Journal of Chinese Architecture and Urbanism

Multi-Level Housing Governance in Rural Settlement: Transformation of Two Vernacular Houses in Zhejiang Province of China

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ABSTRACT

Vernacular houses are a dynamic complex that assemble multi-dimension variables of time, space, and people. Two governance systems, which are the officials and the people, control the village on different levels, and the spheres of their influences are distinct during different socio-economy periods. In this paper, a multi-level analytical framework is used to regroup information. Three agents are engaged in modeling the issue that each plays a different role in different levels of construction. This paper takes the two cases, the Old Tang House (OTH) and the Sishuishanzhuang Chen House (SSCH) in the Xiaqiao Village (under bridge village) in Zhejiang Province of China to study the transformation process of housing settlement in three building levels. The methods of morphology and typology are used to illustrate and disintegrate the process of housing transformation. Then, a further reading of space is conducted to explain how the hidden agents influence and control the transformation. As a result, a clear hierarchy of governance approaches is proved that the larger the scale of observed space, the higher the order of governance power. What happens in settlement level are always controlled by formal governance, meanwhile, in architectural level are controlled by more informal agents from individuals.

Keywords: Levels, governance, agent, rural built environment, vernacular architecture

1. INTRODUCTION

The vernacular house is a concept of multiplicity, literally and figuratively. On the one hand, it refers to a human habitat with local cultural features where people live that fulfill the basic requirements of accommodation and production. On the other hand, it is a dynamic complex that assembles multi-dimension variables of time, space, and people, in nature. Nothing is constant, things change all the time. Transformations are not the result of a single factor, be it the political or economic one. Indeed, it is the result of a composition of various forces including official and folks. These forces form a housing governance system that is constantly changing, which then impacts different levels of built environment, to different extents respectively.

Housing governance is a management system to control housing practice. It is termed and applied firstly in the context of business and enterprise research. It refers to a series of rules and set of owned responsibilities to regulate the architectural practice that ensure the integrity and effectiveness of the housing system [1]. The concept of governance bridges housing form transformation with the agent groups that control the process that how form generates and changes. The system of housing governance is hierarchical, it engages multiple levels of space and agent groups along the lines of architectural practice. It provides key clues to explore the dynamic mechanism of vernacular housing transformation in detail.

The study of vernacular settlement and houses started from the 19th century. During the 19th century, "vernacular architecture" was used by architectural theorists to refer to rural buildings of the preindustrial era, that were apparently the houses of yeoman farmers and that seemed not to have been "consciously" designed or affected by the intellectual and artistic currents of the Renaissance [2]. The discussion concentrated on discovery and peripheral description of shelter types and people, symbolism, and exotic nature of vernacular forms [3-8].

In the 20th century, a survey of vernacular houses was conducted all over the world, by which various forms of vernacular architecture were recorded [9,10]. Having now a rather complete documentation of vernacular-built environments, researchers focus more on the issues beyond form, to explain how the vernacular house forms are generated from specific physical and social environments [11]. Amos Rapoports demonstrated that socio-cultural factors are the decisive factors that affect house form indirectly. Climate, materials, construction, and technology etcetera, as the directly modifying factors can also alter house forms [12]. Architects and geographers continued to explore the connections between culture and the built environment, depicting variations and distributions of built forms within a particular culture or cross-cultural region [13-16].

In recent decades, research on vernacular houses have increasingly stressed on the dynamic and processual nature of tradition. "The vernacular as process" [17] has been raised clearly that attempts to identify the control and authority in vernacular houses. This idea is fundamental to understand vernacular in this paper that eventually motivates advanced research on the transformation of rural housing development into the context of Chinese vernacular architecture.

Current studies on the transformation or evolution of Chinese vernacular architecture are mainly on the transforming process of spatial structure, and the influencing factors of society and culture behind forms. Scholars studied the transformation of rural settlements in different regions from the perspective of social structure. Duan Jin used topology methods to analyze the spatial structure of historic town settlements in the Lake Tai Basin [18]. By establishing an interrelated research method of traditional space analysis, space syntax, and historical geography interpretation, Yan Ruihong carried out graphic analysis on traditional Chinese settlements to explore the deep structure and evolution of spatial forms [19].

Wang Yun used quantitative methods to convert the traditional settlement space composition into a mathematical model to explore the settlement structure based on the relationship between the data [20]. Wang Yanhui combined qualitative and quantitative methods to sort out the morphological characteristics and evolution rules of rural settlements in southern Jiangsu, and to explore the dynamic mechanism between social and economic development and rural spatial form changes [21].

2.   METHODOLOGY
2.1   A multi-level analytical framework
A multi-layered analytical framework is used to disintegrate the village's transformation during different periods. The methodology used in this paper is based on the Open Building Theory, which helps to articulate different functions of various architectural elements and the corresponding design strategies by setting up different analysis levels. In the 1960s, John Habraken defined a whole building entity into two levels, which are structure and infill. The stratification method came into the analysis of production of urban space in the 1990s [22]. According to this theory, the built environment is divided into several inter-influencing levels based on the following hierarchy: conurbation, architecture, indoor space, and infill. There is a relationship between a higher level and a lower one, in that the former provides a setting for the latter. By separating into different levels, a more flexible content can be provided. The multi-layered analysis framework has also been used in urban morphology theory. Conzen developed a method [23] to analyze the urban environment into three levels, street, block, and building [24-25].

Due to the advantages on articulating different built elements specifically, an analysis is conducted with reference to six levels in order to clarify how the settlement and dwellings were transformed and controlled by different governance methods during different socio-political periods, according to different scales of observation [26-27]. Following the sequence from macro to microscope, the six levels are the regional level, settlement level, sub-settlement level, neighborhood level, building fabric level, and infill level.

There is a hierarchy among the six levels. The first three levels are settlement levels, and the last three are building levels. In this paper, only the last three levels of buildings are studied for a precise discussion on housing transformation. The neighborhood level studies the boundary and spatial relations of building groups; the building fabric level studies the form, structure, and functional spaces of the building; the infill level studies the configuration of partitioning, furniture, and equipment inside the building.

By taking the multilevel approach, a synthesized result can be concluded that enhances our understanding of the rural built environment thoroughly, on what had occurred, is occurring, and even is going to happen in the vast area of rural China.

2.2   Research cases
Xiaqiao is a village located in southern Zhejiang province, the mountainous area adjacent to Fujian province [Figure 1]. In this paper, two vernacular houses with traditional forms in Xiaqiao Village, the Old Tang House (OTH) and the Sishuishanzhuang Chen House (SSCH), were selected as comparative case studies, in order to explore the transformations of these houses and the governance controlling them.

The spheres of their influences are distinct during different socio-economic periods. This paper attempts to explain the dynamic process of transformation happening in the rural built environment of China in recent 400 years. It contains four socio-economic periods representing the different development stages that are the Qing dynasty (1616–1911), the Republican China (1912–1948), the Planned Economy PRC (1949–1977), and the Market Economy PRC (1978–2016). The transformation of the whole settlement provides the context to understand the transformations of the two houses [Figure 2].

Figure 1. Location of the Xiaqiao Village, Zhejiang Province, China. Source: Drawings by the author
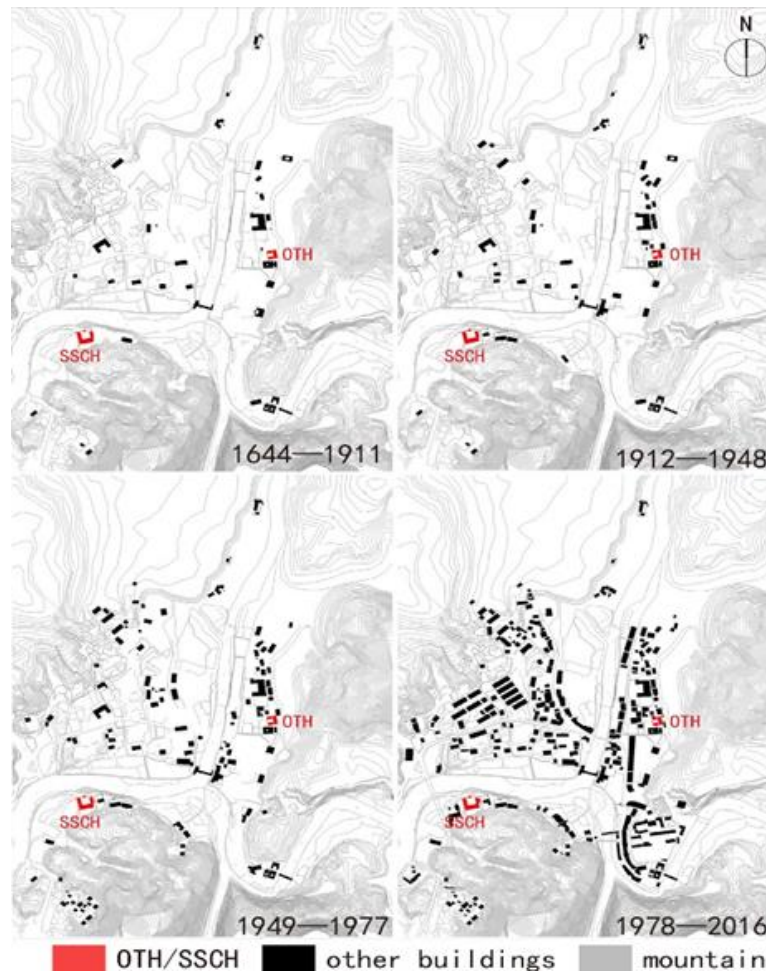
**Figure 2.** Transformation of settlement patterns. Source: Drawings by the author

3. HOUSING TRANSFORMATIONS ON DIFFERENT LEVELS

3.1 Neighborhood level

The neighborhood level is the first level focusing on building. In this level, the combination of one group of buildings is the research object. It explores how a building co-exist and interact with its neighborhood. It reflects the radical root of lifestyle and living mode. The neighborhood level is used to discuss the relationship between a building and its surrounding built environment. Thus, the term of neighborhood here is used to define the buildings that obviously belong to a certain cluster.

The two houses, OTH and SSCH, are built in different periods of the Qing dynasty. They both belong to the category of traditional dwellings. Thus, they share similar features of courtyard houses, following similar rules of traditional construction system. However, due to the different
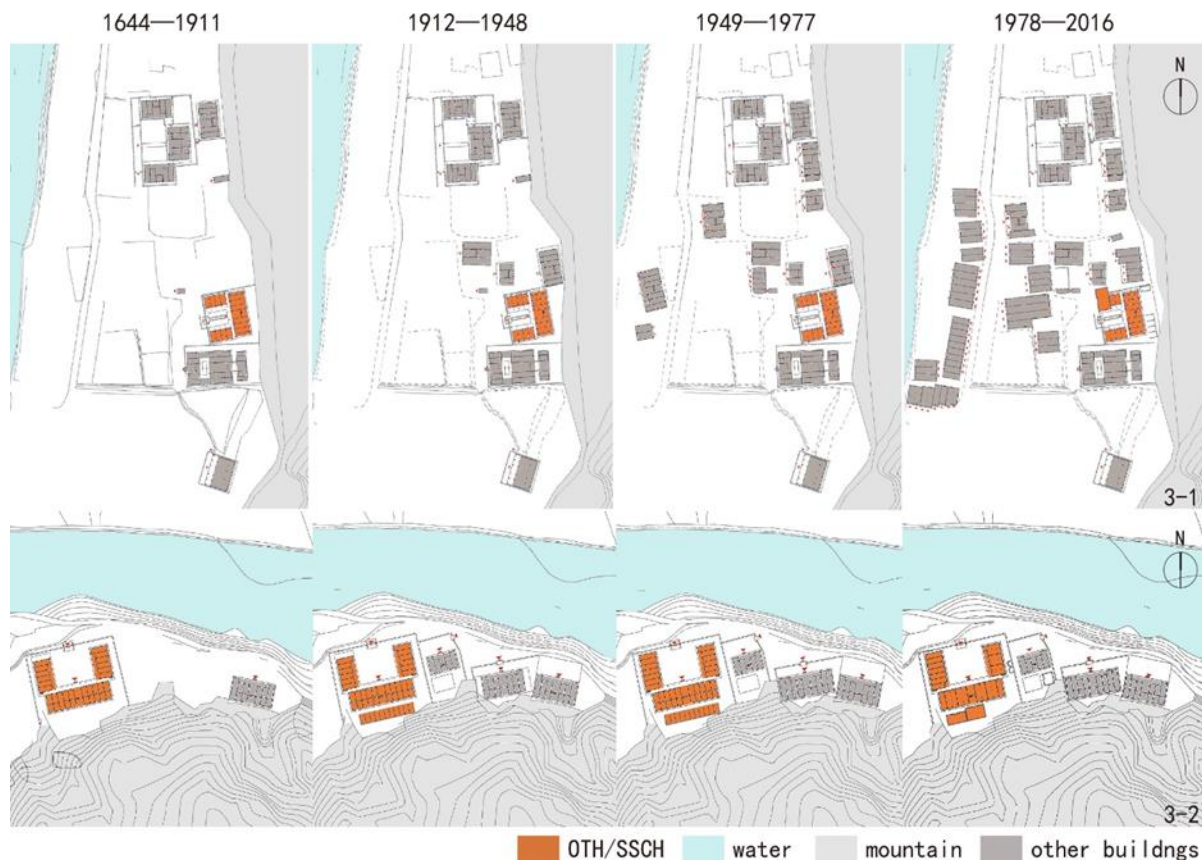
Figure 3. Transformation of neighborhoods (3-1 Neighborhood of OTH; 3-2 Neighborhood of SSCH). Source: Drawings by the author

conditions of land and different requirement of families, in the neighborhood level, the two buildings show different features [Figure 3].

(i) General situation

Due to the increasing built density, the spare spaces around OTH have been encroached into small buildings, and most of them are residential. Due to the ownership of homestead, most buildings around OTH belong to different families of the Tang lineage. There is only one plot that is still owned by the Houchi (后池 rear pond) Lin lineage. The general situation of the neighborhood surrounding OTH inherited the features from the settlement level.

The situation of SSCH is different from that of OTH. Instead of a complete plain on the riverbank, SSCH is located on the slope of the Nanshan Mountain. The area of the suitable lands that are rather flat for construction is limited. It limits the scale of construction and the quantity of houses there. Instead of small fragmented houses built by small families moving out from the big house, four complete courtyard houses occupy the field of Nanshan. Besides, this field is mostly developed during the late Qing dynasty to the early Republican period. After several big houses have occupied the area, new movers can only build their houses in other fields outside this neighborhood.

(ii) Entrance

For the neighborhood of OTH, along with the increase of new buildings, new alleys were created spontaneously by dividing buildings, and more entrances appear along these alleys. But the entrances were not set randomly. Instead, the entrances are always kept in the same orientation. The direction to go inside the building or building group is from west to east.

The entrances of all the houses in the neighborhood of the SSCH mainly depend on the orientation of mountains.

The courtyard houses here are arranged parallel to the mountain contours. Thus, the entrances of three of the four houses are facing the front river. But the orientation of entrance in traditional Chinese houses is a complex result of various considerations including *Fengshui*, wealth accumulation, geographical conditions, and many more. In this neighborhood, the courtyard gate of the Republican house separated from SSCH rotates towards the east to avoid facing the gap of the opposite mountains. It was the personal preferences of the family who lived in the house and who based on geomancy.

(iii) Orientation

In this neighborhood, the orientations of all the main buildings were kept the same during the four periods. For the OTH, all houses face the west where the Beixi Stream (北溪, north stream) flows, and where the Nanjiangjun Mountain (南将军山, south general mountain) stands. For the SSCH, all houses face the Xixi Stream (西溪, west stream), with the mountain at the back. However, the wing buildings in the courtyard house have different orientations due to the courtyard layout. But from the overall perspective of the courtyard house in these two cases, all houses in the neighborhood still have the same orientation.

3.2 Building fabric level

The building fabric level involves the study of the spatial structure of buildings as one group. Three parts are discussed, including the envelope that encloses the interior of a building, the structure that bears the load of a building, and the combination of building groups.

The construction of houses in rural Taishun is based on the spatial unit of *liu* (榴, a file of space). A *liu* is a unit of dwellings both in terms of space and construction in the Taishun county. It is a word in the local dialect equaling to 'bay' in traditional Chinese architecture terminology. It refers to

the space between two rows of columns from front to back.

(i) Enveloping

Both these two houses were built in traditional style using traditional construction material of wood. The buildings are covered by wood panels. Most of them are attached with additional wooden doors while the original traditional styles are retained for the windows. Although the accurate time cannot be ascertained, most of the doors, windows, and wood panels were probably repaired and replaced several times throughout the lifetime of the building, something like a daily maintenance of the building.

The envelope of the SSCH has changed little indeed. Glass windows are added in the middle of the second floor where the original space is open directly to the outside. However, comparatively, the transformation of the envelope of OTH is more apparent. In the OTH, its end *liu* of the right-wing building has been pushed forward. It extrudes from the original place. This change has been made by the male owner in 1990. After 1990, the children of the old couple moved out and built their own houses. Thus, the living space seemed to be spacious to the old couple. Considering the convenience of living, the old man revised the end *liu* by moving the stove from the back to the front. Meanwhile, the front wall of the end *liu* was pushed a step forward to create a better entrance going inside the room.

The major change of the building's form happened on the left-wing building. The end two *liu*s was rebuilt into modern style in 1996–1997 after the old structures have been destroyed by flood. The form and material of the new parts transform drastically and radically. The doors and windows built for the new dwellings are distinct from the traditional ones. The gates are made of metal, and the windows are made of glass with a steel grill outside for safety

purposes. But it is interesting that the gates are still in a four-panel style which is the same as the traditional one.

(ii) Structure

In terms of the general structure, traditional wooden structures of these two buildings were kept the same during the four periods. The logic behind constructing a wood column-beam frame structure is to form a frame that bears the load of the whole building by columns as vertical components and beams as horizontal components. In this kind of structural system, the structural constructions, such as the columns and beams, are totally separated from the infill constructions such as the partition walls.

The major structural components in the traditional construction system includes column, beam, purlin, rafter, and *Dou-gung*. Basically, the columns and beams have not been changed since it was first built. They constitute the fundamental framework of the building. They are always built with solid wood that is dried for a long time and coated with Chinese wood oil to prevent moths and rotting. It is the reason why the major structure of the building can weather different climates for a long time.

Comparing to the major structural elements, the decorative elements in the structure that bear little load were replaced more often. For example, the side *Dou*s (斗) in composition of *Dou-gung* are easier to be lost or replaced by a new one. The same situation happens on other decorative elements in the structural system, such as *Queti* (雀替). In the major part that bears great load, subsidiary construction is added to assist supporting the upper structure. For example, at the corners of the building, a wooden stick is added to the beam to support the overhanging purlin.

The rafters and purlins support all the tiles of the roof directly. They are easier to be corroded by rain, or damaged by strong wind. Thus, rafters and purlins experienced more frequent repair and replacement compared to other structural parts.

Without affecting the stability of the overall structure, part of the structure can be changed according to the changing functions. For example, part of the structure of attic on the second floor has been removed. In the original structure, all the beams were completely connected to the adjacent two columns. It was a typical form of the second-floor structure in the early Qing dynasty. In the late Qing dynasty, the structure had transformed in that the beams on one side had been removed to create a rectangular entrance going inside the attic. Then, in order to facilitate the usage of the attic more efficiently, this part of structure of the building built in the earlier stages had been reconstructed as well that the beams on one side had been removed to create the entrance.

(iii) Combination of building group

Both the OTH and the SSCH have a three-section compound layout (San-he-yuan, 三合院). It is constituted by a courtyard gate, a main building, and two wing buildings. The main building and wing buildings are connected through the roof and platform, making a U-shaped overall layout.

However, the OTH and the SSCH represent two typical cases of traditional courtyard houses built in the early and the late Qing dynasty, respectively. The earlier Qing courtyard houses are much smaller than the later ones. For example, in the earlier courtyard house of OTH, there are 15 *liu*s in total; 7 *liu*s for the main building, and 4 *liu*s for each wing building. But comparatively in the later ones, there are 23 *liu*s in total, containing 11 *liu*s for the main building, and 6 *liu*s for each wing building. Due to the enlarged courtyard space, the late Qing courtyard house represented by the SSCH has a larger and much more spacious front yard than the earlier one represented by the OTH. The causes of

the enlargement of courtyard was by the social development and the specific situation of the tenant. On the one hand, along with the development of social productive forces in the late Qing dynasty, the folks got wealthier, and the population increased as well. Thus, there were real needs to build a larger house comparing to the early Qing dynasty. On the other hand, the financial status, family population, and the social status of the family, determined the size of the courtyard house.

In terms of the overall layout, both the major patterns of these two houses have remained the same. But several changes have been made respectively for the two different cases.

(iv) Transformation of building combination of OTH

For the case of OTH, there are more obvious changes based on the lifestyle and daily needs of the owner [Figure 4]. During the Qing dynasty, the major part for residence remained the same. But due to the needs of daily life, several functional components were constructed. These components included places to store debris, raise livestock, or toilets. They were more easily damaged and had been rebuilt many times due to their temporary structures and rustic building materials.

During the Republican period, the population grew beyond the maximum capacity of accommodations. Residents, again, started to move out. But, in the Republican period, there was insufficient suitable land for construction, thus the scale of moving families was smaller. The continuous turmoil caused a decrease in the accumulation of wealth as well as the determination to build bigger houses for newer generations. Thus, attaching living spaces grew at the back of the courtyard house. It is the Sancenglou house (三层楼屋, three-floor building), the only building higher than two floors before 1980s in the village.

During the period of planned economy, the whole pattern of the OTH was retained. The economic conditions limited the probability of construction, and the ideology encouraged collective activities instead of construction of houses for personal needs. Only a simple even rustic house was built at the connection part between the back courtyard and the Sancenglou building. It was unavoidable due to the urgent need for accommodation.

After entering the period of market economy, the whole society experienced great changes both on tangible and intangible aspects. Two major changes were made after the 1980s. Firstly, the Sancenglou house was burned in the 1990s. After that, the new houses were built gradually on the same site. Secondly, the front half of the left-wing building was destroyed by a flood around 1996. It has been rebuilt into a modern style after that. Both the new buildings built on the two sites do not rely on traditional wooden structure. Instead, new materials of modern architecture such as brick, concrete, and steel, were used as well as new construction techniques, brick structure, reinforced concrete structure, and the mix of the two.

The construction of the new buildings changed the pattern of the neighborhood of the OTH. Firstly, it cut off the direct connection between the OTH and the Sancenglou house that was previously connected. The new houses built on the original site of Sancenglou partly detach from the old house due to the differences of structure and the field of homestead. Secondly, the new house built on the site of the left-wing building is partly independent from the entire courtyard house. It has its own entrance to go inside the house from the outside without having to pass through the courtyard. As the new building is taller, combined with the modern cladding façade, the new house can be well differentiated from the old one.
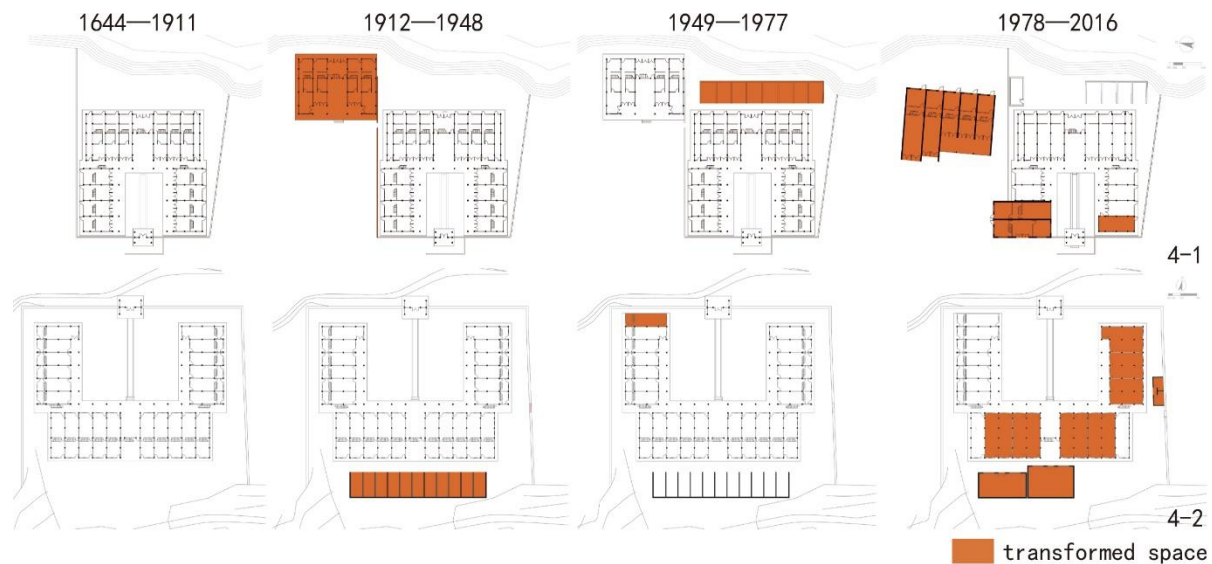
Figure 4. Transformation of courtyard houses (4-1 Courtyard houses of OTH; 4-2 Courtyard houses of SSCH). Source: Drawings by the author

(v) Transformation of building combination of SSCH

The SSCH was built in the late Qing dynasty. The building group remains the same during this period as the OTH. Due to the late construction time, there was no urgent need of expanding the original courtyard house caused by the rapidly increasing population. Besides, similar to OTH, the continuous renovation and rebuilding of the additional functional components are common to see in everyday life [Figure 4].

During Republican period, big families started dividing. Due to the limitation of land in the neighborhood, most of the residents moving out built houses in other areas. Only one family could build their new house next to SSCH, due to the allocation of land property. Generally, this new house would be an independent courtyard completely separated from the SSCH. It stands outside the building group of SSCH. But a side courtyard gate in the back yard still explains the invisible connection between the two houses.

During the period of planned economy of PRC, an additional *liu* has been built at the end of the left-wing building to enlarge the living area of the house. However, the overall layout of SSCH did not change much. The greatest transformation of SSCH building group happened at the fourth stage, the period of market economy of China. The entire building group changed radically from space to function. In 2010, after the establishment of the Corridor-Bridge Cultural Park, which is when the Xiaqiao Village planned to develop tourism, the owner of SSCH renovated the house, turning it from pure self-residential space into a restaurant plus hostel for tourists. In view of this situation, the transformation of SSCH in this level mainly shows in the construction of service rooms, kitchens, public washrooms, and more storage spaces. These components are built in the accessory spaces, such as the back courtyard, and the side courtyards at the back of the two wing buildings.

3.3 Infill level

The infill level is the observation of the building at microscopic level. It focuses on the interaction between human beings and the building on a daily basis. There are two parts that are discussed under this level, which are interior walls, the non-structural partitions and decorations, and the indoor setting and space from the perspective that takes the role of usage and function of a building.

(i)   Partitioning walls

All the interior walls of the traditional houses do not bear the load. They are only wooden panels used to divide spaces from outdoor to indoor, from others' to one's own. The wooden panels are very thin (less than 10 cm thick). The panels have directions, along the depth and the width, both having different functions. In common, the former is used to divide spaces according to ownership, and the latter divides spaces according to functions. To explain further, the panels along the depth differentiate the spatial cell from others' to one's own, and those along the width differentiate space from bedroom to kitchen.

For both of these cases, indoor panels have been changed to reallocate the spaces to meet the changing requirements of the locals based on their daily lives. Some panels were removed, some were added, some were renovated. In the OTH, the panels along the depth have not changed much. The form of space using *liu* as unit has been kept until now. But the panels along the width have been extensively modified, especially in the recent decade. At present, most of the

panels in this direction have been removed. In one cell, there are three panels along the width. These panels divide the whole cell into four spaces that are a living room at the front, a bedroom, a staircase, and a kitchen at the back. It is the most efficient approach to maximize the use of the residential space to fulfill all the needs in daily life. However, along with the residents moving out, those who are still living here can occupy more spaces. They do not need to divide the space so carefully. In fact, the narrowed living spaces cannot satisfy the requirement of modern people who pursue capacious indoor spaces with better sunlight and ventilation. Thus, except for the one that separates the kitchen from other spaces, all the other three partition panels have been removed, at least for the *liu*'s that are still in use.

But in SSCH, the panels along the two directions have been greatly altered. The width-direction panels have all been removed; meanwhile, the depth-direction panels have been removed for every two *liu*s. They all aim to create bigger spaces as dining rooms.
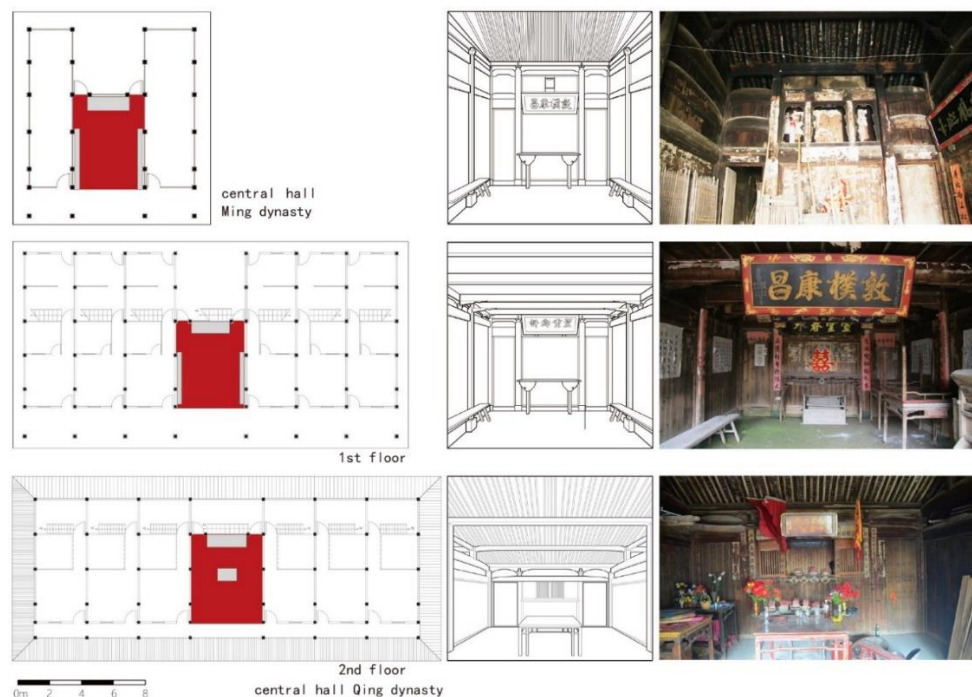

Figure 5. Central Hall in Ming and Qing dynasties. Source: Drawings by the author

(ii) Central hall

The transformation of indoor settings and spaces responds to the changes of daily life. In the traditional living customs, the house can be divided into gathering spaces and private family spaces according to their respective functions. The middle cell of the main building is used as the central hall for big families who are living in the house [Figure 5]. The gathering space is where family events are held, like weddings, funerals, housewarming, birth of a baby, and many more. In common days, the hall provides spaces for residents to chat and communicate. But nowadays, the gathering function of this space has been greatly weakened, and even replaced. With the original residents building new houses outside and moving out, the central hall has been out of use and gradually lost their role as the spiritual core in the house. Hence, it has transformed from a core space to a leftover space.

In the OTH, the central hall is always empty, sometimes, some residents leave their farm implements there. Due to the transformation of ideology, the center hall on the second floor is no longer used to conduct daily religious rituals.

The situation in SSCH is different. Most of the spaces in this house have been turned into hostels and dining rooms, only four cells remain as residential spaces for the villagers. Besides, the central hall of the house has also become a reception space for customers. This space is now used to showcase the vernacular living style for outsiders.

(iii) Private cell

The function of private cells (*liu*s) has undergone greater transformations [Figure 6]. Due to the loss of current residents, some private cells in the OTH are desolate and are stacked with old junks. The others that are still in use have been arranged differently compared to

the original layout. The panels on the first floor have been removed except the last one that separates the kitchen and the front space. Then, a big space is created at the front that is used as a dining room, and to store sundries and farming instruments. To avoid humidity and to allow more privacy, the bedrooms are located on the second floor. In the SSCH, the private cells are turned into hostel as accommodations for travelers. The indoor space is opened up to meet the needs of urban lifestyle.
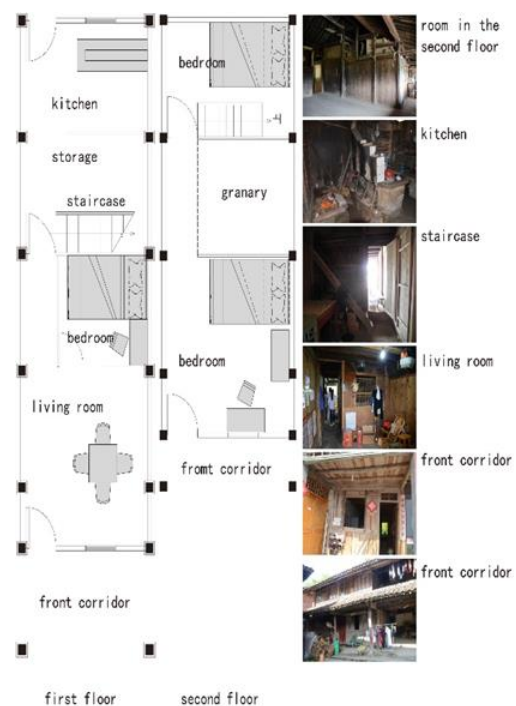
Figure 6. Living cell in traditional buildings. Source: Drawings by the author

Generally, the spatial hierarchy has been changed. In traditional dwellings, a clearly dominant-subordinate relationship exists that the central hall takes the core role in the whole house that occupies a larger space compared to the other *liu*s. The rest of the living cells used to be paralleled, with similar sizes and spatial arrangement. But now, the dominant-subordinate relationship between the central hall and private cells has been changed. Along with the collapse of traditional big family, the core role of the central hall has been eliminated.

The progressive relationship of space in the private cell has disappeared as well. From the front to the back, the space is now integrated as a whole instead of several parts with different functions.
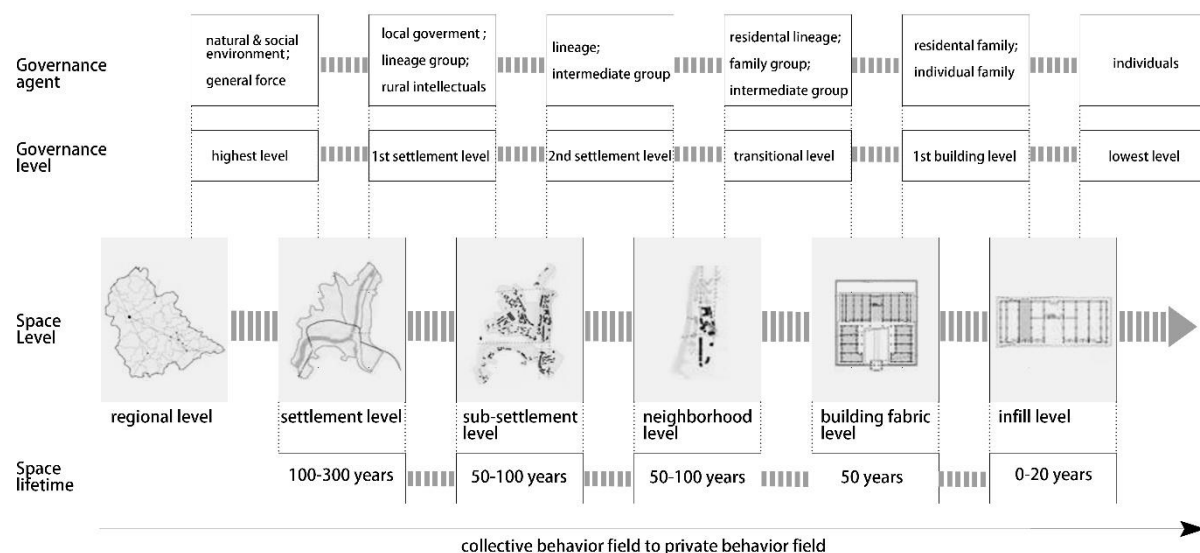
4. GOVERNANCE HIERARCHY: AGENT OF CONTROL

Governance hierarchy explores the relationship between the two major dimensions of the built environment: space, and people. The term people here mainly refers to the governance agency groups which has regulatory powers to change the corresponding spaces, but it also relates to other stakeholders who have similar interests. In the same way as with the different spatial levels, the governance agents also have levels based on social status, and these are government entities with formal administrative responsibilities, institutions and organizations, and every individual resident who is living in the specific space. This helps to understand the public-private partnership in spatial formation with different levels [Figure 7].

4.1 Governance hierarchy

The governance of the housing settlement that controls the transformation of the built environment in different levels has clear hierarchies. Two systems govern the village, which are the administrative management as a top-down system, and the self-management by the villagers as a bottom-up system. These two systems control the village on different levels, and the spheres of their influences are distinct during different socio-economic periods.

Besides, three forces are engaged in modeling the built environment. They are the government, the individual (family or each villager), and the intermediate organizations. The state and the individual are the two poles of the society. The former represents the official ideology that controls the society, and the latter represents the daily life of real people. They play different roles at different levels of construction. An intermediate organization acts as a transitional status between them, it acts as a bridge between the local government and individual villagers. Different groups play this intermediate role in various periods. For example, in Imperial China, the lineage was responsible for communication between public and private; and in planned economy of the PRC, this role was played by the production brigade. Moreover, the changing contexts of the tangible and intangible environment on society, economy, politics, culture, and technology caused corresponding changes in

Figure 7. Governance hierarchy in different levels. Source: Drawings by the author

these two controlling systems and led to a series of contradictions between them in different periods. This may be the key to understanding the transformation of the built environment in the village.

The higher level (like the settlement levels) implies the general trends of rural development that are controlled more by the governmental powers. It is the result of collective behaviors. Meanwhile, the lower level (like the infill level) indicates the way of the ordinaries' everyday life, which depends more on personal experiences. Furthermore, a hierarchy is implied in the six levels that higher levels can influence the transformations on lower levels. However, the delivery of impact is one way that the lower ones can do nothing about the higher ones.

4.2 Transformation of spatial features and governance system

The organizational form in the grass-root society of rural China has changed greatly in the past 400 years, from the Qing dynasty to contemporary times. A sophisticated management system had been established by the local villagers themselves in premodern times for hundreds of years. However, the self-governance system has been broken by the transformation of ideology during the Maoist period, a socialist type of production brigade replaced the traditional self-governance system in rural China.

The grass-root society in the Qing dynasty and the Republican period in rural China belonged to the traditional social formation. It lasted for hundreds of years in imperial period and was kept during the Republican period. The political powerholder has been changed over for several times, and the bureaucracy fell into chaos among the high official departments, whereas the rural grass-root society has not changed much. The organizational formation and management approach of villages in the Qing dynasty have been inherited in Republican period. The social structure in rural China was retained, and the rural governance system continued.

Family is the basic unit of everyday life and social production in an agricultural society. It refers to a group of relatives with closed blood relations who live together and share common wealth to some extent. During the premodern times, there were three major types of family: nuclear family, linear family, and extended family, corresponding to different family structures. Nuclear family has two generations containing a couple of adult parents and their underage children. Linear family has three generations containing grandparents, parents, and underage children, all the nuclear families from the same grandfather can be included. Extended family can include the couple and their married sons or even other relatives.

Home and country isomorphism is an important feature of Chinese society during the premodern period. The relationships among people were basically extended by the family in the context of agricultural society connected by blood relations, which led to a political system with family as a basic unit.

Instead of a formal government department, village as the unit cell of Chinese rural society has been governed by unofficial groups. The lowest level of official administrative department is the county level. Below the county level, all the rural communities, such as town and village, are operated by nongovernmental organizations.

A lineage group, as the coalition of families, was responsible to rule the village in which they lived. In the rural society during the premodern times, the families bearing the same surname and sharing the same ancestor could trace back their constitutive lineages. Both these two terms can be used interchangeably to refer to a type of patriarchal organization [28-29] in China. The individual families belonged to the same lineage group did not necessarily have strong blood relations. Sometimes, some family groups who shared the same surname and lived in neighboring areas united for mutual interests.

However, they would try to manufacture a common lineage history to trace to the same ancestor, making an imagination of family

origins to strengthen the legitimacy of their lineage. Thus, from this perspective, lineage is a 'cooperation' type of organization grouped and operated spontaneously by the villagers themselves in the local community.

Under the home-country structure, the state power and family power are co-dependent. This relationship determines the scramble for the public power of the village by the big lineage group.

The rural intellectuals are the representatives of effective implementation of management by the lineage group. There is another system working in parallel with the lineage system, the rural intellectuals. The grass-roots society in the Qing dynasty consisted of mainly three parts: officials, rural intellectuals, and the ordinary people. The class of rural intellectuals is the intermediary between the bureaucrats and the villagers. During the Ming and Qing dynasties, "national power cannot go below the level of county. The lineage group is the management class below the level of county. All the lineage groups are operated by themselves. The self-governing system produces the local ethic. Local ethic produces the rural intellectual group [30]." (国权不下县，县下惟宗族，宗族皆自治，自治造伦理，伦理造乡绅; *guoquanbuxiaxian, xianxiaweizongzu, zongzujiezizhi, zizhizaolunli, lunlizaoxiangshen*) The rural intellectuals was the only group that could legally represent local communities and government officials to discuss local affairs regarding political issues of the group. Under the rule of the empire, the management of the administrative agencies had not yet penetrated the village, and the unique power of the lineage had maintained the stability and order of the countryside.

According to Vivienne Shue's research [31], in traditional central societies, there were in fact two kinds of order and power: one was the official order or national power; the other was the local order or folk power. The former was centered on the imperial power and formed a graded trapezoidal structure from the top to the bottom; the latter took the lineage family as the center and gathered in a natural village of large or small groups. Each lineage village was a natural "autonomy," like a honeycomb-structure.

There are three kinds of spaces with different hierarchies existing in the village's-built environment, which are family space, lineage space, and common space. Family spaces are the spaces owned and used by the same family as an independent living unit, which are referred to as the private dwellings. Lineage spaces are the spaces owned by the same lineage group as a cluster of families with the same surname and blood relationships, which always refer to the ancestral halls. Common spaces are the spaces shared by the public, which always refers to the bridges and temples.

Family spaces are built by the family members themselves, but the location of the spaces can be controlled by the lineage. Lineage spaces are built by the lineage members and is always initiated by the lineage representative. Common spaces are built by the joint forces of the public, but the built activities are organized by the rural elites.

In December 1978, the Communist Party of China held the Third Plenary Session of the Eleventh Central Committee. It signaled that the Chinese society had entered a new era of reform and opening up. The most direct manifestation and means of the state's effective control over rural society was that the state power system was established in the rural society. In a traditional rural society, this kind of state power was expressed as imperial power; in a modern society, it is directly represented as political power, with the highest authority being the national administrative power. After the national administrative system was sunk to the township during the Republic of China, it was the township government that directly represented the country in rural society. In the new era, with the abolition of the people's commune system and the establishment of the village governance system, the form and scope of the state power have also undergone great changes. The "township government" system has been established by certain administrative divisions: the country's most basic administrative power system. In other

words, the township has become the border between the country and society. The authorities whose power is higher than the townships directly represent the administrative power of the state and belong to the category of the state. The organization or administrative division below the township does not have the nature of the state administrative organization and belongs to the category of society.

In the new period, township officers have a clear bureaucratic structure. Their behavior directly affects the development of rural politics. The township cadre system is composed of two major rules of identity and rank. Township officer mainly refers to the staff of the township regime. According to the sequence of posts prescribed by the national recognition system, towns and townships generally belong to the *ke* (科, department).

In the new period, "township governance" is the dominant force that reflects the state power. "village governance" is the foundation that reflects the community authority. In these organizations, the formal organization of village belongs to the state's political power system, but it is not a government organization. The village party branch is the core of the village-level power organization. The villagers' committees, as self-governed grass-roots organizations, are changing the political nature and operational paths of the village's political methods. Township government and village governance organization are co-dependent.

At the same time, the villagers' group is an important part of the village governance structure. It is also a force that cannot be ignored in rural politics. The villagers' group is not only the most common collective economic organization in China's rural society at the moment, but it is also a community organization composed of natural villages. It is the most basic living environment for villagers and an integral part of the village governance structure. By law, the villagers' group is a collective economic organization and is the owner of collective land.

The elderly authority still played an important role in the display of politics in the countryside. A notable difference between the elderly and the intellectuals of traditional society is that they are not actually detached from the formal organization of the village but are within the system and have certain authority.

The family and the associated lineage are always the basic units for observing the political structure of Chinese rural society. However, since the beginning of the transition into modern society, this situation has undergone changes. As the society continues to divide, lineage forces have been impacted in several ways. Since the founding of the New PRC the foundation of power of the rural lineage has been shaken through the cooperation and collectivization movement. The class division has replaced the affinity of blood, and the social function of family and lineage has even been cancelled. After the implementation of the household contract responsibility system for remuneration in the 1980s, the family's economic interests have been affirmed by the state's laws and given new content. In connection with economic interests, the legal status of rural families has also been restored to a certain degree. On many occasions, the family has become an actor in rural politics. The family's interest structure has become the basis of the rural social and political order. It not only contains information on many rural public powers, but also is the fundamental reason for understanding the stability and turmoil of the rural political order.

5. CONCLUSION

In this research, vernacular houses are seen as a dynamic process instead of a constant entity. The dynamic process is constituted of a series of continuous temporal segments. With this research perspective, the rural built environment is portrayed as a continuum of temporal segments of settlement.

The rural built environment is visualized as an integral part of multiple spatial layers with different scales. Different spatial levels are the result of observing the space through

different lenses with different resolution. It proposes a comprehensive research framework which integrates all the spatial levels to provide increased depth of research into the specific case.

In this research, the three building levels are discussed specifically, to illustrate the formal transformation of space and the governance power behind it. Generally, there are two governance systems that shape the vernacular houses on different levels, a formal one from the government office, and an informal one from the local community. Besides, three agents are engaged in modeling the issue, which are government, individual (family or each villager), and intermediate organizations, with each agent playing a different role at different levels of construction.

The housing governance that controls the transformation of the built environment at different levels has clear hierarchies. Two systems govern the village, which are the administrative management as a top-down system, and the self-management by villagers as a bottom-up system. These two systems control the village on different levels, and the spheres of their influences are distinct during different socio-economic periods. Besides, three forces are engaged in modeling the built environment. They are the government, the individuals (family or each villager), and the intermediate organizations. State and individuals are the two poles of the society that the former represents the official ideology to control the society, and the latter represents the daily life of real people. They play different roles at different levels of construction. An intermediate organization exists as the transitional status between them to link the local government and individual villagers, different groups play the intermediate role in different periods. For example, in Imperial China, the lineage was responsible for the communication between the public and private; and in the planned economy of the PRC, this role was played by production brigade. Moreover, the changing contexts of the tangible and intangible environment on society, economy, politics, culture, and technology caused the corresponding changes of these two controlling systems and led to a series of contradictions between them in different periods. Therefore, it can be seen as the key to understanding the transformations of the built environment in the village.

CONFLICT OF INTEREST
The authors declare no conflict of interest.

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Investigation: Xiaoyu Lin
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Writing – original draft: Xiaoyu Lin
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All authors have read and agreed to the published version of the manuscript.

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