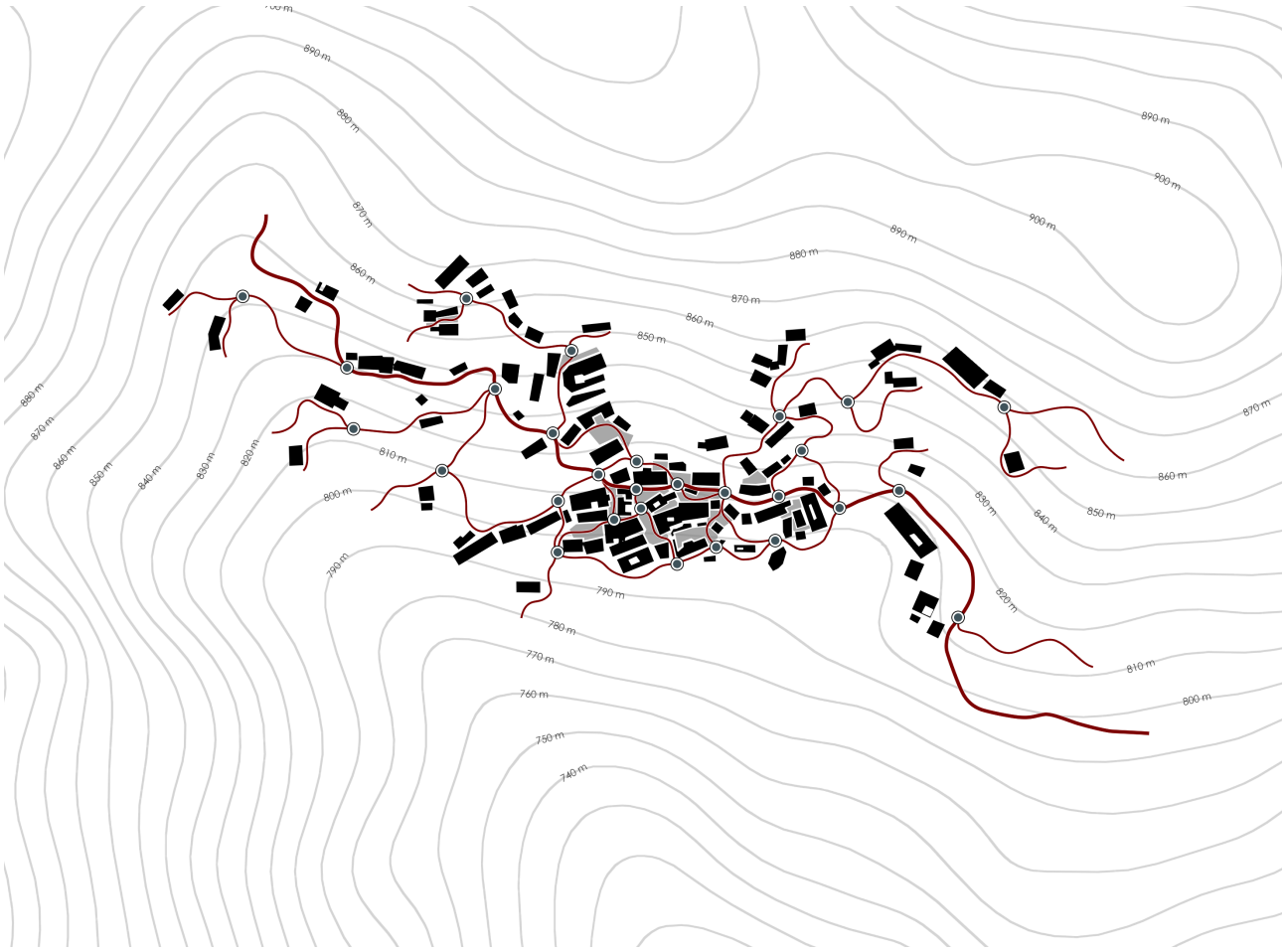


SPATIAL ORDER IN VILLAGES

Translating Traditional Village Spatial Logic into Contemporary Chinese Urban Resettlement Communities

XIAOTONG ZHANG

LUND UNIVERSITY
LTH FACULTY OF ENGINEERING

Spatial Order in Villages

A Study on the Translation of Traditional Village Spatial Logic into Contemporary Urban Communities

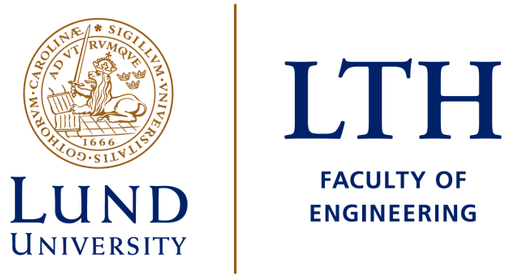
Author
Xiaotong Zhang

Supervisor
Pablo Miranda

Examiner
Per-Johan Dahl

Master of Digital Architecture and Emergent Futures
Department of Architecture and Built Environment
LTH - Faculty of Engineering
Lund University

June 2026



ABSTRACT

In recent years, China has carried out large-scale poverty alleviation and relocation policies, helping many people living in remote mountain areas move into newly built urban resettlement communities near cities. These policies greatly improved living conditions, but at the same time, many daily rhythms and living habits that once existed in villages have been strongly affected by standardized urban resettlement communities.

Based on this background, this research aims to rethink the spatial logic of traditional villages. It focuses on the spatial relationships that naturally formed in villages, studies how these spaces influence people's daily lives, and explores whether these spatial logics can be translated into contemporary Chinese urban resettlement communities.

The research studies ten traditional villages in southeastern China through fieldwork, photography, 3D scanning, and hand drawings. At the same time, the research combines drawing and spatial analysis to understand village spatial order through points, lines, and planes. "Points" represent road intersections, turning points, and nodes where spatial changes happen. "Lines" represent path systems and spatial connections. "Planes" represent open spaces, courtyards, and voids naturally formed between buildings. At the same time, this research combines these three elements with topographic maps and scenario maps to further analyzes point accessibility and proximity, path curvature intensity, spatial morphology, and finally summarizes the hidden spatial patterns inside villages.

The theoretical foundation of this research is influenced by Heidegger, Merleau-Ponty, and Pallasmaa's theories about bodily perception and dwelling. It is also inspired by the research methods of Hillier & Hanson and Rudofsky on spatial relationships, informal order, and vernacular architecture.

Finally, this research attempts to transform these spatial findings from villages into a series of design guidelines and apply them to contemporary Chinese urban resettlement community design. The goal is to explore a spatial generation method that can better recreate village ways of living and everyday spatial relationships.

CONTENT

1. Introduction

1.1 Background of the Topic

1.2 Methods of Research

1.3 State of the Art

1.4 Contribution to the Discipline of Architecture

2. Field Research

2.1 Going to Villages

2.2 Scannings

2.3 Sketches

2.4 Field Research Summary

3. Spatial Observation

3.1 Spatial ClassiÞcation Method

3.2 Spatial Findings

4. Spatial Analysis

4.1 Analysis Method

4.2 Reason for the Analysis

4.2 Analysis of Chenjiapu

4.3 Analysis of the Other Nine Villages

5. Spatial Typologies

5.1 Point Typologies

5.2 Line Typologies

5.3 Plane Typologies

5.4 Beyond Point - Line - Plane

6. Design Guidelines

7. Test

8. Critical Synthesizes of the Design Guidelines

8.1 Analysis of the New Built Environment

8.2 Analysis of the Existing Resettlement Community

8.3 Critical Syntheses of the Guidelines

8.4 Feasibility Analysis of “the New Built Environment” in China

9. Conclusion

1. INTRODUCTION

This chapter mainly introduces the research background, research methods, state of the art, and the contribution of this research to the discipline of architecture. At the same time, it also organizes the overall research framework and main research directions of the thesis, providing a foundation for the following chapters.

1.1 Background of the Topic

In recent years, with the strong development of China's rural poverty relocation policy, a large number of people who once lived in remote villages have gradually moved into resettlement communities built near cities. Although these communities have wide concrete roads, neat high-rise apartment buildings, and clearly divided green areas and activity areas, during my field visits I did not see many residents using these outdoor spaces located in the center of the communities. Instead, I often saw many residents gathering together to chat and relax in narrow small paths and in the corner spaces at the edge of the communities.

When I looked more carefully at these resettlement communities, I found many interesting phenomena. For example, the squares that were designed for specific uses, such as sports squares, were usually not used by the people they were planned for, but instead became places where residents dried grain. Indoor entertainment spaces were often empty for a long time, while residents preferred sitting closely together under the shade of trees. Straight roads were usually only used by vehicles, while residents preferred walking on curved small paths. Residents also tried many ways to grow vegetables and fruits around their homes. On sunny days, people also liked taking bedsheets and quilts outside to dry in open spaces. These strange and informal phenomena are actually caused by the conflict between two different ways of living and two different spatial systems.

For people who lived in villages for a long time, their daily life was originally built on familiar social relationships, comfortable walking distances, naturally formed public spaces, and natural landscapes that could be seen everywhere. Because of this, relocation does not simply mean changing homes. It also means finding their original way of life again in a new environment. When their original way of life can no longer be practiced in the new environment, a series of social problems can appear.

Therefore, how to reduce the conflict between the new living environment and the old living habits has become an urgent problem in the planning of a new generation of resettlement communities.

1.2 Methods of the Research

Traditional villages and contemporary resettlement communities are different not only in their spatial organization, but also in their overall spatial atmosphere, such as sound, smell, and other sensory elements. Therefore, this research plans to study village spaces through the analysis of point, line, and plane, together with the collection of the overall village atmosphere through photographs, scans, and hand drawings. By combining these methods, the research aims to rethink the spatial logic of traditional villages and explore whether it can be translated into contemporary urban resettlement communities in China.

In this research, "point" represents the nodes where paths split, where large directional changes happen, or where spatial conditions change. "Line" represents the roads in the village and their surrounding environments. "Plane" represents squares, courtyards, and the open spaces naturally formed between buildings or between buildings and nature. These three elements are combined with topographic maps and scenario maps to create a mapping of traditional village spaces, which helps support the following analysis.

After completing the mapping of village spaces, this research introduces the concept of "proximity" to study the nearest distance between nodes and understand their distribution. The concept of "accessibility" is used to describe the number of paths connected to each node. Grasshopper is used to calculate the density of the road network and to Þnd areas where the turning angle within two meters is greater than 10 degrees. The average distance between these areas is then calculated. At the same time, the concept of overall curvature strength (Ip) is introduced to describe the level of curvature of the main paths. In addition, black-and-white inversion is used as another way to understand the open spaces in villages.

Finally, through the analysis of ten different villages in southeast China, this research classifies, compares, and studies the collected data in order to identify both the similarities and differences between these villages. Based on these Þndings, the research hopes to develop a series of design guidelines in the form of typologies, in order to provide suggestions and guidance for the design and planning of contemporary resettlement communities in southeast China.

1.3 State of the Art

Overall Spatial Perception

In *Building, Dwelling, Thinking,* Heidegger introduces the idea of the unity of sky, earth, human, and spirit. He believes that architecture is not only about providing shelter, but also about creating the possibility of "dwelling." He argues that architectural space should strengthen the connection between people and the environment rather than separate them. Therefore, through visiting villages, I hope to understand how this relationship can exist in traditional village spaces.

In phenomenology of perception, Maurice Merleau-Ponty emphasizes the idea of the "body as subject" and argues that perception is the foundation of human existence. He believes that space is not an abstract object only for visual observation, but something that is continuously experienced and created through walking, stopping, turning, and everyday life. Therefore, I hope to understand villages through personal experience, and to feel the difference between village space and urban space through actions such as walking and staying in the village.

In *The Eyes of the Skin*, Pallasmaa reflects on the strong focus on visual experience in modern architecture. He argues that architectural experience should pay more attention to the overall sensory relationship between people and space, and emphasizes the importance of touch, sound, and smell in shaping spatial atmosphere. Therefore, I hope to use scenario mapping as a way to record and describe the spaces in villages that create different sensory experiences.

Spatial Organization of Villages

In *A Pattern Language*, Alexander divides space into different small scenarios and argues that cities and architecture should not only be created through top-down planning, but should also grow from everyday activities and local spatial relationships. This means designers should pay more attention to people's daily habits and everyday needs, and shape space through a bottom-up approach. In *Architecture Without Architects*, Rudofsky also emphasizes that traditional villages and vernacular architecture contain a kind of spatial wisdom that has long been ignored by modernism. He believes this wisdom comes from the long-term self-exploration of residents, creating a balance between life and space. Therefore, I plan to begin with the everyday events in villages and study how daily production and daily life inßuence space.

Christian Kerez deeply studied the morphology and typology of favelas in São Paulo, Brazil. He transformed the spatial characteristics of informal housing into a formal architectural language, trying to provide relocated residents with a social spatial structure similar to their original living environment. This research also shows that inside these seemingly chaotic settlements, there are actually clear and complex spatial logics. Therefore, I also hope to extract spatial logic and design language from traditional villages in southeast China that can be applied to resettlement communities.

Limitations of Space Syntax

In order to better understand and analyze village spaces, this research tries to find suitable research methods. In *The Social Logic of Space*, Hillier and Hanson introduced a method called space syntax, which transforms space from a simple physical form into a relational system that can be analyzed, compared, and studied. Space syntax mainly uses indicators such as Integration, Connectivity, Choice, and Depth to study how space influences movement, behavior, and social activities.

Although space syntax is a very classic method for spatial analysis and provides many quantitative indicators, it still has some limitations in certain situations. For example, the indicators Integration and Depth mainly focus on the number of turns in space. They suggest that more turns lead to greater Depth and lower Integration. However, these indicators pay less attention to real physical distance, which creates limitations in winding village environments. At the same time, space syntax usually does not include topography in its mapping system. Because of this, it is more suitable for flat and regular urban environments, while in mountainous villages with large height differences it is often difficult to clearly reflect real spatial experiences and path relationships. In addition, space syntax has limited analysis of path curvature and turning density. It focuses more on the number of turns rather than the actual level of curvature.

Besides this, people's experience of space is also influenced by many other factors, such as three-dimensional spatial changes like expansion and narrowing, surrounding functions, climate, natural landscapes, sound, and smell. However, these experiences related to bodily perception and spatial atmosphere are often difficult to fully represent through traditional space syntax mapping and quantitative analysis.

Therefore, when studying mountainous villages with complex topography, highly curved paths, and rich sensory experiences, traditional space syntax often cannot fully represent their real spatial logic and everyday life experience. Based on this background, this research attempts to expand traditional space syntax analysis by introducing concepts such as proximity, path curvature intensity, topographic change, and sensory experience in order to better understand spatial relationships in villages.

History of Graph and Map

Besides studies of spatial topology similar to space syntax, many other mapping methods have also tried to show spatial structure, people's perception of space, and even the social and political problems behind space in different ways. This research hopes to learn from these cases in order to further expand the understanding of space.

Situationist International (Psychogeographic Mapping)

Situationist International (SI), founded in 1957, was an avant-garde group combining art, architecture, and social criticism. They criticized the modern city as an efficient machine serving capitalism. Based on this background, they developed the idea of "Psychogeography" to study how urban space influences people's emotions, psychology, and behavior. At the same time, they introduced the method of "Dérive," which means walking through the city randomly in order to experience spatial atmosphere and everyday rhythms. Because of this, their maps were no longer objective maps, but subjective maps focused on bodily and emotional perception.

One of the most representative examples is The Naked City, created by Guy Debord in 1957. This map divided Paris into many fragmented pieces connected by red arrows, showing the attraction and emotional changes between different urban areas. The Naked City tried to explain that people's understanding of the city comes more from the relationship between spatial atmosphere and psychology rather than only from physical space itself.

The Image of the City and *The View from the Road*

In *The Image of the City*, Kevin Lynch argued that the city is not only a functional system, but also a spatial image in people's minds. He introduced five important concepts: Paths, Edges, Districts, Nodes, and Landmarks. He also included visual continuity and walking experience into urban studies. In *The View from the Road*, he further studied people's continuous experience of space during movement. He believed that the city is gradually perceived through walking and movement, and that roads are not only transportation systems, but also spatial experiences. He also created visual maps based on changes in human vision, especially focusing on road curvature, spatial compression and release, and the rhythm of continuous space. These studies had an important influence on later cognitive mapping, spatial sequence, and spatial perception studies.

Nolli Map

The *Nolli Map* is a famous eighteenth-century map of Rome created by Giambattista Nolli. It used figure-ground drawing to mark public and semi-public spaces, including church interiors, courtyards, and other spaces. This mapping method clearly showed the relationship between buildings and voids, as well as the continuity of urban public space. It also encouraged people to focus more on spatial relationships in cities rather than only on buildings themselves. In the late 1960s, the drawing method of the *Nolli Map* directly influenced the *Learning from Las Vegas*.

Learning from Las Vegas

In *Learning from Las Vegas*, Scott-Brown, Venturi, and Izenour criticized modernist architecture for being too pure and rational while ignoring real urban life. They argued that even a highly commercial city like Las Vegas has its own spatial logic and urban aesthetics. In order to study this type of city, which was very different from traditional European cities, they developed a new mapping method. Instead of only using plans and functional analysis, they included drawings, photographs, signage analysis, and street observation. For example, they studied not only buildings themselves, but also large commercial signs, moving views from cars, and the urban atmosphere created by lights at night. Through this method, they argued that cities are shaped not only by architecture, but also by symbols, images, and consumer culture. Their research and mapping methods strongly influenced later postmodern urban studies, visual mapping, and everyday urban research.

City Planning According to Artistic Principles

In *Learning from Las Vegas*, the authors also mentioned Camillo Sitte's criticism of overly mechanical and engineering-based modern cities in *City Planning According to Artistic Principles*. Unlike the previous book, this work focused on traditional European cities. Sitte believed that traditional cities had stronger artistic quality and spatial experience than modern regular cities. He also used figure-ground drawings together with perspective sketches to analyze urban spatial relationships. In his research, he paid special attention to the enclosure of squares, street turning, and visual changes. He argued that cities should not only function as organizational systems, but should also become continuous spatial experiences.

Detroit Geographic Expedition

The *Detroit Geographic Expedition (DGE)* was an important critical geography project led by William Bunge during the 1960s and 1970s. They argued that maps are never neutral, and that traditional mapping usually serves governments and capital. Therefore, they tried to use mapping to reveal social problems such as racial segregation, economic inequality, and social injustice in cities. They created many maps about crime, educational resources, child mortality, and the distribution of social problems. In their research, mapping was no longer only a record of physical space, but also became a critical method for revealing social issues and power structures. This project inspired people to use mapping to better understand the social and political issues behind space.

1.4 Contribution to the Discipline of Architecture

This research hopes to rethink how the spatial relationships of traditional villages can be understood, represented, and translated into contemporary resettlement communities in China. Through this approach, the research aims to explore a design method guided by everyday life and spatial logic, and provide a new perspective for architectural studies.

At the same time, unlike many existing spatial analysis methods such as space syntax, which mainly focus on topological relationships like Integration, Depth, and Connectivity, this research pays more attention to factors that are less discussed in space syntax, such as physical distance between nodes, path curvature, topographic change, and spatial experience in the mountainous villages of southeast China. Through the analysis of point, line, plane, and spatial atmosphere, this research develops a new mapping framework that combines quantitative spatial analysis with qualitative sensory experience. At the same time, by introducing concepts such as proximity, path curvature intensity, and scenario mapping, the research further focuses on real walking experience and everyday life in village spaces.

In conclusion, this research does not aim to reject space syntax. Instead, based on the real spatial conditions of mountainous villages in southeast China, it tries to further expand and supplement traditional space syntax through learning from different mapping methods. By combining objective spatial analysis with subjective spatial experience, this research hopes to provide a new way of understanding architectural and urban spaces.

AI was used to check grammar and spelling, and to improve sentence fluency.

AI was also used to generate some images (specifically marked in the text).

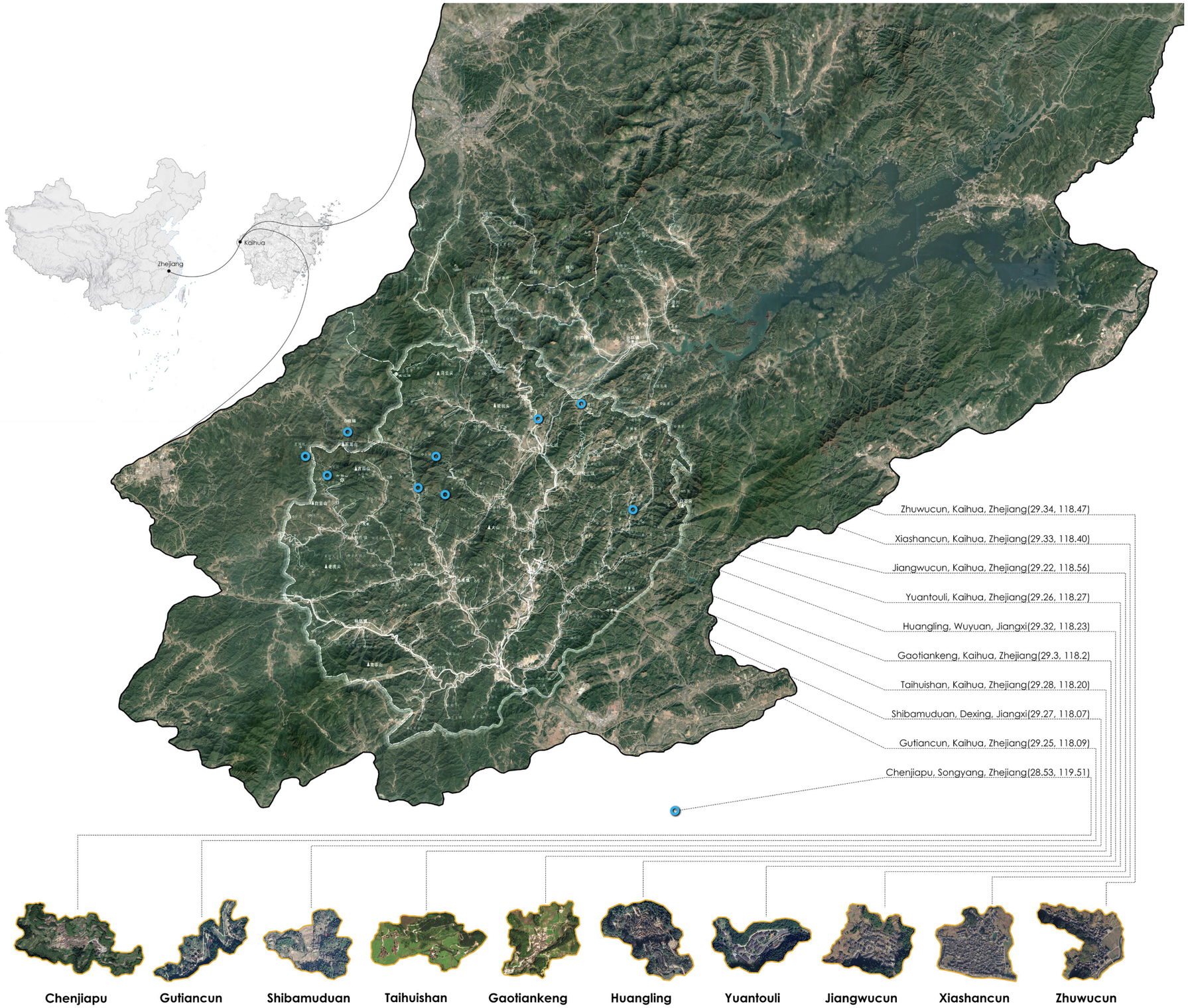
2. FIELD RESEARCH

This chapter presents the initial field research carried out in ten villages in southeast China. Through mapping the location and geographical environment of the villages, scanning and recording local objects with regional characteristics, and creating hand drawings based on memory and sensory experience, this research develops a preliminary understanding of the spatial characteristics, daily life, and environmental atmosphere of the villages. At the same time, these field studies also provide the foundation for the following research.

2.1 Going to Villages

To better and more directly understand the spatial relationships in traditional villages and the living habits of villagers, this research carried out field research and spatial observation in ten traditional villages in Southeast China (Chenjiapu, Gaotiankeng, Gutian Village, Shibamuduan, Yuantouli, Huangling, Jiangwu Village, Taihuishan, Zhuwu Village, and Xiashan Village).

The research does not only focus on architectural forms themselves, but pays more attention to people's daily behaviors in space, and how space affects walking, staying, communication, and ways of use.

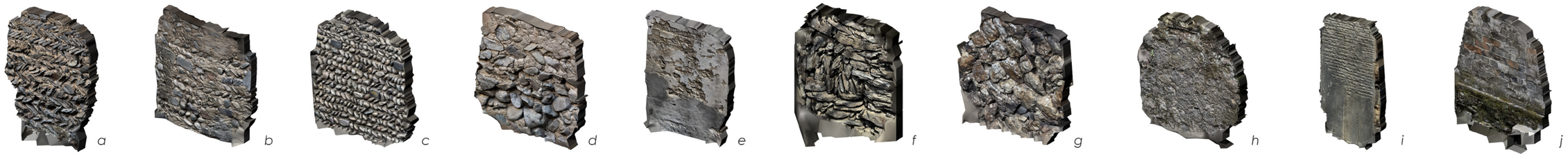


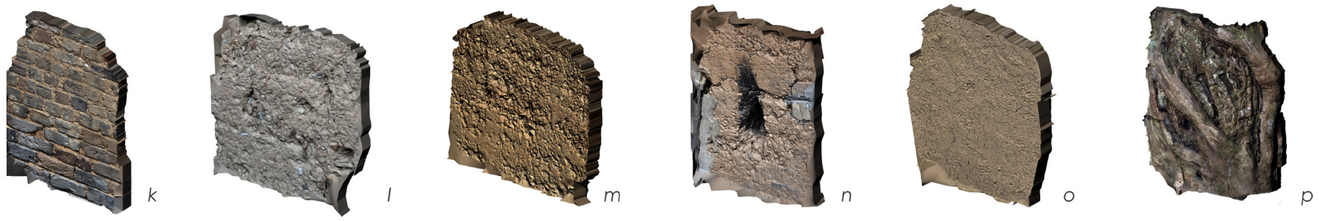
2.2 Scannings

During the field research, besides taking photos and videos of the villages, the research also carried out 3D scanning of some walls, ground surfaces, steps, and architectural elements.

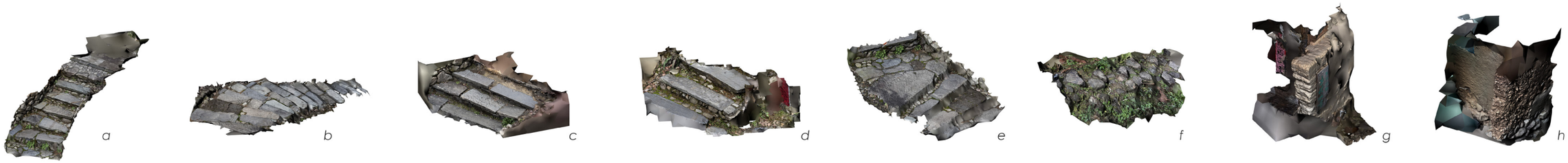
Through digital recording, the research hopes to preserve the materials, structures, and traces in the villages in a more detailed way, and further study how these elements together create the daily spatial experience of the villages.

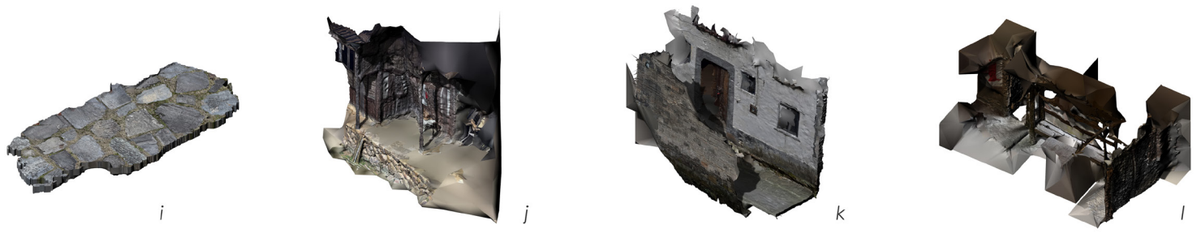
The images below show the scanned objects.



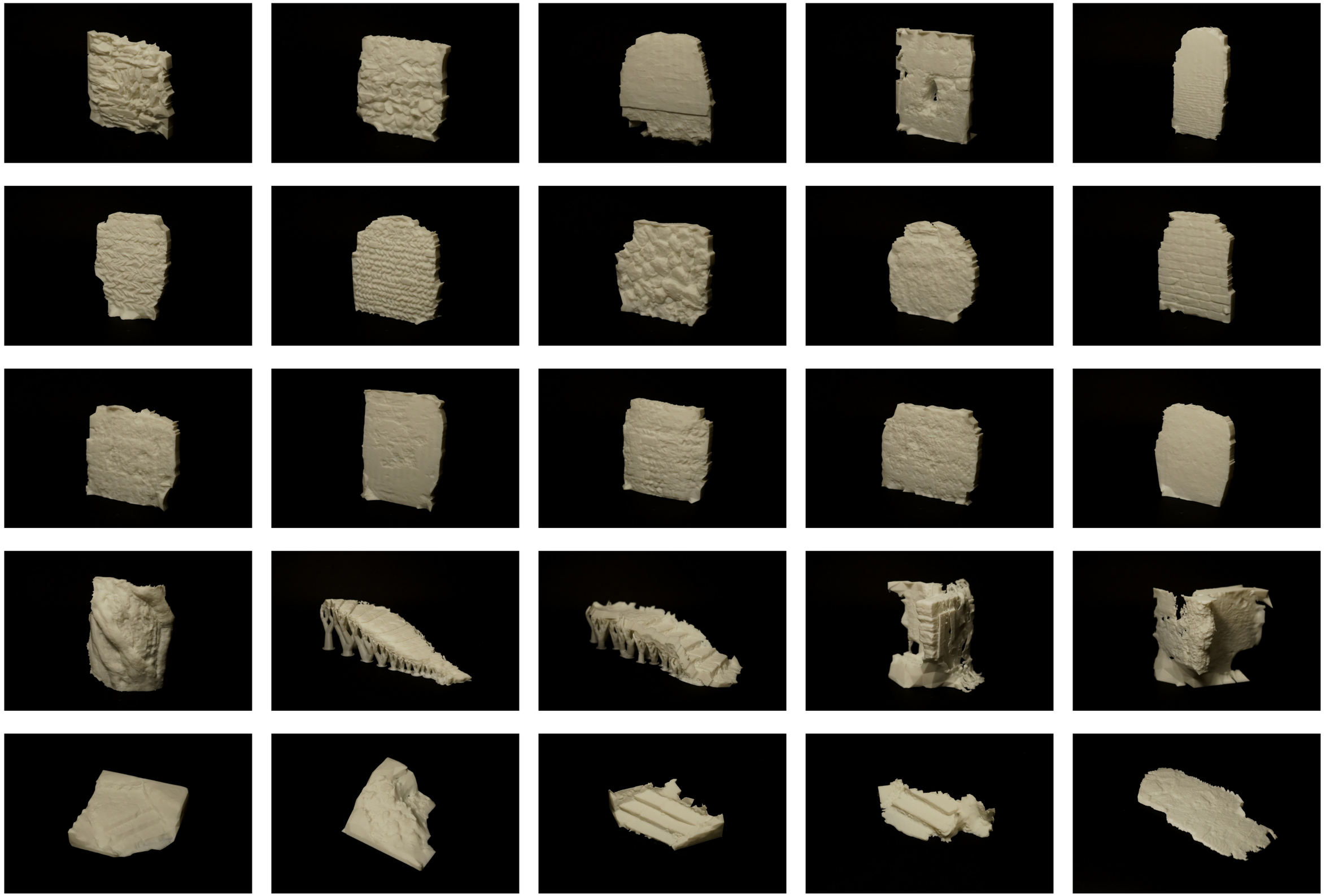


Rubble Stone Wall (Natural Stones + Mortar + Small Rubble): a, b, c, d, e.
Dry Stone Wall (Natural Stones + Small Rubble): f, g.
Stone Wall (Natural Stones(Only)): h, i.
Brick Stone Wall (Bricks + Mortar + Natural Stones): j, k.
Rammed Earth Wall (Clay + Sand + Small Rubble): l, m, n.
Straw Earth Wall (Clay + Sand + Grass Fiber): o.





a, b : Natural stone staircase.
c, d : Natural stone steps.
e : Natural stone steps and corner platforms.
f : Naturally formed steps.
g, h : Rammed earth wall corner.
i : Stone slab floor.
j : Front platform.
k : Alleyways between houses.
l : Small pavilion between houses
p : Trunk.



2.3 Sketches

Besides collecting digital materials such as photographs, videos, and scanned files, this research also tries to record my feelings about village spaces during the field research process. So, after finishing the investigation in each village, I use hand drawings based only on memory to record the spatial moments that left the strongest impression on me. It could be a road, a node, a tree, or a spatial atmosphere.

Compared with photographs and scanned files that mainly record physical information, these hand drawings are more like my subjective memories of the villages. They focus more on bodily perception and spatial experience, and may reflect the spatial atmosphere of different villages from another perspective.

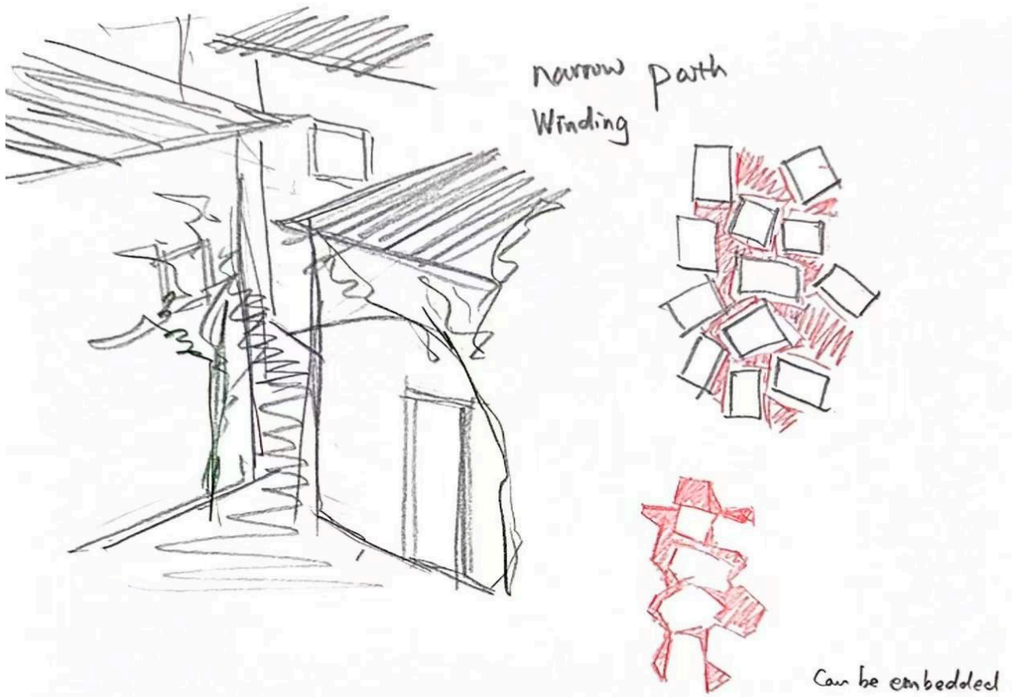
The following images show some feeling drawings from the field research process.



In rural areas along the southeastern coast of China, large mountains and open skies surround a few houses with black-tiled roofs.

The houses do not disrupt the beauty of nature. Instead, they make the landscape more complete and harmonious, as if they have grown from the land itself. This reflects a symbiosis between humans and nature.

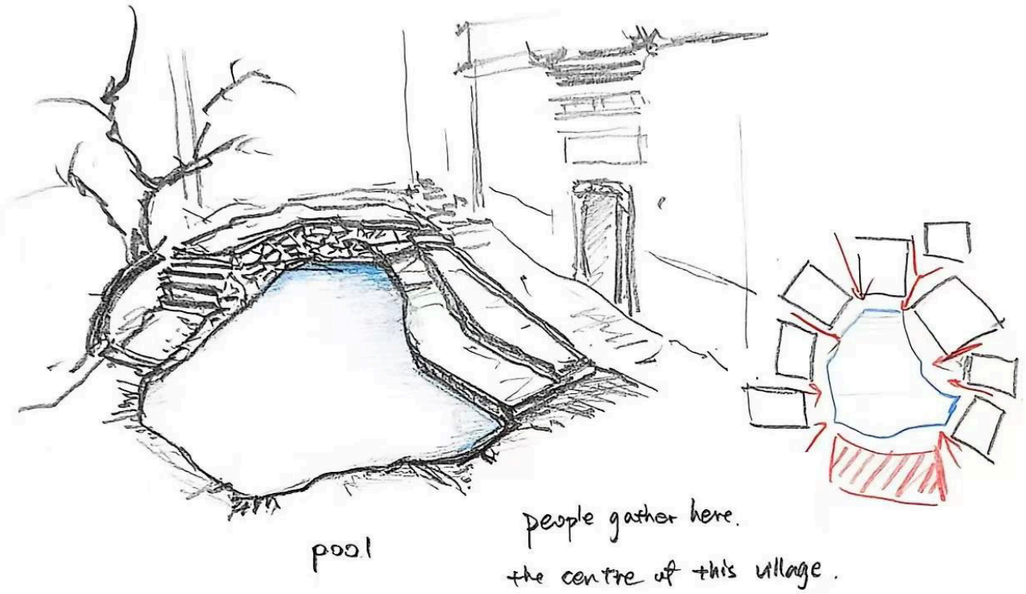
Taihui Shan



The village is full of narrow, winding paths with constant changes in elevation, and you never know what you might encounter around the next corner.

The winding paths reflect the relationship between dwelling and the land. Instead of intentionally altering the terrain, people adapt to it. These natural turns also become spaces where unexpected moments occur.

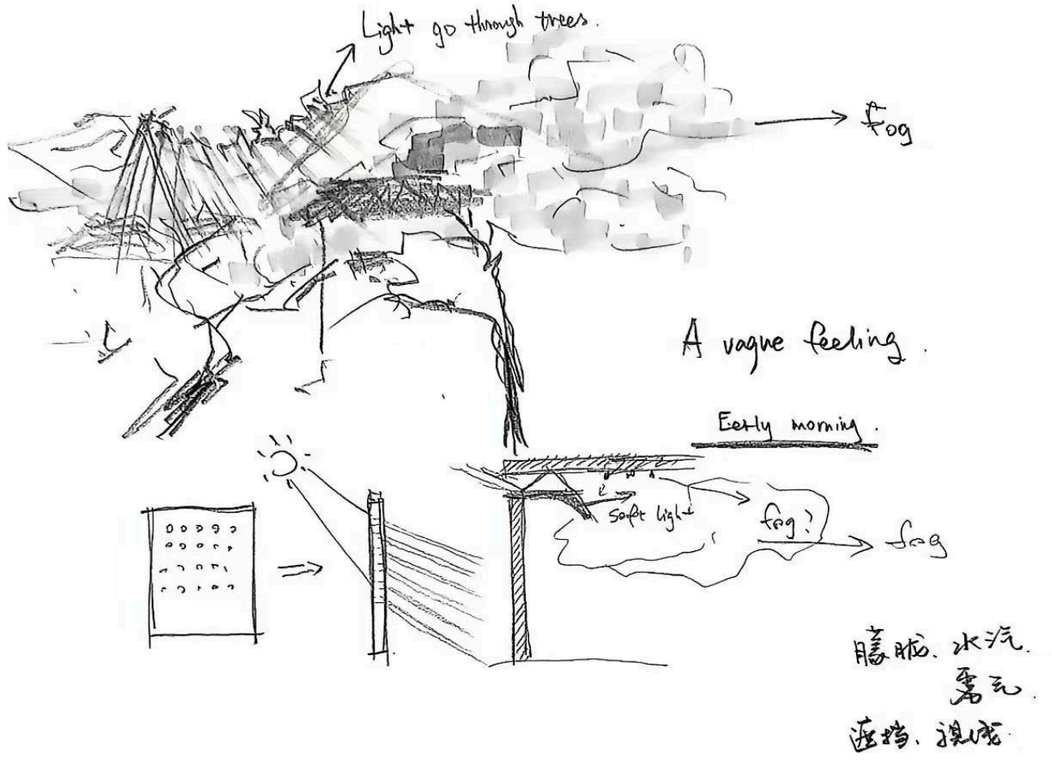
Jiangwu Cun



The pond is another important gathering place in the village, where villagers wash clothes and chat. Compared with the tree, the space around the pond can accommodate more people, but the distance between individuals becomes greater.

In rural China, men are generally engaged in outdoor physical labor, while women are more involved in household work. As a result, the people gathering around the pond are mostly women and children.

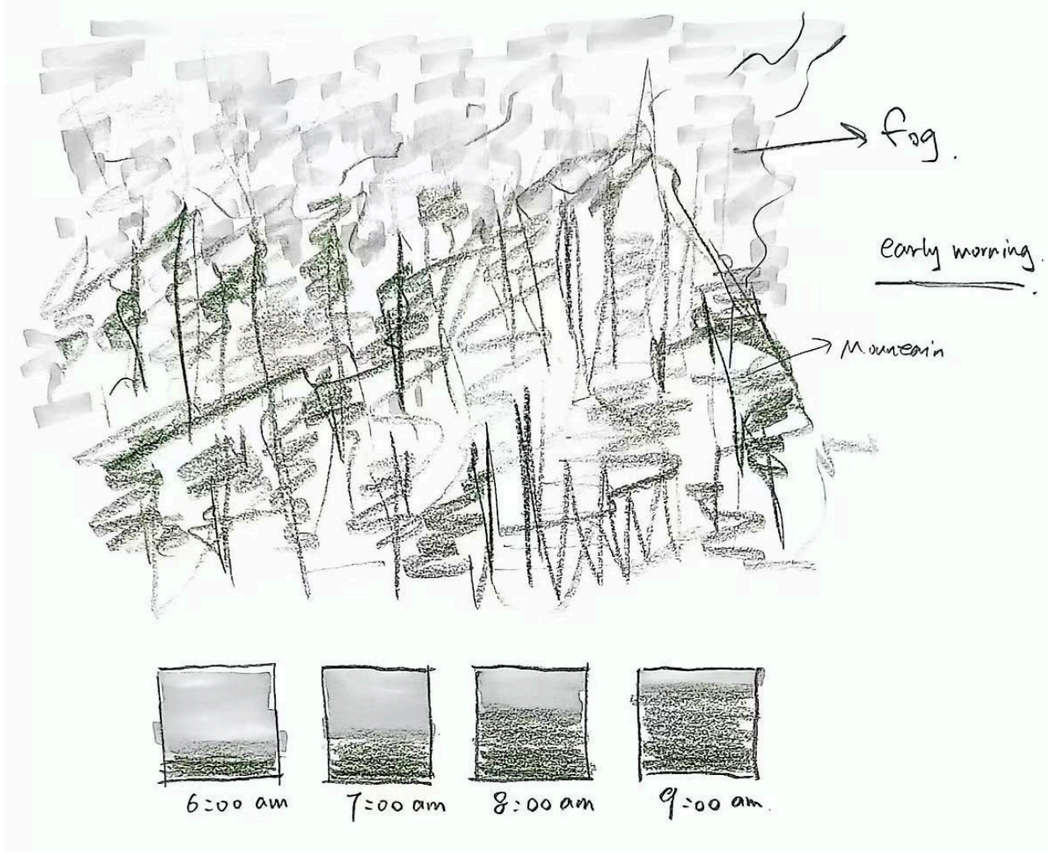
Zhuwu Cun



The morning sunlight passes through the forest, and with the Tyndall effect, it forms distinct beams of light.

This kind of mist appears only in the early morning, representing the beginning of a new day and conveying a sense of time.

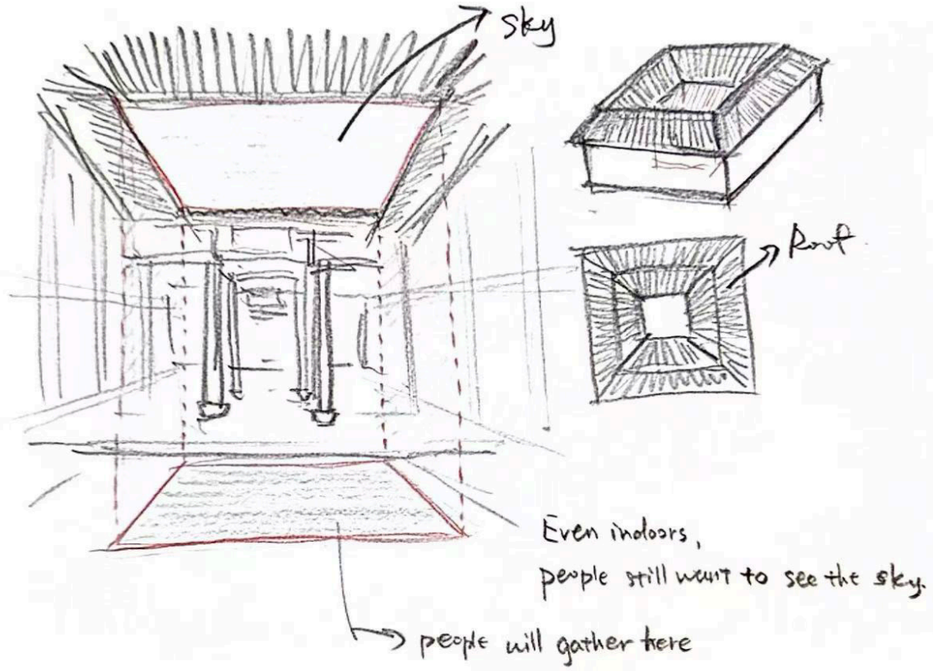
Gaotian Keng



In rural areas, the temperature difference between day and night is signiPcant, making the morning mist very noticeable. The countryside morning often begins in a blanket of white mist.

As the sun gradually rises and the temperature increases, the mist carrying the scent of fresh grass slowly dissipates, marking the beginning of a new day.

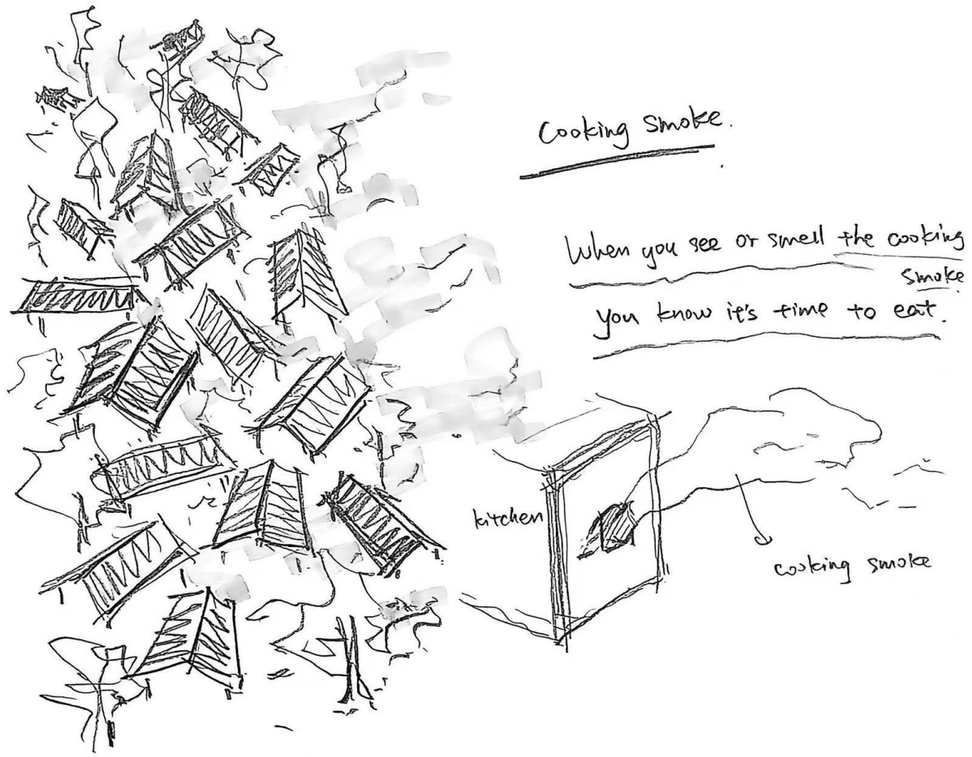
Huang Ling



In traditional houses along the southeastern coast of China, courtyards are present in almost every building, regardless of the size of the house.

Through the courtyard, people can see the sky without leaving the house. It creates a dialogue with the sky and offers a direct connection to it, while also allowing people to sense the changes of weather and time from within the enclosed interior.

Xiashan Cun



In rural areas, people usually cook with Þrewood. The smoke produced by burning wood and cooking rises and drifts outside, forming what is known as cooking smoke.

When cooking smoke rises into the air and the smell of burning Þrewood and food spreads around, people know it is time to eat. In this way, time is translated into visual and olfactory perception.

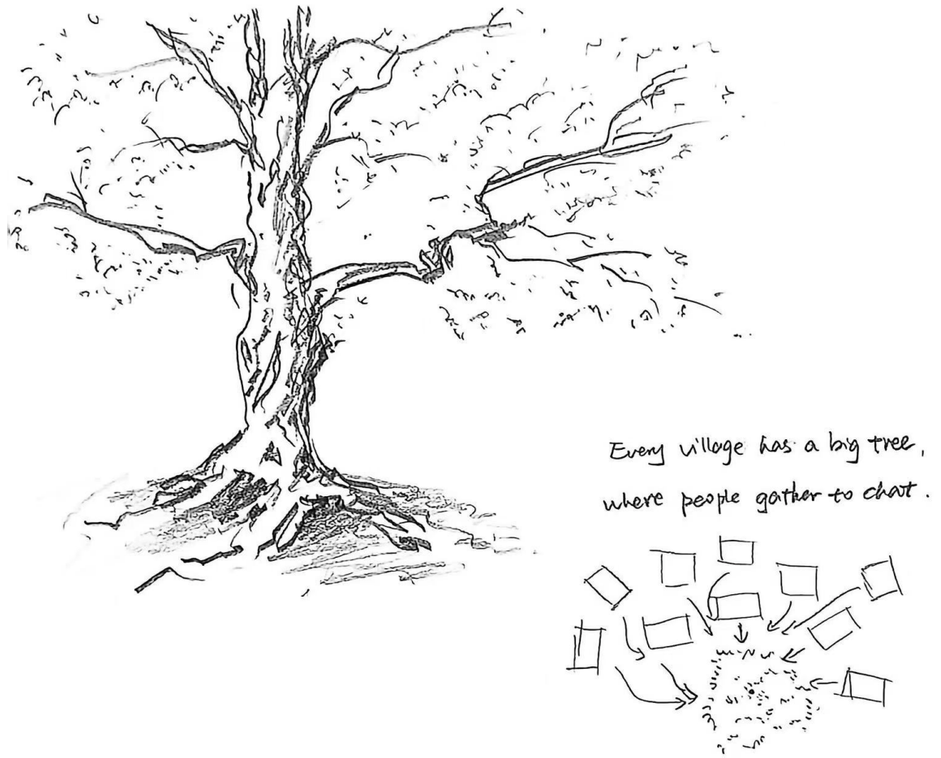
Shibamu Duan



This is a stone bridge at the entrance of the village connecting the two sides of the stream. Inside the bridge, there is a very simple shrine.

The bridge serves as the main connection between people on both sides of the stream, symbolizing communication and integration. The shrine inside represents faith, reflecting a form of coexistence between the divine and humans.

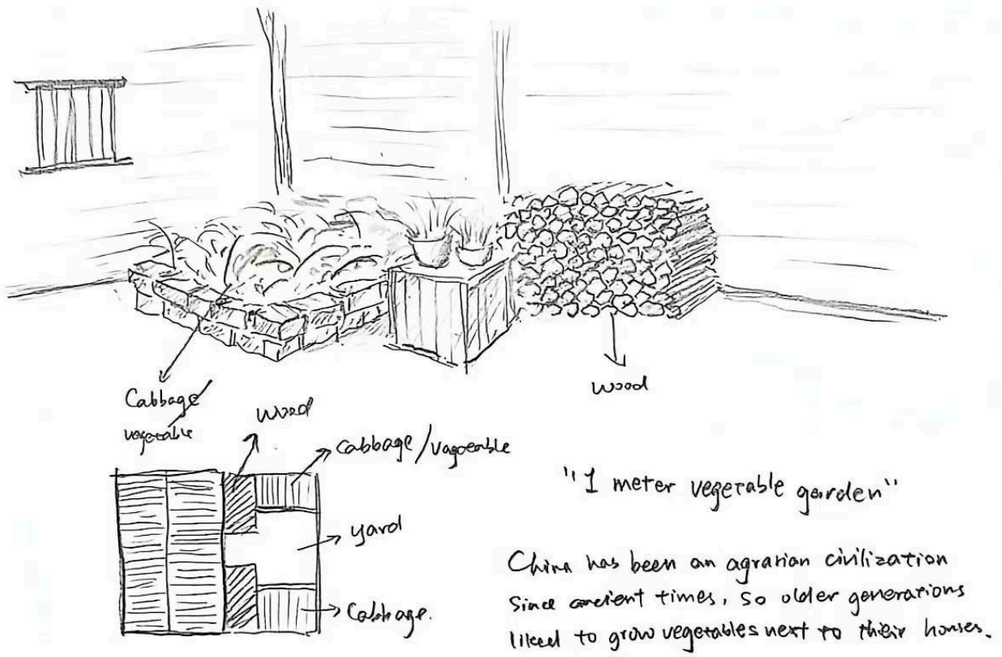
Gaotian Keng



It seems that almost every village has a large tree at its entrance. People gather here to chat and socialize, making it a place where news and stories are shared. Villagers bring their own tables and chairs, and the space under the tree changes with the different arrangements of the furniture.

Gathering around the tree forms a point-like center. In a village where most buildings are only two stories high, the large tree becomes like the "spire of a church."

Chenjia Pu



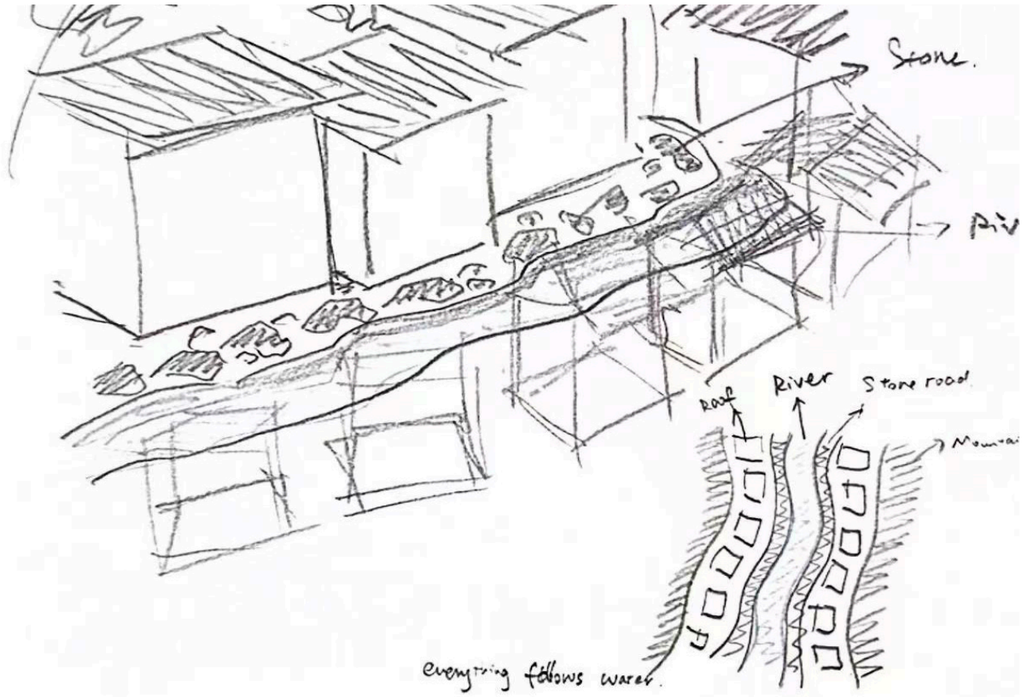
"1 meter vegerable garden"

China has been an agrarian civilization since ancient times, so older generations liked to grow vegetables next to their houses.

Almost every house has a small vegetable garden of a few square meters at its entrance, usually with a pile of Þrewood nearby for cooking and heating.

The vegetables in the garden change with the seasons, and the amount of firewood beside it also varies, directly reßecting the rhythm of seasonal change.

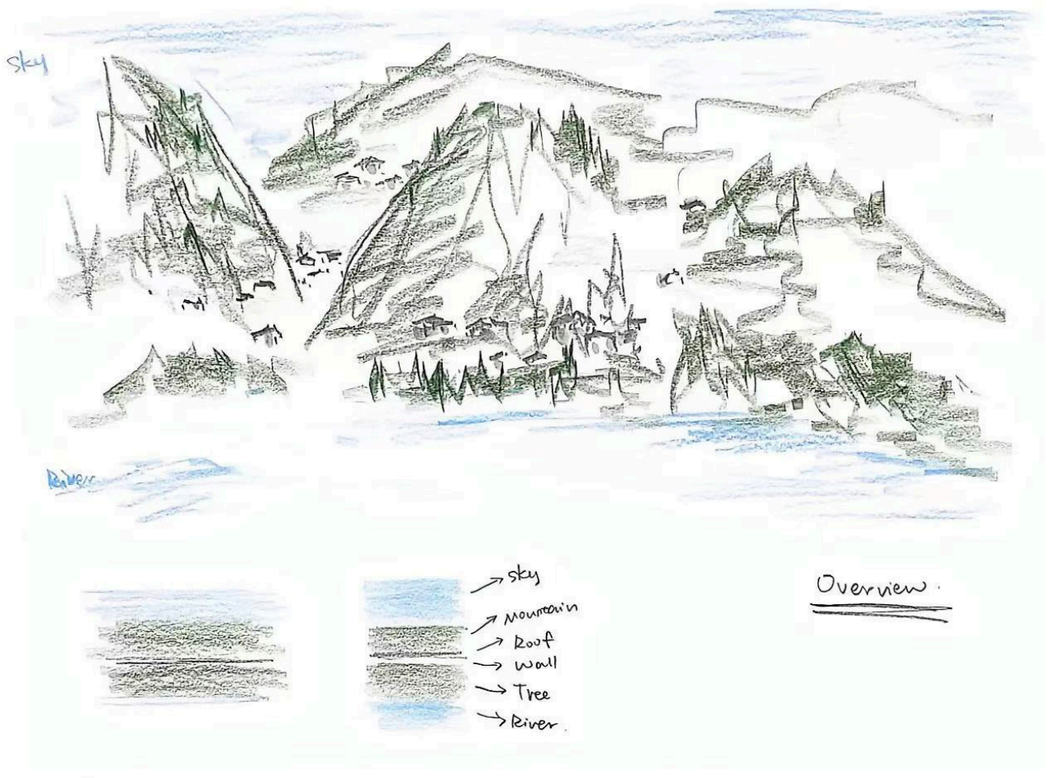
Gutian Cun



In the villages I studied, more than half develop along small streams, with houses on both sides extending into the mountains following the direction of the water.

Their production and daily life both depend on this stream. While making use of it, they also protect it, living in symbiosis with the stream and with the land.

Yuantou Li



The harmonious coexistence of sky, earth, mountains, water, architecture, and human beings.

This idea echoes Heidegger's concept of the Fourfold (Earth, Sky, Divinities, Mortals) in Building Dwelling Thinking.

Taihui Shan

2.4 Field Research Summary

In rural villages along the southeastern of China, a subtle and harmonious relationship exists between people, architecture, and nature. Houses grow along streams and mountains, following the natural terrain. Rather than changing the land, people build in response to its form. Courtyards allow people to see the sky without leaving the house, creating a dialogue between the dwelling and the sky. Rising cooking smoke, the scent of burning firewood and food, morning mist, and the sound of water flowing through the village all become important ways for people to sense time, weather, and everyday life. These elements transform abstract time into visual, olfactory, and bodily experiences.

This spatial condition echoes the idea of "dwelling" proposed by Martin Heidegger in Building, Dwelling, Thinking. In his view, human existence unfolds in the relationship between earth and sky. At the same time, this experience also relates to the phenomenology of perception developed by Maurice Merleau-Ponty, which understands space not simply as an objective object that can be measured and recorded, but as a world experienced through the human body and senses. Similarly, Juhani Pallasmaa argues in The Eyes of the Skin that architecture should engage multiple senses rather than rely only on vision. The rural landscape clearly reflects this idea: mist, cooking smoke, terrain, water, and light together shape the overall experience of space.

Therefore, the village is not only a physical settlement, but also a living expression of the traditional Chinese understanding of the relationship between heaven, earth, and human beings. In this environment, architecture does not control nature but coexists with it, forming a symbiotic relationship between humans, the land, and the natural world.

3. SPATIAL OBSERVATION

This chapter mainly defines the four spatial categories of “point,” “line,” “plane,” and “other,” and organizes the photographs and video materials collected during the field research according to these categories. Through this method, the originally complex and fragmented village spaces are transformed into elements that can be compared and analyzed, providing a foundation for the following research.

3.1 Spatial Classification Method

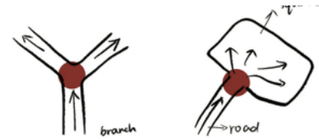
During the field research process, this study recorded a large number of photographs and videos through walking, staying, and on-site observation. The research mainly focused on path changes, spatial turning points, node relationships, building gaps, and different types of open spaces in the villages. At the same time, it also observed how villagers use these spaces in their everyday life.

After collecting the photographic materials, this research tried to classify the images using the three basic spatial elements of "point," "line," and "plane." "point" represents the nodes where paths split, where large directional changes happen, or where spatial conditions change. "Line" represents the roads in the village and their surrounding environments. "Plane" represents squares, courtyards, and the open spaces naturally formed between buildings or between buildings and nature. At the same time, some scenes were difficult to define using these three categories, so they were grouped into the category of "other."

Through this abstract method of classification and analysis, this research hopes to transform the originally complex and informal spatial relationships of villages into spatial logic that can be observed, compared, and studied, and further explore how these spatial relationships influence people's behavior, communication, and everyday life.

POINT

Nodes where roads branch or where spatial changes occur



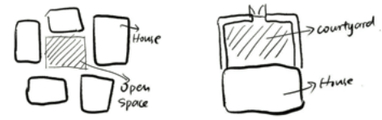
LINE

Village paths and their surrounding environments



PLANE

Open spaces, courtyards, and their surrounding environments



OTHER

Natural environments and unconventional elements



3.2 Spatial Findings



Chenjiapu

Points





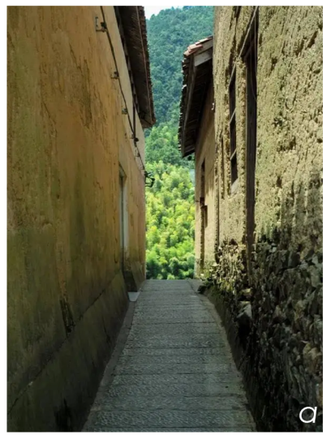


a: Trees usually play an important role in spatial nodes.

b: The form of the trees seems to invite people into the space.

c: At road branch points, there are usually seats for people to rest.

Lines







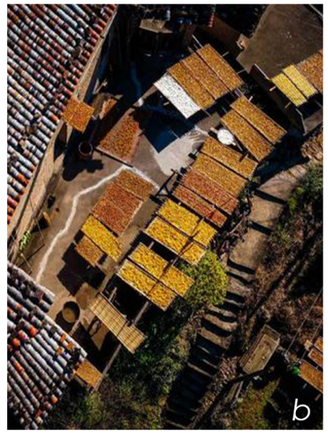
a: The height-to-width ratio of the secondary streets is approximately 3:1.

b: Villagers dry vegetables along both sides of the roads.

c: Both sides of the roads are usually occupied by various objects.

Planes







a: Benches are casually placed in open spaces.

b: Open spaces are natural places for drying things.

c: Villagers do not miss any opportunity to dry things in open spaces.

Others







a: Tall trees can serve as natural visual guides.

b: Under the shade of the trees, there is a unique temperature and humidity.

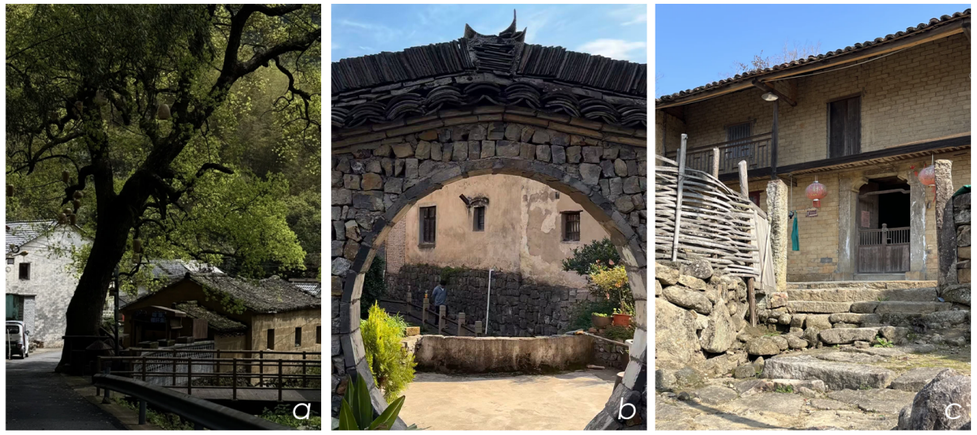
c: The coexistence of stones and plants is an expression of time.

3.2 Spatial Findings



Gutiancun

Points



a: Large trees welcome villagers at the entrance of the village.

b: Arches are the links connecting two different spaces.

c: Two standing columns are used to separate the courtyard from the road.

Planes



a: A small courtyard is created by setting the house back.

b: Firewood, potted plants, and other everyday objects are usually placed in the courtyard.

Lines



a: Benches are usually placed along both sides of the streets.

b: Various objects are often piled up along both sides of the alleys.

c: The roads are usually winding and undulating.

Others



a: Plants growing through the pavement are the result of the combined forces of time and nature.

b: The houses blend very well with the natural environment.

3.2 Spatial Findings

Points



a: There are usually prominent trees at the corners of the roads.

b: Although it is just a simple signboard, it still separates the spaces.

c: Haystacks act both as spatial nodes and as separators of space.

Lines



a: Firewood is often stacked along the roadside.

b: Natural roads create a closer connection to nature.

c: The height-to-width ratio of the alleys is approximately 4:1.



Shibamuduan

Planes



a: Basic productive activities usually take place in open spaces.

b: The open space behind the house is a chicken coop built by the villagers themselves.

Others



a: Trees along the edge of the courtyard can form natural boundaries.

b: The roadside is filled with various seasonal vegetables, and their changes also reflect the passage of time.

3.2 Spatial Findings



Taihuishan

Points





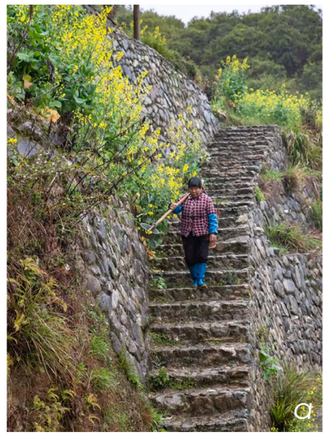


a: The stones by the roadside become places for the elderly to rest.

b: The trees at the branch points are especially eye-catching.

c: Natural stones are used to create turns in the road.

Lines







a: There are many natural stairways in mountain villages.

b: Only winding roads can reach the villages on the mountaintop.

c: The roads inside the village are lined with rapeseed flowers.

Planes





a: Villagers dig fish ponds in the open spaces beside the stream.

b: In the small courtyards of each household,
villagers grow vegetables and fruits.

Others





a: The ivy growing on the houses is a trace of time.

b:The mist is both a reflection of time and a force
that further integrates the village with nature.

3.2 Spatial Findings

Points



a: Spatial variation is created by narrowing the distance between houses.

b: Trees can provide natural spatial separation.

c: The rotation of the houses creates variations in the paths.

Lines



a: The height-to-width ratio of the alleys is approximately 3:1.

b: In narrow spaces, two houses share a single staircase.

c: Production tools are usually placed along the secondary streets.



Gaotiankeng

Planes



a: Green onions are grown and firewood is stored in private courtyards.

b: Villagers use small open spaces to build chicken coops themselves.

c: Riversides are suitable for growing water-demanding vegetables.

Others



a: The smell of morning cooking smoke marks the beginning of the day and is an expression of time.

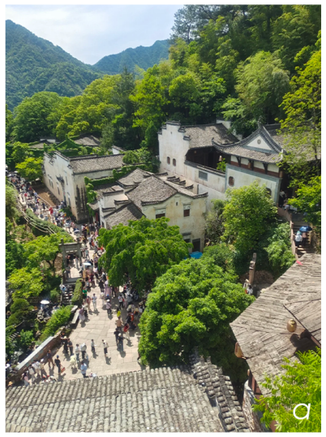
c: Leaning trees have a guiding effect.

3.2 Spatial Findings



Huangling

Points





a: Large trees play a guiding role at intersections.

b: Covered corridors transition the space from fully indoor to fully outdoor.

Planes





a: Villagers carry out productive activities together while chatting in large open spaces.

b: Villagers use the courtyards in front of their houses to dry grain.

Lines





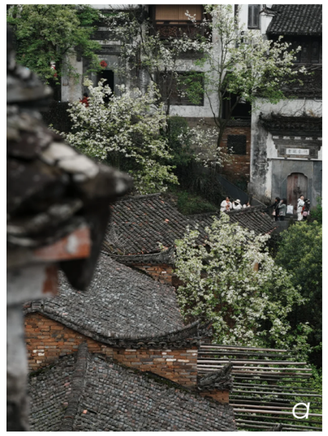


a: Space is left along the roadside for plants to grow.

b: The height-to-width ratio of the main streets is approximately 1:1.

c: Villagers dry corn along the roadside.

Others







a: Houses and trees coexist harmoniously and influence each other.

b: The morning mist marks the beginning of the day.

c: The evening cooking smoke marks the end of the day.

3.2 Spatial Findings



Yuantouli

Points





a: Trees usually appear at road branch points.

b: Leaning trees separate the nearby houses from the distant natural landscape.

Planes





a: Open spaces change according to the vegetation.

b: A ruined house is transformed into an open pavilion for people to rest and socialize.

Lines







a: There is a great deal of vertical circulation shaped by the terrain.

b: The boundaries of the roads are formed by natural roof tiles.

c: The width of the roads changes according to the spacing between houses.

Others







a: The steps are made of natural stone slabs.

b: The sound of flowing water guides people's sense of direction.

c: The color of rammed earth coexists harmoniously with nature.

3.2 Spatial Findings



Jiangwucun

Points

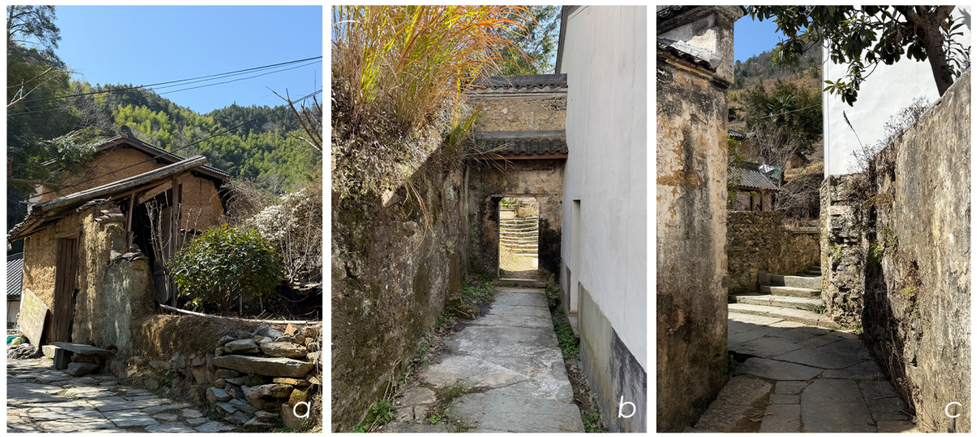


a: Large trees and door openings together define the boundary.

b: Trees usually appear at branch points.

c: Trees separate the courtyard from the road.

Lines

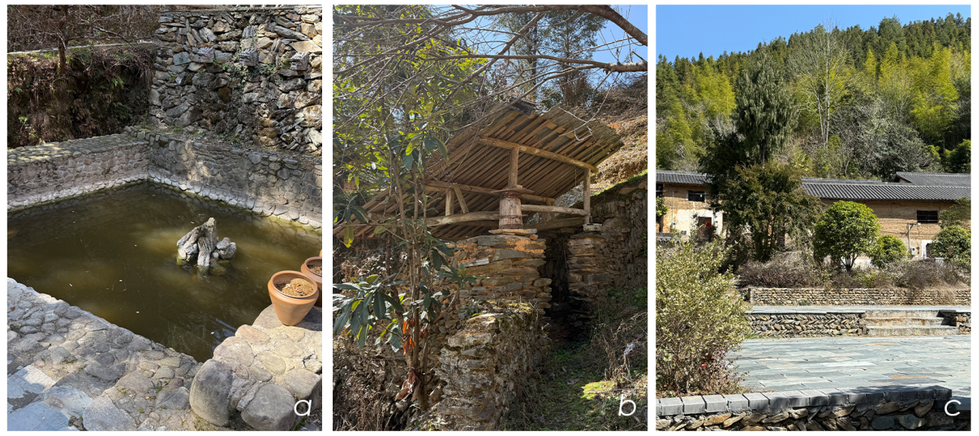


a: Low walls along the roadside provide places for people to lean against.

b: The height-to-width ratio of the most secondary paths is approximately 4:1.

c: The roads follow the rugged ups and downs of the terrain.

Planes



a: The pond at the entrance of the village is a gathering place for people.

b: Villagers use open spaces to build chicken coops.

c: A large plaza enclosed by trees.

Others



a: The changes of light and shadow reflect the passage of time.

b: The alleys carry the mixed smell of wood, grass, and soil.

c: Grass growing through the cracks in the stones is evidence of time.

3.2 Spatial Findings



Zhuwucun

Points



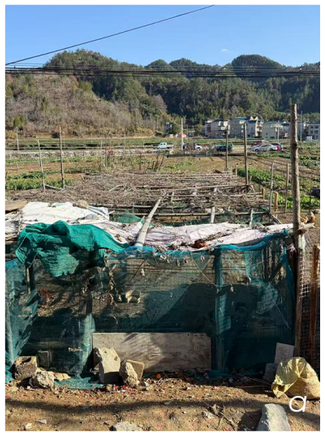


a: A raised platform creates a transition between the road and the house.

b: At the road intersections,

many passersby of different ages gather together to sit and chat.

Planes





a: Villagers use the open spaces beside the farmland to raise chickens.

b: The pond in front of the ancestral hall is

a place for villagers to gather and socialize.

Lines



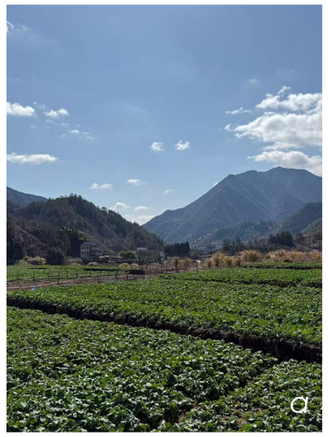


a: The height-to-width ratio of the main roads is approximately 2:1.

b: Villagers raise chickens along the roadside

and use changes in elevation to prevent them from escaping.

Others





a: Farmland, buildings, and mountains are connected together.

b: Moss-covered stone steps are evidence of time

and the result of the coexistence between people and nature.

3.2 Spatial Findings

Points





a: Villagers sit at the nodes where roads intersect.

b: In narrow spaces,

light wells are used to separate different houses.

Lines







a: The height-to-width ratio of the secondary streets is approximately 4:1.

b: Villagers grow vegetables in the open spaces along the streets.

c: Villagers pile up various objects along the small paths leading to their homes.



Xiashancun

Planes



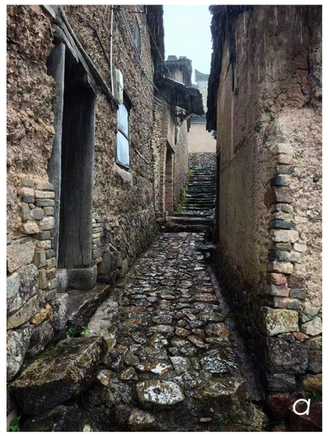


a: Villagers store firewood and grow vegetables in their courtyards.

b: Villagers collectively built an ancestral hall with a light well,

which serves as a gathering place for daily activities.

Others





a: The sound of flowing water along the roadside

guides the sense of direction.

b: Villagers use local materials to build their houses.

4. SPATIAL ANALYSIS

This chapter introduces the specific methods used to analyze village spaces. Through the classification, mapping, and analysis of nodes, paths, open spaces, topography, and scenarios in ten villages in southeast China, the research attempts to rethink the complex spatial relationships inside villages. It also provides a foundation for the following spatial analysis, the development of design guidelines, and the generation of new environments.

4.1 Analysis Method

This research analyzes the nodes (points), paths (lines), and open spaces (planes) in villages one by one, while also combining topographic maps and scenario maps to present and study the overall spatial form and spatial atmosphere of villages in a more detailed way.

In this analysis process, "point" refers to turning nodes on roads and places where spatial relationships change. For the analysis of points, the research mainly focuses on accessibility (the number of paths connected to a node) and proximity (the shortest distance between neighboring nodes). Through these data, the research further studies the distribution of nodes and the connections between spaces in villages.

"Line" refers to paths, walking directions, and connections between different spaces. For the analysis of lines, the research mainly focuses on the overall density of the village road network, the distance between turning points along paths, and the curvature of paths. The research also introduces the concept of "Path Curvature Intensity (Ip)" to study the overall directional changes and spatial rhythm of village paths.

"Plane" refers to open spaces, courtyards, and empty spaces naturally formed between buildings. For the analysis of planes, the research mainly studies and summarizes spatial forms and enclosure relationships. At the same time, by using black-and-white inversion between buildings and open spaces, the research provides another way of understanding space.

The scenario map reorganizes the village photographs collected and classified in the previous chapter according to village paths and walking order. By combining the drawn point, line, and plane maps with topographic maps, it becomes easier to understand the location, spatial relationships, and changing sequence of different scenes in the villages, creating a more immersive mapping experience.

4.2 Reason for the Analysis

As mentioned earlier, this research is influenced by both Space Syntax and Carlo Ratti's criticism in *Space Syntax: Some Inconsistencies*. After combining these ideas with field research, this study found that traditional space syntax pays too much attention to "how many nodes people pass through," while giving less attention to the actual "cost of movement" during walking, such as time, physical effort, and walking distance. Therefore, this research introduces the concept of "proximity" in order to better reflect the real movement cost between different nodes and provide a foundation for later analysis.

At the same time, traditional space syntax has relatively limited analysis of path curvature. It mainly focuses on "how many turns" a path has, while paying less attention to how these turns influence spatial experience. This research believes that path curvature and turning continuously change people's vision and spatial perception, directly affecting walking experience. Therefore, this research introduces the concept of "Path Curvature Intensity (Ip)" to calculate and compare the level of curvature in different paths. Together with the average distance between "significant turning areas," the research further studies the frequency of turning points and explores how path changes influence walking experience.

In addition, traditional space syntax has limited response to topography. However, in the mountainous villages of southeast China, height differences, slopes, and topographic changes often directly influence spatial relationships and path organization. Therefore, this research includes topographic maps in order to better understand the transitional relationships between different spaces during spatial analysis.

At the same time, space syntax often focuses more on geometric relationships while paying less attention to bodily experience and sensory perception within spatial scenes. Therefore, this research creates scenario maps by organizing and connecting different scenes. In this way, geometric analysis can be combined with real spatial situations to better understand the spatial atmosphere and everyday experience of villages.

Finally, by using black-and-white inversion to study the relationship between buildings and outdoor spaces, the purpose is not only to provide another way of observing space, but also to study whether these outdoor spaces naturally formed by voids between buildings contain certain hidden spatial patterns. This may provide a foundation for later research.

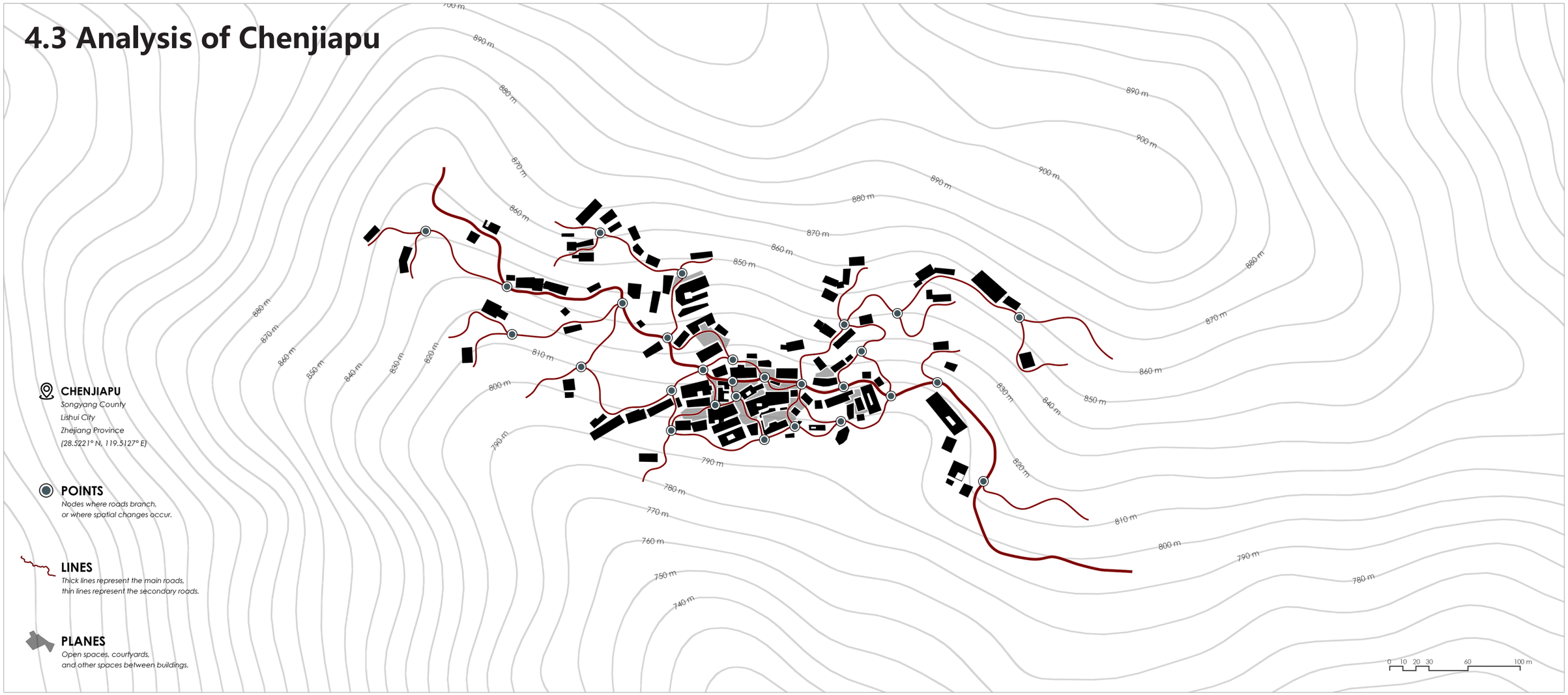
4.3 Analysis of Chenjiapu

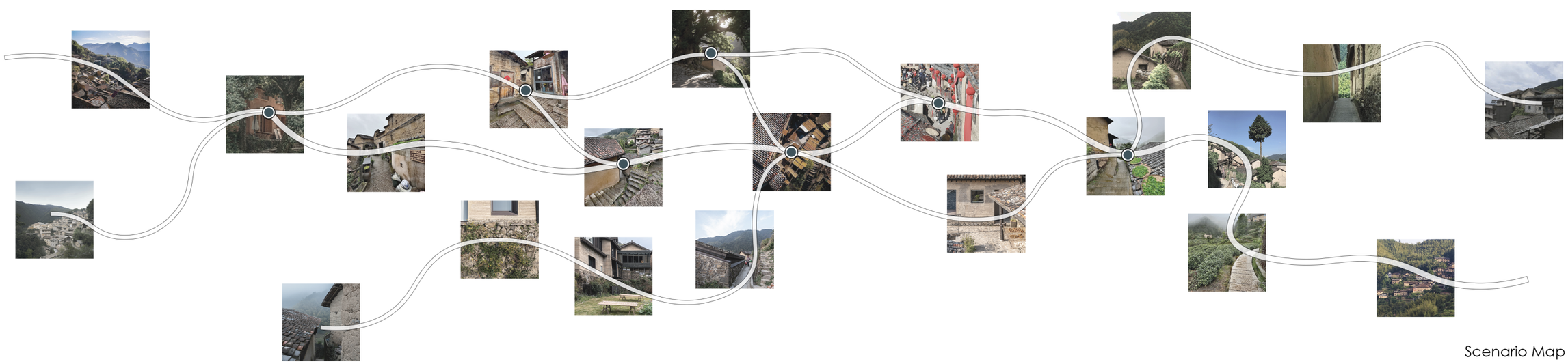
CHENJIAPU
Songyang County
Lishui City
Zhejiang Province
(28.5221° N, 119.5127° E)

POINTS
Nodes where roads branch,
or where spatial changes occur.

LINES
Thick lines represent the main roads,
thin lines represent the secondary roads.

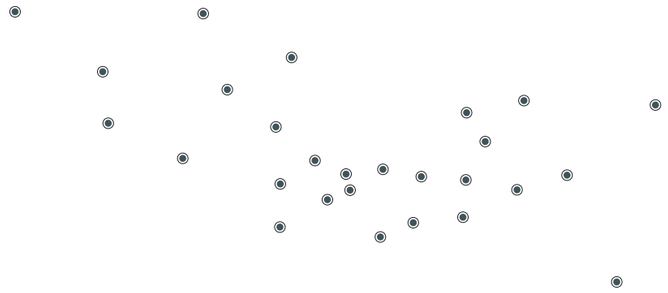
PLANES
Open spaces, courtyards,
and other spaces between buildings.



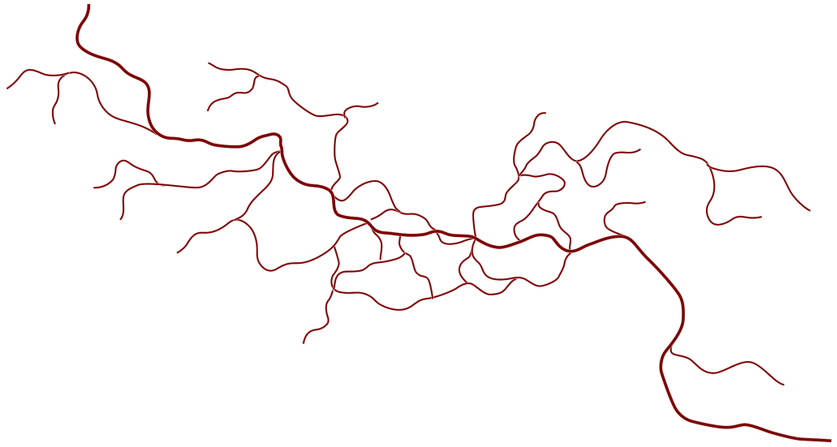


Scenario Map

Point



Line



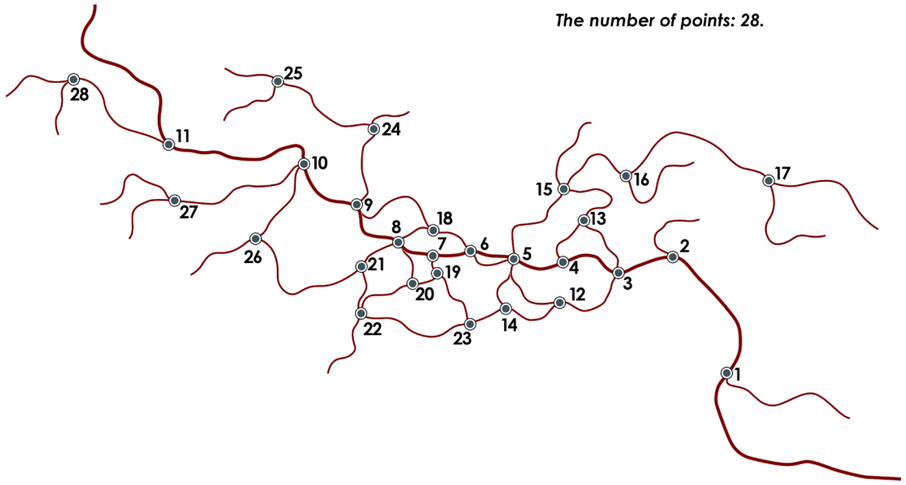
Plane



Analysis of Points

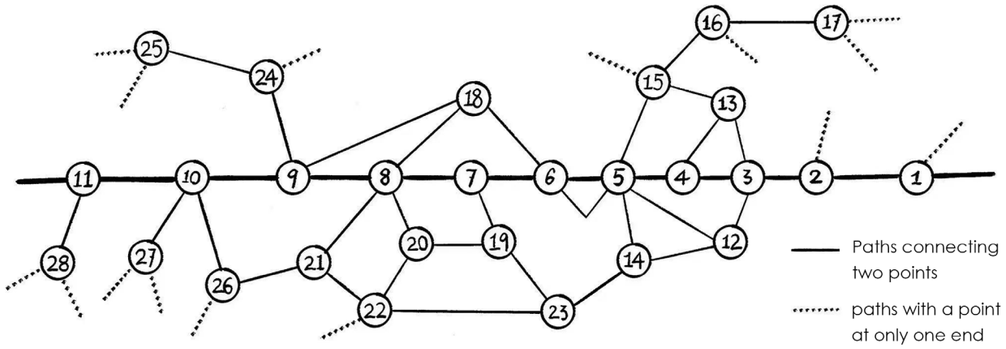
Step 1

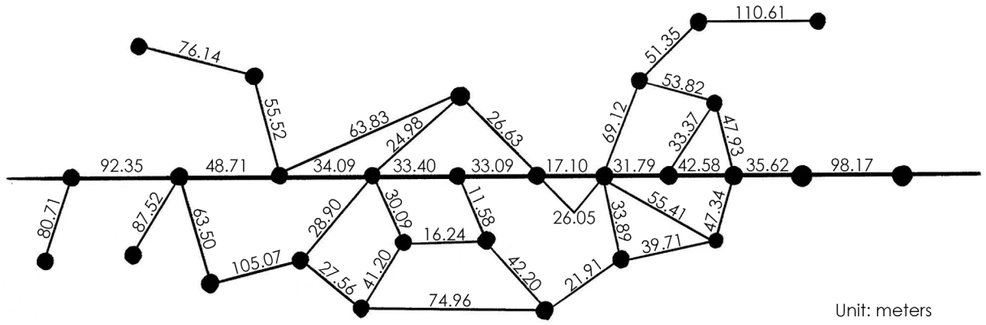
Number the points sequentially from east to west along the main road.



Step 2

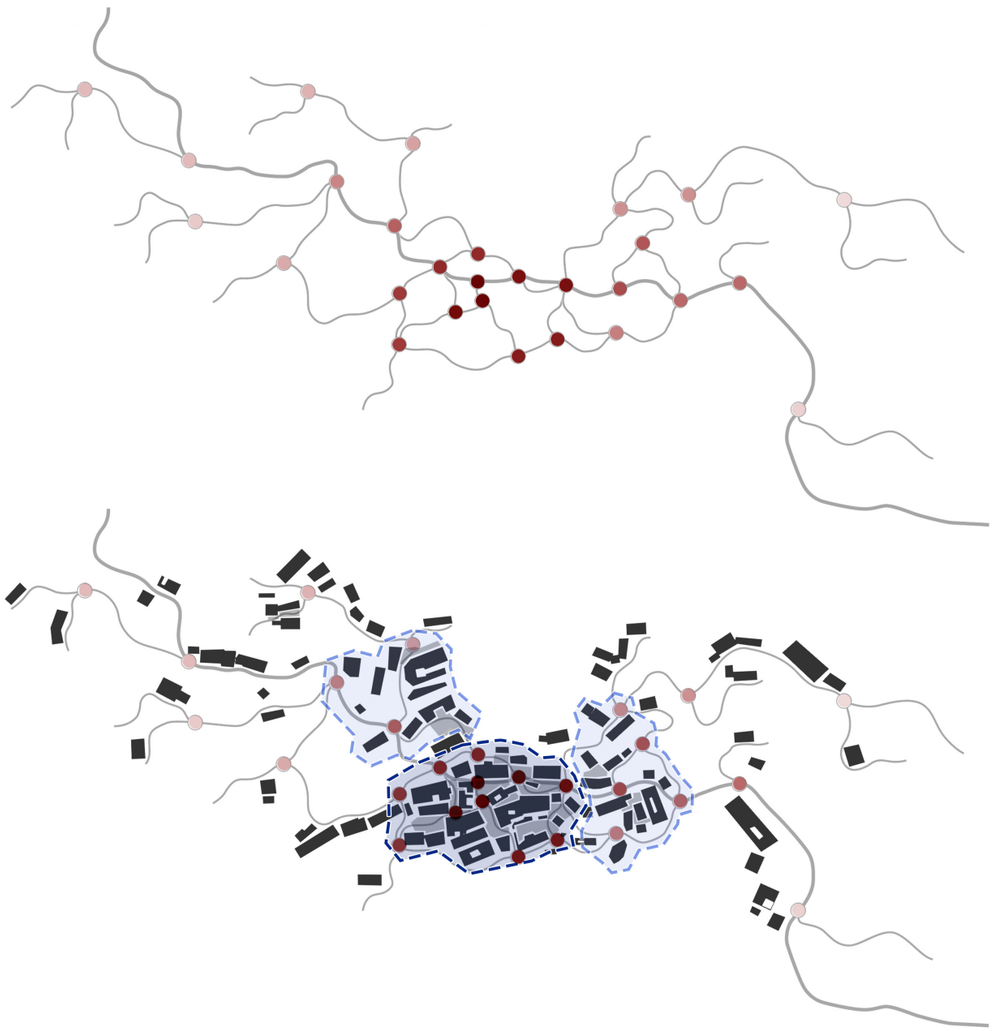
Simplify the paths and points into basic forms. Calculate the distances between the points, and distinguish them with different colors.





Step 2

Simplify the paths and points into basic forms. Calculate the distances between the points, and distinguish them with different colors.



Average Proximity = 44.18 m
Average Proximity in the village center ≈ 20.23 m
Average Proximity in the secondary center ≈ 41.27 m
Average Proximity at the edge of the village ≈ 76.034 m

Use "**proximity**" to represent the minimum distance between a point and its adjacent points.

The smaller this minimum distance is, the higher the node's "proximity" value; conversely, the larger the distance is, the lower the node's "proximity" value.

A single point's "proximity" value cannot represent density on its own. However, if the "proximity" values of points within a certain area are generally high, it indicates that the density of points in that area is also high.

Point index	The shortest distance to adjacent points
1	98.17
2	35.62
3	35.62
4	31.79
5	17.10
6	17.10
7	11.58
8	24.98
9	34.09
10	48.71
11	80.71
12	39.71
13	33.37
14	21.91
15	51.35
16	51.35
17	110.61
18	24.98
19	11.58
20	16.24
21	27.56
22	27.56
23	21.91
24	55.52
25	76.14
26	63.50
27	87.52
28	80.71

→

Point index	The shortest distance to adjacent points
7	11.58
19	11.58
20	16.24
5	17.10
6	17.10
14	21.91
23	21.91
8	24.98
18	24.98
21	27.56
22	27.56
4	31.79
13	33.37
9	34.09
2	35.62
3	35.62
12	39.71
10	48.71
15	51.35
16	51.35
24	55.52
26	63.50
25	76.14
11	80.71
28	80.71
27	87.52
1	98.17
17	110.61

Color Scale

Unit: meters

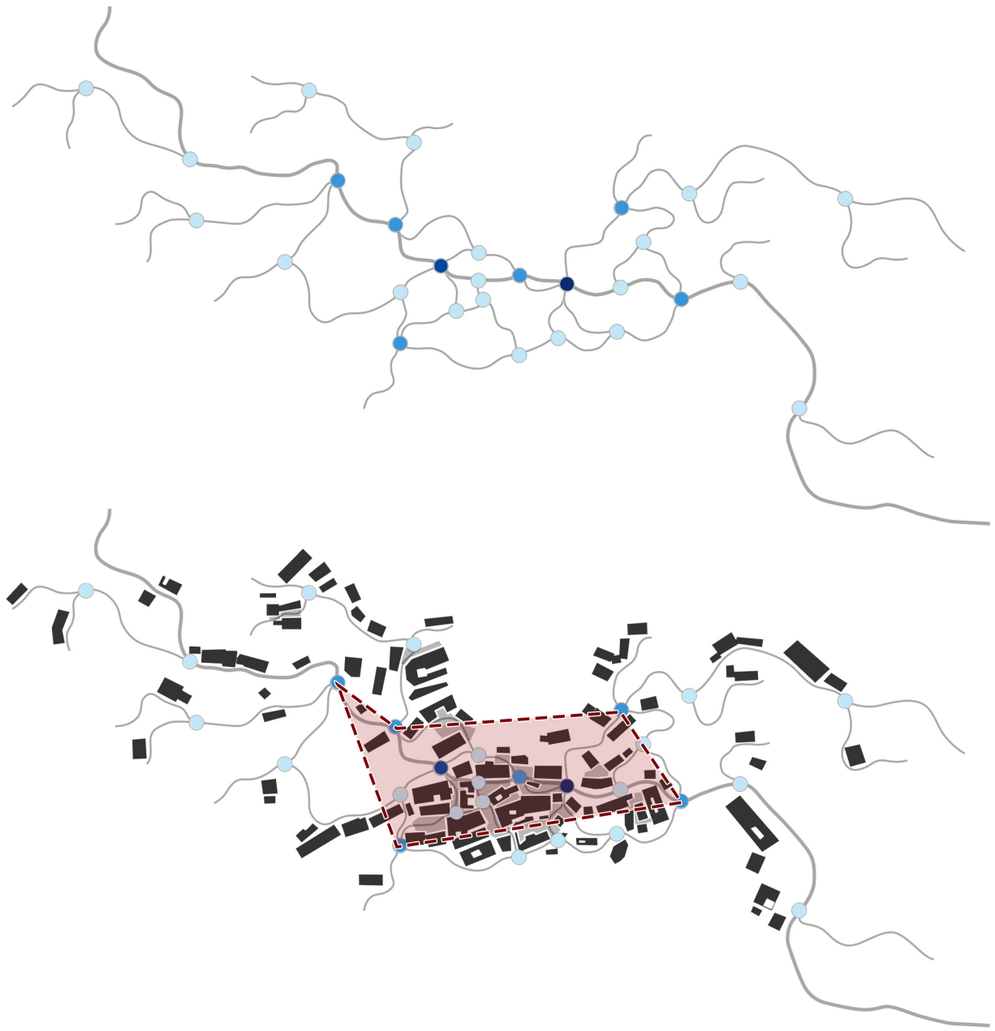
(Arrange in ascending order from the shortest distance to the longest.)

Average shortest Distance: 44.19m

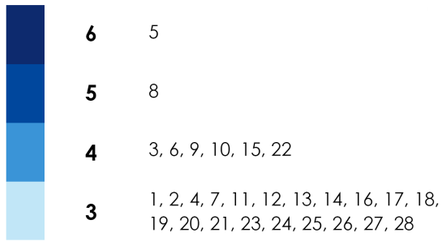
By outlining the village center in dark blue, it can be seen that the "proximity" values of the points in this area are generally high, indicating the highest point density in the village center. The secondary centers are marked in light blue, where the "proximity" values are slightly lower than those in the center but still higher than those in the outer areas. This suggests that point density gradually decreases from the village center toward the outer areas.

Step 3

Calculate how many paths each point is connected to, and distinguish them with different colors.



Average Accessibility = 3.39
Average Accessibility in the village center ≈ 3.64
Average Accessibility in the secondary center ≈ 3.50
Average Accessibility at the edge of the village ≈ 3.00



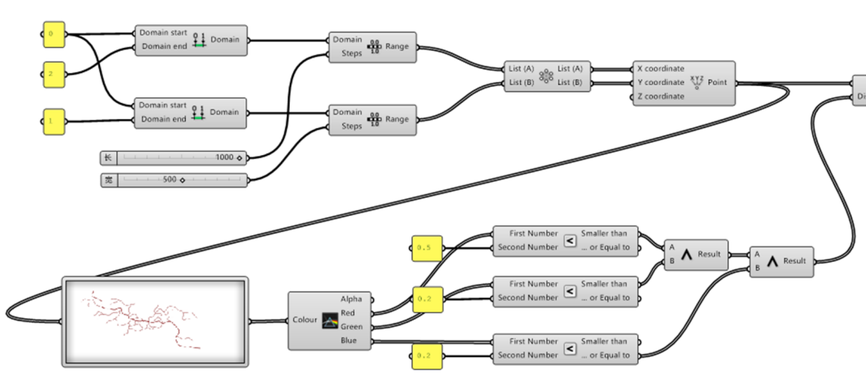
Use "**accessibility**" to represent the degree to which a point connects to paths. For example, if one point connects to three paths, then the "accessibility" of this point is 3.

By connecting the outermost points with an "accessibility" value of 4, it can be seen that the resulting area mostly covers the center of the village, showing that points closer to the village center have more connections. In addition, most points with an "accessibility" value of 4 or higher are located along the main paths, indicating that the main paths connect the largest number of paths and points.

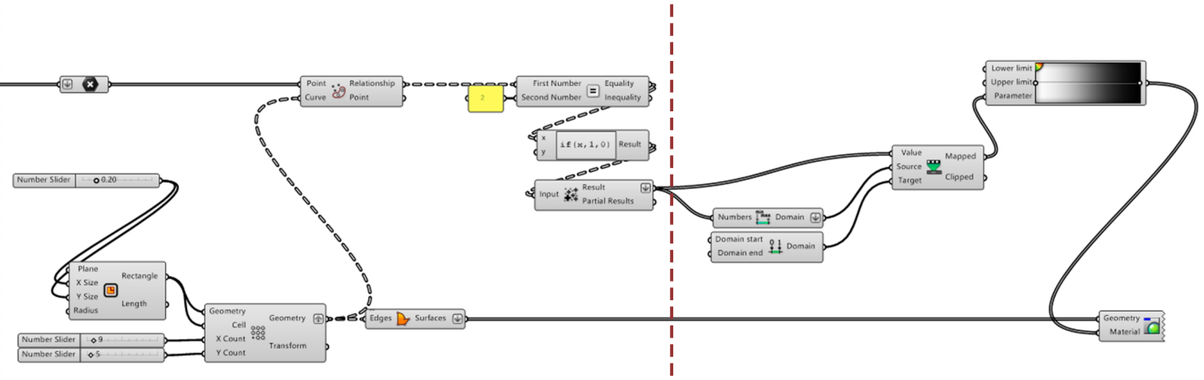
Analysis of Lines

Step 1

Analyze street network density with grasshopper

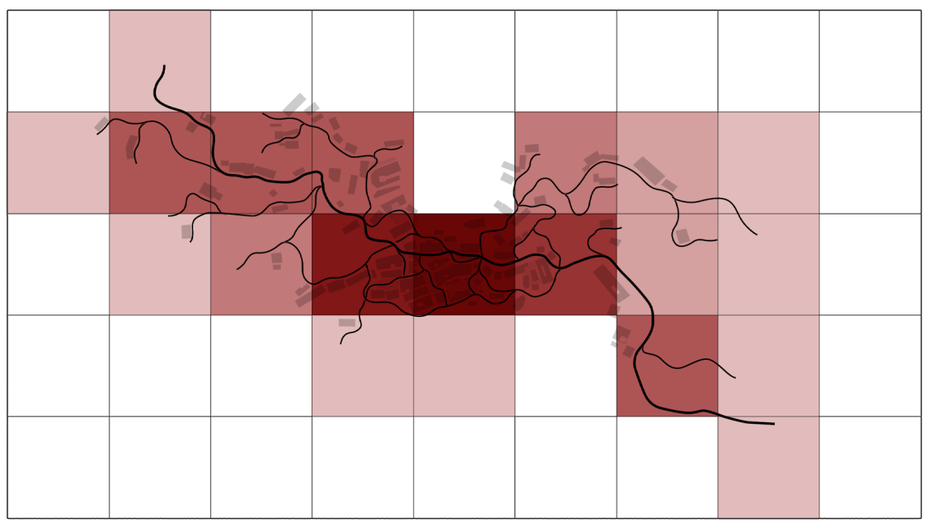


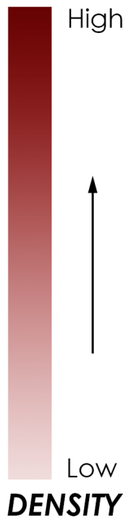
a. *Import the road network image with the paths highlighted in red, add a point grid, and use **color extraction** to identify all points (P) located on the road network.*



b. *Divide the base map using a grid and calculate the **number** of points (P) within each grid cell.*

c. *Generate a density map based on the values within each grid cell.*

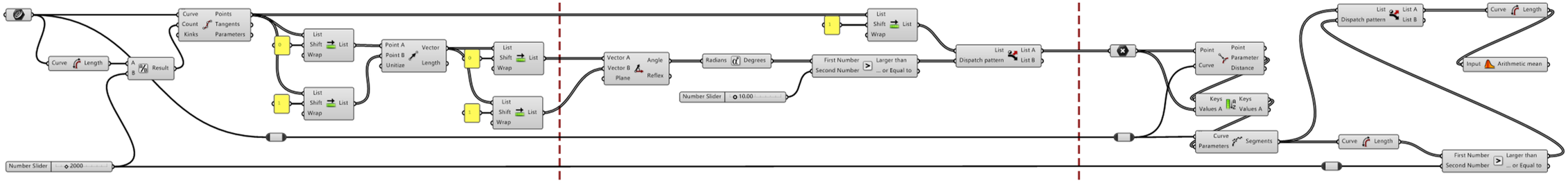




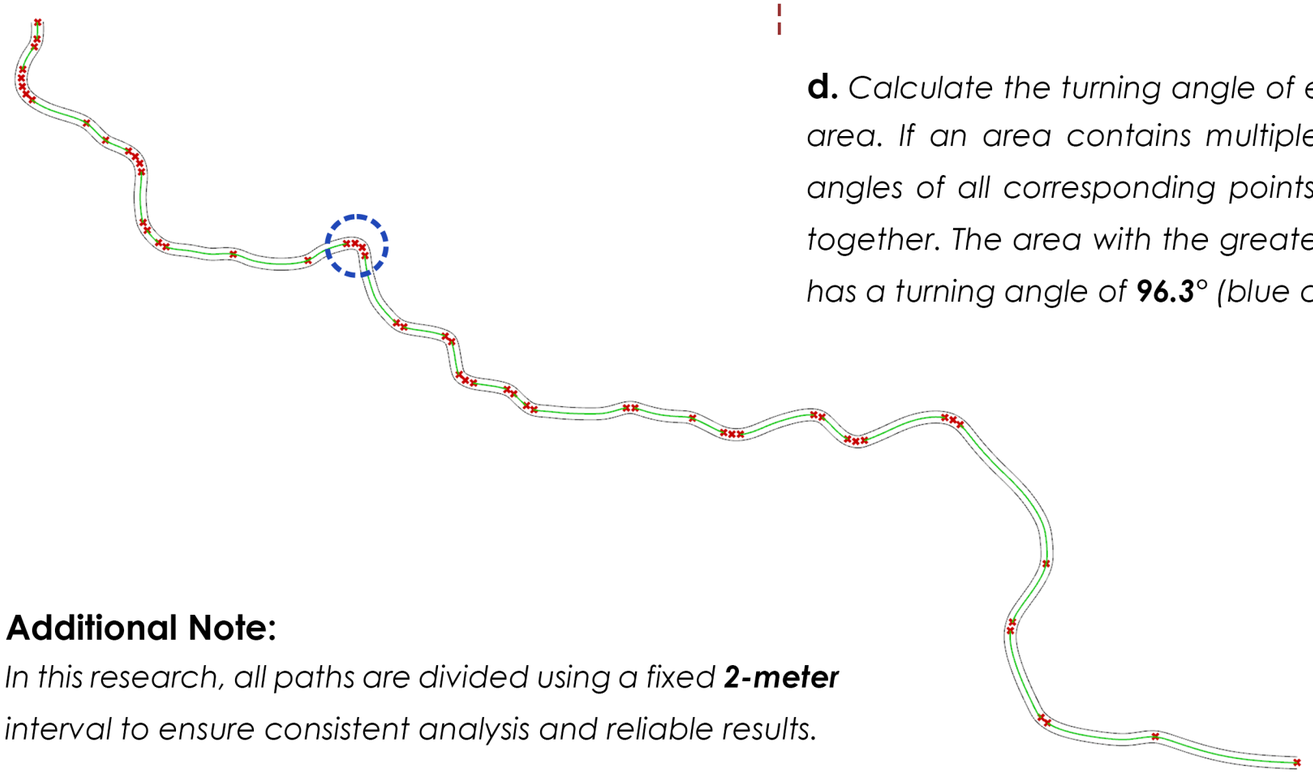
*By overlaying the street network density map with the village base map, it can be seen that the **closer** to the village center, the **higher** the street network density, which gradually decreases toward the outer areas. The high-density areas are **mainly located along the main paths**, showing that the village grows around its main routes. This also suggests that the village center is gradually formed by the concentration of paths and activities.*

Step 2

Analyzing main path form and curvature with grasshopper



a. *Divide the main paths into 2-meter intervals and generate vectors from the each adjacent points created by the division.*



b. *Calculate the angle between each pair of adjacent vectors and select the points (red) where the angle is greater than 10° .*

d. *Calculate the turning angle of each turning area. If an area contains multiple points, the angles of all corresponding points are added together. The area with the greatest curvature has a turning angle of* **96.3**° *(blue circle).*

c. *alculate the distances (green lines) between each turning areas, and than compute the average value.* ***The final result is 21.71 m.***

e. *To analyze the overall rhythm and degree of directional change along village paths, the concept of* ***Overall Path Curvature Intensity*** *(I_p) is introduced.*

$$I_p = \frac{\sum \theta_i}{L} \quad (\text{Unit: degree/ meter})$$

I_p *= overall path curvature intensity*

θ_i *= directional change angle at* ***EACH SAMPLED POINT***

L = ***TOTAL*** *length of the path*

(In general, the larger the I_p value, the more curved the path is.)

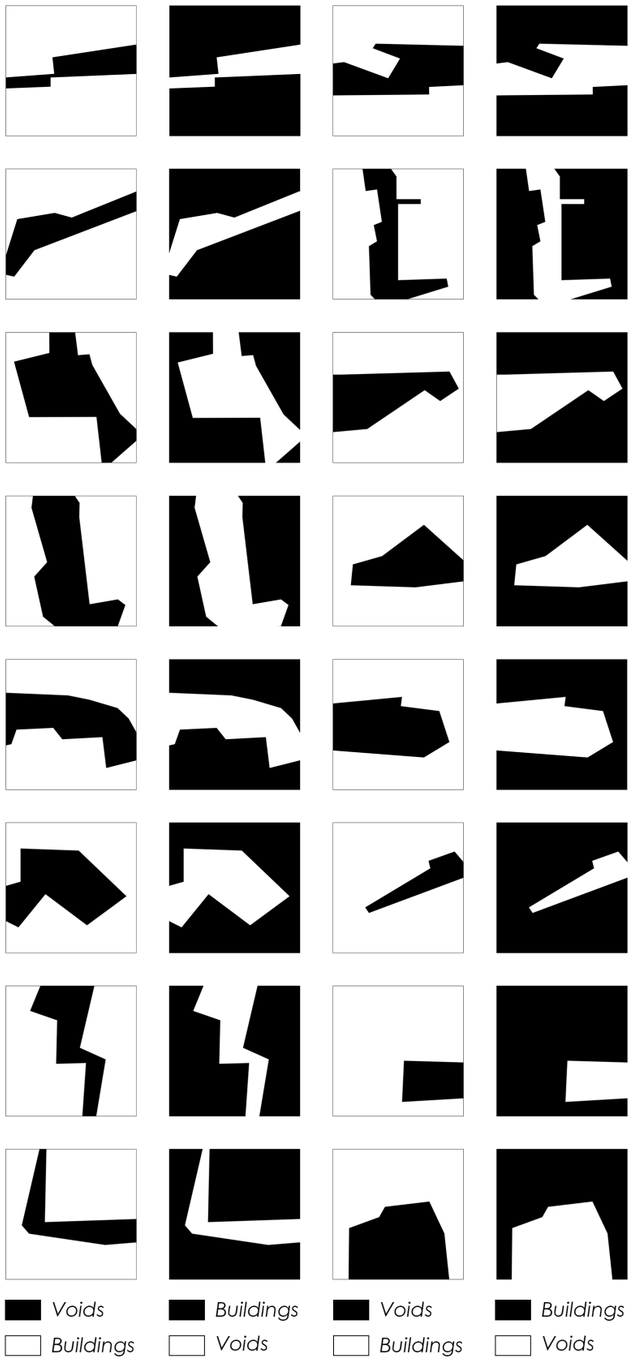
Using this formula in this village :

I_p = 2.34 ***(θ_i = 1507.49 ° , L = 644.41 m.)***

Additional Note:

In this research, all paths are divided using a fixed ***2-meter*** *interval to ensure consistent analysis and reliable results.*

Analysis of Planes



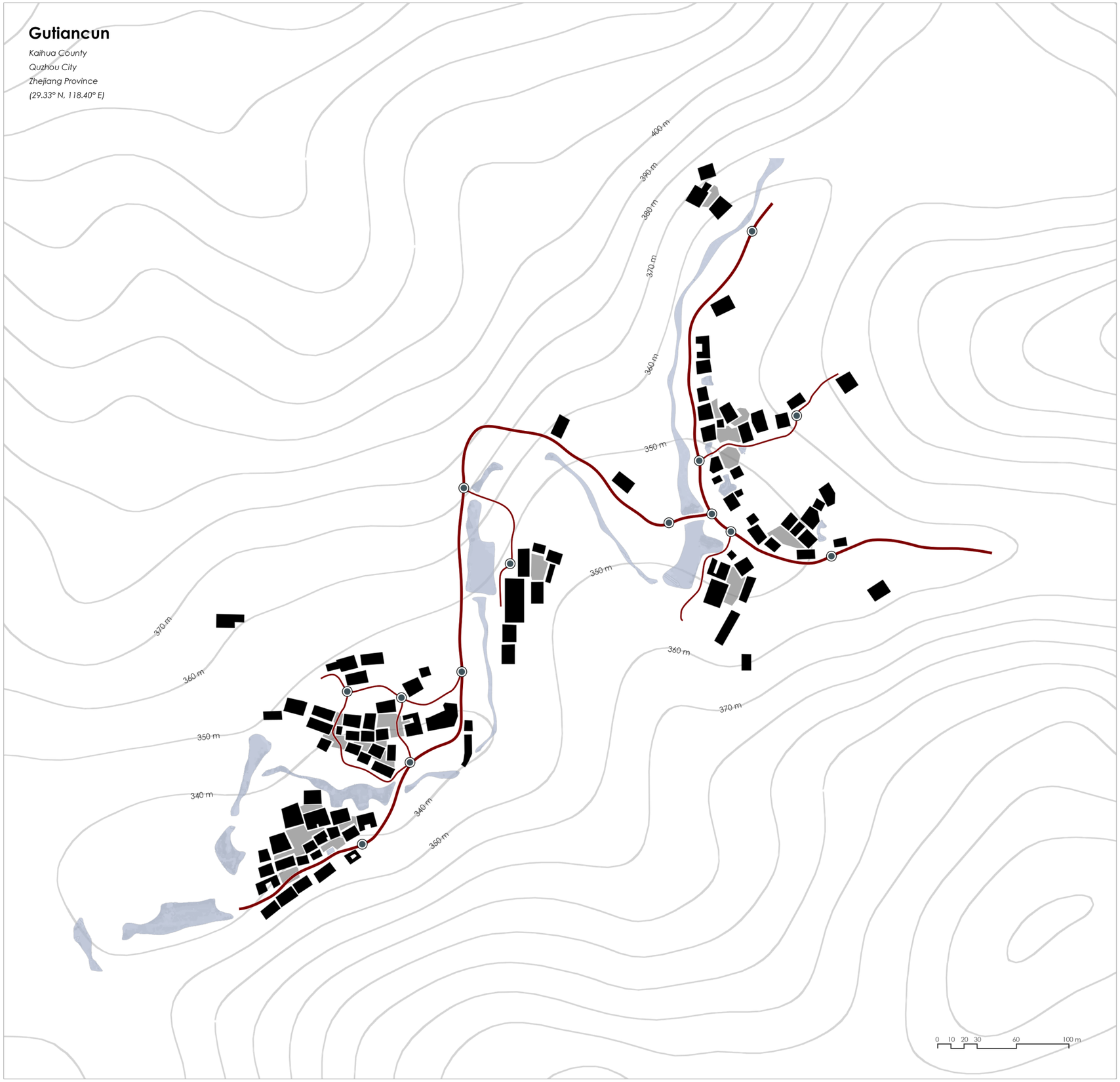
*("**Voids**" : open spaces naturally formed between buildings.)*

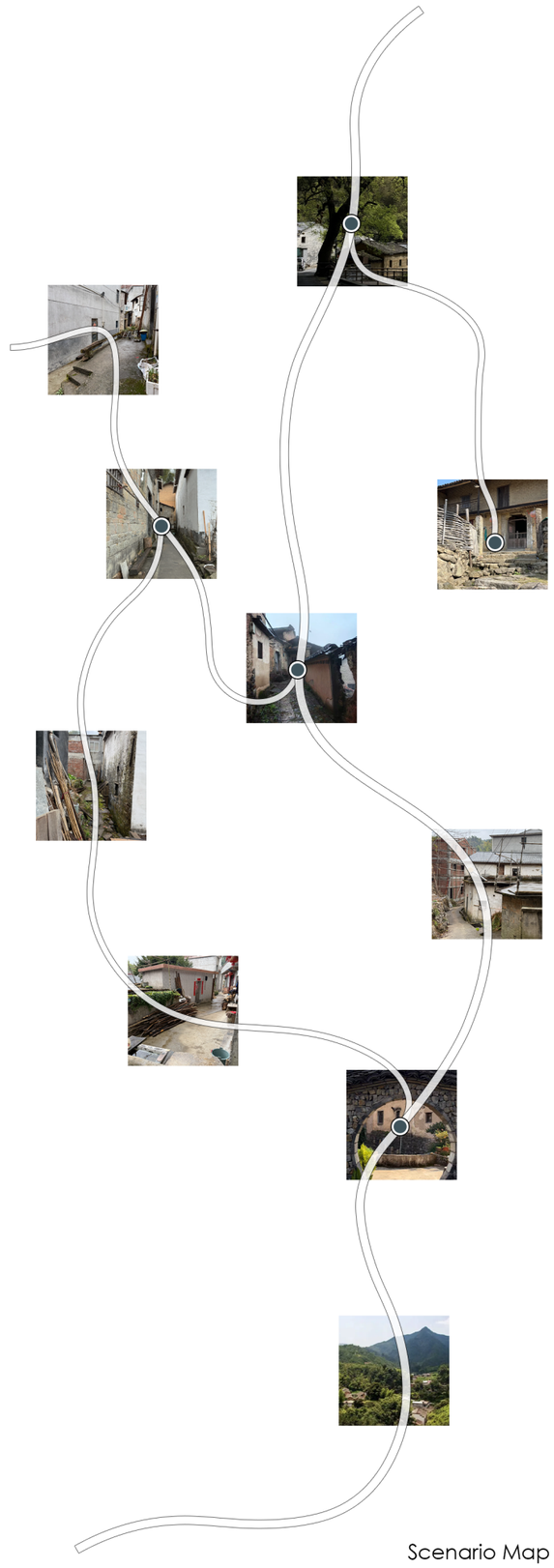
4.4 Analysis of the Other Nine Villages

Gutiancun
Shibamuduan
Taihuishan
Gaotiankeng
Huangling
Yuantouli
Jiangwucun
Zhuwucun
Xiashancun

Gutiancun

Kaihua County
Quzhou City
Zhejiang Province
(29.33° N, 118.40° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.64***

Average Accessibility in the village center ≈ ***3.14***

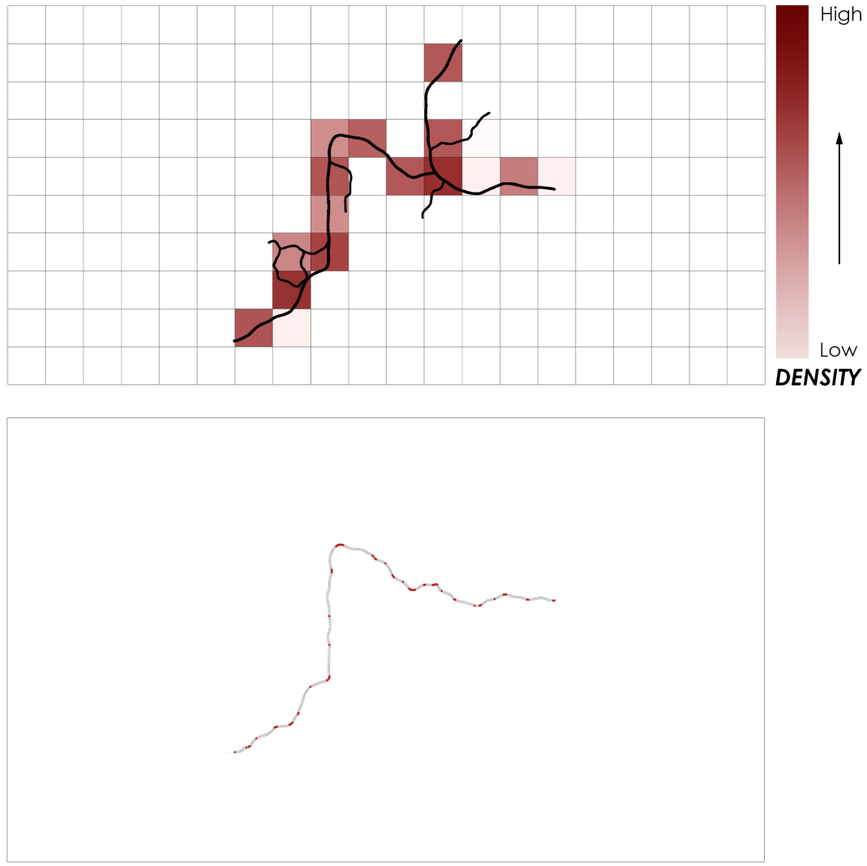
Average Accessibility at the edge of the village ≈ ***2.14***

Average Proximity = ***55.36 m***

Average Proximity in the village center ≈ ***31.43 m***

Average Proximity at the edge of the village ≈ ***79.29 m***

Analysis of Lines



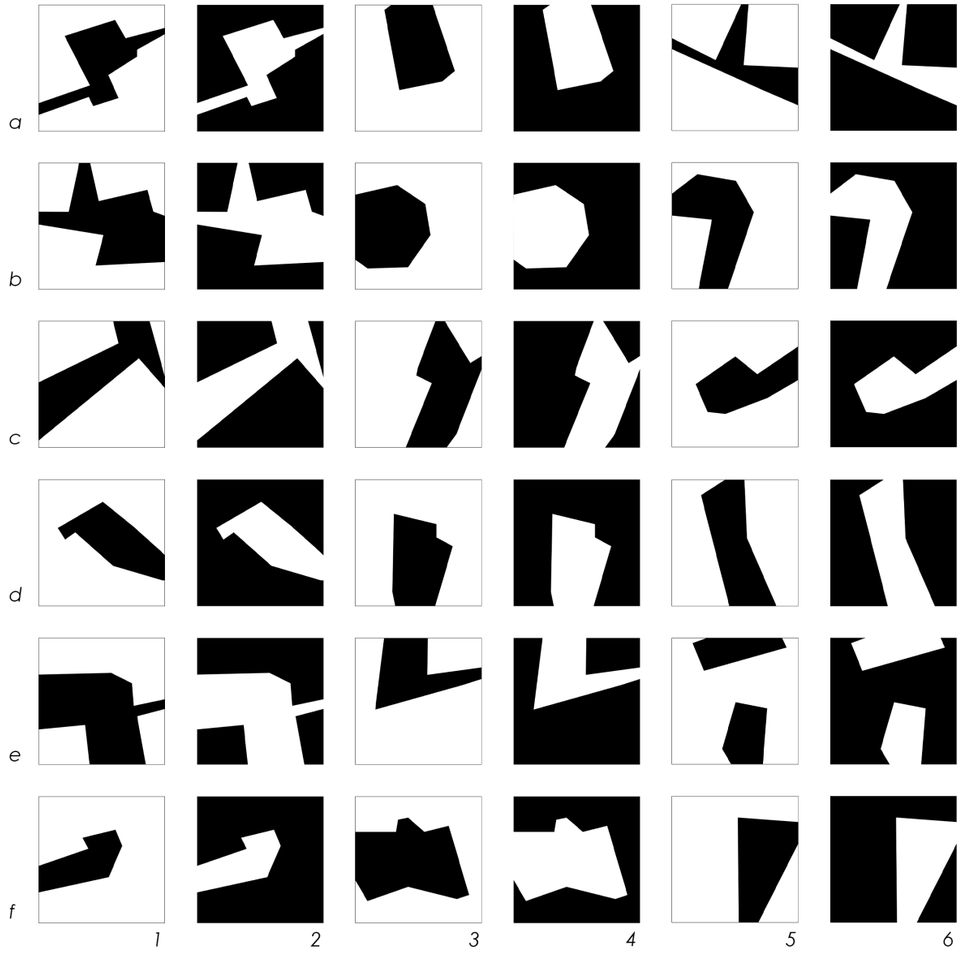
Average Distance Between Turning Areas = ***26.05 m***

I_p = ***2.25*** *(θ_i = 1815.27 ° , L = 807.23 m)*

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

Columns 2, 4, and 6 : *Voids* *Buildings*

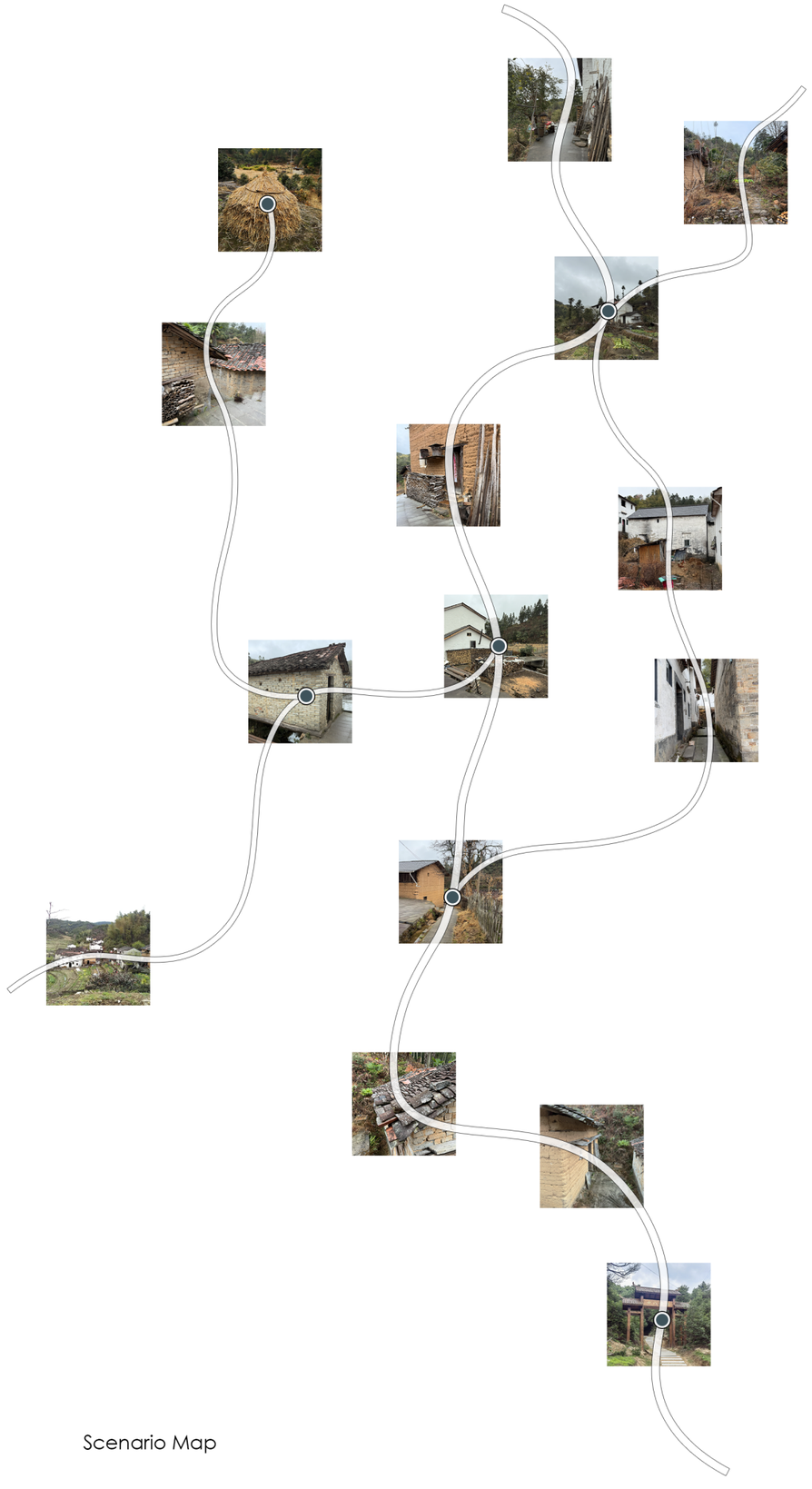


a	*Spatial Expansion*	*Inclined Boundary*	*Path Intersection*
b	*Angular Space*	*Polygonal Space*	*Right-Angle Turn*
c	*Spatial Compression*	*Branching Junction*	*Spatial Expansion*
d	*Oppressive Space*	*Narrowing Space*	*Gentle Turn*
e	*Narrow Junction*	*Dramatic Turn*	*Fragmented Space*
f	*Angular Transition*	*Irregular Boundary*	*Triangular Space*

Shibamuduan

Dexing County
Shangrao City
Jiangxi Province
(29.27° N, 118.07° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.64***

Average Accessibility in the village center ≈ ***2.50***

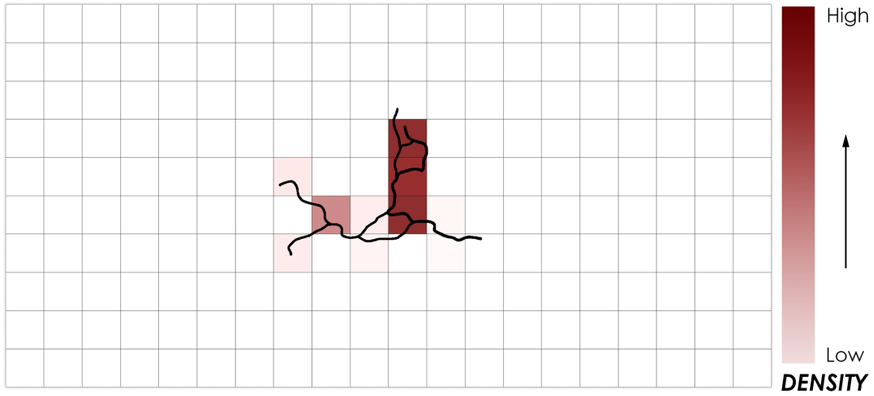
Average Accessibility at the edge of the village ≈ ***2.80***

Average Proximity = ***44.55 m***

Average Proximity in the village center ≈ ***36.17 m***

Average Proximity at the edge of the village ≈ ***54.60 m***

Analysis of Lines





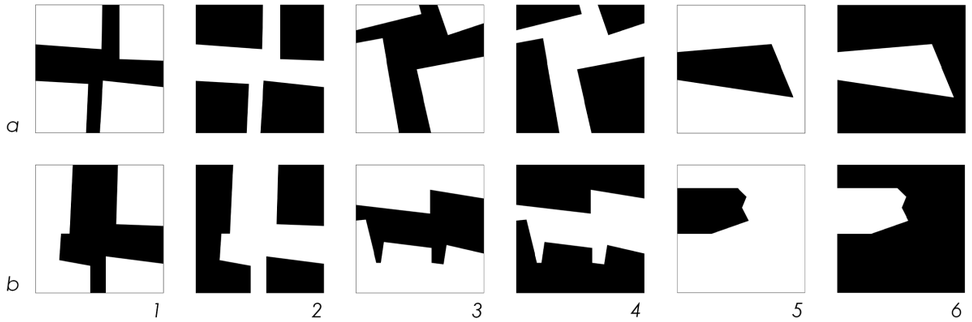
Average Distance Between Turning Areas = ***25.66 m***

I_p = ***2.70*** *(θ_i = 1264.16 ° , L = 468.70 m)*

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

Columns 2, 4, and 6 : *Voids* *Buildings*

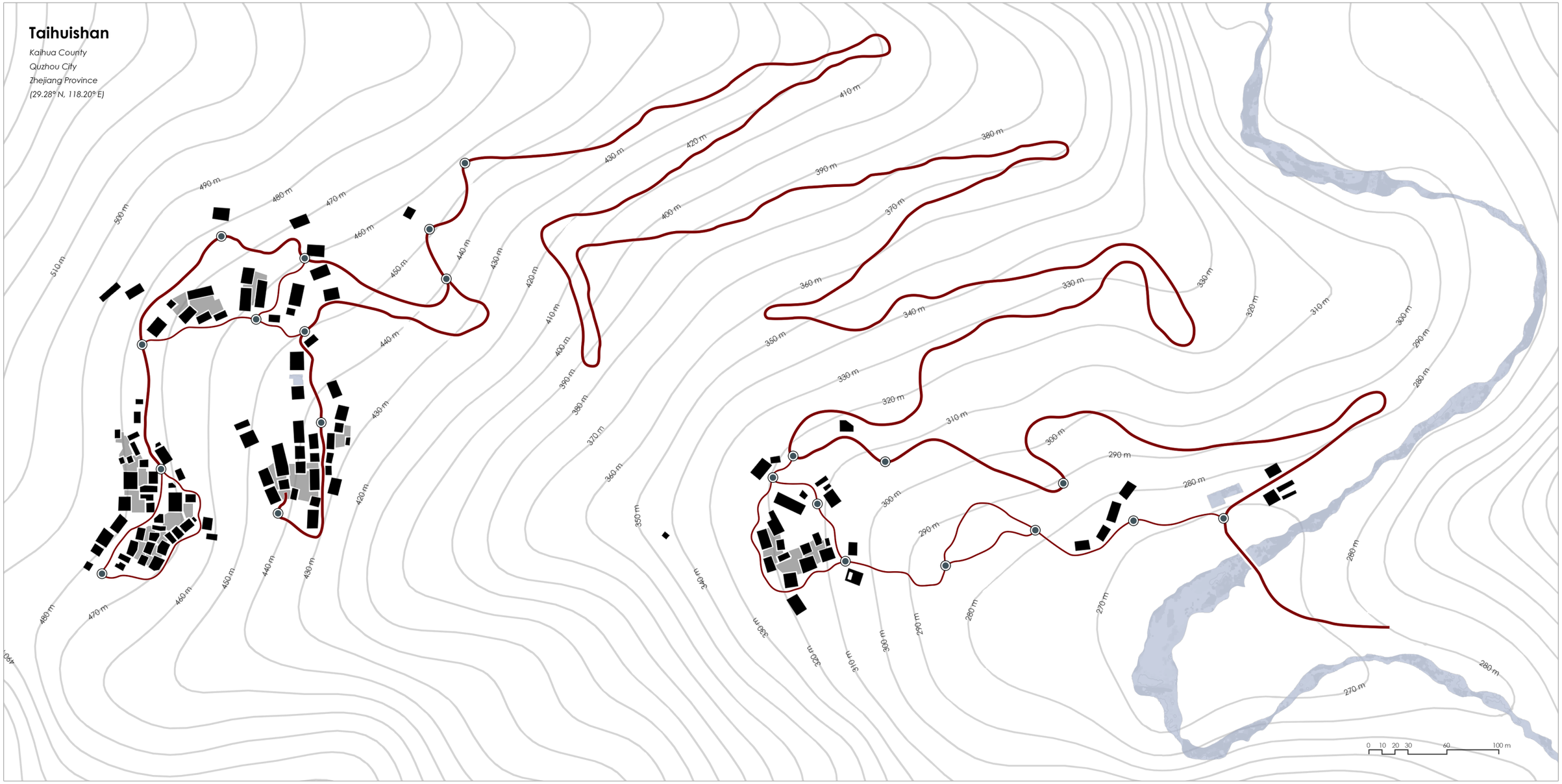


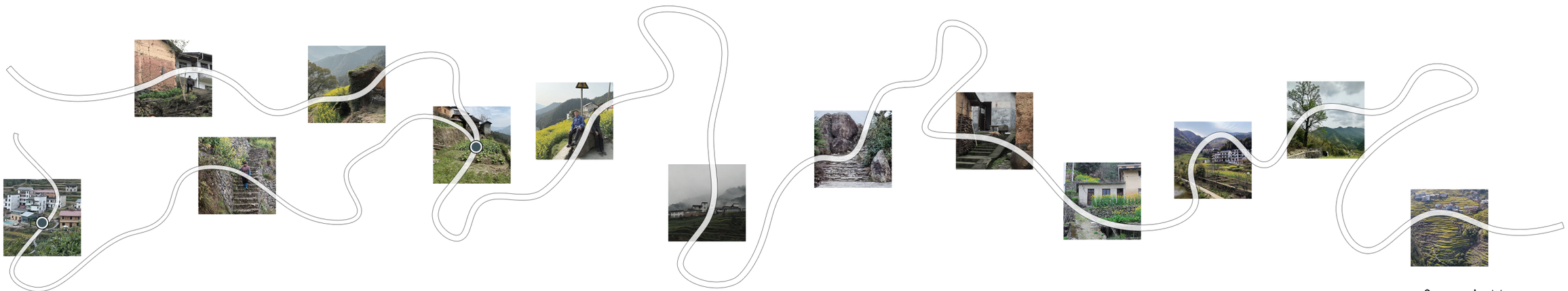
a *Cross Intersection* *Angled Intersection* *Sharp Space*

b *Three-Way Junction* *Projecting Wall* *Gentle Space*

Taihuishan

Kaihua County
Quzhou City
Zhejiang Province
(29.28° N, 118.20° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.55***

Average Accessibility in the village center ≈ ***2.62***

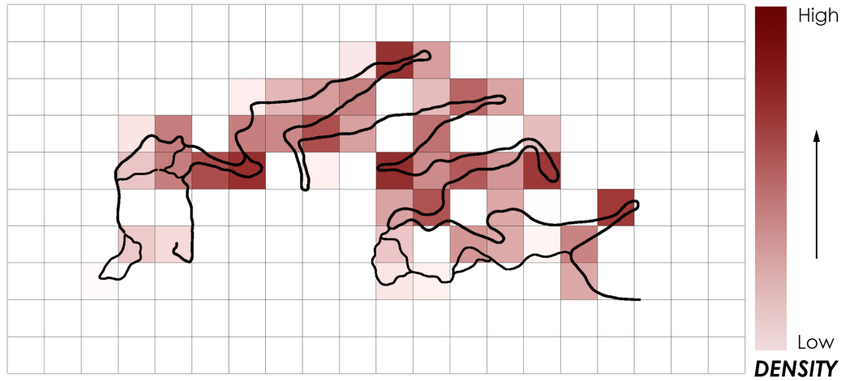
Average Accessibility at the edge of the village ≈ ***2.44***

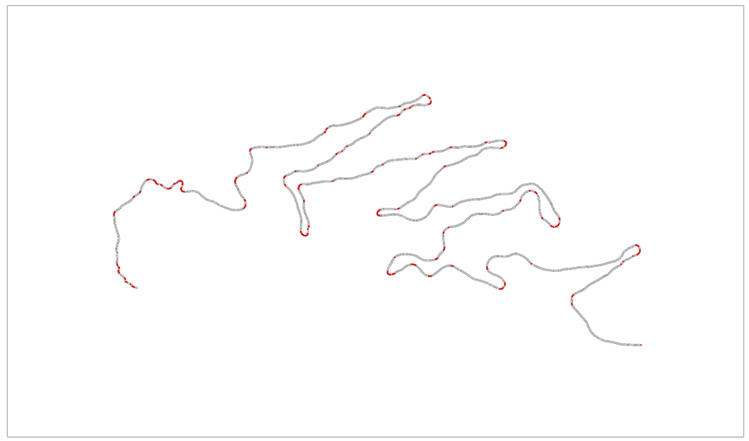
Average Proximity = ***70.00 m***

Average Proximity in the village center ≈ ***58.00 m***

Average Proximity at the edge of the village ≈ ***87.33 m***

Analysis of Lines





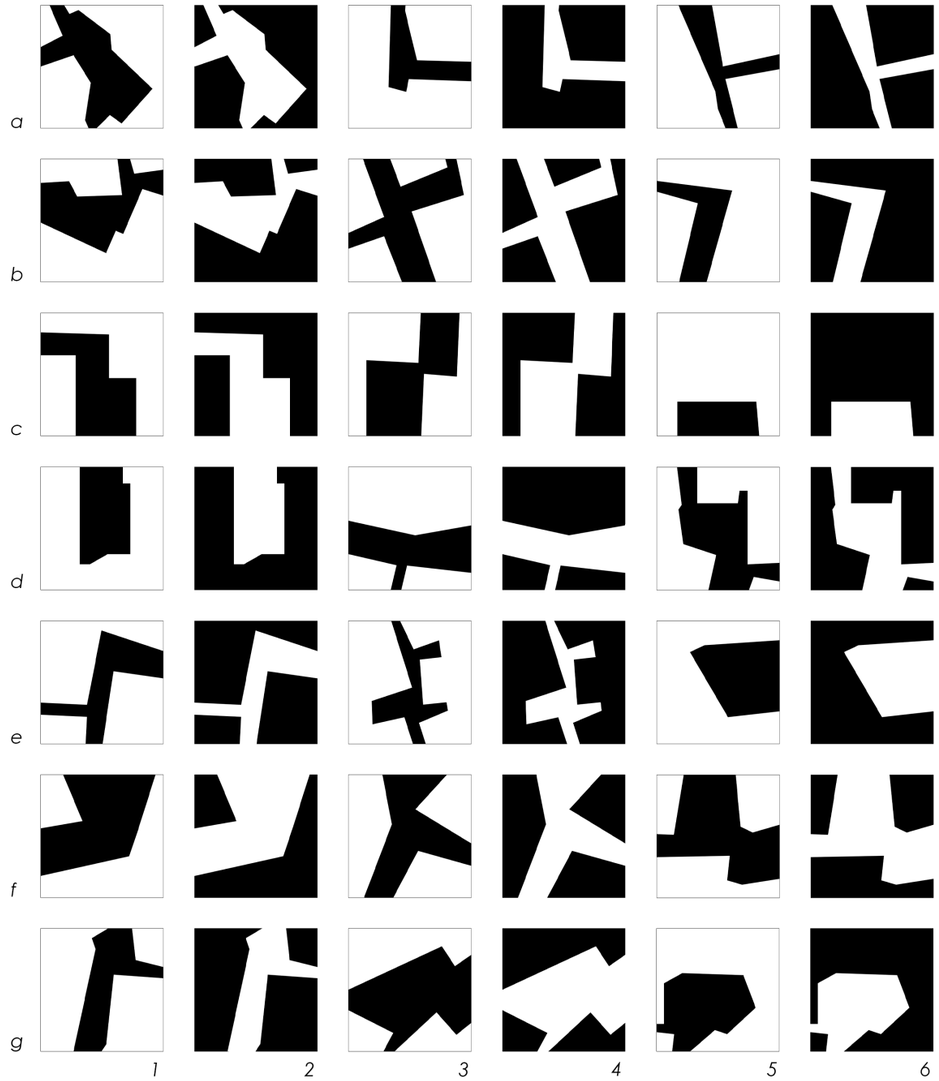
Average Distance Between Turning Areas = ***37.31 m***

I_p = **2.20** (θ_i = 8389.53 ° , *L = 3809.54 m*)

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

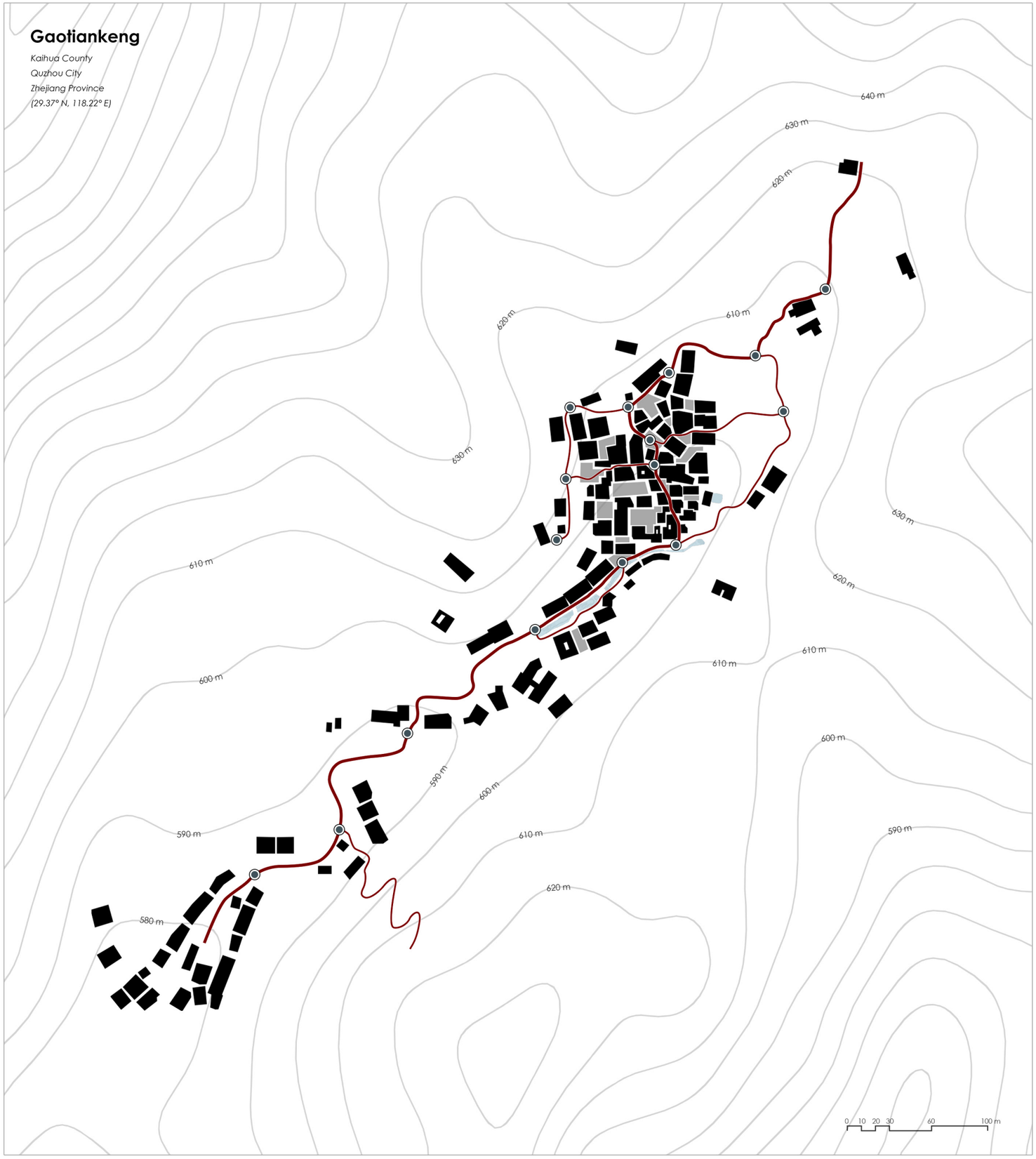
Columns 2, 4, and 6 : *Buildings* *Voids*

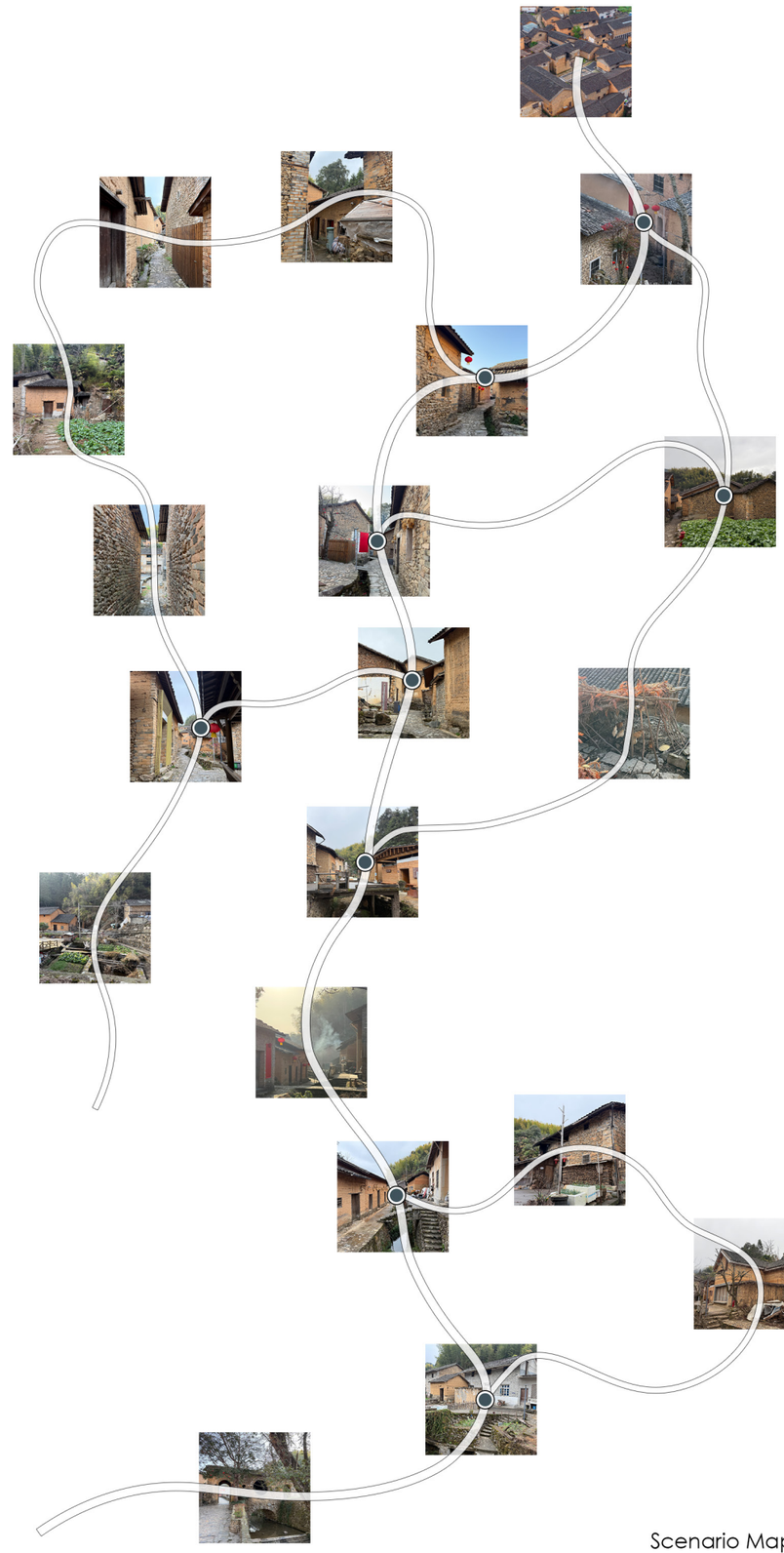


a	*Irregular Intersection*	*Right-Angle Connection*	*Inclined Intersection*
b	*Angular Compression*	*Diagonal Intersection*	*Right-Angle Turn*
c	*Right-Angle Space*	*Offset Space*	*Enclosed Space*
d	*Gentle Corner*	*Symmetrical Compressio*	*Complex Node*
e	*Inclined Transition*	*Branching Path*	*Open Plaza*
f	*Sharp Corner Space*	*Sharp Intersection*	*Acute Turn*
g	*Narrow Passage*	*Irregular Plaza*	*Sudden Expansion*

Gaotiankeng

Kaihua County
Quzhou City
Zhejiang Province
(29.37° N, 118.22° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.56***

Average Accessibility in the village center ≈ ***2.55***

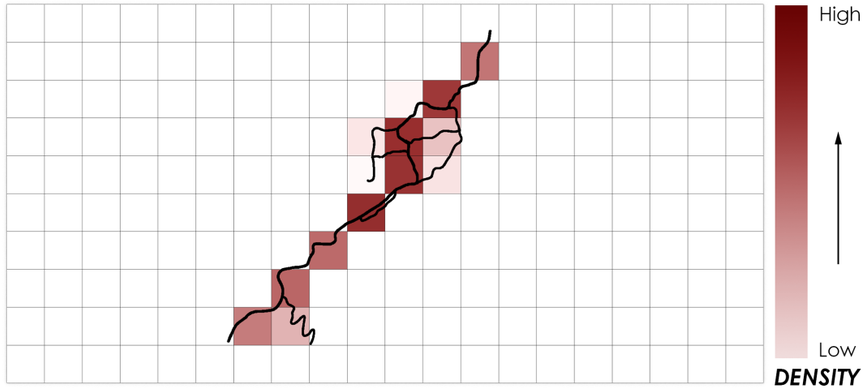
Average Accessibility at the edge of the village ≈ ***2.57***

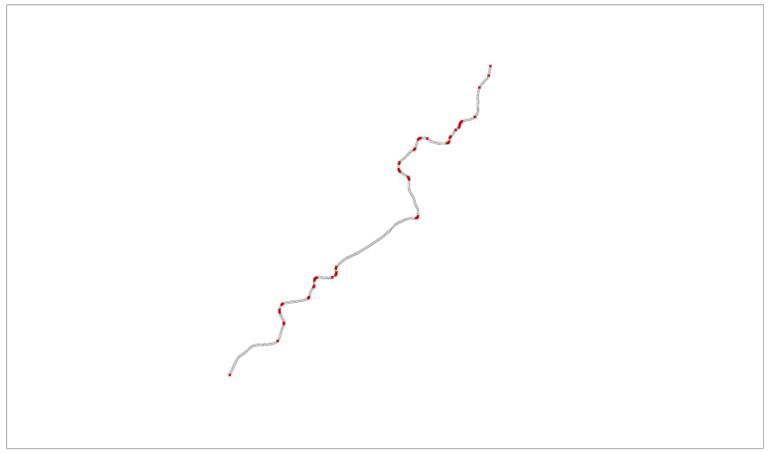
Average Proximity = ***55.56 m***

Average Proximity in the village center ≈ ***36.22 m***

Average Proximity at the edge of the village ≈ ***80.43 m***

Analysis of Lines





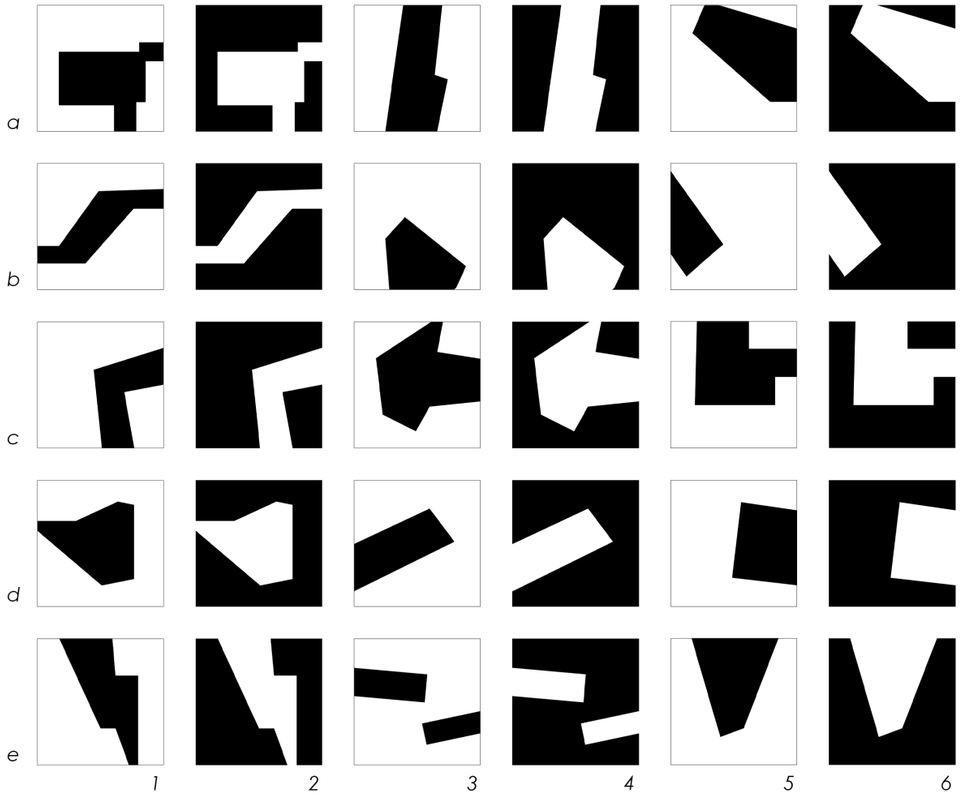
Average Distance Between Turning Areas = ***26.37 m***

I_p = ***2.58*** *(θ_i = 1853.61 ° , L = 719.10 m)*

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

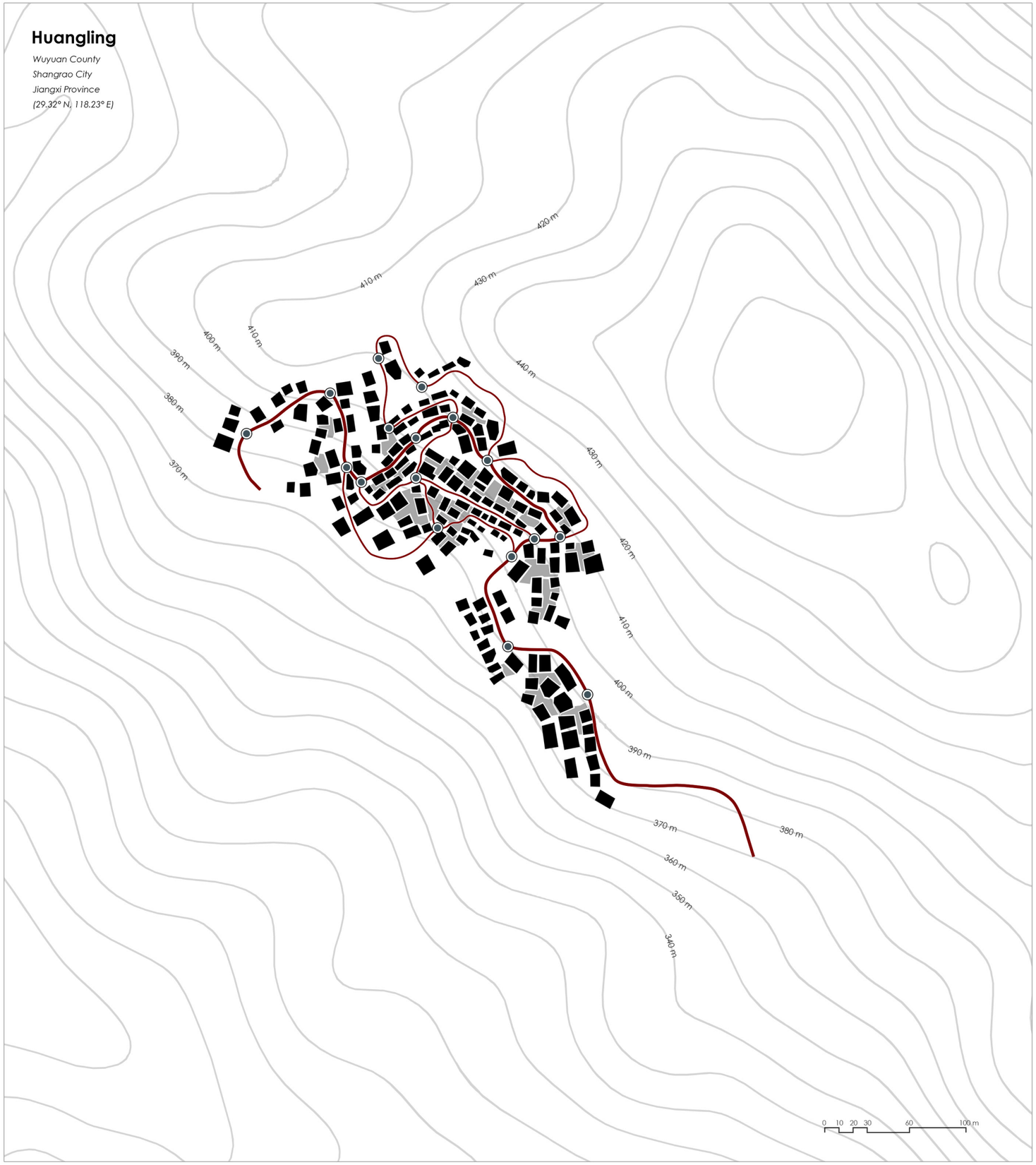
Columns 2, 4, and 6 : *Voids* *Buildings*



a	*Offset Enclosure*	*Narrowing Boundary*	*Inclined Enclosure*
b	*Inclined Path*	*Pentagon Space*	*Acute Space*
c	*Obtuse Turn*	*Irregular Node*	*Right-Angle Enclosure*
d	*Triangular Space*	*Diagonal Space*	*Regular Plaza*
e	*Zigzag Boundary*	*Offset Path*	*Tapered Space*

Huangling

Wuyuan County
Shangrao City
Jiangxi Province
(29.32° N, 118.23° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.71***

Average Accessibility in the village center ≈ ***3.10***

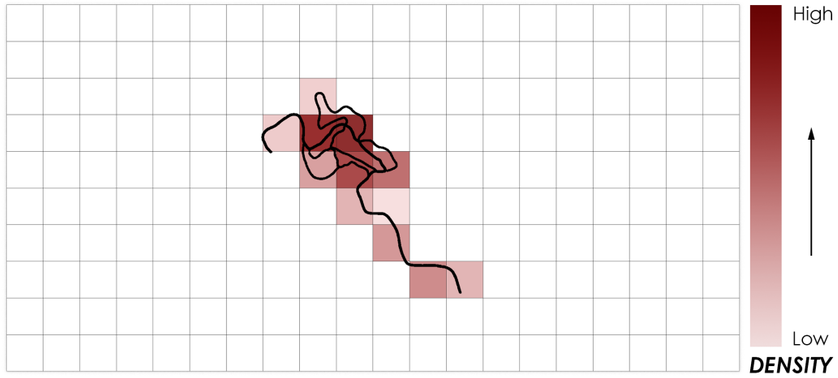
Average Accessibility at the edge of the village ≈ ***2.00***

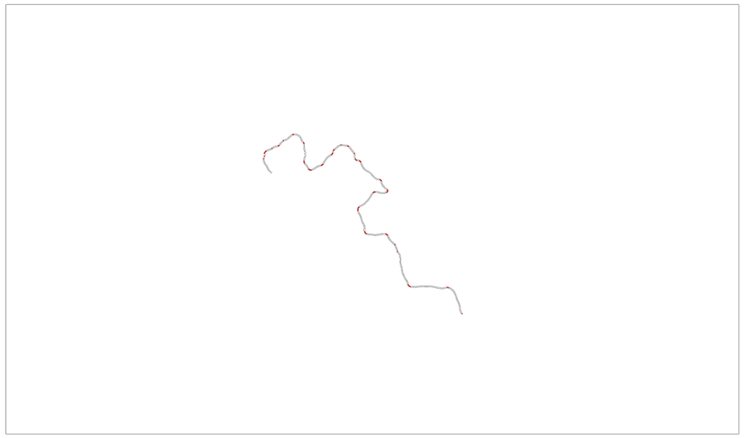
Average Proximity = ***41.82 m***

Average Proximity in the village center ≈ ***30.82 m***

Average Proximity at the edge of the village ≈ ***62.00 m***

Analysis of Lines





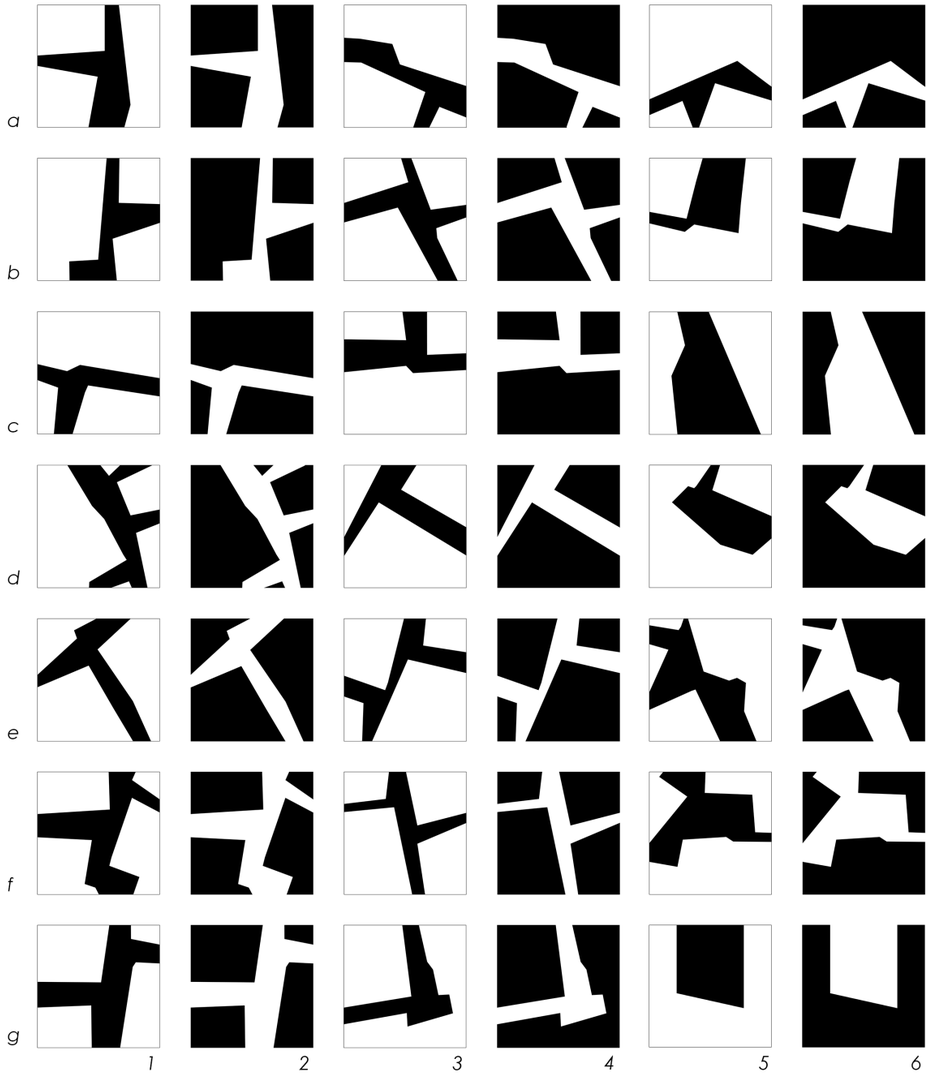
Average Distance Between Turning Areas = ***28.69 m***

I_p = **2.81** (θ_i = 2570.95 ° , *L* = 913.97 m)

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

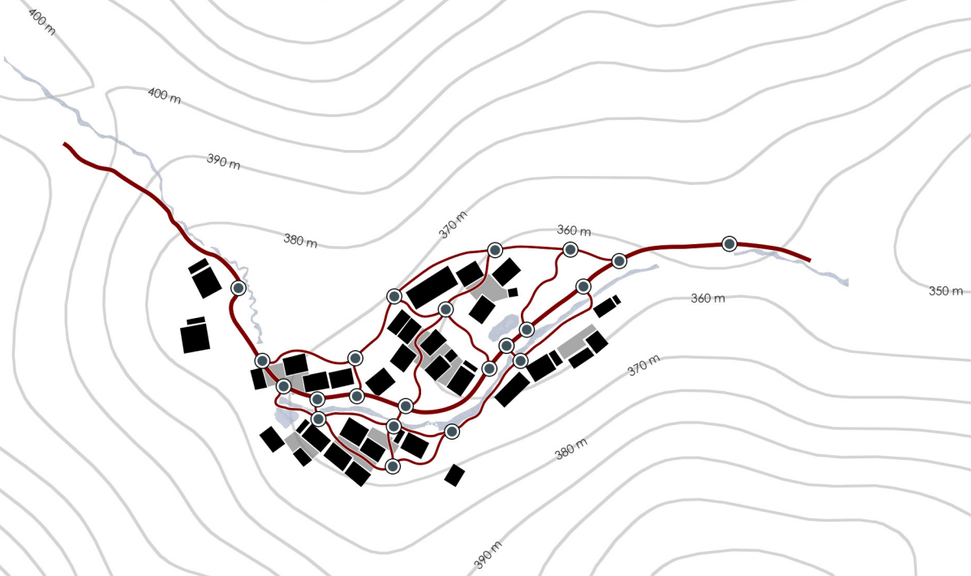
Columns 2, 4, and 6 : *Voids* *Buildings*

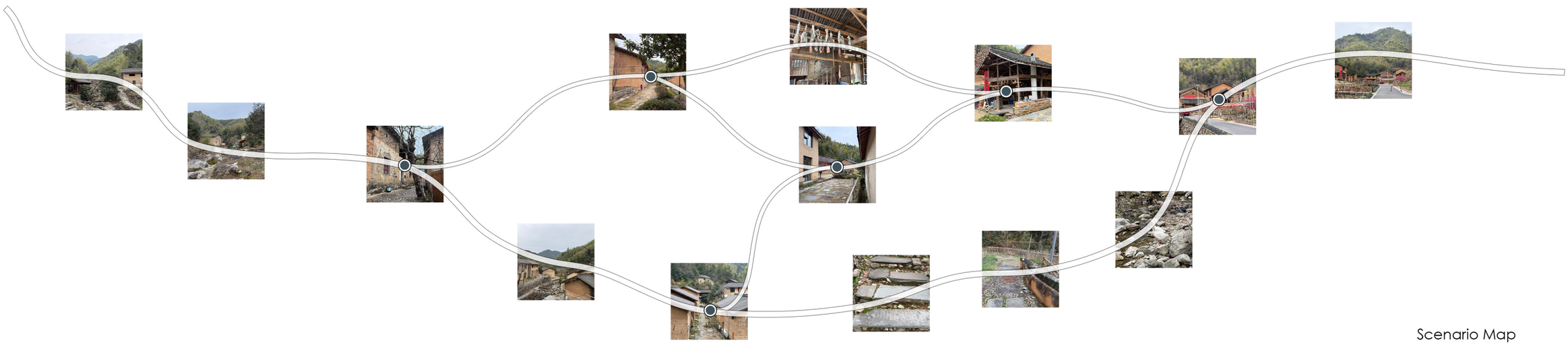


a	*Offset Intersection*	*Offset Junction*	*Rotated Building*
b	*Offset Turn*	*Path Merge*	*Sudden Spatial Change*
c	*Inclined Junction*	*Gentle Turn*	*Narrowing Passage*
d	*Branching Split*	*Perpendicular Intersection*	*Spatial Expansion*
e	*Right-Angle Intersection*	*Spatial Contraction*	*Central Narrowing*
f	*Irregular Crossing*	*Irregular Cross Intersection*	*Offset Junction*
g	*Parallel Intersection*	*Corner Expansion*	*Trapezoidal Space*

Yuantouli

Kaihu County
Quzhou City
Zhejiang Province
(29.26° N, 118.27° E)





Scenario Map

Analysis of Points

Average Accessibility = ***3.09***

Average Accessibility in the village center ≈ ***3.25***

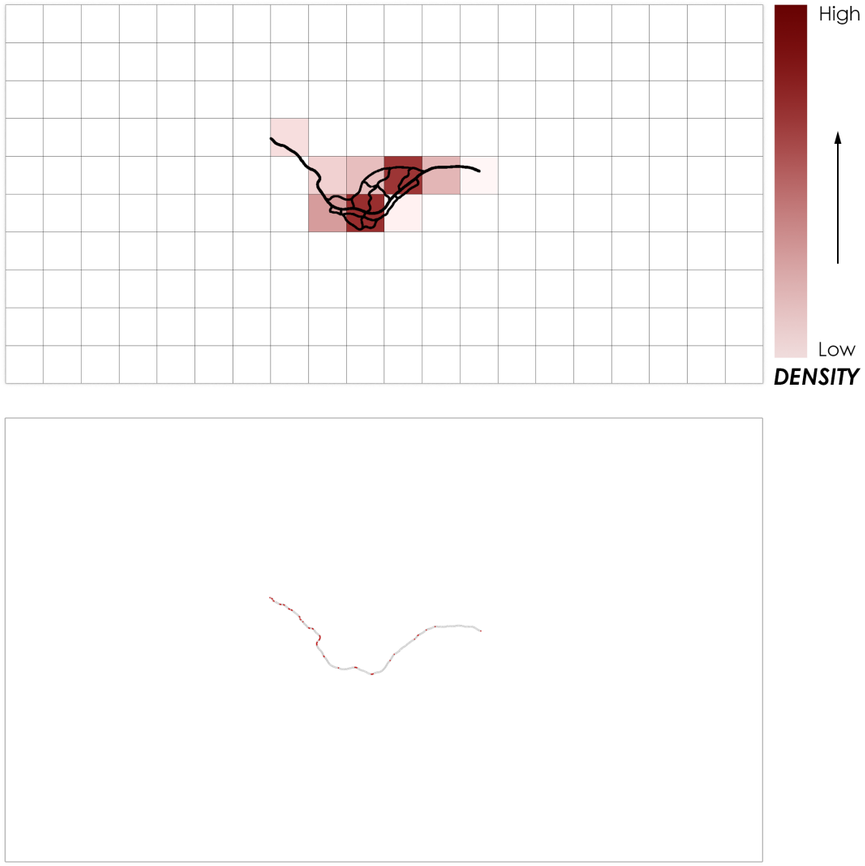
Average Accessibility at the edge of the village ≈ ***2.67***

Average Proximity = ***23.45 m***

Average Proximity in the village center ≈ ***17.94 m***

Average Proximity at the edge of the village ≈ ***38.17 m***

Analysis of Lines



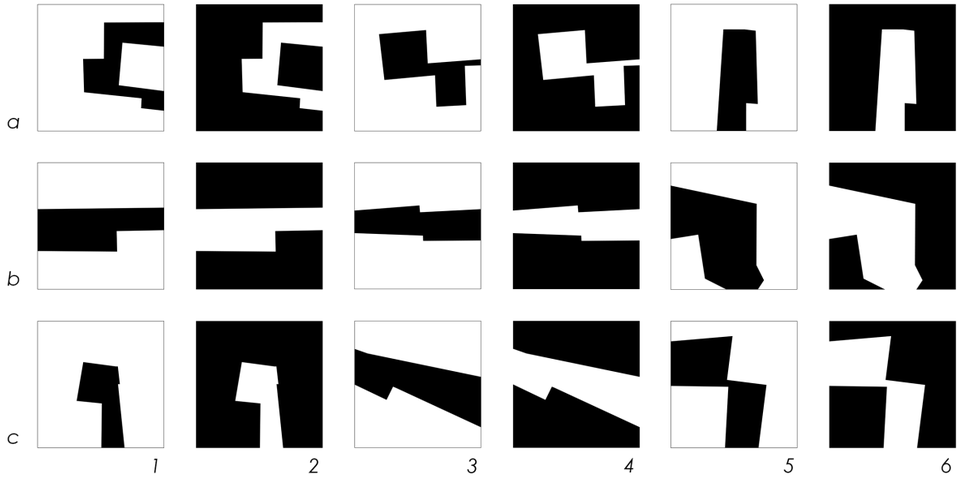
Average Distance Between Turning Areas = ***22.05 m***

I_p = ***2.45*** *(θ_i = 1416.48 ° , L = 577.05 m)*

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

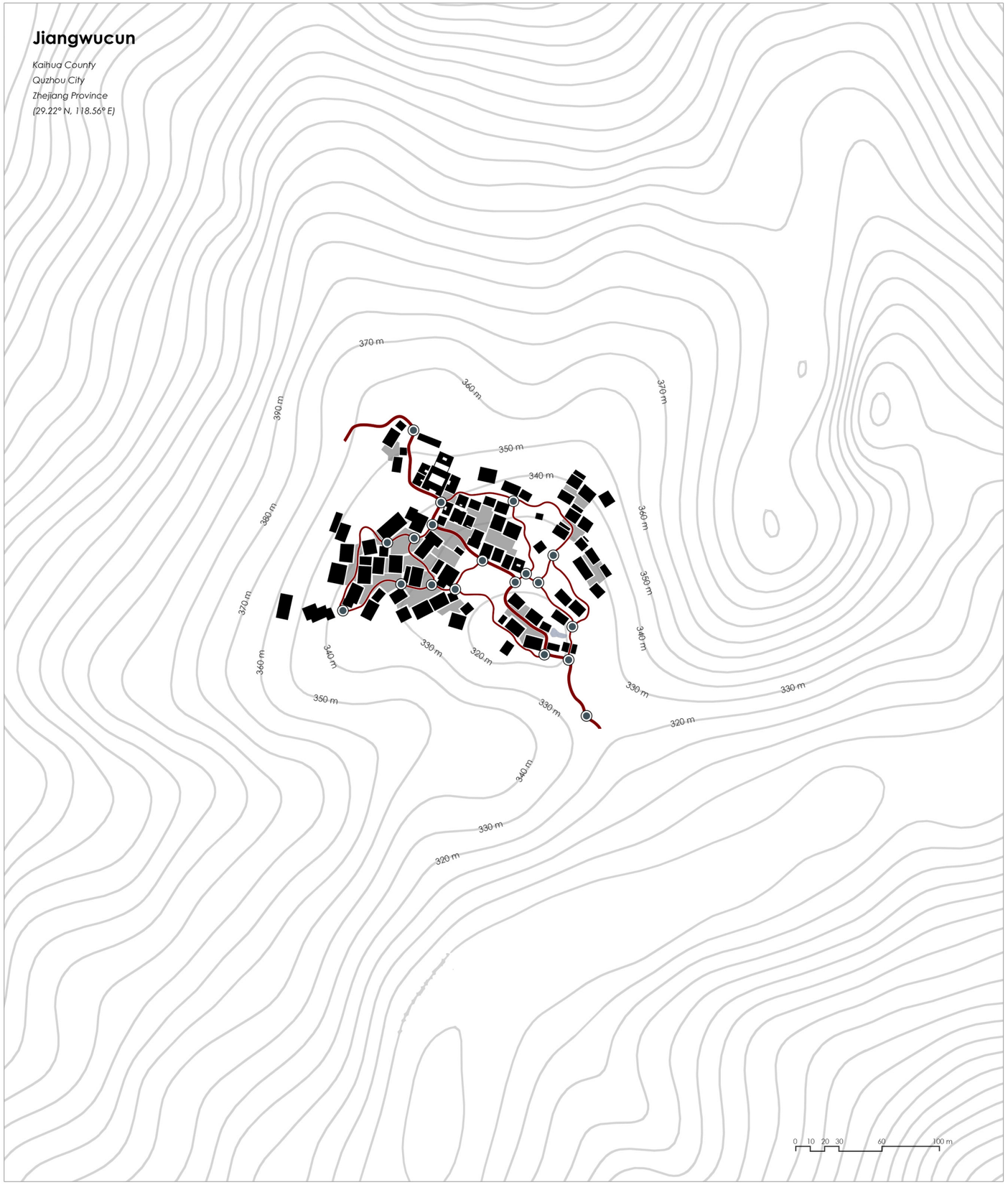
Columns 2, 4, and 6 : *Voids* *Buildings*

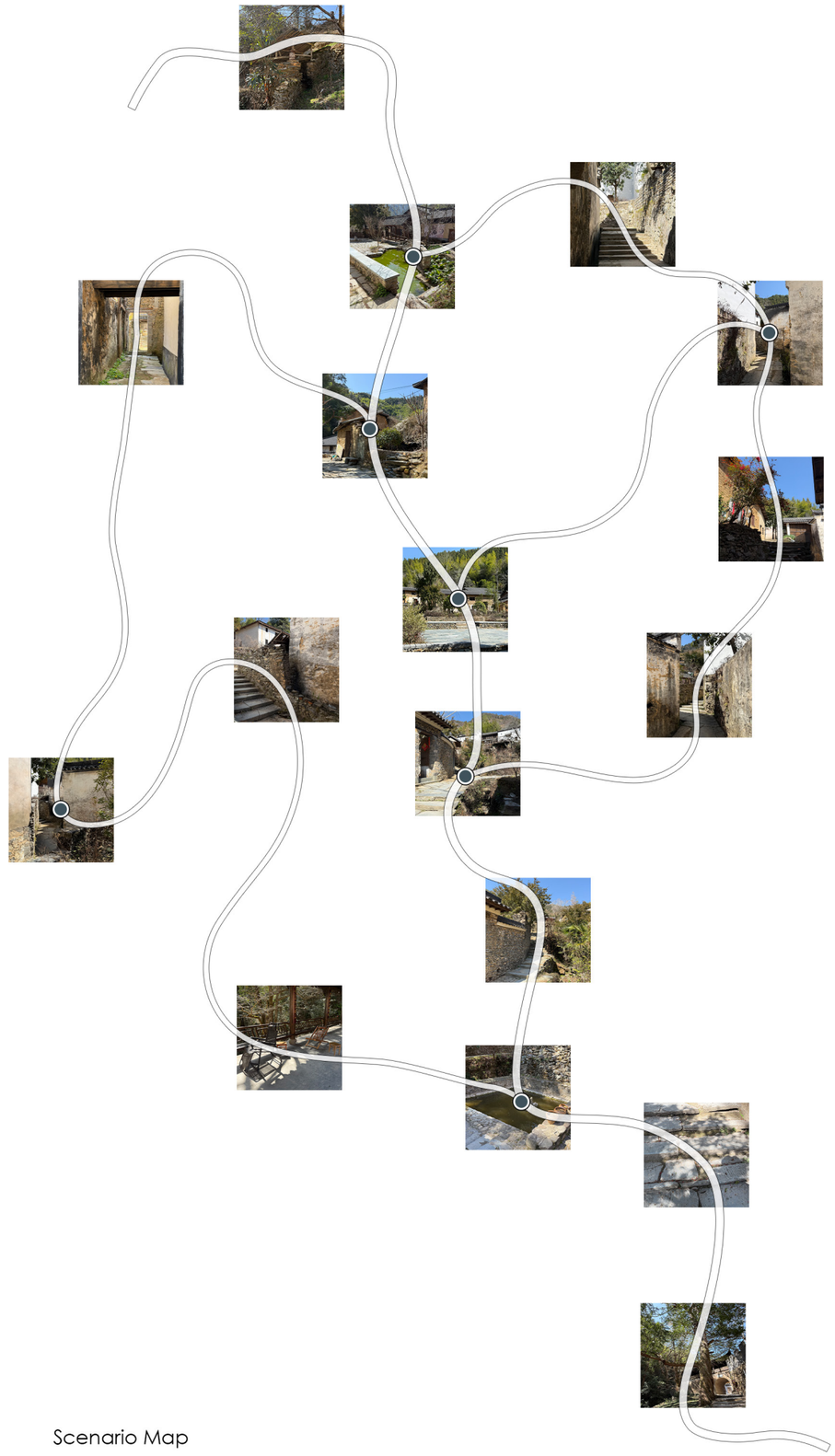


a	*Offset Enclosure*	*Adjacent Plazas*	*Linear Enclosure*
b	*Horizontal Compression*	*Narrow Space*	*Obtuse Turn*
c	*Spatial Expansion*	*Central Compression*	*Sudden Compression*

Jiangwucun

Kaihua County
Quzhou City
Zhejiang Province
(29.22° N, 118.56° E)





Scenario Map

Analysis of Points

Average Accessibility = ***2.74***

Average Accessibility in the village center ≈ ***2.74***

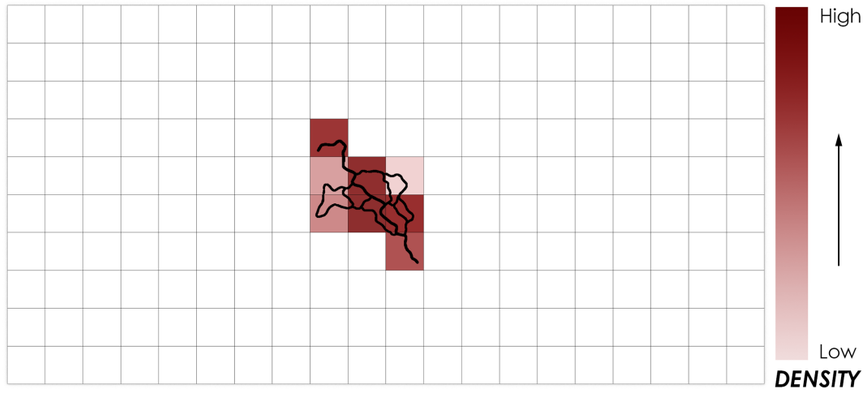
Average Accessibility at the edge of the village ≈ ***2.71***

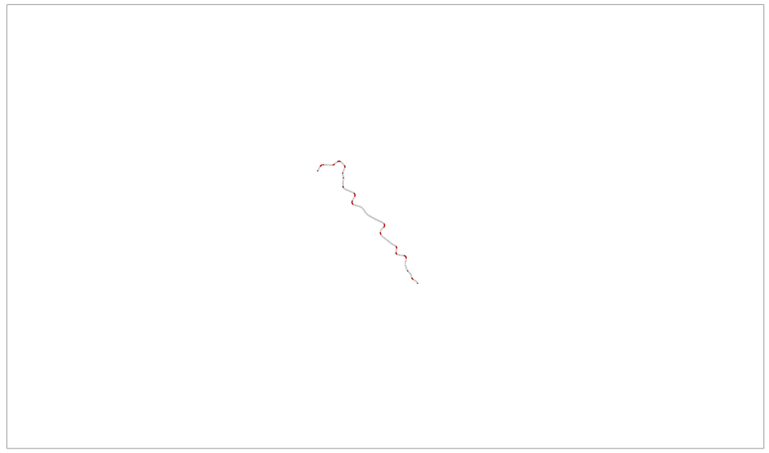
Average Proximity = ***29.05 m***

Average Proximity in the village center ≈ ***20.33 m***

Average Proximity at the edge of the village ≈ ***44.00 m***

Analysis of Lines





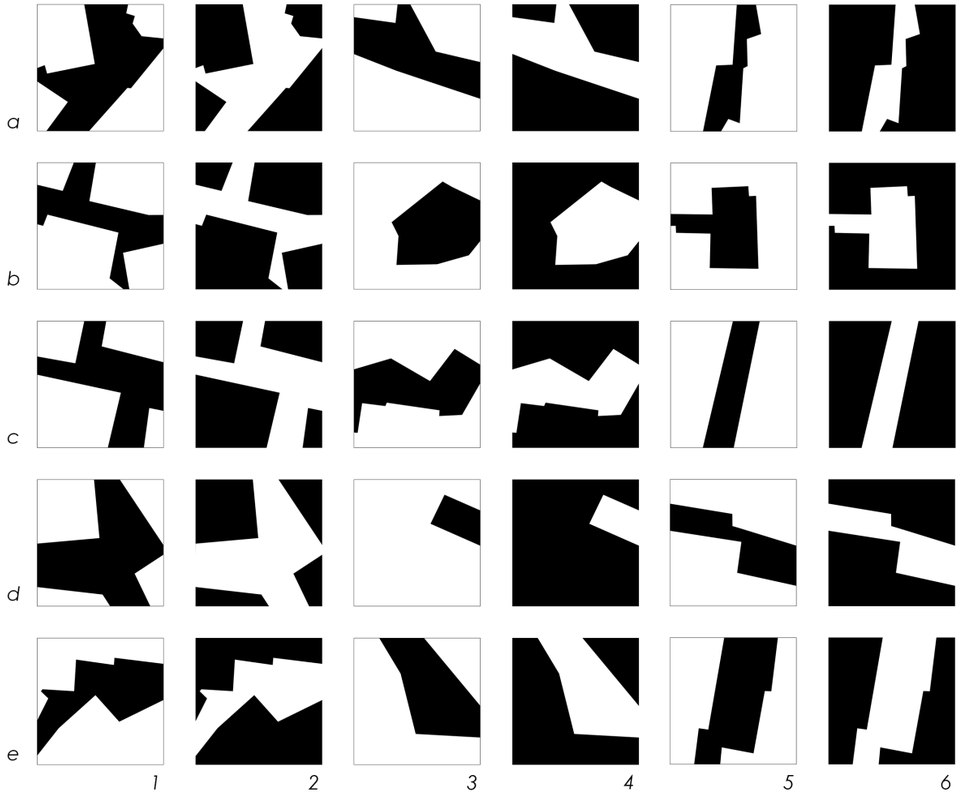
Average Distance Between Turning Areas = ***24.26 m***

I_p = **2.76** (θ_i = 1389.71 ° , *L* = 502.82 m)

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

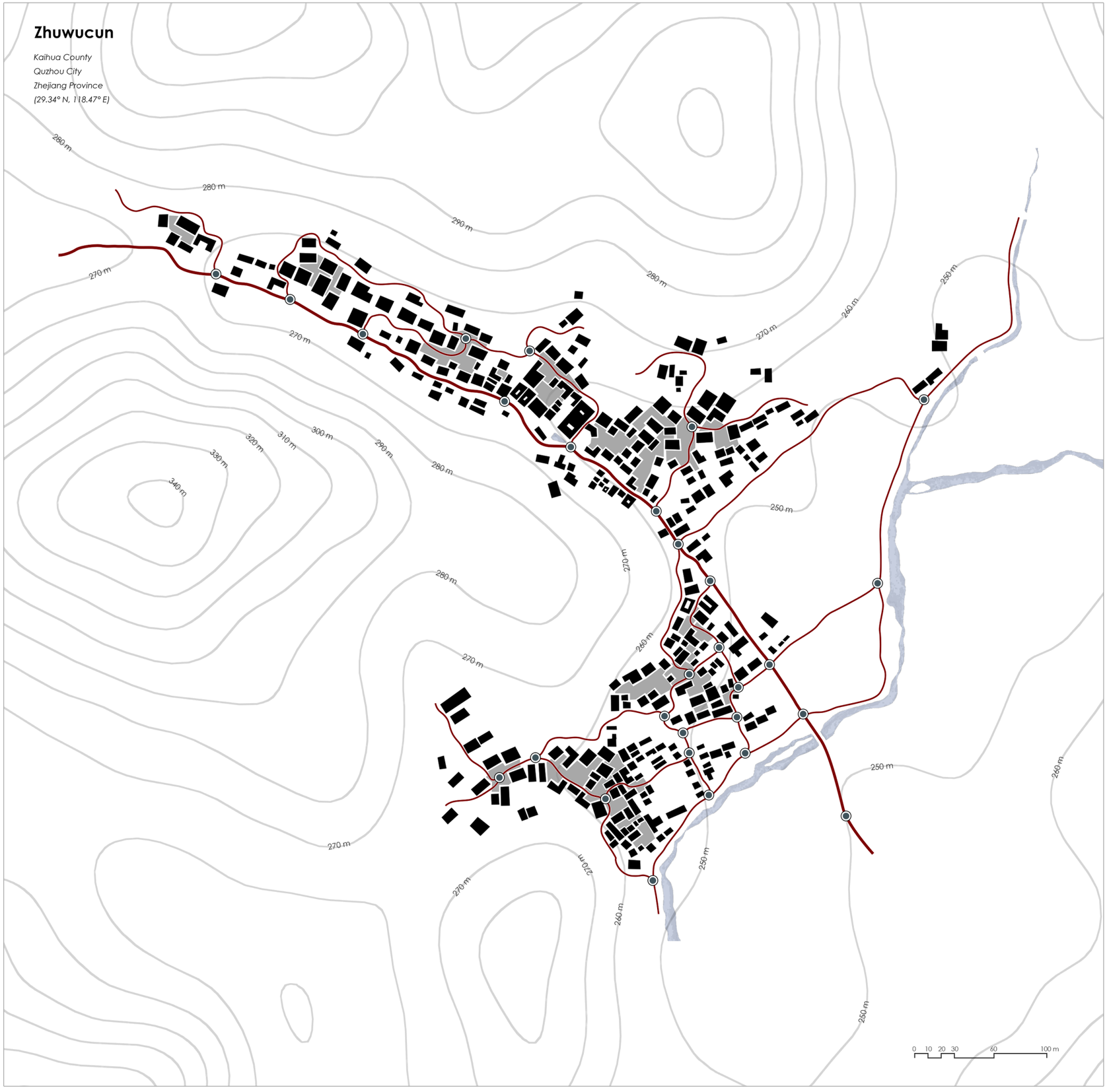
Columns 2, 4, and 6 : *Voids* *Buildings*



a	*Triangular Space*	*Inclined Path*	*Winding Path*
b	*Building Rotation*	*Pentagon Space*	*Semi-Enclosed Space*
c	*Vertical Crossing*	*Central Compression*	*Linear Space*
d	*Corner Transition*	*Isolated Space*	*Offset Compression*
e	*Zigzag Boundary*	*Contracted Corner*	*Zigzag Passage*

Zhuwucun

Kaihua County
Quzhou City
Zhejiang Province
(29.34° N, 118.47° E)





Scenario Map

Analysis of Points

Average Accessibility = ***3.03***

Average Accessibility in the village center ≈ ***2.93***

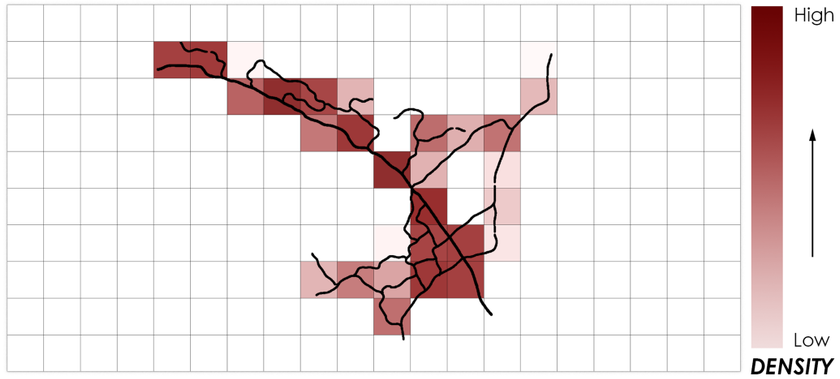
Average Accessibility at the edge of the village ≈ ***3.13***

Average Proximity = ***47.90 m***

Average Proximity in the village center ≈ ***36.29 m***

Average Proximity at the edge of the village ≈ ***58.73 m***

Analysis of Lines





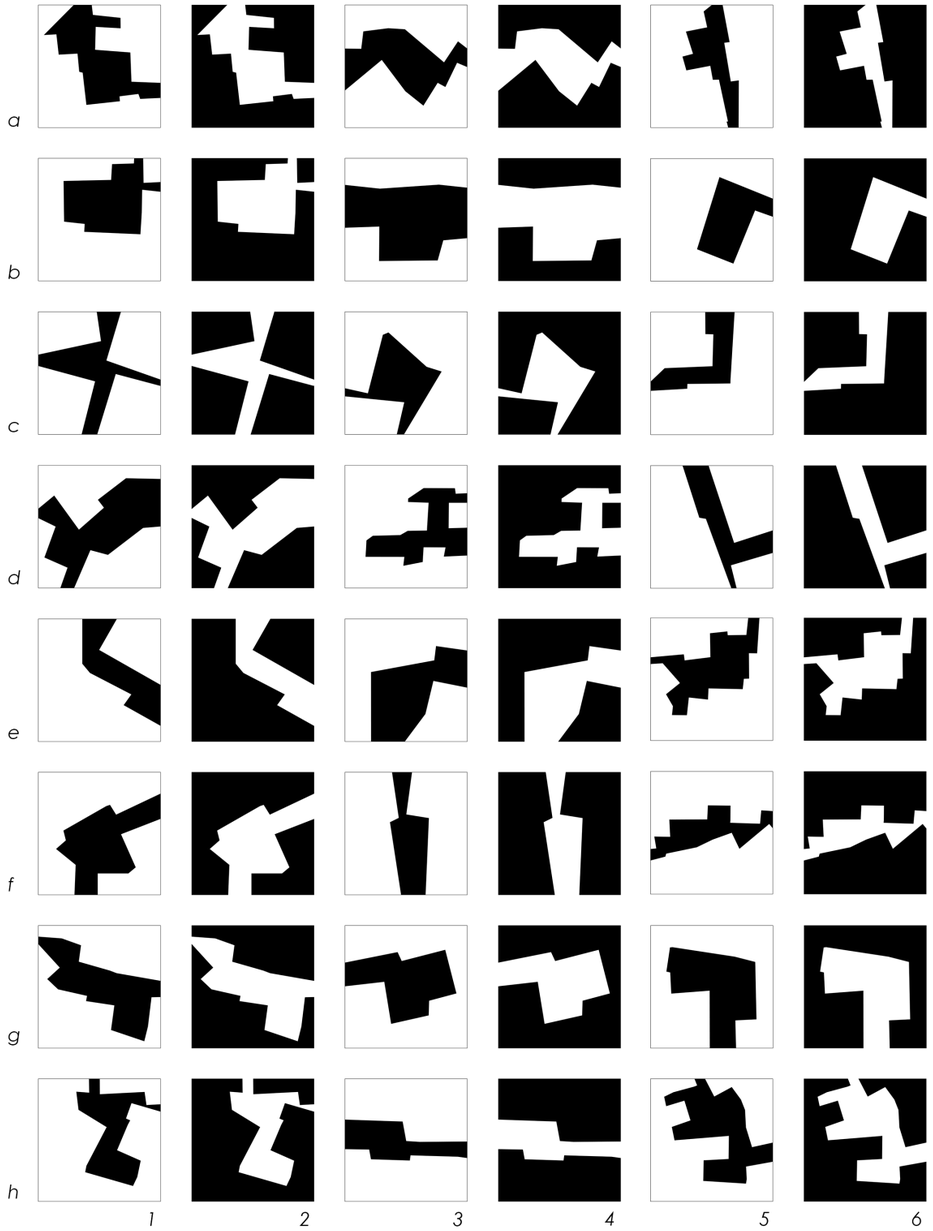
Average Distance Between Turning Areas = ***23.00 m***

I_p = **2.33** (θ_i = 1995.47 ° , *L* = 854.86 m)

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

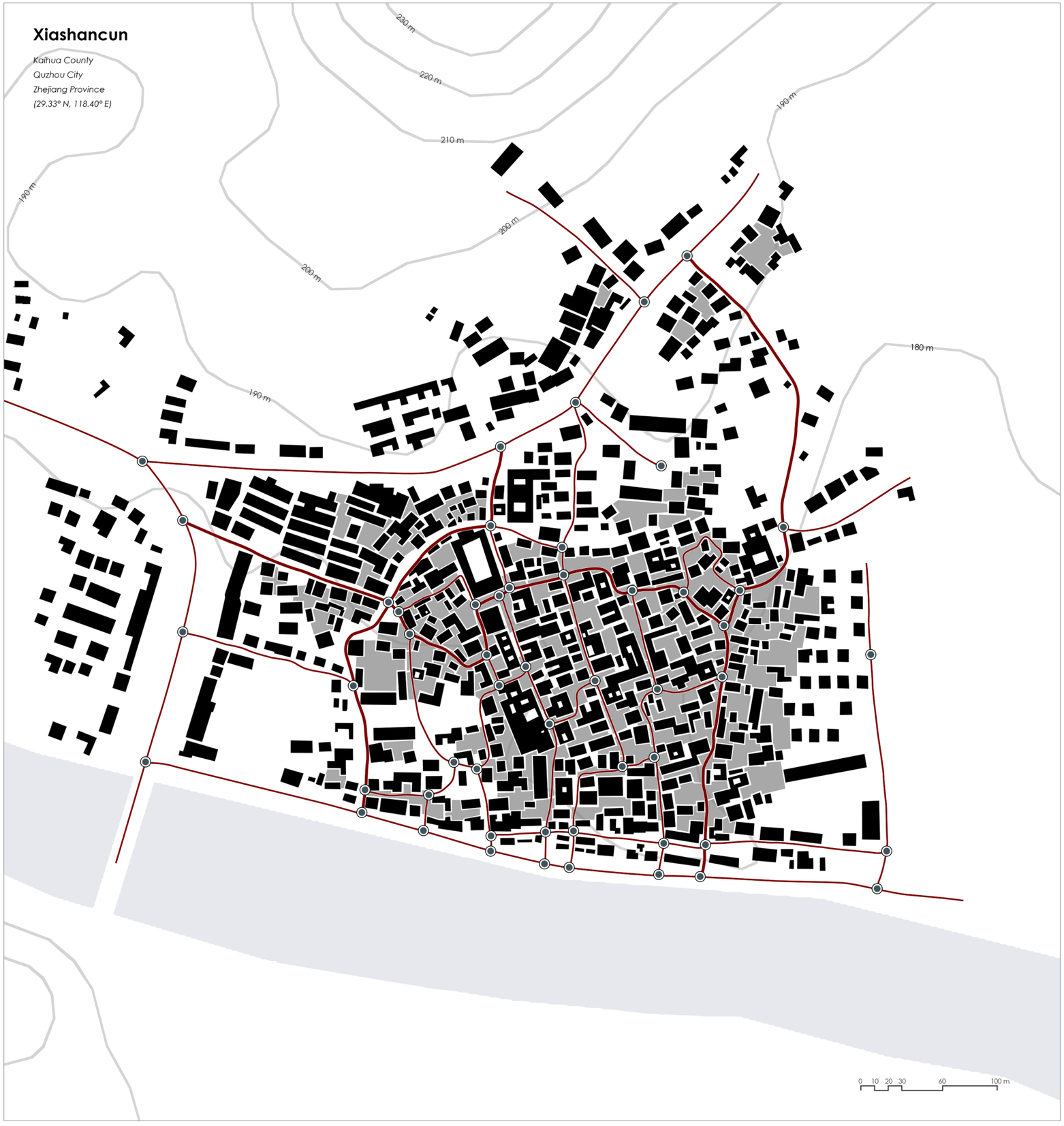
Columns 2, 4, and 6 : *Voids* *Buildings*

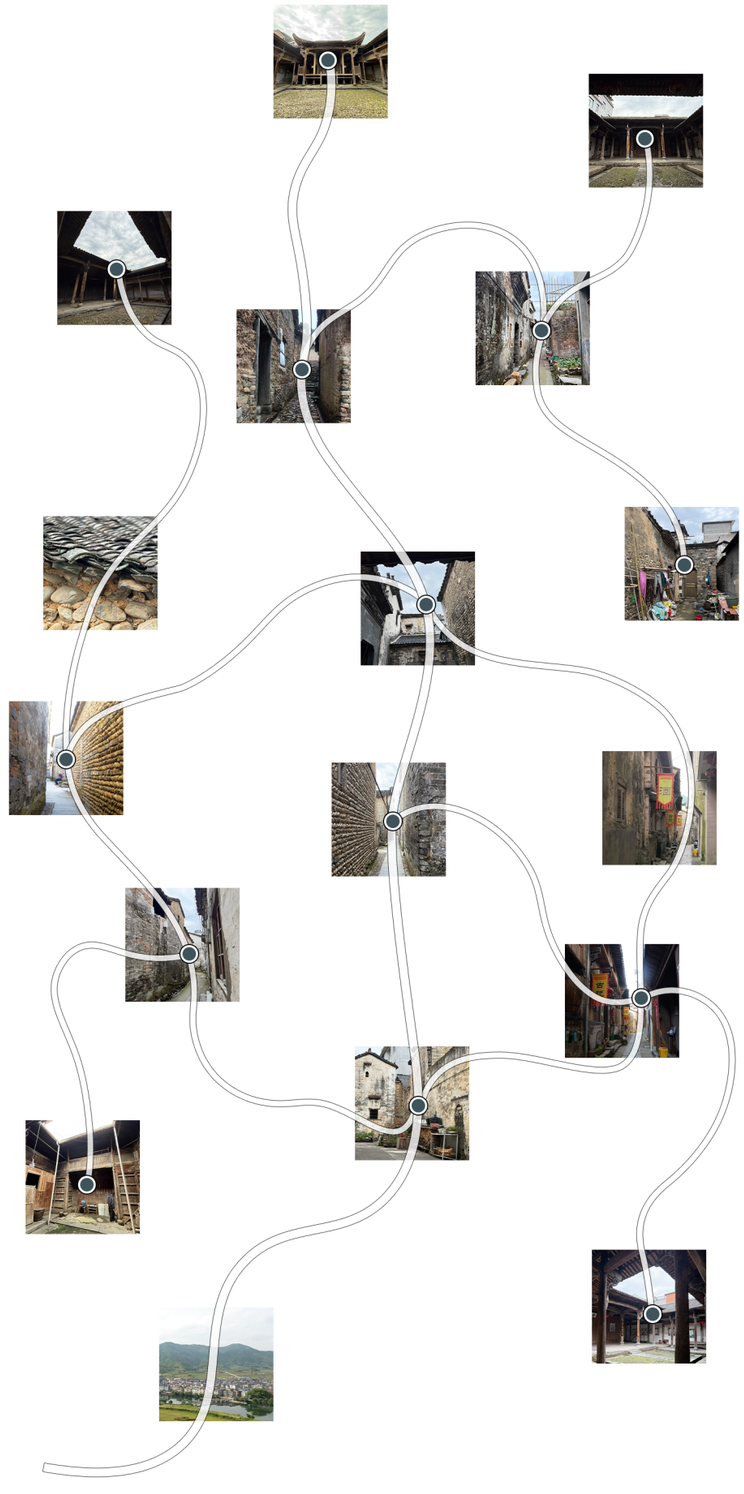


a	*Offset Space*	*Zigzag Space*	*Narrow Alley*
b	*Enclosed Plaza*	*Semi-Enclosed Plaza*	*Rotated Mass*
c	*Inclined Intersection*	*Acute Plaza*	*Projecting Building*
d	*Zigzag Path*	*H-Shaped Space*	*Right-Angle Turn*
e	*Winding Passage*	*Corner Enclosure*	*Zigzag Plaza*
f	*Radiating Node*	*Central Compression*	*Right-Angle Indentation*
g	*Irregular Boundary*	*Offset Mass*	*L-Shaped Plaza*
h	*Pocket Space*	*Horizontal Compression*	*Spatial Compression*

Xiashancun

Kaihua County
Quzhou City
Zhejiang Province
(29.33° N, 118.40° E)





Scenario Map

Analysis of Points

Average Accessibility = ***3.16***

Average Accessibility in the village center ≈ ***3.24***

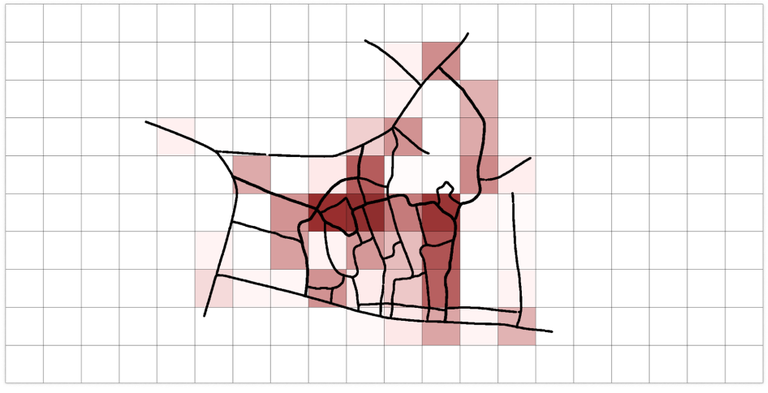
Average Accessibility at the edge of the village ≈ ***2.92***

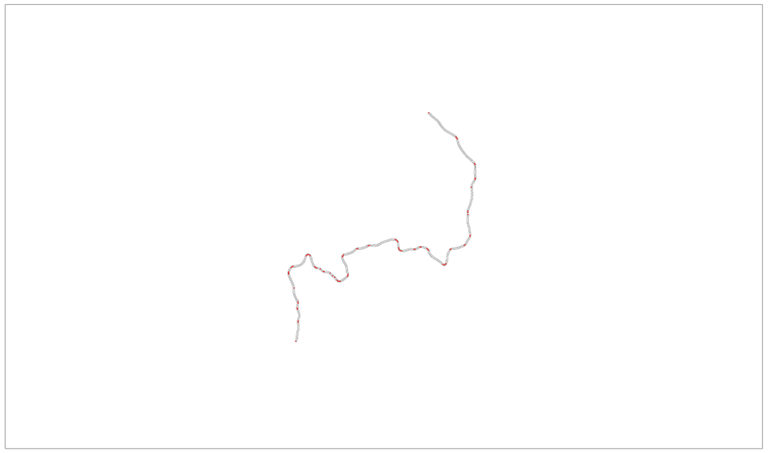
Average Proximity = ***36.66 m***

Average Proximity in the village center ≈ ***27.84 m***

Average Proximity at the edge of the village ≈ ***61.77 m***

Analysis of Lines





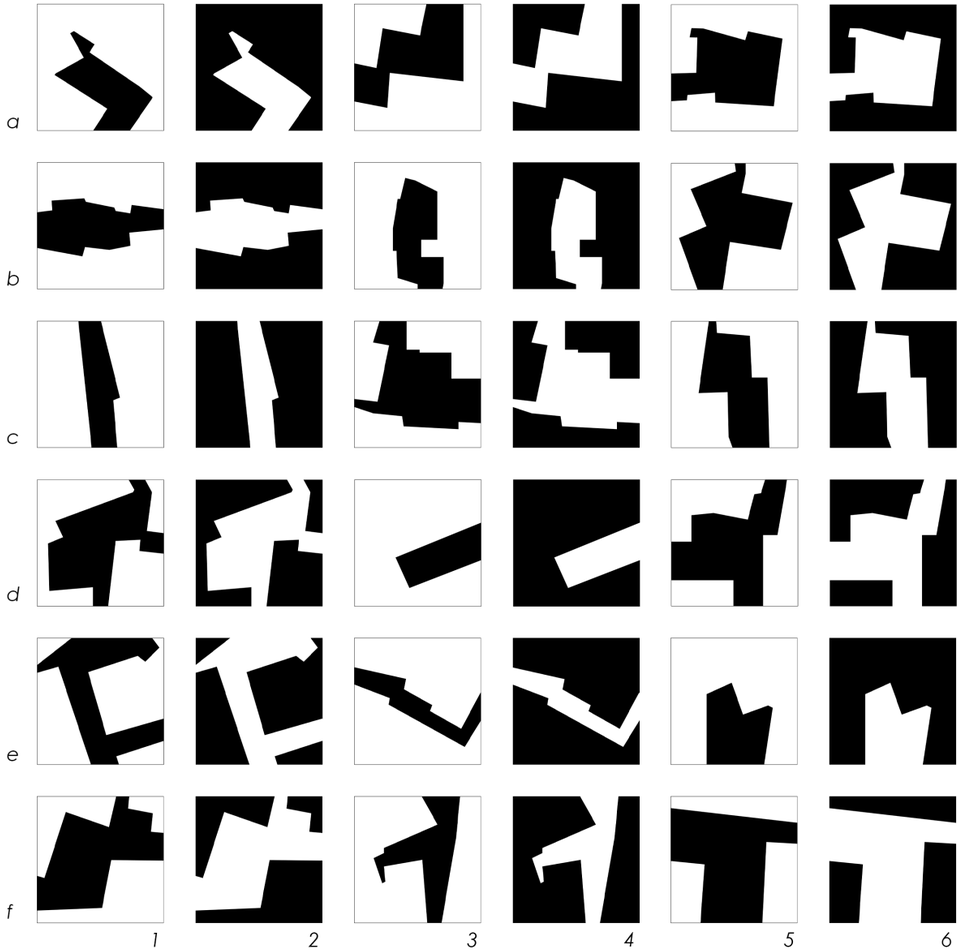
Average Distance Between Turning Areas = ***20.66 m***

I_p = ***3.16*** (θ_i = 2504.82 ° , *L* = 792.41 m)

Analysis of Planes

Columns 1, 3, and 5 : *Voids* *Buildings*

Columns 2, 4, and 6 : *Voids* *Buildings*



a	*Triangular Space*	*Zigzag Corner*	*Enclosed Plaza*
b	*Fragmented Edge*	*Central Compression*	*Triangle and Right Angle*
c	*Gentle Transition*	*Irregular Plaza*	*Offset Space*
d	*Corner Plaza*	*Rectangular Space*	*Radiating Plaza*
e	*F-Shaped Block*	*Right-Angle Turn*	*Projecting House*
f	*Central Compression*	*K-Shaped Block*	*T-Shaped Block*

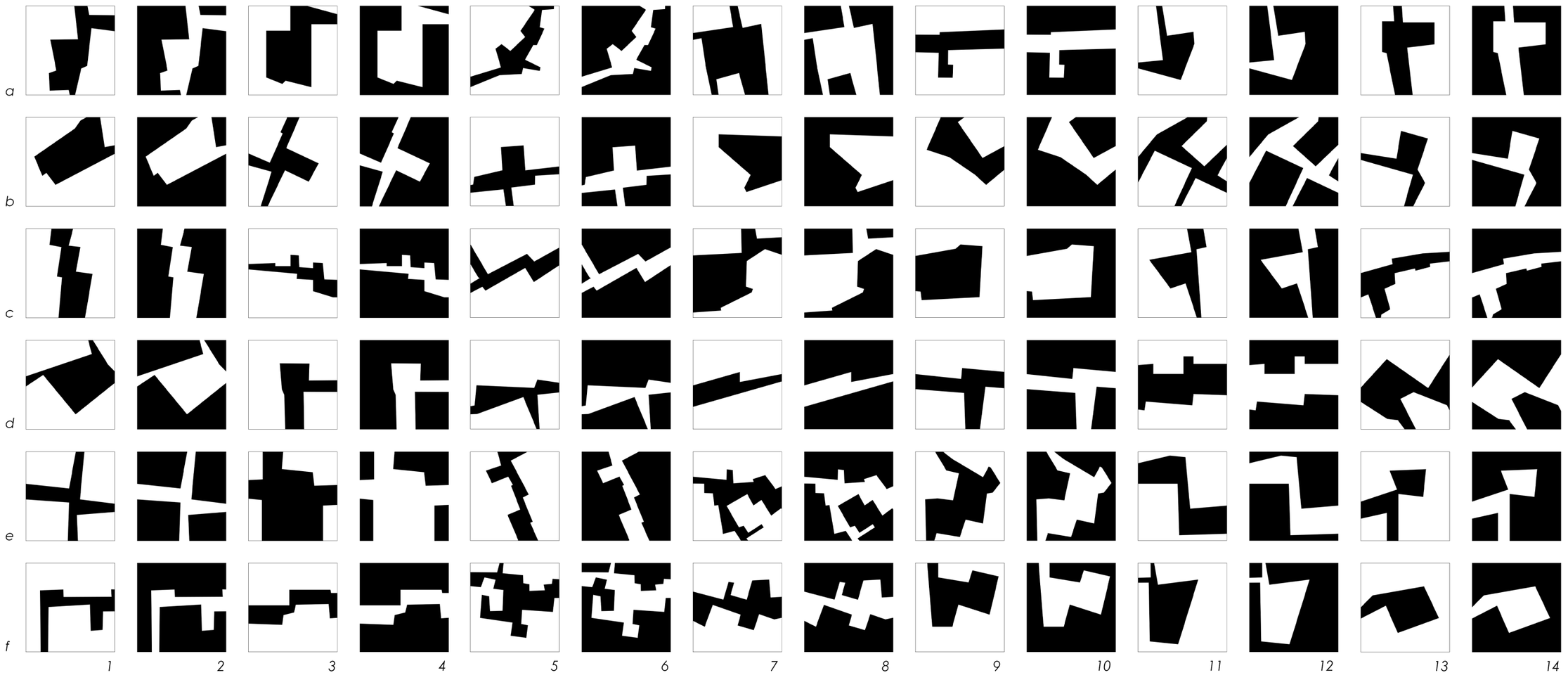
For more analysis, see the next page

Analysis of Planes

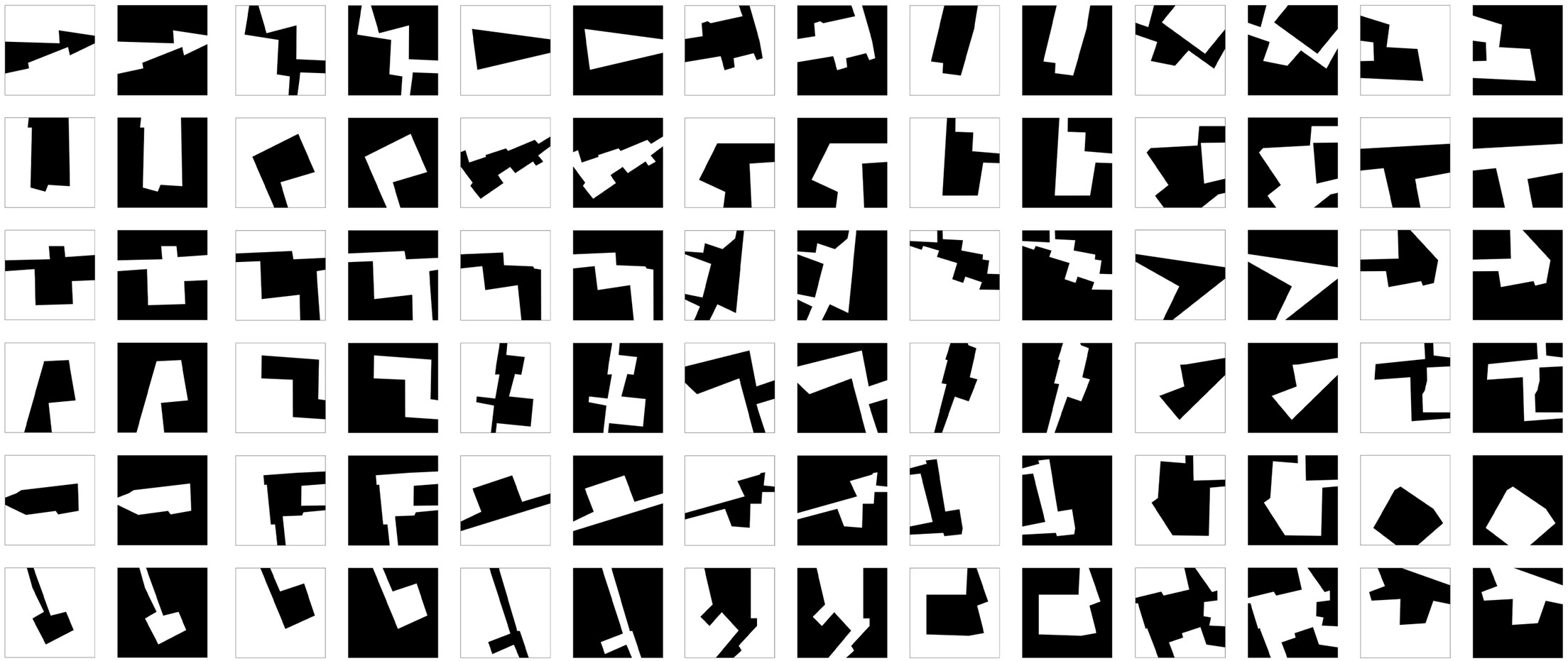
Additional Analysis of Xiashancun

Odd Columns : ■ *Voids* □ *Buildings*

Even Columns : □ *Voids* ■ *Buildings*



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	*Streetside Void*	*Right-Angle Turn*	*Pocket Plaza*	*Projecting House*	*Streetside Pocket Space*	*Corner Plaza*	*Recessed Building*							
b	*Corner Space*	*Front Yard Space*	*Intersection Plaza*	*Front Yard*	*Corner Plaza*	*Tree-Like Branching*	*Corner Plaza*							
c	*Zigzag Space*	*Spatial Contraction*	*Multiple Right-Angle Turns*	*Obtuse Turn*	*Enclosed Courtyard*	*Sudden Expansion*	*Curved Space*							
d	*Sudden Spatial Change*	*Corner Open Space*	*Building Rotation*	*Spatial Contraction*	*Interlocking Intersection*	*Gentle Spatial Turn*	*Acute Turn*							
e	*Cross Intersection*	*Central Plaza*	*Spatial Narrowing*	*Path Around Building*	*Spatial Expansion*	*Continuous Corner Plazas*	*Building Enclosure*							
f	*Corner Void*	*Offset Block*	*Fragmented Edge*	*Continuous Block Space*	*Surrounded Plaza*	*Private Space*	*Pocket Space*							



15 16 17 18 19 20 21 22 23 24 25 26 27 28

Arrow-Shaped Space
Parallel Edge
Streetside Plaza
Enclosed Space
Spatial Expansion
Dead-End Space

Z-Shaped Corner
Bag-Shaped Space
Intersection Plaza
Z-Shaped Enclosure
Corner Plaza
Bag-Shaped Space

Spatial Expansion
Fragmented Edge
Continuous Right-Angle Turns
Continuous Pocket Plazas
Recessed Building
Linear Space

Zigzag Edge
Obtuse Corner Plaza
Junction Plaza
Right-Angle Turn
Offset Plaza
Main Path to Side Path

Regular Edge
Corner Plaza
Staggered Buildings
Spatial Expansion
Continuous Turns
Gradual Expansion

Junction Plaza
Narrow Connection
Acute Turn
Enclosed Space
Large Corner Plaza
Junction Plaza

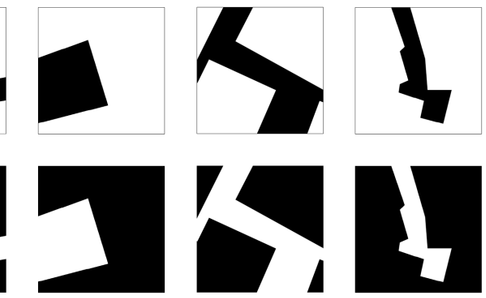
Recessed Building
T-Junction
Corner Expansion
Continuous Intersections
Square Space
Continuous Pocket Plazas

Analysis of Planes

Additional Analysis of Xiashancun

Odd Columns : ■ *Voids* □ *Buildings*

Even Columns : □ *Voids* ■ *Buildings*



29 30

Dead-End Pocket Space

Continuous Right-Angle Turns

Front Courtyard

Continuous Pocket Plazas

Offset Space

Streetside Pocket Plaza

Appendix to This Chapter: Data Summary

		Accessibility			Proximity (m)			Curvature			
		Average	Center	Edge	Average	Center	Edge	Distance (m)	I_p	θ_i $(°)$	L (m)
A	Chenjiapu	3.39	3.64	3.00	44.18	20.23	76.04	21.71	2.34	1507.49	644.41
B	Gutiancun	2.64	3.14	2.14	55.36	31.43	79.29	26.05	2.25	1815.27	807.23
C	Shibamuduan	2.64	2.50	2.80	44.55	36.17	54.60	25.66	2.70	1264.16	468.70
D	Taihuishan	2.55	2.62	2.44	70.00	58.00	87.33	37.31	2.20	8389.53	3809.54
E	Gaotiankeng	2.56	2.55	2.57	55.56	36.22	80.43	26.37	2.58	1853.61	719.10
F	Huangling	2.71	3.10	2.00	41.82	30.82	62.00	28.69	2.81	2570.95	913.97
G	Yuantouli	3.09	3.25	2.67	23.45	17.94	38.17	22.05	2.45	1416.48	577.05
H	Jiangwucun	2.74	2.74	2.71	29.05	20.33	44.00	24.26	2.76	1389.71	502.82
I	Zhuwucun	3.03	2.93	3.13	47.90	36.29	58.73	23.00	2.33	1995.47	854.86
J	Xiashancun	3.16	3.24	2.92	36.66	27.84	61.77	20.66	3.16	2504.82	792.41
Average		**2.85**	**2.97**	**2.64**	**44.85**	**31.53**	**64.24**	**25.58**	**2.56**	**2470.75**	**1009.01**

5. Spatial Typologies

This chapter further organizes and analyzes the research results from the previous chapter, and carries out a typological study of village spaces through four aspects: point, line, plane, and sensory experience. At the same time, this research also summarizes their spatial characteristics, distribution patterns, and relationships with each other in order to identify possible spatial rules. These findings provide a theoretical foundation for the development of design guidelines and the generation of new environments in the following chapter.

5.1 Point Typologies



Trees at Crossroads



Transition Arches



Courtyard Columns



Guiding Stones



Entrance Trees



Compressed Walls



Transitional Corridors



Raised Steps



Expanded Nodes

Spatial Characteristics

Through on-site observations, Village nodes are often associated with strong spatial changes, including changes in visual direction, movement direction, and spatial rhythm. Around these nodes, elements such as trees, stones, columns, changing wall conditions, raised steps, and grey spaces frequently appear. Rather than completely separating spaces, these elements act as open spatial dividers, subtly marking transitions between different spatial conditions.

Spatial Characteristics of Village Nodes :

1. Small-scale Spatial Interruptions :

Village nodes are often formed through subtle spatial interruptions rather than large architectural gestures.

2. Semi-open Spatial Boundaries :

Nodes are often defined through semi-open elements rather than solid boundaries.

3. Natural Elements as Spatial Organizers :

Natural elements such as trees and stones often participate in shaping and organizing spatial relationships around nodes.

4. Transitional Spatial Conditions :

Nodes frequently mediate transitions between different spatial states, such as light and shadow, movement and pause...

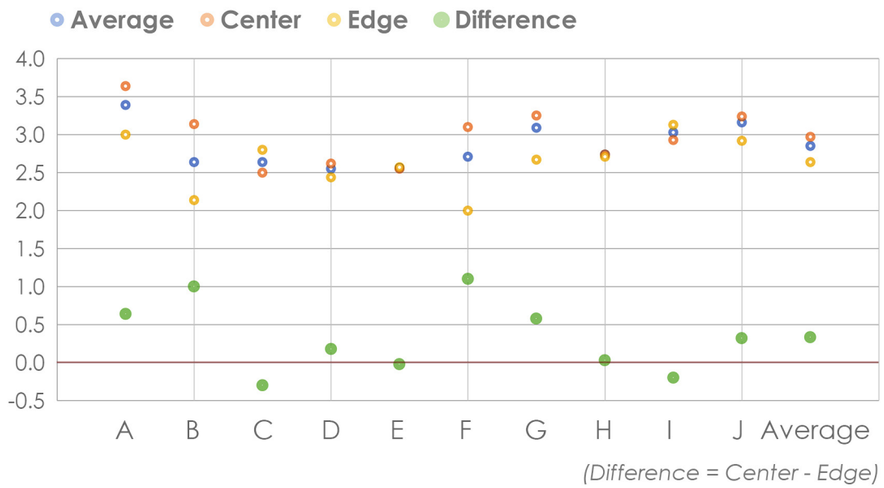
5. Movement Slowdown :

Nodes often slow down movement through turning, narrowing, elevation changes, or spatial interruptions.

Redefinition of Nodes :

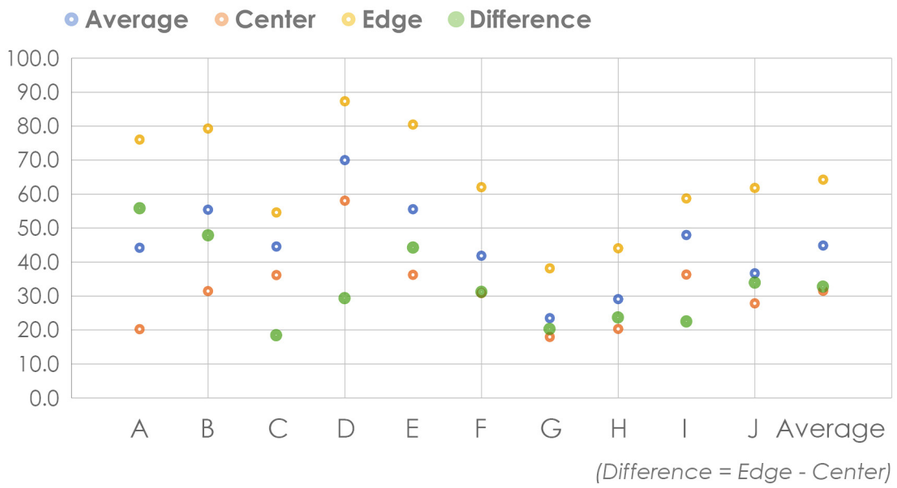
Nodes are semi-open spaces that connect various spatial conditions through the use of large amounts of natural elements and subtle interventions, while also functioning to slow down spatial rhythm.

Accessibility



(Difference = Center - Edge)

Proximity



(Difference = Edge - Center)

Distribution Characteristics of Village Nodes :

1. Higher Accessibility in Village Centers :

Village centers generally connect more paths, creating stronger spatial relationships and aslo encouraging gathering.

2. Closer Node Distribution in Village Centers :

Central areas contain more frequent spatial transitions and more continuous changes in movement direction and spatial rhythm.

3. Denser Spatial Networks in Village Centers :

Higher accessibility and shorter proximity together form denser spatial networks in village centers, creating stronger spatial continuity and more opportunities for pause and interaction.

4. Looser Spatial Structures at Village Edges :

Compared to village centers, edge areas usually contain fewer node connections and larger distances between nodes, resulting in simpler and more direct spatial structures.

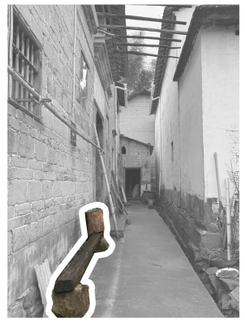
5. Center-Edge Spatial Hierarchy :

Differences in accessibility and node proximity between centers and edges create a clear spatial hierarchy within traditional villages, organizing spaces with different levels of activity and connectivity.

5.2 Line Typologies



Low walls for leaning



Seats along paths



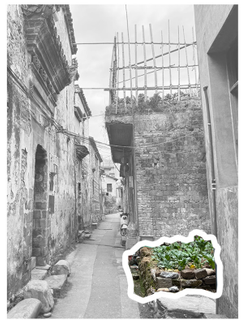
Objects stacked



Tools stacked



Drying crops



Vegetables grown



Raising chickens



Height-to-width ratio of main paths ≈ 1 : 1



Height-to-width ratio of secondary paths ≈ 4 : 1

Spatial Characteristics

Through on-site observations, village paths are usually narrow and highly curved. While only maintaining the minimum width required for two people to walk side by side, the edges of the paths are often accompanied by everyday production and living activities, such as leaning or sitting along walls, stacking objects, drying clothes and crops, growing vegetables, and raising poultry. These activities gradually create passive changes in the width of the paths.

Spatial Characteristics of Village Paths :

1. Everyday Activities Embedded in Paths :

Village paths are not only circulation spaces, but also spaces closely connected to everyday living and production activities.

2. Passive Changes in Path Width :

Everyday production and living activities along the edges of paths gradually create passive changes in path width.

3. Narrow and Curved Spatial Forms :

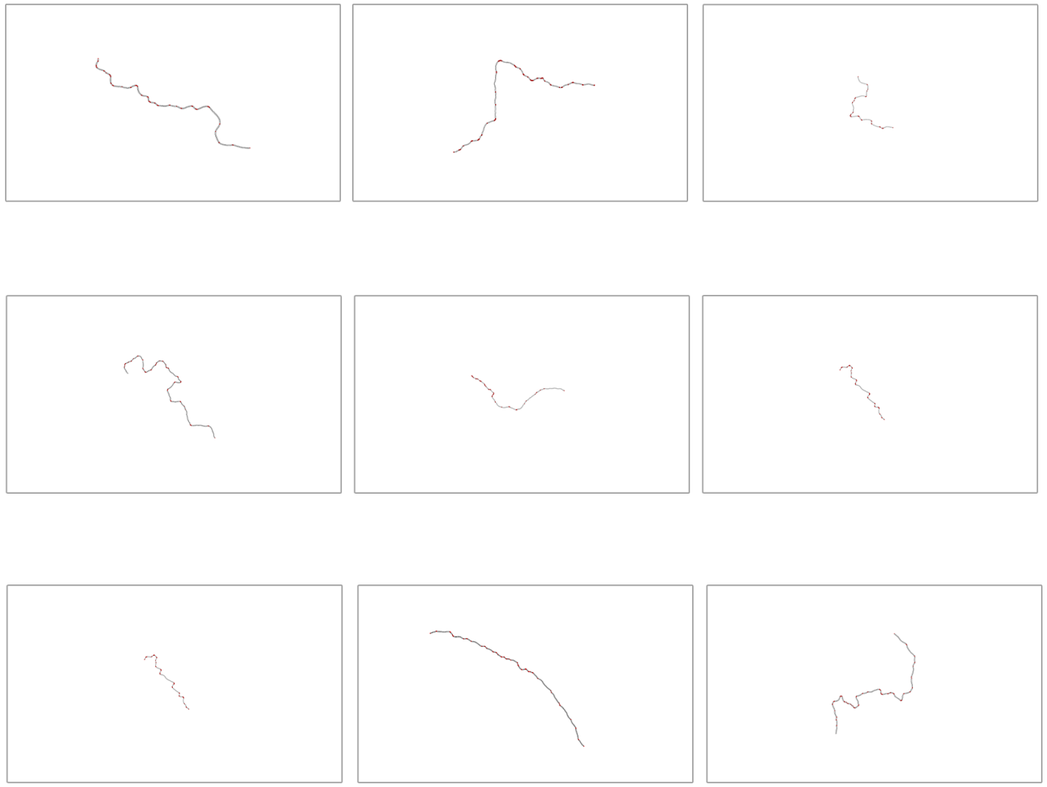
Village paths are usually narrow and highly curved, forming more continuous and changing movement experiences.

4. Path Hierarchy :

Differences in height-to-width ratios between main and secondary paths create different levels of enclosure, movement intensity, and spatial perception.

Redefinition of Paths :

Paths are linear spaces strongly shaped by everyday activities, where directions and width continuously change, closely connecting movement, production, daily life, and spatial experience.



Curvature Characteristics of Village Paths :

1. Informal Path Formation :

Highly curved paths are often shaped by terrain, building relationships, and everyday activities rather than strict geometric planning.

2. Directional Complexity :

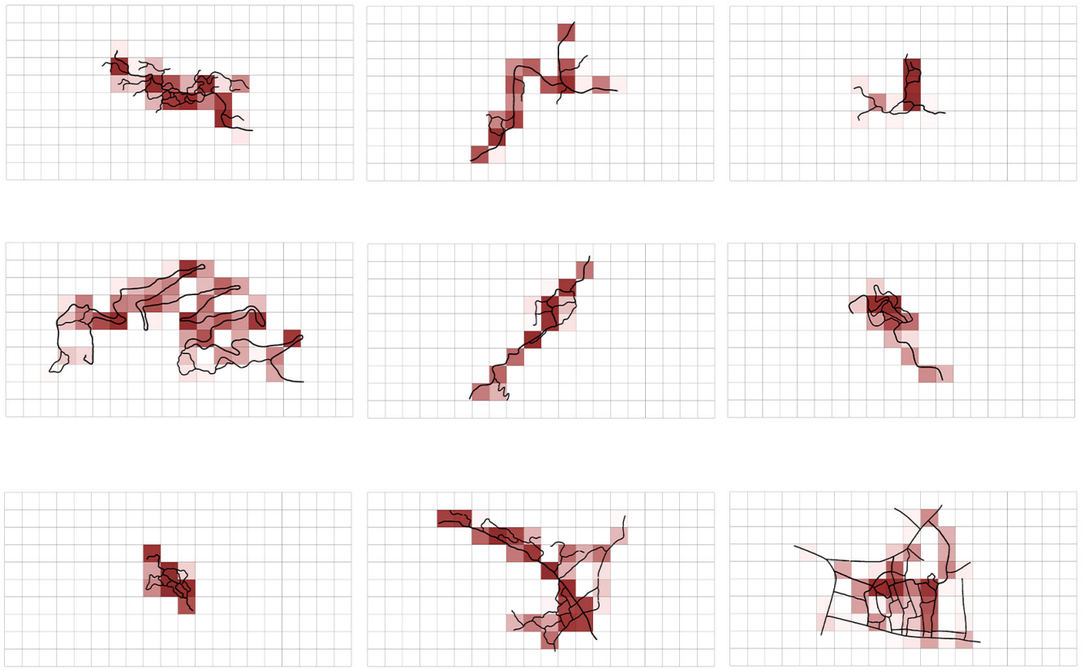
Shorter distances between turning points cause people's movement and visual directions to continuously change along the path.

3. Spatial Rhythm :

Continuous directional changes create changing spatial rhythms and movement experiences.

4. Slowing Movement :

Changing spatial rhythms tend to slow down movement and increase opportunities for observation and interaction.



Distribution Characteristics of Village Paths :

1. Central Concentration :

High-density areas usually appear around village centres, main paths, and important junctions.

2. Network Transition :

The density gradually decreases from the centre to the edge, creating a transition from connected spaces to scattered spaces.

5.3 Plane Typologies



Tree Enclosure



Building Enclosure



Front Courtyard



Resting Space



Gathering Space



Drying Space



Working Space



Planting Space



Chicken Raising Space

Spatial and Distribution Characteristics

Through on-site observations, Village open spaces are usually naturally formed voids between buildings or between buildings and the surrounding natural environment, such as open plazas, courtyards, and other informal spaces. These spaces support everyday activities including gathering, entertainment, resting, working, large-scale drying, planting, and poultry raising.

Spatial and Distribution Characteristics of Village Open Spaces :

1. Informal Formation :

Village open spaces are usually naturally formed between buildings or between buildings and the surrounding natural environment.

2. Irregular Boundaries :

These spaces often contain offset, fragmented, zigzag, and irregular edges instead of clear geometric forms.

3. Spatial Expansion and Compression :

Paths, corners, and transitions continuously create changing spatial experiences through expansion and compression.

4. Continuous Spatial Network :

These spaces often appear together with paths, corners, and intersections, forming continuous spatial relationships throughout the village.

5. Spatial Distribution :

Because these spaces are closely connected with paths and nodes, they are mostly concentrated in village centres and decrease toward the edges.

6. Everyday Activities :

Because of their continuous and diverse spatial conditions, village open spaces often support gathering, resting, drying, planting and poultry raising.

Keyword Frequency from Plane Analysis

High-frequency spatial terms include

Expansion
Compression
Turn
Junction
Corner
Pocket
Irregular
Offset
Zigzag
Fragmented
Continuous

Redefinition of Spaces :

Spaces are naturally formed between buildings and the surrounding environment. They contain irregular boundaries and rich spatial variations, support everyday activities such as gathering, resting, drying, and planting, and form continuous spatial networks closely connected with paths and nodes.

5.4 Beyond Point-Line-Plane



Morning Mist



Morning Smoke



Evening Smoke



Plants on Walls



Plants in Stone Cracks



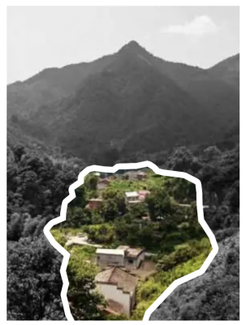
Plants in Ground Gaps



Water-Stained Corners



Local Materials



Harmony with Nature

Atmosphere, Time, and Sensory Experience

In rural villages, there are always things that cannot be defined by points, lines, or planes: the morning mist and dew, the smoke rising before meals and the smell of firewood, the rustling of leaves and the sound of flowing streams, the scent of grass mixed with soil, the smoothness of stones and the roughness of tree bark, the moss growing on roof tiles, the rain marks on walls, and the small plants quietly emerging from cracks. Together, they shape the space and atmosphere of the village.

Atmosphere, Time, and Sensory Experience Elements :

1. Time and Weather :

Morning mist, Cooking smoke, Seasonal changes of plants, Rainwater puddles, Hanging clothes to dry.

2. Sound and Rhythm :

Sound of flowing water, Rustling leaves, Birds singing, Footsteps, Sound of wooden doors, Crackling firewood, Distant conversations.

3. Smell and Air :

Smell of soil, Smell of firewood, Smell of cooked food, Smell after rain, Smell of wood, Smell of grass, Humid air.

4. Material and Touch :

Temperature of stone, Moss-covered steps, Rough walls, Damp wood, Mud ground, Wind against the skin.

Summary of Atmosphere :

These elements form a sensory atmos--phere connect space with nature, weather, time, and everyday life, shaping the unique experience of rural villages.

Village	***Urban***
Changing natural light	Stable artificial lighting
Natural sounds	Traffic noise
Smell of nature	Filtered air
Irregular shadows	Uniform streets
Interaction with plants and rain	Separation from natural processes
Visible traces of everyday life	Clean but emotionally neutral spaces

Differences :

These comparisons reveal that many contemporary urban environments have gradually lost certain sensory, temporal, and atmospheric qualities that were once deeply connected to everyday human experience.

6. Design Guidelines

Design Guideline 01 ~ 03 :
From Points

Design Guideline 04 ~ 06 :
From Lines

Design Guideline 07 ~ 11 :
From Planes

Design Guideline 12 ~ 16 :
From Sensory Experience

This chapter develops a series of design guidelines for contemporary resettlement communities in China based on the previous research, analysis, and summary of village spaces.

Design Guideline 01

from spatial characteristics of village nodes : 1, 2, 3

Create Soft Spatial Boundaries Around Nodes

Instead of creating oversized plazas, small interventions such as trees, steps, walls, planting edges, low structures, and partial shelters should be inserted around nodes. These elements should appear continuously within walking distance to maintain spatial richness and sensory variation.

Design Guideline 02

from spatial characteristics of village nodes : 4, 5

Create Nodes as Spatial Transitions

Nodes should not function only as circulation intersections, but also as moments of slowing down, turning, pausing, and spatial transition. Spatial transitions should be created through changes in width, direction, light, level, enclosure, and visual framing.

Design Guideline 03

from distribution characteristics of village nodes

Create a Hierarchical Node Network System

In community center areas, nodes should maintain higher connectivity and shorter distances to create continuous spatial interaction. Central nodes are recommended to connect 3 ~ 5 paths, while edge nodes may remain simpler connected. The distance between central nodes and their nearest neighboring nodes should remain around 30m, while in edge areas this distance should not exceed 65m.

Design Guideline 04

from spatial characteristics of village paths

Create Diverse and Habitable Paths

Pedestrian paths should provide enough width for everyday activities such as sitting, leaning, and short stays, while avoiding excessive width. The height-to-width ratio of primary paths should not be lower than 1:1, while secondary paths should remain around 3:1 in order to maintain spatial enclosure along the paths. Activities such as drying clothes should be concentrated within specific shared areas rather than occupying the entire circulation system.

Design Guideline 05

from curvature characteristics of village paths

Create Curved and Dynamic Movement Systems

Primary pedestrian paths should introduce at least one directional change greater than 10 ° within every 25m segment in order to maintain spatial variation and directional rhythm. After the circulation system is generated, the Overall Path Curvature Intensity Ip should be calculated to evaluate spatial complexity. The Ip value of primary paths should generally not be lower than 2.5.

Design Guideline 06

from distribution characteristics of village paths

Create Hierarchical Path Network Systems

Primary paths should connect major public spaces and social nodes, while secondary paths should support smaller-scale everyday activities. Path density should gradually decrease from community centers toward edge areas. Secondary paths should frequently reconnect to primary circulation systems in order to maintain spatial continuity and accessibility. Long isolated circulation routes should be avoided.

Design Guideline 07

from spatial and distribution characteristics of village spaces : 1

Create Thick Spatial Boundaries

The boundaries of open spaces should not remain thin and sharply separated. Walls, plants, steps, edges, shelters, and transitional zones should be used to create layered spatial boundaries. These boundary conditions should support both spatial enclosure and interaction between people and the environment.

Design Guideline 08

from spatial and distribution characteristics of village spaces : 2, 3

Create Irregular Open Spaces

Open spaces should avoid rigid and overly regular geometries. Instead, spaces should be formed through offsets, corners, expanaion, compression, and fragmented boundaries in order to create richer spatial variations and experiences.

Design Guideline 09

from spatial and distribution characteristics of village spaces : 4

Create Continuous Open Space Networks

Open spaces should not exist as isolated plazas, but as continuously connected spatial systems linked with paths and nodes. Smaller open spaces should appear continuously along primary circulation routes in order to support everyday activities and spatial interaction.

Design Guideline 10

from spatial and distribution characteristics of village spaces : 5

Create Spatial Density Gradients

Spatial density should gradually decrease from community centers toward edge areas in order to maintain hierarchical spatial relationships. Community centers should contain denser and more continuous open space systems, while edge areas may become more dispersed and open.

Design Guideline 11

from spatial and distribution characteristics of village spaces : 6

Create Flexible Everyday Spaces

Open spaces should support informal daily activities such as gathering, resting, planting, drying, working, and temporary occupation. Instead of assigning overly fixed functions, spaces should remain adaptable and open to different forms of everyday use.

Design Guideline 12

from Atmosphere, Time, and Sensory Experience Elements : 1

Create Climate-Responsive Spaces

Spaces should be designed to respond to sunlight, shadow, wind, rain, humidity, and seasonal changes throughout the day and year. Different areas should provide different experiences, such as: Narrow passages can create changing shadow and wind conditions, while courtyards, deep eaves, and semi-open spaces can strengthen the perception of rain, humidity, airflow, sunlight, and seasonal atmosphere.

Design Guideline 13

from Atmosphere, Time, and Sensory Experience Elements : 2

Create Layered Soundscapes

Pedestrian areas should be acoustically protected from surrounding vehicular roads. In the pedestrian areas, natural sounds should become part of spatial experience. Water flow, wind, footsteps, conversations, birds, and daily activities should continuously appear along movement routes. Highly isolated and acoustically neutral environments should be avoided.

Design Guideline 14

from Atmosphere, Time, and Sensory Experience Elements : 3

Create Sensory Atmospheres Through Smell and Air

Local wind direction should be considered when designing street blocks. Plants, soil, wood, humidity, rain, and everyday activities should shape the smell and air conditions of space. Airflow and ventilation should allow changing environmental conditions to remain perceptible within everyday life.

Design Guideline 15

from Atmosphere, Time, and Sensory Experience Elements : 4

Create Tactile Material Experiences

Materials should maintain tactile richness rather than becoming visually uniform and overly smooth. Stone, wood, rough walls, moss, ground textures, and weathered surfaces should remain part of everyday bodily experience. Local materials should be used as much as possible, allowing material aging and traces of use to gradually become part of the spatial atmosphere.

Design Guideline 16

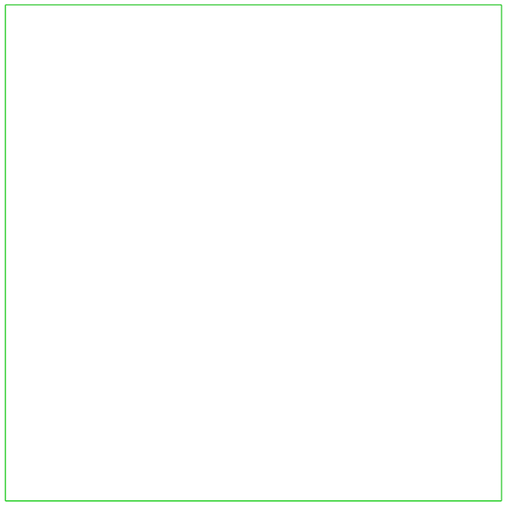
from Atmosphere, Time, and Sensory Experience Elements

Create Slow and Emotionally Rich Environments

Spatial atmosphere should encourage slowing down, observing, resting, and emotional interaction with the environment. Highly standardized and emotionally neutral environments should be avoided.

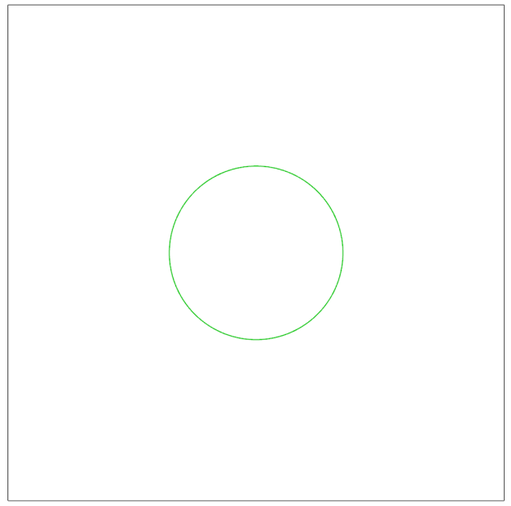
7. Test

This chapter follows the design guidelines proposed in the previous chapter and combines them with the slime mold simulation in Grasshopper to generate a new type of resettlement community as a test. At the same time, the generated results in this chapter also provide a foundation for later comparison and analysis with existing resettlement communities.



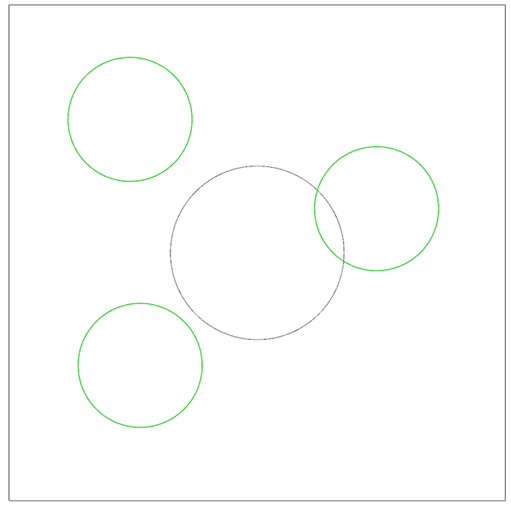
Step 01

Setting the site (200m × 200m)



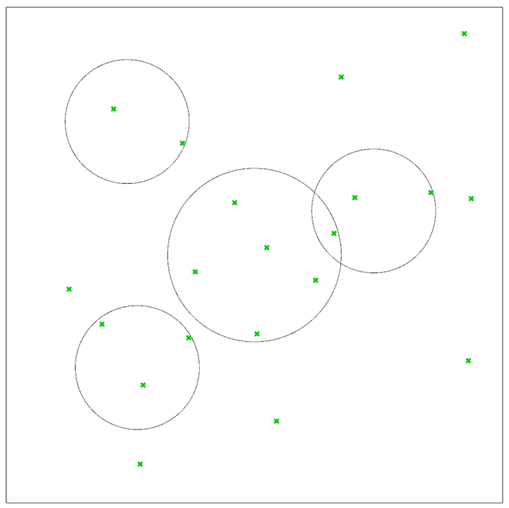
Step 02

Defining the central area



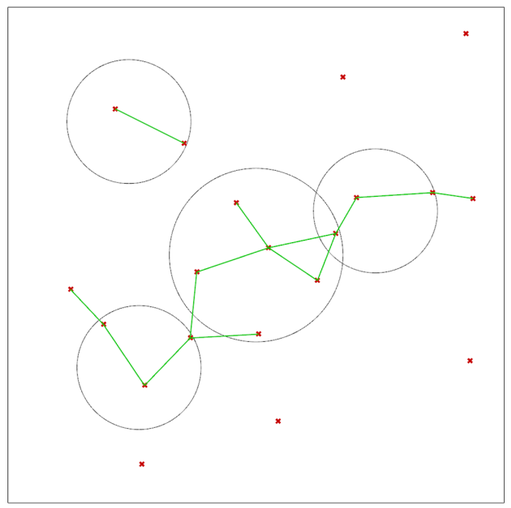
Step 03

Randomly generating three secondary centers, with the remaining areas defined as edge areas



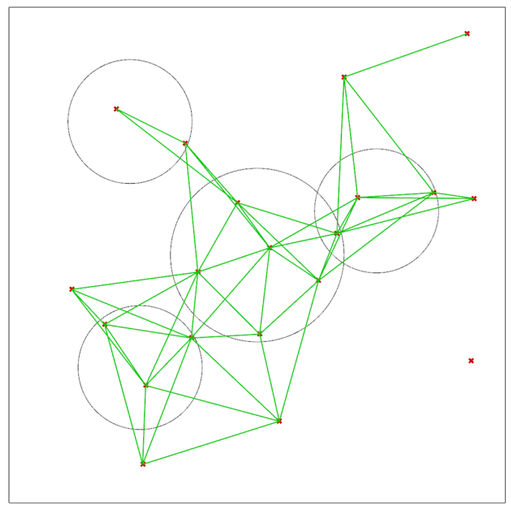
Step 04

randomly generating nodes with different densities according to area hierarchy



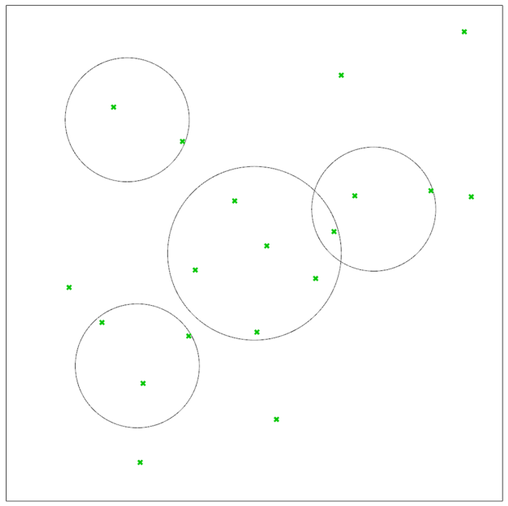
Step 05

checking if the node spacing in the central area is less than 30m



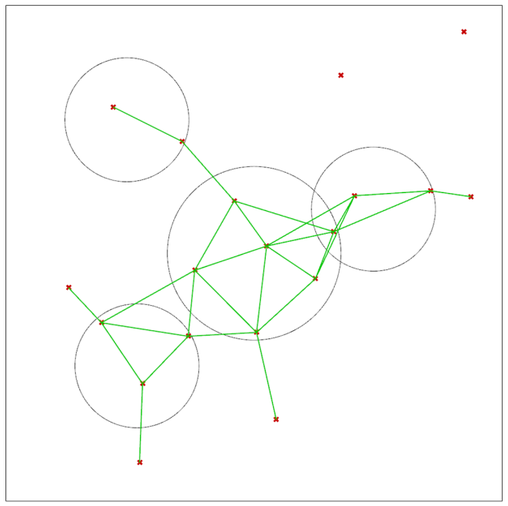
Step 06

Checking if minimum distance between all nodes is less than 65m, and removing nodes that do not meet the requirement



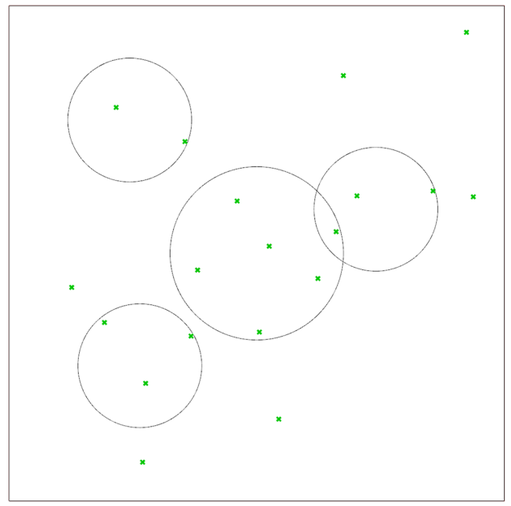
Step 07

Defining the final nodes



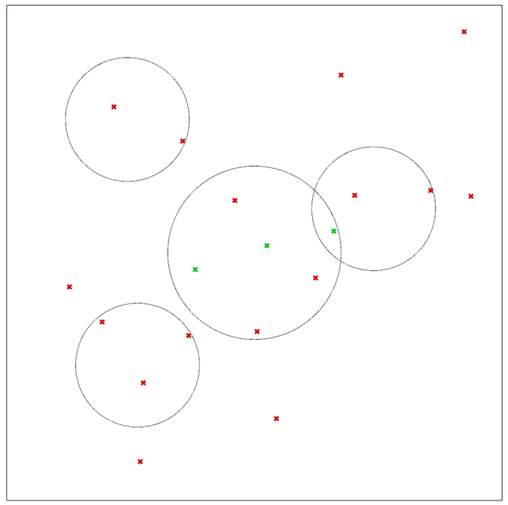
Step 08

Determining the 3 primary nodes based on an average proximity value of 45m



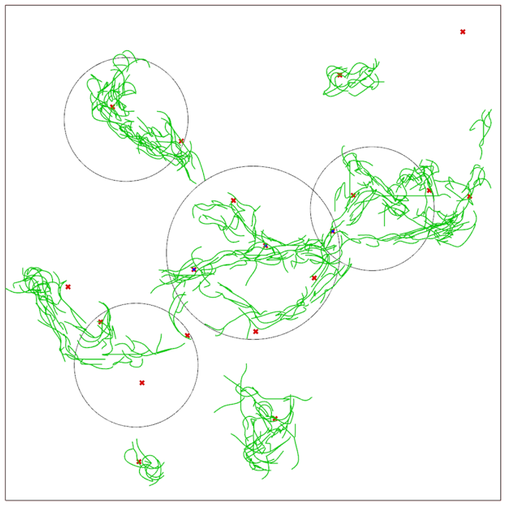
Step 09 *Slime Mold Simulation*

Setting all nodes as starting points for the slime mold simulation



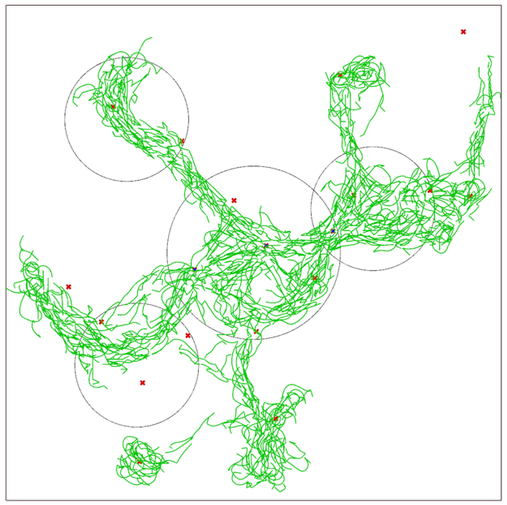
Step 10 *Slime Mold Simulation*

Setting the three primary nodes as food points



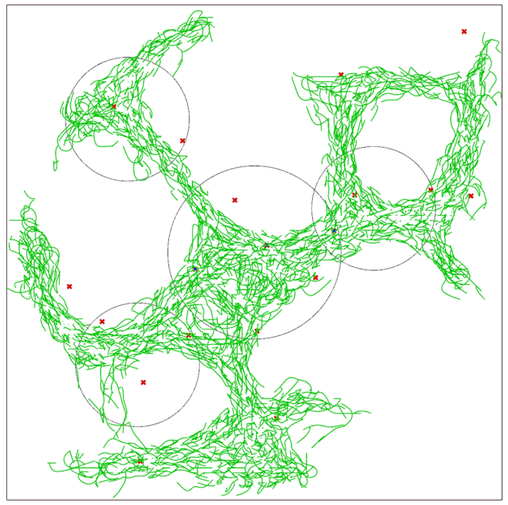
Step 11 *Slime Mold Simulation*

Starting the simulation: first second



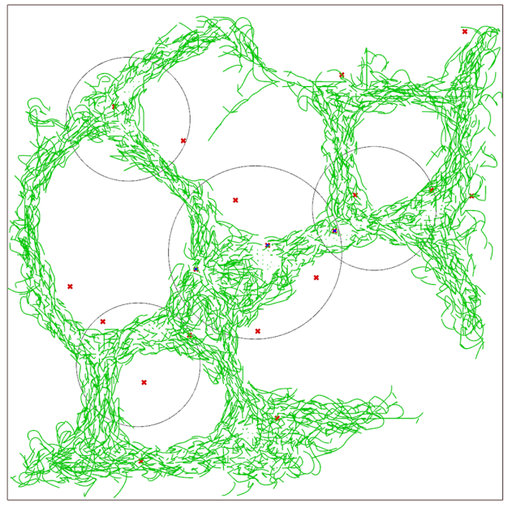
Step 11 *Slime Mold Simulation*

Second second of the simulation



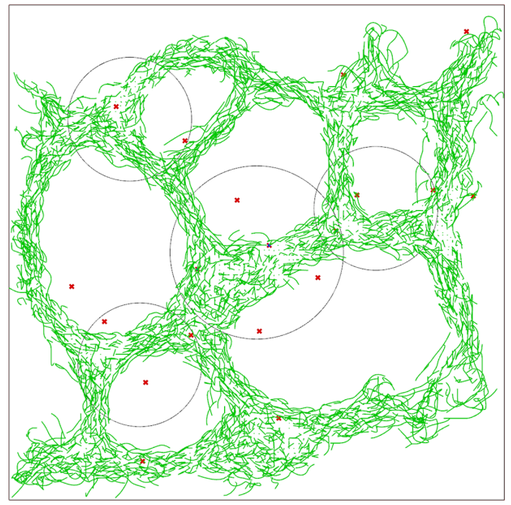
Step 11 *Slime Mold Simulation*

Third second of the simulation



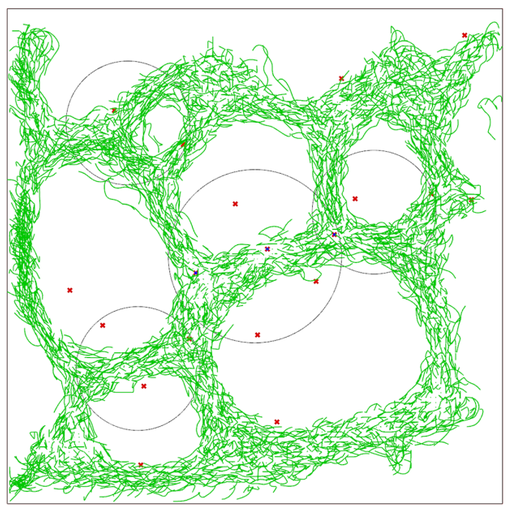
Step 11 *Slime Mold Simulation*

Fourth second of the simulation



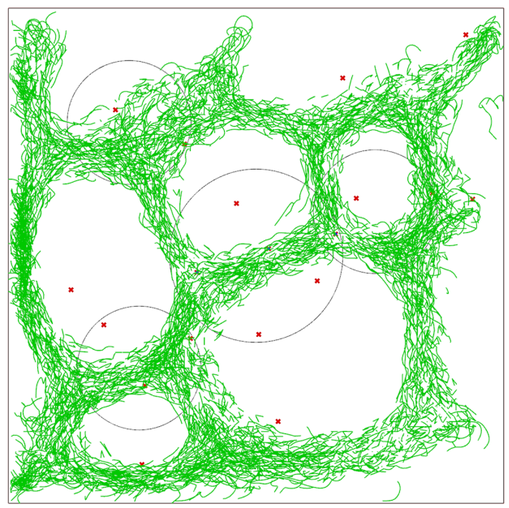
Step 11 *Slime Mold Simulation*

Fifth second of the simulation



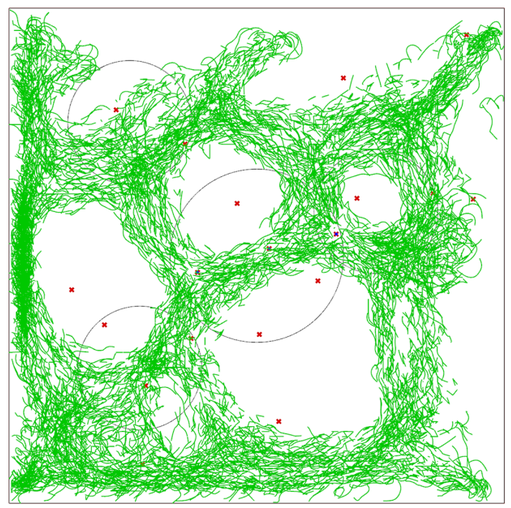
Step 11 *Slime Mold Simulation*

Sixth second of the simulation



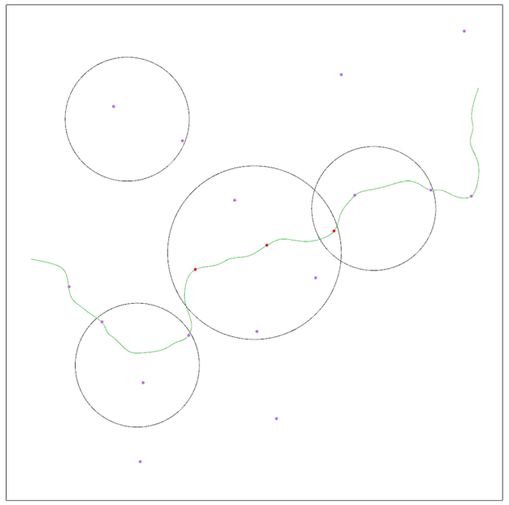
Step 11 *Slime Mold Simulation*

Tenth second of the simulation



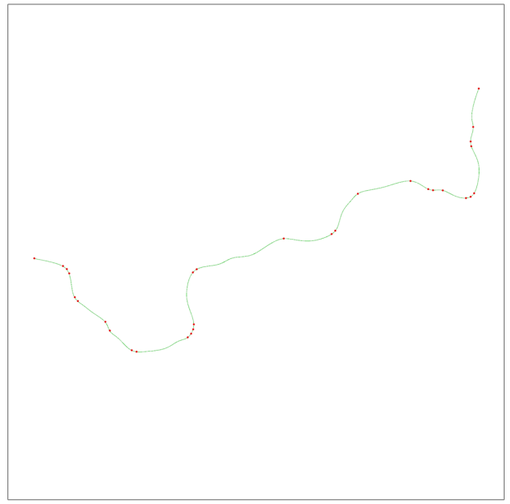
Step 11 *Slime Mold Simulation*

Twentieth second of the simulation



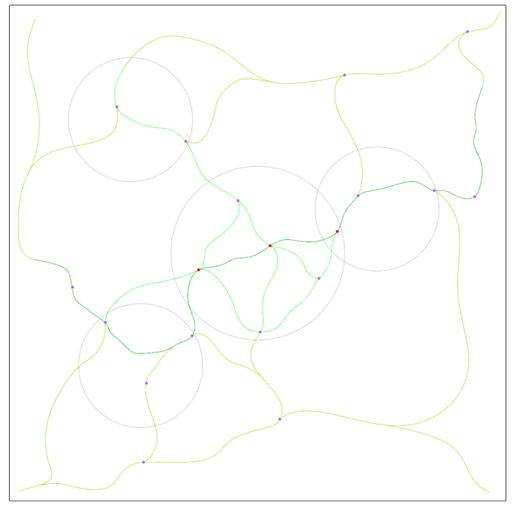
Step 12

Defining primary paths based on the order in which paths appear in the simulation. Connecting as many nodes as possible



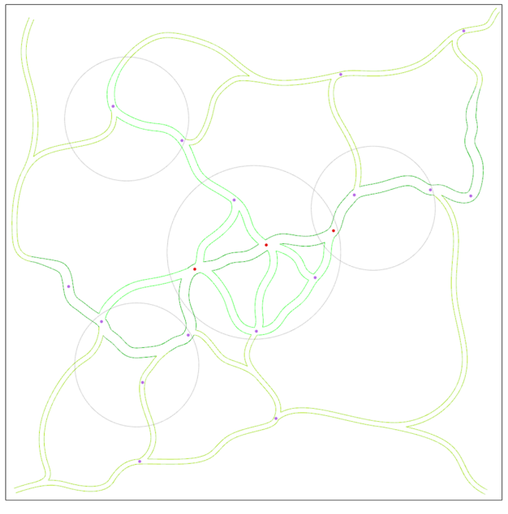
Step 13

Calculating the curvature of primary paths to check whether they meet the standard. The result meets the requirement



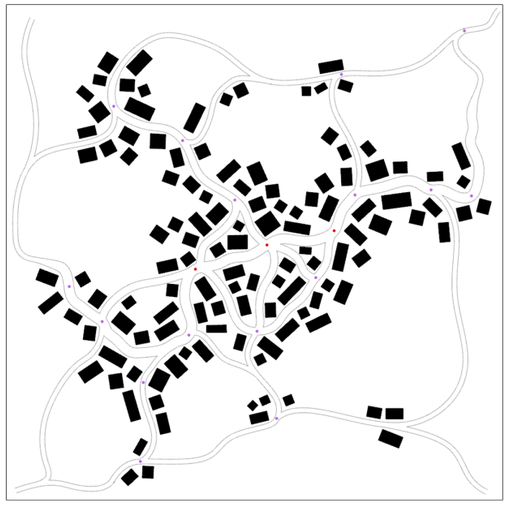
Step 14

Defining the remaining paths based on the order in which they appear, and calculating the proximity and accessibility of each node, all of which meet the standard



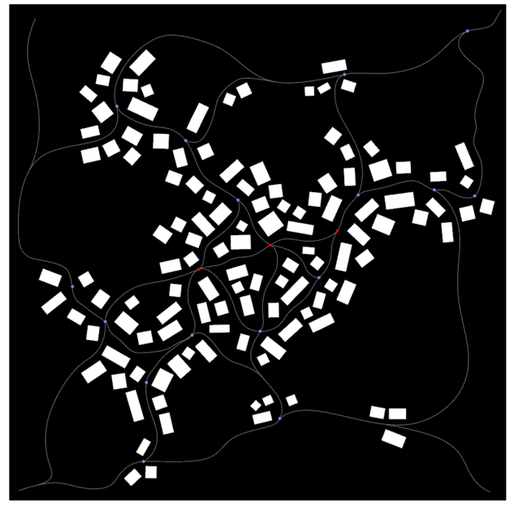
Step 15

Adding different widths to roads of different hierarchies



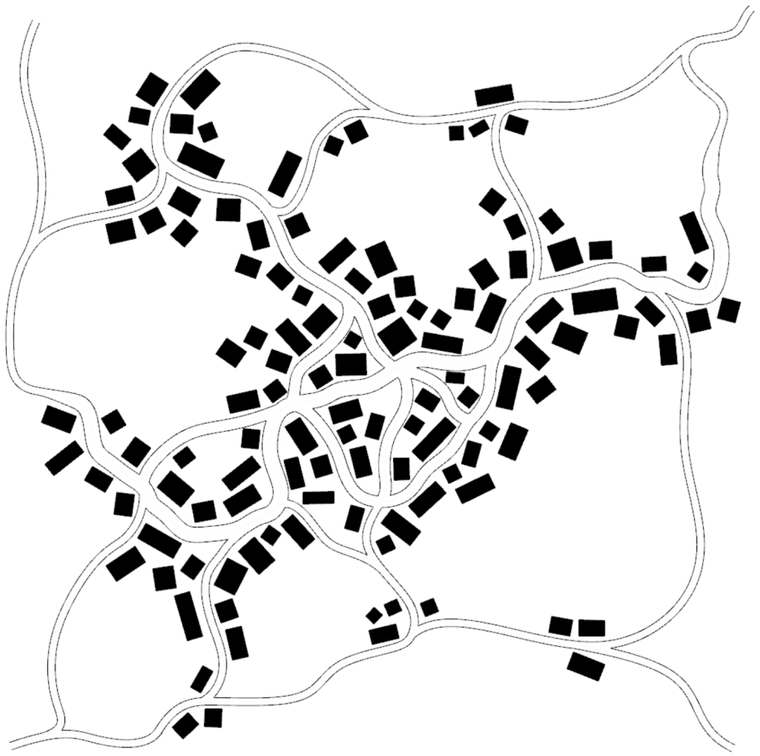
Step 16

Randomly generating buildings along the paths and manually adjusting them



Step 17

Reversing black and white to check whether the spaces between buildings have irregular boundaries and are mostly distributed near nodes and paths



New Built Environment



Rendering Generated by AI

8. Critical Synthesizes of the Design Guidelines

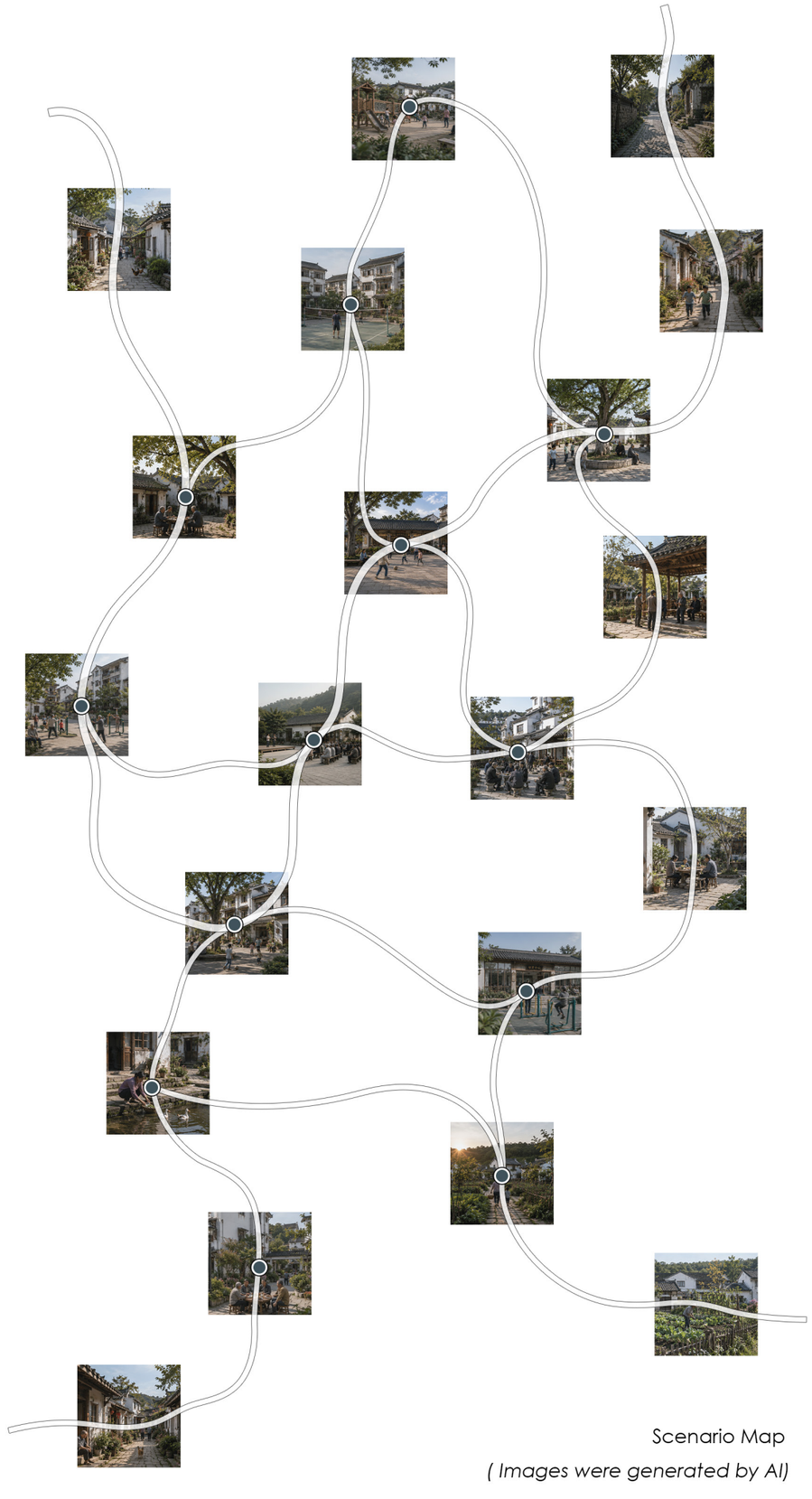
This chapter first analyzes both the newly generated environment from the previous chapter and existing resettlement communities through point, line, plane, and scenario studies. Combined with the design guidelines, the chapter further carries out a critical comparison and synthesis of these two types of environments. At the same time, the final part of this chapter also studies several similar cases in China in order to further discuss the practical possibility of this new environment in contemporary China.

8.1 Analysis of the New Built Environment



New Built Environment

This terrain is based on a real site in a city in southeastern China



Scenario Map

(Images were generated by AI)

Analysis of Points

Average Accessibility = ***3.11***

Average Accessibility in the village center ≈ ***3.83***

Average Accessibility in the secondary village center ≈ ***3.11***

Average Accessibility at the edge of the village ≈ ***2.33***

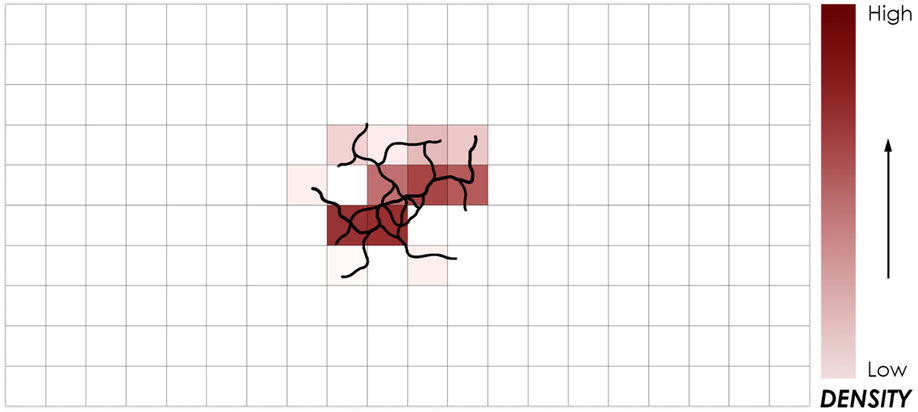
Average Proximity = ***24.31 m***

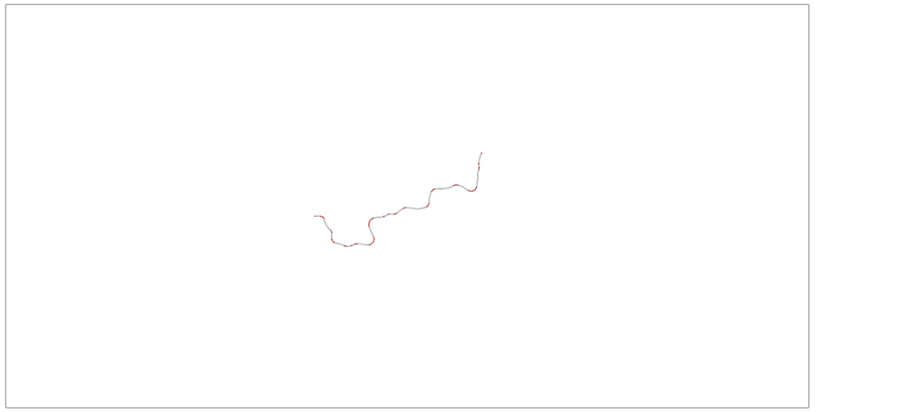
Average Proximity in the village center ≈ ***20.86 m***

Average Proximity in the secondary village center ≈ ***20.57 m***

Average Proximity at the edge of the village ≈ ***31.50 m***

Analysis of Lines





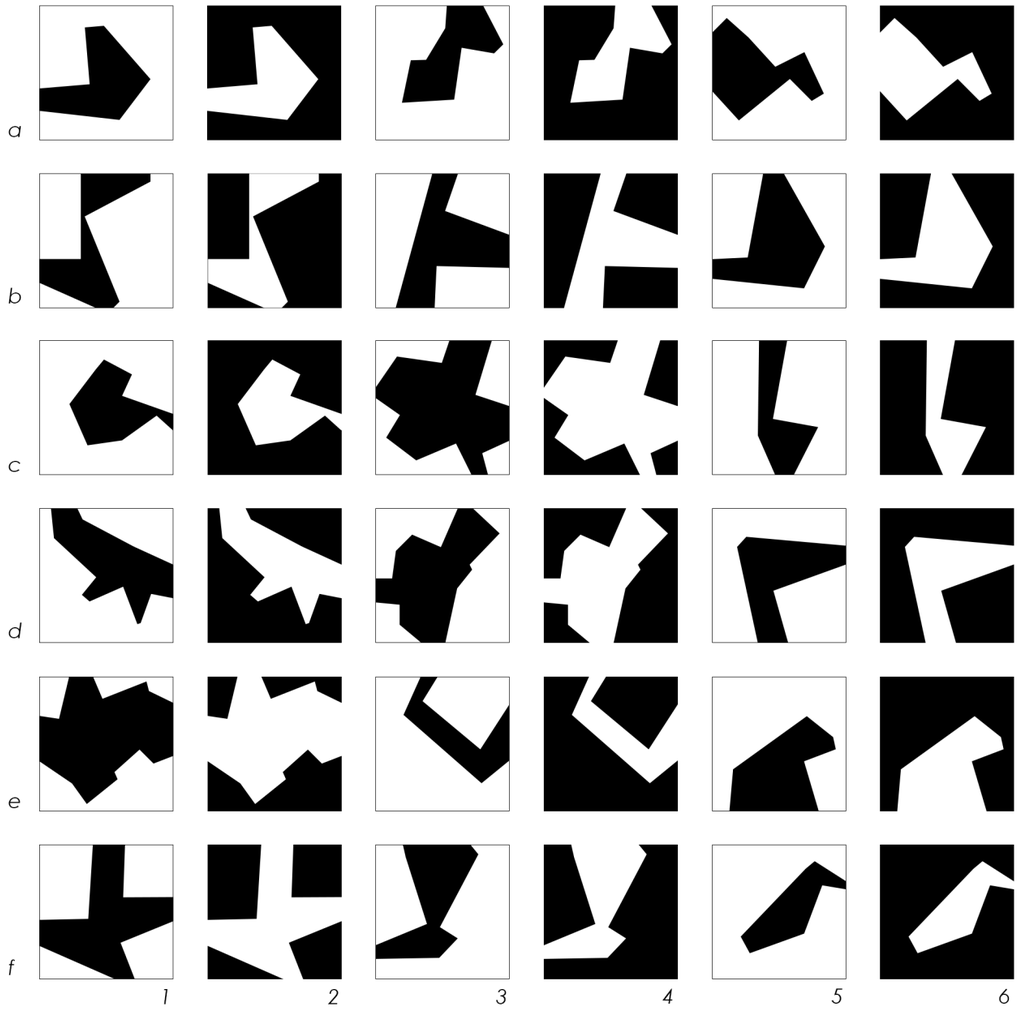
Average Distance Between Turning Areas = ***15.19 m***

I_p **= 3.88** *(θ_i = 1102.37 °, L = 284.32 m)*

Analysis of Planes

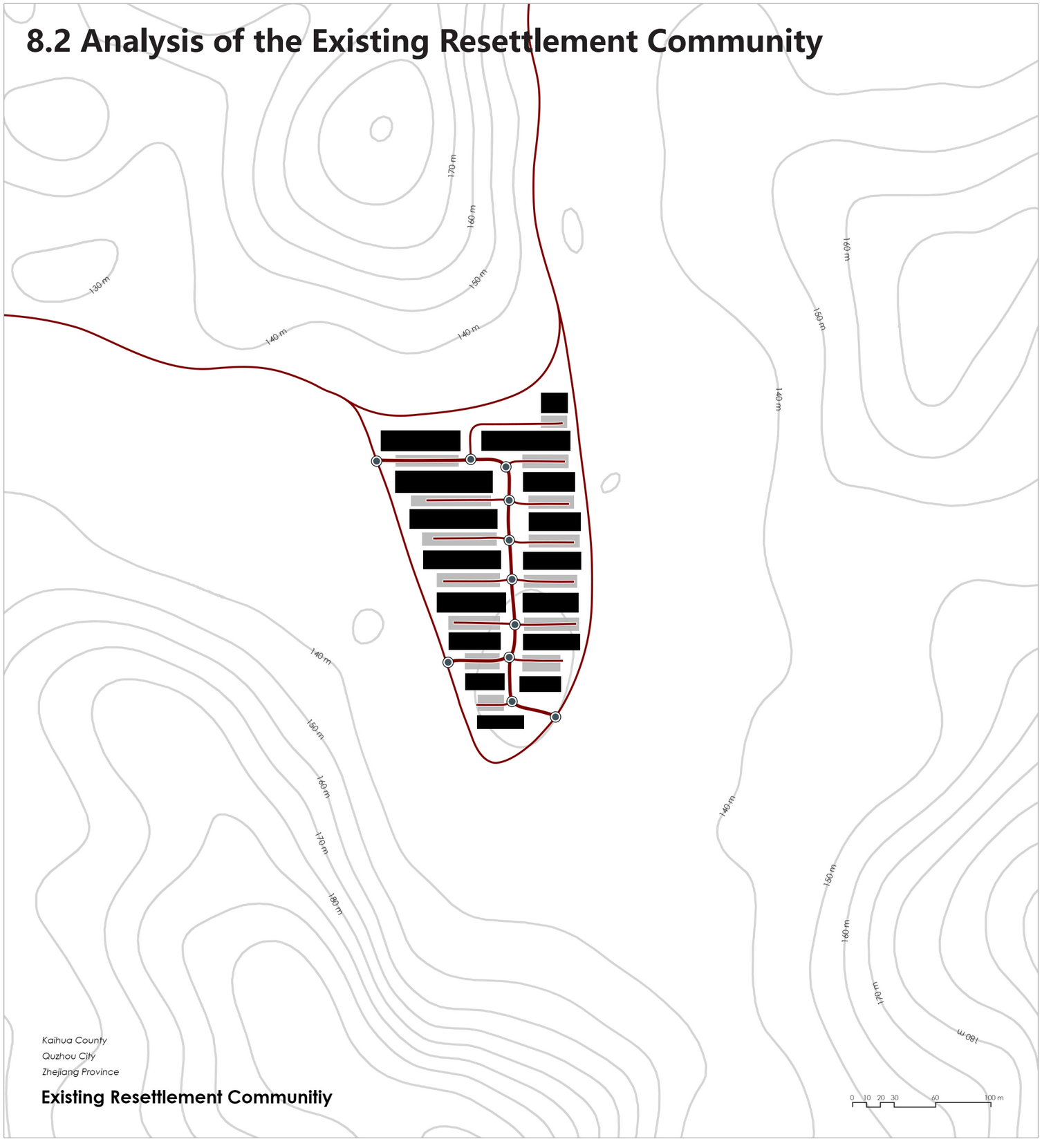
Columns 1, 3, and 5 : *Voids* *Buildings*

Columns 2, 4, and 6 : *Voids* *Buildings*



a	*Spatial Expansion*	*Spatial Transition*	*Spatial Contraction*
b	*Central Narrowing*	*T-Junction*	*Corner Plaza*
c	*Enclosed Space*	*Central Plaza*	*Narrow Linear Path*
d	*Roadside Small Space*	*Spatial Expansion*	*Corner Plaza*
e	*Intersection Plaza*	*Turning Path*	*Semi-Enclosed Space*
f	*Four-Way Intersection*	*Central Compression*	*Spatial Expansion*

8.2 Analysis of the Existing Resettlement Community



Kaihua County
Quzhou City
Zhejiang Province

Existing Resettlement Communitiy



Satellite Maps of Case Study Resettlement Communities



Overly Straight Roads



Monotonous Open Spaces



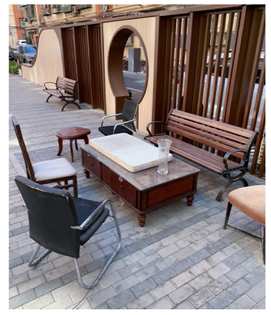
Forced Separation by Roads



Gathering Along Low Walls



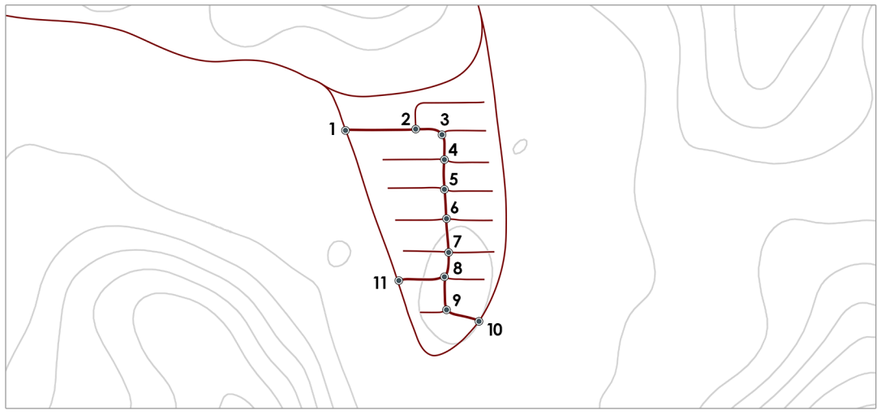
Sitting Under Trees



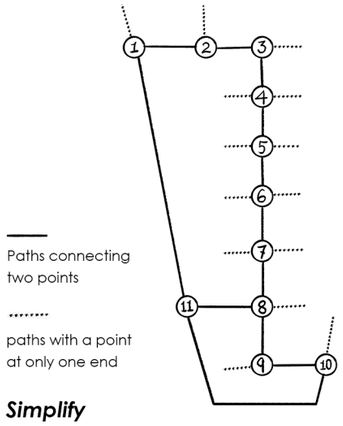
Spontaneously Built "Nodes"

Photos Collected From Several Different Resettlement Communities

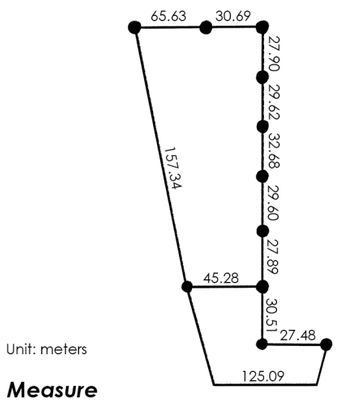
Analysis of Points



Number



Simplify



Measure

By analyzing the map, it was found that the distribution of nodes within this community is overly uniform, making it difficult to distinguish between central and peripheral areas. To verify this assumption, the standard deviation of the proximity values was calculated and compared with the standard deviation of the proximity values from the ten previously studied traditional villages (respectively: 27.70, 35.03, 24.25, 33.66, 25.94, 18.53, 16.23, 19.52, 26.51, 23.65).

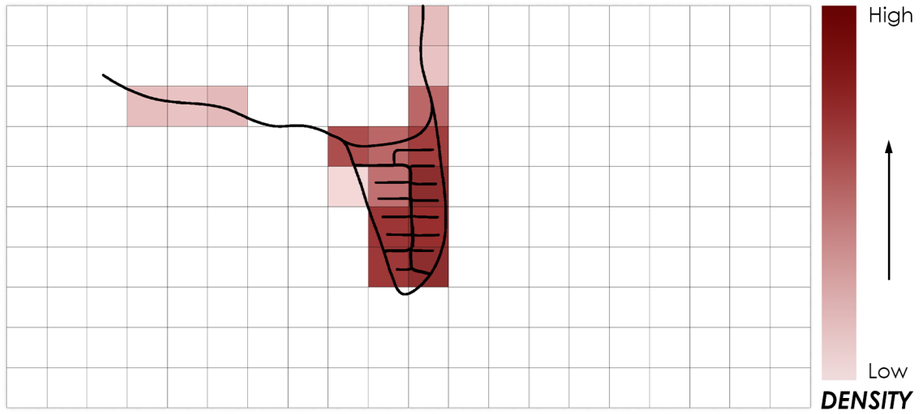
The results show that the standard deviation of the proximity values in the existing resettlement community is significantly lower than that of the ten traditional villages. If the outermost paths of the resettlement community are excluded and only the internal paths are considered, the resulting standard deviation of proximity is only 1.34. This indicates that the internal spatial distribution is excessively uniform, making it impossible to identify central and peripheral areas, therefore confirming the assumption.

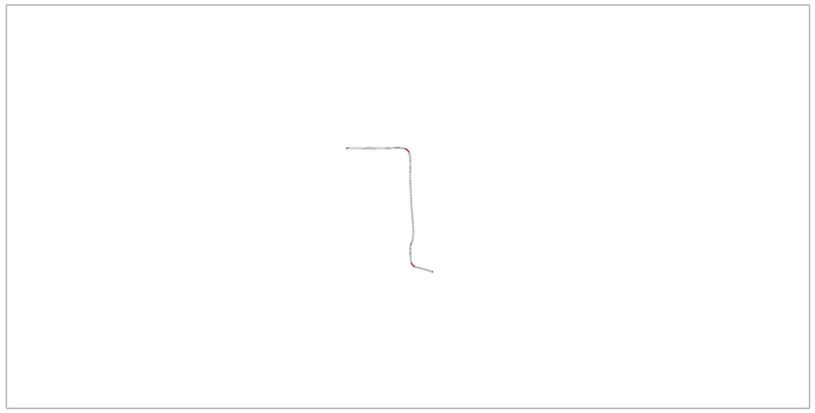
As a result, only the overall average values of accessibility and proximity could be obtained.

Average Accessibility ≈ ***3.45***

Average Proximity ≈ ***33.40 m***

Analysis of Lines

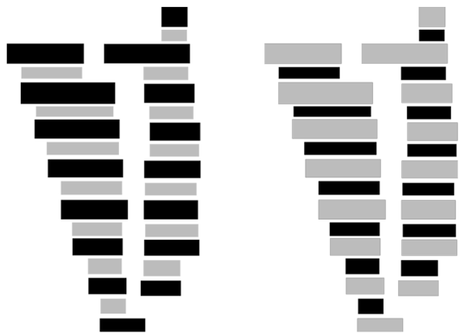




Average Distance Between Turning Areas = ***69.59 m***

I_p = ***0.83*** (θ_i = 242.23 ° , L = 290.37 m)

Analysis of Planes



From the observation of the map, it can be seen that the outdoor spaces within the existing resettlement community are generally monotonous, with little spatial variation. Most of them are rectangular spaces, which are significantly different from both traditional villages and the newly generated communities based on the design guidelines.

8.3 Critical Syntheses of the Guidelines

Comparison Between Existing Resettlement Communities and the New Built Environment

Through the analysis in the previous two sections, it can be clearly seen that there are large differences between the spatial organization of existing resettlement communities and the new environment generated based on the design guidelines. In order to clarify the motivation behind the new villages and further understand the spatial logic contained in the design guidelines, the following section will continue to compare and analyze these two types of communities through the aspects of point, line, plane, and sensory experience.

Point

If only the overall average values of accessibility and proximity are compared, the difference between the two communities may not seem very large. In some cases, the existing resettlement communities may even have a slightly higher average accessibility value than the newly generated community. However, as mentioned in the previous section, when calculating the standard deviation of node proximity, it becomes clear that the node distribution in existing resettlement communities is too even and lacks variation. Because of this, it is difficult to identify clear central and non-central areas, and the spaces lack enough variation to attract people. In contrast, after following Guideline 3, the new community can be more easily divided into different areas, allowing different types of functional spaces, such as community centers, sports areas, and leisure areas, to be arranged more effectively.

In existing communities, nodes are mostly located at traffic intersections. However, people usually prefer gathering in smaller spaces with support and enclosure, such as beside walls, under trees, or near building entrances. Because of this, it is difficult for existing communities to create comfortable spaces for residents to stay. This has also led to the appearance of many informal gathering spaces built by residents themselves inside these communities, which indirectly shows the problems in node design within existing resettlement communities. Therefore, communities should follow Guidelines 1 and 2 and use soft spatial boundaries to create spatial transitions.



Too few seats inside the community



Residents gathering near building entrances



Residents prefer sitting against walls



Informal nodes created by residents 01



Informal nodes created by residents 02



Informal nodes created by residents 03



Residents prefer sitting under trees beside walls



Large trees becoming gathering nodes



Self-built tables for playing chess

Photos collected from several different resettlement communities

Line

In existing resettlement communities, pedestrians and vehicles are not separated. This not only creates safety problems, but also makes the roads too wide and lacking in human scale, reducing many everyday activities that could originally happen along the streets. Overly wide roads also increase the distance between people and reduce opportunities for accidental communication and social interaction. At the same time, the overly tall apartment buildings in these communities further increase the imbalance between street width and building height, often creating feelings of pressure and insecurity. Therefore, communities should follow Guideline 4 by separating pedestrians and vehicles while also reducing the width of pedestrian roads. This would allow street edges to support more everyday activities again. At the same time, building heights should be reduced appropriately while building density is increased, helping the street proportion return to a more human-scale relationship.

Through Grasshopper analysis and formula calculation, it can be seen that the existing communities have an average distance between turning areas of 69.59m, which is much higher than the 15.19m in the new community and the suggested 25m in Guideline 5. At the same time, the Ip value of the existing communities is only 0.83, which is far lower than the 3.88 in the new community and the suggested value of 2.5. These two sets of data show that the roads in existing communities are too straight and lack curvature and spatial variation. This kind of road layout can reduce people's willingness to walk, because paths and landscapes that are too repetitive and lacking in variation can easily create feelings of boredom and pressure during walking.

Because the node distribution is too even, the road density also becomes overly uniform. This kind of road network, which lacks hierarchy and variation, can reduce people's desire to explore and make walking less enjoyable. Therefore, similar to the new community, existing communities should follow Guideline 6 and create hierarchical path network systems. Roads should be clearly divided into primary and secondary paths. Main roads should mainly connect important outdoor spaces and central nodes, while secondary roads should mainly connect living areas, forming a complete road network with clear hierarchy.



Overly straight roads



Beyond human scale



Overly wide roads

Photos collected from several different resettlement communities



Properly curved roads



Human-scale roads



Roads full of everyday life

These three images were generated by AI

Plane

Because the buildings in existing resettlement communities are arranged too parallel to each other, the open spaces formed between them become overly regular in both boundary and internal form. At the same time, the edges of these open spaces are often directly connected to building walls, lacking transitional elements such as trees, steps, and corridors. This makes spatial transitions feel hard and lacking in layers and variation, and also makes it difficult to attract residents to stay and gather. Therefore, similar to the new community, existing communities should follow Guidelines 7 and 8 by using low walls, plants, and height differences to create more layered spatial boundaries. At the same time, without affecting sunlight conditions, the angle relationship between buildings should be adjusted slightly so that outdoor spaces can form more irregular boundaries, increasing the richness and interest of space.

In existing resettlement communities, the arrangement of buildings, the distribution of nodes, and the distribution of roads are all too even. As a result, the distribution of outdoor open spaces also becomes overly uniform and lacks hierarchy and variation. Therefore, communities should follow Guidelines 9 and 10 to create a more continuous and layered spatial experience together with nodes and paths.

In existing resettlement communities, the functions of many open spaces are defined too strictly, making it difficult for residents to use and transform these spaces freely according to their own needs. Because of this, many outdoor areas lack everyday life and long-term activity. Therefore, communities should follow Guideline 11 and leave some spaces open for residents to use and build by themselves. In this way, open spaces can support different everyday activities such as gathering, resting, drying clothes or grain, and temporary activities. At the same time, this kind of more open space can more easily encourage communication and interaction between residents.



Overly regular spaces



Meaningless lawns



Continuous trees forming natural boundaries

Photos collected from several different resettlement communities



Using corridors to connect open spaces and walls



Spaces that support different kinds of activities



Spaces enclosed by trees and buildings

These three images were generated by AI

Sensory Experience

In existing resettlement communities, both outdoor spaces and housing design tend to “overprotect” people. At the same time, because the building arrangement and spatial distribution are too uniform, it becomes difficult for residents to feel the spatial differences created by sunlight, wind, humidity, rain, and seasonal change in everyday life. Therefore, communities should follow Guideline 12 and create spaces that can respond to climate and environmental changes. For example, narrow paths can create constantly changing light, shadow, and wind conditions, while courtyards, deep roofs, and semi-open spaces can strengthen people’s perception of rain, humidity, airflow, and sunlight, making spatial experience richer and more connected to time.

In existing resettlement communities, pedestrian areas often lack design and protection for the sound environment. Vehicle noise can easily enter everyday living spaces, making the environment feel simple and lacking in layers. At the same time, overly wide roads and repetitive paving materials can weaken the richness and variation of sound during its movement through space. Therefore, communities should follow Guideline 13 and reduce the influence of vehicle noise in pedestrian areas as much as possible. At the same time, the materials of roads and street-facing walls can be adjusted to create more possibilities for sound reflection and transmission, allowing natural sounds and everyday sounds to become part of the spatial experience.

In existing resettlement communities, spatial design often pays little attention to airflow, smell, and humidity changes, making the environmental experience between different areas too similar. At the same time, overly wide roads and overly regular building layouts reduce the movement and retention of wind, moisture, and plant smells in space. Therefore, communities should follow Guideline 14 and consider local wind direction and ventilation conditions in neighborhood design. For example, more flexible street and building layouts can allow smells to naturally enter different spaces. At the same time, everyday activities such as planting, drying, and cooking can be combined so that air and smell change over time, creating a richer and more lively sensory experience.

In many contemporary buildings, materials often focus too much on visual unity and long-lasting appearance, while lacking tactile experience and bodily interaction with space. At the same time, the large use of standardized materials gradually removes local character and traces of everyday use from space. Therefore, communities should follow Guideline 15 and preserve the tactile qualities and natural changes of materials as much as possible. For example, differences in temperature, roughness, and texture between materials can allow people to feel richer spatial changes while touching, walking, and staying in space. At the same time, wear over time, plant growth, and traces of use can gradually create a more real and lived atmosphere.

In existing resettlement communities, spaces are often too standardized and uniform. People mainly move through spaces quickly rather than staying and experiencing the environment. This kind of environment, lacking variation and emotional experience, gradually weakens the relationship between people and space and makes everyday life feel monotonous. Therefore, similar to the new community, existing communities should follow Guideline 16 and create richer spatial relationships through the combined effect of nodes, paths, open spaces, and sensory environments. In this way, residents can once again feel the atmospheric changes created by different environments in everyday life and rebuild emotional connections with space.



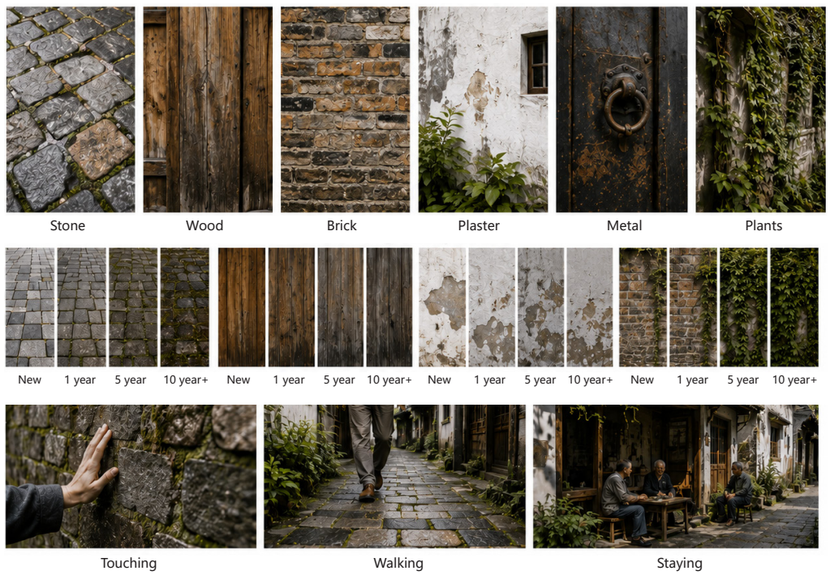
Experiencing changes of light and shadow



Experiencing the sound of rain in courtyards



Feeling airflow in semi-open spaces



Images were generated by AI

8.4 Feasibility Analysis of “the New Built Environment” in China

Presentation of Existing Similar Cases

In order to test the real possibility of “The New Built Environment” in China, this research selected three cases from the internet that have forms similar to the proposed environment but were generated through different methods. The successful construction of these projects shows, to some extent, that resettlement communities designed based on the design guidelines proposed in this research are not only possible in the future, but may also already have practical feasibility in the present.

Dongziguan, Hangzhou

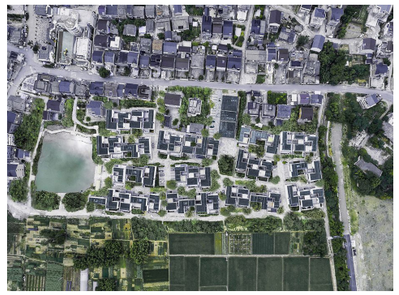
Dongziguan is located in a very typical village area in southeast China. In order to improve the living conditions of local residents, the local government decided to first relocate 50 households and build a resettlement community on the south side of the old village, following the traditional land distribution system of one house for each household.

Behind the rich forms of traditional settlements, there are often similar spatial prototypes. This project tries to abstract these common spatial characteristics from a typological perspective and reconstruct the original spatial logic. By using a small number of basic units together with organizational rules, the design attempts to create a diverse settlement form.

Through subtle changes to two basic building units, four different housing types were developed. These units are then arranged through front-back shifting and east-west mirroring to create small clusters with shared courtyards. Compared with traditional linear housing layouts, this arrangement greatly improves land efficiency, as well as the layering and privacy of courtyard spaces.

Each housing cluster contains a semi-public open space, which helps support communication between neighbors and strengthens community belonging and social connection. At the same time, considering the villagers’ strong desire for housing independence, each house remains completely independent without sharing walls with neighboring houses, with distances between houses ranging from 1.6 to 3.2 meters.











Images from the Internet

Miluo, Yueyang

Miluo is located in Hunan Province, China. And this project is a rural resettlement housing project involving the relocation and resettlement of nearly 400 rural families from six local villages. The first phase of the project was completed in 2021. As residents gradually moved in and opened small village businesses such as supermarkets, restaurants, and different kinds of shops, a basic community atmosphere has already started to form.

The design team respected the local rural lifestyle and, based on this, tried to rebuild a collective living environment with social interaction and a sense of community, allowing the everyday atmosphere of village life to return. The team extracted six basic building types from the traditional "large house" forms found in the original villages. These types were then transformed, selected, and combined to create settlement clusters of different scales. Around each cluster is a vehicle road, while pedestrian paths are formed inside between the houses.

At the same time, while trying not to block sunlight, the design strengthens the spatial connections between houses and highlights the connectivity of the traditional "Xiangbei large house." In this way, the project creates a new type of building cluster that can be combined and separated flexibly. Through shared roofs and connected spaces, the design attempts to physically shorten the distance between neighbors and encourage stronger community relationships and social atmosphere.











Images from the Internet

Yanmaidi, Liangshan

This project is located in Yanmaidi Community, Liangshan Yi Autonomous Prefecture, Sichuan Province, China. It is a rural resettlement community built by the government for lower-income villagers during China's poverty alleviation campaign.

In the middle- and high-altitude areas of Liangshan, traditional settlements were usually organized around the idea of "houses inside and farmland outside." These settlements were often dispersed, weakly centralized, but still closely connected between groups. However, during recent decades, the traditional closed village structure has gradually shifted toward a more open and inclusive culture. As a result, the traditional spatial form of settlement groups has also changed into multi-family neighborhood units centered around shared community spaces. Today, the settlement structure is organized into three levels: natural village – villager group – housing cluster. Between neighboring clusters, green corridors of 6–12 meters are reserved and planted by residents, forming a local agricultural landscape.

In Liangshan, it is common to see people sitting together on the ground beside houses, inside courtyards, or under trees. These spaces are considered an important type of local neighborhood space. Housing and neighborhood spaces together form residential clusters, with each cluster containing around 8–10 houses. The spatial forms include enclosed central courtyards, semi-enclosed spaces, and linear street layouts.

The transportation system uses a "ring road + pedestrian-vehicle separation" strategy to create a walkable residential community. A circular vehicle road connects the five residential clusters and the community center. Parking areas are arranged along the outer edge of each cluster beside the ring road, while the inside of the clusters remains pedestrian space. This design not only meets parking needs, but also improves walking safety and comfort.

The project also uses micro-topography to shape the settlement as part of the landscape. A small hill in the center of the site is preserved, and the community cultural center and viewing tower are designed according to the natural terrain.











Images from the Internet

9. Conclusion

This research begins with the conflict between the spatial form of many contemporary resettlement communities in China and the original living habits of residents. Based on this background, the research asks whether the spatial logic that naturally evolved over a long period of time in traditional Chinese villages can be translated into contemporary resettlement communities, allowing residents who have lived in villages for a long time to still have a better everyday living experience in a new environment.

Through field research in ten traditional villages in southeast China, this study records and analyzes the relationships between nodes, paths, open spaces, and sensory atmosphere within the villages. Inspired by space syntax, the research uses "point," "line," and "plane" as its main analytical framework. At the same time, it also responds to the limitations of space syntax when studying mountainous villages. Therefore, the research introduces topographic maps, scenario maps, and concepts such as proximity and Path Curvature Intensity (Ip), which are more suitable for studying villages in southeast China. In this way, the research attempts to transform the originally complex, informal, and difficult-to-measure village spatial relationships into a spatial system that can be observed, compared, and analyzed.

During this process, the research identifies a series of repeating spatial characteristics, including but not limited to node networks with higher density and stronger connectivity in central areas, village paths with continuously changing directions and widths, and irregular open spaces naturally formed by buildings and the environment. At the same time, the research also emphasizes the importance of atmosphere and bodily perception, including sound, smell, light, material texture, humidity, and seasonal change.

Based on these research findings, the thesis further uses a typological method to organize and summarize the spatial characteristics of four main elements: point, line, plane, and sensory experience. On this basis, the thesis attempts to transform these spatial characteristics into a series of design guidelines. Following these guidelines, the research then uses Grasshopper to generate a new environment in order to explore whether these spatial logics can be translated into the generation process of contemporary resettlement communities.

Finally, through comparing existing resettlement communities with the newly generated environment, the thesis provides a critical synthesis of these design guidelines. Through the comparison, it becomes more clear that there are major differences in spatial experience between existing resettlement communities and the new environment generated from the guidelines. At the same time, considering the practical possibility of realizing this new environment, the thesis also studies several contemporary resettlement community cases with similar spatial characteristics. Through this analysis, it can be seen that this type of resettlement community already has a certain level of practical feasibility in contemporary China, further proving the operability of the overall research process and design method.

In the end, although the design guidelines proposed in this research show a certain level of feasibility, this study should not be understood as a complete architectural solution. Instead, it should be seen more as an exploration of how traditional spatial logic can continue to influence future architecture and urban design. At the same time, the research also attempts to propose a new research method that combines spatial analysis, generative systems, and bodily experience in order to rethink the logic behind the creation of future living environments.

References

Alexander, C. (1977). A Pattern Language: Towns, Buildings, Construction. New York: Oxford University Press.

Alexander, C. (1979). The Timeless Way of Building. New York: Oxford University Press.

Bachelard, G. (1994). The Poetics of Space. Boston: Beacon Press.

Corner, J. (1999). The Agency of Mapping: Speculation, Critique and Invention. In D. Cosgrove (Ed.), Mappings (pp. 213–252). London: Reaktion Books.

Cullen, G. (1961). The Concise Townscape. London: Architectural Press.

Debord, G. (1955). "Introduction to a Critique of Urban Geography." Les Lèvres Nues, 6.

Debord, G. (1958). Theory of the Dérive. Internationale Situationniste.

Deleuze, G. and Guattari, F. (1987). A Thousand Plateaus: Capitalism and Schizophrenia. Minneapolis: University of Minnesota Press.

Heidegger, M. (1971). "Building Dwelling Thinking." In Poetry, Language, Thought. New York: Harper & Row.

Hillier, B. and Hanson, J. (1984). The Social Logic of Space. Cambridge: Cambridge University Press.

Hillier, B. (1996). Space is the Machine. Cambridge: Cambridge University Press.

Jacobs, J. (1961). The Death and Life of Great American Cities. New York: Random House.

Koolhaas, R. (1978). Delirious New York. New York: Monacelli Press.

Lefebvre, H. (1991). The Production of Space. Oxford: Blackwell.

Lynch, K. (1960). The Image of the City. Cambridge, MA: MIT Press.

Merleau-Ponty, M. (2012). Phenomenology of Perception. London: Routledge.

Norberg-Schulz, C. (1980). Genius Loci: Towards a Phenomenology of Architecture. New York: Rizzoli.

Pallasmaa, J. (2012). The Eyes of the Skin: Architecture and the Senses. Chichester: Wiley.

Ratti, C. (2004). "Space Syntax: Some Inconsistencies." Environment and Planning B: Planning and Design, 31(4), pp. 487–499.

Rossi, A. (1982). The Architecture of the City. Cambridge, MA: MIT Press.

Rowe, C. and Koetter, F. (1978). Collage City. Cambridge, MA: MIT Press.

Rudofsky, B. (1964). Architecture Without Architects. New York: Museum of Modern Art.

Sitte, C. (1889). City Planning According to Artistic Principles. New York: Random House.

Soja, E. (1996). Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places. Oxford: Blackwell.

Tschumi, B. (1994). Architecture and Disjunction. Cambridge, MA: MIT Press.

Venturi, R., Scott Brown, D. and Izenour, S. (1972). Learning from Las Vegas. Cambridge, MA: MIT Press.

Vidler, A. (2000). Warped Space: Art, Architecture, and Anxiety in Modern Culture. Cambridge, MA: MIT Press.

Zumthor, P. (2006). Atmospheres. Basel: Birkhäuser.

Zardini, M. (Ed.). (2005). Sense of the City: An Alternate Approach to Urbanism. Montreal: Canadian Centre for Architecture.

GOA (Group of Architects). (2017). Dongziguan Affordable Housing, Hangzhou, China.

SUP Atelier. (2021). Miluo Village Renewal Project, Hunan, China.

Lu, Y., Wang, Z. and Zhang, X. (2020). Yanmadi Resettlement Community, Liangshan, Sichuan, China.

ArchDaily. (2017). "Dongziguan Affordable Housing / GOA." Available at: https://www.archdaily.com/

ArchDaily. (2021). "Miluo Village Renewal / SUP Atelier." Available at: https://www.archdaily.com/

Dezeen. (2017). "GOA builds Dongziguan housing inspired by traditional Chinese villages." Available at: https://www.dezeen.com/