

## Main Building as a Central Courtyard Pattern in Lasem, Central Java, Indonesia

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### ABSTRACT

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Lasem, a city of a thousand gates often referred to as "Petit Chinois" by foreign tourists, possesses extraordinary historical heritage as the former capital, making it a Heritage City. This is one of the reasons for choosing Lasem as a research study location. This article contributes by identifying typical spatial patterns in Lasem. In this study, the focus of observation is Chinese settlements located in Babagan Village, Soditan Village, Karangturi Village, and Gedongmulyo Village, where these areas are the locations for the development of Chinese settlements in Lasem. This paper aims to understand the development of the typology of Chinese residential courtyards in Lasem and their survival to the present day, so that they can become part of the national cultural heritage. The research method used is descriptive qualitative, involving literature studies, field surveys, and analysis using graph access. The results found that the typology of the morphological floor plans of the Chinese settlement houses in Lasem differs in accessography from their country of origin. Courtyards, which serve as building shafts in their home country, are not found in the houses of the Lasem Chinese settlements. The courtyards in the Chinese settlements of Lasem are precisely positioned around the main building. The uniqueness of the typology of the Chinese settlement courtyards in Lasem is the result of the space occupied by humans to survive and the community's attachment to their place of residence.

## 1. INTRODUCTION

Courtyards are part of traditional Chinese houses and are surrounded by buildings. They are used in China as a model of the artificial environment, including urban planning, urban parks, and residential houses [1]. Courtyard houses are the basic units of the city, and almost everyone, from emperors to commoners, lived in them, although there were strict class differences between residences. Courtyard houses were designed to cater to large families of three or four generations [2].

A Siheyuan is a Chinese quadrangle, which is an architectural complex with walls, courtyard houses, one main entrance gate, and at least one or more courtyards surrounded by one-story buildings. A house with a courtyard in it represents a form of China's traditional house. These courtyard houses are among the oldest existing houses, apart from those in Africa, the Middle East, India, the Mediterranean region, Rome, and Greece [2]. Based on data from archaeologists, the earliest excavated houses in China belonged to the Yangshao culture (5000-3000 BC) [3]. This culture was discovered in Mianchi County (Henan province) in 1921. This courtyard-shaped house was designed for reasons of climatic factors and environmental conditions as well as socio-cultural considerations [4]. Thus, with the surrounding walls in the house, it becomes a place for residents to seek shelter from hot, cold, rainy, and sunny weather. In addition, this courtyard house is designed to seek Chinese harmony.

In Chinese architecture, the theory of Feng Shui ("Wind and Water") is utilized to direct wind and water to perfection, and this is evident in traditional courtyard houses, which are able to channel wind and collect qi. As noted in the ten books on life houses, no matter how good the interior of a house is, if the overall shape of the house is not profitable, it remains unprofitable [5]. Therefore, the outer shape of the building must also be appropriately considered.

The Siheyuan house was originally designed to accommodate a large family. Further development allowed it to house up to three to four generations. The Siheyuan has characteristics such as a hierarchical structure, bilateral symmetry, a center or central axis, and tends to be closed [6]. The front yard of the house typically measures between 15 m – 25 m in width and 25 m – 50 m in depth. There are five basic types of Siheyuan houses in Beijing:

- 1) A one-yard house (sometimes a "three-sided cage" is called a siheyuan without facing the north of the hall);
- 2) Two-yard house (small);
- 3) Three-yard house (standard);
- 4) Four-yard house (large);
- 5) Five-yard house with garden (large).

Other, less common types include: one main yard and one secondary yard (kuayuan) complex courtyards built side by side, and two or multi-group yards built side by side.

In feudal China, some large families had two brothers living in the same house. So they constructed two compounds side by side with the same or similar size and layout, yet independently connected [5].

Chinese courtyard houses often have assorted windows/lattices pierced in various geometric organic patterns (e.g., circular, square, rectangular, fan, floral) for sunlight and air to pass through so one can glimpse the scenery inside. Wall, various kinds of windows are artistically designed and carved, making the housing complex feel like it has been cut off from the road yet [5].

The location of the gate of the house is important in Feng Shui theory because the gate is the "mouth of qi" through which qi ("cosmic energy") enters or leaves. The orientation and size of the openings have a direct link to the communication between inside and outside. The design and ornament of the gate of the house are considered important because it shows one's social status during the Chinese imperial period [5].

In northern China, the courtyard is enlarged in a south-north direction to receive more sunlight in winter. This layout mainly comes from the central part of the Yellow River [6]. If the outer space is limited by medium-sized walls and the yard size is proportional to the courtyard and the height of the surrounding buildings, residents will feel comfortable. If disproportionately, residents may feel isolated, and need to adjust to the climate by building higher or lower walls for air circulation [5].

In China, traditionally, the garden is part of the overall Chinese concept of the house which means garden house. A house reflects the close relationship between the house, the yard and the garden [7]. Although some garden houses are large estates, most imitate nature in miniature to show the aesthetic aspect of complementary elements (rocks, water, plantations, etc.) in a relatively small outdoor space [6].

The layout of the building has an urgent role in determining the direction of the courtyard, as well as the position of the sun and the direction of the wind. All of these can be affected by microclimatic conditions, which refer to local environmental variables such as temperature, humidity, wind speed and solar radiation which can differ significantly on a small scale within an area [8]. Laying the correct yard orientation can help develop thermal comfort [9]. However, if you put the wrong yard orientation, it can have the opposite effect.

The benefit of the yard is to find it as an inner form, which offers attachment to the form and the occupants of the house as well as a sense of secrecy [10]. Several theories' governing courts act as:

- 1) The yard can be multi-functional as a kitchen or a guest room;
- 2) A place to interact Space for all family members;
- 3) Sleeping area when the climate is conducive;
- 4) Encourage families to act as a group;
- 5) As visual privacy;
- 6) Barrier noise from outside.

Healing can be obtained from the courtyard place [11]. In this case, the architect can add a courtyard design to have a positive effect on the five senses of the human body through the addition of trees, flowers, water, etc.

Traditional Chinese houses have a structure of at least one or two courtyards. The number of courtyards depends on family size and wealth. It can be seen from the Ming dynasty to the Qing dynasty that houses with one, two, three, or more courtyards are still preserved [12].

The discussion about the courtyard in this Chinese house is

so interesting that it is considered important to do research. It is known that the Chinese population has also spread throughout the world, one of which is Indonesia. One of the Chinese people who migrated to Indonesia was for trading purposes. When they cannot return to their home country, of course, they will make their settlements in each of the places they visit. The distribution of the Chinese to Indonesia, among others, to areas of West Java such as Cirebon, and Central Java such as Pekalongan, Kudus, Demak, Gresik, Tuban, and Lasem. These places are the oldest Chinese settlements found in Indonesia.

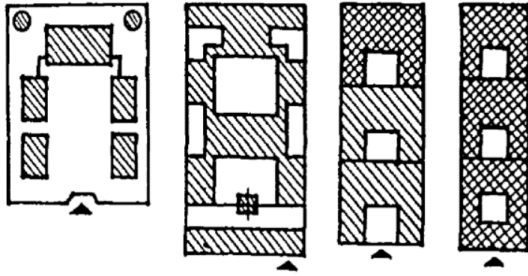
Lasem (Lao Sam) was chosen for research because the city has a rich history dating back to the 4th century AD. Geographically, Lasem is part of the Rembang Regency (111° 00'-111° 30' East Longitude and 6° 30'-7° 6 South Latitude) located at the northeastern tip of Central Java Province which consists of two seasons.

This research was conducted from February 2019 to June 2020. The current condition of the Lasem settlement no longer significantly reflects Chinese settlement development. However, its existence is an artifact of a heritage city that holds substantial potential for global tourism. The persistence of this Chinese settlement becomes very interesting to study, particularly when parts of the houses in this Chinese settlement still endure despite having undergone acculturation with the surrounding culture. The houses of Chinese residents in Lasem are considered to have architectural forms similar to those in China. The question then arises: which parts of the Chinese houses in Lasem still survive or are preserved as part of the legacy of the past?

The structure of this paper is as follows: the next section will discuss some of the relevant literature on courtyards and their formations. The reference for the courtyard description used for comparison with the courtyard in Lasem is a typical courtyard model from the Ming and Qing dynasties. The research method section will explain the data collection process, the tools used, and how the data was collected. The final section will present the results of data analysis using access graphs, followed by a discussion of the implications of our findings for urban planning.

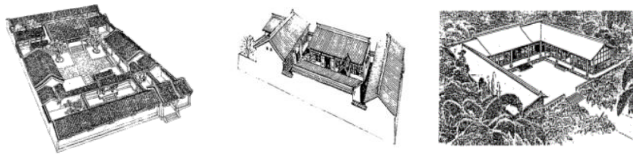
## 2. LITERATURE REVIEW

In Chinese architecture, exterior open space serves as an important complement to the structure of the enclosed space that surrounds it [13]. This open space is often referred to as the courtyard (yuanzi, yuanluo, or tangyuan). The term courtyard generally applies to a relatively large open space. A quite narrow open space may be called a sky well (Tianjin). This courtyard is used as a productive place for activities such as work, storage, and relaxation. Courtyards also bring in the natural atmosphere existing outside the walls of the house. The traditional house in China is a courtyard dwelling [14]. Although the courtyard is not the only type of house available, most of the population from north to south China utilizes this type. The proportion and scale of the courtyard vary between North China and South China. Generally, courtyards in North China are wider than those in South China. The following image depicts some of the courtyard formations from old Chinese settlements:



**Figure 1.** Several courtyard formations in the Old China settlement

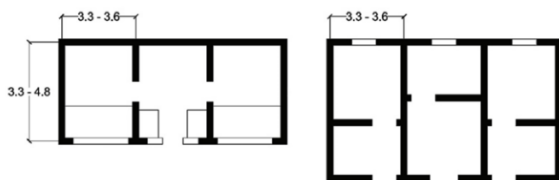
Figure 1 shows some courtyard formations in ancient Chinese settlements. Variation and development of the form of the yard in this house depends on factors such as climate, environment, and socio-political, cultural, and people's beliefs [14]. The cold weather in northern China and the high humidity and heat in southern China affected the shape of the courtyards [13]. For example, the placement of courts and buildings will have an effect in reducing direct sunlight in the room.



**Figure 2.** Courtyard perspective

There are about three to four generations that will be accommodated in a traditional Chinese house in one family. The courtyard (yuanluo/tangyuan), being the main architectural element of the courtyard of the Chinese house, is also called the well of light (Tianjin). The size and shape of the courtyard are determined by the desired sunlight needs in this housing complex (see Figure 2 from the perspective of the courtyard) so the sizes of the courtyards in the north and south are different. Small courtyard sizes are used to reduce sunlight in summer and large courtyards are used to get plenty of sunlight in winter [4].

Chinese houses have a common and distinctive spatial composition [13]. Chinese buildings not only consider closed structures and roofs, but also emphasize open spaces. The Chinese structure starts with jian, kajian, and jia.



**Figure 3.** Jian width in northern China

Most Chinese residences have a horizontal structure consisting of at least three jian. The Jian concept is connected laterally along transverse lines, which are sometimes referred to as "dragons" to emphasize its linearity. The width of each jian in northern China generally ranges from 3.3-3.6 meters as seen in Figure 3, while in southern China it is between 3.6-3.9 meters.



**Figure 4.** Jian application in Chinese architectural residential rectangular

The central jian of a rectangular dwelling of three or five bays is usually wider than the flanking jian, as it is often the main ceremonial or utility "room," but its function and name vary from part of the country to another (see Figure 4). In Chinese architecture, exterior open space is an important spatial form that complements the surrounding structure or adjacent structures. Open areas are also called "courtyards". A large courtyard is called a yuanzi while a smaller courtyard is called a "sky" (Tianjin), besides that the exterior open space also functions as a productive space.

Meanwhile, Chinese architecture in Southeast Asia has the following architectural characteristics [15]:

- 1) Courtyard;
- 2) Distinctive roof shape;
- 3) Open structural elements;
- 4) Use of distinctive colors;

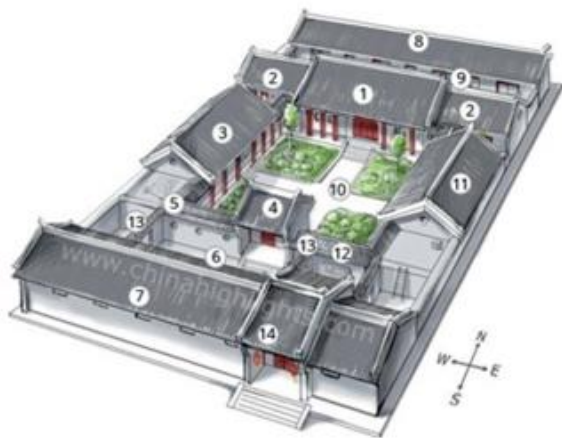
Courtyard is located behind the main house building [16]. Access to the courtyard apart from the residential space, there is always additional access (side entrance) from the side of the main building. When the main gate is closed then the front yard can function for private activities.

Residential areas on the edge of neighborhood roads are generally directly adjacent to neighborhood roads, regional main roads, or other residential areas. This building generally only functions as a residence without additional business activities. The pattern of the courtyard is located at the side or back with separate access (side entrance).

So, there are always two accesses marked with a door leading to the main access and additional access that is always closed by a curtain/blind element. Figure 5 shows a typical model of traditional courtyards houses from the Ming to Qing dynasties. Meanwhile, the characteristics of Chinese Architecture that need to be discussed and recognized are [17]:

- 1) Space organization;
- 2) The Jian;
- 3) Axial Planning, there are three rules used in axial planning in Chinese Architecture, namely:
  - a) Placing the main room at the center of the main axis and other spaces placed on the left and right or front and back of the overall arrangement;
  - b) The composition of the main building into a central/main building (Central Building Layout);
  - c) The third arrangement is used in a wider group of buildings.

Axial planning proves that the grouping of buildings or spaces in Chinese architecture is a manipulation of space. The use of space and minor halls is intended to create contrast with the ending of the climactic elements in the main space.



1. Zhenfang – main residence
2. Erfang – storage space
3. Xixiangfang – western residence
4. Ermen, Chuihuamen – second gate
5. Zoulang – corridor
6. Walyuan – first courtyard
7. Daozuofang – the room facing the back
8. Houzhaofang – north building
9. Disanjinyuan – third courtyard
10. Nelyuan -- second courtyard
11. Dongxiangfang – eastern residence
12. Yingbi – spirit screen
13. Pingmen – small gate
14. Damen – main gate

**Figure 5.** Typical models of traditional courtyard houses in the Ming dynasty (1368-1644) to the Qing dynasty (1644-1911)

### 3. RESEARCH METHOD

The analysis process starts from literature studies, surveys and field observations. For field surveys in February 2019 in 4 sample houses. Due to limitations and difficulties in being able to communicate with house owners, one village only received one sample of houses. Of the four houses, it is certain that they have a yard. A total of 4 samples were carried out by direct observation to the field to identify the presence of yards and several masses on the house plots which include the main house, front house and back house. Then map and analyze the types of yards in Chinese settlements in Lasem using access charts. Graph theory is a branch of mathematics and computer science, graphs are usually used to represent an object that has a relationship with other objects. In using the access graph approach, the authors interpret the building as a space to determine the position of the courtyard to the building. Furthermore, from the results of the mapping, compared, analyzed and got the findings.

### 4. RESULT AND DISCUSSION

Lasem is located in Rembang Regency, Central Java, Indonesia. The map can be seen in Figure 6.

To discuss the typology of the courtyard in Lasem, here are some historical periods that explain the development of Chinese settlements which consist of four periods.



**Figure 6.** Lasem's position on the map of Indonesia

#### 4.1 History of Chinese settlements in Lasem

In the first period, namely before 1600, the emergence of Chinatown in Lasem was marked by the development of settlements around the pier on the banks of the Lasem River and centered on the Cu An Kiong Temple. On the south side, which would later become the Daendels Highway, was the seat of government consisting of the palace and the square. The order of the central government is based on the pattern of the Majapahit empire. So that Lasem has two residential nuclei [18], namely Chinese settlements by the river whose pier became the axis of trade and the palace which became the center of government. Chinese settlements spread from around the pier to the highway. This first residential area is called Dasun with the orientation of the house facing the river. On the west side of Kali Lasem, there are no significant settlements.

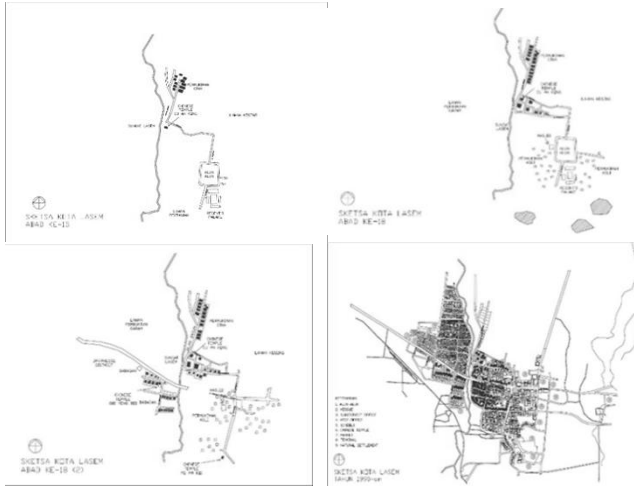
The second period, after 1600, was when there was a lot of Chinese immigration from the Fujian province. The Chinese settlement expanded to the south side of the highway by remaining on the banks of the Lasem river. This area was named Karangturi, after which the Poo An Bio Temple was soon established.

In the third period, around 1740, there was a conflict in Batavia where there was a massacre of ethnic Chinese. Some Chinese people fled to Lasem because they felt it was safer. The west side of the Lasem river, called Babagan, became the location for the settlements of the newcomers where the Gie Yong Bio Temple was later built. The palace as the center of government began to be controlled by the Dutch in 1679. After 1750 the center of government moved to Rembang so Lasem was demoted from a city to a sub-district until now. In 1808 the main highway of Lasem began to be designated as part of the postal highway by Daendels (grotepostweg). So Lasem River began to lose its role as a transportation route. The orientation of the area also shifts from the river to the Daendels Highway.

The fourth period, the end of the 19th century, was the peak of Lasem's glory when a railway line was built connecting Lasem with other cities. In addition, opium, or opium, has become an illegal commodity to be traded and has made some Lasem people rich. Settlements developed to the west of the Lasem River and the north side of Jalan Daendels called Gedongmulyo. This new area was designed by the Dutch so that the roads built have a grid pattern. In Gedongmulyo no temple was built. This new settlement became the last Chinese settlement in Lasem. From 1835 to 1910, the Dutch colonial government limited the movements of the Chinese by making

a policy of wijkensetsel, namely a policy that separated Europeans, natives, and immigrants such as Chinese, Indians, and Arabs. Each group as much as possible is collected in separate areas. This separation has a long-term impact so the term Chinatown then appears as a collection of houses of ethnic Chinese people [19].

From the division of the 4 periods, it can be seen the morphology of the formation of the city of Lasem, especially in the distribution of Chinese settlements in Lasem, is shown in Figure 7.



**Figure 7.** The morphology of Lasem City based on the distribution of Chinese settlements (redrawn by authors from Pratiwo and Nazir [20])

The observation map of the study area is divided into 4 quadrants, namely the Gedong Mulyo area, the Soditan area, the Babagan area, and the Karangturi area as shown in figure ground Figure 8.



**Figure 8.** Figure Ground Lasem and the division of the research area

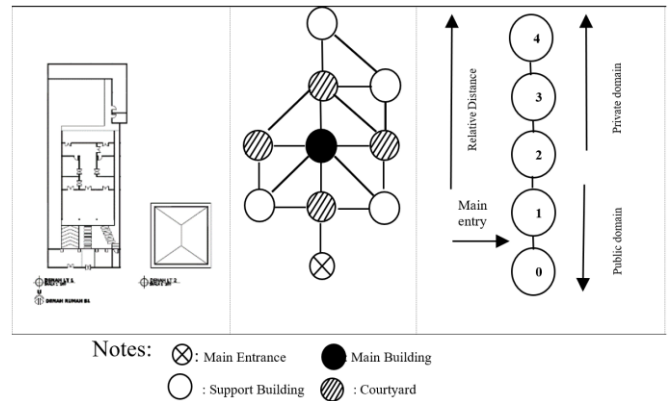
#### 4.2 Courtyard typology data in four observation areas

The following is data on several building layouts in the Soditan, Karangturi, Babagan, and Gedongmulyo areas:

##### 1) Soditan

Due to the difficulty in entering the homes of Chinese

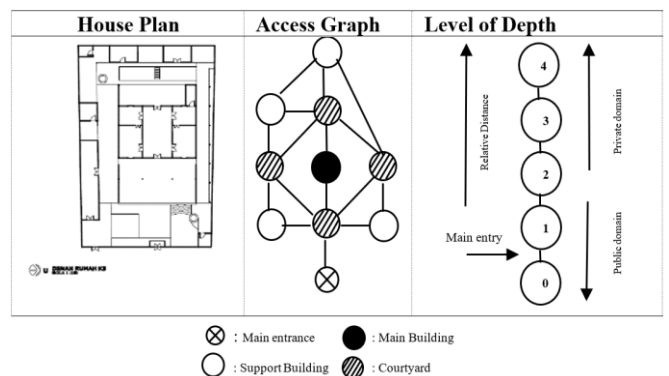
residents in Lasem, each village was only able to obtain one sample of houses. In Soditan village, the main building pattern is located in the middle, at the entrance gate there are supporting houses located in the front and back. While the yard itself is located between the front and back of the main house and one side of the building (see Figure 9). The circle that is crossed (main entrance) is the beginning of entering the building. The courtyard is symbolized by a shaded circle, and the main building is symbolized by a black circle. While the empty circle is another supporting building on the site of the house. Numbers one to five indicates the depth of the building which is increasingly difficult to reach or more private. The depth of the building in the case of the yard in Soditan has a depth of up to five.



**Figure 9.** Case study of courtyard houses layout in Soditan

##### 2) Karangturi

For the case of the house in Karangturi, from the main entrance, you will immediately meet the first courtyard which has access to the right and left of the supporting buildings. The first yards can be directly connected to the main building, as seen in Figure 10. The side courtyards are not connected to the main building. In the supporting buildings on the side, each is connected to a courtyard. Building depth reaches a depth 4.



**Figure 10.** Case study of courtyard houses layout in Karangturi

##### 3) Babagan

In the example of the house in Babagan, there are four courtyards where the main entrance it is directly connected to the front yard which is also connected to the front support building on the right and left sides (see Figure 11). Furthermore, the front yard can be directly connected to the second supporting building. The main building itself can be

connected only through the front and rear courtyards. The yard that has the most connection with the main building or other supporting buildings is the yard on the third level. This yard connects three supporting buildings and one main building. There are seven supporting buildings, each of which is connected to the yard.

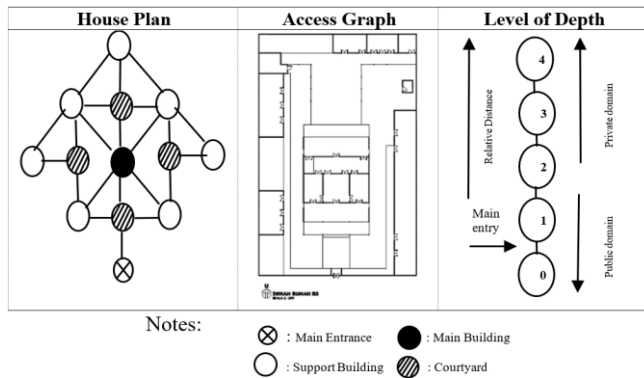


Figure 11. Case study of house courtyard layout in Babagan

#### 4) Gedongmulyo

Observations in the Gedongmulyo area are as follows: This house has five courtyards, from the main entrance directly to the front yard which is parallel to the front supporting buildings on the right and left sides (see Figure 12). Furthermore, the first court can be connected directly to the main building. Yards that have the most connectivity are on the third-floor courtyard which is connected to the main building, the other three courtyards, the supporting buildings on the right side on the second-floor depth, and the supporting buildings on the fourth-floor depth.

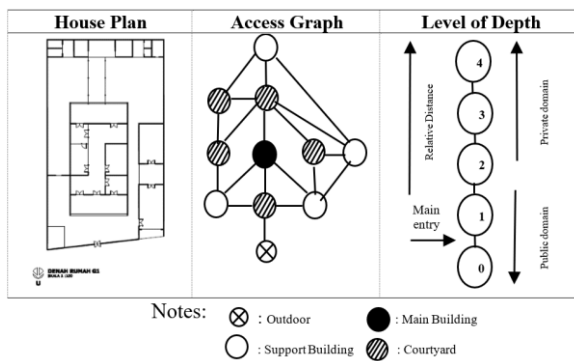


Figure 12. Case study of courtyard houses layout in Gedongmulyo

### 4.3 Typological analysis of the Chinese residential courtyard in Lasem

To compare the existing courtyard patterns in Chinese settlements in Lasem, we can refer to their country of origin. Traditional houses in China generally have a yard. Although the courtyard pattern in North and South China is different, the courtyard in China tends to be in the middle of the building components. Patterns are empty spaces enclosed or surrounded by buildings as can be seen in Figure 13.

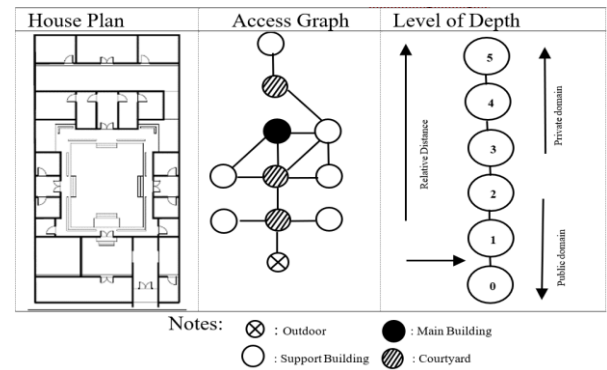


Figure 13. Courtyard typologies in China

In the original traditional Chinese house, from graph access, it can be seen that there are three courtyards. You will directly meet the front courtyard which is parallel to other supporting buildings on the right and left sides. To be able to connect to the main building, you have to go through two courtyards that are bordered by doors. The second courtyard is a courtyard that has four connections to the front courtyard, the main building, and the supporting buildings on the left and right before the main building. While the last courtyard only connects supporting buildings at depth levels three and five.

Based on the results of field observations related to the pattern of the yard in Lasem it can be compared to the 4 villages as shown in Table 1.

To better understand how the courtyard is in Lasem, shown in Table 1 explains that the yards in the four villages functioned as dwelling houses, with one main building and four to seven supporting buildings at that location. The number of courtyards is around four to five with an average depth of level four.

From the results of the comparison between the yards in Lasem and from their home country in China, in terms of graphic access, there is no similar pattern in viewing Chinese Lasem with access to graphics from their country of origin.

Table 1. Comparison of courtyards in four villages in Lasem

No	Information	Soditan	Babagan	Karangturi	Gedongmulyo
1	The location of the house against the Lasem River	East of the river	West of the river	East of the river	West of the river
2	Building Function	Residential House	Residential House	Residential House	Residential House
3	The number of courtyards in the building site	4	4	4	5
4	The number of main buildings on the building site	1	1	1	1
5	The number of main buildings on the building site	4	7	4	4
6	Level of depth	4	4	4	4
7	Courtyard pattern on a building site	Around the main building	Around the main building	Around the main building	Around the main building

However, if you look closely, the position of the yard when you see Chinese Lasem itself can be divided into six types, namely:

- 1) Located in front and behind the main house;
- 2) Located in front, back, and side of the main house;
- 3) Located beside and behind the main house;
- 4) Located in front and side of the main house;
- 5) Located in front of the main house;
- 6) Located behind the main house;

Lasem's Chinatown house yard pattern has a slightly different pattern. In general, the open space that appears is not right in the middle of the surrounding buildings. However, there is the main building or main house which is in the middle of the components of the house with a courtyard around it. This means that the center is the courtyard itself, but the main center is the main house.

## 5. CONCLUSIONS

Based on field observations, the pattern of Chinatown houses in Lasem has a different pattern from the country of origin. In general, the pattern of houses in China has a yard in the middle of the surrounding buildings. Meanwhile, what is found in the Chinatown house in Lasem is the main building which is the center of the entire building block. The part of the Lasem Chinese residential house that has survived to this day is the existence of the courtyard itself, although it has a different floor plan morphology, there is an almost identical pattern, namely around the main building (both in front, side and back). The things that affect the morphological shape of the floor plan of the Lasem Chinese house are thought to be partly due to the fact that the people living in the house have adapted to the local climate and the surrounding socio-cultural environment. This is the uniqueness of the courtyard in Chinatown Lasem which must be maintained and preserved, so that the courtyard pattern does not disappear or it does not become the identity of Chinatown in Lasem.

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## REFERENCES

[1] Xu, P. (1998). "Feng-Shui" models structured traditional beijing courtyard houses. *Journal of Architectural and Planning Research*, 271-282. <https://www.jstor.org/stable/43030469>

[2] SVD, Z.W. (2020). A courtyard house-Siheyuan Siheyuan as the dwelling place of the traditional chinese family. In *Forum Teologiczne*, 21: 207-217. <https://doi.org/10.31648/ft.6096>

[3] Liu, X. (2002). The origins of Chinese architecture. In *Chinese Architecture*. Yale University Press, New Haven and London.

[4] Zhang, D. (2017). Courtyard housing in China: Chinese quest for harmony. *Journal of Contemporary Urban Affairs*, 1(2): 38-56. <http://dx.doi.org/10.25034/ijcua.2017.3647>

[5] Zhang, D. (2015). Classical courtyard houses of Beijing: Architecture as cultural artifact. *Space and Communication*, 1(1): 47-68. <https://doi.org/10.15340/2148172511881>

[6] Knapp, R.G. (2012). *Chinese houses: The architectural heritage of a nation*. Tuttle publishing.

[7] Wang, J.C. (2005). House and garden: sanctuary for the body and the mind. *House home family: Living and being Chinese*, 73-97.

[8] Bagneid, A. (2006). The creation of courtyard microclimate thermal model for the analysis of courtyard houses. Texas A&M University.

[9] Abass, F., Ismail, L.H., Solla, M. (2016). A review of courtyard house: history evolution forms, and functions. *ARPJ Journal of Engineering and Applied Sciences*, 11(4): 2557-2563.

[10] Sthapak, S., Bandyopadhyay, A. (2014). Courtyard houses: An overview. *Recent Research in Science and Technology*, 6(1): 70-73.

[11] Rust, C. (2010). *Design for healthcare. The United States of America: Renee Wilmeth*.

[12] Siheyuan-Chinese Courtyards. (2020). <https://www.chinahighlights.com/travelguide/architecture/siheyuan.htm>.

[13] Knapp, R.G. (2000). *China's old dwelling*. Honolulu: University of Hawaii Press.

[14] Liu, Y., Awotana, A. (1996). *The traditional courtyard house in China: Its Formation and Transition*.

[15] Khol, D.G. (1984). *Chinese architecture in the straits settlements and western Malaya: Temples kongsis and houses*. Kuala Lumpur: Heineman Asia.

[16] Ariestadi, D., Sudikno, A., Wulandari, L.D., Arsitektur, P.S. (2014). Teritori ruang hunian dan kawasan pada arsitektur rumah courtyard di kampung arab. *Prosiding Seminar Nasional Arsitektur Pertahanan*, 155-164.

[17] Widayati, N. (2004). Telaah arsitektur berlanggam china di jalan pejalan raya nomor 62 jakarta barat. *Journal of Architecture and Built Environment*, 32(1).

[18] Prasetyaningsih, Y.K. (2007). Perubahan dan kontinuitas pola spasial pada rumah tinggal china di soditan, karangturi, dan babagan, lasem. *Lintas Ruang: Jurnal Pengetahuan dan Perancangan Desain Interior*, 1(1): 41-52.

[19] Handinoto. (2008). Perkembangan bangunan etnis tionghoa di Indonesia (Akhir Abad ke 19 sampai tahun 1960 an). *Prosiding Simposium Nasional Arsitektur*, 2: 1-17.

[20] Pratiwo, Nazir, S. (2010). *Arsitektur tradisional tionghoa dan perkembangan kota*. Yogyakarta: Ombak.