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The virtual reconstruction of the historic districts of Shanghai European identity in traditional Chinese architecture

In the megalopolis of Shanghai, small historical units, surrounded by skyscrapers and the constant expansion of buildings, remain, and convey the identity of a traditional China. Some of these units have been studied and detected to create means of enhancing the historical landscape. The aim is to collect and catalogue, in a census form, the identity characteristics of these small worlds that tell stories of contamination and constructive events between East and West. Thanks to degrees and re-search programs between the University of Pavia, students perform data collection and 3D modelling operations on buildings that are still considered to be "of little value" to promote a reflection on the importance of these urban realities. Digital technologies at the service of documentation of the historical architectural heritage become useful tools through which it is possible to accomplish actions of synthesis that are useful for the construction of models. The de-

sign of the minor city that has no monuments or emergencies, if conducted with particular attention to the story of the imperfections and unique qualities of each building, is capable of promoting the identity of the place. The history, the events, and the manners of the place are reflected in the model, which is an expression of western thought applied to an oriental reality. The drawings and models of this article express a multiple round-trip value of languages between east and west in the construction of a virtual landscape that crosses borders to become a common mean for the enhancement and protection of the historic city.

Keywords:
Virtual Reality; 3D Modeling; Database; Traditional Architecture; Shanghai

1. THE REASONS FOR A STYLISTIC AND FORMAL CONNECTION

The 19th-century industrialization process imposed the transmigration of a large sample of stylistic models from West to East in the architectural and urban context. In East Asia, the activities of the British East India Company and the development of industrial colonialism produced a cultural conflict that lasted many years, introducing globalization issues and controversial aspects of integration that are still deeply relevant today.

The two Opium Wars, the Taiping uprising and Tsu Hsi's policies, that opposed the requests for renewal aroused by the collision with Western-type civilization and which resulted in the Boxer re-volts, marked a difficult process of inserting social, cultural and political models in China's economic and productive fabric. The industrial districts were born in that period, in correspondence with the main commercial ports of the country, where industries and factories were concentrated and imitating the European models at a distributive and functional level.

Numerous housings arose alongside these areas and civil architecture, as well as industrial architecture, began to imitate the models of European capitals. The brick architecture of these new sectors survives the revolts, the "progress", and the People's Republic of China, which indeed makes some of its compositional and formal aspects its own, so that these units, which still recount the image of an Industrial Europe, over time become historical models of reference in urban, traditional and Chinese culture.

Neighborhoods like Qingcun in the FengXian District, or the historic cotton district of Changzhou are just a few examples of the many units that have remained intact as oasis in the center of the great Chinese metropolises (Fig. 1). An important debate is underway in these areas about the importance of preserving the identity of the place. Not only a question of memory and place, but also economic and social value.

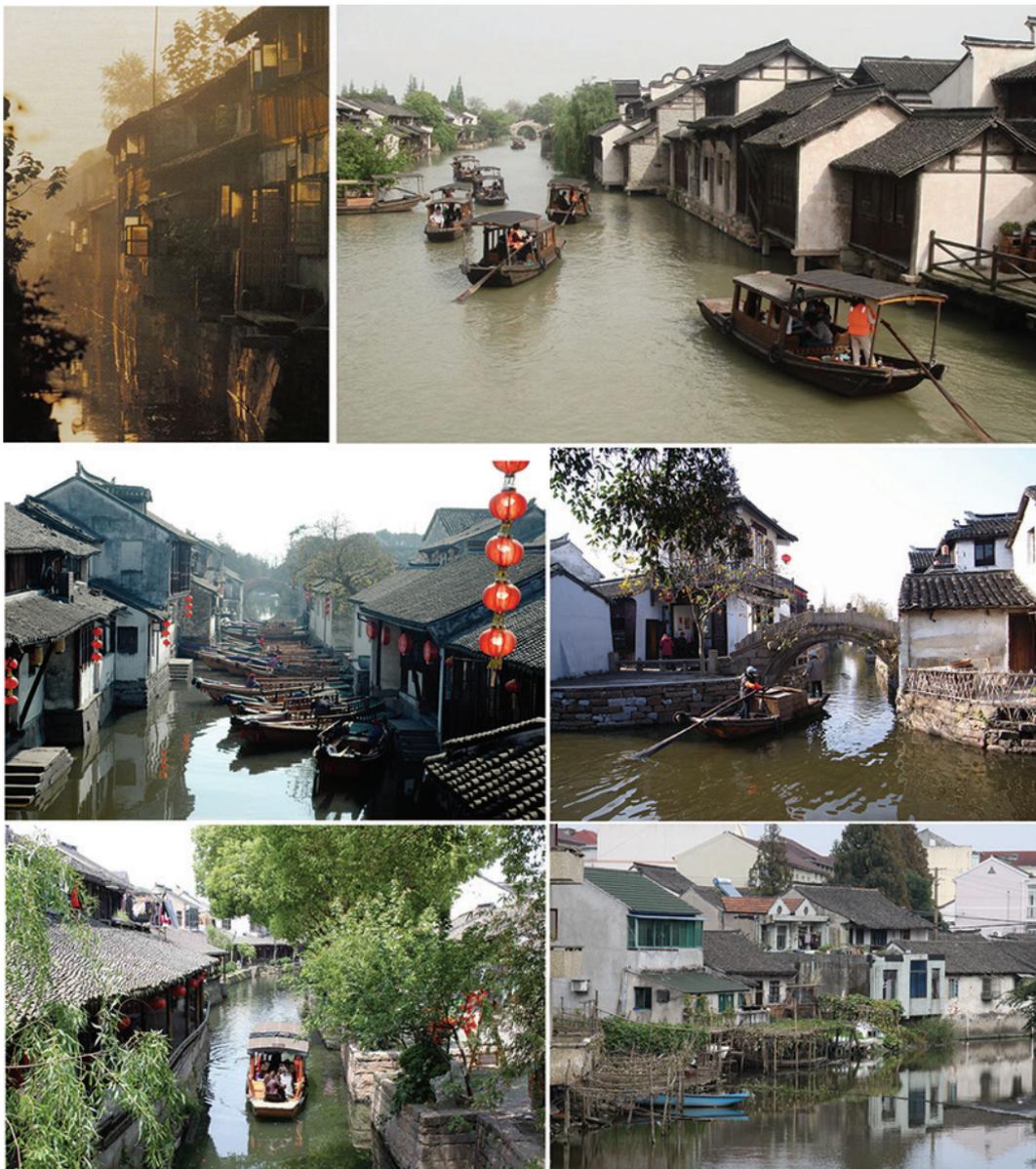


Fig. 1 - Water Town of the Yangtze River Delta, Wuzhen, Zhouzhuang, Luzhi, Qingcun.

A similar case, albeit a more recent one, is the Jewish ghetto of Shanghai, called little Vienna, for which numerous works, not only private, of recovery are taking place. The research project concerned the definition of analysis protocols for these areas. Actions were promoted within the collaboration between the University of Pavia and Tonji University in Shanghai, consolidated in the study and research activities promoted within the Double Degree in Building Engineering and Architecture, chair of Survey & Restoration. Analysis of the peculiar characteristics of the traditional architecture of the suburbs of Shanghai has been promoted, for the creation of means to enhance the image of the place.

The study, the survey, and the documentation of Chinese historical and traditional contexts, in which stylistic and formal models attributable to a connection between West and East are evident, are conducted to develop three-dimensional models. These models are useful for the protection of the stylistic and formal qualities of minor architecture, which today is often placed in the shadow of large skyscrapers. In the digital model, developed by following a practice of digital measurement and detection, the architectural space finds a new cultural dimension, once again western, and a renewed possibility of communicating its history and its link with the tradition between West-East-West.

2. IMAGE PRESERVATION STRATEGIES

It is not enough knowing how China has lost forever an enormous amount of its historical architectural heritage in recent decades. Despite the recent awareness of the Chinese authorities, stopping this phenomenon is practically impossible. Many actions taken by the government to protect the assets of historical interest will have a safeguard for the main monuments, but it is on the widespread fabric that the most serious loss is consumed. Since the 1950s, many changes have occurred in China's cities: from self-sufficient economies to open economies; from traditional to industrial (or post-industrial) cities; from low building and medi-



Fig. 2 - Pictures of the Qingcun neighborhood.

um density cities to high density and crowded cities; from traditional cities with strong cultural identity to international cities. Nowadays, many Chinese cities have lost their identity: just in a few cities, the traditional urban morphology survives. [1]

An extraordinary economic growth almost always poses a threat to existing heritage and monuments. If with communism there has been the greatest deterioration of Asia's cultural identities, the economic push that has transformed Chinese cities in the last fifty years has ended this undertaking. An oblivion veil was placed on the image of the landscape and on those locations that today can be found only in some cinematographic works. In this context of mythical exaltation of the traditional image and criticality of preservation of places, the obvious contrast is with the model and the individual dream of the rich Chinese (Fig. 2). Changing the reference model therefore requires a process of cultural growth, the exaltation of certain characters, certain flavors, the development of a dialogue focused on the beauty of the shade of time. Moreover, through the image, certain knowledge processes can also partially safeguard

the heritage by leaving a trace, a sign, of how certain places are or how they have been.

3. RESEARCH METHODOLOGY AND STRATEGY

The research, which starts with some case studies described below, deals with the theme of the expeditious documentation of heritage. The aim is to define effective tools for the narration of the cultural value of certain architectural and urban contexts. It is planned to use "low cost" tools and equipment for the definition of three-dimensional models and digital prototypes capable of reproducing the character of these places. In the study of the urban landscape, the importance of the informal typological reconstruction of traditional Chinese architecture emerges. For this reason, the two case studies presented address two different scales of analysis: that of the urban landscape, for the context of Quingun and the cities of water, and those of the formal analysis of historical architecture, for the case of the Jewish jet (Fig. 3). The research is part of a dialogue that promotes, with the Chinese colleagues of Tongji University, a comparison

of the different descriptive abilities of the drawings. It is not intended to pursue a rigorous and scrupulous survey method for the construction of instruments for restoration and conservation. Instead, we want to demonstrate how with quick survey procedures, not burdensome in terms of commitment, even economics, it is possible to give value to places through de-sign. The drawing, be it the representation of a 2D elevation or a three-dimensional model (Fig. 4), is the tool that can help appreciate the aesthetics of a place. The amazement that is generated through the virtual redevelopment of certain spaces, through videos, renderings, images that make us understand how a place is composed, can lead to awareness. The latter produces a renewed interest in heritage. Therefore, following the wave of awareness that the Chinese world has had towards its traditions, thanks to films and the media, it is possible to give these tools a scientific value. The objective is to promote more adequate attention to the documentation and protection of this important heritage. Photogrammetry actions, using drones or a simple camera, reproduce models that describe the



Fig. 3 - Planimetric analysis of the canal section being researched in Qingcun.

state of the places (Figg. 5, 6). It is then possible from these models to obtain an additional tool for controlling the city, creating information systems that unify the aspects of gaming with those of the planned management of the city.

The 3D models produced become tools for real-time navigation through digital platforms (Fig. 7). These products today find a cue in the urban territory of Shanghai and tomorrow could favor the documentation of remote villages. The latter, as in a virtuous circle, thanks to these actions could find easier connections with the rest of China.

4. THE VERNACULAR ARCHITECTURE OF QINGCUN AND THE CITIES OF WATER

Over thousands of years of civilization, China has developed various typologies of settlements and vernacular dwellings; most of these common places in the countryside are the work of anonymous builders who have been able to express morphologically the popular culture, the conventions, and the identity of each community. Of course, Chinese vernacular architecture varies by geographic location and for different kinds of nationalities and cultures. The location affects the environmental conditions, topography and thus on the construction technologies development applied, which allows us to take full advantage of the natural ecological resources and at the same time respect the environment itself.

“The vernacular housing is a rational response to the climate in terms of material, passive techniques and local environment: they have functioned well and housed Chinese people for thousands of years”. [2] All vernacular dwellings are characterized by the use of natural materials; “most rural houses adopt the local materials such as wood on the mountain, soil on the plain, rock on the shoal and grass on the field, which makes each house seem like growing on the land, and become an organic whole with the natural environment”. [3]

Chinese traditional architecture is characterized by the organization of space made by standardized units that can optimize the use of wood. “The basic concept involves the use of the Jian as a

standard unit which may be expanded or repeated to form either individual buildings or groups of buildings. [...] The Jian is a rectangular room or space defined by wall or columns which separate it from adjoining room or spaces”. [4]

The town of Qingcun is in Fengxian District, a suburban district of Shanghai. Qingcun Old Town is a good example of vernacular architecture from Jiangnan, the region in the southern area of Yangtze River which includes Shanghai Municipality, southern Jiangsu Province, and northern Zhejiang Province. In the early Song Dynasty (960 AD - 1279 AD), Qingcun was a fishing village where farmers, merchants, craftsmen, and literati of Bianliang used to live along the canal through the village called Qinxi. During the late

Yuan (1279 AD - 1368 AD) and early Ming Dynasty (1368 AD - 1644 AD), Qingcun became a small coastal town and then a commodity distributing centre. During the Jiaqing period of the Qing Dynasty (1644 AD - 1911 AD), the town became more prosperous for commerce; then during the anti-Japanese war the economy was depressed, more than 300 buildings were burned and shops were looted by Japanese. During the years of the Republic of China, the economy restarted to develop and historical records show that there were four rice mills, two soy sauce factories, fifteen grocery stores, two cotton shops, and two pawn shops in the Old Town. In the last decades, many industries and shops were built, and the town expanded its edges.

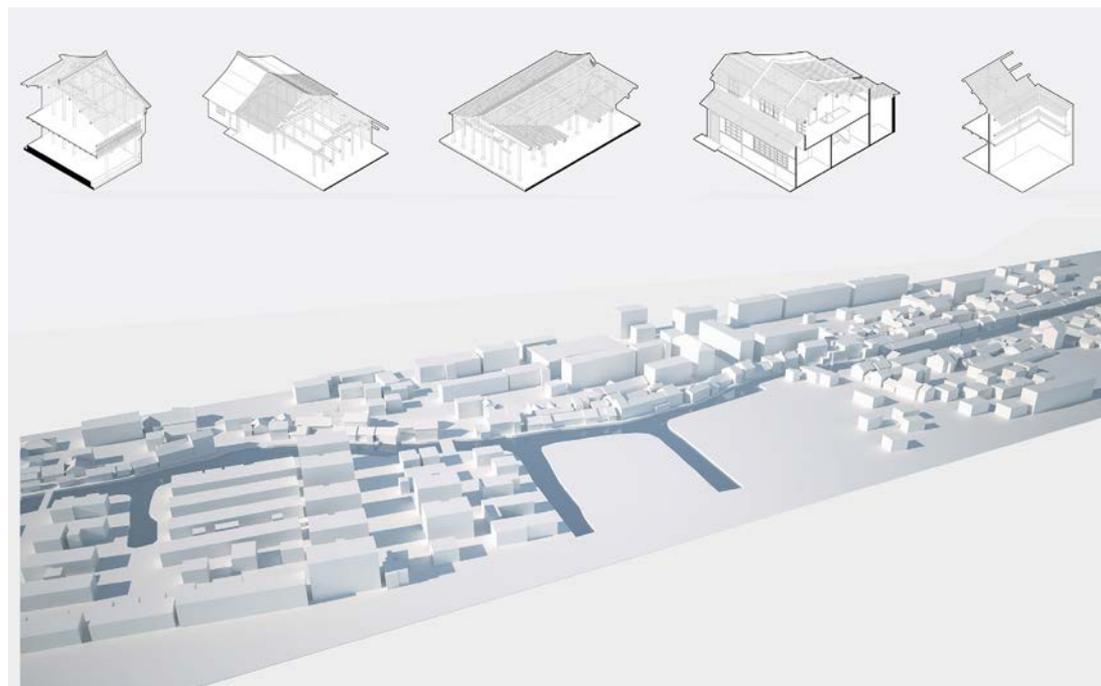


Fig. 4 - 3D model of Qingcun and typological analysis of building units.



Fig. 5 - Development of 3D models of building units using SFM photogrammetry.

For the analysis of Qingcun Town the vernacular architecture resulting from construction technology called Xiangshan Gang has been considered. Its traces are to be found within the Yingzao Fayuan, a book written by Yao Chengzu, a famous Xiang Shan master carpenter. [5]

Referring to the present situation, the vernacular settlements in rural areas close to large cities such as Shanghai have suffered the effects of the great urban development of the last 30 years. The natural environment has been transformed for economic, cultural, and social influences. Quoting Professor Ruan Yisan "In the 1980s, there were about 2,000 ancient cities and 20,000 ancient towns. However, due to haphazard demolition and commercial development, fewer than 10 ancient cities remain". [6] During the 1980s, government authorities of this region introduced controls and development for the conservation of historic settlements which are Zhouzhuang, Tongli, Luzhi, Nanxun, Wuzheng, and Xitang. In particular, the key figure of this process is Professor Ruan Yisan of the National Research Centre of Historic Cities in Tongji University, who, in association with Tongji Urban Planning Institute, has planned all the conservation interventions, titled "Conservation and Development of Ancient Towns in the South of the Yangtze River". The position of these water towns on the bank of rivers or lakes is a traditional feature. Focusing on the riverfronts, according with the relationship between water and land, as stated in the book "*Chinese*

Houses. A Pictorial Tour of China's Traditional Dwellings" [7], we can see many different cases: a river sandwiched by two streets, a river sandwiched by a street and a footpath, a river sandwiched by two footpaths, a street running parallel to a watercourse, a street running parallel to a river, a river sandwiched by two buildings, a river running parallel with a street (the building in between is long and narrow), a building meeting

a river and a street at right angles, possessing in most cases access to both the street and the river. Qingcun waterfront is planned as a river sandwiched by a street on one side and by buildings on the other side. In water town, the front side of the front door faces the street and the back door to the river; the streets between buildings and rivers usually are very important for water transportation. Along rivers often some wharves are



Fig. 6 - 3D model portion of the waterfront of Qingcun.

very helpful for inhabitants to use water for cleaning and go on board; there are public and private docks, designed in harmony with the context of the river. The street system is usually very narrow; "the streets parallel to waterways are commercial, with a width of between one and a half and three meters. The perpendicular streets are small lanes that connect neighbourhoods. Buildings are arranged in rows and are usually two-stories high" [8]. In these towns, "buildings were originally designed as shops" [9] but then, through economic, social, and cultural development over few centuries, many buildings have changed their original use becoming residences or offices. In addition to functional changes, during years, as historical sedimentation, people usually have built additional parts to accommodate new needs such as kitchen, bathroom, etc.; along canals, this variable ledge resulted in the generation of dynamic lines as "the houses along the Suzhou canal near the Maple Bridge" [10] but also these additions changed the historical layout. Following traditional Chinese architecture principles, most of the houses in these towns adopted a timber structure as skeleton and brick or masonry walls as non-load bearing partition. Other traditional elements of water towns in Jiangnan are the lattice windows, which "facilitate ventilation and encourage the scenery within to blend with that outside".[11] Lattice windows also are an "artistic reflections of traditional Chinese reserve" [12], in fact "in the past, traditional ethics made it inappropriate for guests to see female members of the family in either the drawing-room or the courtyard, meaning it was necessary to blur their view".[13] The image of the city in water-town as Qingcun Old Town is characterized by white walls. These create a strong contrast with dark openings, black tiles (in the past each house had a different roof), small stone bridges; the interior and exterior spaces' atmosphere is intimate and peaceful. Most of the ancient buildings in Qingcun were built in Xiangshan style. The town is one of 32 historic districts in the urban area of Shanghai, and it hasn't experienced a process of demolition and reconstruction during urban development in China; for this reason, we can still see most of the urban and building fabric intact.



Fig. 7 - Views of the 3D model of Qingcun.

5. THE TILANQIAO AREA AND THE SHANGHAI GHETTO

The area is in the Hongkou District, not far from the Huangpu River, and it is easily reachable by the main Changyang Road. This one crosses this

part of the city for more than five kilometres, and secondary roads such as Huoshan Road (former Huashan Road), Zhoushan Road (former Chusan Road). It is also well known as Tilanqiao, because of the homonymous prison located there. While

in the past the North Bund area was merely used for transportation purposes for the north city harbour, due to French and English concession, this area started to be a building site for a series of constructions that had to remember the foreign countries of origin. That is why a series of architects coming from Europe imported the European prototypes up to Shanghai by imposing dimensions, proportions, styles, and final use. The Ghetto of Tilanqiao, less than half a mile far from those Prototypes, have a much smaller dimension but still with its own identity, even after several high-raised construction process around.

The history of the Jewish community in Shanghai territory is commonly known between the period of the two World Wars, because of several groups of people coming as refugees after escaping from anti-Semitic national governments. However, some previous episodes of Jewish coming to Shanghai were detected already in the 19th century. Firstly, Sepharditis and Baghdadis came there around 1880 to set up their cotton business, as previously, at the beginning of the century the Sassoon family had settled their own business for tea, cotton, and silk in Shanghai, the David Sassoon & Co company. Because of their wealth, their fame became popular, attracting other families which were invited to come to Shanghai, a prosperous and welcoming place for business. Shanghai at that time was yet undeveloped and the firm provided accommodations for its foreign staff, creating the first Jewish community in the city, as testified by the presence of a Jewish cemetery since 1862. When the Ohel Rachel Synagogue was built, it marked the first wave of immigration, which in-volved other synagogues construction, like the Ohel Moishe, schools, and houses. Then, in 1920, a Russian flow of Jews started migrating crossing Manchuria and Northern China and in 1930 the registered Jews in Shanghai were more than 4500. [14]

After the racial laws in Germany (1931) and Italy (1938), Jews were obliged to move away from the territories where nationalistic anti-Semitic governments set their power. Shanghai resulted to be an easy place to escape for those who decided to

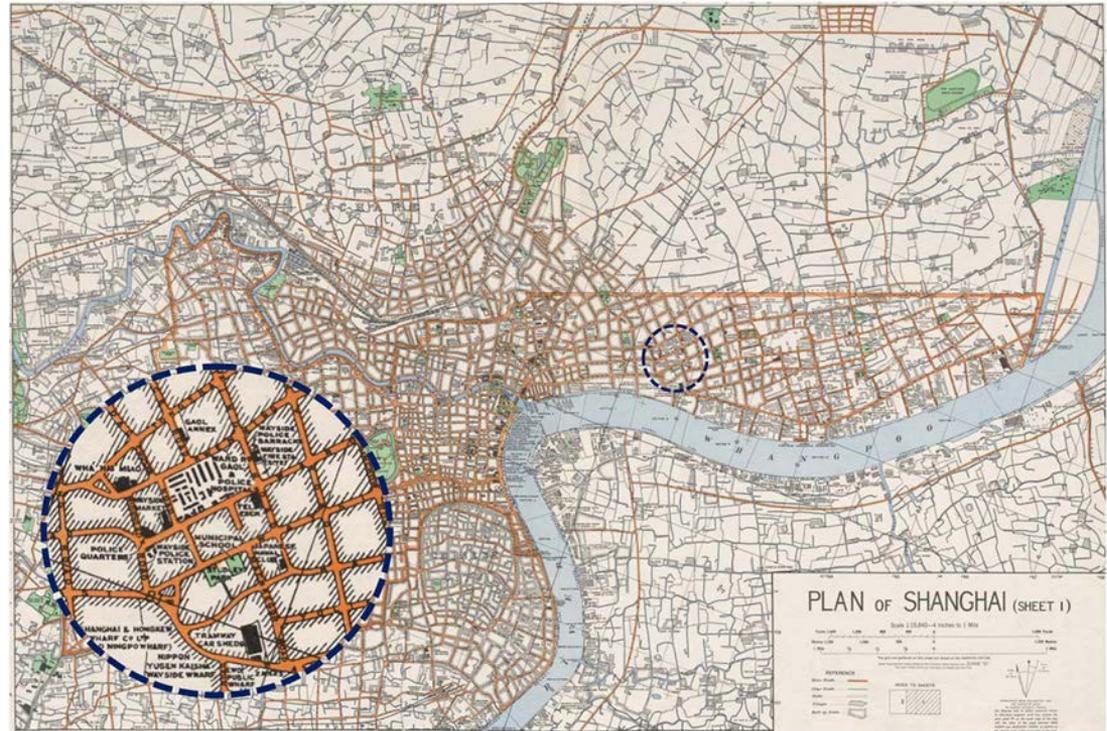


Fig. 8 - 1930s map with the location of the Shanghai Ghetto.

start an overseas adventure, as a visa was not required in China (Fig. 8). The anti-Jews propaganda pushed 20,000 people to abandon these territories and reach Shanghai. There were not any authorities to control immigration, because of the Sino-Japanese War taking place in that period, but also the low rates for living there were appealing, compared to other wealthier countries. Due to the large number of coming people and to the limited portion of the city available, because of concessions and conquered territories, Hongkew District, through Shanghai Municipal Council, agreed to find accommodation in the Tilanqiao area, and allowed the immigrants to build some of the houses that are still there nowadays. That

is why the Tilanqiao area is a multitude of historically relevant buildings, some of them well preserved and some others in a problematic state but still in use. It is the case of the ones located on the former Wayside Road (now Changyang Road) and Chusan Road (now Zhoushan Road), all of them belonging to the Jewish Community and still identifiable beneath the multitude of other newer constructions. From the design point of view, there is a slight difference both functional and aesthetic between those facing the main street and the ones of the proper community. While the first ones are public buildings, like the Baima Café, Ohel Moishe, the old building for the press, and the Tilan Bridge Prison some meters far from

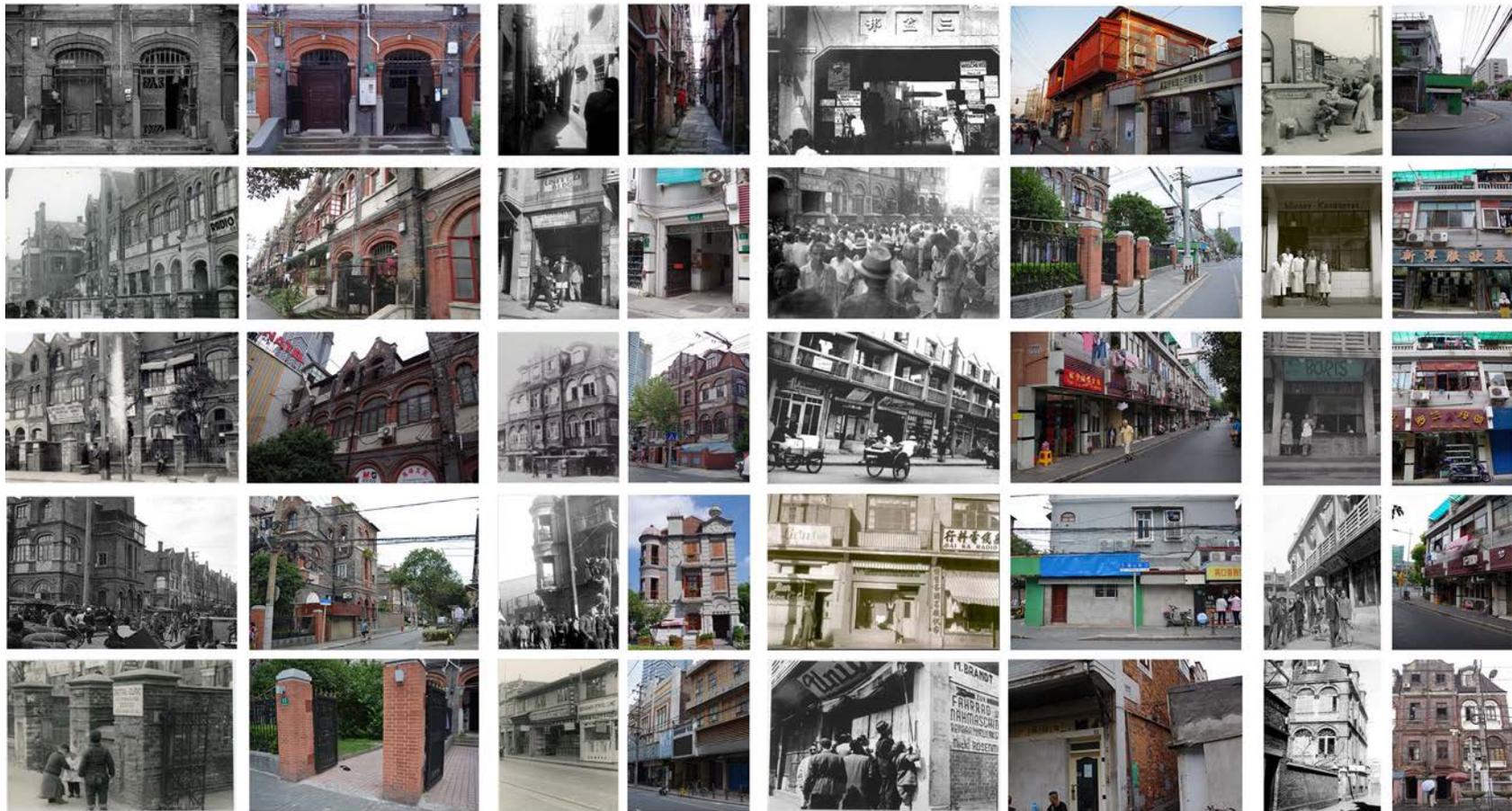


Fig. 9 - Comparison of historical photographs and the current state of the Shanghai Ghetto.

them, the other ones are merely residential and used nowadays for the same purpose, even with a few modifications. Moreover, for the construction technique, it is essential to underline that, due to the prestige associated with the public buildings, they have always been subjected to continuous maintenance and, by the way, changed in some features the original colours or style, but preserving the shape, while residential construc-

tions generally maintained their original character. From the construction point of view, it is remarkable that original buildings dating 1920-1940 were built in bricks, following the techniques of the western designers who indicated precisely the way to end up the positioning of the bricks layers, obtaining thus a harmonious composition still visible today. The following constructions, 1950-1980, were completed by using the reinforced concrete,

as an innovative material for that period, coming from French experience in using the pouring mortar liquid between steel rebars previously folded. This allowed to raise buildings with higher plots, more floors, and external balconies, still visible. It was only with the advent of concrete progress that buildings were covered by mortar instead of being left with the original brick surface. However, according to multiple sources and after in-

depth analyses conducted on-site, it is possible to affirm that original bricks, brown, red and black, were suddenly covered in red and black paint, to make them more similar to the shikumen of the Communist Party, after the end of the World War II, with the confirmation of the Chinese national identity (Fig. 9). These colours, used initially for maintenance and repair purposes, were then applied to all buildings of the same areas, even the concrete ones, emulating the presence of bricks. It is also evident that multiple adaptations and interventions were made, because of swell and detachment phenomena, showing the inner layers of paint and revealing the original material colour. The initial red paint was obtained by using a plumb oxide, commonly known as red, because traces of metal have been detected from samples of detached paint. Then, it was changed with chemical additions when plumb was declared toxic and no more usable on buildings. Moreover, constructions belonging to different areas or streets show not the same colour, but gradations of grey, darker or lighter according to the painters' choice but revealing lack of coordination over the years. In addition to that, a roof analysis has been done to understand the reasons for the use of such different materials, like steel, aluminium, brick, wood, stone, and steel. Firstly, it is relevant that there is not a clear correspondence of structure material and coverage, but it is possible to recognize a common technique associating the building structure linked to its age and the roof structure. While recent buildings have adopted different solutions to better answer the population needs, the costs vanishing the initial interest to preserve the character of the area, however, the original brick buildings have all a wood structure for the roof and facades mostly in brick. This gives the characteristic red roof headquarter, like the older parts of Shanghai in the city centre. All these elements, along with the decorations conceived give a typical character to that place, a *genius loci*, as Christian Norberg Schulz claims for architecture and landscapes, surviving in these areas and trying to preserve a local identity against the destructive technique of these last years. A separate discussion must

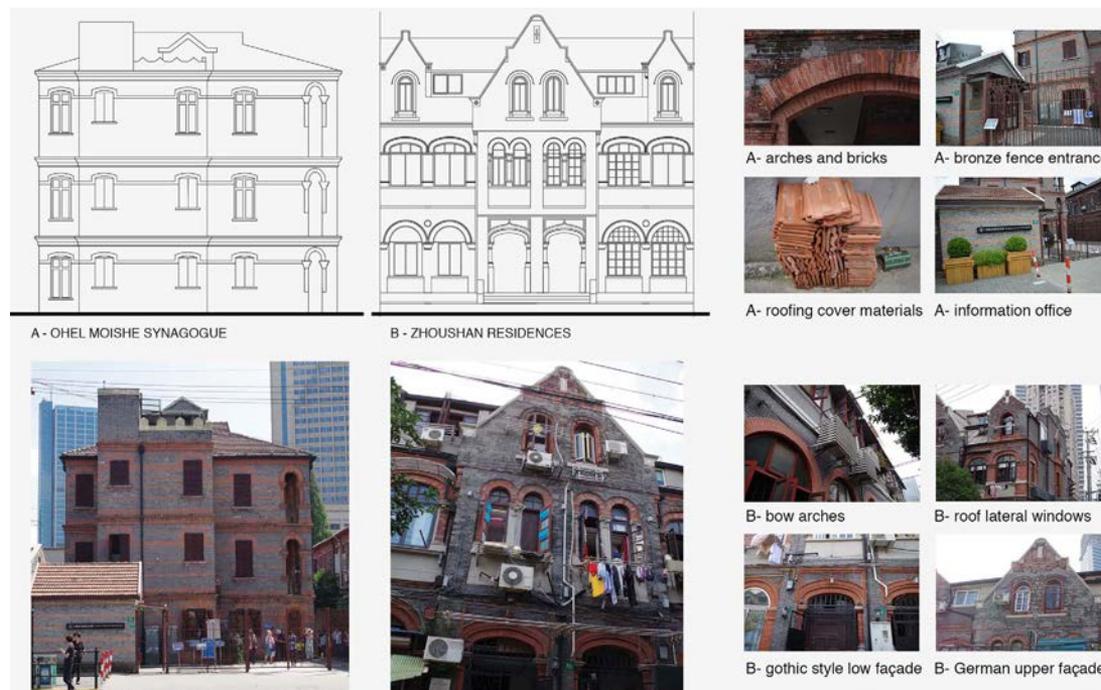


Fig. 10 - Typological analysis of the Ghetto fronts.

be provided to the Ohel Moishe, site of the Jewish Museum. Originally conceived as a residential house with a three-story building, after the war it became a public school with offices and only then the site for administration. In 2006 it was declared as a heritage building and dedicated to the permanent exposition of the Jewish community history. During their functional inner transformations, the interventions did not modify only the structure, but also the aesthetic impact and when the museum was settled, the Hongkou administration decided to make a heavy extraordinary maintenance aiming to restore the original appearance of the 1930s. The added mortar was removed, the brick surface restored and painted according to the actual building context, but some windows and openings changed, mainly on the first and second floor, the

patio veranda, used to protect inhabitants against sun during the hot days, restored (Fig. 10). Another example of Jewish architecture is represented by the Baima Café in Changyang Road. Historically known as Little Horse Inn, it was used as a common meeting point for the community, along with the Little Vienna Café whose references are eligible in multiple documents. According to the historical book, the Jewish refugee Rudolf Mossberg, who went to Shanghai seeking asylum, bought a building and settled there the Baima Café. It was dismantled in 2009 after several years of misuse and different ownerships and then the Hongkou District reconstructed it following the original shape and decorations and functional use (now Atlantic Café). Nowadays, it contributes to enhancing the historical value thanks to its architectural style.



Fig. 11 - 3D model of a block of the Shanghai Ghetto.

The variety of houses is dependent on age and the applied style essentially on the builder's choice without a real criterion, especially for residential units, with an exception represented by two classes of buildings. In Zhoushan Road and a portion of the internal residential part, commonly known as community, the houses are equal to each other's as if there was a module which had to be repeated multiple times. Modularity had the advantage to simplify the construction method, avoid possible mistakes due to lack of detailed design, and ensured the cheap-

ness of the realization thanks to the reduced time required for the building process, from the material collection up to the decoration and painting final phases (Fig. 11). Some examples are taken from Germany or France, where internationally known architects made their main works based upon this innovative concept. In Tilanqiao the mentioned blocks of houses, whose design derives from Western architectural ideas have also the same typology of inhabitants, linked by religious and community reasons, as they escaped from a common enemy.

Some other similar constructions can be found at the rear side of Zhoushan Road residential units, next to the Lilong community. They consist of six modular blocks; whose features are different from the context for style and material choice. JDC building is located in front of Huoshan Park, and it hosted the committee in charge of assisting the Jewish refugees for their first periods after their settlement, providing financial and supply help as well as medical and dental assistance from 1932 to 1943. The uniqueness of the building is re-markable not only for its dimen-

sion but mainly for its decorations, mouldings, and impact on the urban context. In addition to them, older historical residential blocks add to the historical buildings for which the District has recommended preservation, to avoid their demolition, like what happened to the ones located near the museum area, reconstructed in concrete but without following any style. To identify the inner character of the area, a full stylistic investigation has been conducted along with the other analyses reported in this research. The main objective is to record an abacus of samples for windows, doors, gates, and materials for walls and flooring finishes to provide a better understanding of the area, by underlining the main shapes, materials, and general choices made by previous designers (Fig. 12).

6. CONCLUSION

The analysis carried out, based on theoretical concepts, allowed to chart the urban morphology and to understand the image of the historic urban landscape, pointing out the important and essential characters. The analysis also uncovers the historical sedimentation of the old town, whose original characters persist in some place, in others are vaguely perceptible, in other completely non-existent. The need to document the main characters of the urban landscape seems inevitable if we observe the rapid processes of demolition/reconstruction or invasive conservation that occur in many areas of contemporary China. The subsequent study of methods for fast survey was constantly supported by the morphological study of the old town, allowing a continuous dialogue between these methods and the main urban characters.

In this way, the survey's methodology was defined, consisting mainly of the use of software for three-dimensional models' creation by the elaboration of photographs, combined with the results of the direct survey that allowed to get reliable vector models. This combination lets to obtain complex integrated models that describe the urban landscape and its main characteristics.



Fig. 12 - Virtual navigation in the Ghetto model.

The defined systems represent a valid starting point for the research and application of optimal solutions for more general cases in China and abroad. The various outputs of research allow the creation of the basis for the real con-

servation of the memory of urban traditional landscapes in China, and they can be used for raising awareness on the issues of conservation, through the use of documentary, visual and multimedia systems

NOTE

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[10] LIU L. G., *Chinese Architecture*, London, Academy Editions, 1989

[11] CONGZHOU C., HONGXUAN P., BINGJIE L., *Chinese Houses. A Pictorial Tour of China's Traditional Dwellings*, cit. p. 103

[12] *ibid.*

[13] *ibid.*

[14] If the Sephardim had come from British Empire, spoke English and practiced differently the Judaism, the Ashkenazi population, who was coming from the Russian Empire, used to speak Russian. They were seeking a new homeland after the Russian Revolution and the Japanese occupation of Manciuria, reaching the immigration peak after the collapse of Czarist Russia, in 1918. Some of them were even Polish, firstly migrating from Poland to Russia and then from Russia to China, as claims Erik Shaffer in *From Poland to Shanghai*. Cfr. Erik Shaffer, *From Poland to Shanghai*, 2011 Leo Melamed, Polish Jewish Refugees in the Shanghai Ghetto, Interview with U.S. Holocaust Memorial Museum.

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