The pattern is typical for an old port city like Tanggu, yet more and more historic agglomerations are replacing their characteristic urban fabric with a single and unified pattern nowadays. Here at the site of Dagou, by understanding the urban morphology, the place identity and collective memory of the locals are respected. Unlike Yujiapu CBD on the east or Tanggu Old Town on the north, the buildings are not following an urban planning paradigm. Instead, it clearly records the development sequence of the industrial constructions and has its own inherited order and archetype. The unique pattern also leaves much open space, providing more resilience for the development of this mega-region.

Various industrial elements are potential for future reuse because these huge constructions have the capacities to accommodate greater densities with experimental typologies that reshape conventions of urban life, and also provide possibilities for industrial heritage conservation to memorize Tanggu's history and development of the past century.

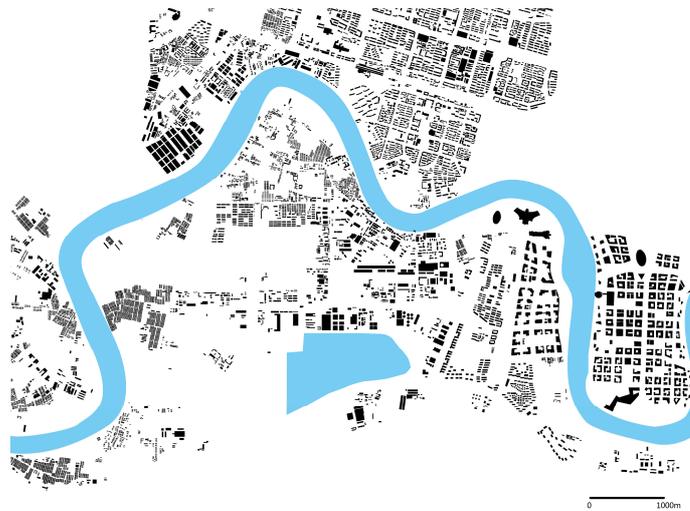


Fig. 4: The Urban Design Elements of Dagū: Architectural Context of Dagū.

4.3 Existing Neighbourhoods

After the relocation of the Chemical Works, most people working at Dagū will leave and only the existing communities and villages would be the source of public social interactions. The vibrancy of the neighborhoods is continuously expressed in a network of public places such as farm market, ferry and parks in the neighborhoods. The existing agglomerations are not following any general plan, resulting in the distribution of sporadic domestic spaces.

Preserving these existing communities and villages is extremely vital to retain place sense and attachment for a site of vast regeneration and replacement. Dagū needs image and identity that respects its history and defines its place in the region. These preserved communities and villages are fitted into a flexible clustered network. The flexible structure makes it possible to accommodate the original villages and communities without destroying their irregular boundaries, creating a vibrant diverse community network that includes existing and developing urban form. The structure also allows future growth in high density clusters of development centered on future transit oriented hubs.

The structure relies on the ecological system of Dagū. By making use of the ecological elements and providing features and amenities of leisure, the spaces between the clusters also to attract students, staff, and residents from across Dagū and its adjacent CBD.

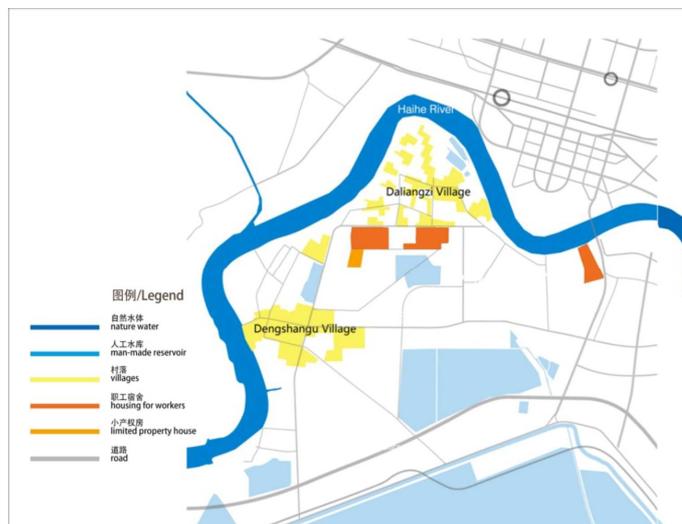


Fig. 5: The Urban Design Elements of Dagū: Location of Original Communities.

5 EDGE OR CENTER? ENVISIONING A VIBRANT DAGU

Unbalanced development between center and the edge has led Dagū to an awkward position and an unpredictable future. It is a great challenge to have so many fragmented urban edge areas to be regenerated at the scale of the mega-region. In between several rapidly developing areas, Dagū is also in the threat of losing its own cohesion and becoming the offcut of Tanggu's development, as is shown in the general plan of Tanggu and Tianjin.

This paper makes no claim to revise the general plan. It does, however, attempt to achieve a vibrant urban environment by repairing the elements of urban fabric and their relationship. The approach starts with the typological study on the elements of urban design including ecological system, architectural context and existing neighborhoods, which often are merely the discard of rapid urban renewal. These elements are potential to express vibrancy in the regeneration process of mega-region in regards with health, safety, pride, dependence, engagement and diversity. These aspects of vibrancy explain why people seem to form a sense of cultural identity and attachment to the features of certain urban spaces when they have easy access to natural, cultural and public spaces.

In order to preserve the existing communities and reuse the brownfield near Yujiapu CBD, the ecological system should be well preserved and made use of. The three elements are influenced by each other and engender new tasks for design work to provide:

- (1) healthy relationship between original and new communities;
- (2) good public space;
- (3) vibrant urban life in existing places;
- (4) connection with Old Town and CBD;
- (5) environment free from chemical pollution.

As the three elements are in correlation with each other in the plan of Dagū. They should be considered as an intertwined whole. The idea is to loop the old and new elements based on a circular public space which is organized by the existing water system. Dagū will not be simply a suburb or a sleeping town. It will reformat the agglomeration's edge and be a center that is a destination place of its own image. People can wander in this rounded public space while engaging in the activities of communication between different groups.

6 URBAN DESIGN STRATEGY

According to the above analysis, the industrial buildings, the vibrancy of old communities and the river system are three main features of Dagū site, which provide the source of our design. As an approach to revitalization, organizing the design task with these elements of urban design can help analyzing and shaping complex metropolitan systems. The strategy of Dagū Revitalization will focus on how an expanded notion of elements specifically vital to the site can serve as the backbone of a much more integral urban project.

The first step of reformatting the edge is to connect the site with Tanggu city in important nodes of the public loop, especially to Tanggu Old Town, Yujiapu CBD and Nanyao Peninsula reserved for future big event. The following strategy is to strengthen the ecological structure which can separate different clusters. The ecological system plays a role as a public garden for people to relax. At the same time, different clusters play a role in enriching the garden's types, providing a colorful life for the people. These clusters include the existing community, industrial heritage, lakeside cultural center and central cluster, forming a loop garden as the conceptual structural urban design (Fig. 6). The design strategy follows the issues on ecological structure, the vitality of neighbourhoods and conservation of factory buildings, of which the first one is the most fundamental element connecting all of the existing water and building the basic structure of the site. The road system, the public traffic system, land use and the form of urban spaces are fitted in it, which helps improve human scale pedestrian movement with a rich network of integrated public places to encourage social interaction. As a method to combine the original communities and other parts of Dagū, public facilities and open space are shared at the edge of each cluster, thus developing a network of linkages to connect the new development and its public amenities to adjacent neighbouring communities. It encourages compact development to connect people and places on domestic spaces and beyond.

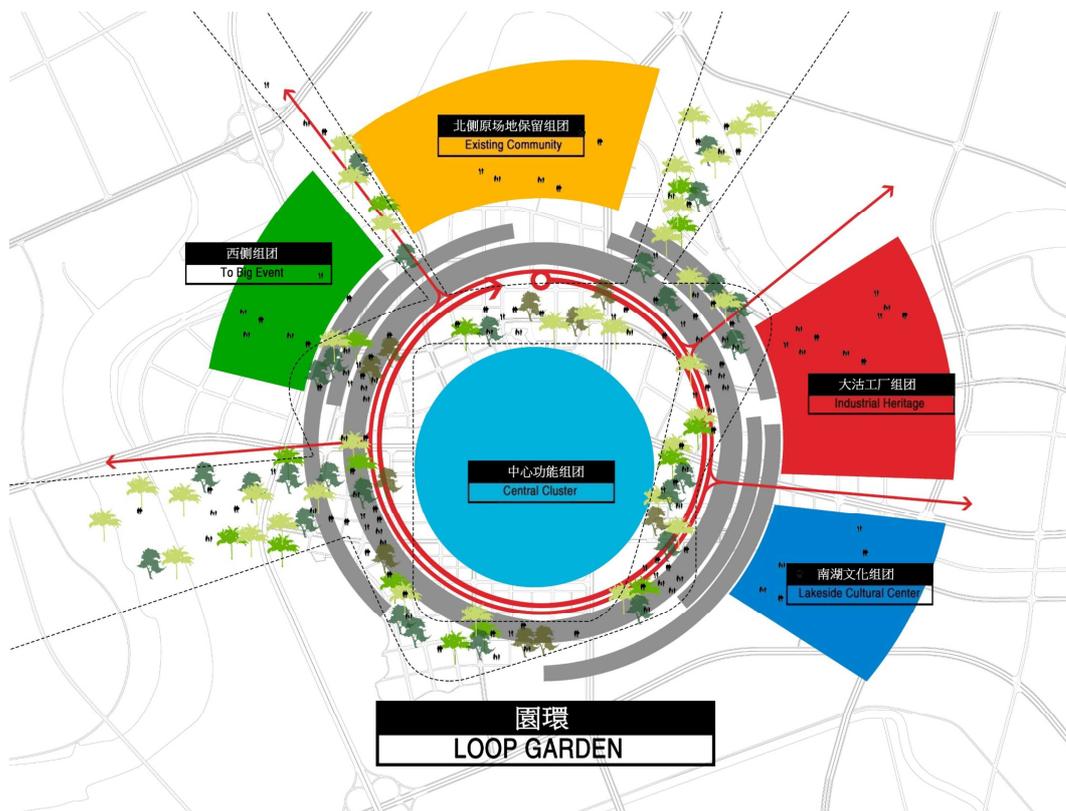


Fig. 6: The Conceptual Structural Urban Design.

6.1 Form a Green Loop

Industrial reservoirs and canals are preserved to provide open space in the neighbourhoods. The reservoirs are made use of to develop lakeside public space, forming the central districts of the city. The ecological corridors are extended on the basis of existing canals in order that the green space can define different clusters. The preserved rivers and canals are interwoven into the fabric of the neighborhoods to provide open space for residents. Various types of access to nature are achieved by combining Different kinds of water and green land, which either serves as an edge or view corridor of the clusters, or as channel flowing through the communities.

6.2 Preserve Vitality of Neighbourhoods

In this flexible structure, each cluster can be identical, which makes it possible to accommodate the existing villages and communities. To ensure the continuity of the memory of the locals, the old communities and villages are encouraged to grow spontaneously, but not sprawling. The green belts — ecological corridor as natural barrier will define the limit for the village development. New community merges with the old one when public activities take place in the green loop between them. The Merging edge helps compensate public facilities and open spaces for the old neighbourhoods.

6.3 Regenerate Industrial Heritage

Industrial heritage and open space in brownfield is preserved as a park for later development. It creates pedestrian links between the city and nature and helps cleaning the polluted land as well, bringing citizens and tourists together while keeping resilience for future commercial renovation. For example, gas pipelines can be reconstructed as a pedestrian trail. By expanding the park's landscape, cultural and creative industry is attracted. It activates the heritage park with cultural and recreational life.



Fig. 7: Urban Design Strategies: Form a Green Loop, Preserve Vitality of Neighbourhoods, and Regenerate Industrial Heritage.

7 STRUCTURAL PLAN

With the ecological system of a fundamental structure on the site, a structural plan is developed. For land use in Dagu, the major public space is on the east, which can serve the Yujiapu and Xiangluowan CBD, and the commercial axis extends westwards to the residential clusters, to make a balance between residential and public functions.

Each cluster has its own center, which is related to the lake or reservoir, so the ecological space can be shared. In each cluster, memorials, heritage, and other physical vestiges of the city's history are embedded in the urban fabric rather than exiled to a certain spot. Subway system provides support for the cluster spatial structure. Underground lines will link the centers. Expressways go between the cluster in order that arterial roads link to Old Town and CBD. Dagu can be pedestrian friendly in the approach of adopting a multi-level walking system. For underground level, there will be some commercial space near subway stations. For upper level, the gas pipes in the factory will be reconstructed as a pedestrian bridge. In between them is the ground pedestrian system and ferry route on water (Fig. 8).

Ecological green space separates clusters, and lakeside area becomes center of urban public activities, with more accessible green space in the communities. The ecological system also contributes to development intensity control. From east to west on the site, the Building height and intensity of development go down, make a transition between the CBD and the Nanyao Peninsula reserved for future big event.

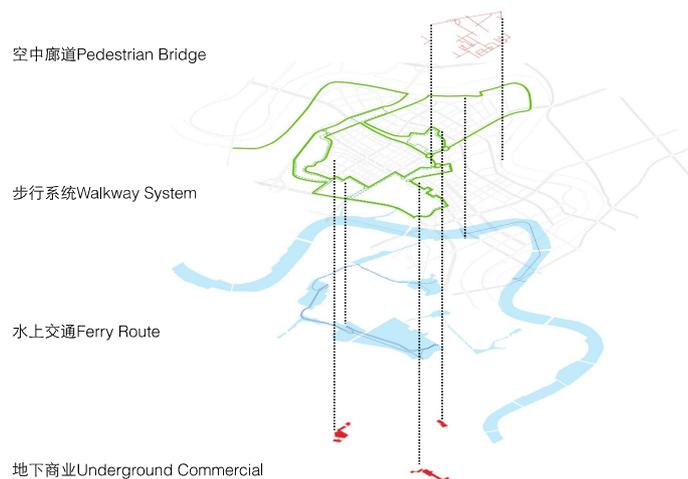


Fig. 8: Traffic Structure: Multi-level Pedestrian Space.

8 DESIGN REFINEMENT

8.1 Zoning

Good urban fabric plays an important role in improving physical environmental qualities and human behaviors. The texture of the city is derived from typological analysis on the existing buildings. The analysis illustrates that each cluster has its own identity. This conclusion becomes the foundation for urban fabric

repair work, so that the various types of urban space can create various urban life scenario. For the heritage park cluster, resilient urban landscape is overlapped on the industrial buildings. The South Reservoir cluster acts as the core of urban public space, with its waterfront pedestrian friendly so that people can get easy access to nature. The North Reservoir cluster provides public service to 3 communities around it, which is a leisure space for citizens. The West Reservoir follows the regional view corridor, with the water flowing through the communities to form a green space for people's daily life. Meanwhile, green and public space acts as a buffer zone between different urban fabrics so that all the identical clusters can be merged and share a structural view corridor. Also, various types of the interaction between people and the nature around the green belt are compared and applied to detailed design, including waterfront cultural center, riverside parks, and the public space around the northern communities.

Based on the typological studies of urban design elements, some images of phenomena are intersected. This study approach is applied to the site as a criterion for zoning before detailed design, and it draws some vivid perspectives to guide further design. Through this process, 6 different types of relationship between people and the nature around the ecological corridor are concluded, and become the core areas of the site for detailed design (Fig. 9). For Each of them, arrangement of public facilities such as parks, concerts and museums is uniquely studied to make full use of its background conditions, and to create new typologies combined with the re-organization of the center and edge.

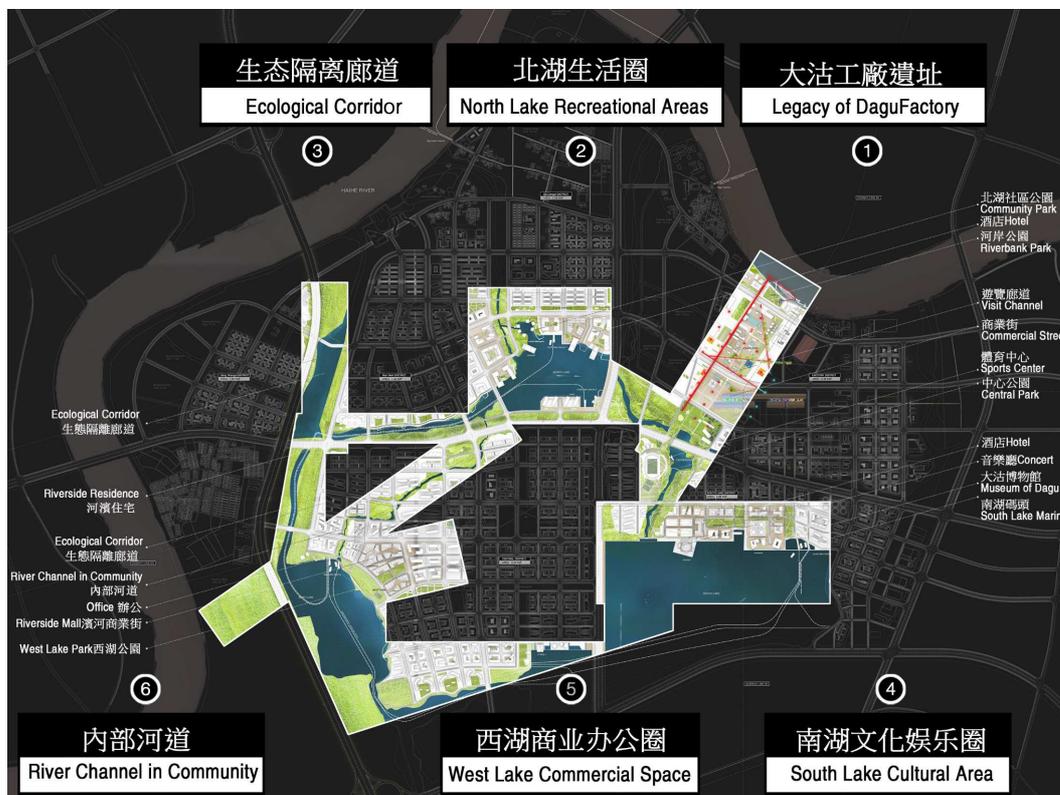


Fig. 9: Structure of Dagu Revitalization Urban Design and Detailed Design for Core Areas.

8.2 Typologies and Principles for Design

8.2.1 Waterfront Cultural Center

The South Lake Cultural Center is influenced by Yujiapu CBD in the east, community development in Central District in the west and the Dagu factory in the north. At the same time, it is the biggest ecological element in the loop green belt, which can provide a comprehensive interaction between nature and human. Thus, people working in Yujiapu, residents from Central District may meet here and bring vitality to it. The design should catch every chance to build a healthy relationship between human activities and nature.

- Provide commercial, leisure, cultural spaces and sports facilities around the lake.
- The buildings should be mix use to bring vibrancy day and night.
- Arrange the public buildings near the water.

- Add open spaces for people to meet each other or have a rest along the waterfront.
- Create nice environment and convenient facilities for people to enjoy the nature.
- Make use of subway lines to bring more new vitality into the area.
- Use the underground space for public activities.
- Reuse the industrial pipeline for the upper level pedestrian trail and gardens for staffs.
- Introduce light, green space and other natural elements into public space, commercial and office in section.
- Balance the relationship between large buildings and view corridor.

8.2.2 Industrial Park

The industrial park is the most important historic place and the core of the site for decades. Dagu Chemical factory has influenced almost every community on the site, and its moving out has become one of the most significant motives for the design. Based on its effect, the design should find out the method to reuse this area by introducing cultural creative industry, technology industry and industrial park. Industrial park plays an important role among the three and serves the staffs and residents as a part of the ecological system. The axis of the park is from the Haihe River bank to the parks on the site. The park extends as this linear shape connects with nodes on the site, establishing the pedestrian space of river bank and emphasize landscape connectivity between Old Town and the site.

- Emphasize link with Tanggu old town by connecting the riverside park and ferry.
- Implant new functions to factory buildings of high quality and create exciting space of their own characteristics.
- Reuse pipelines in the factory as a pedestrian bridge to connect the bank of Haihe river and parks on the site.
- Experiment with modes of pedestrian space along the riverside.
- Use elevation difference to maintain the independence of the area along the riverside.
- Use the upper floor system to connect the bank with the city.
- Add facilities for recalling people's memory of the factory.

8.2.3 Public Space for Communities

The North Lake Area is respondent to the concept of preserving existing communities in the site. There are several communities located beside the lake, so it becomes the public center of the whole area. Hotel, commercial space and city park are located beside the lake, which provide public space for residents around the North Lake. As all of the public space is connected by the loop, it is possible for residents of all communities to use the Central Park and Sports Center.

- Increase low-story houses as well as paths where people can interact with water easily.
- Build public buildings between the lake and the existing community, which is in the north of the lake.
- Keep the texture and function of existing communities to maintain their vitality.
- Add schools, hospital and other public facilities to improve the quality of life in old communities, and decrease excessive frequent travel to Tanggu Old Town.
- Preserve Daliangzi Village and its resilience for future development.
- Control architectural height and outline to keep the river bank open and accessible.
- Reduce interference between private and public.
- Public buildings should be located close to the water but not block the access of waterfront area.

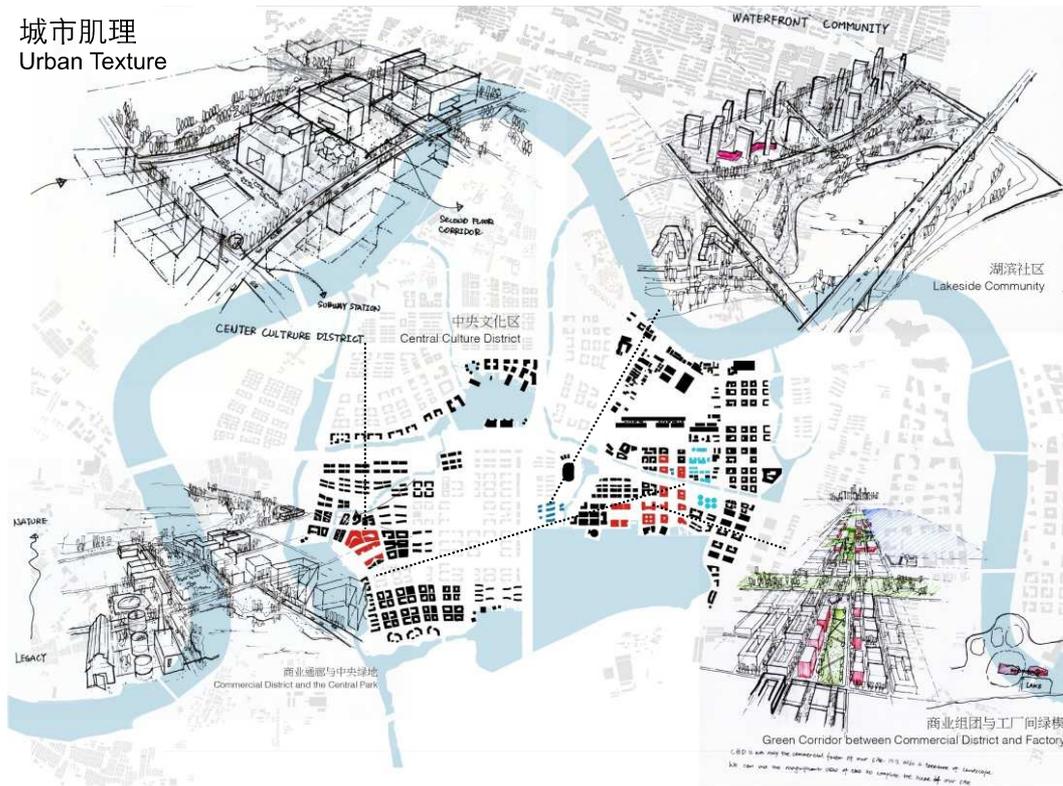


Fig. 10: Texture Study of Dagu Revitalization Urban Design.

9 CONCLUSION

The outside vision of site does not merely mean the structure of planning or the bird view, it should convey the designer's perspective of the question of what is the city, which is the core idea of a design. Meanwhile, the outside vision of a site should be corresponded with the inside vision of a design.

Revitalization of Dagu is a case to exemplify how urban design rather than a general plan can deal with urban structure by starting with marginal elements people intuitively feel as vibrant. Inspired by the proposal of Christopher Alexander, this study aims to implement the exercise operating on the living urban fabric instead of simplified structure that we were educated and supplied with.

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