Smart Villages

Rural revitalisation strategies based on Taobao Village development model in rural areas of GBA

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COLOPHON

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P5 report
Master Graduation Thesis Project 2022-2023

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June, 2023

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ACKNOWLEDGEMENT

In this report, I am going to show the results of my graduation research on rural areas in the Greater Bay Area. I was born here, originally from a rural area in the western part of the area and have spent most of my life living in Guangzhou. As I was growing up, I witnessed the prosperity of the metropolitan areas in GBA. However, I care a lot about the vast rural areas that gave birth to me, which have been left behind by the regional development.

I used this excellent opportunity to explore the future possibilities of my beloved homeland, as well as other rural areas in the world. However, this short journey has encountered many challenges, including the pandemic which prevented me from having on-site trip back to China. Luckily, some people have constantly supported me and kept me going through this project.

I would like to show my heartfelt appreciation to my mentors. I am grateful to my first mentor, Lei Qu, who has kindly guided me throughout the whole research process. She seems to know everything and is always willing to enlighten me when I am frustrated by problems. She has a thorough understanding of urban-rural context, which enables her to give me precise suggestions that I need. I am grateful to my second mentor, Steffen Nijhuis. With his knowledge of urbanism and landscape architecture, he understands and supports my enthusiasm for rural landscapes. He not only guides me on how to translate an idea into spatial strategies step by step, but also shows me the systematic way of research and design thinking.

I am grateful to my family, especially my father, Maohan Zhang, and mother, Qun Qiu, who give me unconditional love and financial support. Although they could not understand my major, they are always willing to praise my work and support me to study abroad. Thanks to the love given by Mohan Qiao, who cares about me even though we are not in the same time zone. He constantly shows great patience and cheers me up when I'm down.

I am grateful to my fellows from the Urbanism and the Landscape Labs. We have accompanied each other while exploring different topics. Thanks to Xiaoge Huang, we had the same first mentor and had a lot in common to share. Thanks to Kemeng Zhao, we spent lots of time together in the library and supported each other. And I am grateful to my faithful friends in China, we shared interesting things with each other at home and abroad so that I never leave my homeland in spirit. They all brought endless joy to me when I was struggling for life.

With the completion of this report, my ten-month graduation project comes to an end, as well as my two-year master's program. The experience of studying abroad independently is an unforgettable journey in my life. And the time I spent diving into the field of urbanism will become a treasure in my future days.

"Technology is society,
and society cannot be understood or represented
without its technological tool"

Bijker, Hughes, Pinch, & Douglas (2012)

ABSTRACT

China's rapid urbanisation and industrialisation seriously impacted rural areas, which is reflected significantly in the Greater Bay Area. With globalisation and digitalisation, the emergence of Taobao villages has become a new model for rural development in China. However, socio-economic activities entering in Taobao villages with digital technology were unguided and lacked spatial planning. Consequently, the pursuit of economic growth has resulted in the sacrifice of agricultural resources, degradation of the ecological environment, and terrible spatial quality. With the regionalisation and integration of the Greater Bay Area, the need for sustainable rural revitalisation has become urgent.

To envision future possibilities for rural development, this project introduces the concept of Smart Villages, aiming to enhance agricultural productivity and improve rural liveability. With the Dutch layer approach as the main methodology, the project understands the essential resources that support Smart Villages development and evaluates the spatial conditions of rural areas at regional, district, and local scales. To conclude, the key design elements for Smart Villages development include agricultural agglomeration, accessible networks, and rural liveability. Based on these findings, the project shows a potential Smart Villages development framework that serves as a guidance for rural areas. A series of spatial design strategies are also presented and applied to two design cases, Xingtan in Foshan and Chikan in Jiangmen. They represent rural areas at different levels of development, showcasing scenarios of agro-industrial and eco-agricultural development respectively. It demonstrates how rural areas make use of local resources to spontaneously develop into Smart Villages, thereby reducing dependence on urban centres and contributing to the development of metropolitan regions.

The project highlights the need for a flexible approach to rural revitalisation in the digital future. By embracing the concept of Smart Villages, it advocates for sustainable agricultural practices, improving infrastructures, and enhancing the quality of life for rural communities. The proposed framework and design strategies offer valuable insights for planners, policymakers, and stakeholders seeking to foster the sustainable development of Smart Villages in a spatial perspective.

Keywords: *sustainable revitalisation, spatial strategies, agricultural upgrading, rural liveability, digitalisation*

CONTENTS

Figure I Farmers working in a greenhouse equipped with smart agriculture technology

MOTIVATION

The rapid urbanisation in China with the view of pro-urban has highlighted the urban-rural dichotomy and resulted in a significant urban-rural disparity (Davoudi & Stead, 2020). The development strategy of New-type Urbanization begins to emphasise urban-rural relationships and will promote the integrated development of urban and rural areas. However, to realise the coupled development of rural revitalisation and urbanisation, the 'three rural problems' left by history must be solved (Long, Tu, Ge, Li, & Liu, 2016). The phenomenon of rural hollowing is severe, and the non-agriculturalisation process has transformed the land use, population structure, and industrial base of rural areas. Therefore, it is an important research topic to break the constraints and help the rural area develop synergistically.

With the globalisation and informatisation of the market economy, e-commerce has initially shown its potential to drive the economic development of rural areas. The concept and application of smart villages have also been developed and emphasised in recent years (X. Zhang & Zhang, 2020). Along with the growing problem of rural hollowing out, new industries relying on digital platforms are gradually moving into the villages and activating abandoned rural land resources. The emergence of such phenomena as Taobao villages is one of the digital economy models of cooperation between people and enterprises in the context of booming e-commerce. The digital economy model bridges the gap between invisible economic development and tangible resources and space in the form of the Internet, and its development provides an excellent opportunity to reflow talents and revitalise rural areas.

Figure II 5G signal tower infrastructure constructed in rural areas

DEFINITIONS

1. Hukou: A unique Chinese household registration system that proves the identity information of each citizen. Each citizen has one and only one hukou location, including urban or rural, and there are certain limitations to changing the hukou.

2. Village: In China, the village is a concentration of the agricultural population and is commonly found in vast natural landscapes. People living in rural areas have rural hukou and mainly engage in agricultural production activities.

3. Villagers: People who live in rural areas and have rural hukou.

4. Village collective: A grassroots mass self-governance organisation of villagers in China responsible for implementing democratic elections, decision-making, management and democratic supervision activities for the development of villages, but is not an administrative organ.

5. Property owner: A farmer who owns arable land and other means of production and has the right to own and use the land.

6. TVE (township village enterprises): The market-oriented collective, cooperative or individual enterprises organised by villagers under the purview of local governments based in townships and villages in China.

7. E-commerce: An activity of buying or selling products on online services or over the Internet.

8. E-commerce business: A business entity that operates online, facilitating the buying and selling of goods and services over the internet. Examples of well-known e-commerce business companies in China include Taobao, Alibaba, and Amazon.

9. Alibaba: The world's largest company providing e-commerce and e-services, whose model is an online B2B (business to business) marketplace.

10. Taobao: The e-commerce platform of Alibaba, the largest C2C (customer to customer) online marketplace in China in terms of transaction volume.

11. Taobao village: An 'internet village community' based on Internet information technology, a cross-regional reorganisation of economic and social structures with Taobao as a medium for production, life and transactions, formed by a particular scale of villager groups spontaneously. (Chen, 2016)

12. E-commerce association: An organization or group that represents and supports the interests of companies and individuals involved in electronic commerce, providing resources, networking, and education related to e-commerce industry trends and policies.

13. Agritainment: An activity that combines the agricultural and tourism industries. It uses farming households as a unit and offers visitors a rural life experience with agricultural products and agricultural activities as an attraction.

1

BACKGROUND

1.1 CONTEXT

1.1.1 The necessity of rural revitalisation

Urban-rural relationships

China has transformed exceptionally quickly from a traditional agricultural society to a modern industrial society. The problem of urban-rural dichotomy has persisted throughout the development of urbanisation. Davoudi and Stead summarise two opposing schools of thought in their work (2002), including the anti-urban and pro-urban perspectives, in which the latter is the root cause of China's urban-rural dichotomy.

At the end of the nineteenth century, the flourishing of Western industrial civilisation and the impact of the market economy began stimulating the accelerated development of Chinese cities. The significant economic advantages of cities have led to a growing gap between urban and rural areas. Since the reform and opening up, the market economic system has even solidified the urban-rural disparity in China because of the long-accumulated production factors of cities (Bai, 2012). After establishing the unique Hukou system in China, the differentiated management process between urban and rural areas kept strengthening the vast gap in their relationships. The constant concentration of production factors in cities has directly led to an extreme imbalance in production activities and resource distribution.

Today, the city and countryside show a completely different picture (figure 1.1). Urbanised areas have become agglomerations of population, material and economic flows and have a constant attraction.The cities are completely dominated by high-end buildings and dense neighbourhoods with well-equipped public services. In contrast, rural areas are not competitive in the market economy and are at a stage of serious loss of development resources.

Figure 1.1 Urban and rural areas in China

Post-industrialisation

The industrialisation development accelerated after the establishment of China in 1949. With capital, technology and population flowing into the urban areas and dominating regional development, the industry became the leading sector in guiding social development (Zheng & Ye, 2009). The process had led to uneven distribution of developing resources between urban and rural areas, including job opportunities. As rural development is still based on the agricultural sector, young people tend to migrate into the cities for jobs rather than stay in small villages. As human resources decline, the lagging rural economic development reinforces the dichotomy between urban and rural areas.

Rural industrialisation started to happen during the 1950s, with the non-agricultural activities being collectivised by the commune system. Many rural collective enterprises developed based on the iron and steel industry, while small businesses, such as township and village enterprises (TVEs) and private enterprises (PEs), began to thrive in labour-intensive and light processing industries (Mukherjee & Zhang, 2007). According to Xu and Tan (2002), they all contributed directly to the substantial increase in income of rural populations, especially those small enterprises, because of their flexibility and productivity. As we stepped into the 20th century, the new-type urbanisation concept raised in 2014 indicated that promoting agriculture through industry is a critical path to urban-rural integration. The upgrading of rural industrialisation shows its significance and urgency for further regional development in China.

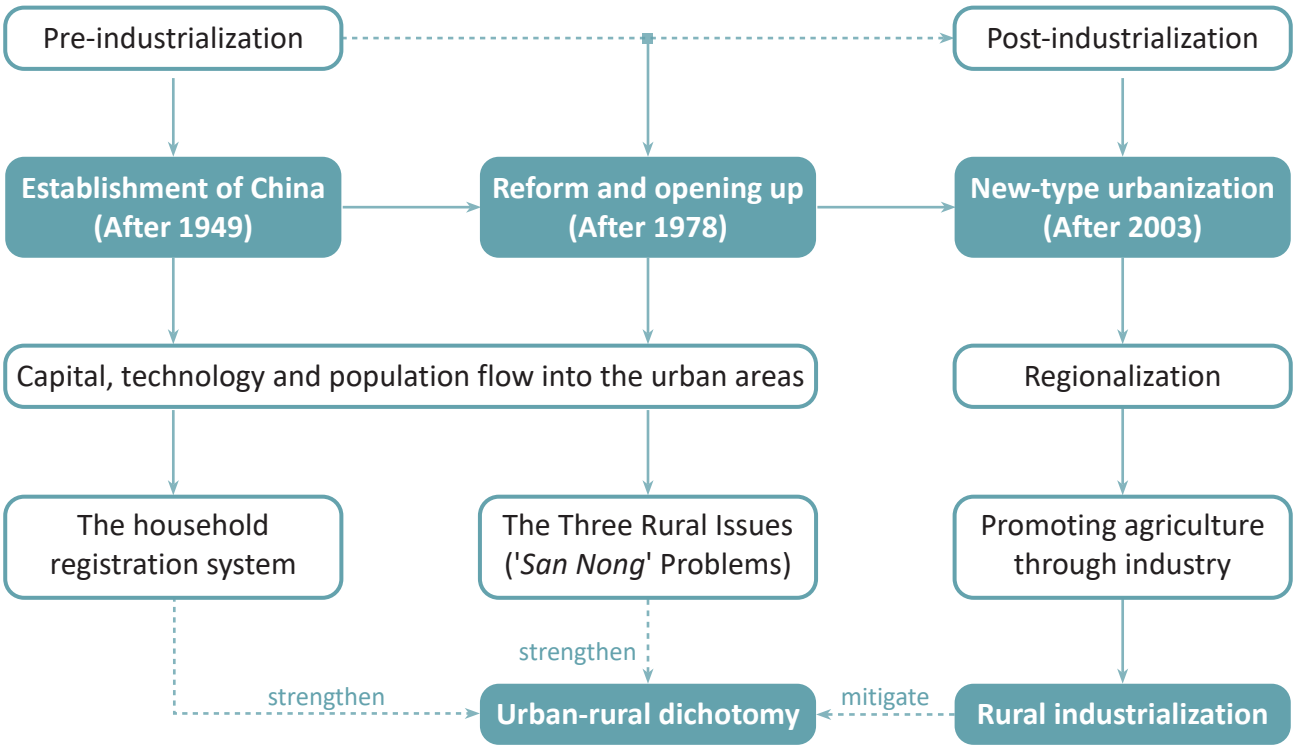


Figure 1.2 Industrialization process affects the urban-rural relationships in China

1.1.2 The rural dilemma

Declining rural areas

However, the direct result of rural industrialisation is the decay of agriculture. With industrial areas expanding to the countryside, more and more arable land was destroyed or occupied by construction activities. By 2018, agricultural land had been changed to construction land in varying degrees across the country, with the most significant decline, particularly in the eastern coastal area (figure 1.3). At the same time, the decline in the productivity of arable land over the years has shown the damage to the natural environment caused by uninterrupted urban development (figure 1.4). In research from Davoudi & Stead (2002), rural areas are no longer equated with traditional agriculture in the real urban-rural relationship. The urban-rural relationship will gradually shift from the single dependence of rural areas on the urban economy to a more complex cooperation system.

Promoting economic development through developing rural agricultural industry and establishing an integrated planning system can help narrow the urban-rural development gap and eliminate urban-rural barriers. The proposed rural revitalisation strategy reflects the previous pro-urban development outcome and a strategy to solve the problem of rural shrinkage (Chen, Zhou, Huang, & Ye, 2021). Therefore, rural revitalisation is a necessary research topic for solving the declining rural problem.

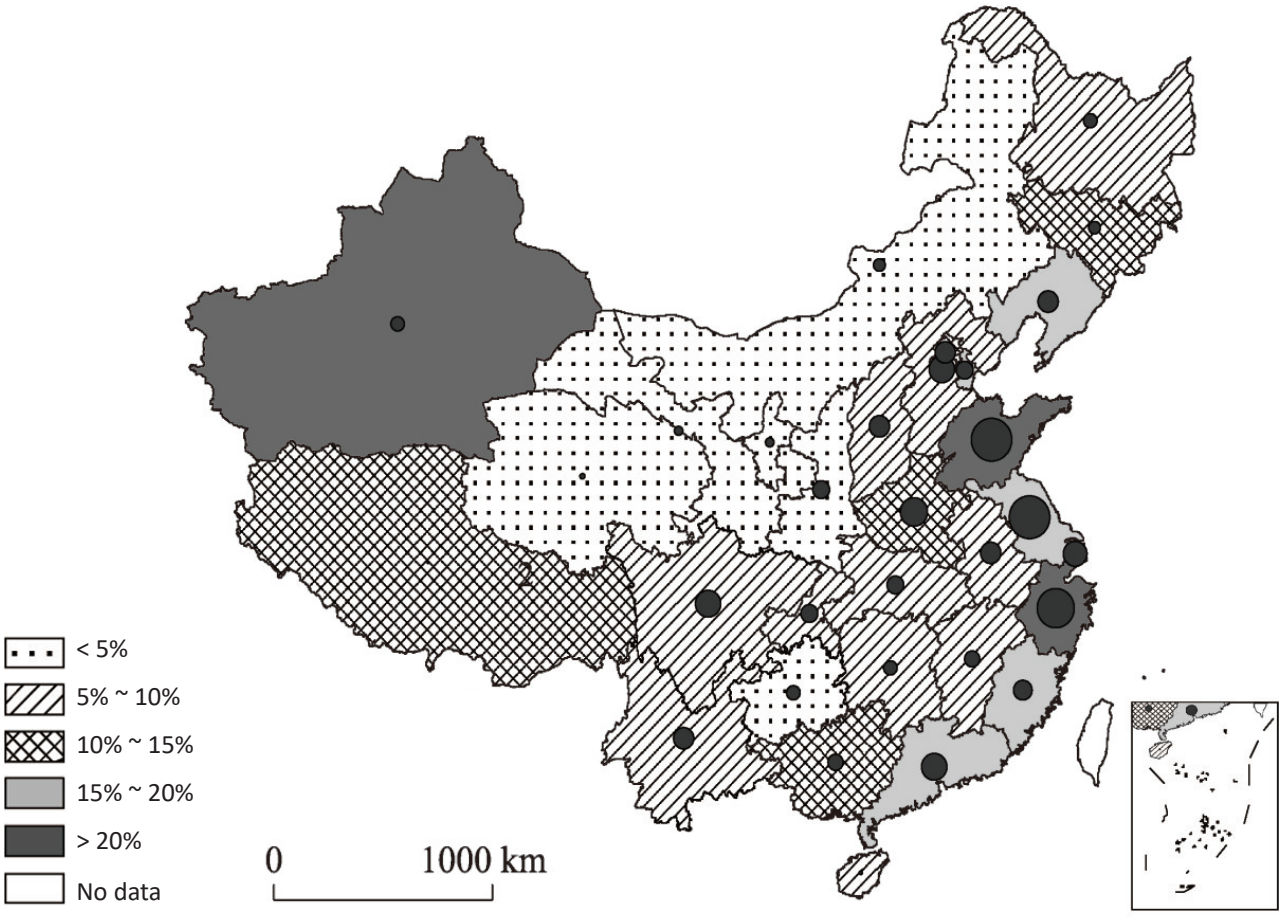


Figure 1.3 Map of the proportion of arable land occupied by construction land

The three rural problems

The strong attraction of urbanised areas has led to an increasingly severe problem of 'rural diseases'. The three rural problems, also known as 'San nong problems', are typical rural development dilemmas in China, which include the rapid non-agriculturalisation of the rural population, industry and land use (figure 1.5).

The non-agriculturalisation of the rural population closely connects with the phenomenon of rural hollowing. The data on employed workers in urban and rural areas show a steady decline in rural workers over the past two decades, who kept flowing into industries in the cities (figure 1.6). According to Liu (2018), nearly 290 million rural people have moved to the cities for better job opportunities and higher pay in non-farm sectors. With the exodus of the rural population, the loss of the young adult labour force limits agricultural activities in rural areas. Population ageing is a growing problem as older people become the main population in villages, too old to continue working on the arable land and maintaining traditional agriculture. With the decrease in farmers working in rural areas, it is difficult for the agricultural industry to continue to develop.

Consequently, the outflow of the population has left villages with many abandoned houses and land, which could be rented or sold at an extremely low price. In order to save the local economy, villages began to experience industrialisation by utilising those abandoned rural spaces. Rural industrialisation brings opportunities for rural development but creates more spatial conflicts. Due to the unregulated land acquisition system and land property rights, industrial land has caused excessive encroachment on the countryside (Liu, Bin, & Wang, 2014). In the vast rural landscape, huge factory buildings can be seen everywhere, confronting the small rural dwellings. The factories cultivated the local economy but damaged the soil and waterbody with their industrial pollutants. The resulting environmental pollution will further aggravate the living conditions in the villages, prompting more people to leave the villages.

Industrial development inevitably takes a further toll on traditional agriculture. Due

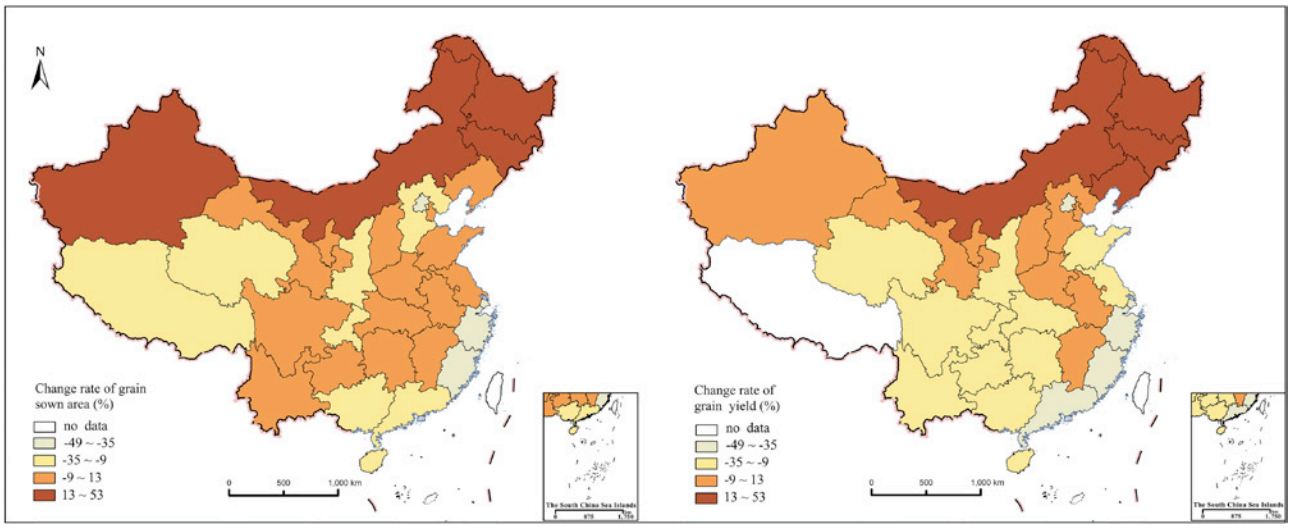


Figure 1.4 Change rate of grain sown area and yield in 2000 and 2013

to the transition of resource exploitation, environmental degradation commonly occurs in villages. According to a national study done in 2014 on the quality of arable land nationwide, the degraded area of arable land nationwide has exceeded 40% of the total arable land area. At the same time, the lack of infrastructure makes the rural domestic, and industrial waste discharged recklessly, aggravating the rural environmental problems.

How can rural areas break through their existing constraints to seek development for a better future? There is an urgent need to break the vicious cycle of rural disease and revitalise the countryside, a vital issue to help balance urban and rural resources and promote urban-rural integration. As the basis of rural life, agriculture should be valued carefully while revitalising the countryside.

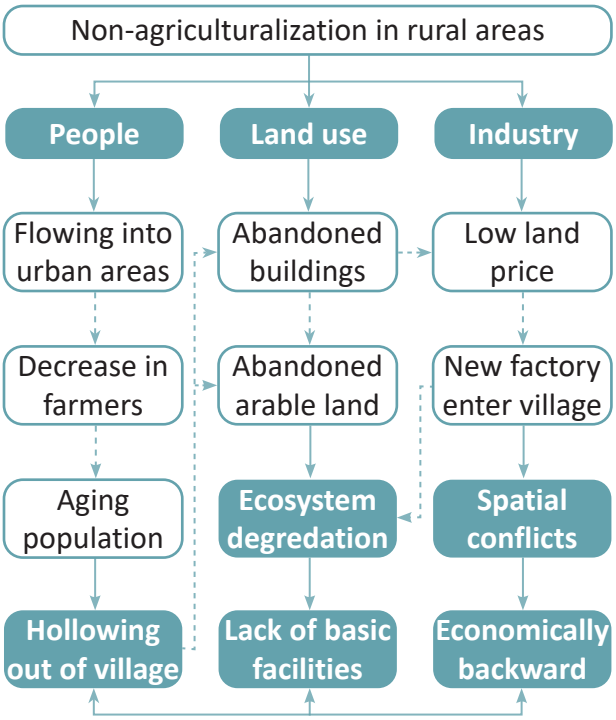


Figure 1.5 The vicious cycle of 'rural disease'

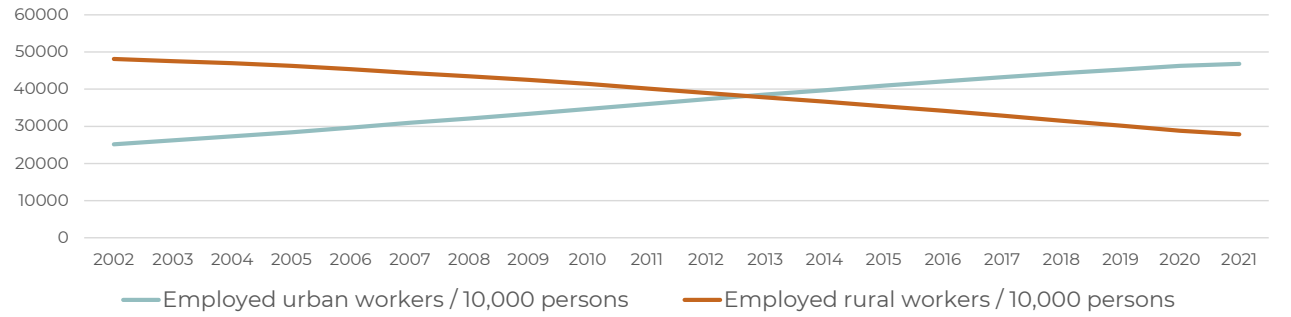


Figure 1.6 Number of employed workers in urban and rural areas

Figure 1.7 The non-agriculturalization of people, land use, and industry affects the rural space

1.1.3 A new way of rural development

Taobao Village developed quickly

Despite the many difficulties encountered, Taobao Village shows the possibility of future rural development since it developed quickly in the past decade. According to the public data shared by Alibaba Research Institute, the number of Taobao Villages throughout the country has kept increasing every year since they emerged. The number of Taobao villages in the coastal area has achieved leapfrog growth, and the growth rate of Taobao Villages in the central region generally exceeds that of the eastern coastal region (figure 1.8 & 1.10).

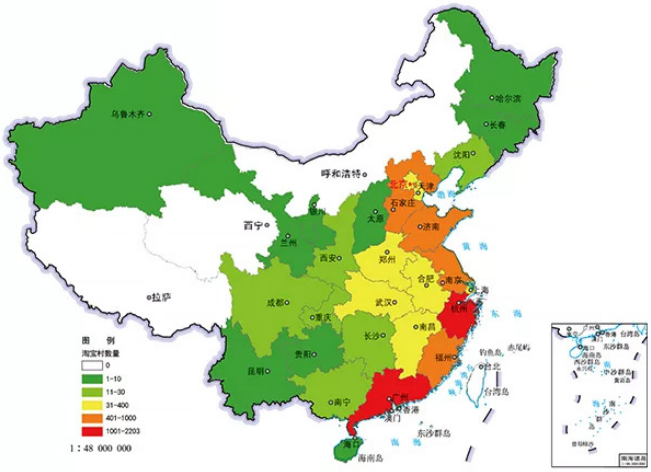


Figure 1.8 Taobao Villages distribution map

What is Taobao Village? It is a development model for villages to develop e-commerce spontaneously based on Internet technology. Taobao is one of the most mature online platforms for providing products and trading services in China. Today, villages across the country have the potential to develop this kind of digital economy model as their wish. Due to its geographical location, the eastern coastal region has the highest concentration of Taobao village development (figure 1.9). In particular, the Greater Bay Area has more Taobao villages than any other region, demonstrating the potential for rural areas in GBA.

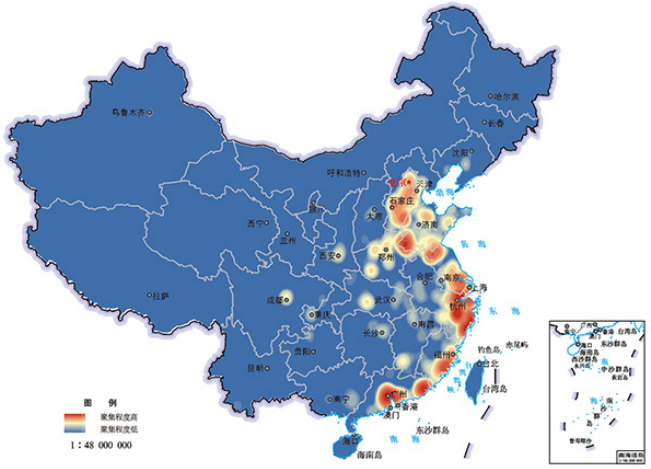


Figure 1.9 Taobao Villages kernel density analysis

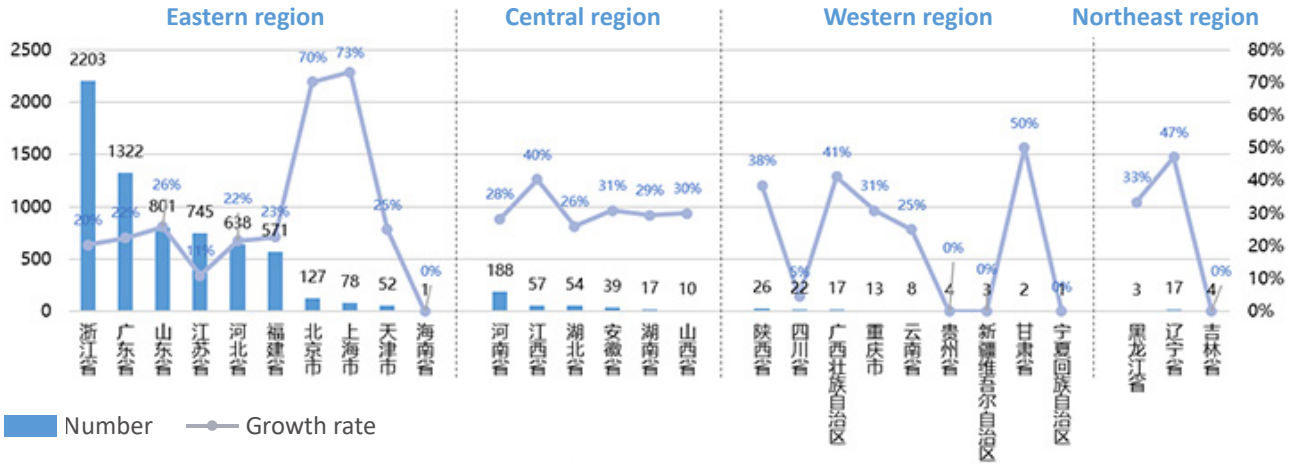


Figure 1.10 Number and growth rate of Taobao villages in 2021

Facing post-pandemic limitaions

Unfortunately, the arrival of the 2020 pandemic has impacted hugely urban and rural development. The Chinese government's strict policies on epidemic prevention have restricted the cross-regional flow of factors, and the traditional rural development path has been hampered. The tangible and intangible boundaries restrict and block the flow of resources, which increases the difficulty of resource allocation and regional development (figure 1.11). Over the past decade, the number of migrant workers flowing from the countryside to the cities achieved negative growth for the first time in 2020.

However, the future possibility has emerged already. Taobao villages have shown a high growth trend every year since they appeared in 2009 (figure 1.12). Even in the face of the 2020 pandemic, the number of Taobao villages growing has not been affected (figure 1.13). In the digital era, the Internet has changed people's lifestyles and inconspicuously penetrated the countryside's daily life. Currently, many different models of digital technology are entering rural areas to help industry development. The emergence of e-commerce models corroborates the possibility of digital economic development in villages, which can structure new social relations and help reshape rural spaces (Zi, 2019).

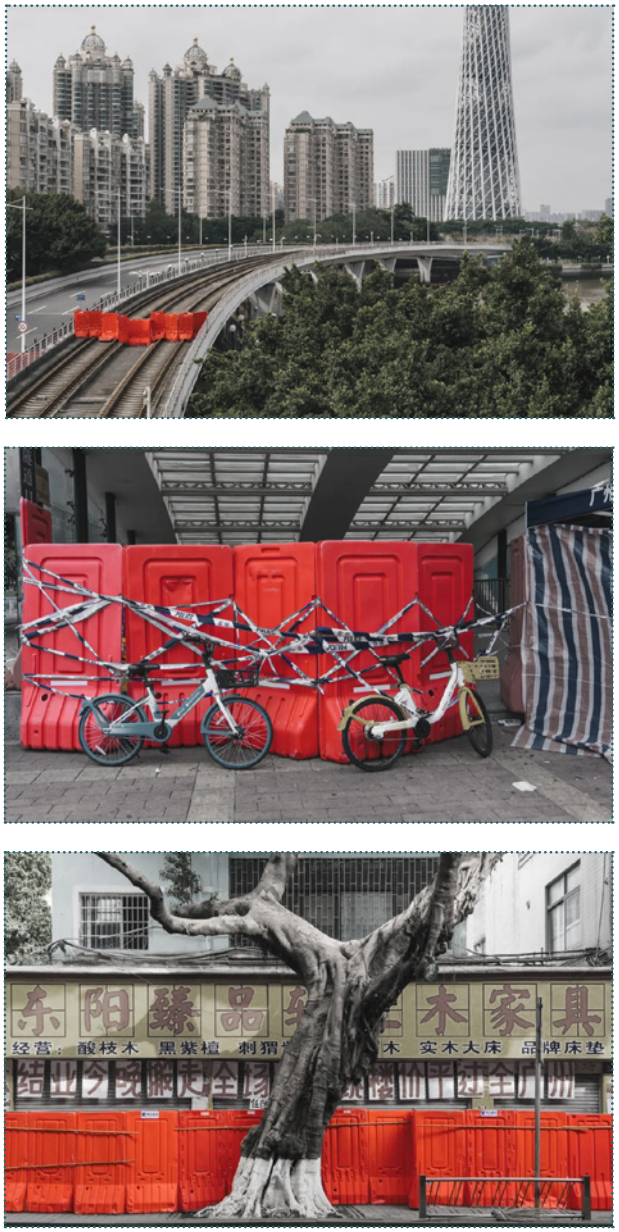


Figure 1.11 Borders during post-pandemic

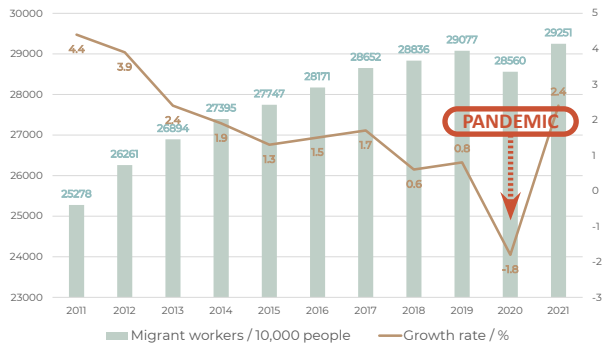


Figure 1.12 Population and growth rate of migrant workers from 2011 to 2021

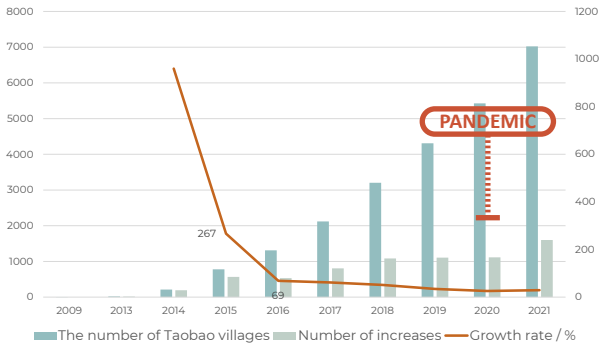


Figure 1.13 Taobao village number, increase and growth rate in China from 2009 to 2021

1.1.4 Taobao Villages as a future possiblity

Globalised market with e-commerce

From a globalisation perspective, the emergence of e-commerce can provide more market opportunities for rural economic development. Since digital platforms can create more efficient and transparent market information, economic transactions across time and space have become possible. Instead of being limited by the central place theory, rural economic development can participate in the global market with the support of the online platform.

China's e-commerce transactions had a massive rise in value between 2005-2016, capturing over 40% of the global market share (McKinsey Global Institute, 2017, figure 1.14). From a worldwide perspective, China has already taken on a large number of export transactions, which are based on a well-established logistics infrastructure (figure1.15). These are all opportunities for developing e-commerce for the future of rural areas.

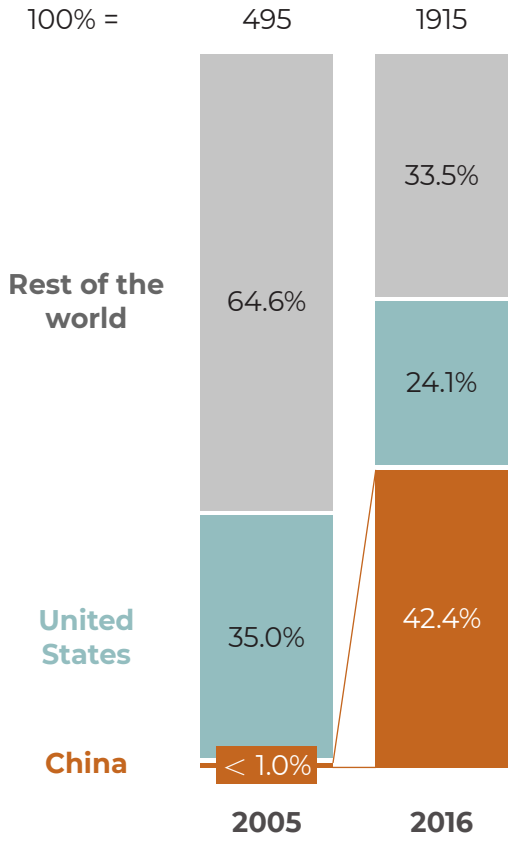


Figure 1.14 E-commerce transaction value

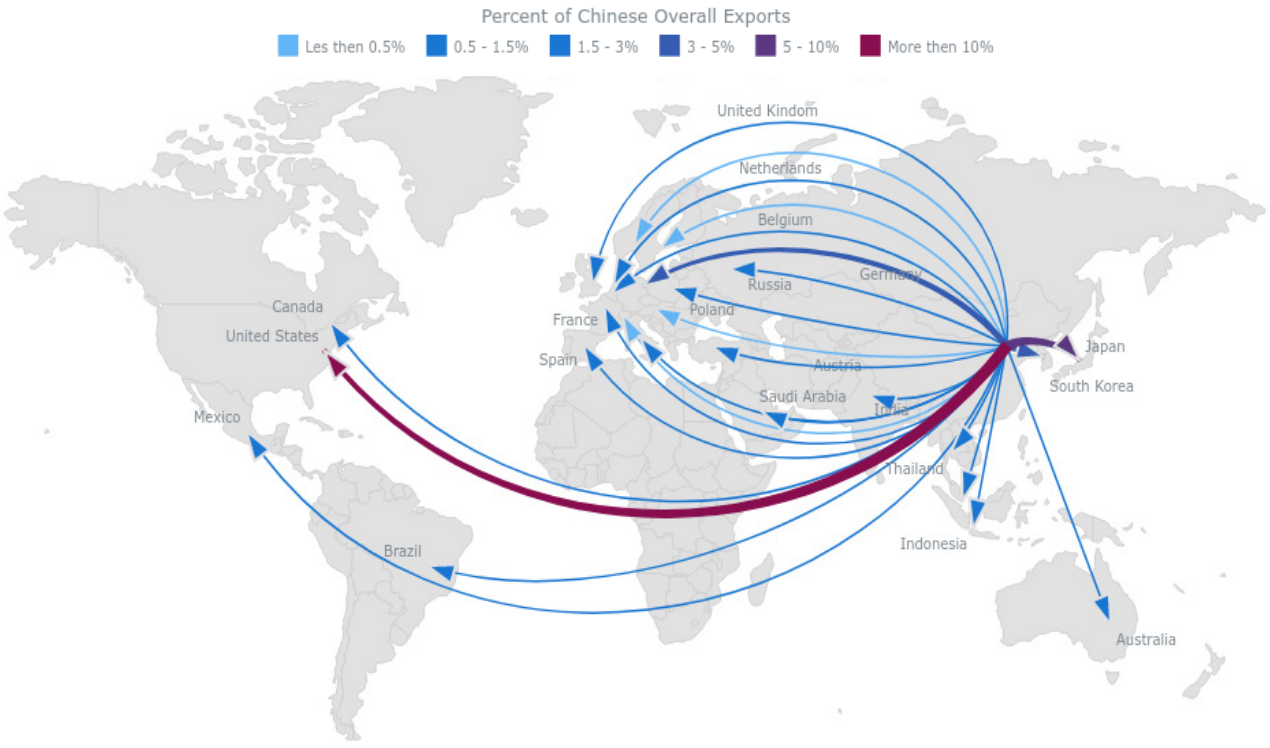


Figure 1.15 Chinese export trade flows to the world

Digitalisation in rural areas

Rural areas are becoming more and more informative, and the smart village concept is gradually gaining attention (X. Zhang & Zhang, 2020). The Chinese government has also noticed this trend and has issued documents to facilitate network infrastructure development in rural areas, especially the construction of 5G signal base stations. The statistics already point out that the number of broadband internet users in rural areas, even in poor villages, has been steadily increasing (figure 1.16).

In the countryside, digital technology has already been embedded in the daily lives and productive work of villagers. Live streaming is one of the most popular functions developing in the countryside. It is easy for the villagers to learn to utilise low-cost technology to sell their agricultural products using smartphones. For villages with historical sites or beautiful landscapes, online streaming is also the most effective way to promote rural tourism. From the logistic perspective, drone delivery is already a mature technology used in rural areas to complete the last mile of transportation.

On the other hand, digital services in China have started to diversify. Many Internet companies have started to create digital ecosystems that provide services, including finance, transportation, shopping, entertainment, and other functions (figure 1.19). The improvement of the e-service system provides support for the digital development of rural areas.

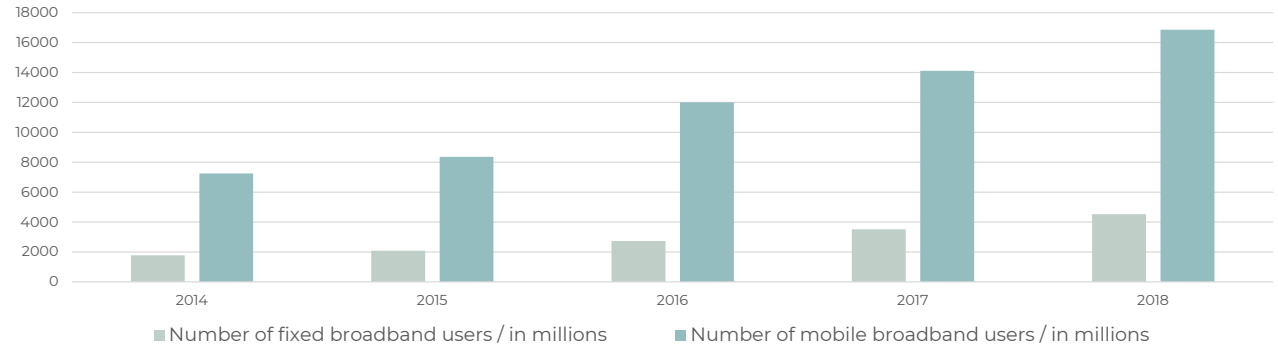


Figure 1.16 Number of broadband users in poor villages in China

Figure 1.17 Emerging rural e-services, including the construction of 5G signal base stations, Internet tutoring course, live webcasting, and drone logistics

Centrality

As a model of urban geography that explains the distribution patterns of economic systems in space, central place theory reveals the centrality of urban development and distribution. In particular, it can explain the logic of the distribution of urban and rural settlements in terms of number, size and location.

A distinct logic of hierarchy exists in the urban-rural system in ancient Chinese society, especially in the traditional rural areas. As the most minor human settlement, the village fulfils the function of daily human living. The town becomes the first level central point for the dispersed villages, concentrating the main economic transactions in the rural areas. As a higher-level central place, the city collects tremendous resources for social development. The traditional relationship between the township and the city allows for a centrality of trading behaviour in the market, which is the basic logic for social development from the spatial perspective.

In modern society, the emergence of e-commerce has broken traditional centrality. With the help of digital platforms, villagers can shop directly online instead of going to the town to buy something. Goods will be delivered directly to the villagers through a logistical transport system. Digitalisation cuts across the central place theory and opens up the possibility of future decentralisation in rural areas.

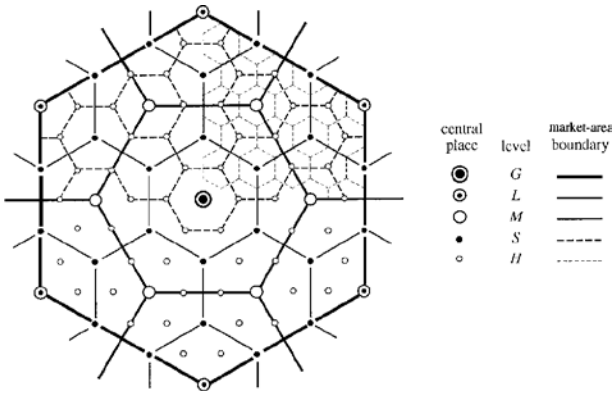


Figure 1.18 Central place theory

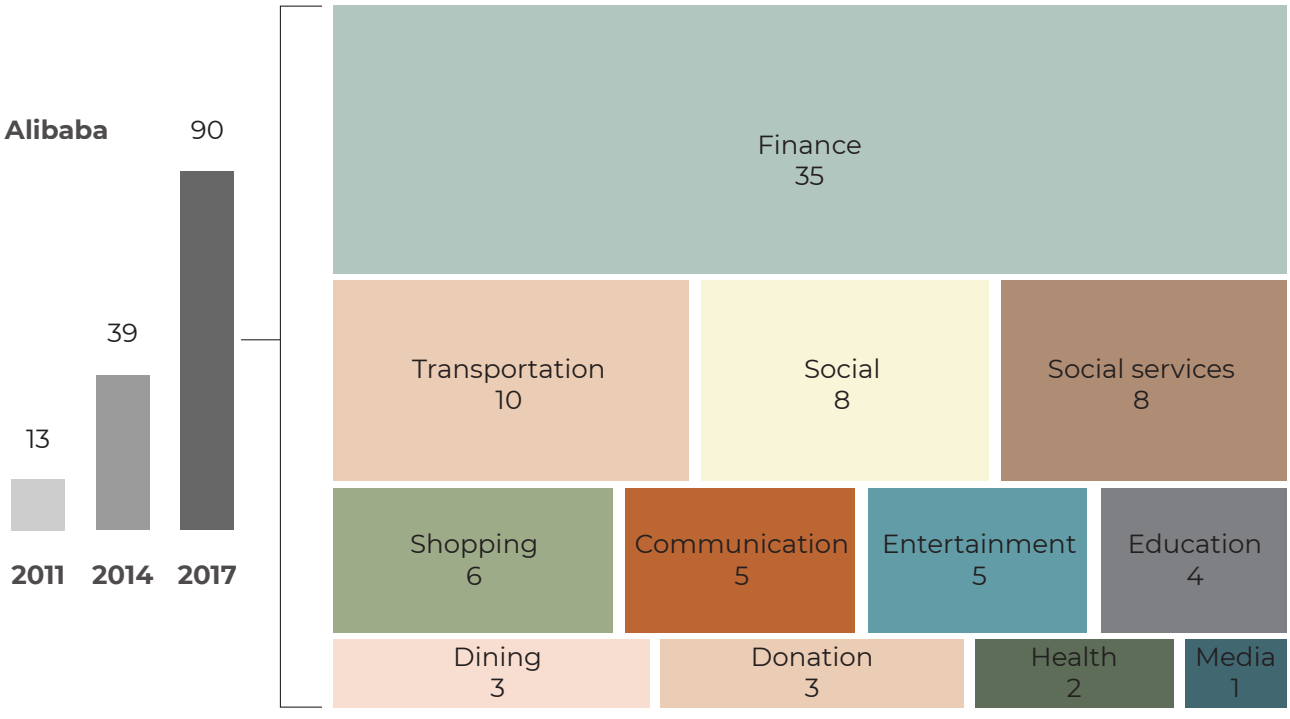


Figure 1.19 Digital ecosystem built by Internet company in China

1.2 RESEARCH FOUCS

1.2.1 Rural areas in GBA

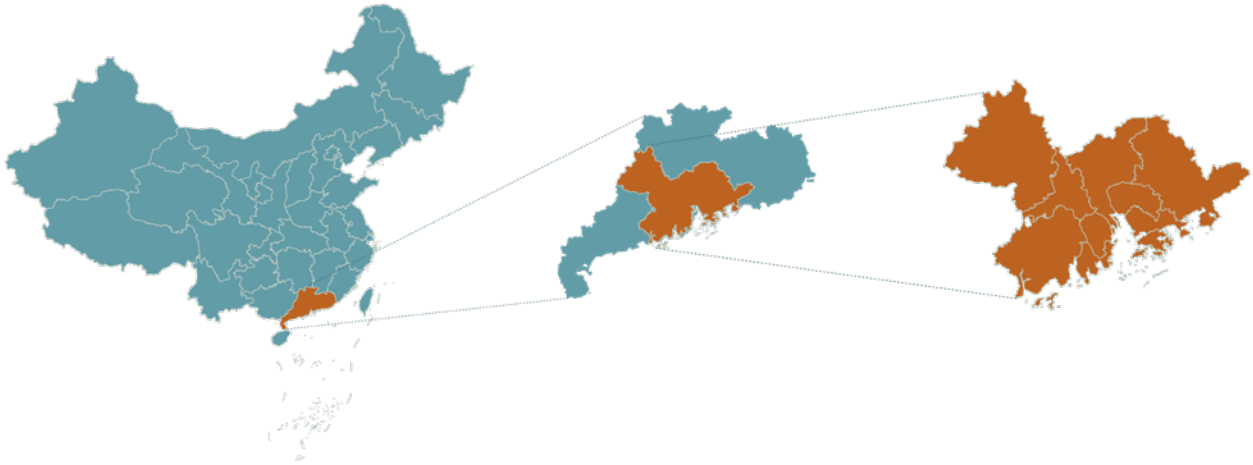


Figure 1.20 Location of research area

Currently, Taobao Villages are thriving in the eastern coastal area of China (figure 1.8), especially the delta area, because of the concentrated development resources. As one of the four largest bay areas in the world, the Greater Bay Area is an integrated economic area developing in China located in the central part of Guangdong province (figure 1.20). It consists of 9 cities and 2 special administrative regions, including Guangzhou, Shenzhen, Zhuhai, Foshan, Dongguan, Zhongshan, Jiangmen, Huizhou, Zhaoqing, Hong Kong and Macau, with a total area of 56,000 square kilometres. In 2018, the total built-up area of the GBA reached 9,143 square kilometres, mostly concentrated in urban areas in the delta hinterland. The Greater Bay Area has experienced rapid urbanisation in the past two decades.

In contrast, the vast landscape has spawned countless villages, with large rural areas urgently needing development. Due to its unique geographical location, the rural development of the region is highly valued. In 2000, agricultural land was the dominant land use function in the delta (figure 1.21). The rich soil and water resources have supported the development of agriculture. But after two decades of rapid urbanisation, built-up areas have dominated the delta (figure 1.22). The built-up area has severely eroded and destroyed the original agricultural land. Even agricultural land not in the hinterland of the Greater Bay Area has experienced varying degrees of decline.

With the concentration of economic development and rural resources, GBA has become one of the first regions to experience the development of Taobao villages and has witnessed their prosperity. Therefore, it is of great interest to study the resources of the rural areas and identify the possibility of developing smart villages in the future with the GBA as an example.

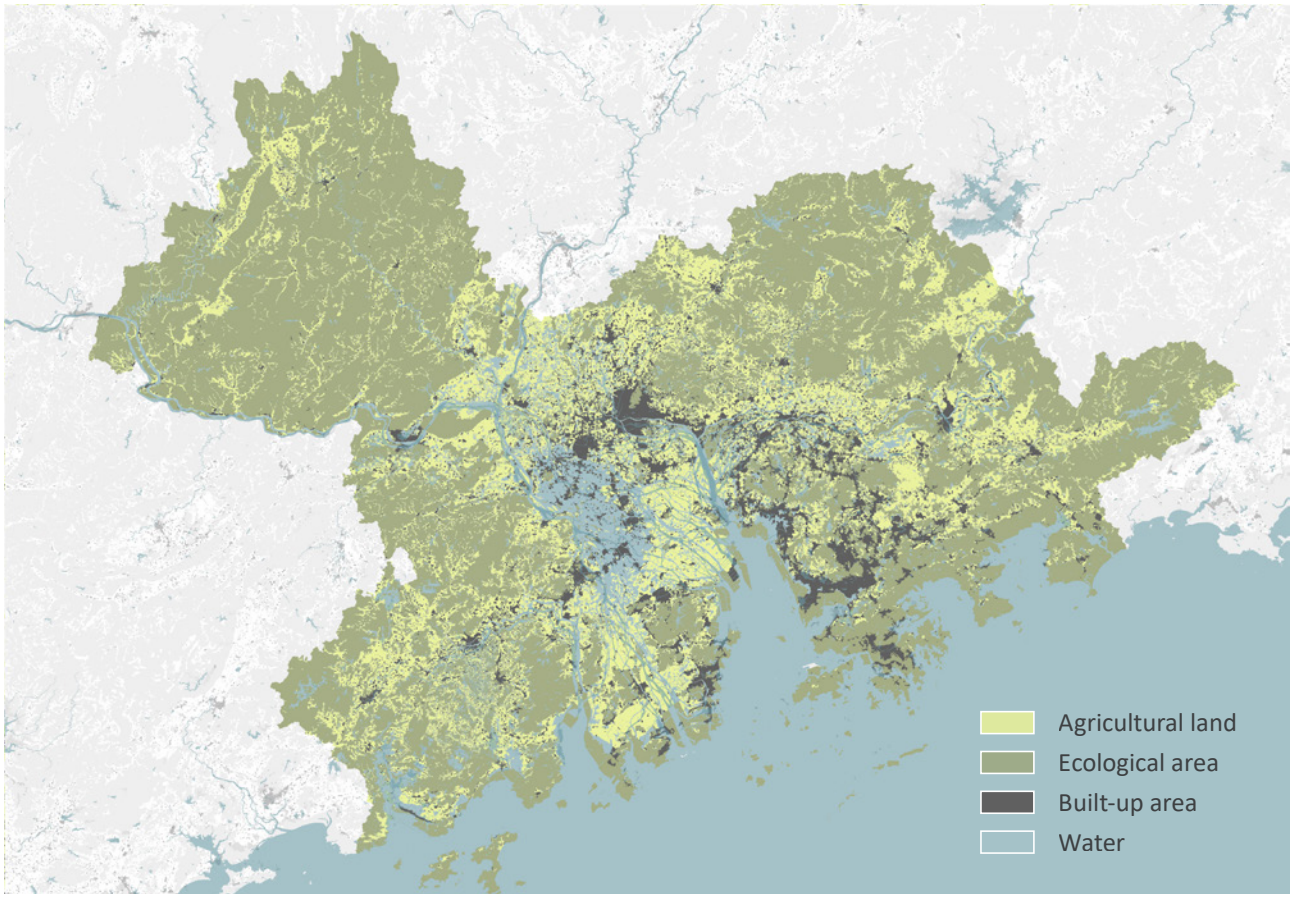


Figure 1.21 Landuse of Greater Bay Area in 2000

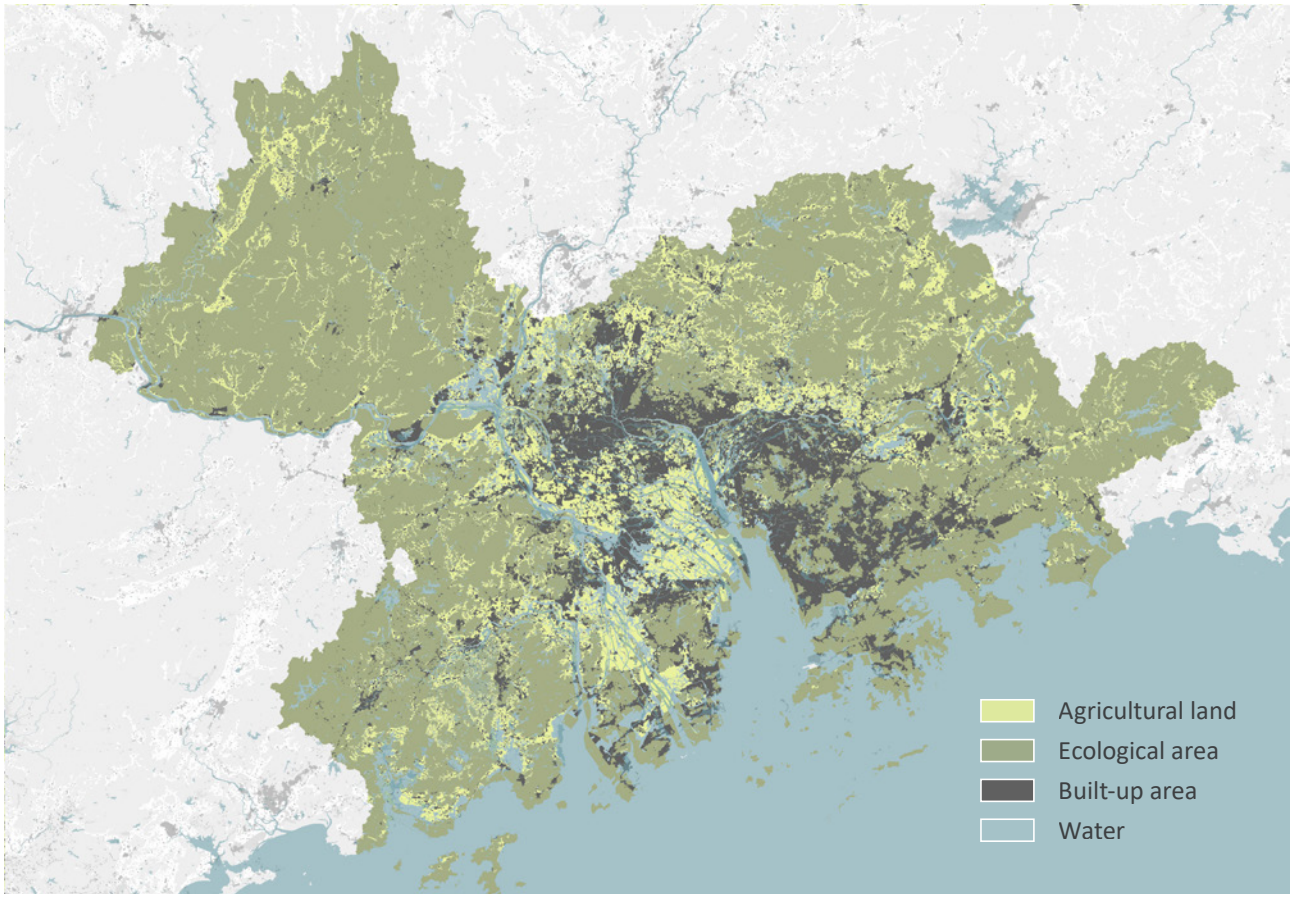


Figure 1.22 Landuse of Greater Bay Area in 2020

1.2.2 Taobao Villages in GBA

Taobao villages are growing very fast in the Greater Bay Area. With the exception of Shenzhen, which is already fully urbanised, the other eight cities have developed varying numbers of Taobao Villages (figure 1.24). As the city with the highest concentration of development resources, Guangzhou has the most villages under the Taobao Village development mode.

The quality of life in many villages has been improved, and villagers are involved in developing the village economy (figure 1.23). More and more shops in the villages are cooperating with Alibaba to become rural Taobao shops and beginning to develop a new commercial way by combining online and offline selling. With the advent of e-commerce, rural logistics also began to develop. While most of the industries involved in Taobao mode require a lot of human resources and do not require high-end technology, more and more villagers are able to join the industry. Villagers gradually realise they can find local job opportunities, and the problem of rural brain drain is initially being alleviated. The governments have also shown an interest in the e-commerce phenomenon, with many villages organising e-commerce training courses to help villagers learn online skills.

However, this is not a universal development situation. As a new economic development model, Taobao Village can certainly help villages develop their industries, but there are still many problems to be solved to achieve sustainable rural revitalisation.

Figure 1.23 The thriving of Taobao Villages

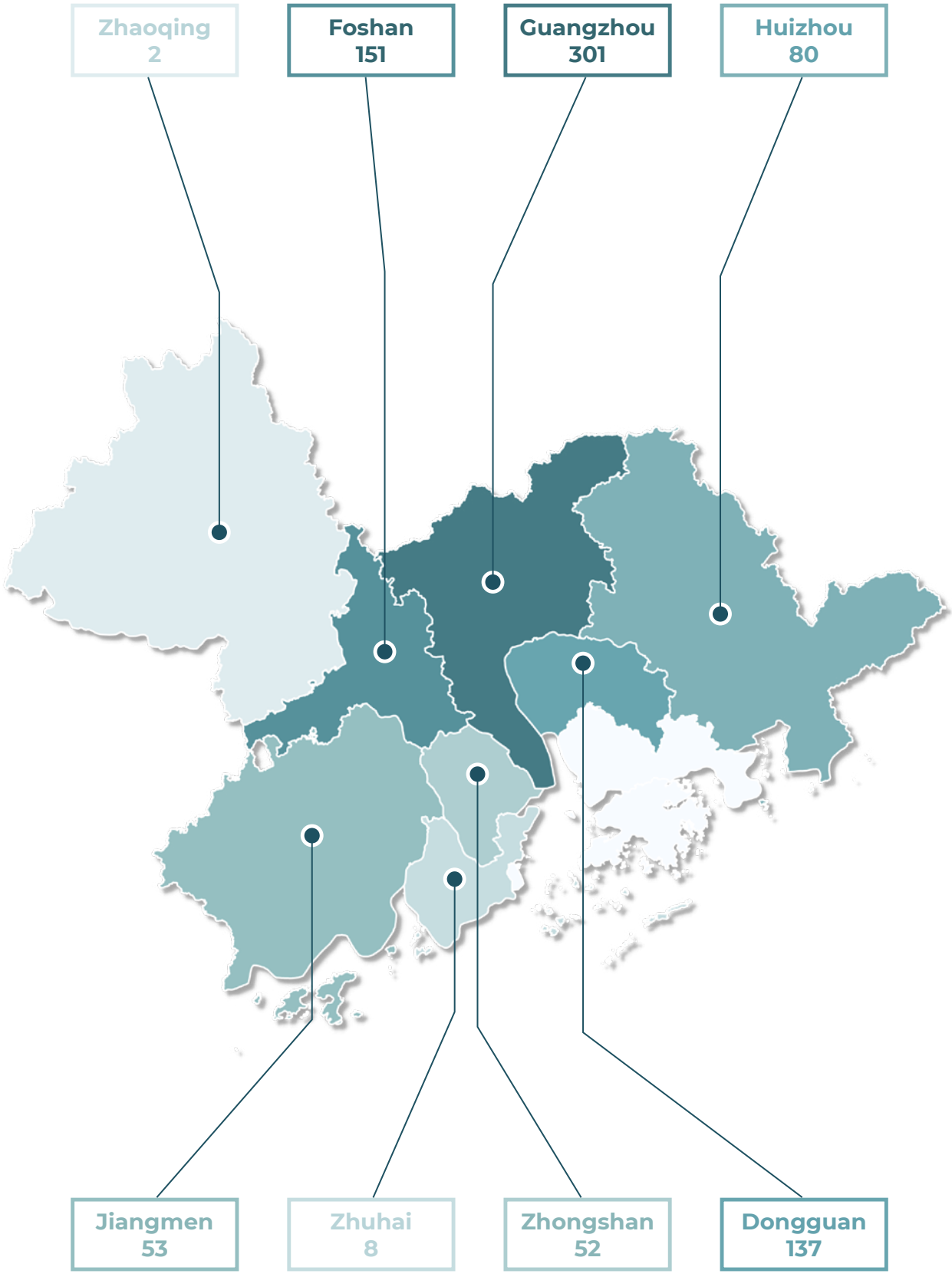


Figure 1.24 Taobao Villages distribution in GBA

1.3 PROBLEM POSITIONING

1.3.1 Differentiated spatial development

Regional accumulation and dispersion

The regional distribution of Taobao villages shows a polarisation between accumulation and dispersion (Figure 1.25). This regional variability can reveal the resources required for rural development. Therefore, exploring the reasons for the distribution of Taobao villages on a regional scale can help to build digital villages in the future actively.

A large number of Taobao villages are concentrated in the rural areas around Guangzhou, Foshan and Dongguan. It can be found that Taobao villages will develop near different land use functions, especially industry and agriculture. In addition, their development is linked to the construction of infrastructure and the gathering of population resources. Due to the proximity of these villages to the city, they can use and share most of the city's resources. It can be seen that Taobao villages will currently tend to cluster in the suburban areas of the city where resources are easily accessible.

In contrast, Taobao villages in cities such as Jiangmen, Zhaoqing and Huizhou are more dispersed. Mountains and farmland are the dominant geographical conditions in these areas, resulting in the built-up areas being small. The transformation of villages is limited, and only villages close to towns with a concentration of resources are allowed to develop. However, fewer resources for development and an industrial base are the general dilemmas facing village development. With a vast natural base, there is a need to provide the necessary conditions for the transformation of villages, thus helping to revitalise them.

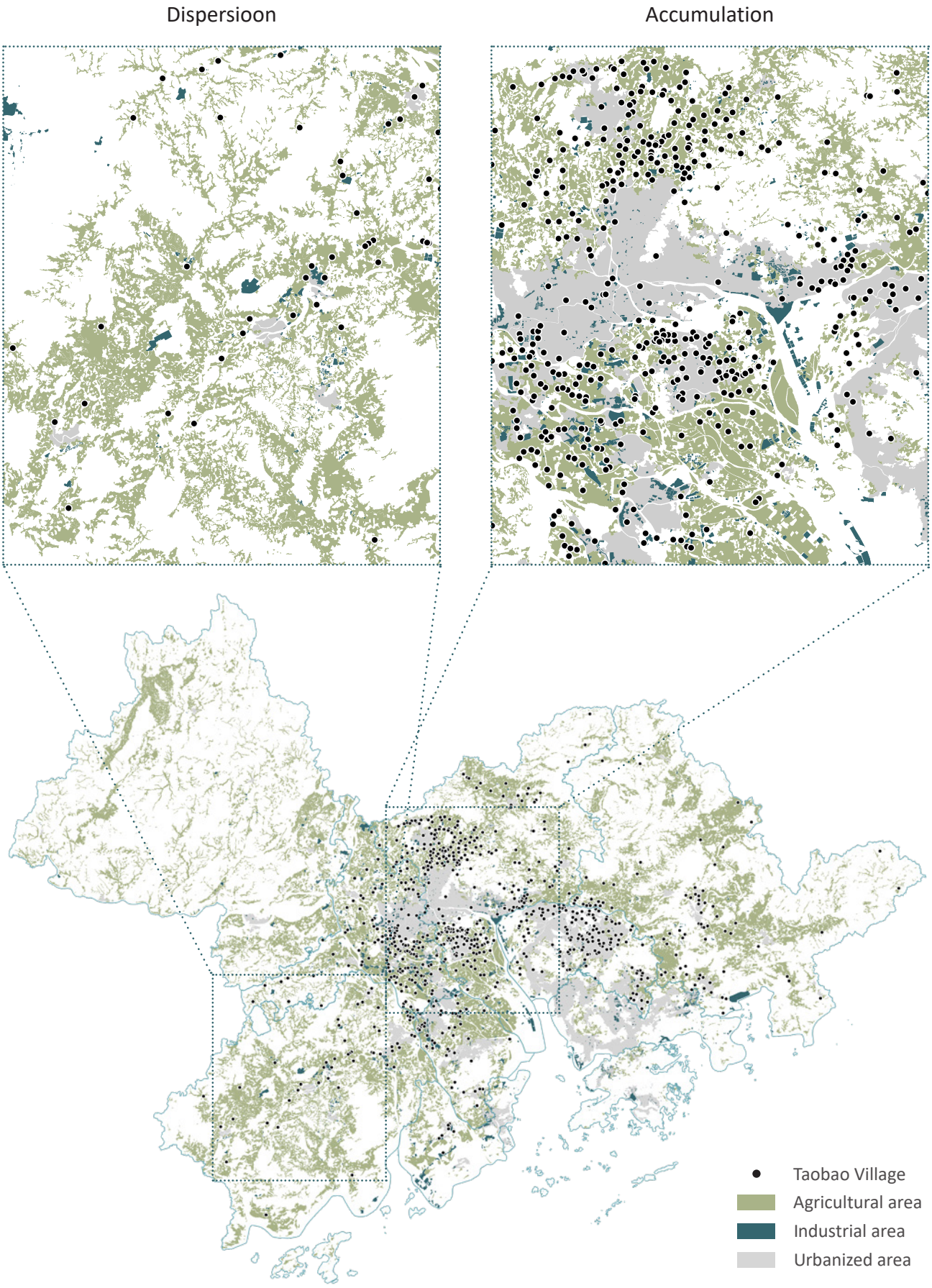


Figure 1.25 Distribution map of Taobao Villages in GBA

Shortage of basic infrastructure

The development of the countryside is constrained by a lack of resources, especially for basic public services. In contrast to the cities, the construction of rural infrastructure has always lagged behind (figure 1.27). In the countryside, many buildings are still in rough condition, and the quality of construction varies. Some houses do not even have a complete water and electricity supply. At the same time, the government's road facilities are not well laid out due to the nature of the land. The lack of transportation facilities will also limit the logistics, thus preventing the development of the rural economy.

In terms of Internet penetration, it has been slowly increasing each year in both rural and urban areas, which indicates the potential of digitalisation for the future (figure 1.26). However, Internet development in rural areas has always lagged behind urban areas regarding network roll-out. Together with the ageing population, many rural elderly do not know how to access the Internet. Digital literacy is also an essential aspect of the developing process that is needed to be considered.

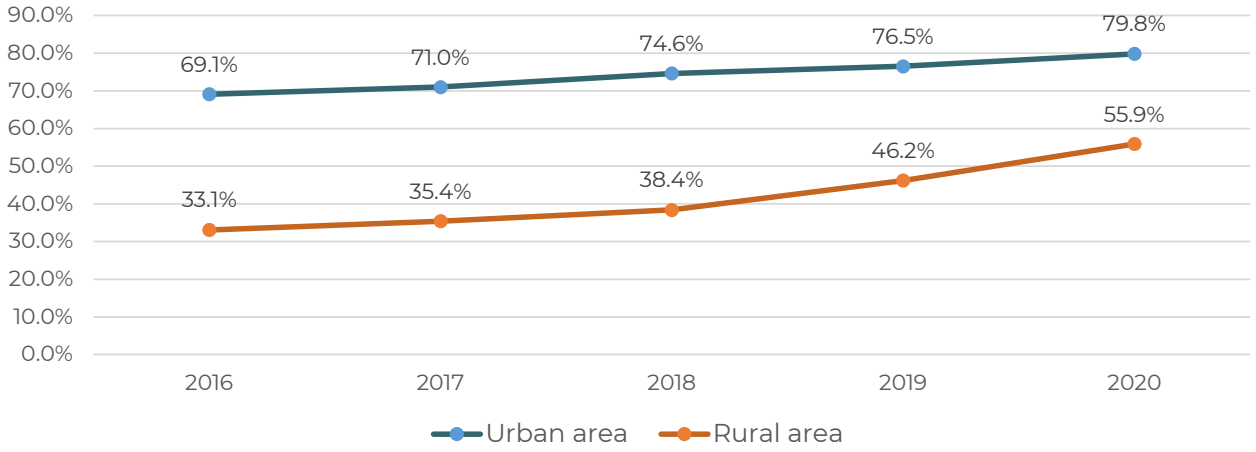


Figure 1.26 Comparison of Internet penetration rate in urban and rural areas

Figure 1.27 Lack of infrastructures in rural areas, such as supermarket and road construction

1.3.2 Degrading rural ecosystem

Potential of ecosystem in rural areas

In the study by Peng J., ecosystem services are a critical composite indicator of the ecological effects of urbanisation (2017). Therefore, understanding the ecological effects of the countryside can help raise environmental concerns in the development process of the countryside and recognise the importance of rural revitalisation for the future development of the GBA. According to a new study on the ecological context of the GBA (Jiang et al., 2021), both carbon sequestration and food production services are essential services rural ecosystems provide (Figure 1.28).

The supply of carbon sequestration is higher in areas with higher vegetation cover, while the supply of food production services is higher in arable land, grassland and water bodies. At the scale of the entire Greater Bay Area, the eco-region is mainly located in the peripheral areas, mainly including Zhaoqing, Jiangmen and Huizhou cities. At the same time, these cities have the most significant number of rural areas, showing a strong link between the countryside and the ecosystem.

In contrast, cities in the central region, such as Guangzhou, Shenzhen and Hong Kong, receive meagre ecological benefits due to high population density and rapid urban expansion. As rural areas have a surplus of ecological services, cities need the countryside to provide them with ecological benefits.

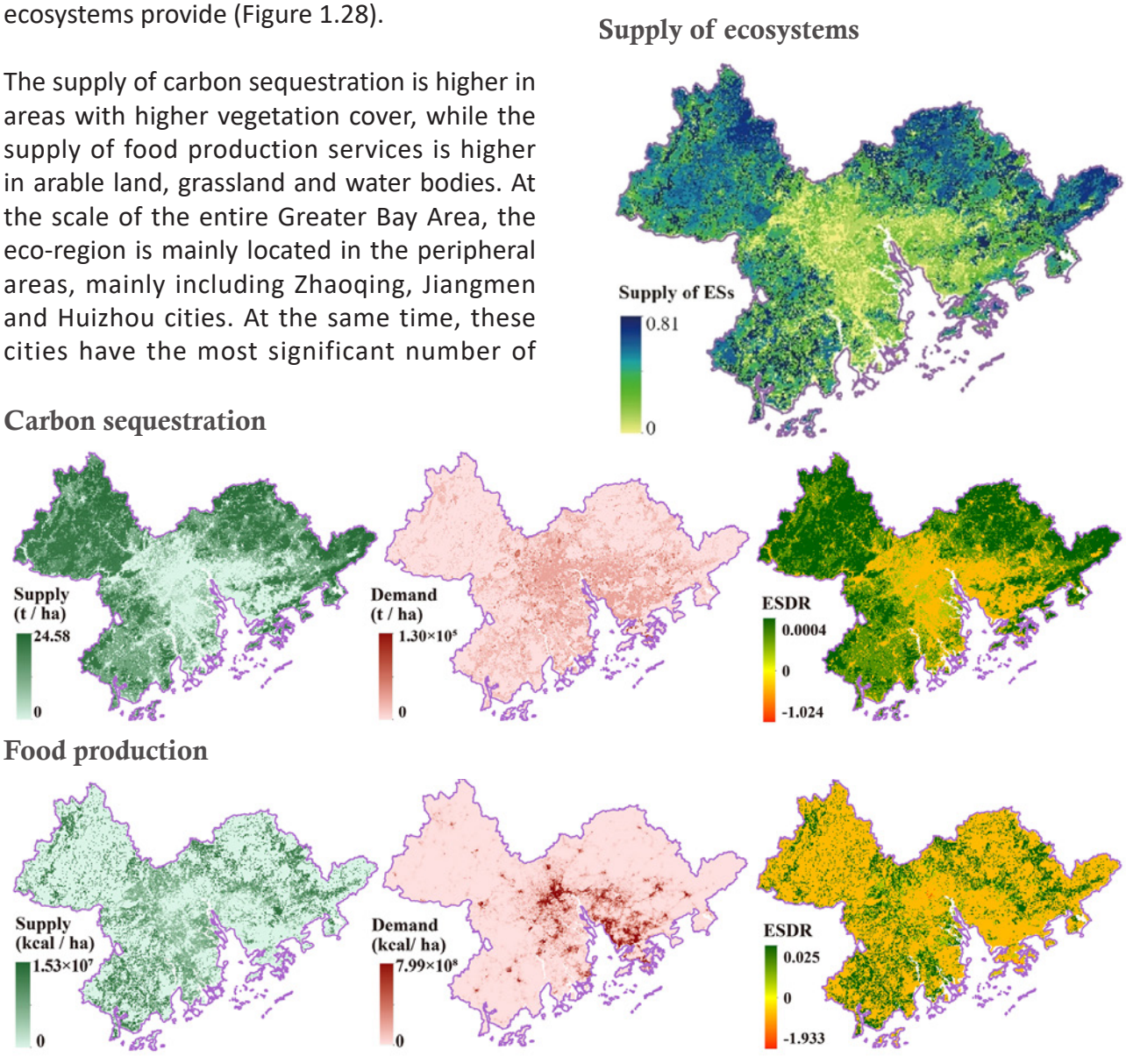


Figure 1.28 Ecosystem supply-demand ratio maps show great potential in rural areas

Uncontrolled construction

In such a context, village collectives and landowners have the strongest right to govern rural development. As a bottom-up development model, villages have the right to determine their land construction and planning.

The lack of top-down control has led to a chaotic development of rural spaces. The economic backwardness has led to an urgent need for more industrial development in the villages. Industrial land has often encroached on rural spaces in order to build more factories, which would provide villagers with jobs close to their homes. In the absence of forward-looking development plans, factories, rural dwellings, and farmland can be found in close proximity to each other in the modern countryside (figure 1.29). The conflict between land uses affects the quality of the rural habitat. Noise and pollution from factory operations can affect the daily lives of villagers and the quality of farmland.

In order to make money, villagers will privately build additions to their homes and rent them out. The development of the Taobao model still requires offline physical space for e-commerce offices and storage space, so villages with low rents tend to attract incoming businesses easily. Worse still, villagers may choose to rent out the use of the land and demolish the original dwellings for factory construction just for higher income. More and more poor-quality buildings are being built, ruining the rural scenery. All of this contributes to the reduction of public space and the quality of the living environment in the countryside.

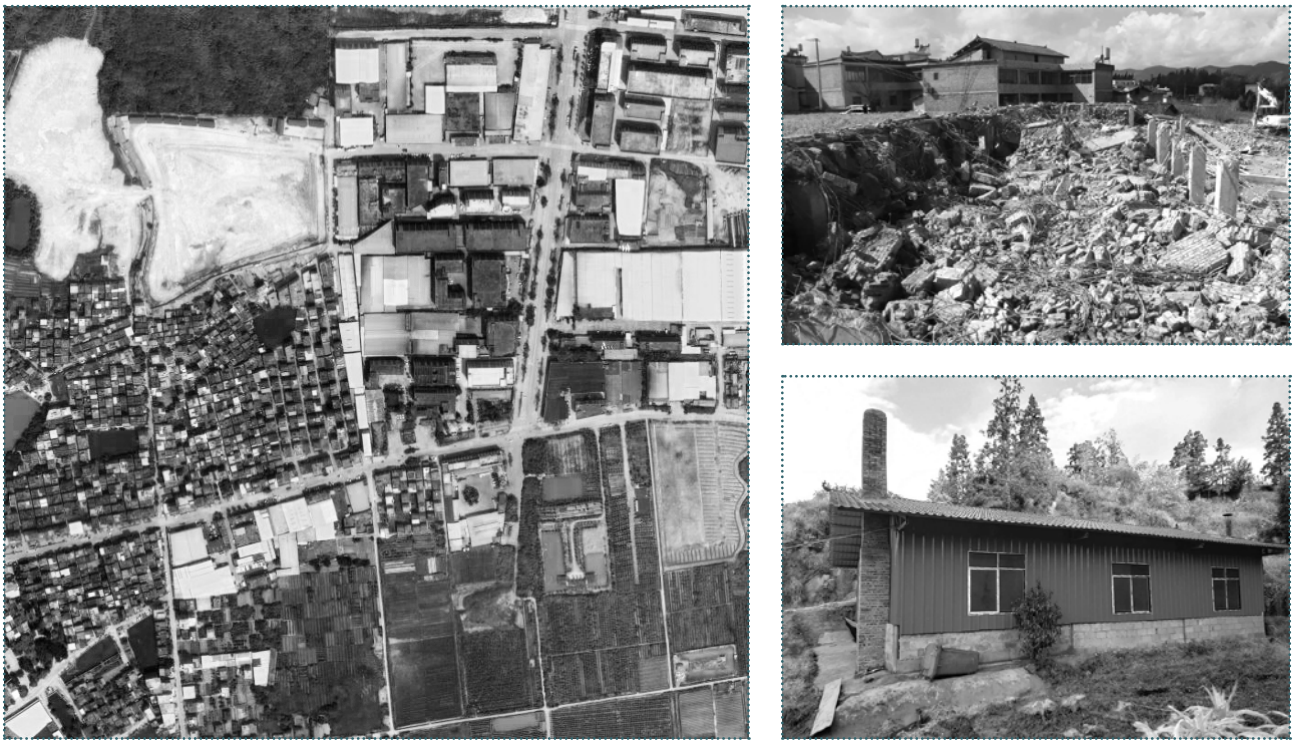


Figure 1.29 Spatial conflicts due to disorderly construction in rural areas

Destruction of agriculture

Uncontrolled construction has also damaged the rural ecosystem, especially the agricultural system. The agricultural land in GBA has decreased significantly in the past 20 years (figure 1.31). In 2000, the area covered by paddy fields reached 10,985 km2, while that of cropland reached 4,676 km2 (figure 1.30). By 2020, their areas have dropped by more than 1,000 square kilometres and 800 square kilometres respectively, leaving a total of less than 14,000 square kilometres of agricultural land in the GBA. The phenomenon of arable land degradation occurs not only in the delta hinterland, where the built-up area is most concentrated but also in remote mountainous areas. It shows that the impact of rural industrialisation on agricultural land is widespread. Since current Taobao villages focus mainly on the secondary industry and overlook the primary industry, it has caused damage to the natural landscape situation. That is, this kind of development doesn't solve the problem of non-agriculturalisation in rural areas but even worsens it.

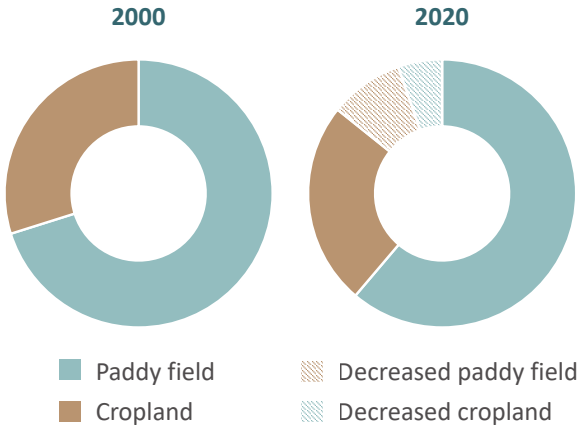


Figure 1.30 Data of decreased area

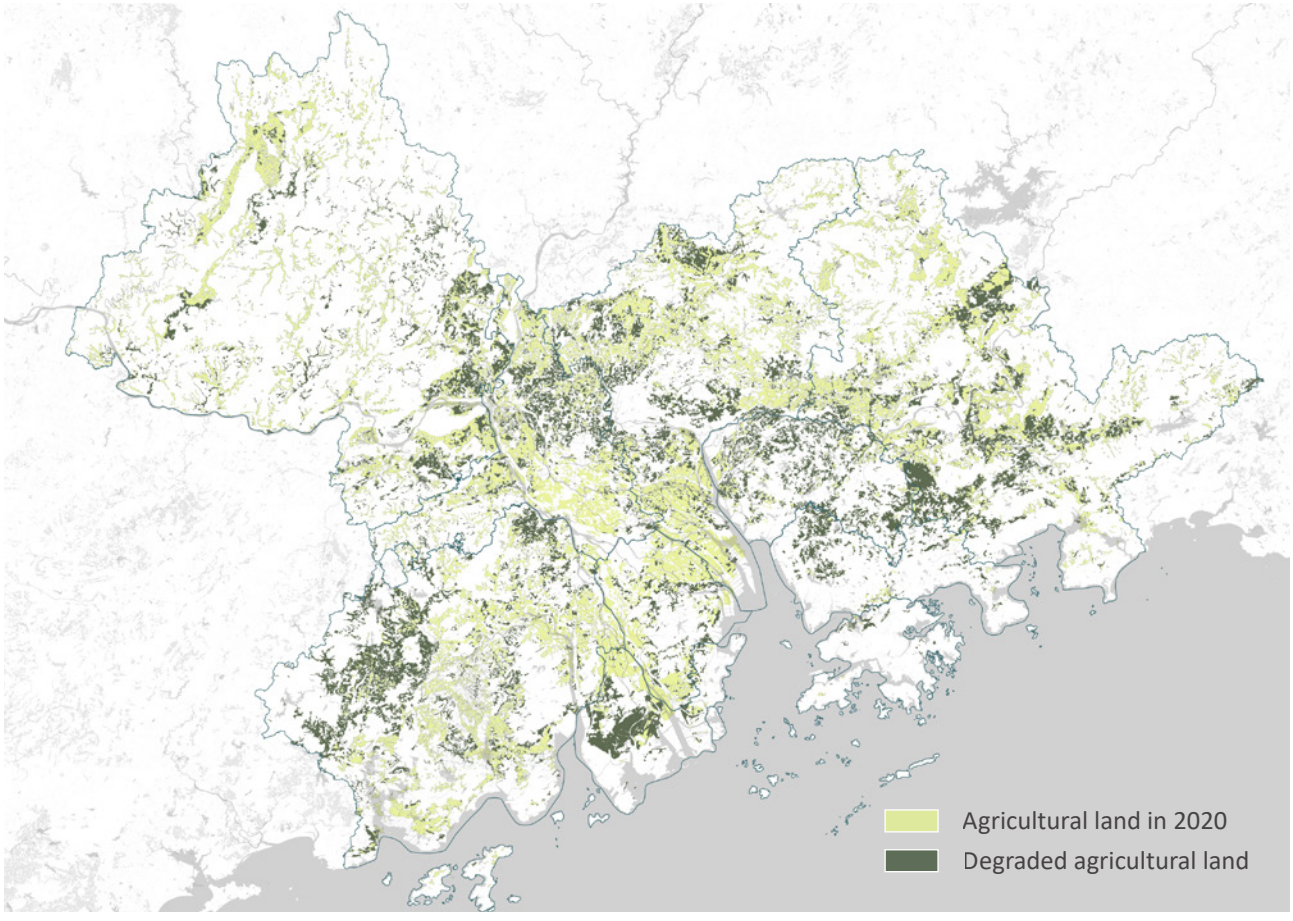


Figure 1.31 Degraded agricultural land in the past two decades

1.3.3 Homogeneous industrial structure

Labour-intensive industries

The industries on which Taobao villages are currently developed are mainly labour-intensive. Due to the generally low education level of villagers and the small population base of young adults in rural areas, labour-intensive industries are the best choice for rural economic development. As the logistics chain is indispensable in the e-commerce system, the packing work in the transportation chain is one of the most typical industries in villages. Villagers are simply responsible for matching orders with the goods the customers need and packing them up for further delivery. In addition, the furniture processing and agricultural by-product processing industries are all classic Taobao village industries, as the assembly and distribution of products can rely on a large workforce to complete.

Market-oriented development

The formation and flourishing of Taobao villages is a sign of the informatisation of villages leading to industrialisation and marketisation (Men, 2019). According to the statistics of the leading products of the top one hundred Taobao Villages, their development relies mainly on manufacturing (figure 1.33). Clothing, furniture, shoes, and home appliances are the most developed industries in Taobao Village, and they all belong to the low-end light manufacturing sector.

Most villages prioritise industries with higher market demand for higher market profits. In addition, neighbouring villages are backed by the same industrial base, which can lead to villages developing homogeneous industries and thus forming vicious market competition. In such a context, the manufacturing industry does not compete for quality but for efficiency of production, which can lead to uneven product quality and affect the village's economic development.

In addition, the status of Taobao Village is certified by the Alibaba Research Institute. As a commercial company, Alibaba has a certain guiding effect on market demand and supply. The list of Taobao villages and the types of industries it published showcase the current hotspots of market supply and demand, thus giving the villages an industrial direction to develop the Taobao model. Therefore, this market-oriented development model is a major problem for Taobao villages at present.

Figure 1.32 Villagers working in labour-intensive industry

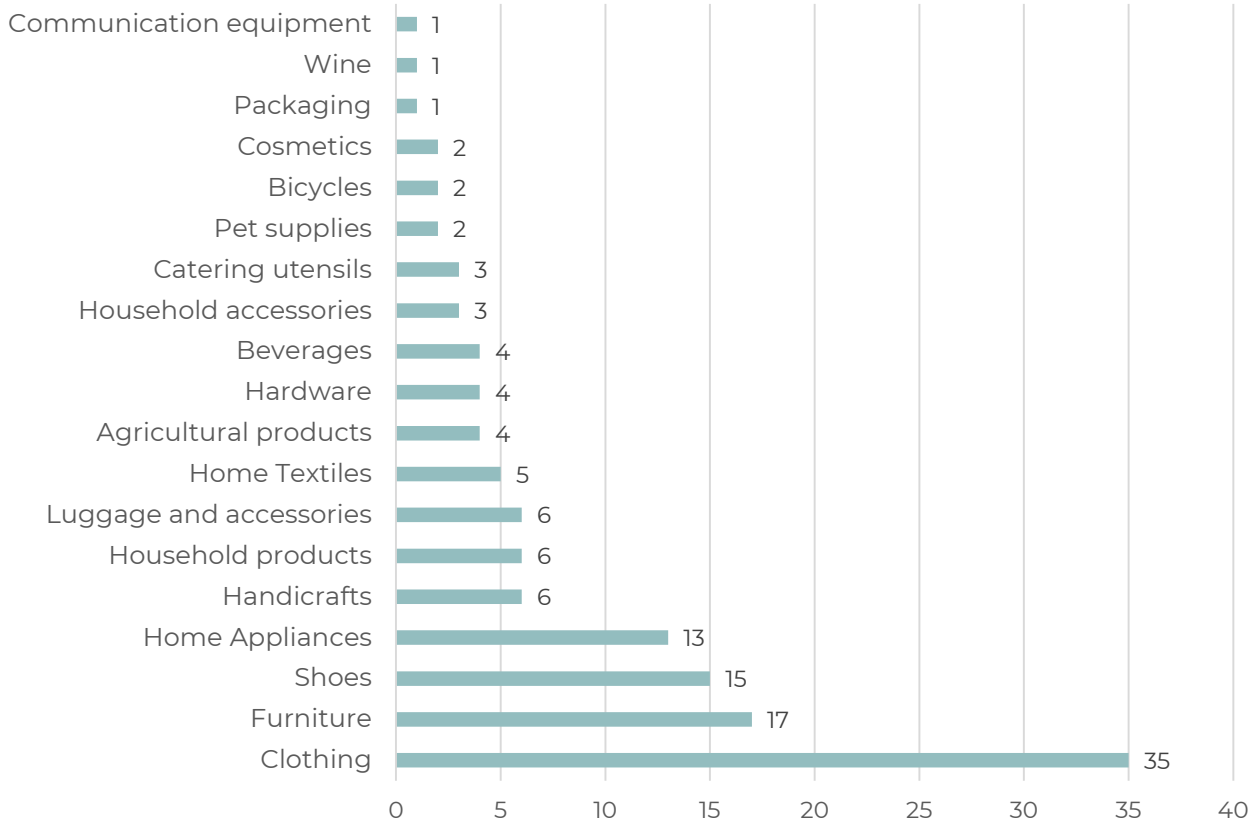


Figure 1.33 The main products of the top 100 Taobao villages

1.3.4 Challenging the local society

Conflicts in the governance system

If we look at the public sector, private sector and civil society, many stakeholders are related to the construction of digital villages. According to the influence of the stakeholders on the project, three categories can be distinguished: primary, secondary, and wider stakeholders.

Due to the characteristics of land property rights that village collectives and property owners have the most significant power in rural development, villages mainly follow a spontaneous bottom-up development model. There are also conflicts of interest between village collectives, local residents, migrant workers and tourists. Companies related to digital economy development have developed some mature models that are not all-inclusive. From regional scales, the planning from different levels of government and the developing wishes of the village are often not synchronised. To conclude, the development of Taobao Villages remains in a non-integrated planning dilemma.

Social segregation

From a social perspective, according to sociologist Fei Xiaotong, traditional rural society in China is an acquaintance society. Villagers know each other and exchange knowledge without interference from strangers outside the village. All the new information is shared by friends and relatives of the villagers and is therefore very credible.

However, the development model of e-commerce is bound to attract more migrant workers. After they establish a business in a village, these foreign business people will also attract their friends and relatives into the villages, breaking the original stable social relationships. In addition, the arrival of e-commerce platforms and enterprises will also impact the original village society. Villagers no longer get their information simply from the people they know but more from strangers they do not know if they are trustworthy. In the face of new and complex social relations, there is a need to protect the interests of the original local villagers and to increase social inclusiveness.

The original acquintance society

The new stranger society

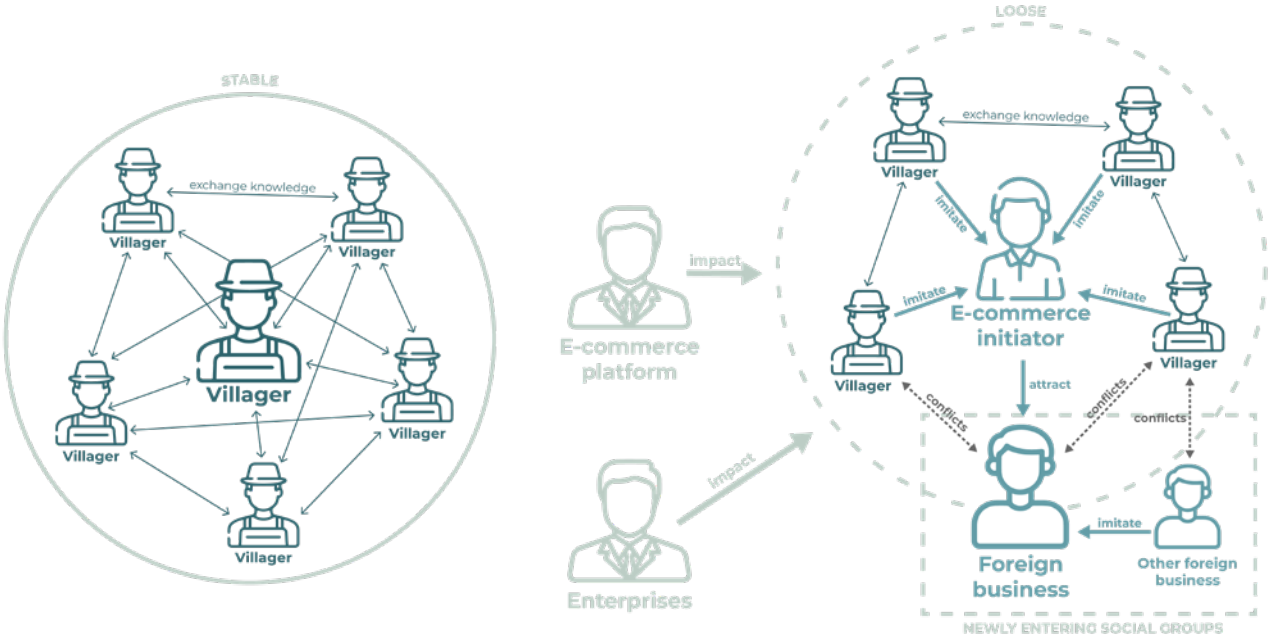
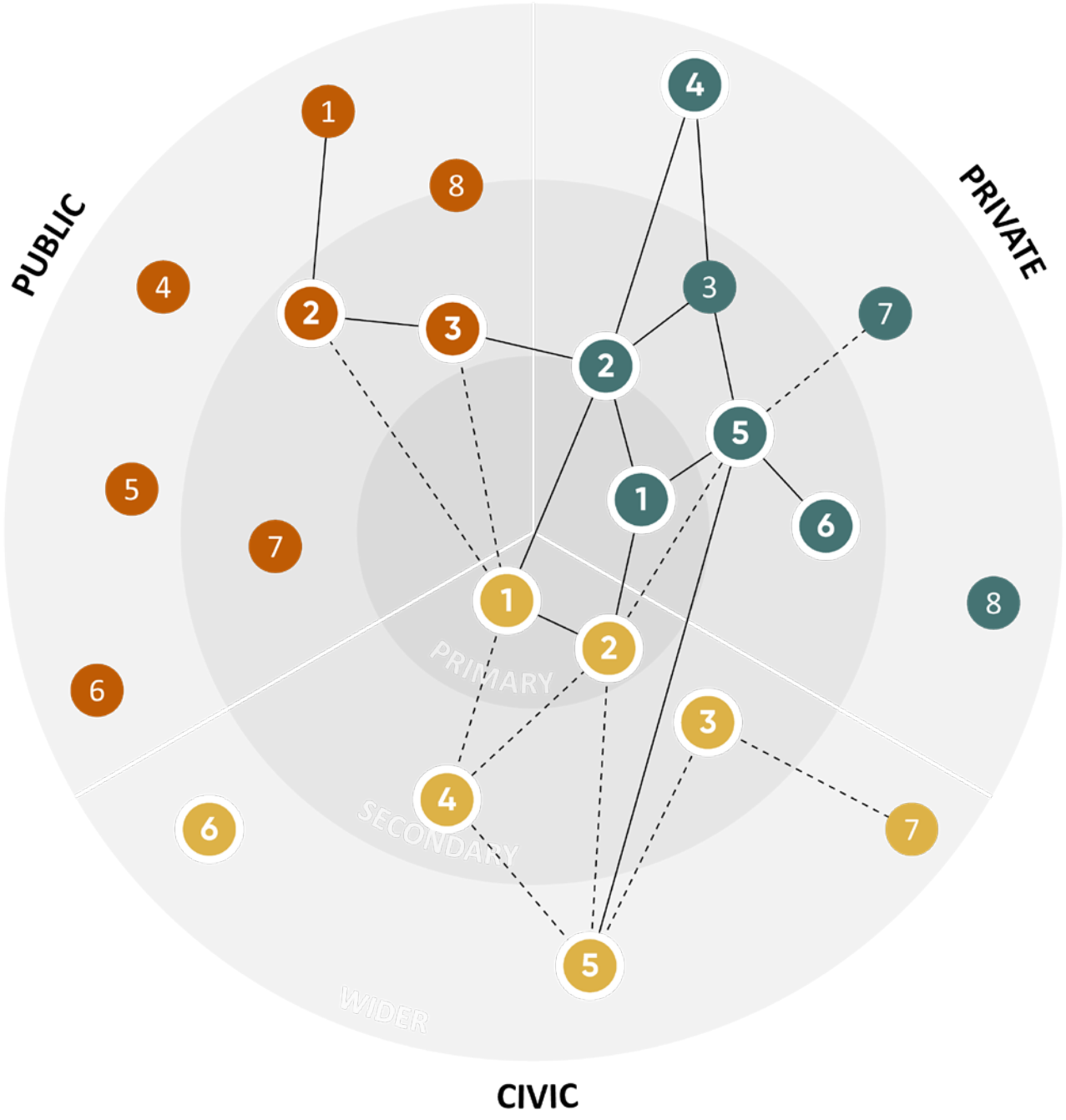


Figure 1.34 The transition of rural society



Public sector

1 Central government
2 Provincial government
3 Municipal government
4 Ministry of natural resources
5 Ministry of industry and technology
6 Ministry of culture and tourism
7 Ministry of agriculture and rural area
8 Planning institute

Private sector

1 TVE (township village enterprise)
2 E-commerce company
3 Logistic company
4 ICT provider
5 Factory
6 Investor
7 Real estate developer
8 Education organization

Civil society

1 Village collective
2 Property owner
3 Local resident
4 Farmer
5 Migrant worker
6 Expertise
7 Tourist

Cooperation ———
Contradiction - - - - -

Figure 1.35 Analysis of relationships between stakeholders in Taobao Village model

1.4 PROBLEM STATEMENT

Due to China's strong urban-rural dichotomy, vast rural areas generally face the development dilemma brought about by resource loss. Despite the limitation of urban-rural resource flow in the post-epidemic era, traditional villages can be developed by applying modern technology to help restructure their economic and social life, demonstrating the potential for future rural revitalization.

As a relatively mature model of the rural digital economy, Taobao village has been developing rapidly in China in the past decade. Although this model has successfully driven the economic development of thousands of villages, it lacks attention to the impact on sustainable spatial development and rural society. The dilemma of rural development lies in the rapid non-agriculturalization of population, land use, and industry. The Taobao Village model has accelerated these changes, which has negatively affected the social life and industrial structure in the villages. Homogenized competition in low-end processing and manufacturing industries, disorderly spatial development and construction, degrading agriculture and ecosystem, and foreign impacts on local society are all problems brought about by the entry of the digital economy into the countryside.

These problems arise because Taobao villages are spontaneously formed as a bottom-up strategy, and their uncontrolled and barbaric growth challenges the original rural structure. Due to the failure to form a complete planning system, villages have always lacked a forward-looking development perspective. Based on the existing Taobao Villages development model, designing spatial strategies to reconfigure the socio-economic life of the rural area and constructing a smart village model can help address these challenges.

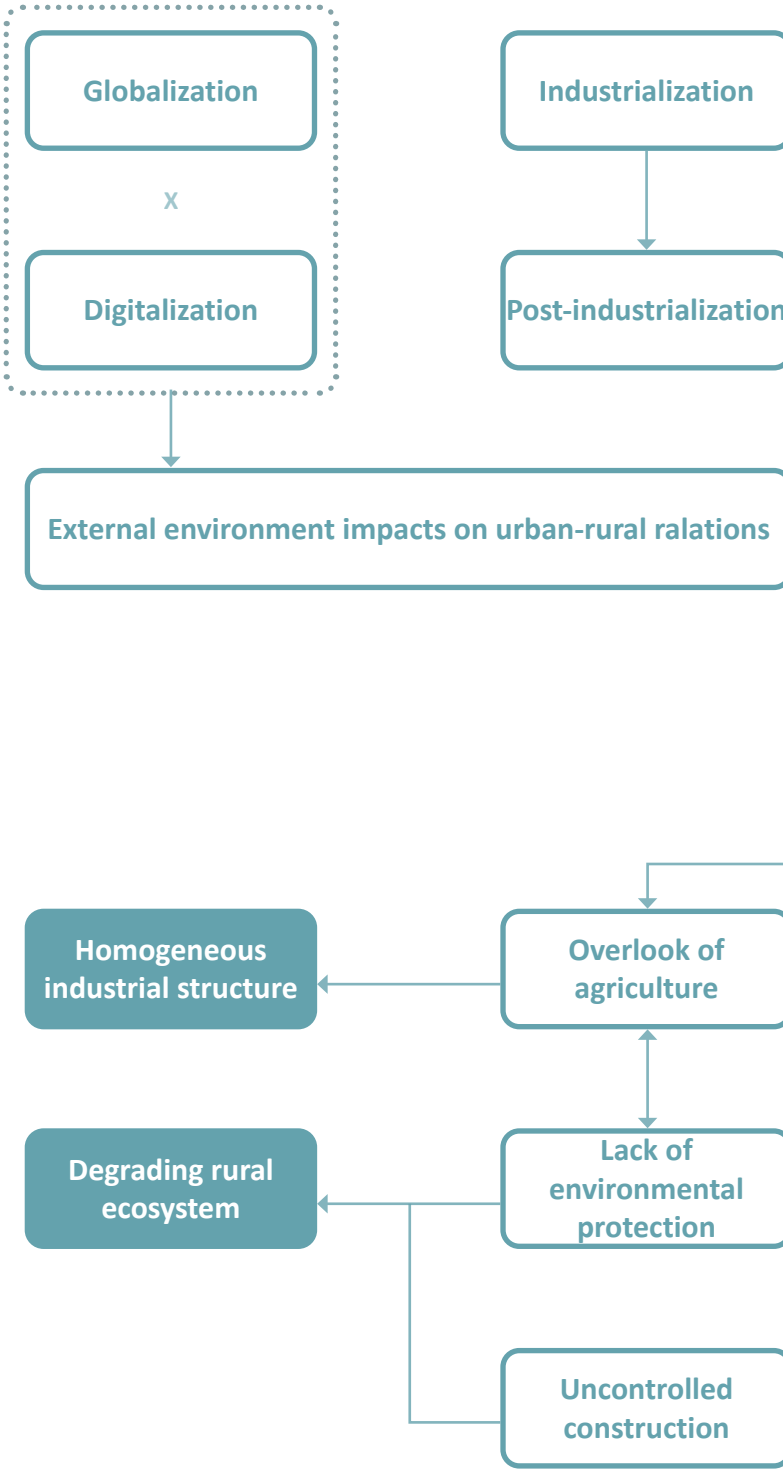
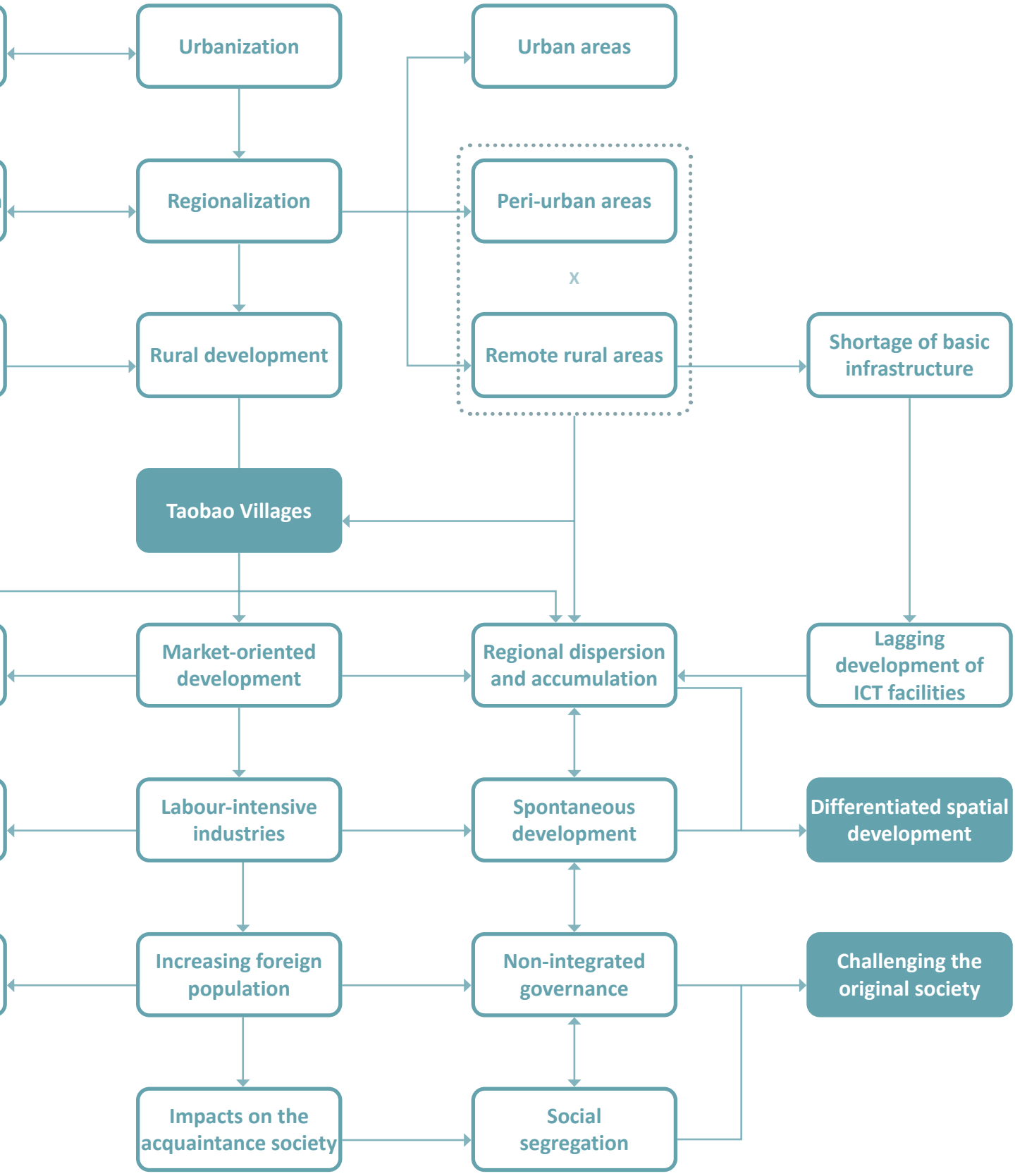


Figure 1.36 Understanding of problem positioning


Urbanization
Urban areas
Regionalization
Peri-urban areas
x
Rural development
Remote rural areas
Shortage of basic infrastructure
Taobao Villages
Market-oriented development
Regional dispersion and accumulation
Lagging development of ICT facilities
Labour-intensive industries
Spontaneous development
Differentiated spatial development
Increasing foreign population
Non-integrated governance
Challenging the original society
Impacts on the acquaintance society
Social segregation

2

RESEARCH FOUNDATION

2.1 RESEARCH AIM

1) Understand the digital development

The first step of the project is to understand the operational mechanisms of the digital industrial economy and its positive impact on rural spaces by analyzing and interpreting the developed Taobao villages. Envision the possibilities of digital village development by summarizing the spatial pattern and drivers of the autonomous formation of Taobao villages.

2) Planning complex rural network systems

From the perspective of a planner, the project aims to understand rural revitalization at a regional scale and rationally reallocate the development resources while improving the rural system from spatial, economic, and social perspectives. Furthermore, providing the basis of network systems for the digital development of rural areas.

3) Proposing spatial developing strategies

The project aims to provide not only guidance on the systematic development of different villages but also the spatial configuration of the individual village. Different principles and strategies will be applied to improve rural liveability while valuing the ecosystem.

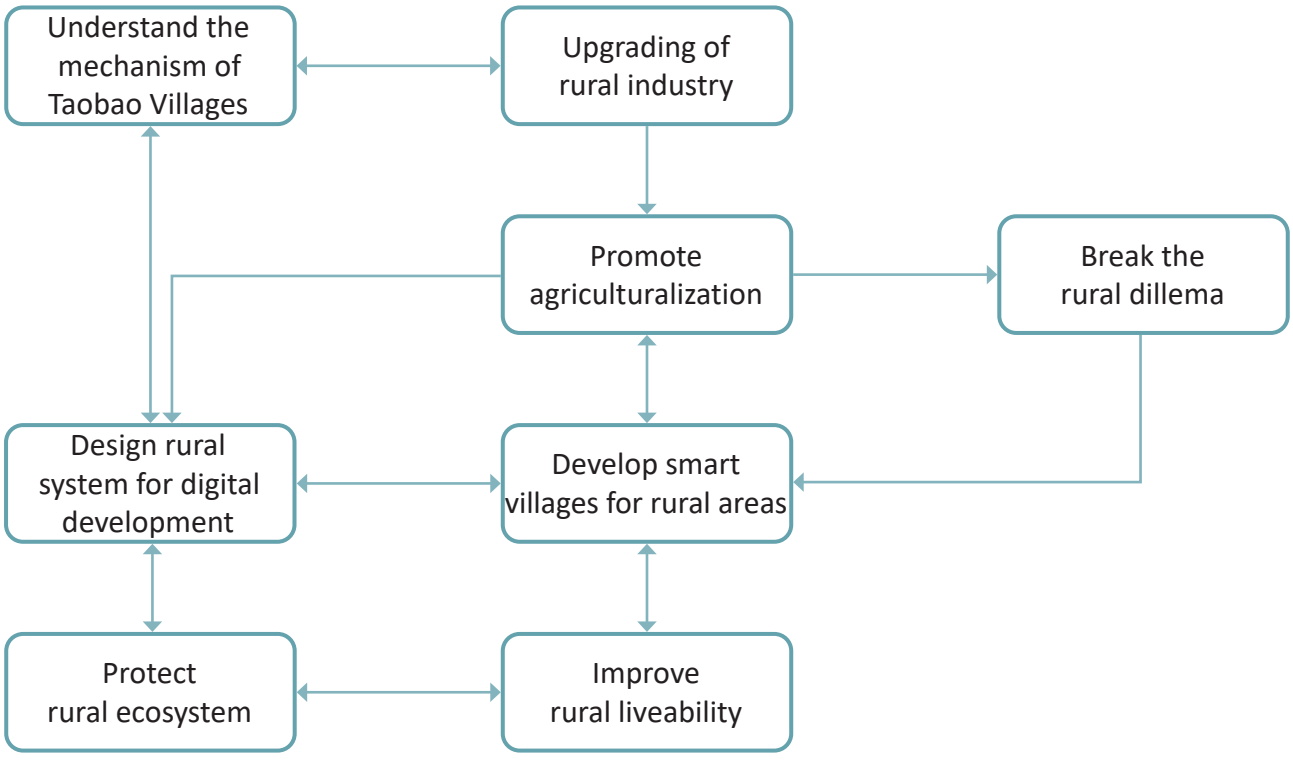


Figure 2.1 Framework of research aims

2.2 THEORETICAL UNDERPINNING

2.2.1 Key theories

Rural revitalization

The changes in rural areas are mainly affected by the interaction between the external and kernel systems of rural development. They may cause changes in the rural systems, resulting in spatial, industrial and social, which may positively help rural revitalisation.

According to research from Long, Tu, Ge, Li, and Liu (2016), exploring the composition of rural space requires following a methodology of elements, structure, and function. Changes in this system can cause rural transformation, thus contributing to rural revitalisation.

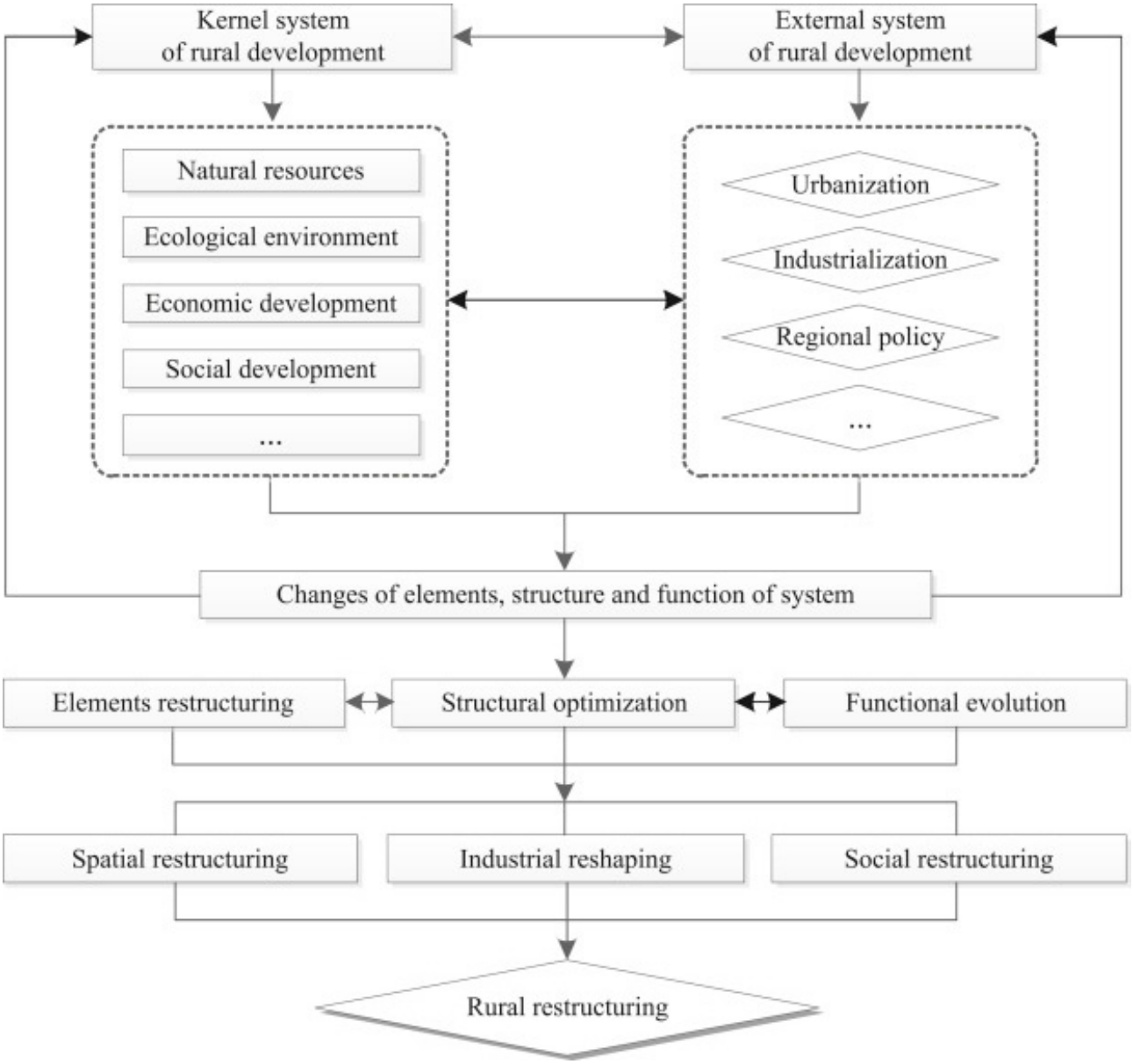


Figure 2.2 Rural revitalization framework

Smart Village

The concept of Smart Village aims to use digital technology tools to solve problems and improve the quality of life in rural areas. The study of smart villages relates somewhat to the more popular concept of smart cities. Smart cities aim to control and solve problems in cities in areas such as traffic management, natural disasters and government services. When the concept is migrated to villages, it is expected to help manage villages and enhance their potential for economic development.

The current academic debate on the concept of smart villages is relatively diverse, and this project summarises six aspects of smart villages that need attention from the perspective of spatial planning and village governance (figure 2.3).

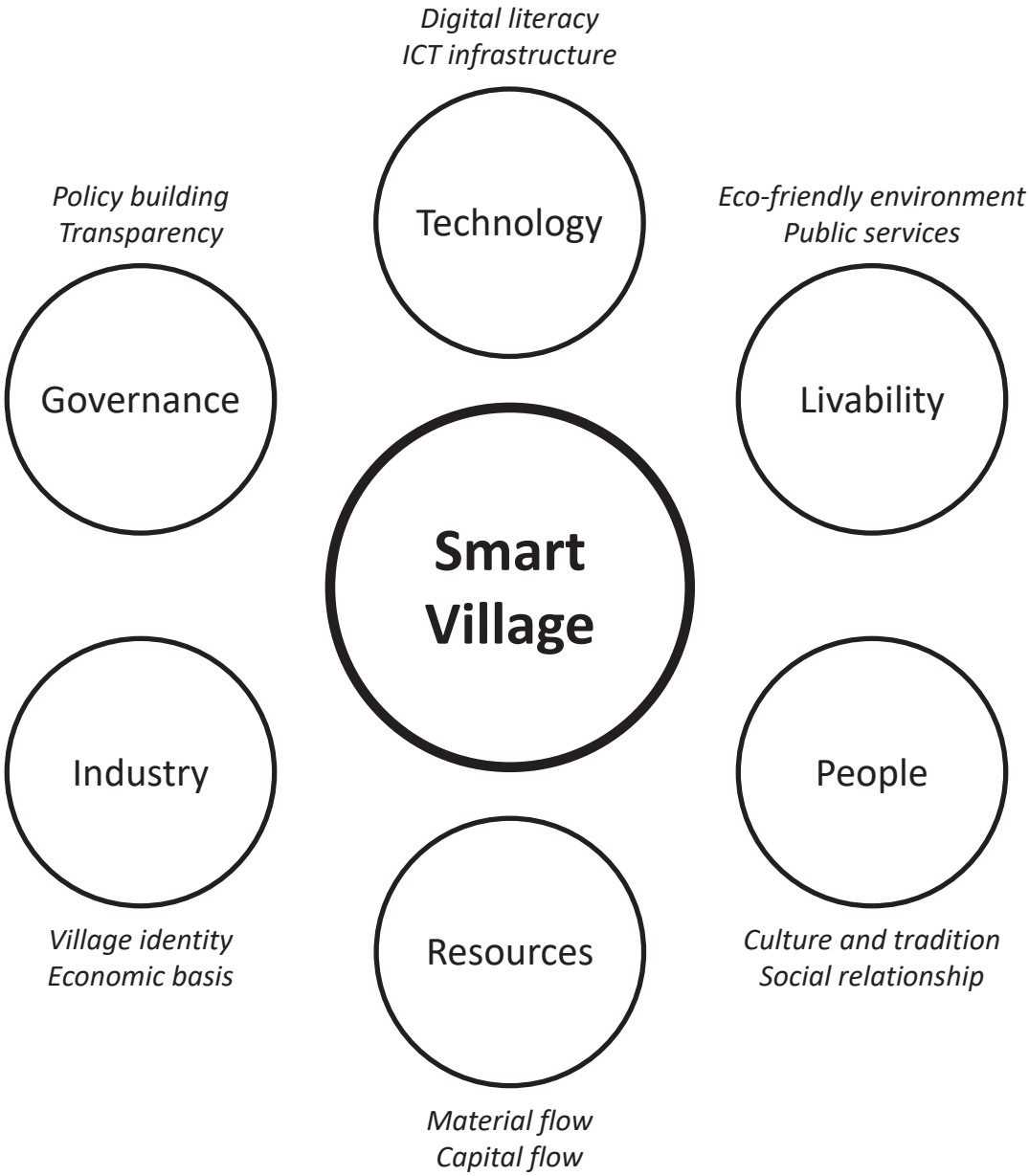


Figure 2.3 Smart village concept

The network society

The existence of networks, including infrastructure, production and living networks, has changed the traditional spatial development pattern. According to Dupuy (2008), 'the networks paved the way for widespread spatial development, modernisation and decreasing population density in rural areas'. Significantly, the ICT network, as the new information facilities, may also change the geographical form of human settlements, as communication is the most fundamental element of daily activities.

As villages that develop autonomously based on the e-commerce model, Taobao villages are only likely to form under conditions where a mature network system is in place. It follows that villages need more developed systems to support their future development. All nodes are necessary for a network society, and no intense centre exists. Rural areas can be envisaged as an extensive network in which villages communicate and cooperate with each other and are not dependent on urban areas where resources are concentrated.

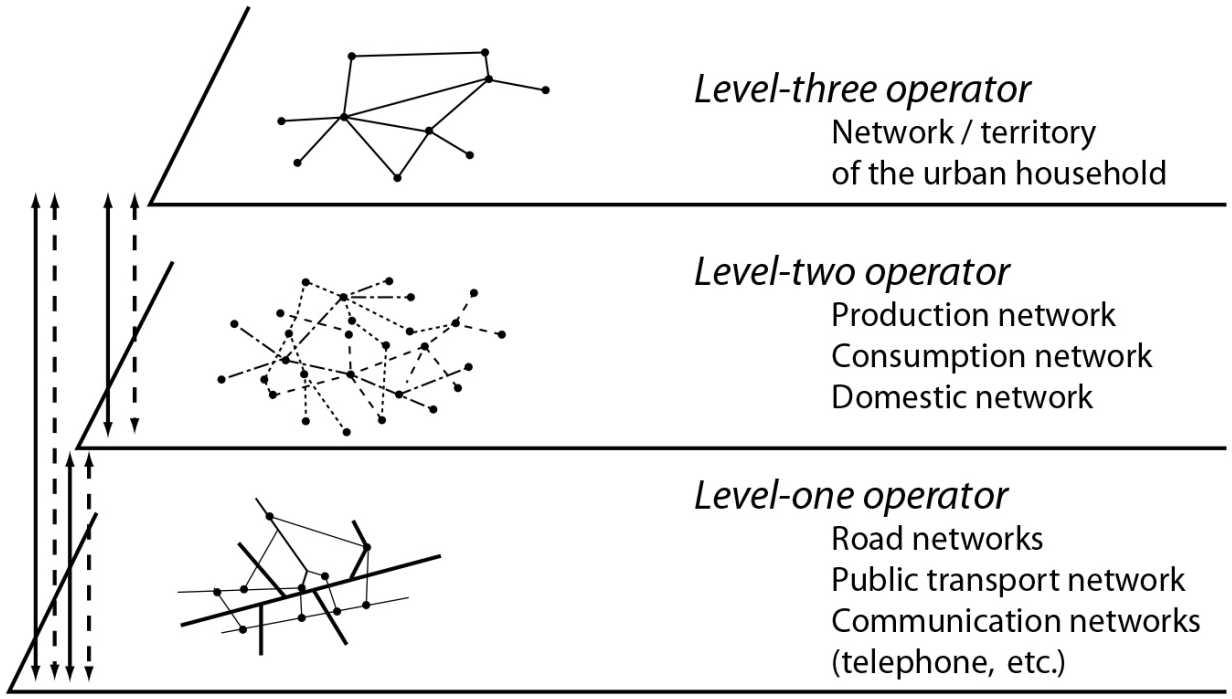


Figure 2.4 The three levels of network operators organizing space

2.2.2 Theoretical framework

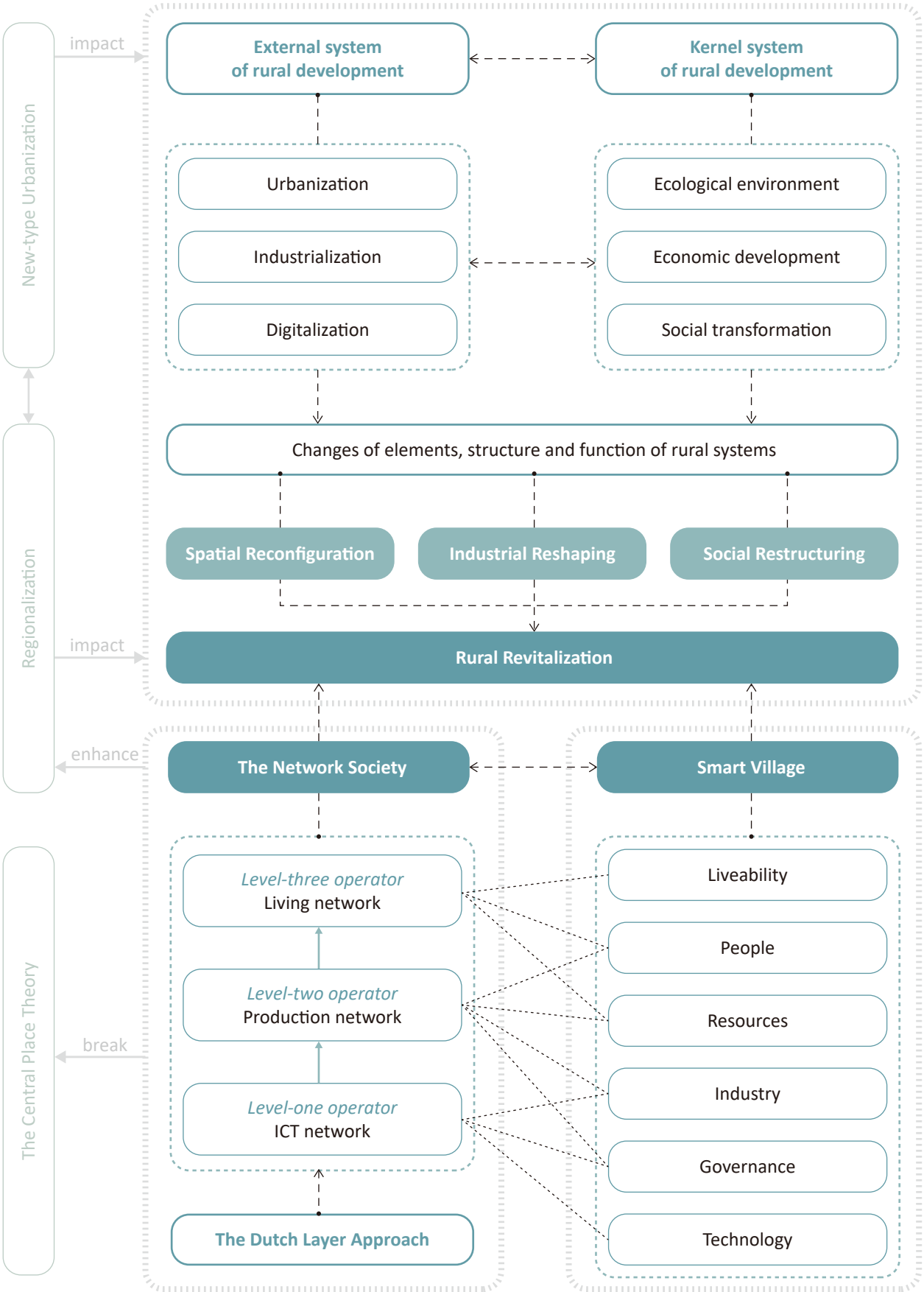


Figure 2.5 Theoretical framework

2.3 RESEARCH QUESTIONS

How to construct 'Smart Village' based on the optimised Taobao Village model to upgrade the agricultural industry and improve rural liveability for future rural revitalisation in GBA?

SQ 1: How to understand the spatial impact of the digital economy on rural areas and optimise the Taobao Village mechanism for rural development?

SQ 2: What spatial approaches need to be implemented to improve the quality of life and protect ecosystems in rural areas?

SQ 3: How can the network system positively impact the development of localised industrial structures and sustainable agriculture?

SQ 4: How to mitigate social segregation and help reconstruct social relations in the face of new populations entering rural areas?

2.4 METHODOLOGY

2.4.1 The Dutch layer approach

A variety of factors influence urban and rural development, and complex systems need to be perceived and interpreted. In order to develop a comprehensive approach to understanding spatial development, the Dutch layer approach emerged. The layer approach understands the landscape of urban and rural development as a three-layer system of interrelated dynamics, including substratum, networks, and occupation (figure 2.7). Today, many scholars believe there is also a fourth layer, the cultural dimension (figure 2.6). They have different rates of change, influencing changes in human settlements in different spatial and temporal dimensions.

As the Taobao development model can be seen as a network society developed by all kinds of networks, the Smart Village concept is possible to develop further. With the methodology of the layer approach, it could help me analyse and understand how each layer works for rural development and how these layers cooperate or contradict each other.

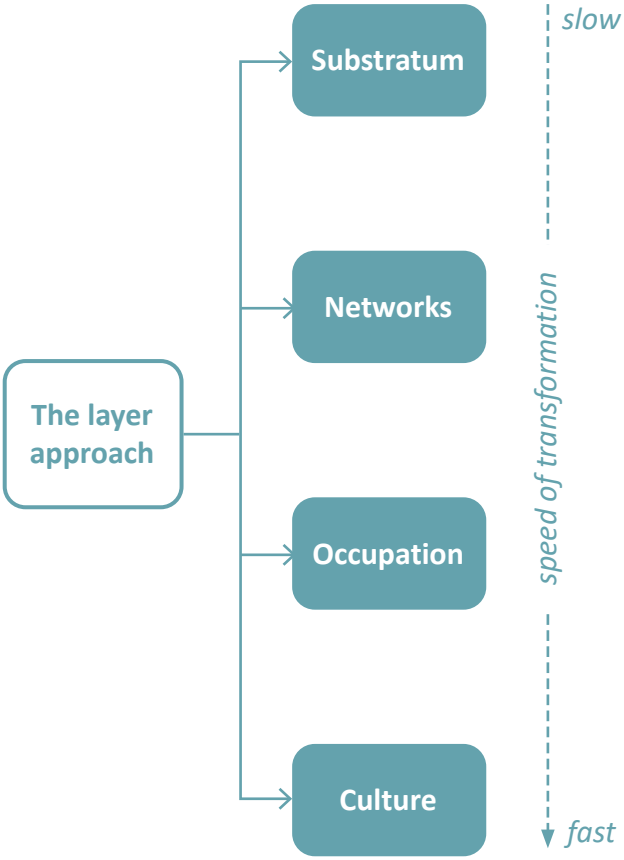


Figure 2.6 The Dutch layer approach

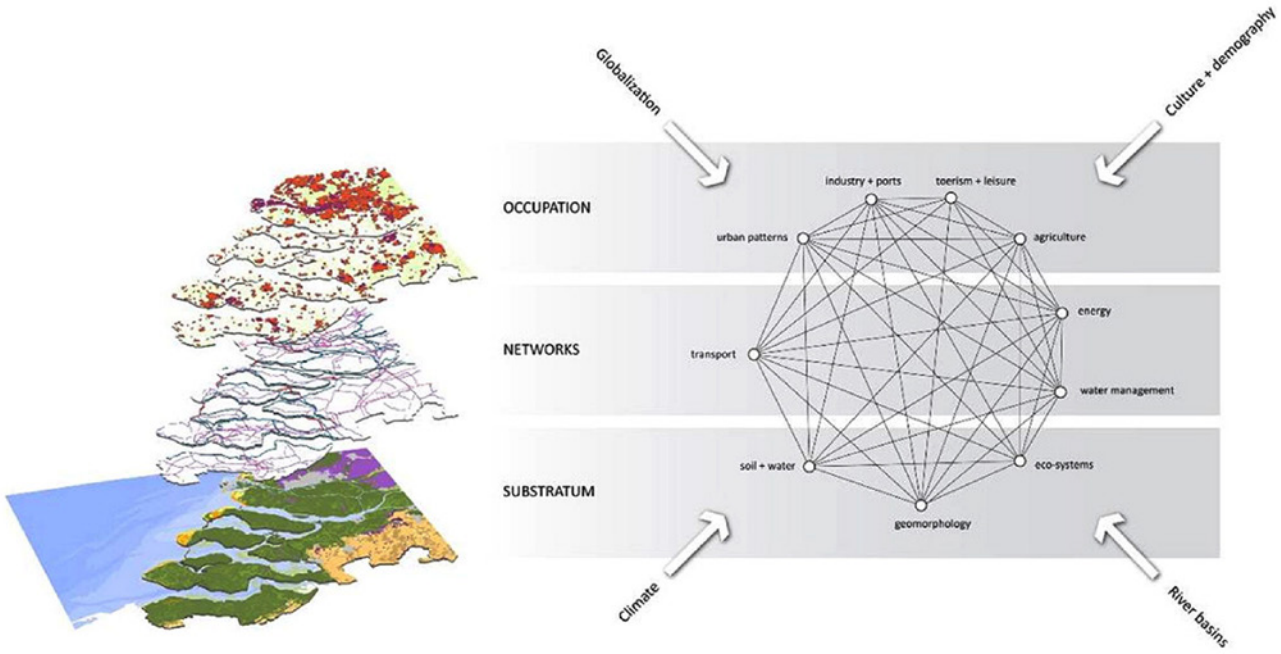


Figure 2.7 The Dutch layer approach and the complex system of delta area

2.4.2 Research methods

In order to explore the main research questions, four sub research questions need to be answered in this project. They focus on the spatial mechanisms, design strategies, network systems and social impacts required for the development of smart villages. To investigate the different questions, two main types of methods, design research and research by design, are used in this project. The corresponding specific methods are used in studying the different questions (figure 2.8).

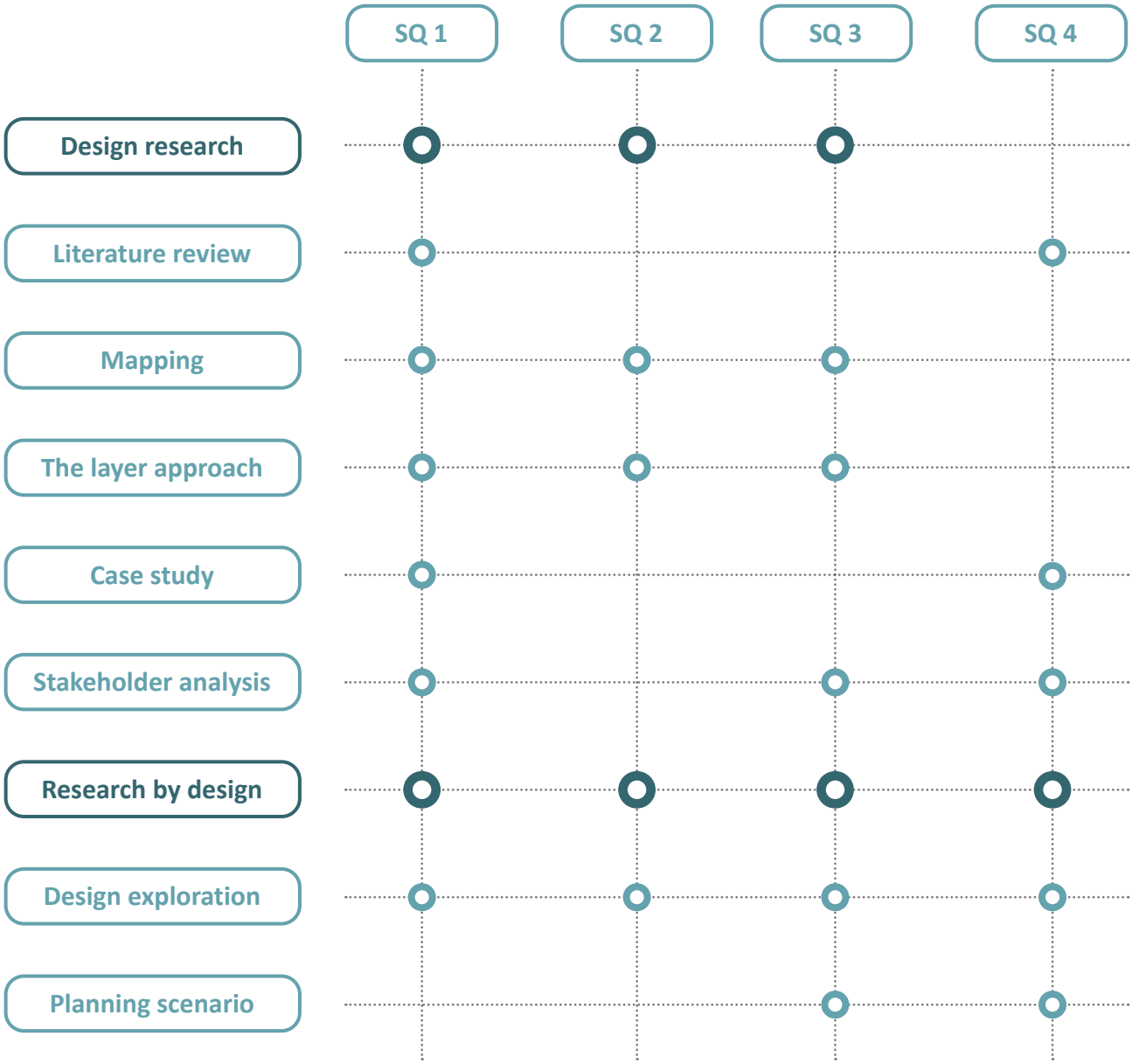


Figure 2.8 Research methods

2.5 CONCEPTUAL FRAMEWORK

Based on the previous theoretical research and methodology, a conceptual framework for constructing a smart village model to help revitalise the countryside is summarised (figure 2.9). The spatial reconfiguration will be the basis of the project and will be linked to the reshaping of industry and the restructuring of society through technology, thus creating a system of smart villages.

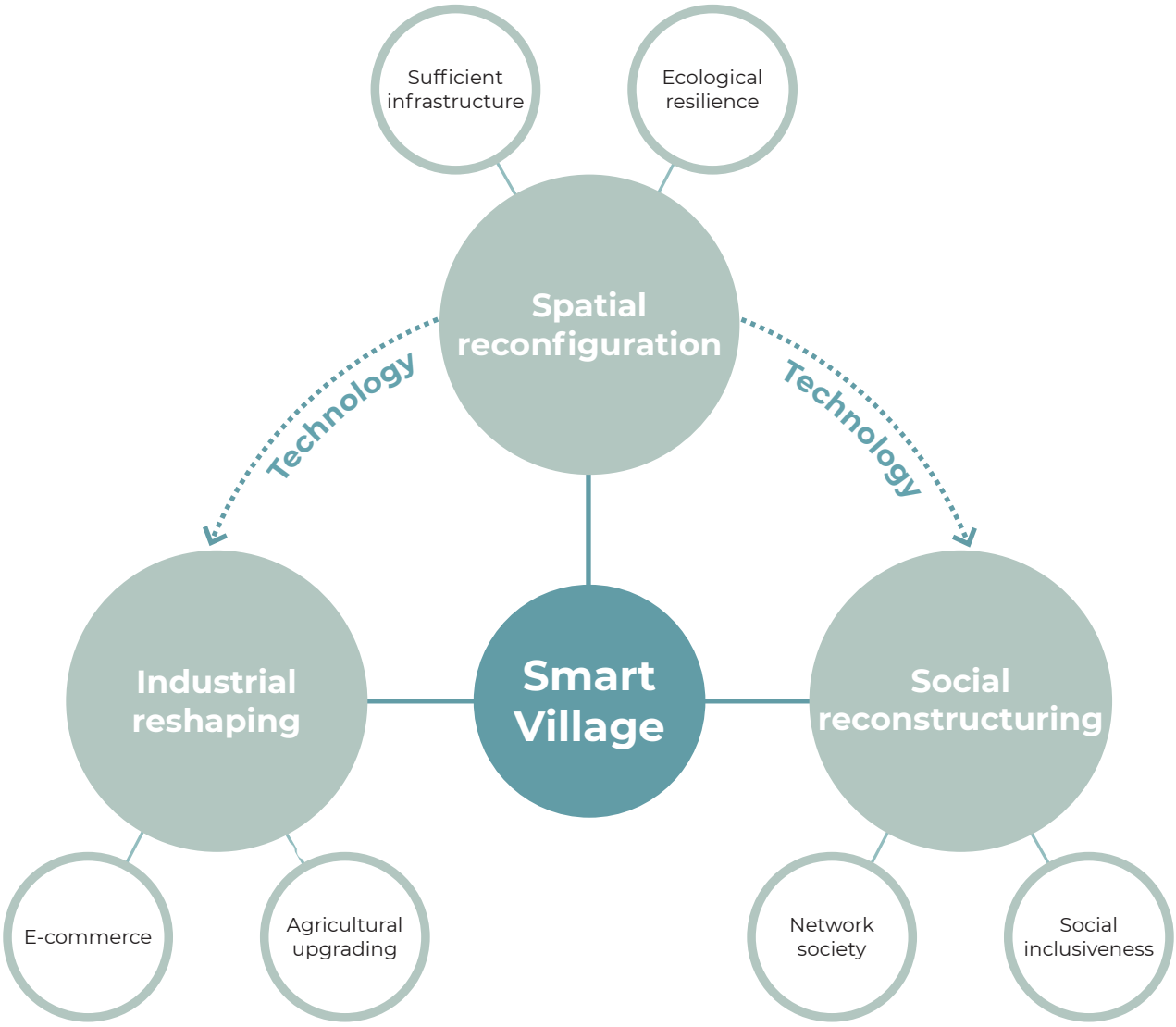


Figure 2.9 Conceptual framework

2.6 RESEARCH FRAMEWORK

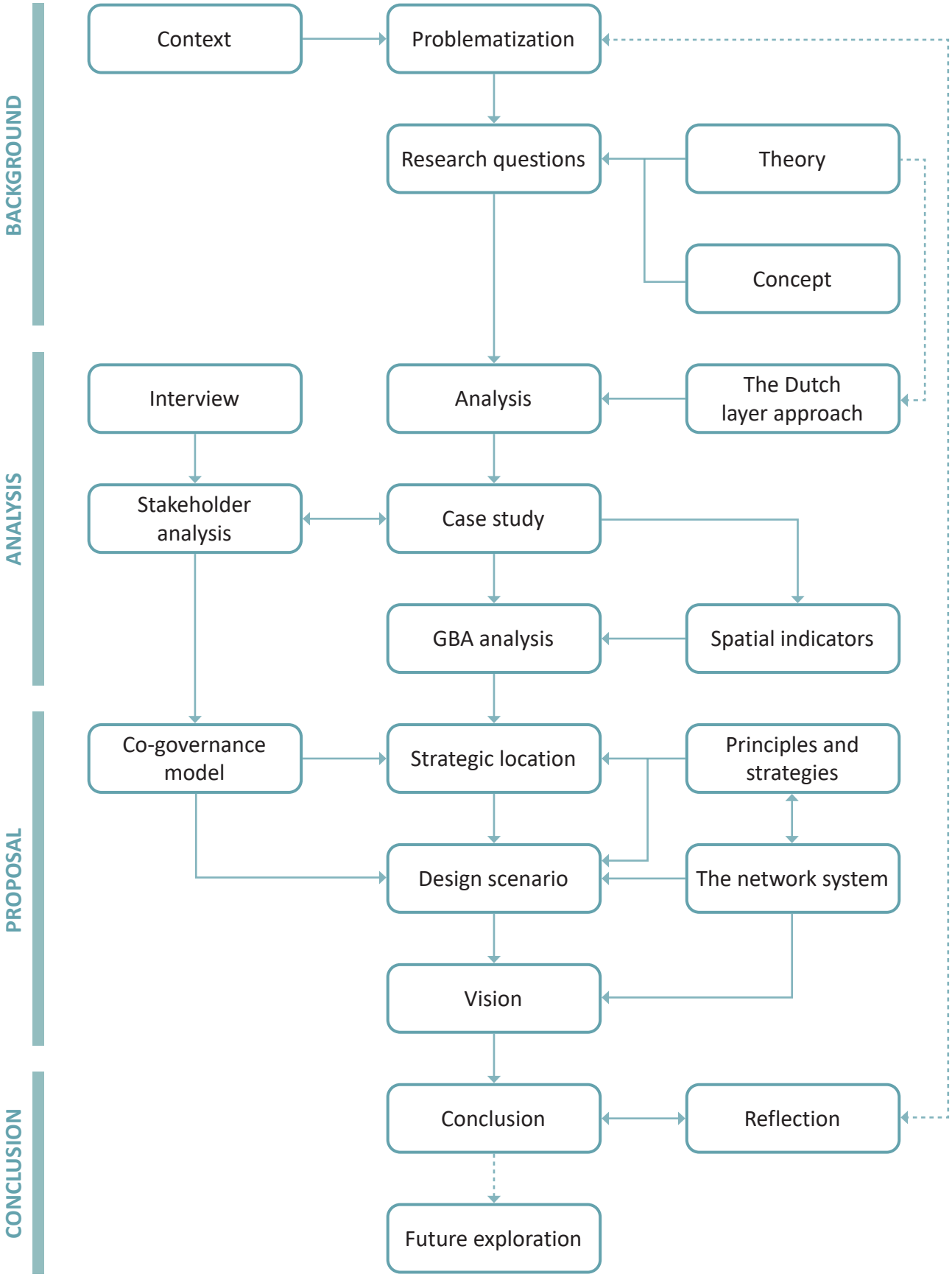


Figure 2.10 Research framework

3

FROM TAOBAO VILLAGE TO SMART VILLAGE

3.1 CASE STUDY

3.1.1 Analytical framework

Case studies are the most effective method to understand the mechanisms of economic behaviour in the development of Taobao villages and their impact on rural spaces. By analysing a well-developed Taobao village, the drivers of its success can be understood, and spatial variation can be summarised. Currently, successful Taobao village cases occur mainly in peri-urban areas, where resources are more readily available and concentrated. This section, therefore, focuses on analysing established Taobao villages in peri-urban areas and applies the knowledge gained to the design and revitalisation of rural areas (figure 3.1).

The analysis of rural areas focuses on three scales: local, meso and regional (figure 3.2). The spatial changes, industrial structures and social relations of villages are understood separately from a cross-scale perspective. For the cases, the analysis is mainly conducted at the local and meso scales to understand the causes and consequences of the spontaneous formation of a single village and the combined effects it creates on the surrounding areas. For the GBA, the focus is mainly on the regional scale, analysing the regional allocation of resources and development potential. This chapter aims to draw out the mechanisms of Taobao village development through analysis and to derive the spatial factors that need attention.

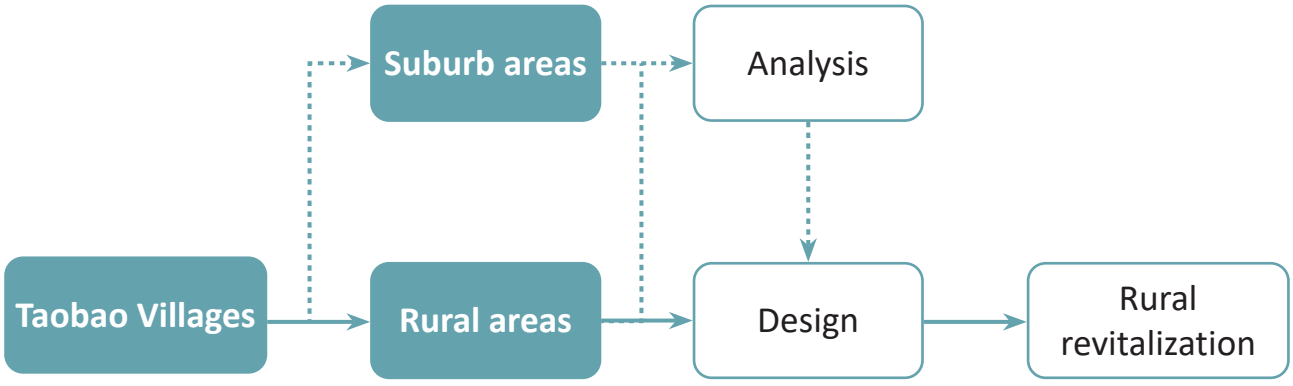


Figure 3.1 Relationship between case study and further design proposal

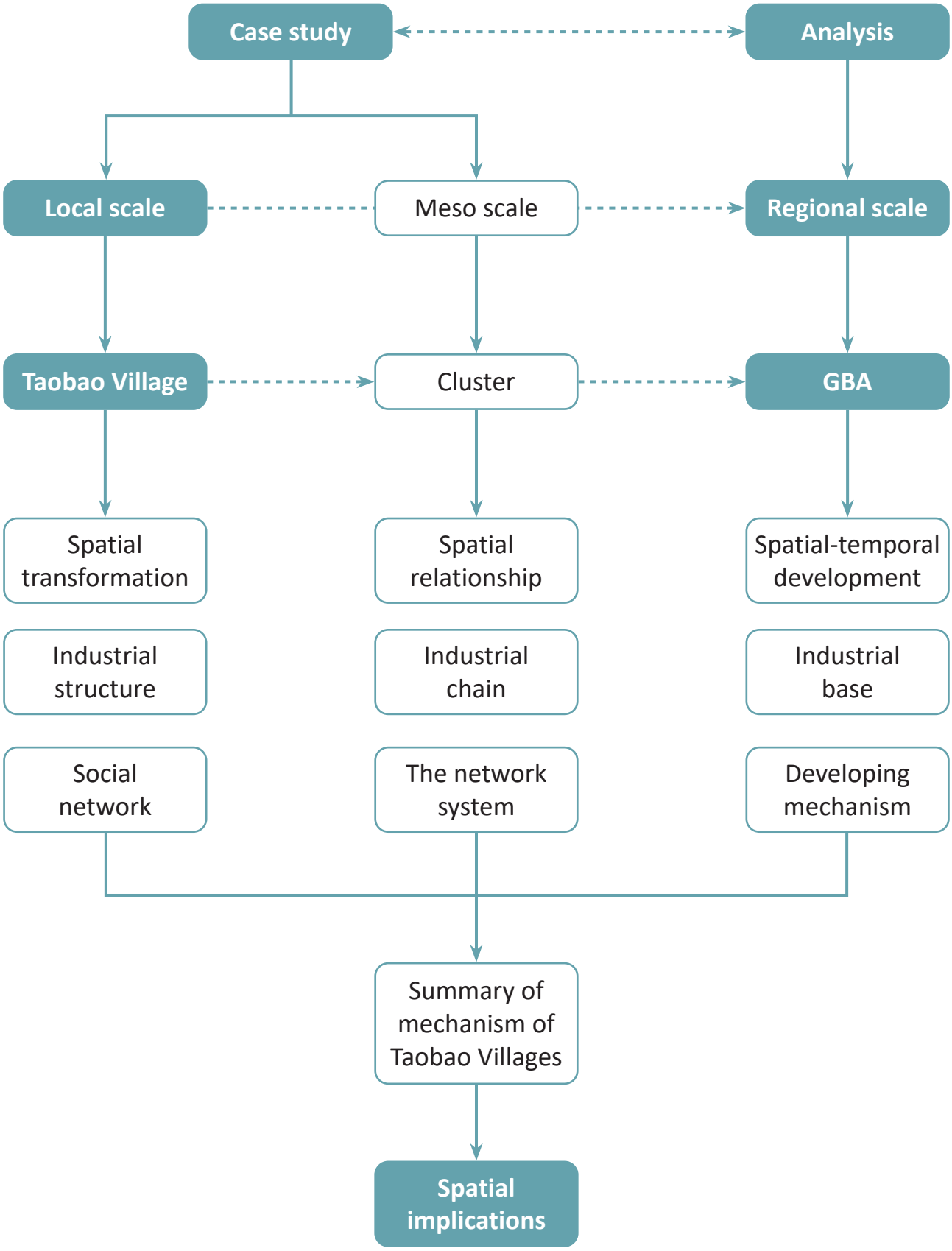


Figure 3.2 Analytical framework for understanding the mechanism of Taobao Villages

3.1.2 Introduction of selected cases

During the initial cognitive of Taobao villages, it was initially concluded that village types have two classifications of location and industrial base (figure 3.3). Generally speaking, villages based on industrial development are more likely to develop Taobao models, and most occur in peri-urban areas, while a few occur in rural areas with sufficient infrastructure and resources. Peri-urban areas are prone to be the birthplace of purely trading-based Taobao villages that rely on surrounding industries due to their well-developed transport facilities. As it has a similar economic mechanism and spatial qualities to industry-based villages, trading-based Taobao villages will not be explored in this project. On the other hand, Taobao villages based on agricultural development mainly occur in rural areas rich in agricultural resources, which fully demonstrates the potential for revitalized development in rural areas.

However, there are no mature Taobao villages in rural areas in the GBA. In order to fully understand Taobao villages moedel, four mature Taobao villages were selected across the country for analysis in this project, and two villages will be described in detail in this chapter (figure 3.4). Lirendong Village is located in the peri-urban area of Guangzhou and is an industrial-based Taobao village. Shahe and Yanxia villages are located in the rural area of Suqian City, Jiangsu Province, and are agricultural-based Taobao villages.

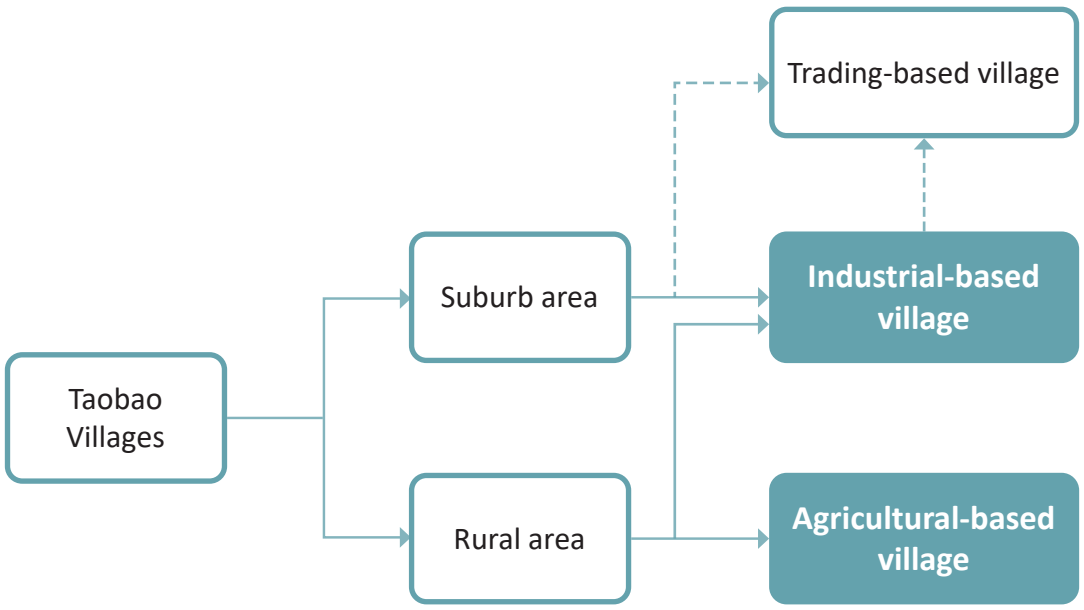


Figure 3.3 Preliminary classification of Taobao Villages

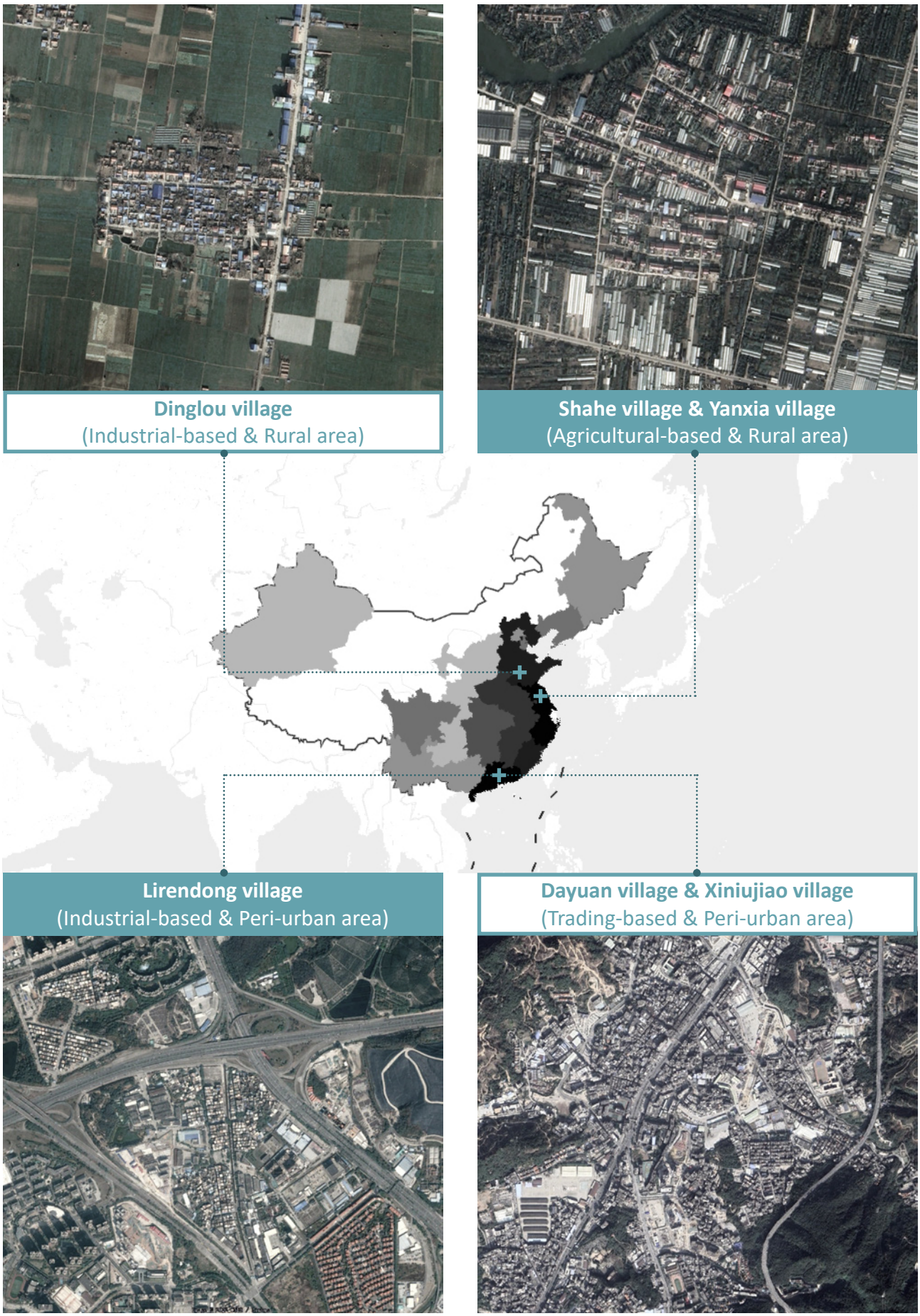


Figure 3.4 Location of studied cases

3.2 LIRENDONG TAOBAO VILLAGE: INDUSTRIAL-BASED TYPE IN SUBURB AREA

3.2.1 Introduction

Lirendong Village is located in the Panyu District of Guangzhou in the Guangdong-Hong Kong-Macao Bay Area. Long ago, it was a traditional agricultural village. With the urban expansion, it has gradually transformed into an industrial village with the advantages of its peri-urban location and abundant resources. Backed by an industrial belt of garment manufacturing, Lirendong village has a significant garment processing, manufacturing and sales industry. In recent years, the rise of e-commerce has led to the transformation of the garment sales industry to the Taobao model. As a result, more and more residential spaces have been converted into commercial or production spaces, and the village has gradually been transformed into a Taobao Village by the penetration of e-commerce.

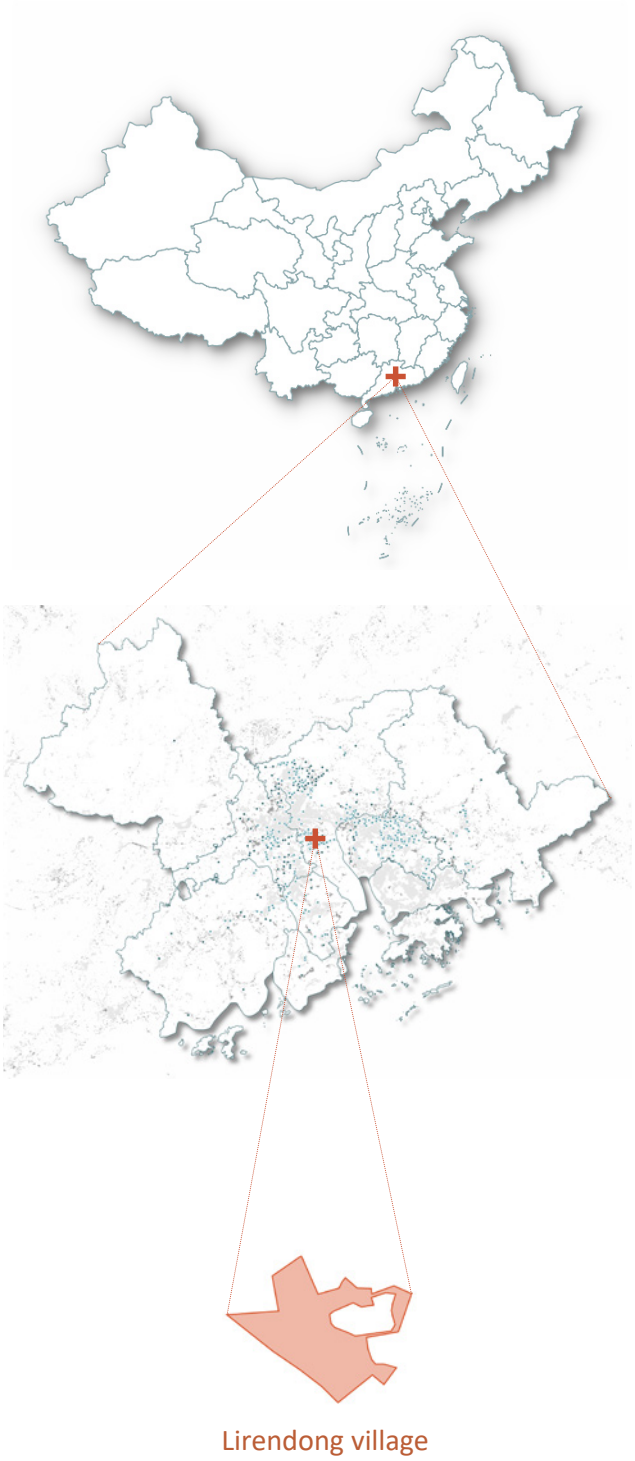


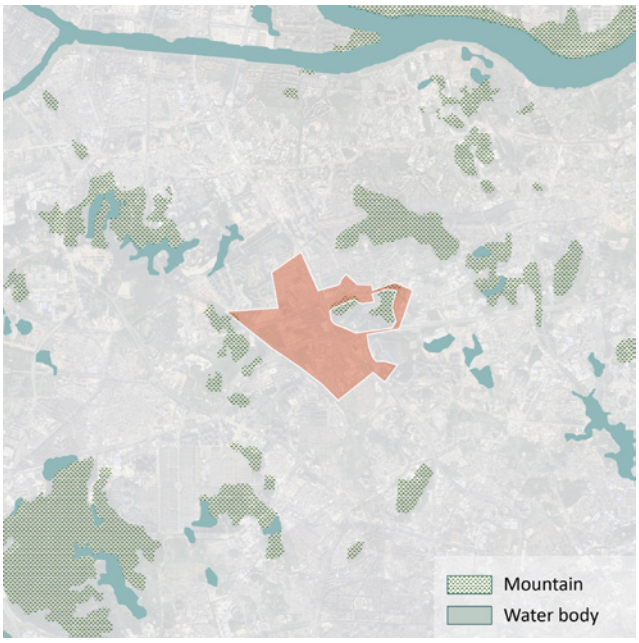
Figure 3.5 Location of Lirendong Village

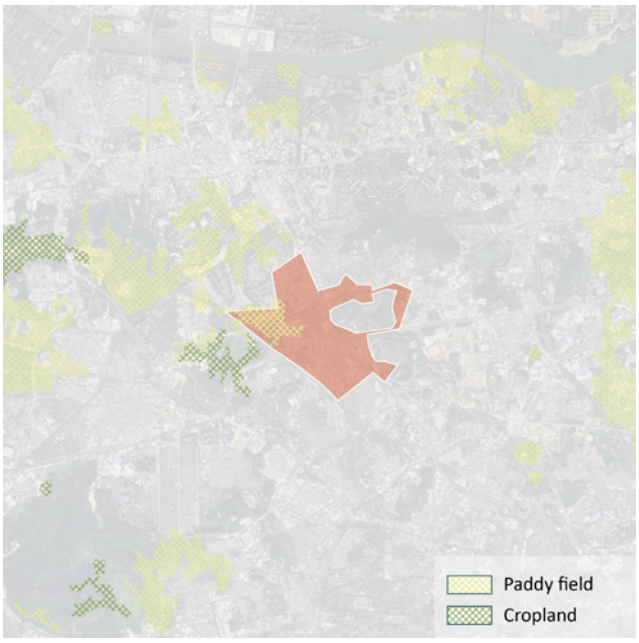
Natural landscape

Due to its location on the outskirts of the city, Lirendong village does not rely on natural landscapes and water bodies for its development.

Agricultural land

A small amount of traditional farmland still survives in and around Lirendong village.



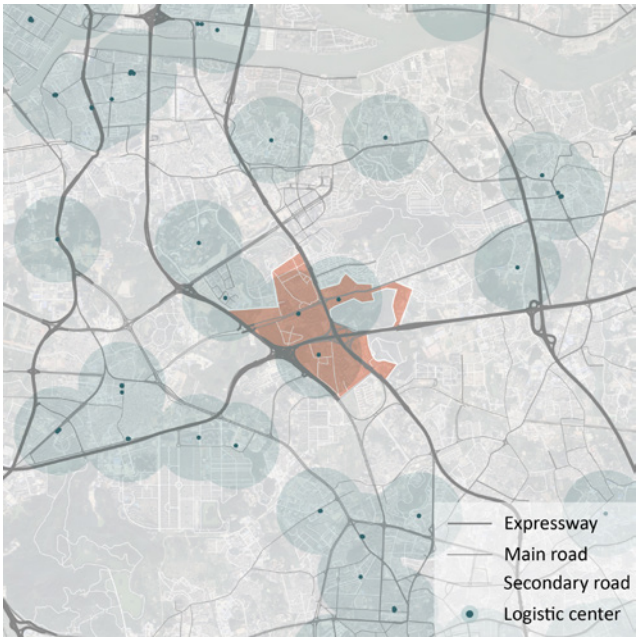


Logistics network

The village is rich in transport and logistics resources with north-south and east-west expressways.

Industrial basis

A small industrial park backs the village, and many small factories or family workshops are inside.



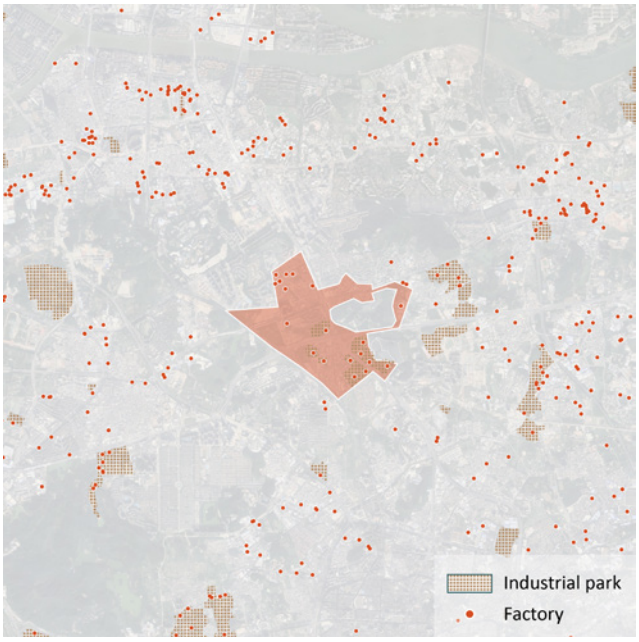


Figure 3.6 Context analysis of Lirendong Village

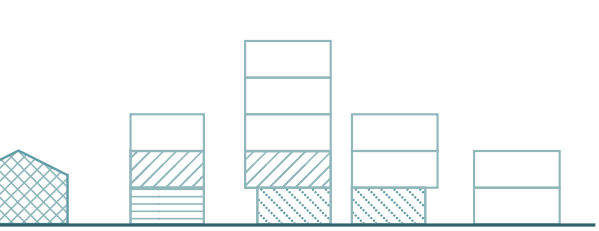
3.2.2 Spatial-temporal transition

Figure 3.7 Spatial-temporal transformation analysis

It can be found that most of the agricultural land was destroyed due to the village development. The arrival of the industry has taken up large areas of construction land for factories. The influx of people has increased the demand for residential space, and the village has expanded further.

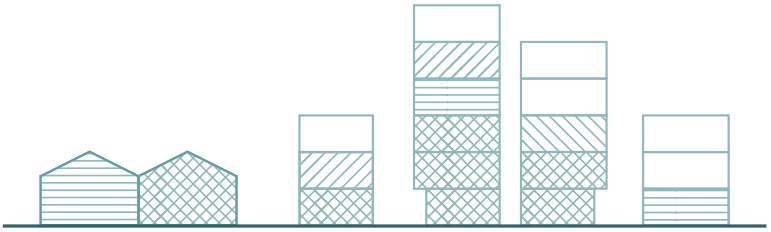
Regarding the shift in building function, the lower floors have been converted into warehouses for storage or small workshops. The middle floors are transformed into e-commerce functions, taking on sales and logistics functions. The upper floors still retain their residential function.

12
tories and warehouses



y Lirendong village

2020
Expansion of industrial and rural areas



Industry Lirendong village

3.2.3 The social-spatial network system

According to the research on the Lirendong Village by Zhou, J. (2017), the entry of the Taobao model has changed the original social structure of the village (figure 3.8). Regarding people relations within the village, the entry of foreigners has impacted the existing social relations. The new e-commerce promoters influenced the local population and led to more people developing e-commerce. This has led to a change in the division of labour and the formation of a mature industrial chain within the Lirendong Village.

The spatial network cooperation system of the Lirendong Village can be analysed on a meso scale (figure 3.9). The redundant industries within the village flowed out, creating a link between the village and external functions. The Lirendong Village is both a source and a feeder of goods, and it has close links with both the cloth market and the garment production factories. Due to the logistics and transport involved, the distance between such industrial spatial cooperation doesn't exceed 30 km.

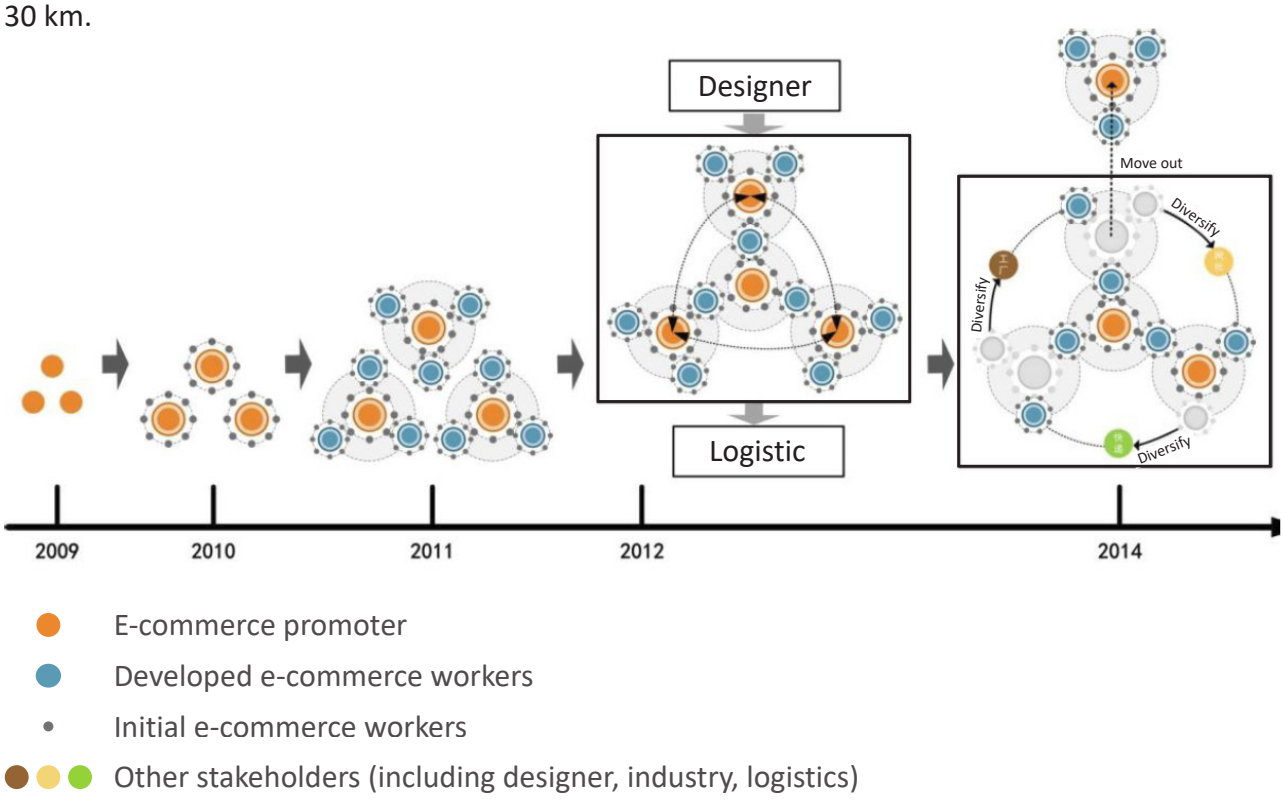


Figure 3.8 Development of social structure under Taobao mechanism

Figure 3.9 The spatial network system

3.2.4 Spatial transformation of industrial-based Taobao Village

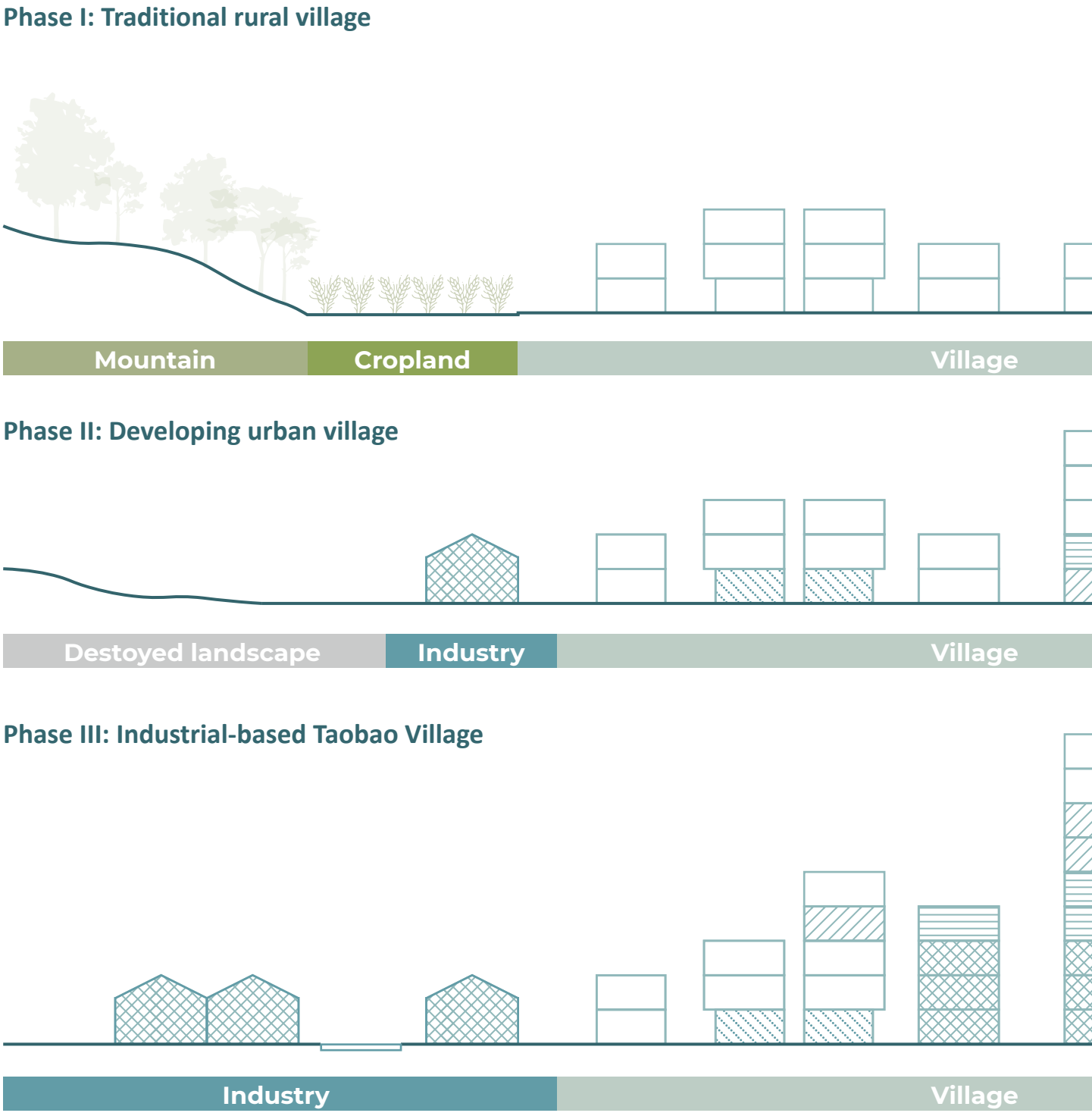
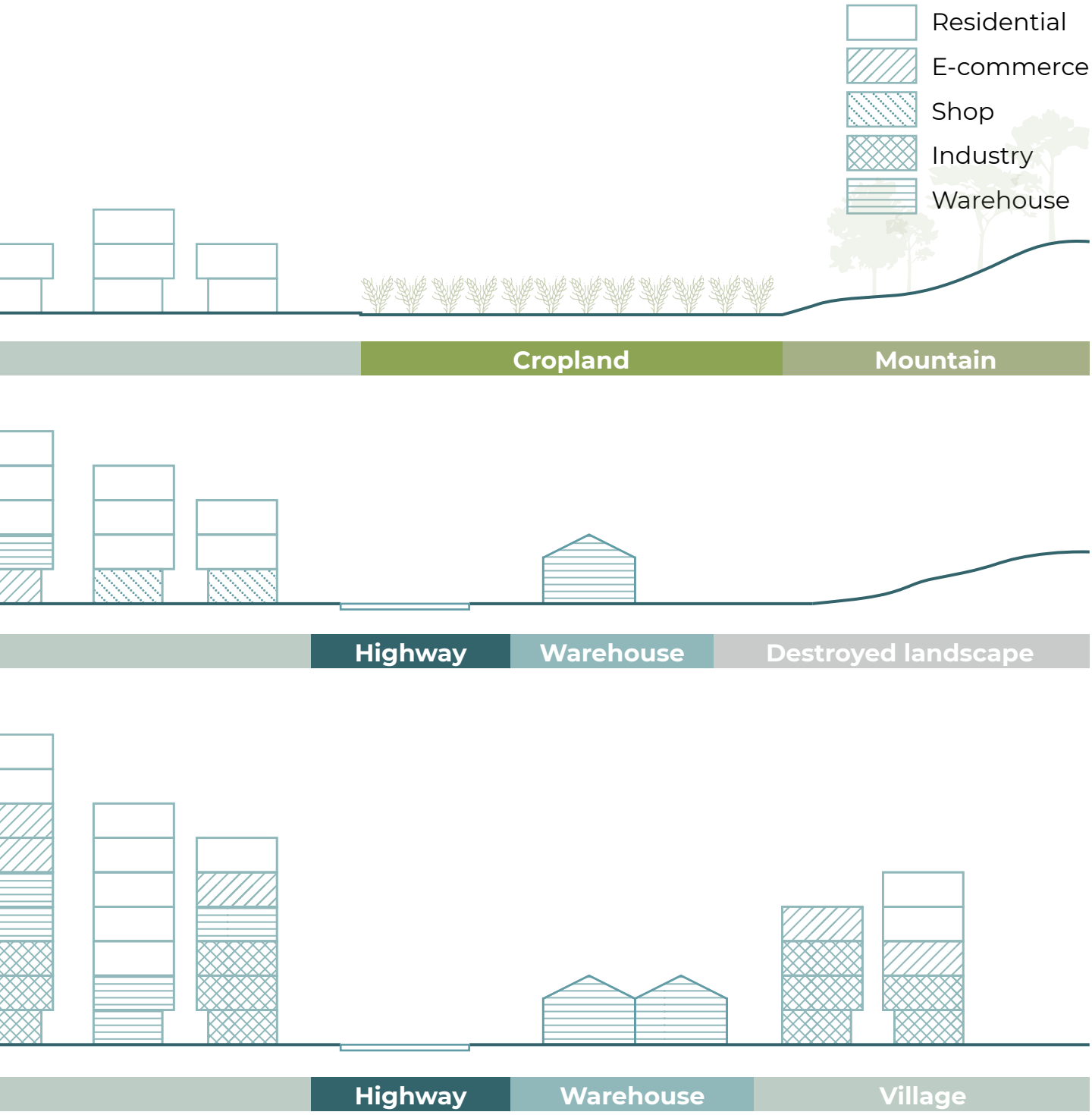


Figure 3.10 Sections of spatial transformation of industrial-based Taobao Village

The analysis of the Lirendong village allows for the spatial changes of the industry-based Taobao Village to be summarised from a profiling perspective. In the beginning, most of the villages were traditional agricultural villages. The urbanisation process transformed agricultural land into building land, and industrial functions, including factories and warehouses, were built up in a big way. With the entry of e-commerce, the spatial texture and function of the villages are transformed. Villages will experience horizontal and vertical expansion, with an increase in building density. Residential space gives way to production space and e-commerce functions, triggering a change in village attributes.



3.2.5 Atmosphere of industrial-based Taobao Village

Figure 3.11 Atmosphere of industrial-based Taobao Village

The Taobao Village model has really helped the economic development of the villages and has improved the construction of public services to some extent. Villagers have more opportunities to earn money, and they have the money to improve the quality of their residential buildings and the public environment. To support the development of e-commerce, the village collectives have even built an e-commerce service centre to help villagers develop their e-commerce businesses.

However, the Taobao Village model focuses on economic benefits at the expense of environmental sustainability. The presence of factories in the village has resulted in a lot of pollution and the need for logistics has increased the amount of waste in the village. The clutter of public spaces continues to affect people's daily lives. The village continues to move towards non-agriculturalisation, and the current development model has destroyed the traditional agricultural base on which the countryside was built.

3.3 SHAHE & YANXIA TAOBAO VILLAGE: AGRICULTURAL-BASED TYPE IN RURAL AREA

3.3.1 Introduction

In China, the famous Shuyang model is the most mature case of agricultural development in Taobao Villages. Shahe and Yanxia villages, located in Suqian City, Jiangsu Province, are typical Taobao Villages based on the Shuyang model (figure 3.12). The two villages are located approximately 3 km apart, and they did not form as separate Taobao Villages but developed in cooperation with each other. As the villages are backed by the huge Shuyang flower and wood industry and are on a vast agricultural landscape, they are developing an e-commerce business of growing, packaging, displaying and selling flowers and trees. The Yanxia village mainly undertakes the function of flower and tree growing and has many other villages like it in its vicinity, which have good market competition and cooperation. Shahe village mainly buys from other villages and undertakes the following e-commerce services.

Figure 3.12 Location of Shahe & Yanxia Villages

Natural landscape

Rivers play an important role as a natural ecological substrate to support agricultural development.

Agricultural land

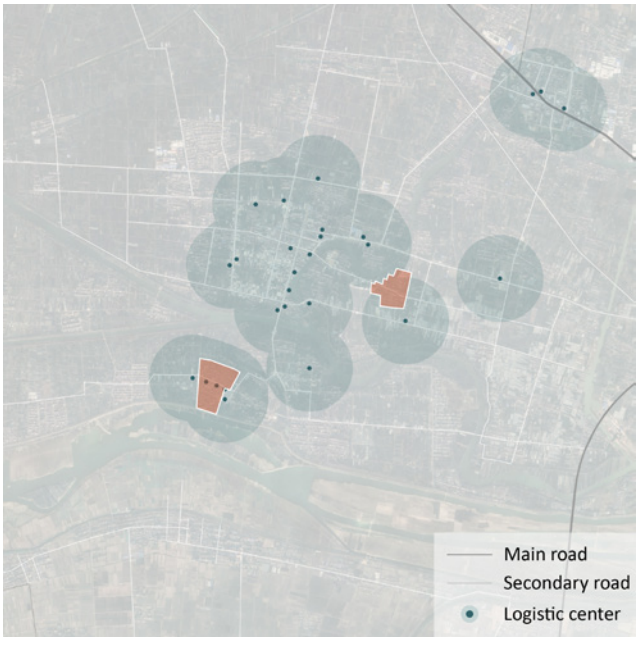
Agriculture is the most significant land use function here, mainly arable land, and some greenhouses have been developed.

Logistics network

Logistics facilities are concentrated near the villages, but transport facilities are not well developed and rely on village roads for transportation.

Industrial basis

Industrial parks are not the basis for rural development, but several small workshops still exist in the surrounding villages.



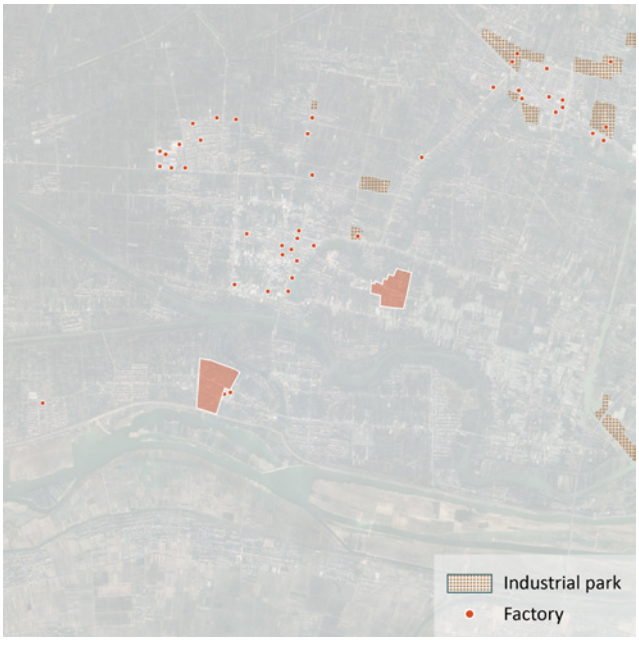
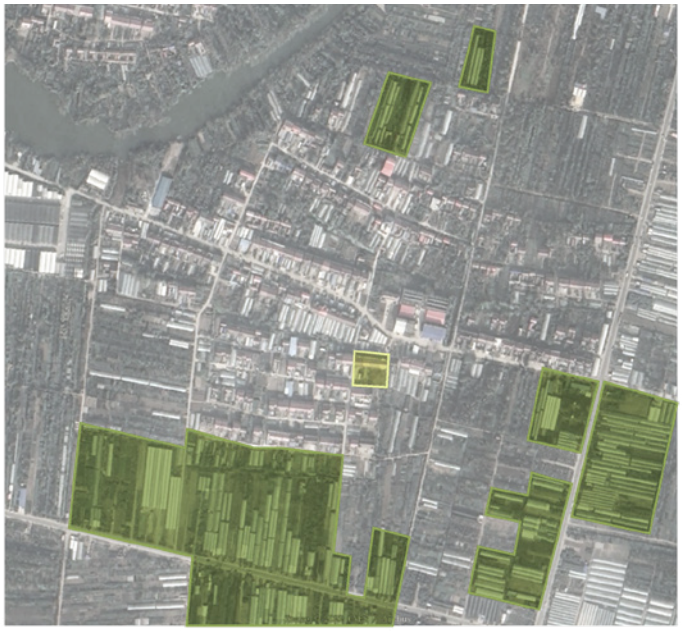


Figure 3.13 Context analysis of Shahe Village and Yanxia Village

3.3.2 Spatial-temporal transition

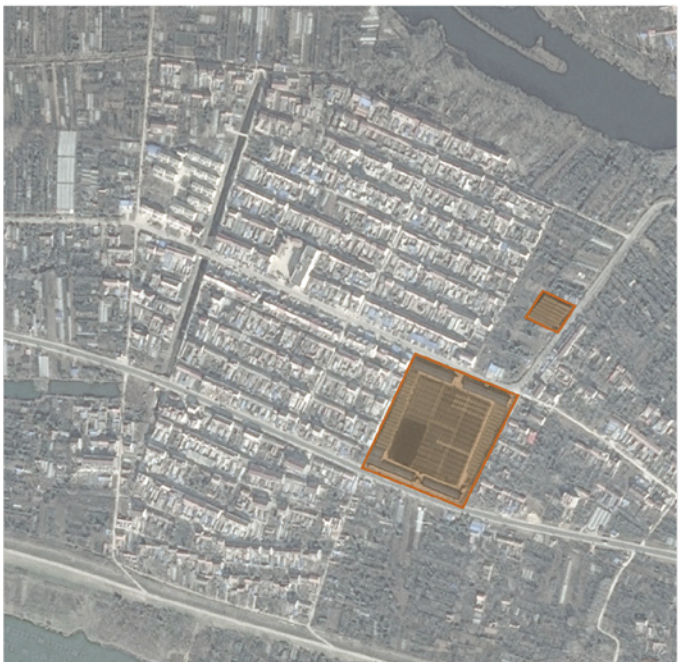
Figure 3.14 Context analysis of Lirendong Village

2018
Expansion of greenhouses and industry



After experiencing the arrival of Taobao e-commerce and driven development, the village of Yanxia has mainly experienced the upgrading and development of agriculture. In order to improve production and the quality of the flowers and trees, the construction of greenhouses continued, covering the original natural farmland. A small number of the original village houses were added to handle the flower and tree products. Although Shahe village does not undertake cultivation functions, it still builds centralised greenhouses to store its products.

2021
Extension of village residential buildings



3.3.3 The social-spatial network system

The e-commerce model has different cooperation methods with villages relies on agriculture and may have different socio-economic effects (figure 3.15). Individual farmers can start their own e-commerce and finish the whole process by themselves, including producing, packaging, advertising and marketing. Farmers may also outsource processes to enterprises, creating good cooperation. In addition, introducing government policies to support the development of the industry can help the industry form a clustering effect. With the government taking the lead in guiding enterprises and farmers to cooperate, this type of PPP model combines top-down and bottom-up strategies properly.

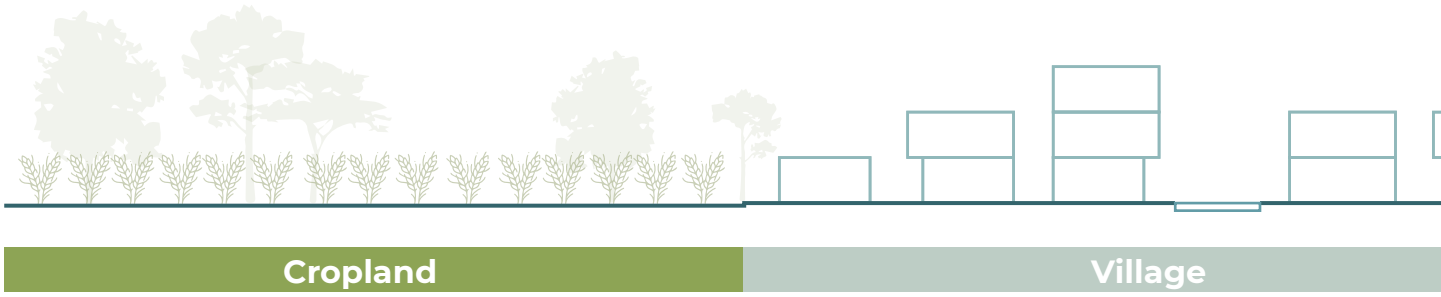
In the case of Yanxia village and Shahe village, all three models emerged (figure 3.16). The farmers in Shahe village only provide flora products, while the small enterprises in Yanxia village will take on the follow-up of the chain. On a larger scale, both villages will cooperate with nearby flora markets or industrial parks, resulting in higher economic benefits.

Figure 3.15 The models of agricultural-based Taobao Village development

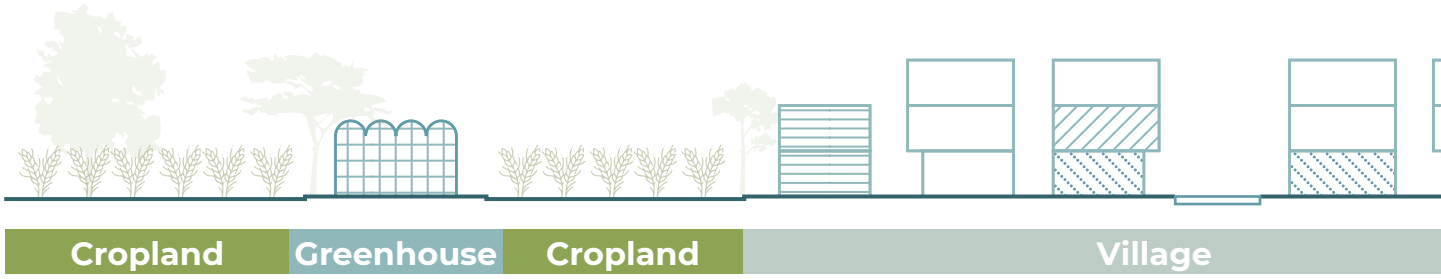
Figure 3.16 The spatial network system

3.3.4 Spatial transformation of agricultural-based Taobao Village

Phase I: Traditional rural village



Phase II: Developing rural village



Phase III: Agricultural-based Taobao Village

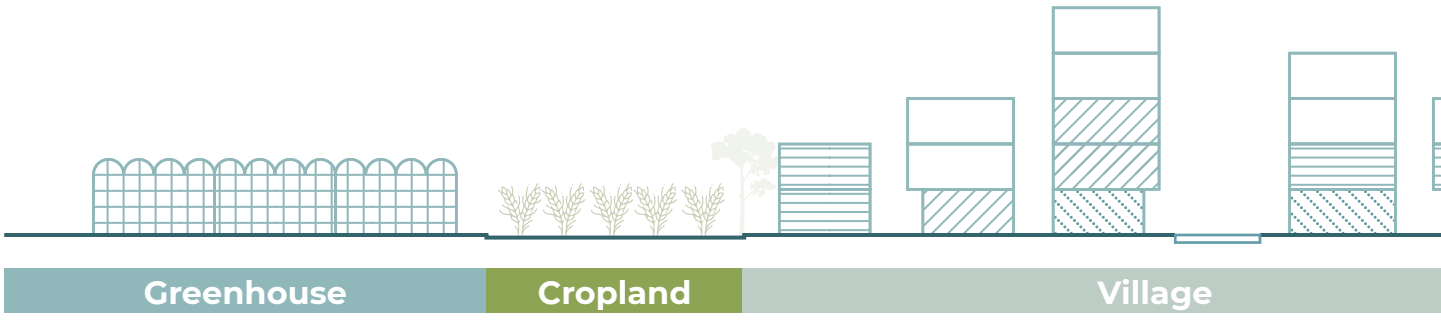


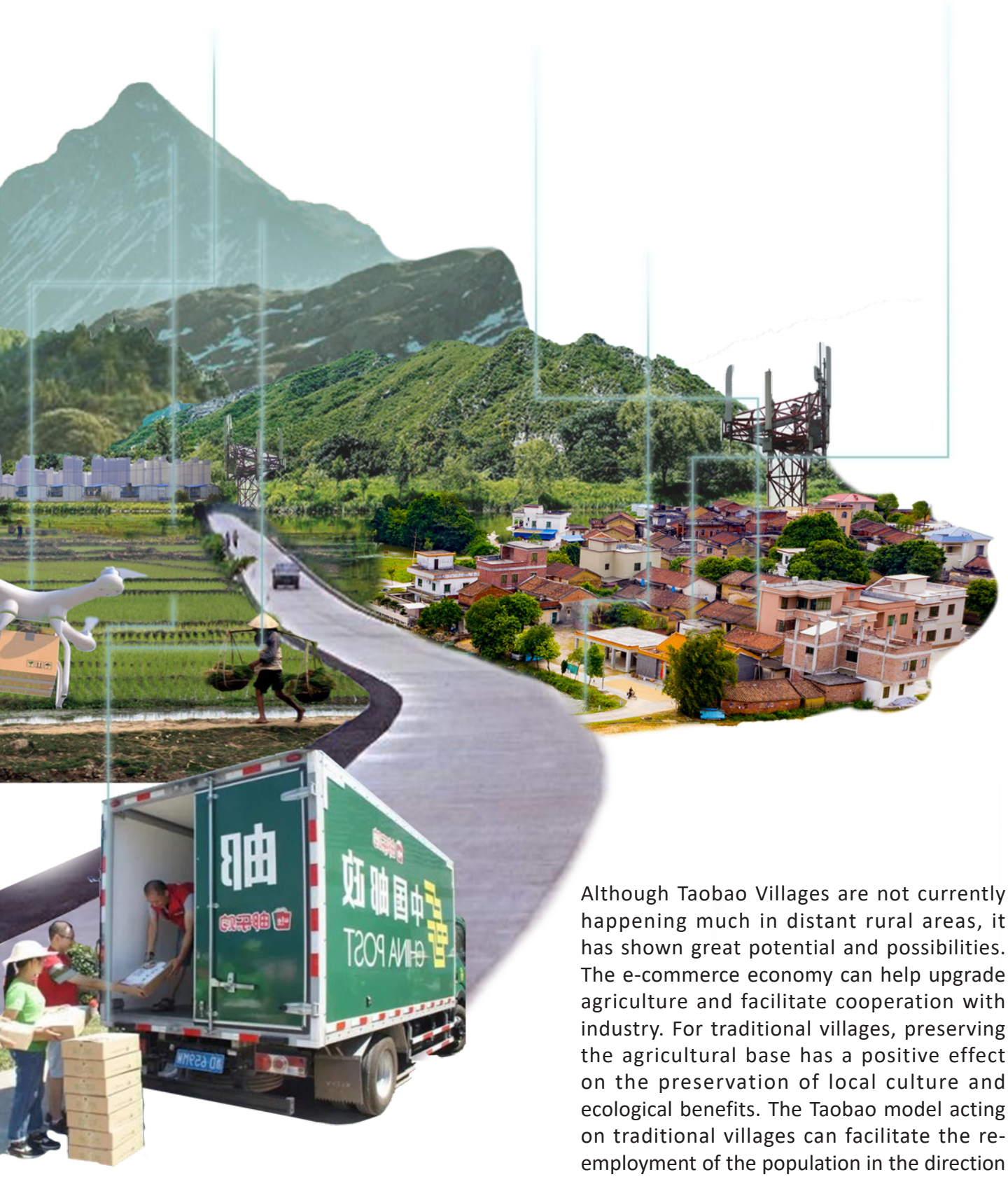
Figure 3.17 Sections of spatial transformation of industrial-based Taobao Village

The analysis of Shahe village and Yanxia village allows for the spatial changes of the agricultural-based Taobao Village to be summarised from a profiling perspective. The Taobao model has the potential to develop in traditional agricultural areas and does not require major destruction of the agricultural substrate. To enhance the economic efficiency of agricultural products, the emergence of greenhouses can improve yields and quality.

The development of the industry will facilitate the transformation of the village business and cooperation between villages or towns. Agricultural products can be concentrated in towns and villages with better logistical resources and sold through e-commerce.

3.3.5 Potential of developing agricultural-based Taobao Village

Figure 3.18 Potential of agricultural-based Taobao Village



Although Taobao Villages are not currently happening much in distant rural areas, it has shown great potential and possibilities. The e-commerce economy can help upgrade agriculture and facilitate cooperation with industry. For traditional villages, preserving the agricultural base has a positive effect on the preservation of local culture and ecological benefits. The Taobao model acting on traditional villages can facilitate the re-employment of the population in the direction of agriculture and help villages retain their talents. In addition, modern information technology can help farmers promote their products and complete sales logistics. All these are the opportunities that digitalisation brings to traditional agricultural villages.

3.4 REGIONAL DEVELOPMENT

3.4.1 Spatial-temporal development of Taobao Villages in GBA

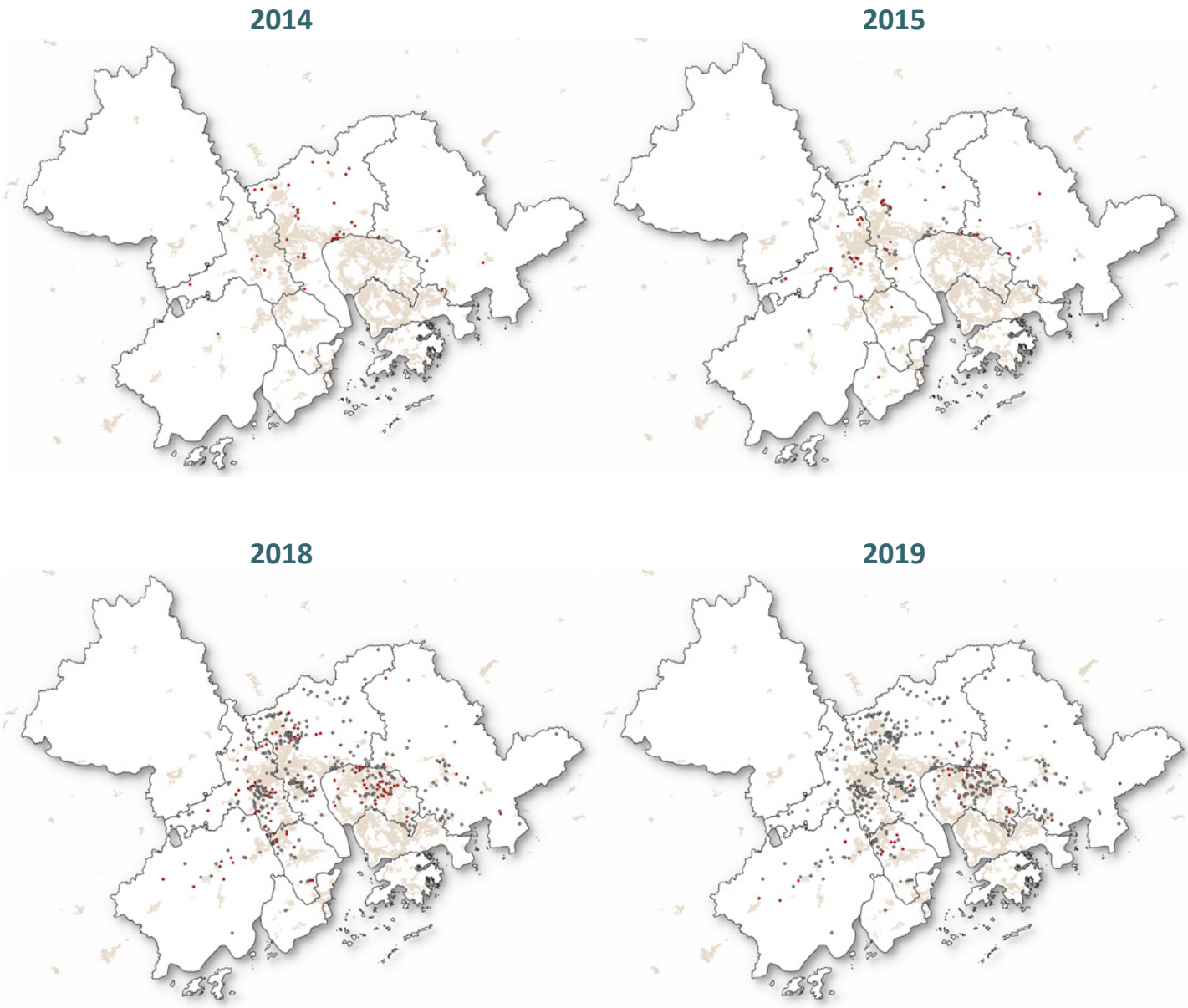
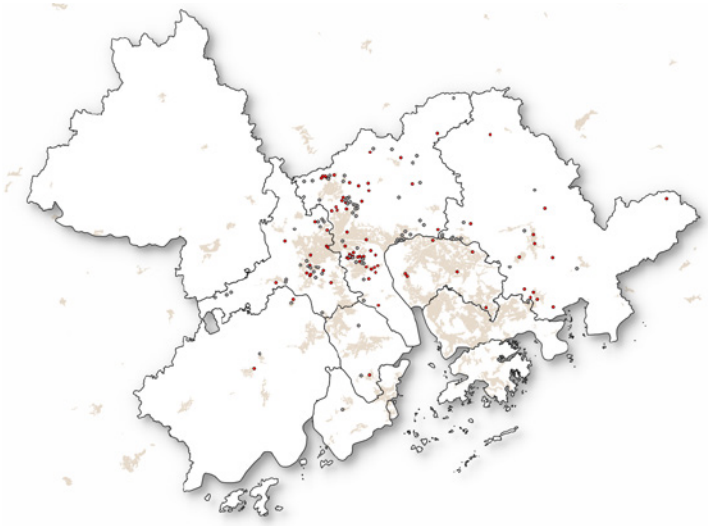


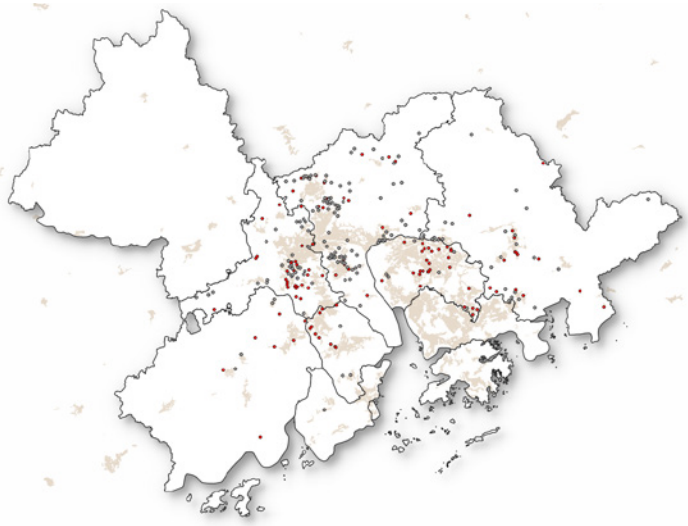
Figure 3.19 Distribution of Taobao Villages in GBA from 2014 to 2021

The Taobao Village phenomenon began to emerge in the GBA around 2014 and dramatically increased each year. It is mainly found in suburban areas, mostly in the form of urban villages that have been transformed. Taobao Villages have also started appearing in distant rural areas in recent years.

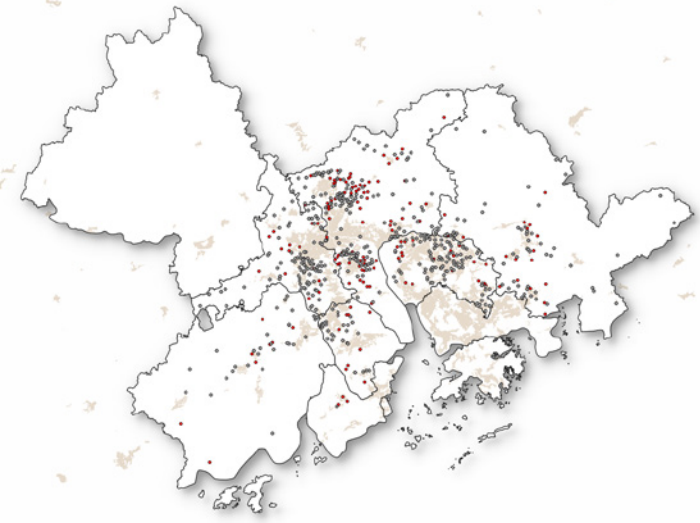
2016



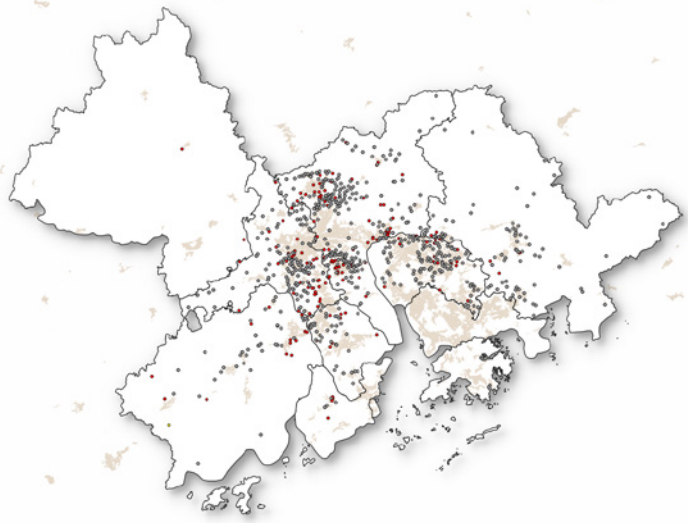
2017



2020



2021



3.4.2 Heatmap of Taobao Villages distribution

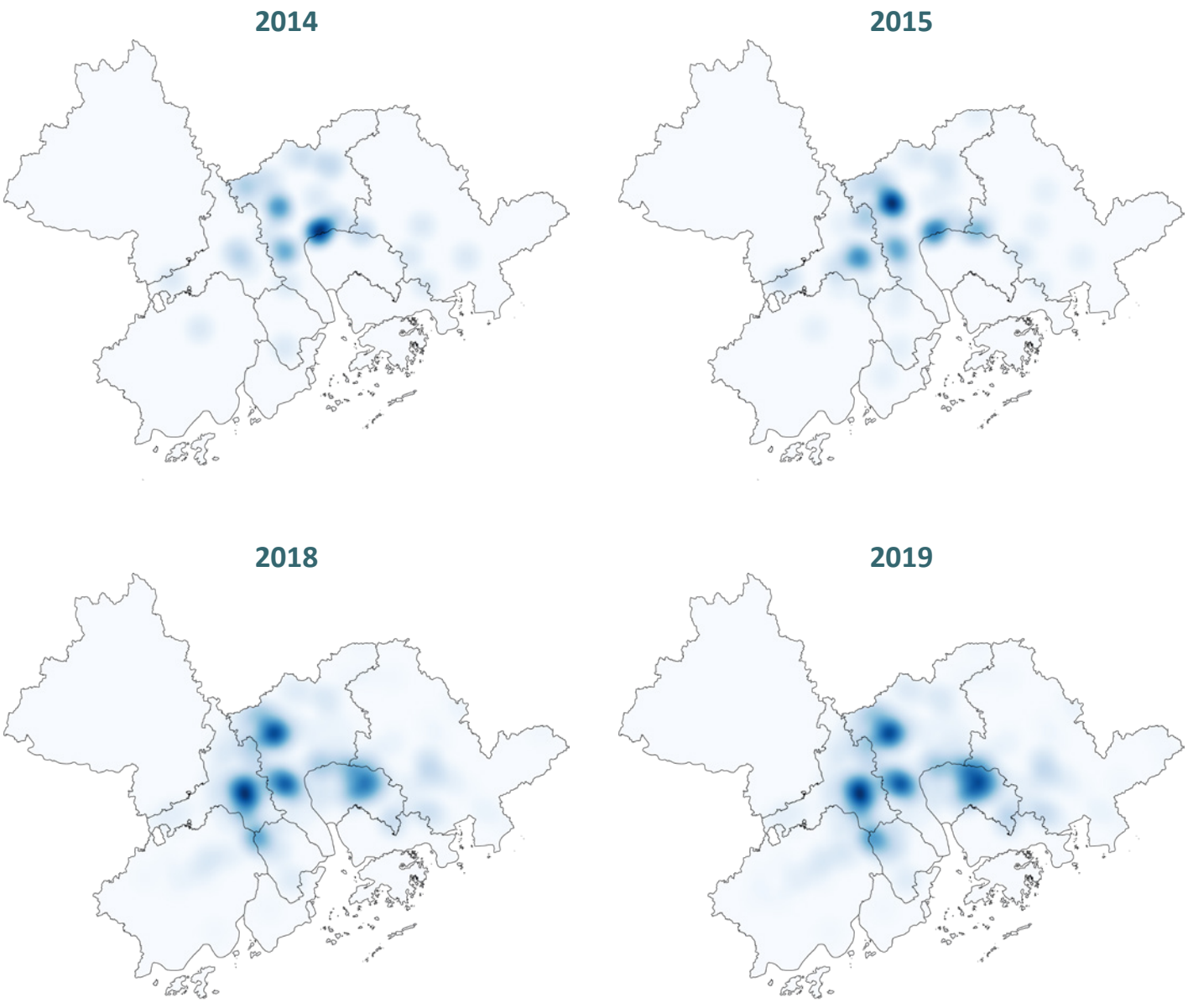
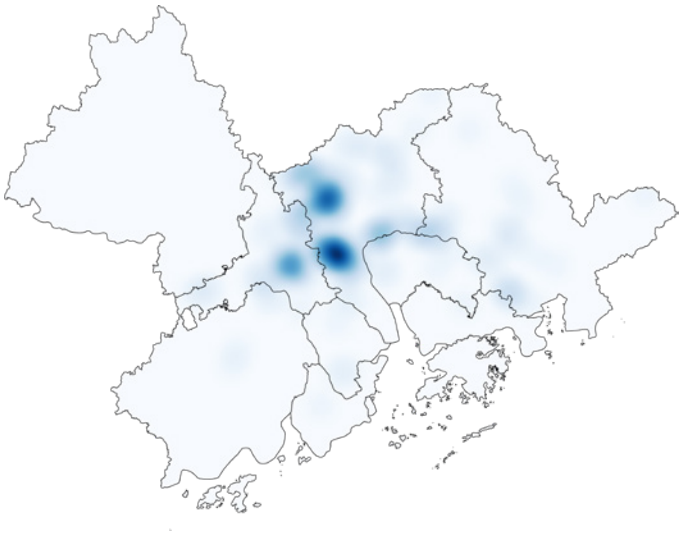


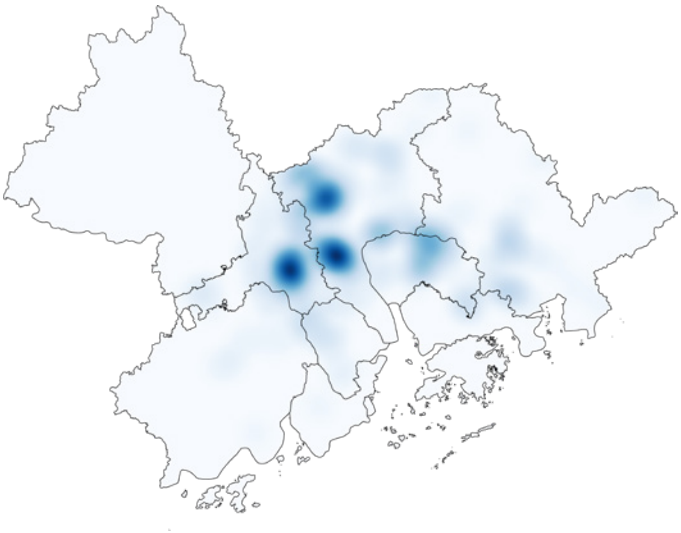
Figure 3.20 Heatmap of distribution of Taobao Villages in GBA from 2014 to 2021

The heat map shows that Taobao villages tend to occur in clusters. The emergence of new Taobao villages is influenced by the surrounding villages that have already developed, continuing to densify the area each year. Currently, the densest concentration of Taobao villages is along the border of Guangzhou and Foshan, and in the rural areas of Dongguan.

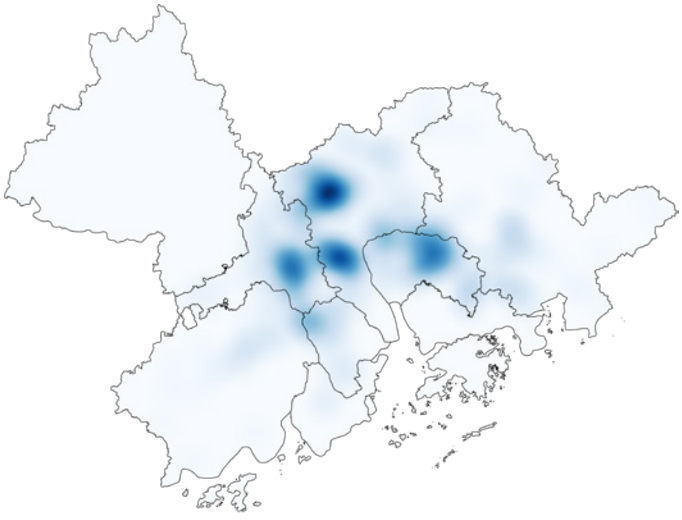
2016



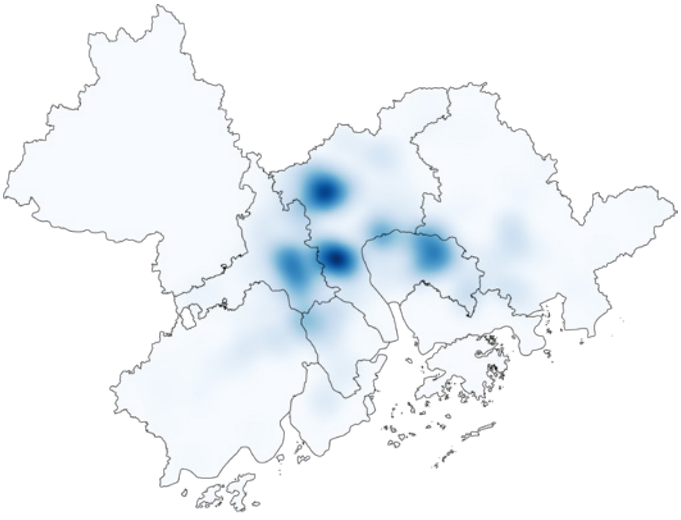
2017



2020



2021



3.4.3 Phases of development

Phase I: Emergence (before 2014)

Taobao villages first began to emerge in the peri-urban area of Guangzhou. Due to the proximity to resources, including transport facilities, industrial base, and population resources, the villages could take the lead in development. In addition, the lower land price is one of the reasons why industries choose to locate in the villages.

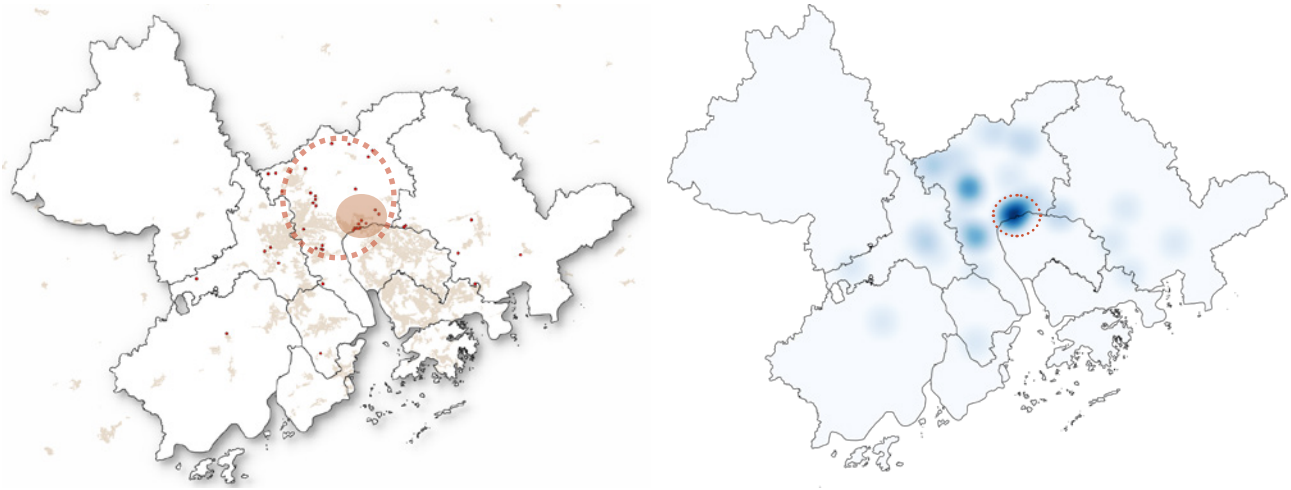


Figure 3.21 Taobao Villages developing trend before 2014

Phase II: Radiation (2014-2016)

Taobao Villages continue to develop mainly on the border of Guangzhou-Foshan. As Foshan has an excellent industrial base, the extension of the industrial chain has led to the formation and development of specialised villages.

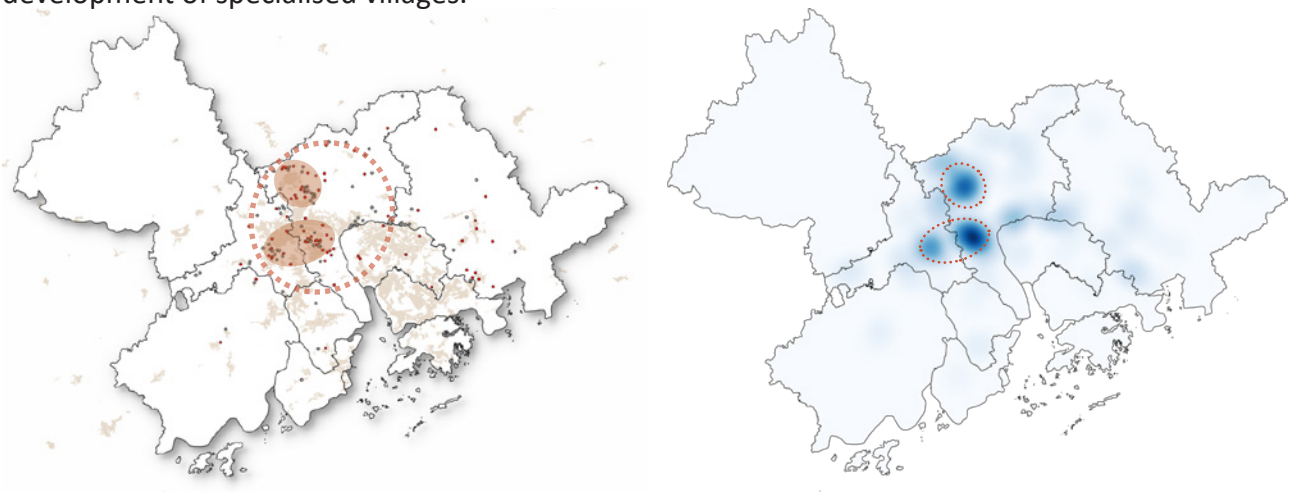


Figure 3.22 Taobao Villages developing trend from 2014 to 2016

Phase III: Diffusion (2016-2018)

Taobao Villages began to show a trend of spreading to distant rural areas. As the e-commerce economy has raised attention, new policies and facilities have brought development opportunities to rural areas.

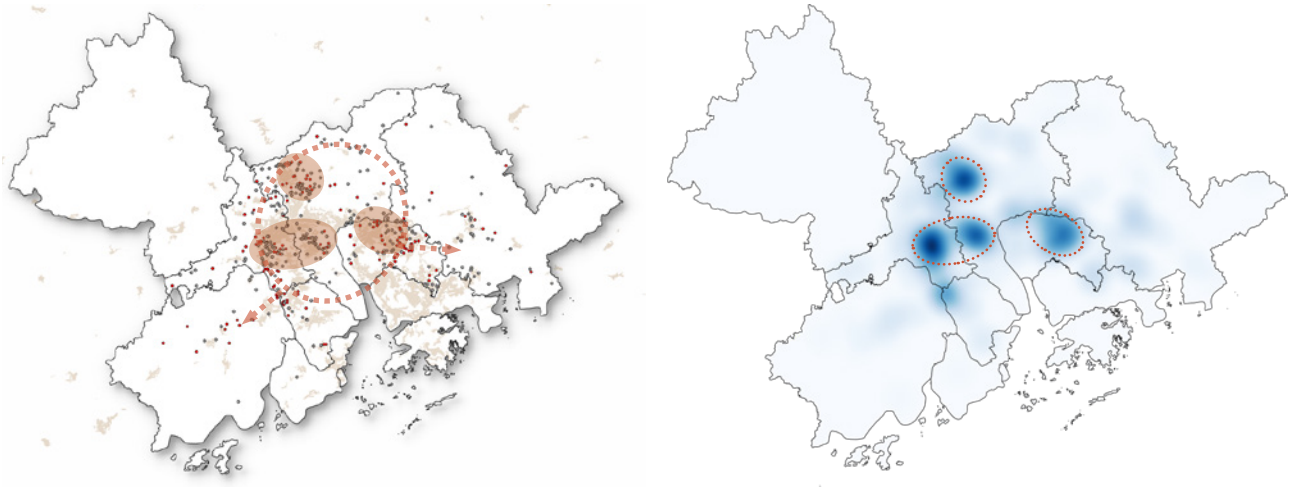


Figure 3.23 Taobao Villages developing trend from 2016 to 2018

Phase IV: Clustering (2018-2021)

Taobao villages that have formed continue to influence the surrounding rural areas. More and more villages are moving towards an e-commerce economy, creating a clustering effect.

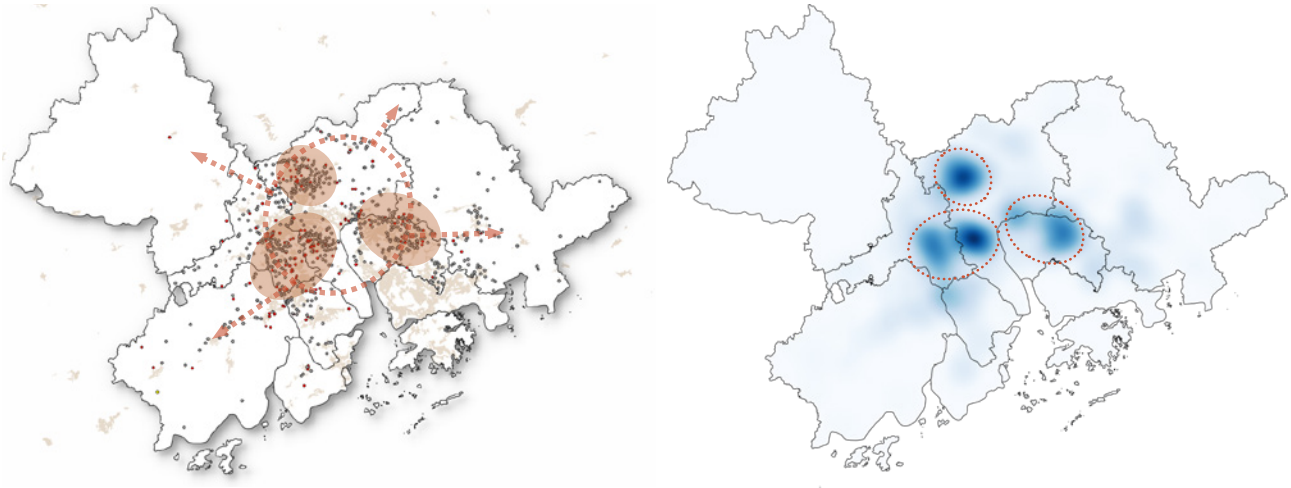


Figure 3.24 Taobao Villages developing trend from 2018 to 2021

3.5 DEVELOPING MECHANISM

3.5.1 Incremental development inside the village

The case study shows that rural development always happens gradually and autonomously. According to Li, X., Luo, Q., & Yang, H. (2013), the process has an intrinsic development mechanism and is influenced by external factors and the internal environment (figure 3.25). Existing external policies, markets and industrial bases cause e-merchants to move into villages and begin to drive the e-commerce economy. After the success of the e-commerce model, it radiates to other spaces in the village based on the spatial distribution of resources. With continued influence and spread, the entire village space may be transformed into a specialized space that supports the development of e-commerce.

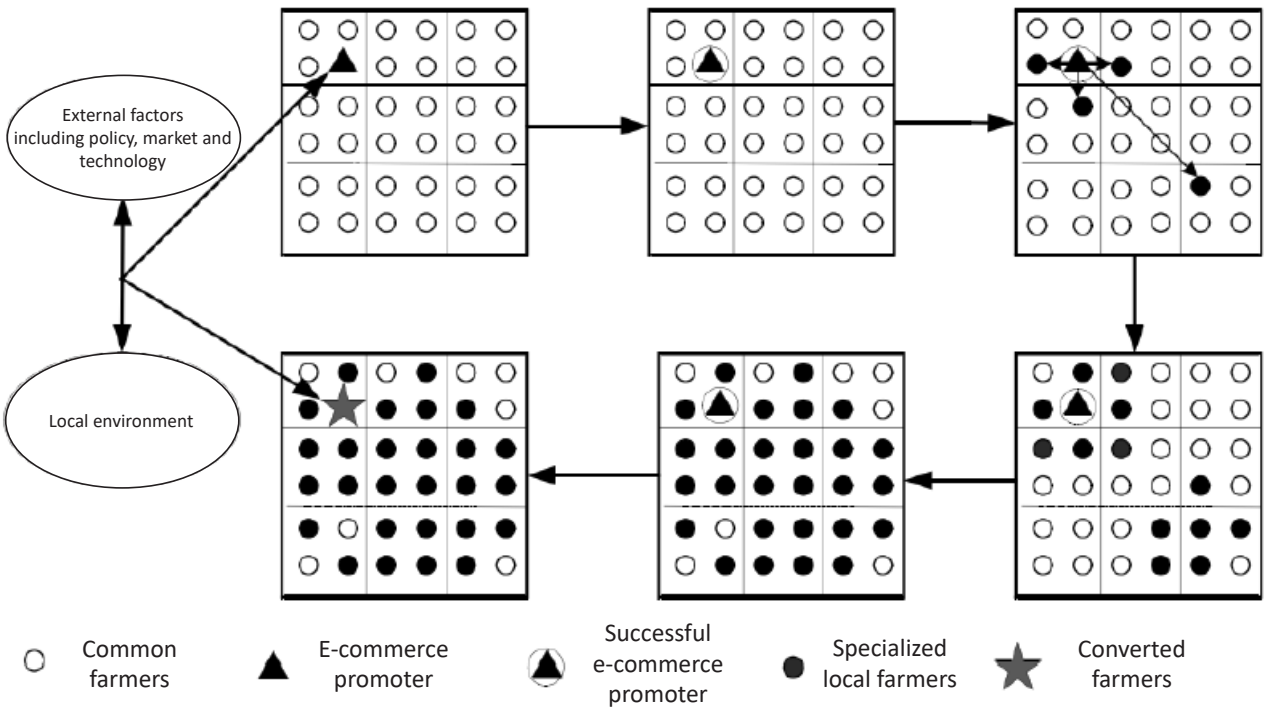


Figure 3.25 Developing mechanism inside Taobao Village

3.5.2 Clustering effects of villages

The development of a village influences other nearby villages, creating a clustering or cooperative effect (figure 3.26). Supported by a solid industrial background, villages are more inclined to develop similar industries. Neighbouring industries will form resource sharing and positive competition, promoting the development of industries. Depending on the development needs of the industry chain, different villages may also develop different functions, thus forming a cooperative network system. Whichever model is used, it is the potential for a cluster effect in the networked development of villages. In general, there are objective limits to the distance of cooperation between villages, industries, and clusters, including infrastructure, product preservation, and so on (figure 3.27). When envisaging village networks, reasonable distances between nodes need to be considered.

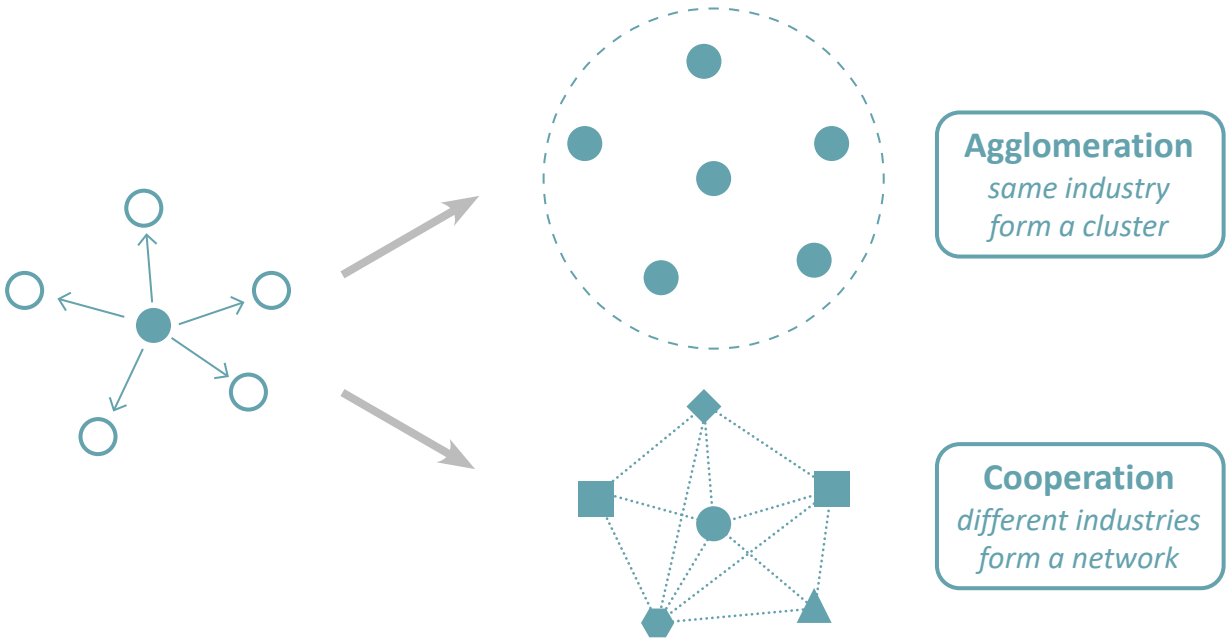


Figure 3.26 Developing pattern of Taobao Villages

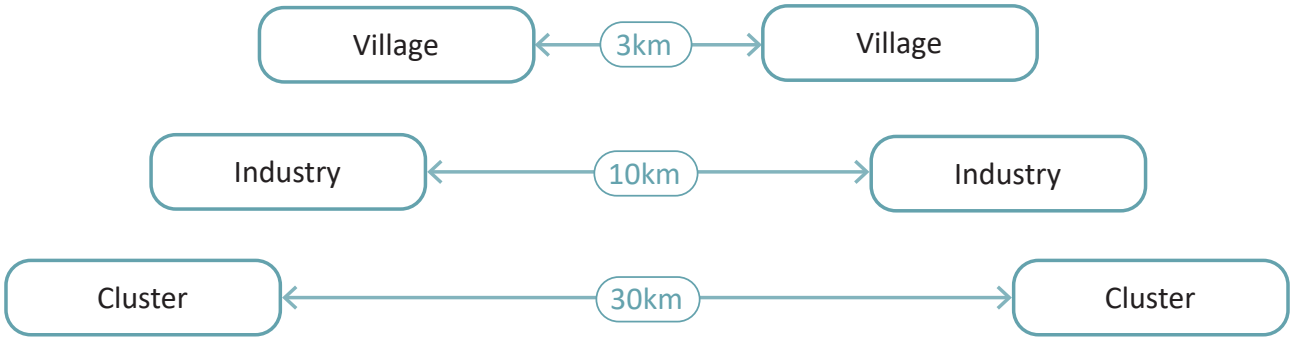


Figure 3.27 General distance of cooperation

3.6 SPATIAL IMPLICATIONS

3.6.1 Economic activity demands the support of physical space

According to Luo, Z., & Qiao, Y. (2021), there are four main drivers for understanding the formation of Taobao villages from a socio-economic perspective, which is coordinated by rural governance (figure 3.28). Many established Taobao villages have applied the model to more than just the industrial economy but also rural governance and information services. The Suichang model is a typical successful example of rural e-services (figure 3.29). The PPP model of farmers, village enterprises and village collectives are the basis for the success of this model. In practice, however, all economic and cultural activities need to be supported by physical space. Even ICT technologies require tangible physical facilities to support information exchange.

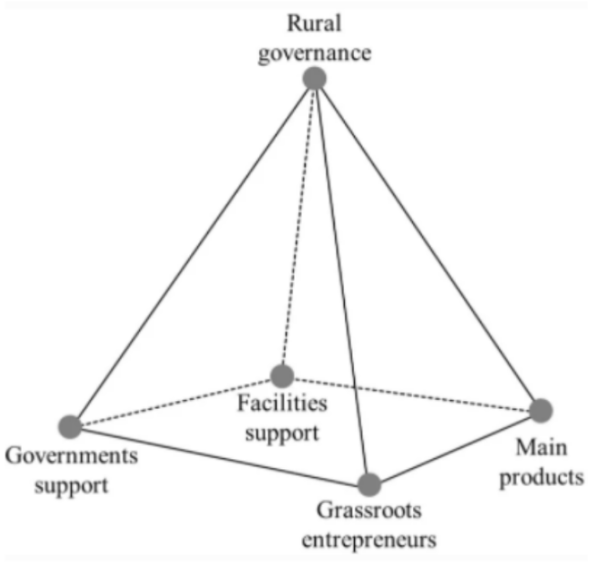


Figure 3.28 The model of the driven factors of Taobao Villages model

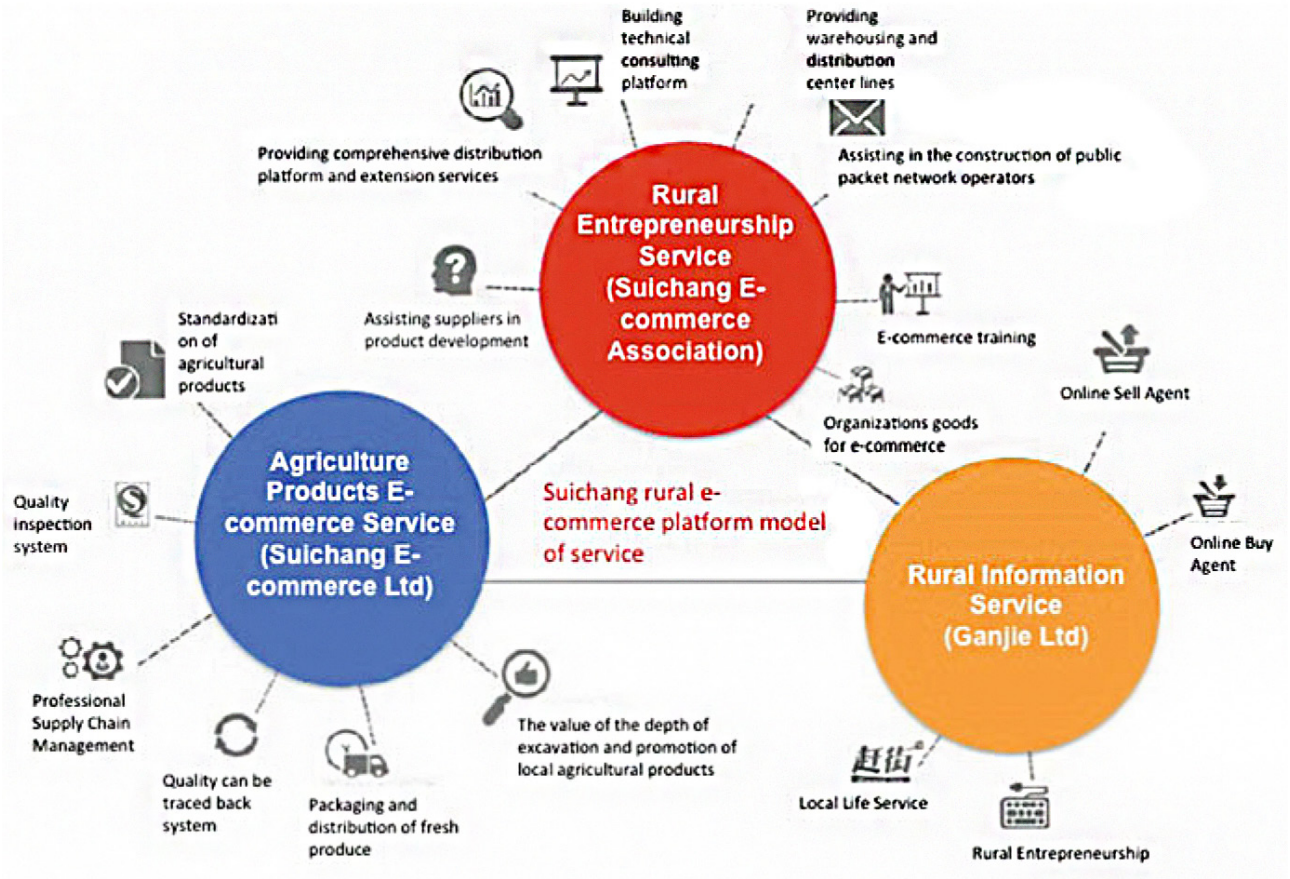


Figure 3.29 Suichang pattern of rural e-commerce cooperation

3.6.2 Developing elements of Taobao villages

Based on the research and analysis of the industrial-based and agricultural-based Taobao villages in this chapter, the influencing factors associated with their development are summarised (figure 3.30). Spatial elements are the physical basis for supporting the development of socio-economy, while socio-economic elements in turn facilitate spatial development. Under the influence of different factors, villages have the potential to develop into different types of Taobao villages.

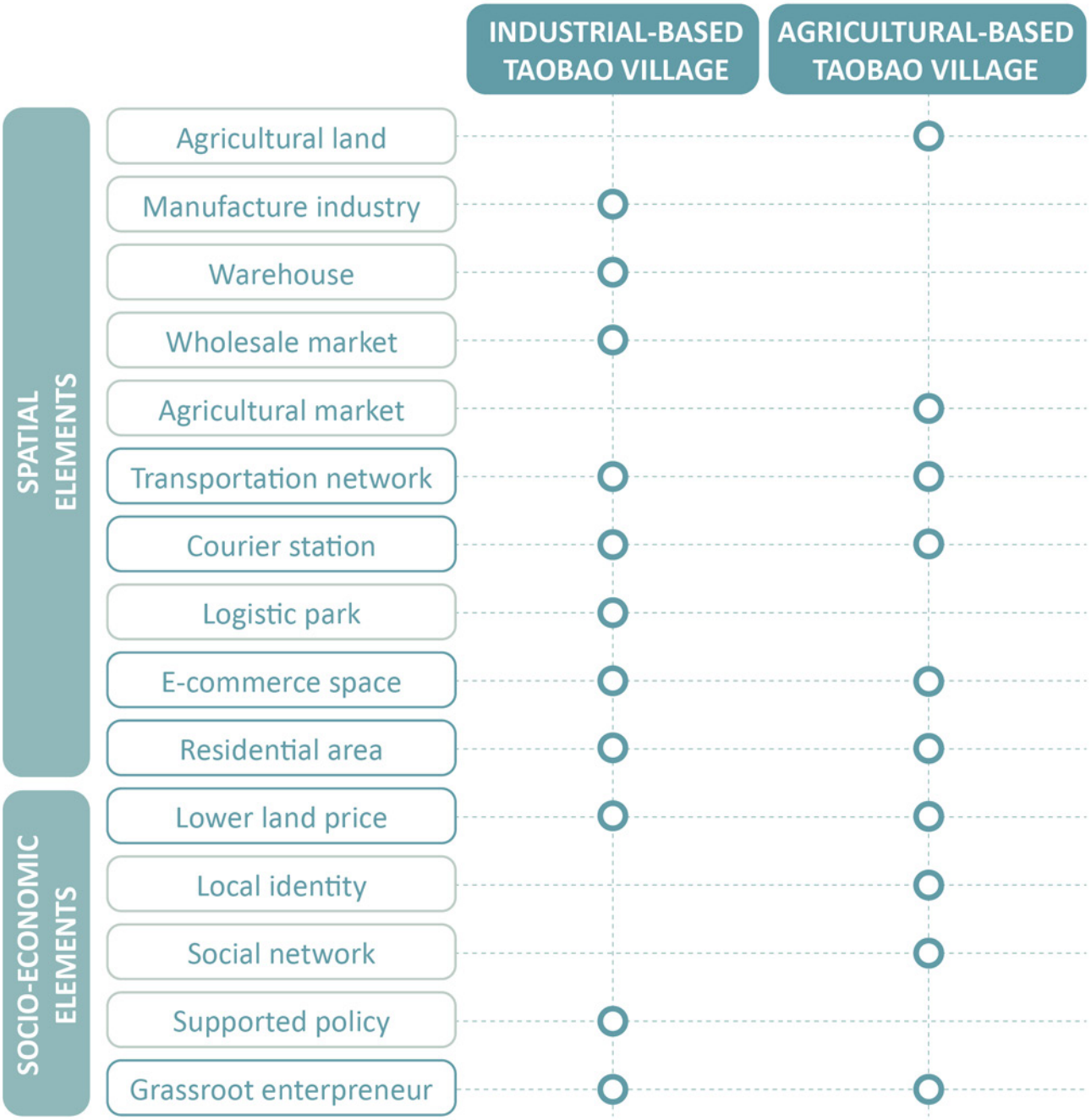


Figure 3.30 Developing elements of industrial-based and agricultural-based Taobao villages

3.6.3 Spatial elements for smart village development

The way that space affects the development of villages has always been the focus of this project. From the perspective of spatial planning, the changes in Taobao villages is a spatial transformation caused by the entry of economic behaviour patterns into the countryside, and there is a mutual reinforcement between the two. Changing and improving the spatial conditions can help the economic model of e-commerce to thrive and also promote the construction of digital villages. The project wants to balance the development of economic benefits, agricultural basis and rural livability by implementing spatial conditions.

The spatial elements regarding the digital development of rural areas can be derived from the case study of a mature Taobao village (figure 3.32). Industrial space provides the basis for economic behaviour to take place. In particular, agriculture is far more important in the countryside than other manufacturing industries. Logistics facilities provide the physical spatial link to the chain of e-commerce, stringing together the intangible economic behaviour with the physical space. And the quality of the living environment determines the potential for sustainable development of the village.

Figure 3.31 Balancing different qualities for rural development

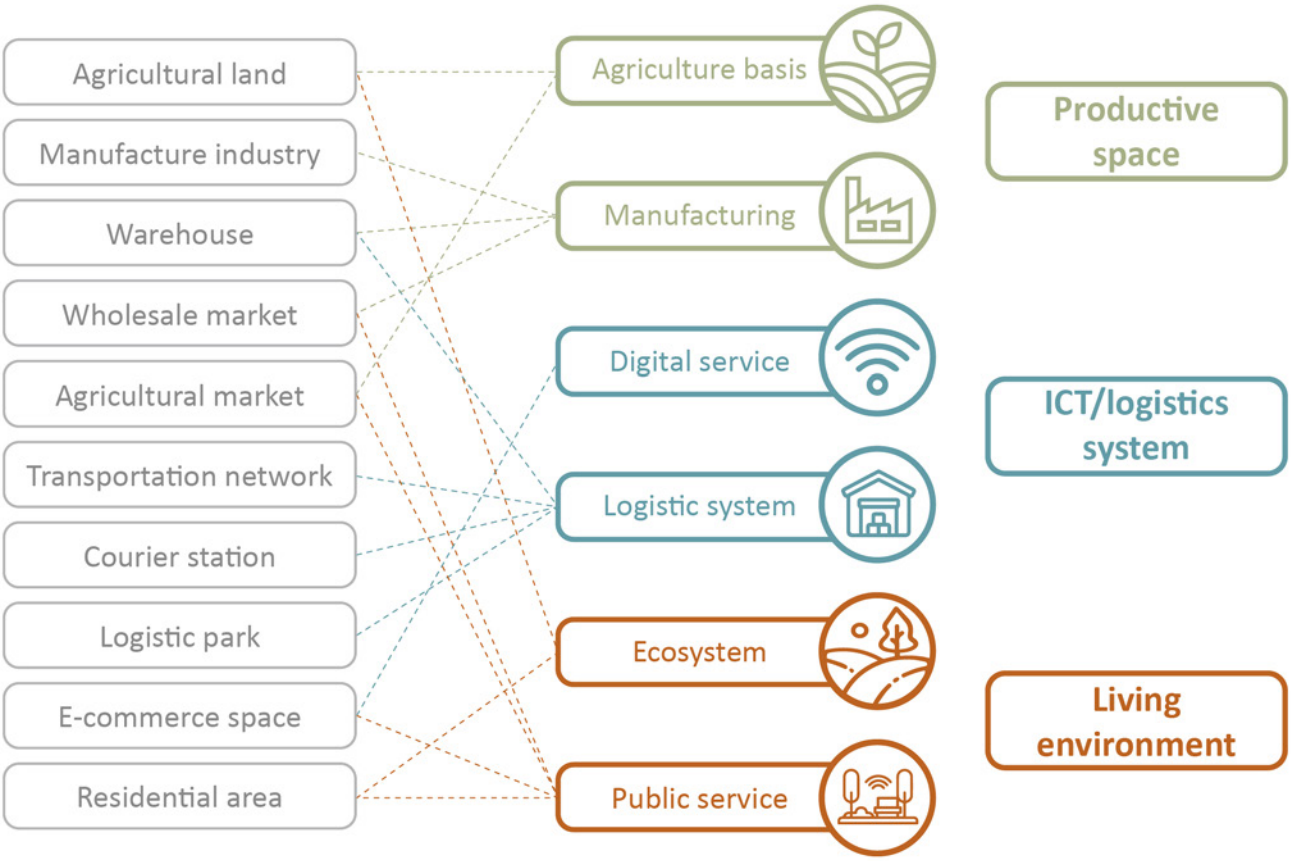


Figure 3.32 Implementing spatial elements for digital development of rural areas

4

POTENTIAL OF SMART VILLAGE

4.1 NATURAL ENVIRONMENT

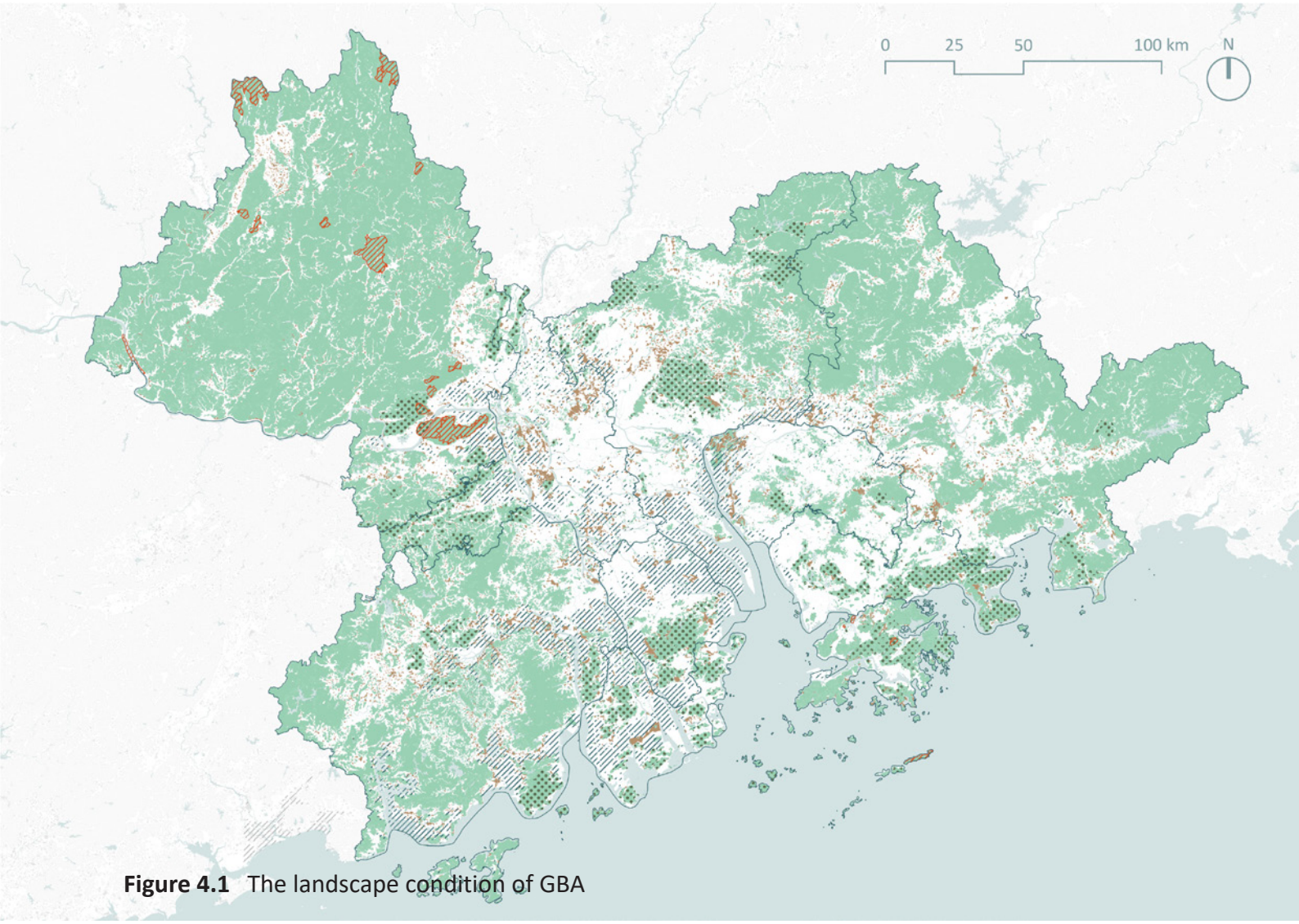


Figure 4.1 The landscape condition of GBA

The GBA is highly urbanised and mostly concentrated in the hinterland in the centre of the delta. As the Pearl River Delta is dominated by hilly terrain, the urbanised areas are surrounded by the mountain terrain.

4.2 AGRICULTURAL BASIS

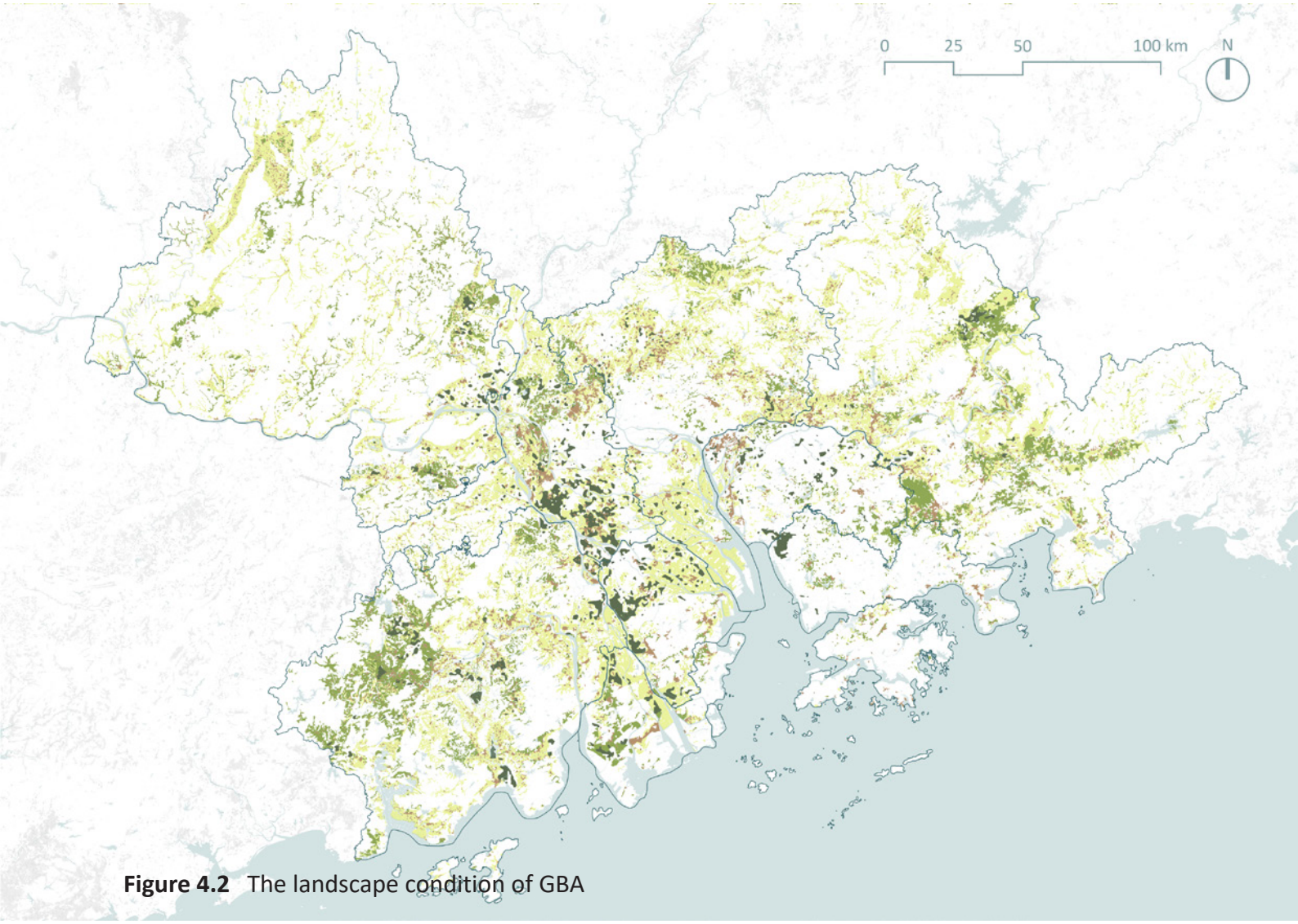


Figure 4.2 The landscape condition of GBA

The agricultural land use in GBA includes dyke ponds, paddy fields, and cropland. Mapping provides an understanding of the distribution of the different land uses. In general, the western part of the GBA has more agricultural resources, especially the dyke pond system in the delta-specific agricultural environment. In general, agricultural land in the south-western hinterland and southern coastal areas suffered from a flooding crisis.

4.3 ACCESSIBILITY

4.3.1 Highway transportation and logistic points

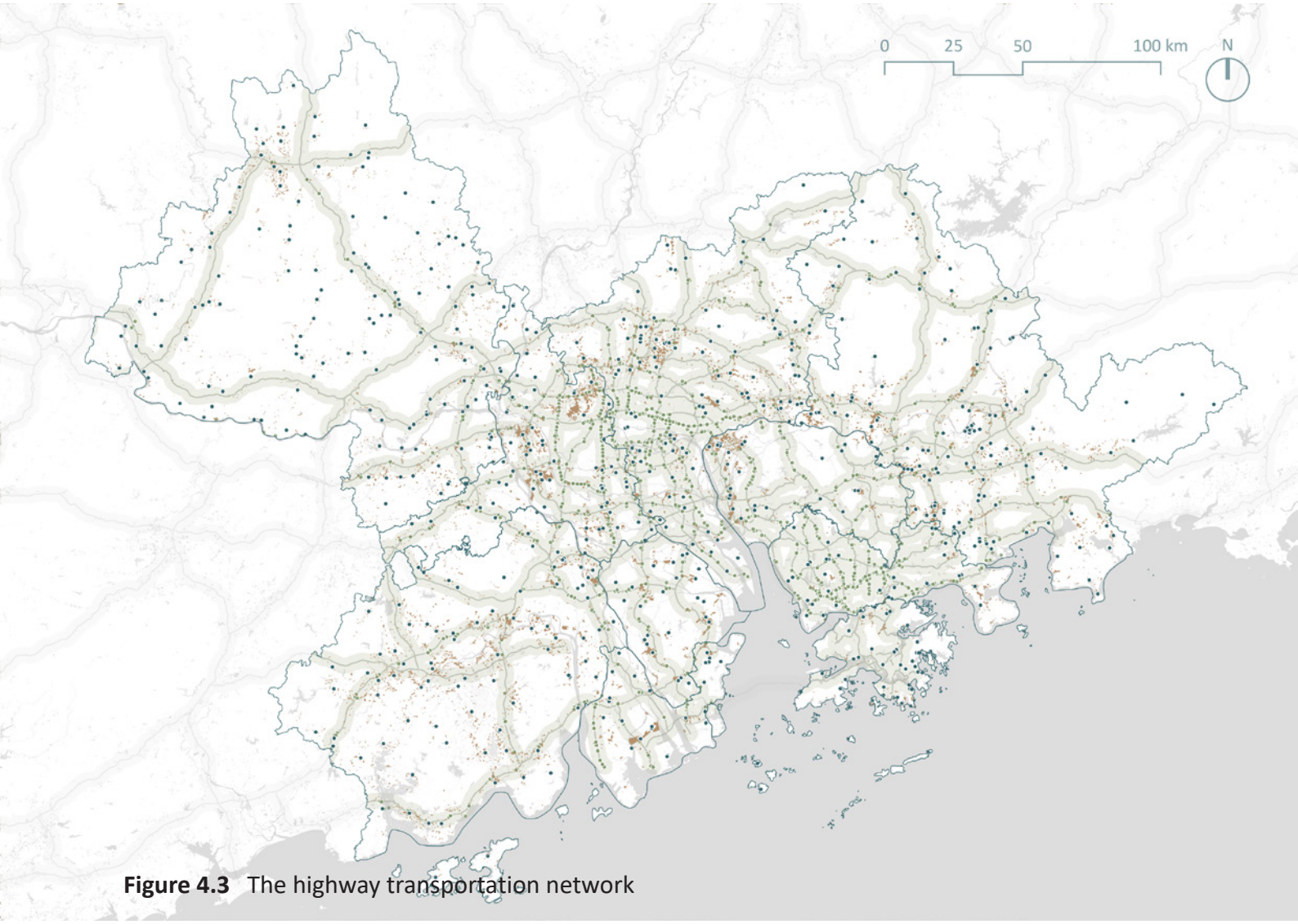


Figure 4.3 The highway transportation network

Rural area
Water body
Logistic point in rural areas
Highway entrance
Highway network
3km buffer zone of highway

The highway is the most direct transport system connecting the villages. By analysing the highway system with a 3 km buffer zone, it is possible to find areas of villages with better accessibility. In addition, the development of e-commerce relies on the support of logistics sites. Currently, most of the GBA rural areas can be covered by logistics facilities, but it is not yet an efficient network system of centres.

4.3.2 Railway and waterway transportation

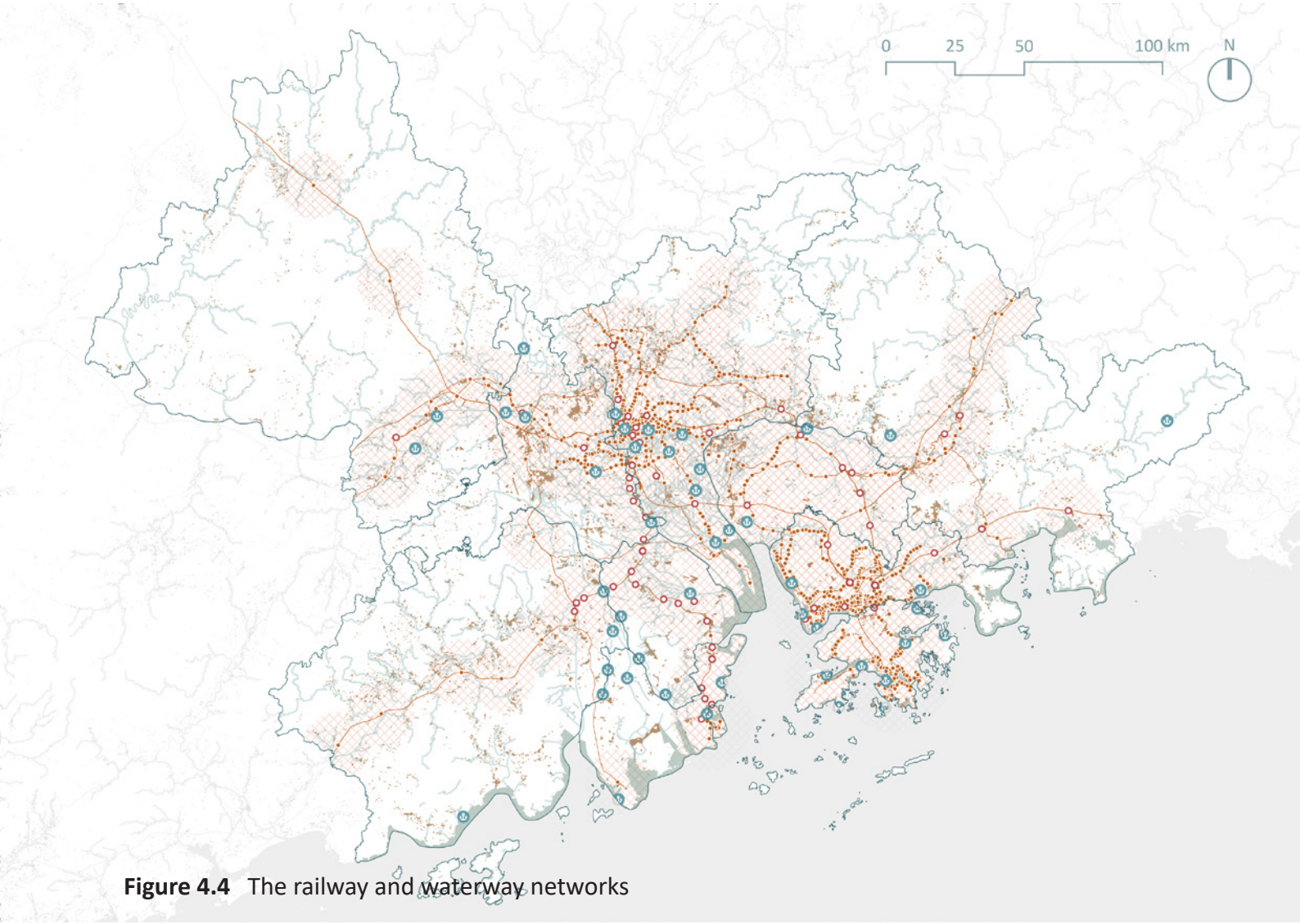


Figure 4.4 The railway and waterway networks

Rural area
Waterway
Port
Main railway station
Railway station
Railway line
10km buffer zone of station

From the perspective of regionalisation and globalisation, the decentralised development of e-commerce economic behaviour in the countryside gives it the potential to reach larger markets. Railways and ports have become essential carriers of logistical transport. The coverage of the railway system is still dominated by the cities in the delta hinterland, with only the major towns in the rural areas having railway stations. Ports are mainly located on the western side of the GBA, where waterways are abundant.

4.4 INDUSTRIAL BASIS

4.4.1 The potential of agro-industry development

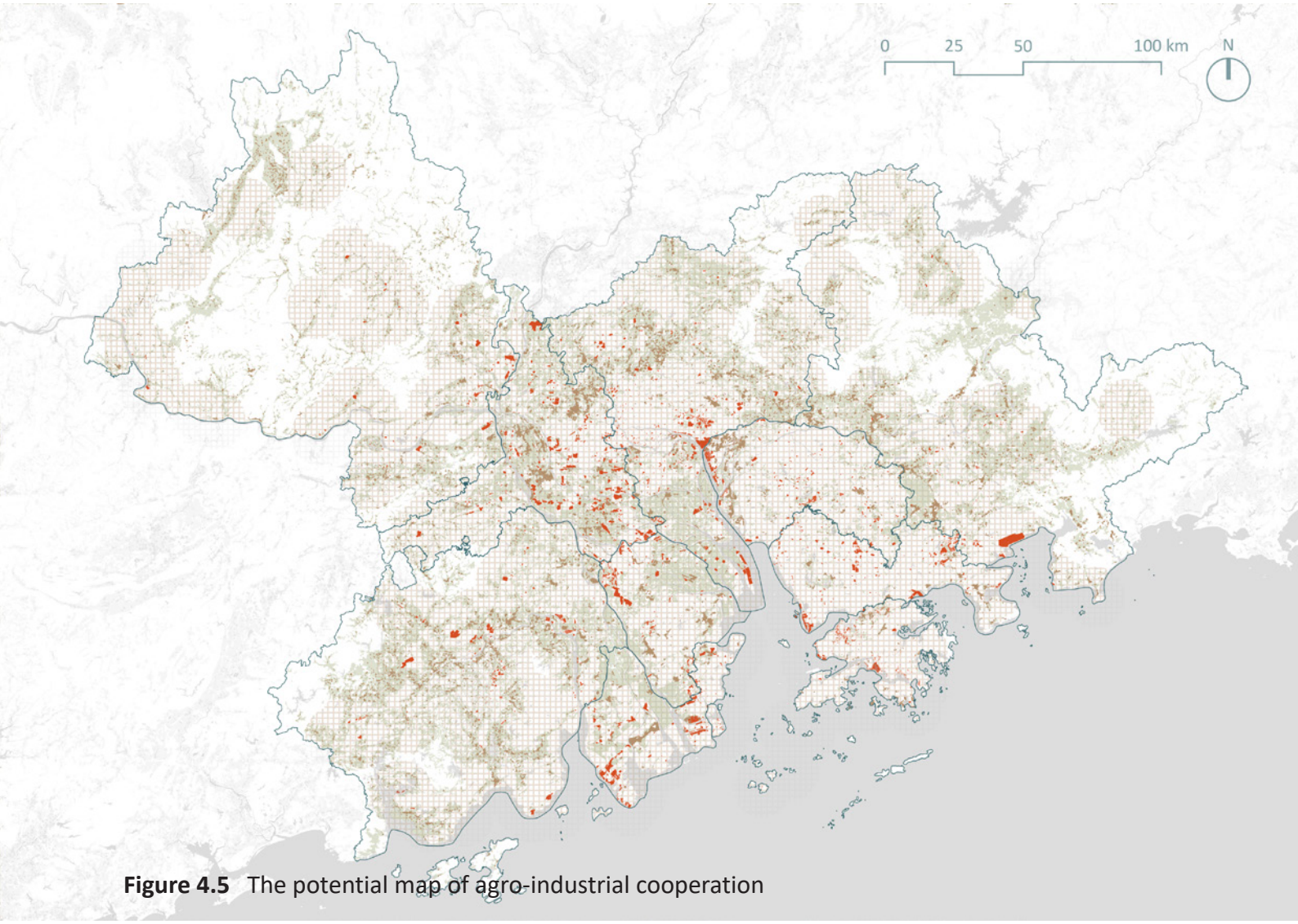


Figure 4.5 The potential map of agro-industrial cooperation

Agricultural area
Industrial area
10km buffer zone of industrial area
Rural area
Water body

The distribution of industrial and agricultural areas can be used to find the potential for developing agro-industrial cooperation. As the general distance between industries generating cooperation is around 10 km, a buffer zone analysis of the factory areas allows for identifying agricultural areas that are most likely to cooperate with factories. By understanding the specific types of industry and agriculture, strategies for industrial upgrading can be further generated.

4.4.2 The manufacturing belt of garment processing industry

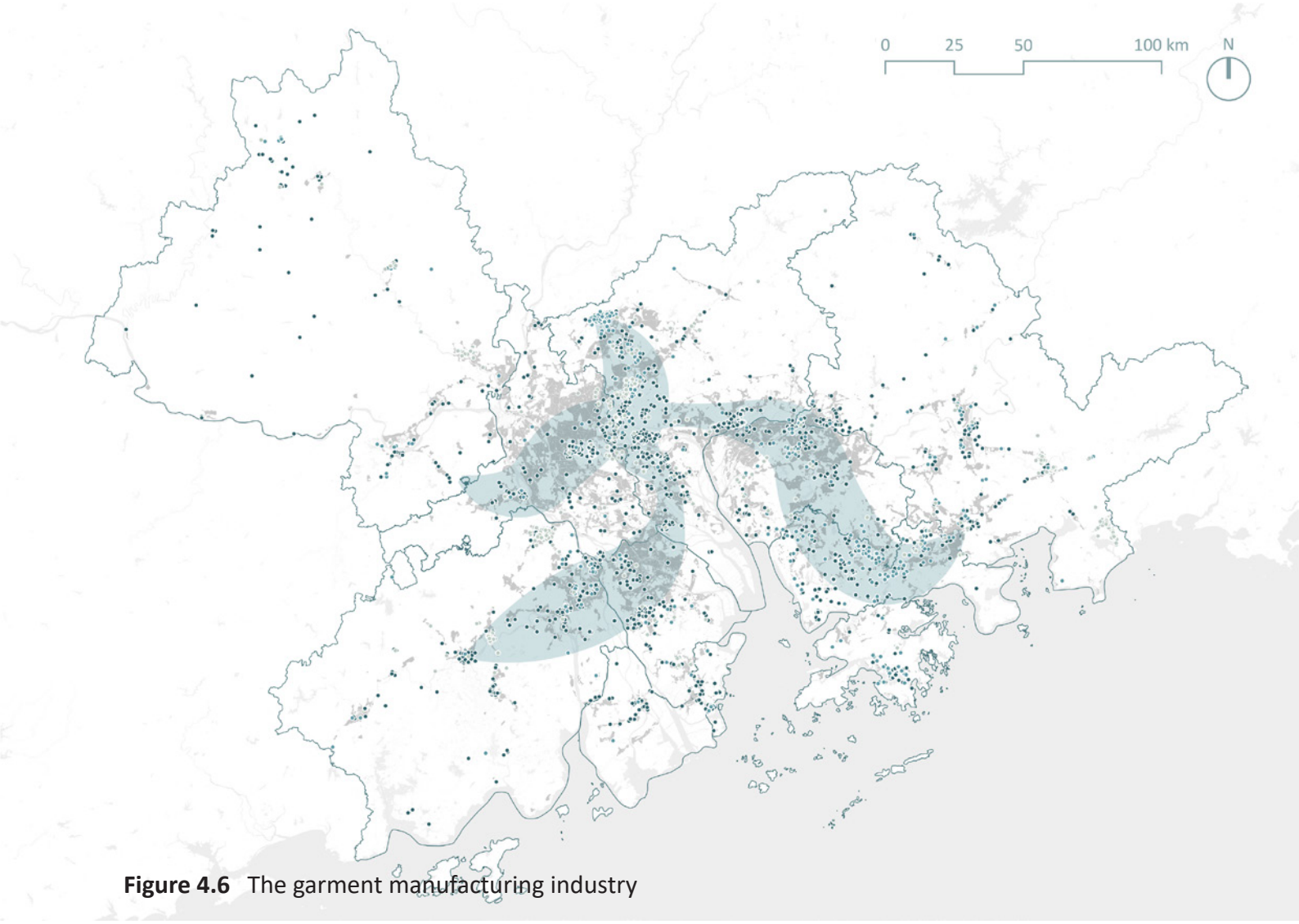


Figure 4.6 The garment manufacturing industry

To understand the distribution of industries, the project used QGIS as a tool to perform kernel density analysis and mapped out the agglomerations based on the results (figure 4.6, 4.7, 4.8, & 4.9). As the garment processing industry is associated with panel beating, which requires the support of the plantation industry, it has the potential to develop into agro-industry. The garment manufacturing industry belts that already exist are concentrated in the delta hinterland, associated with the industrial belts of Guangzhou, Shenzhen, Foshan and Zhuhai.

4.4.3 The belt of food and beverage processing industry

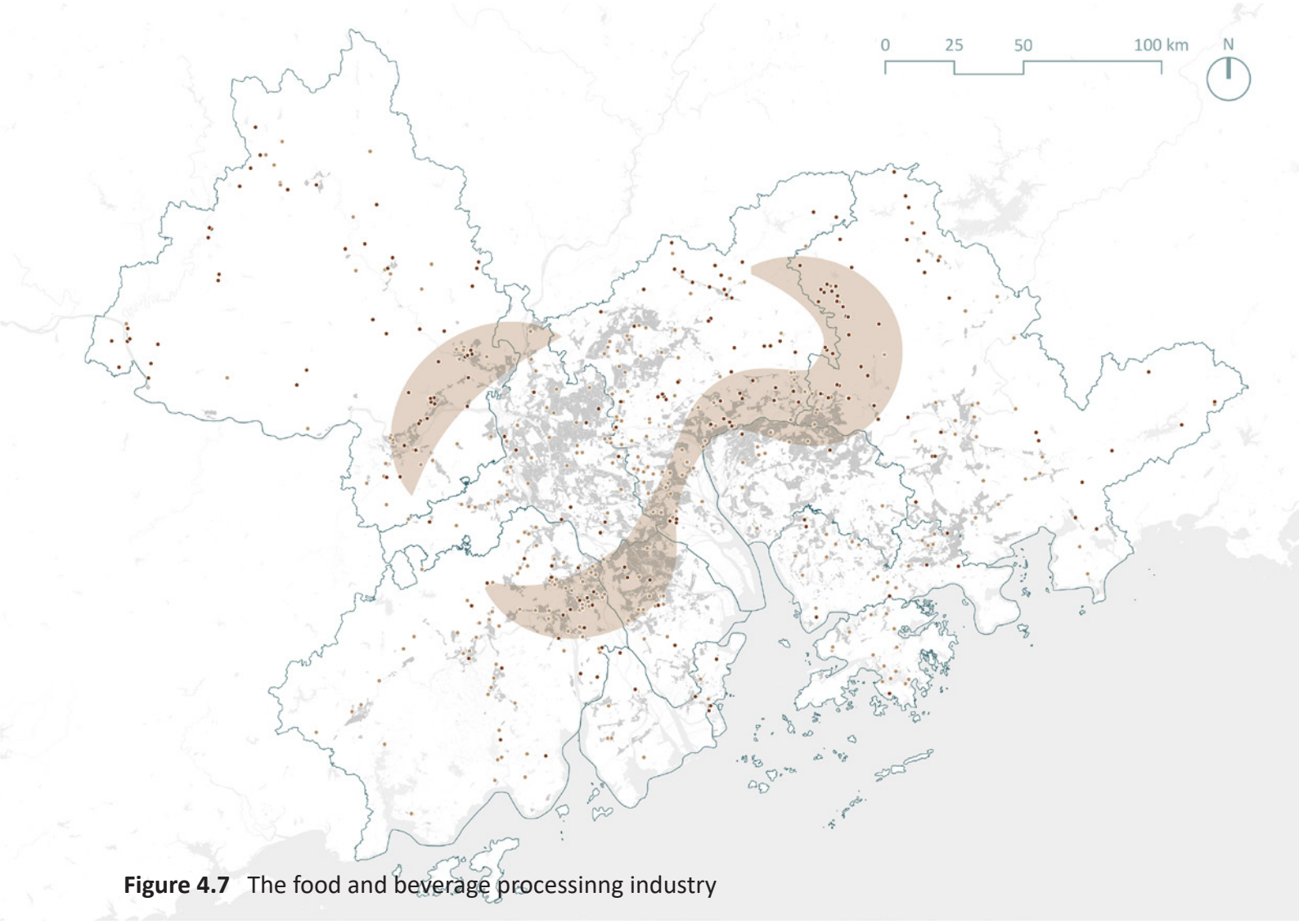


Figure 4.7 The food and beverage processinng industry

Food processing factory
Beverage processing factory
Industrial belt
Industrial land
Water body
Rural area

The production of both food and beverages requires crops as raw materials, and therefore the food processing industry has the potential to cooperate with agriculture. The number of food processing factories in the GBA is small and located outside the main urbanised built-up areas.

4.4.4 The belt of wood and furniture processing industry

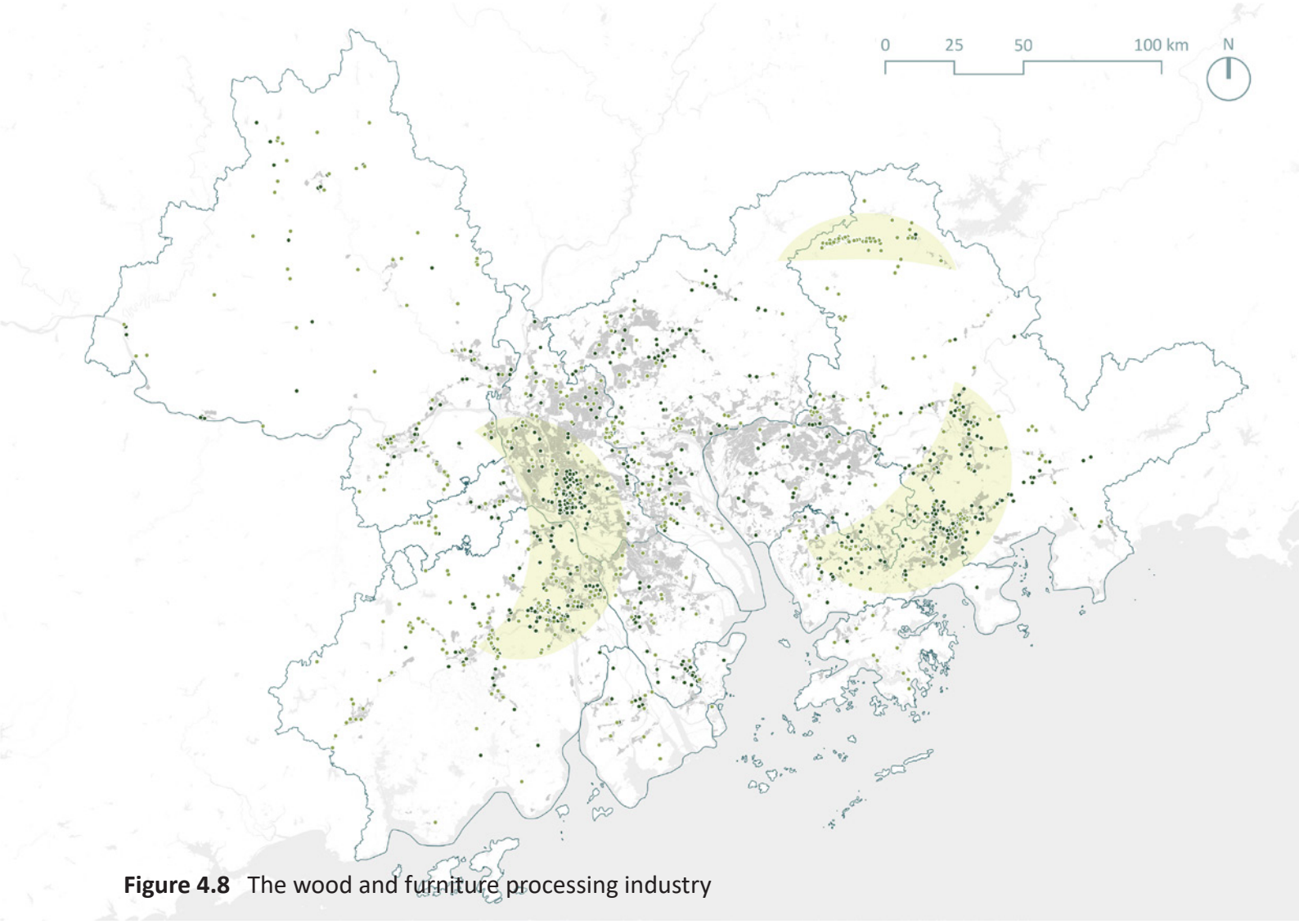


Figure 4.8 The wood and furniture processing industry

Forestry and crops can provide raw materials for furniture manufacturing, and therefore it has the potential to work with the vast natural resources of the landscape. The relevant factories are currently located mainly on the western side of the region, which is rich in agricultural resources, and on the mountainous eastern side, which is rich in forestry resources.

4.4.5 The belt of paper processing and printing industry

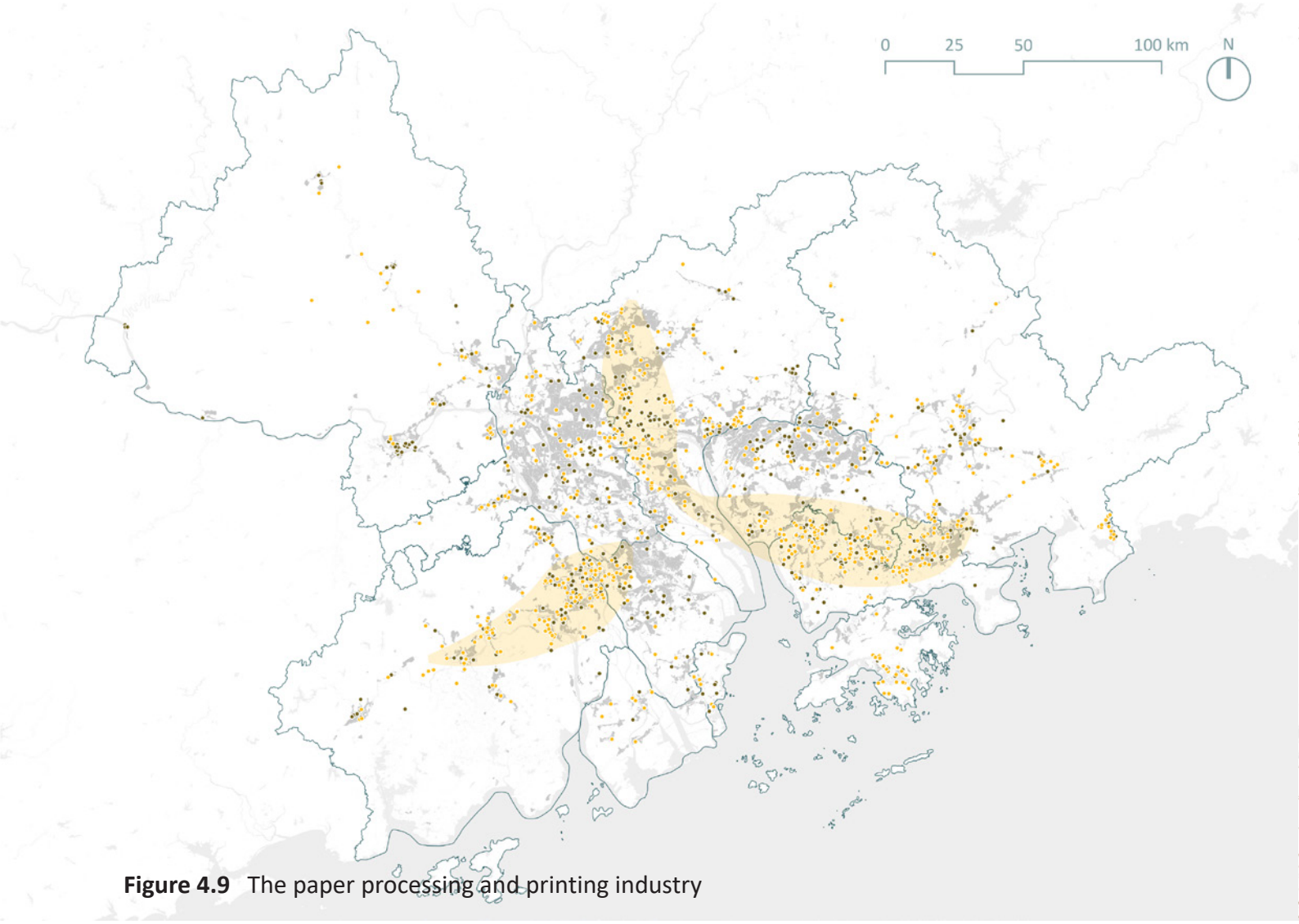


Figure 4.9 The paper processing and printing industry

The paper processing and printing industry are closely linked to forestry and agricultural resources, and it is also a potential sector for agro-industry development. Its industrial manufacturing belt is mainly located in the corridor of Guangzhou and Shenzhen, and the western part of the GBA.

4.4.6 The knowledge industry

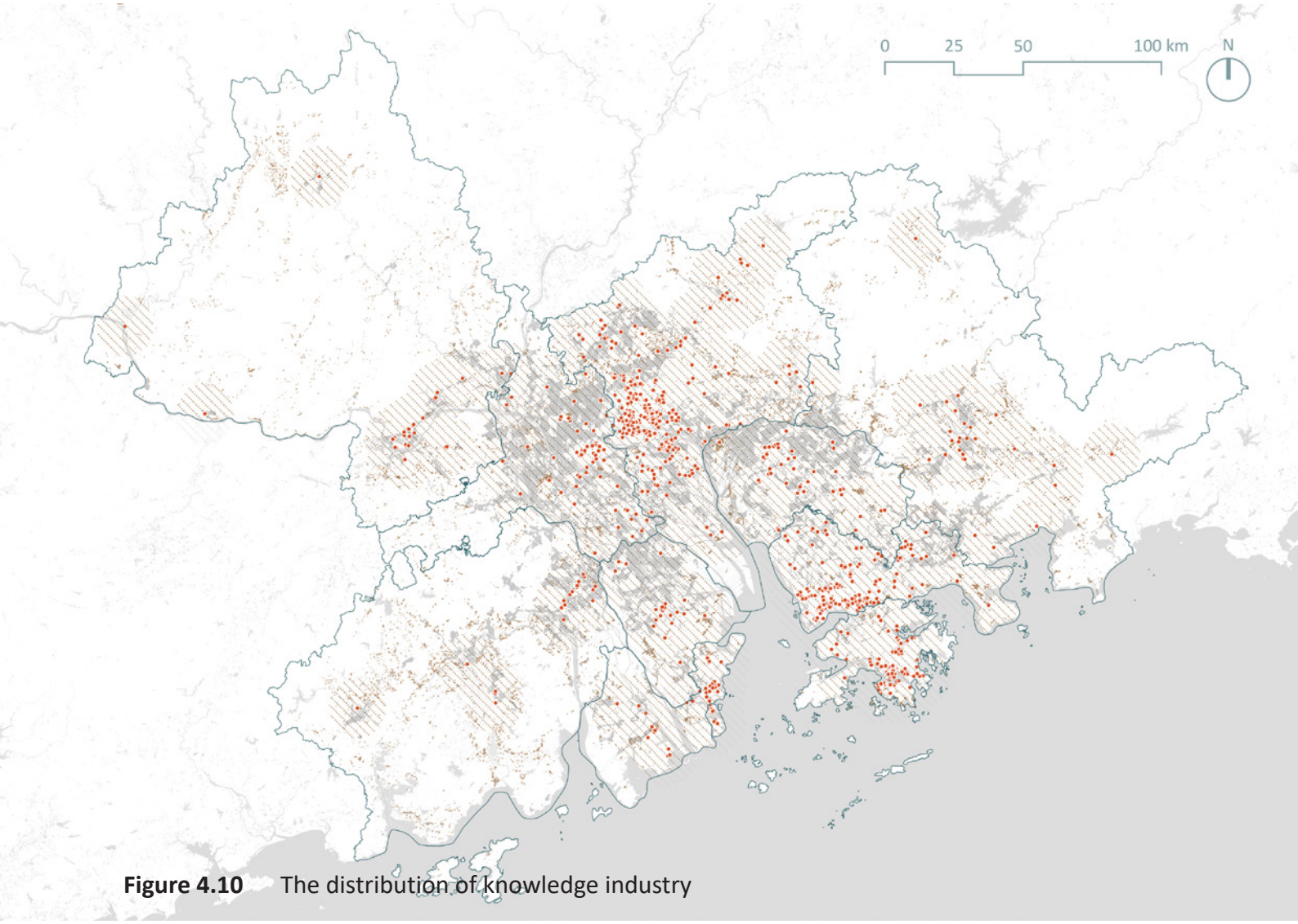


Figure 4.10 The distribution of knowledge industry

In the process of industrial upgrading, knowledge-based industries, especially the higher education sector, can help with knowledge sharing and technological transformation. Areas with higher education resources can easily access the necessary information needed for industrial transformation. The 10 km buffer zone analysis can identify rural areas covered that have the potential to take the lead in development.

4.5 SOCIAL-CULTURAL ASPECT

4.5.1 Public service and living quality

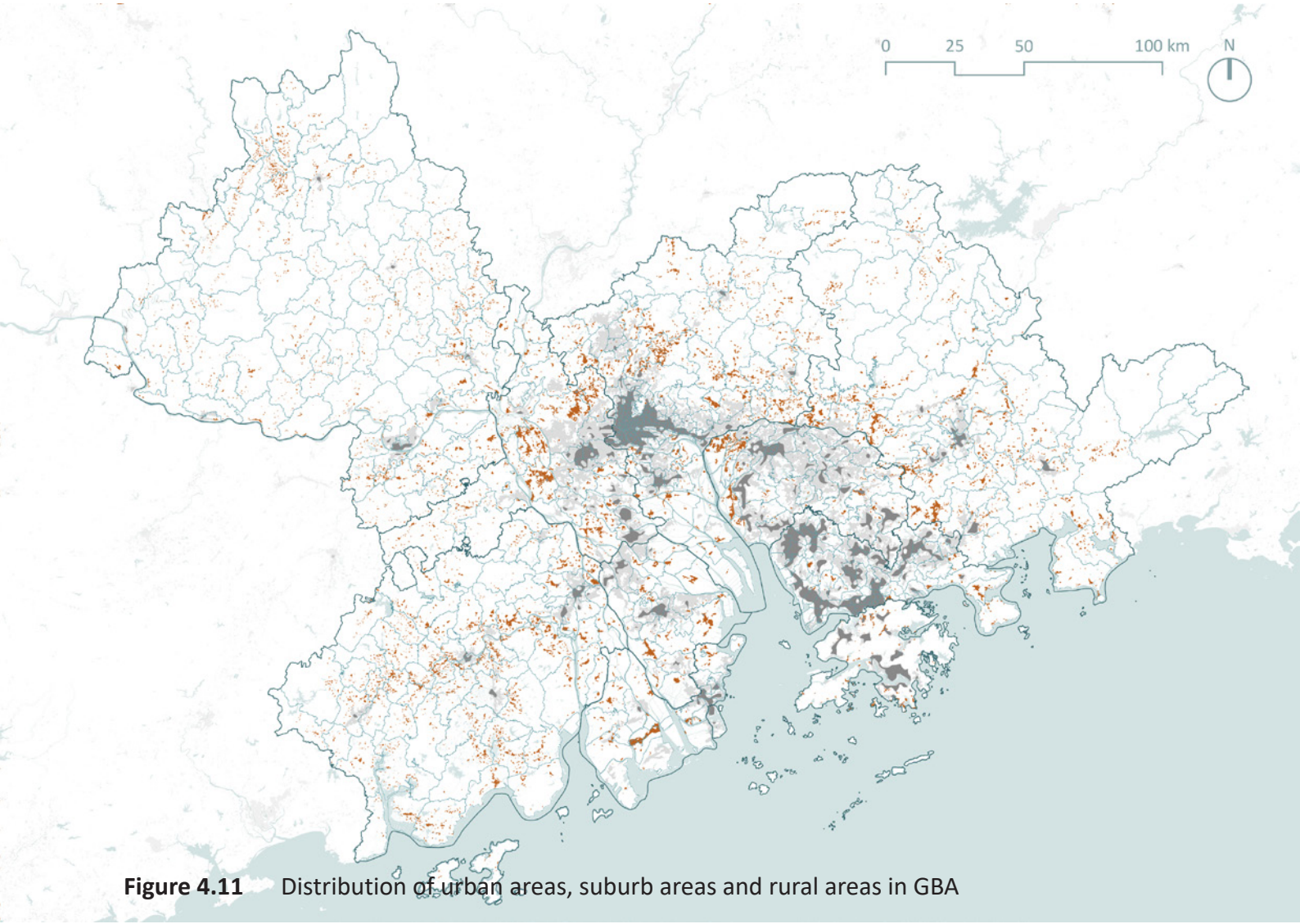
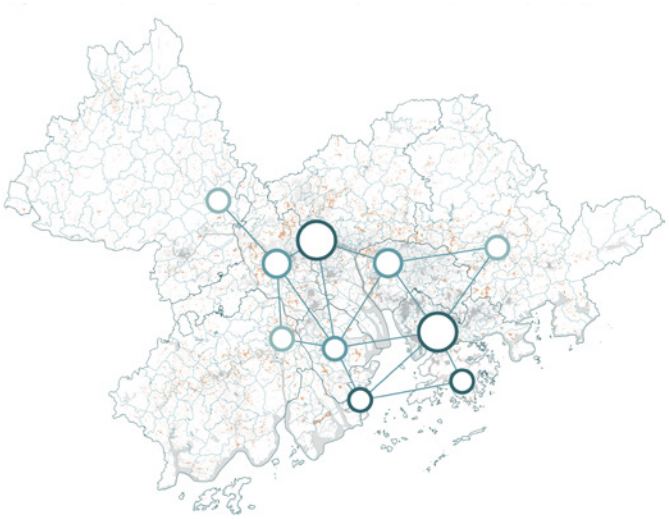


Figure 4.11 Distribution of urban areas, suburb areas and rural areas in GBA

Human settlements can be divided into urban center, peri-urban areas and rural areas. Urban centre, as the area with the highest concentration of resource elements, has the best quality of life. Rural areas urgently need an improvement in quality of life due to a lack of infrastructure.

4.5.2 Centrality



From the spatial perspective of built-up areas, urbanization in the GBA is under a polycentric development model. Rural areas are largely ignored on the outside. China's administrative zoning follows a strict hierarchy and order, and the countryside is put in a more backward position in terms of construction. The development model of a network system does not have a polycentric hierarchy and is more suited to the vast countryside.

Figure 4.12 Polycentric model of GBA

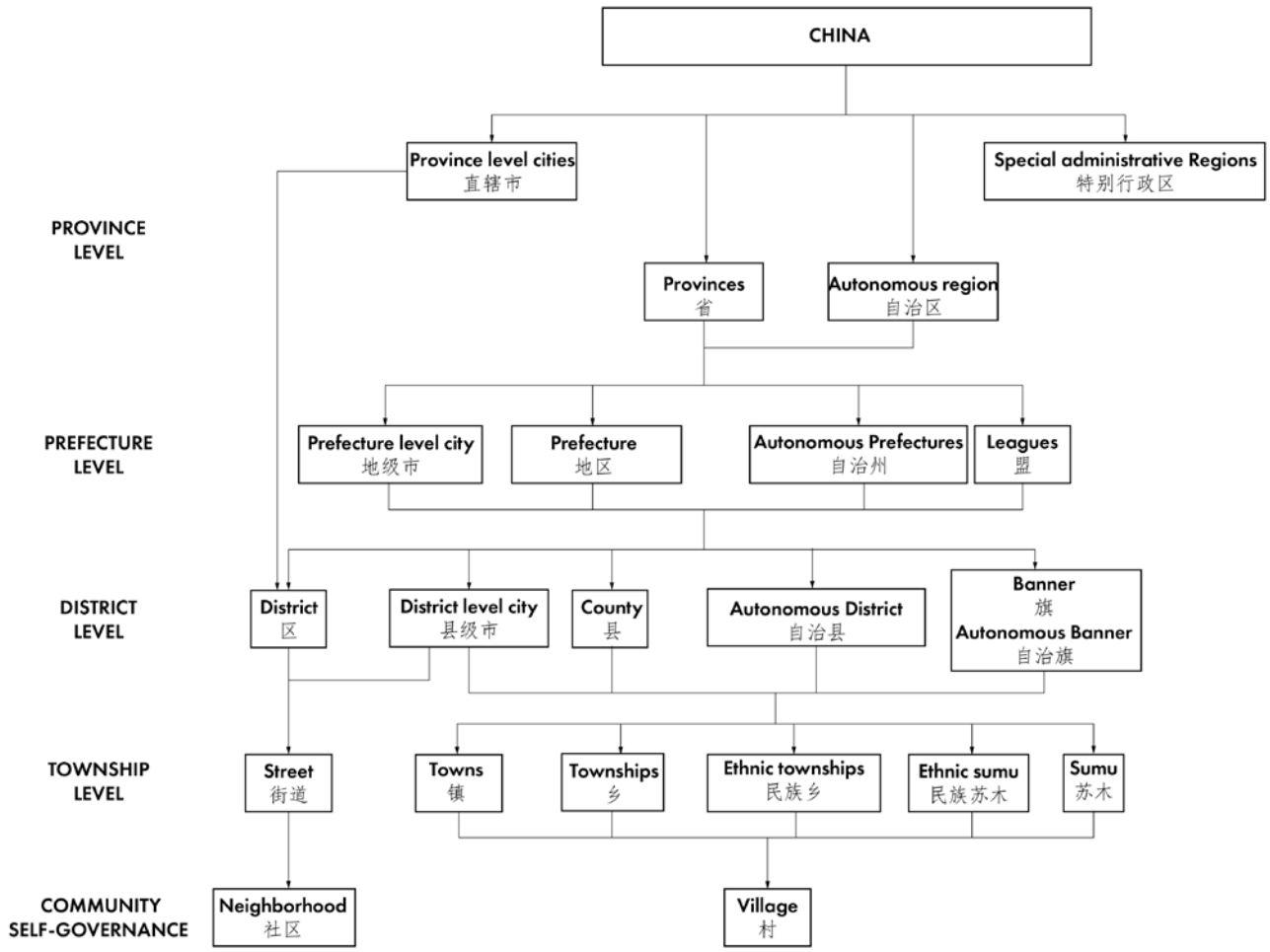


Figure 4.13 Hierarchy of administrative divisions in China

4.6 POTENTIAL REGION

In conclusion, the project aims to understand the distribution of all kinds of resources through the layer approach. (figure 4.15)

The GBA has a nice ecological substratum, which supports a large area of agricultural space and provides a good basis for rural agriculture development. Due to the dense network of waterway, paddy fields and dyke pond in the deltaic hinterland are presented on large areas of the alluvial plain. In the far northern and eastern areas, the height difference of the mountains does not make it suitable for developing paddy fields. The predominantly cropland agricultural resources are well suited to the mountainous areas. The industrial belt is currently concentrated in the urbanized areas of the southern coast, with light industry and high-tech industry strongly developed in the GBA. The one-hour living area transport system proposed in GBA, including highways, railways, ports and airports, already provides good access to the central region. In the remote mountainous areas, transport by road is still primarily relied upon. The current polycentric structure dominates the development of urban agglomerations, and the countryside is still highly dependent on the resources from urban areas. In order to support the development of the countryside, attempts need to be made to break this dependency.

To support the development of smart villages, it is necessary to enhance existing resources and implement scarce resources. Many areas already have good basic conditions, which will become potential areas for future rural development (figure 4.16). Where the potential is best, smart villages can be developed first and will be used as activation points to help to surround rural areas to further develop.

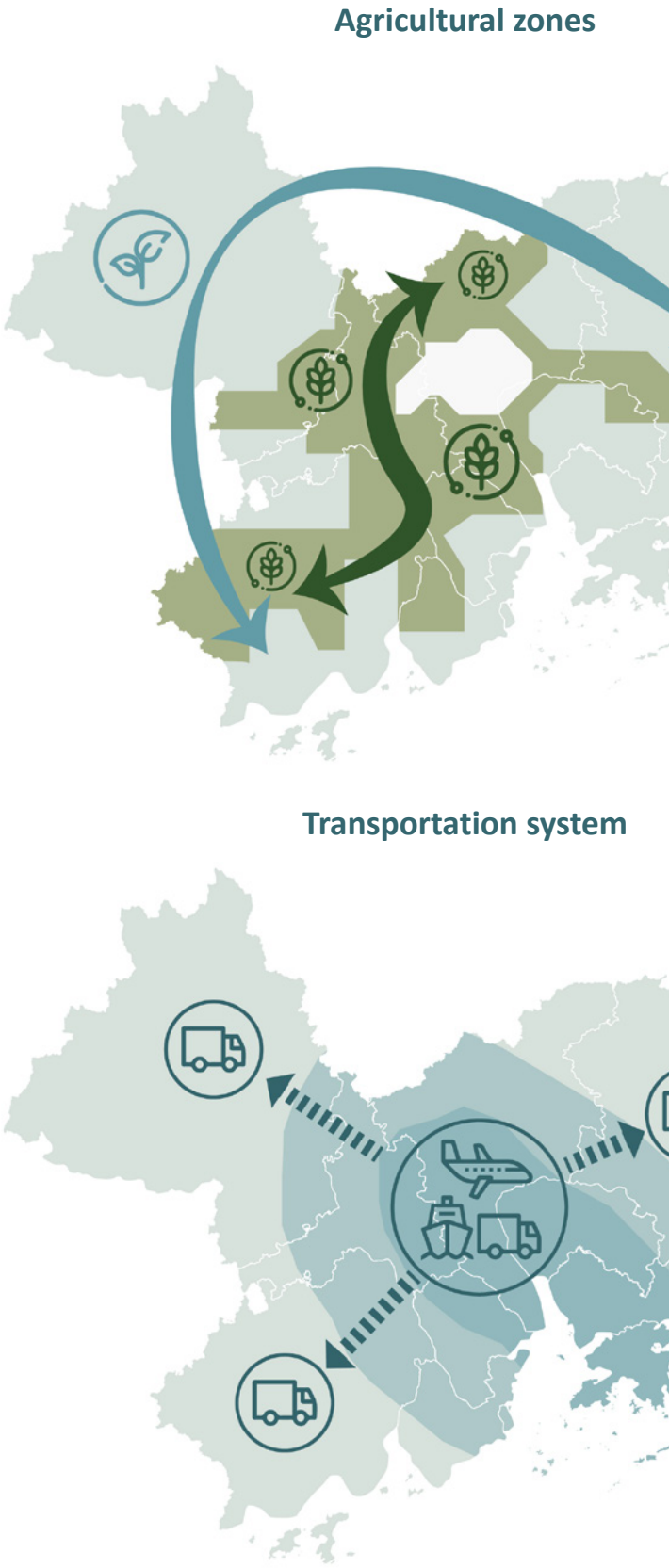
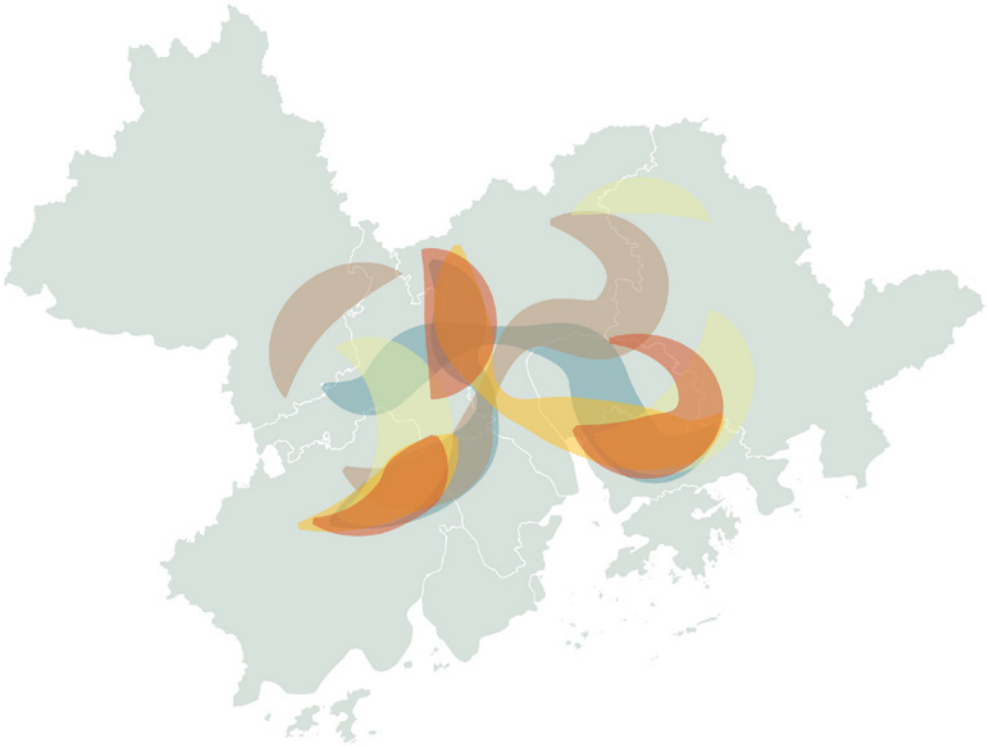


Figure 4.14 Conclusions on developing potential of th

Industrial belts



Developing network

he GBA

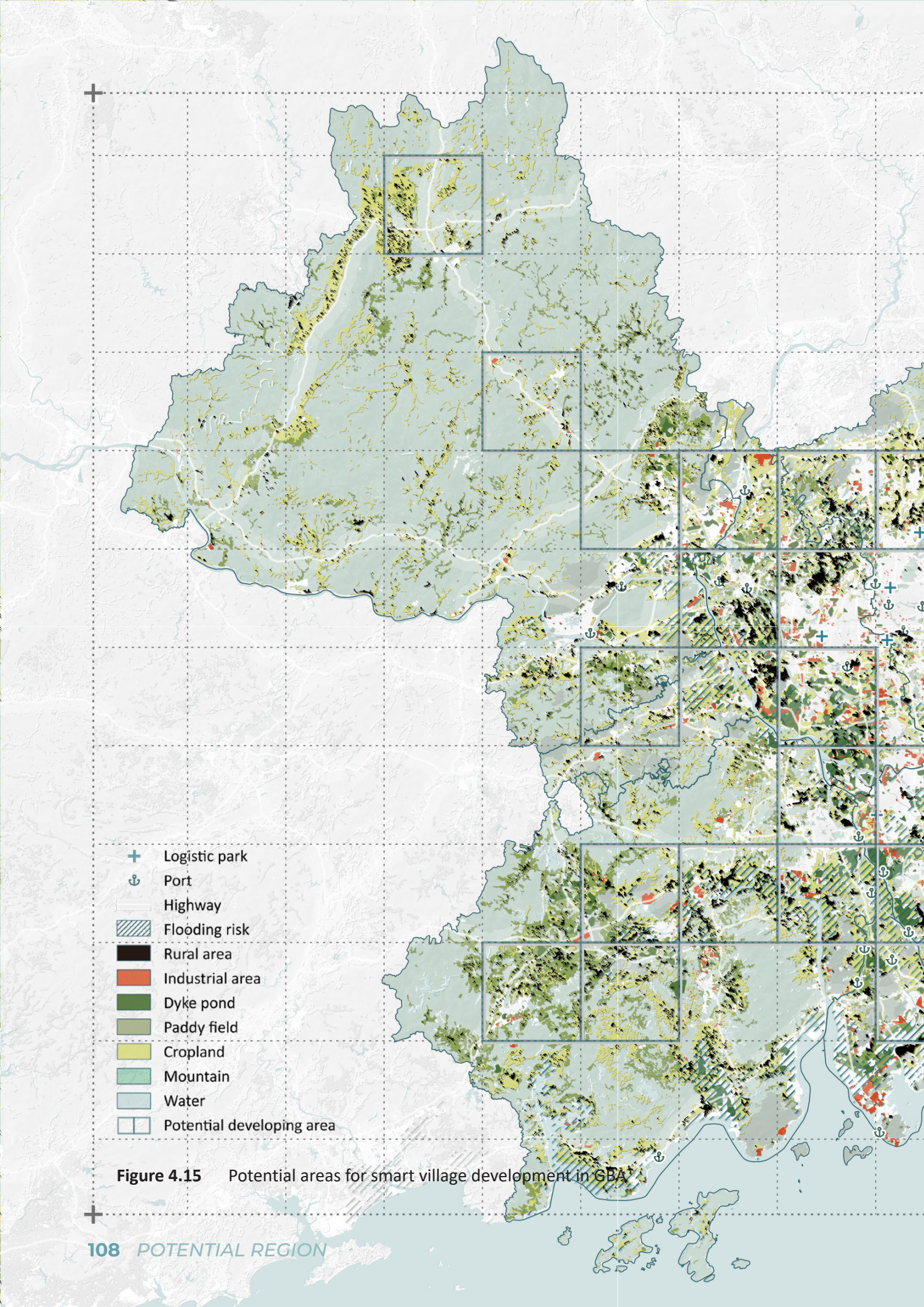
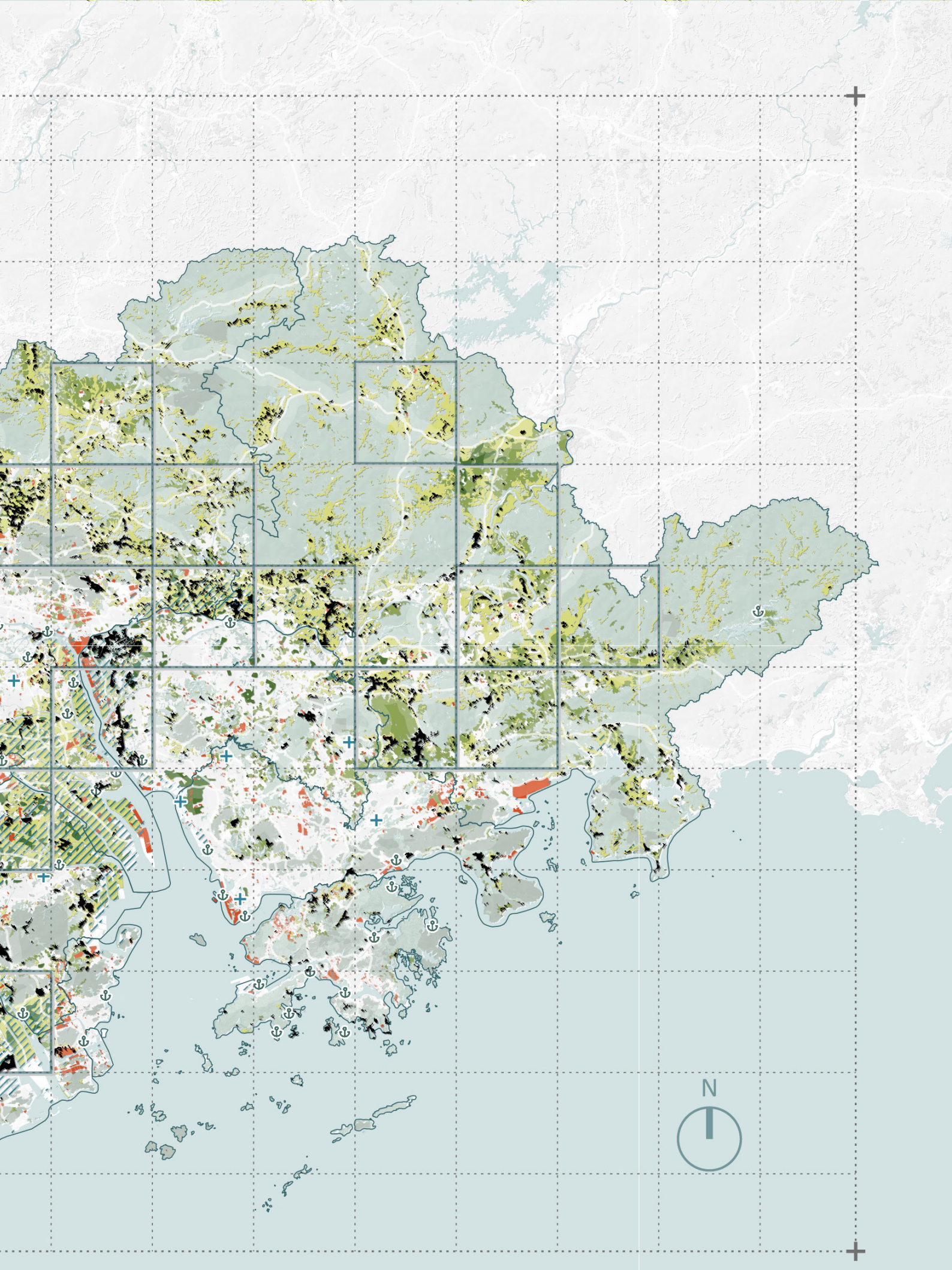


Figure 4.15 Potential areas for smart village development in GBA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5

SMART VILLAGES DEVELOPMENT

5.1 UNDERSTAND RURAL CONDITIONS

In order to further guide the development of areas with potential, specific rural spaces and other underlying conditions need to be understood. After the study of the GBA, it was found that rural areas have some typical spatial characteristics. Therefore, three representative areas were chosen for the study.

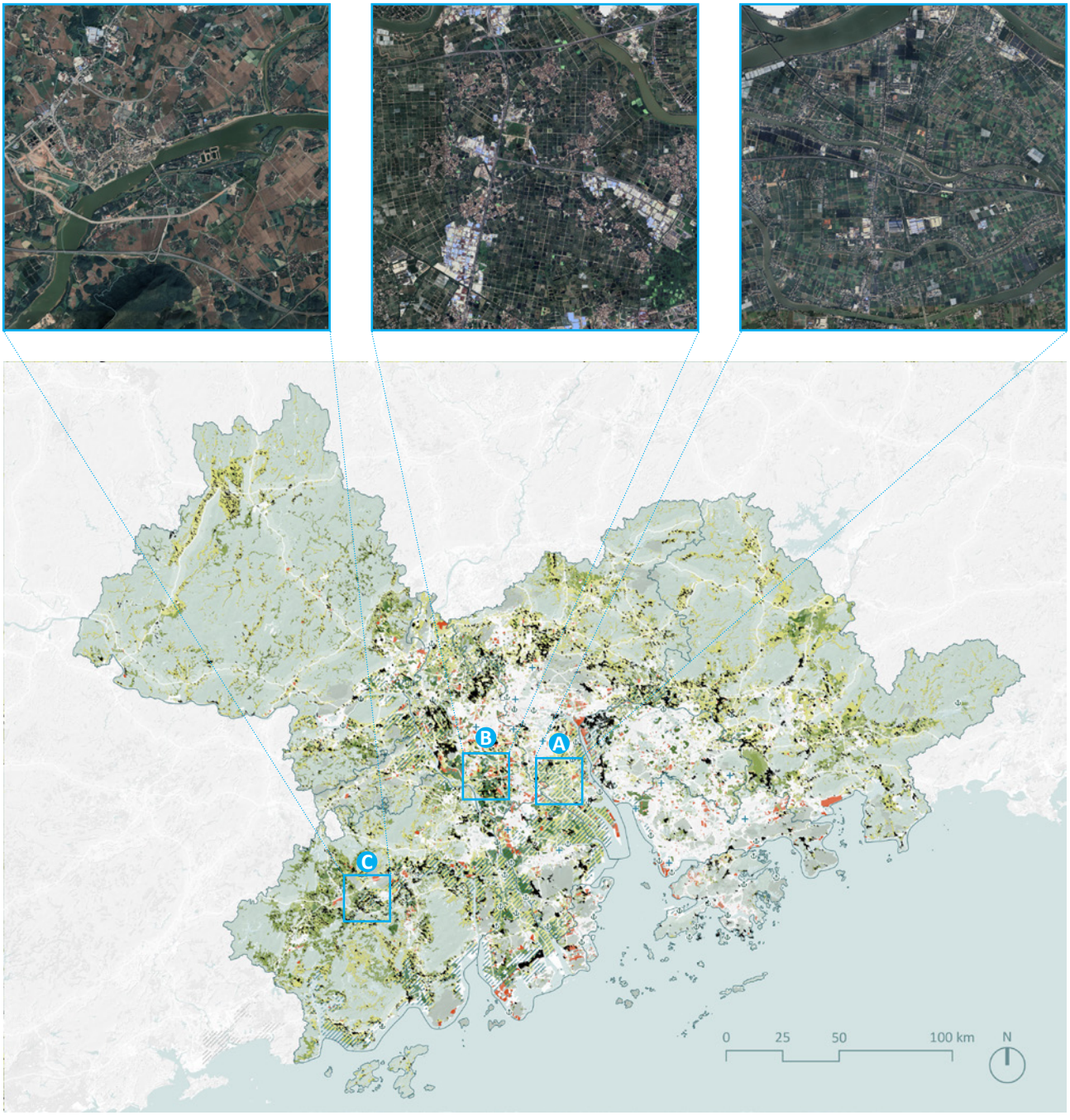


Figure 5.1 Typical areas for understanding spatial conditions of rural areas in GBA

5.1.1 Spatial typology

According to the concept of the layer approach and the explanation of the spatial elements in figure 3.32, the study of the space of the substratum layer is the basis for the rural development in the project. The study of the village, industry, and agricultural area of rural areas allows for a summary and categorisation of their spatial archetypes.

Water systems are an essential basis and backbone for the development of villages. Village space develops linearly along the river in areas with an abundant water network. Conversely, villages tend to be scattered individually or form clusters over agricultural land in the plains. The distribution of factories is mainly related to accessibility. Factories along arterial roads form individual patches or clusters in large industrial estates. As the space closely related to the ecological base, agricultural land is closely linked to the distribution of natural resources such as rivers and mountains. Large areas of paddy fields will be reclaimed depending on the water system structure. In mountainous areas, on the other hand, cropland is mainly formed in a patch state.

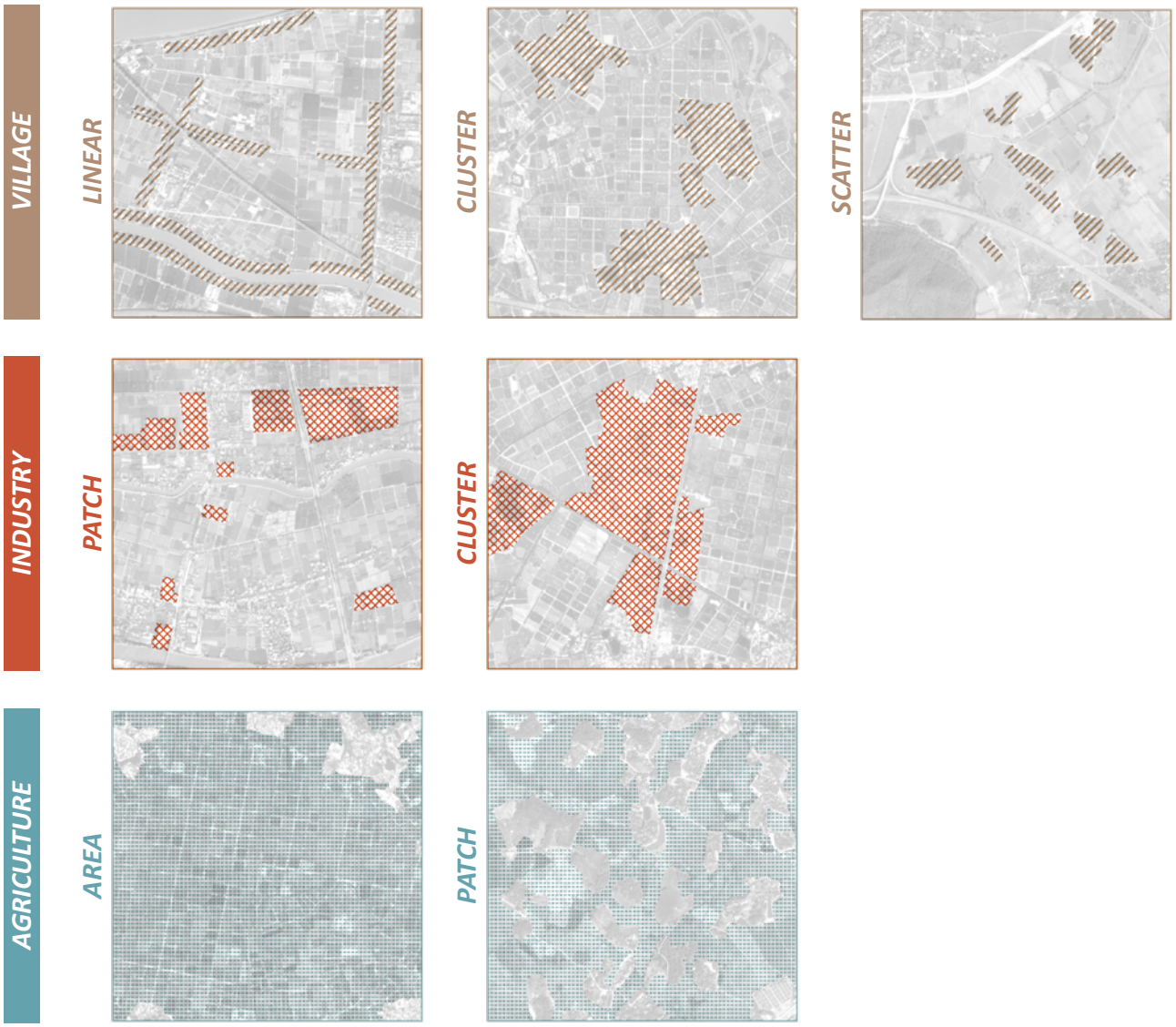


Figure 5.2 Spatial typologies of village, industrial area, and agricultural area in GBA

5.1.2 Spatial relationships

The three typical study areas are made up of different combinations of spatial typology and therefore present different spatial relationships between components (figure 5.3).

The constituent elements of site A include linear villages, patched industry and area-like paddy fields. Villages are developed along waterways, while factories are built along roads. There is no direct spatial relationship between the construction of villages and factories, and no direct connection between the built-up area and the agricultural environment.

The constituent elements of site B include patched or cluster villages, cluster industries and areas of dyke pond agriculture. The factories are built along the most accessible arterial roads and form clusters, while the villages are distributed in clusters around them. There is a particular association between the villages and the factories, as the factories were built by the collective investment of the villages. The village is located near the water, so it has a specific echoing relationship with the paddy field substrate.

The constituent elements of site C consist of patches of villages and patches of cropland, with no or very few factories present. Villages develop along rivers to form large clusters and develop into town wars. Some villages are also set back from the hills and closely relate to the agricultural base.

The different relationships between villages, factories and agricultural areas (figure 5.4) require unique design strategies for the future. Site A and B both lack industrial-agricultural linkages, while site C requires more attention to strengthening the relationship between the built environment, agriculture, and the ecological substratum.

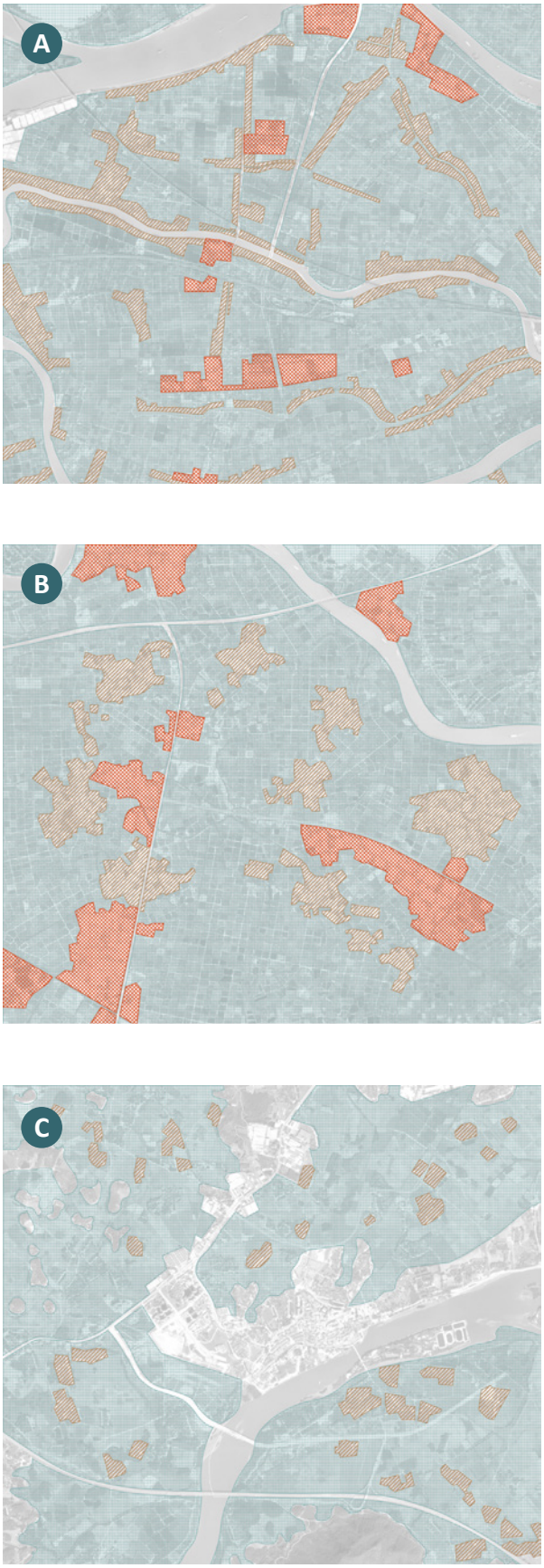
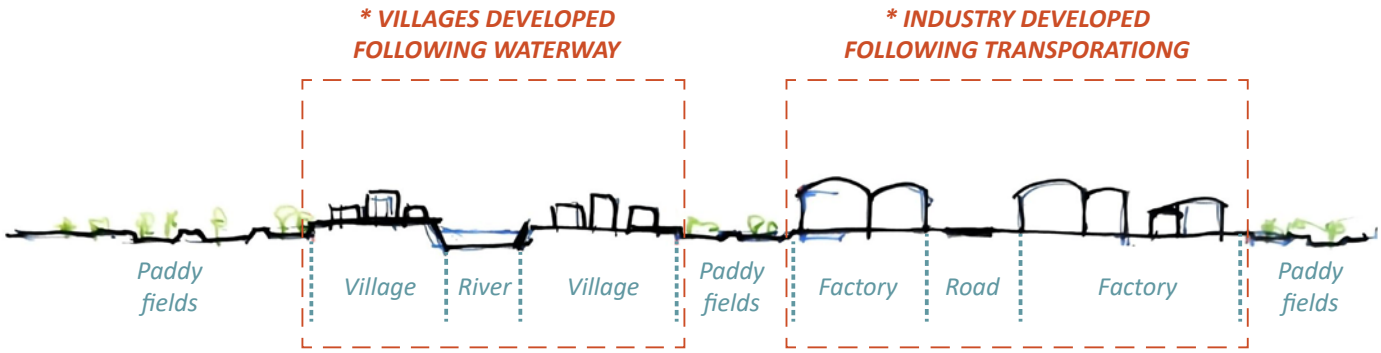
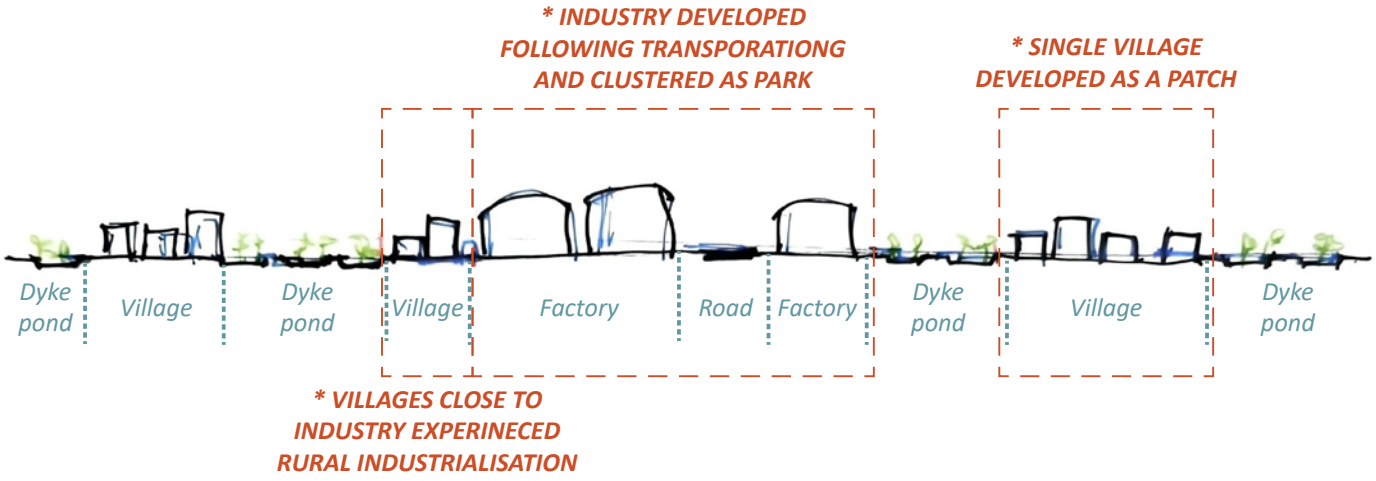
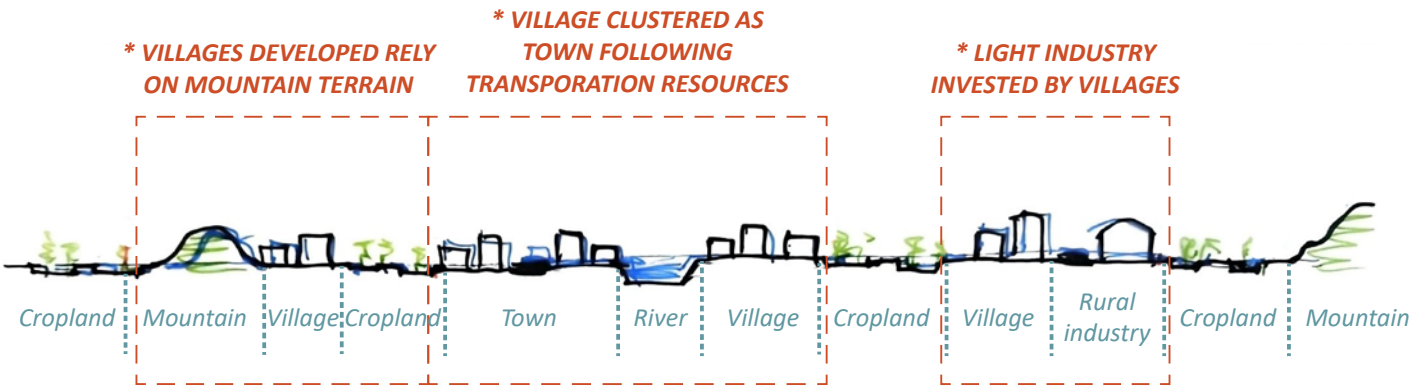


Figure 5.3 Different combination of the spatial compone


* VILLAGES DEVELOPED FOLLOWING WATERWAY
* INDUSTRY DEVELOPED FOLLOWING TRANSPORATIONG
Paddy fields
Village
River
Village
Paddy fields
Factory
Road
Factory
Paddy fields


* INDUSTRY DEVELOPED FOLLOWING TRANSPORATIONG AND CLUSTERED AS PARK
* SINGLE VILLAGE DEVELOPED AS A PATCH
Dyke pond
Village
Dyke pond
Village
Factory
Road
Factory
Dyke pond
Village
Dyke pond
* VILLAGES CLOSE TO INDUSTRY EXPERINECED RURAL INDUSTRIALISATION


* VILLAGES DEVELOPED RELY ON MOUNTAIN TERRAIN
* VILLAGE CLUSTERED AS TOWN FOLLOWING TRANSPORATION RESOURCES
* LIGHT INDUSTRY INVESTED BY VILLAGES
Cropland
Mountain
Village
Cropland
Town
River
Village
Cropland
Village
Rural industry
Cropland
Mountain

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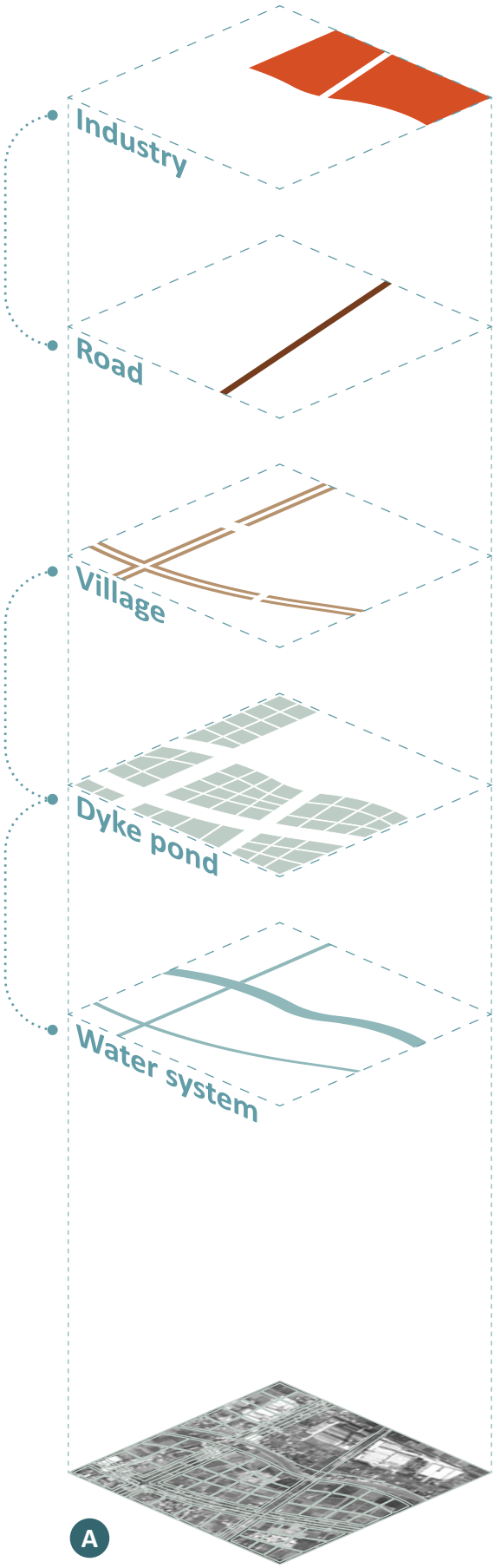


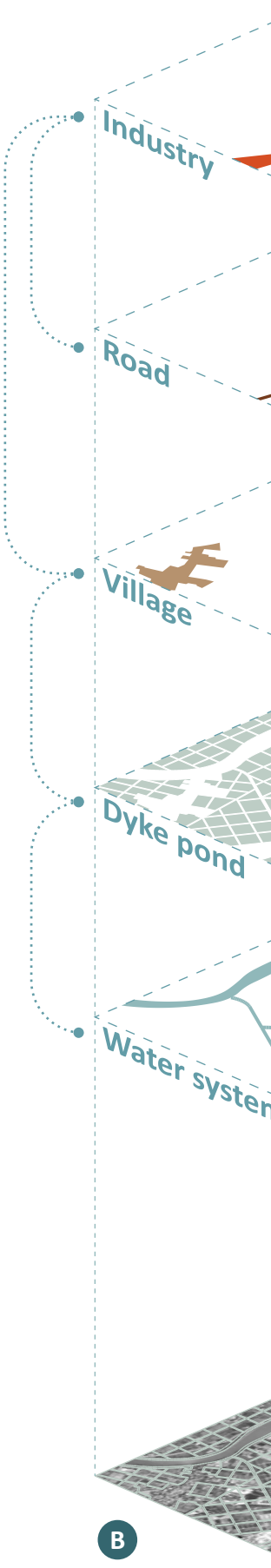
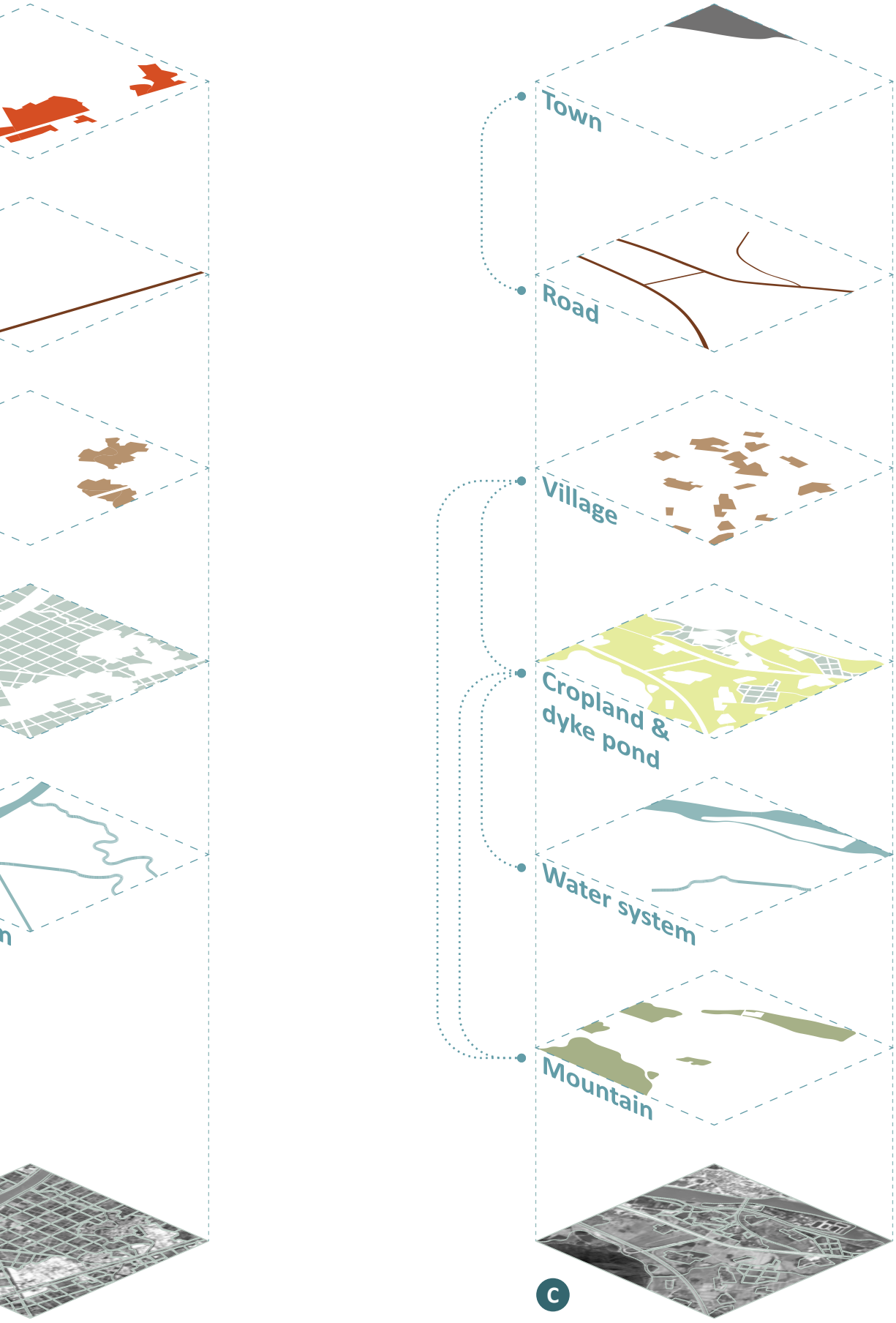


Figure 5.4 Relationships between different spatial elements in typical rural areas


Town
Road
Village
Cropland &
dyke pond
Water system
Mountain
C

5.2 LEARNING FROM BEST PRACTICE: AALSMEER

Rural development in GBA can learn from global examples, and Aalsmeer, one of the best areas in the Netherlands for developing the flower industry, can inspire the project.

From the best practice analysis, it is necessary to learn the transferable principles that allowed the industry to develop.

5.2.1 Ecological horticulture

Figure 5.5 Greenhouse for horticulture

Aalsmeer is a town in the province of North Holland. Due to its proximity to Westeinderplassen, a beautiful lake, the town enjoys excellent soil and water resources. Based on this, Aalsmeer has developed a world-renowned flower industry and a reputation as the capital of flowers. Greenhouse, one of the leading farming techniques, provides the best onditions for the growth of flowers.

In this context, Aalsmeer uses sustainable ecological horticulture for its planting. Instead of using chemicals, it minimises pollution by cultivating flowers with natural soil. The farmers use advanced techniques to enhance the organic substance and microbial activity within the soil. In addition, they use traditional methods such as crop rotation to improve the fertility of the soil and are able to promote biodiversity. The different types of plants provide habitats for beneficial insects, which simultaneously makes for better eco-horticulture. By creating a rich and diverse ecosystem, pests can be fended off, and the natural spread of pollen can be supported.

In addition, the Wageningen University Research Centre and other research institutes are cooperating with Aalsmeer for innovation and sustainable development of the industry. They want to develop new cultivation techniques and improve the sustainability of the industry by improving growing methods and plant varieties. All this research work will help Aalsmeer become an innovative flower industry pioneer.

5.2.2 For domestic and foreign logistics

Figure 5.6 Logistic resources with good accessbility

As flowers do not have the same long shelf life as other products, an efficient logistics system is essential for the flower industry to flourish. A robust logistics system has been the critical factor in supporting the development of Aalsmeer as a world-renowned flower capital, with a strong infrastructure for transporting and distributing flower products, enabling flowers to be sold nationally and worldwide.

The cultivation of flowers began before the 1880s. It was not until 1952 that Aalsmeer's flower auction house began to flourish thanks to the construction of the N201 motorway. The construction of the road made it easier to connect Schipol Airport with Aalsmeer. In 1968, the auction houses in Aalsmeer were merged into a larger one and a better network was established.

5.2.3 Digital auction boots flower industry

Figure 5.7 Operation scheme of the digital auction

Aalsmeer Flower Auction is an essential strategy for the globalisation of the flower industry. By setting up an information-sharing process, the auctions help farmers to expand their marketing channels and provide transparent information to buyers (figure 5.7). Farmers who raise flowers can provide samples to the auction hall after the harvest, along with information on quality and quantity. The auction hall displays information about flower products online, and buyers can make their selections and bid fairly and openly. According to Van Heck and Ribbers, this sample-based auction method facilitates the communication of market information (1997). The online trading platform provides a real-time information hub for flower buyers from all over the world, enabling the flower industry to grow worldwide.

At the same time, they have also set up offline auction rooms accordingly. The offline space allows visitors to see the flower trade first-hand and gives them a good impression of the industry. It has become a very popular tourist attraction. It allows people to learn about the exact process of the auction and to see the different varieties of flowers at the same time.

5.2.4 Tourism industry

Figure 5.8 Tourism attractions in Aalsmeer

Based on the development of the eco-flower industry, Aalsmeer has a thriving tourism industry. As an ornamental object, flowers attract many tourists to visit and play. The tourism industry also contributes to the economic benefits of the flower industry, which in turn feeds back into it. With the Westeinderplassen Lake nearby and the natural beauty of the polder landscape, Aalsmeer has an excellent ecological environment. The government has taken the lead in creating several trails for visitors, which can be walked or cycled independently. The system of trails allows people to go to different points of the landscape and to experience the culture and beauty of the Aalsmeer in depth.

In addition to the natural landscape, the Aalsmeer also offers a wide range of events and activities. Aalsmeer Flower Festival is an annual event showcasing flowers and consists of different events, such as flower exhibitions and parades, which attracts visitors from near and far. In addition, the Aalsmeer Museum, based on an old factory building, has become a landmark that offers an insight into the history and culture of the area. Moreover, the Aalsmeer takes advantage of its lakes and canals to offer water recreation activities such as boat trips, which are also popular with visitors.

5.3 PRINCIPLES FOR SMART VILLAGES DEVELOPMENT

5.3.1 Design principles

Based on the above analysis and the conclusions drawn in chapter 3 related to the spatial elements of smart village development, the project proposes three fundamental design principles (figure 5.5), including agricultural agglomeration (the substratum layer), accessible network (the network layer), and rural liveability (the occupation layer).

Agricultural agglomeration focuses on upgrading the local rural industry and strengthening the productive space in the countryside, thereby contributing to the rural economy. Agriculture as the base of the countryside should be protected and developed. In the industrial context of the GBA, there is potential for cooperation between the primary and secondary or tertiary sectors. The entry of new technologies, especially smart-agricultural technologies, can significantly improve the productivity and efficiency of agriculture.

The accessible network is concerned with constructing and improving ICT and logistics systems, helping the communication between different development elements. Spatially, constructing a transport network system is the basis for developing a smart rural economy, with facilities including roads and ports. At the same time, there is a need to educate the rural population about the relevant knowledge.

Rural liveability focuses on improving the quality of the rural living environment, emphasising the harmonious coexistence of people and the environment. In the process of rural development, attention must be paid to the protection of the natural ecology. Improving the quality of the rural living environment is one of the most critical strategies.

The three broad principles serve as a development agenda and are applied strategically at different scales (figure 5.6). Different development strategies are presented when the design principles are applied to actual sites.

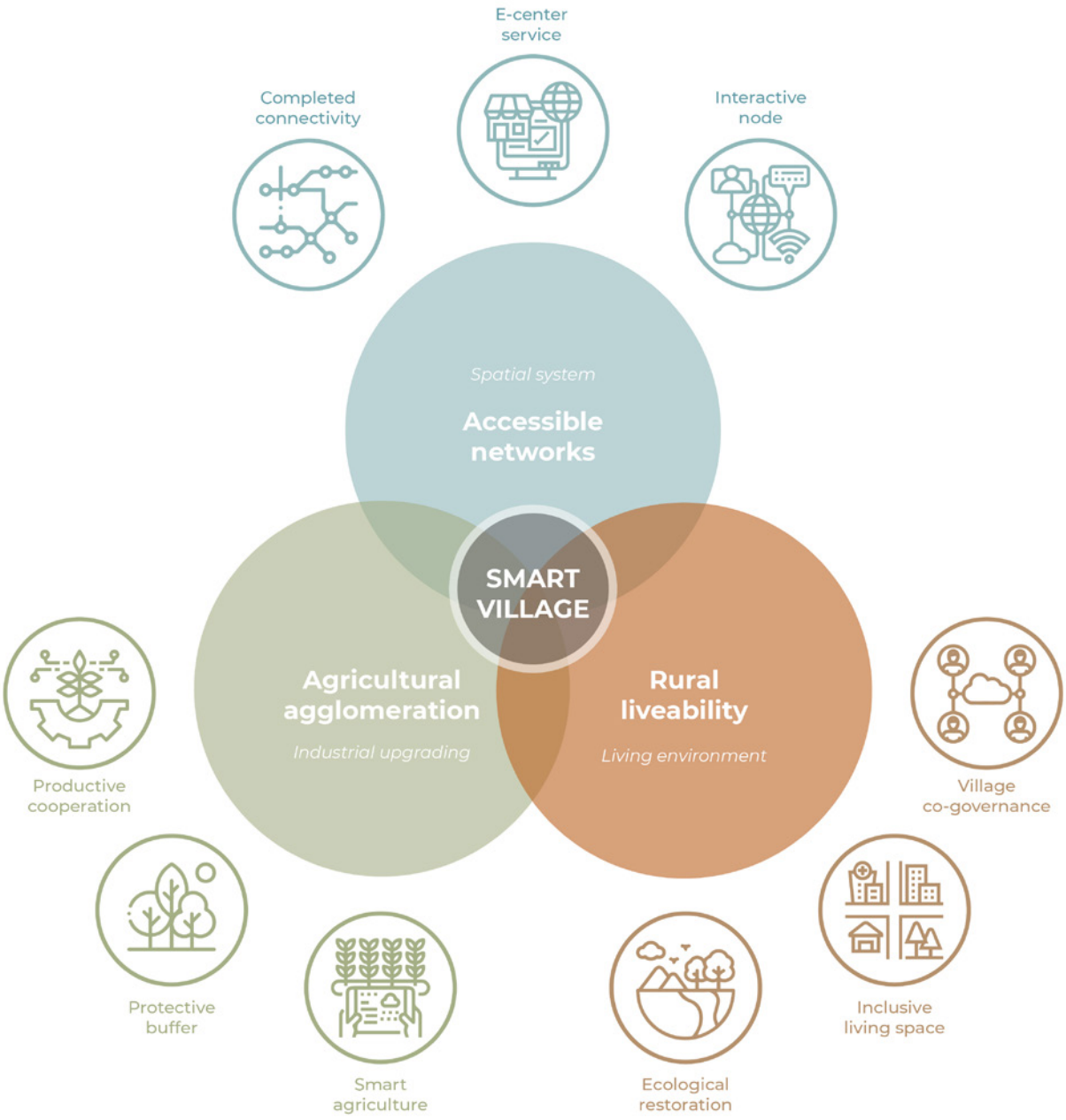


Figure 5.9 Design principles

5.3.2 Toolkit of design principles

The project contains a comprehensive design toolkit that operates on a regional to local scale, guided by three fundamental principles. These design toolkits have been shaped by a combination of existing design practices and personal design experience. This section aims to explain the origins and practical application of the principles.

For the development of agricultural agglomerations, the design objectives are to stimulate agricultural growth while maximising ecological and economic benefits. A fundamental design principle underpinning this objective draws on industrial cooperation, where the spatial elements of agro-industry, aqua-agriculture and agro-forestry have been identified and summarised through literature reading. In particular, the research from Silva, Baker, Shepherd, Jenane, and Miranda-Da-Cruz (2009), and from H. Ren, Li, Shen, Li, and Wang (2004) have inspired my design of the principles of productive cooperation. In addition, the design principles for smart agriculture are primarily derived from successful agricultural practices already in place, such as the floral greenhouses in Aalsmeer.

For the creation of accessible connections, the design objective is to enhance connectivity for village development and local industry. This objective is rooted in the findings and analysis of the Taobao village in Chapter 3, which emphasises the significance of a complete logistics and transport system for the development of the village. Therefore, the design principles emphasise the importance of completed connectivity and interactive nodes. Taking inspiration from the emerging digital economy hub in China, this project proposes a local digital service centre to facilitate this connectivity.

For the improvement of rural liveability, the aim is to integrate rural living spaces with the natural environment properly. In pursuit of this goal, the design process incorporates a variety of landscape-based design methods and principles. Since the GBA is threatened by flooding frequently, water management became an important aspect of ecological conservation, influencing the design approach. The landscape design toolbox from Newman and Qiao (2022) has greatly enlightened me. In addition, the integration of blue and green spaces with the human environment has facilitated the creation of inclusive living spaces.

By refining and incorporating these design principles, the project strives to achieve a holistic and sustainable approach that addresses agricultural development, connectivity and rural livability in the area.

Figure 5.10 Experiments in the living labs to improve agricultural technology

Figure 5.11 Practice of agro-forestry in Myanmar

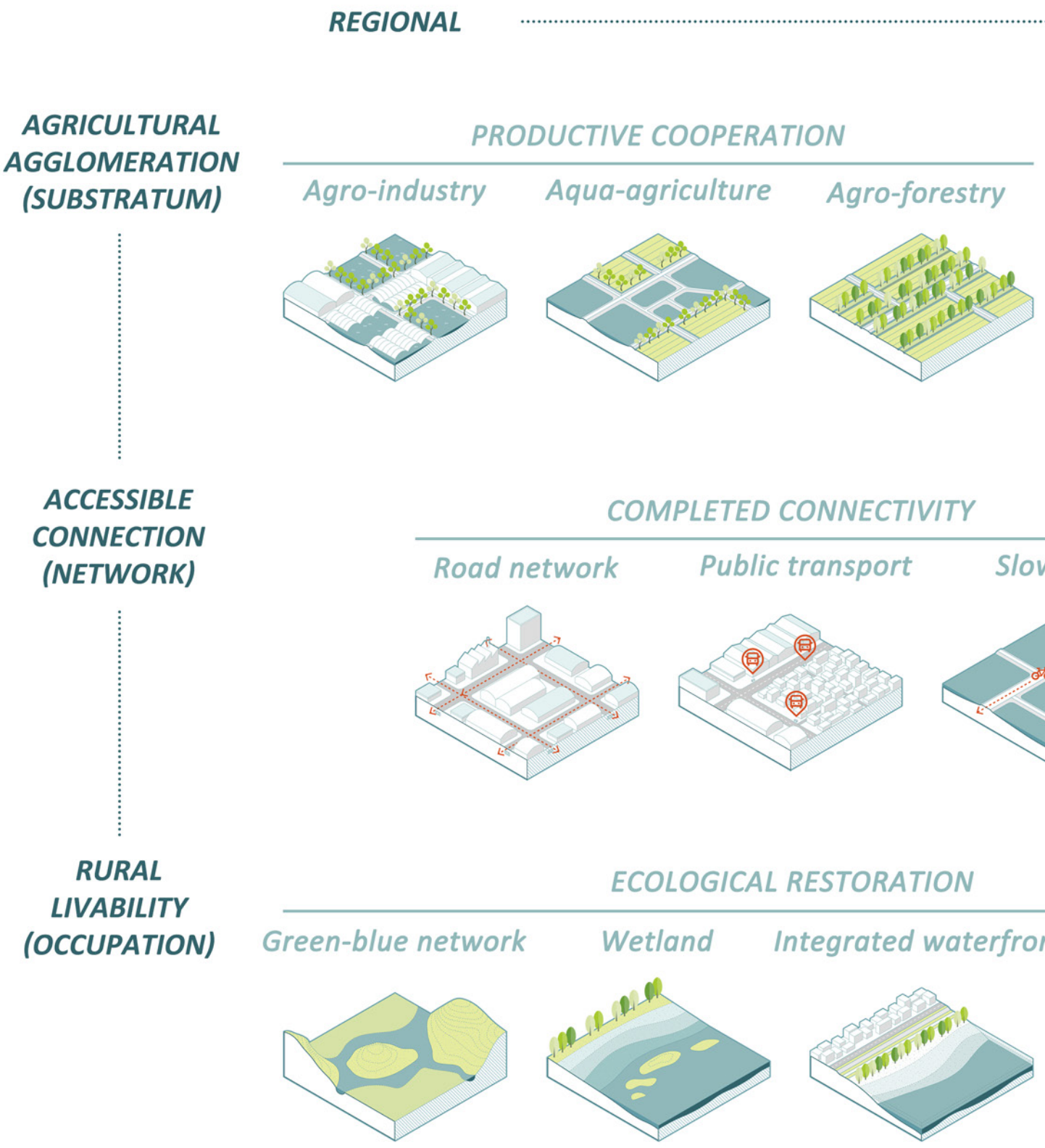
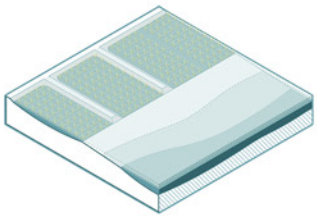


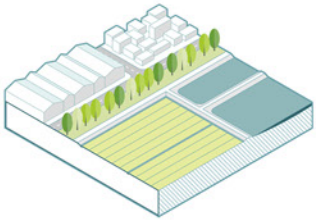
Figure 5.12 Toolkit of design principles

PROTECTIVE BUFFER

Flood resilience

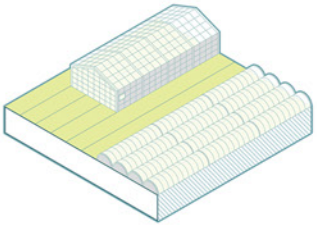


Green belt

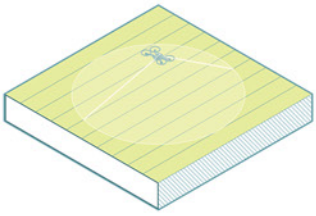


SMART AGRICULTURE

Greenhouse

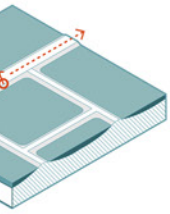


Drone monitoring

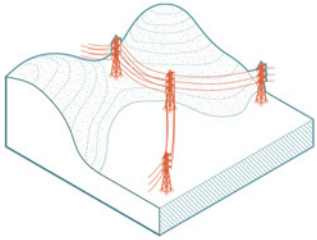


INTERACTIVE NODE

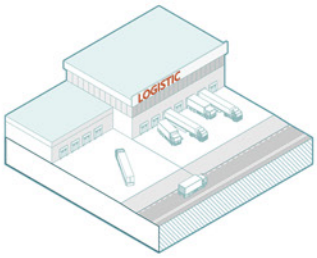
w traffic



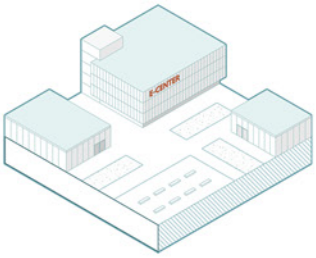
ICT network



Logistic system

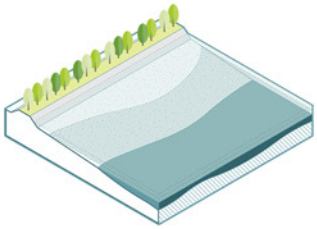


Digital service

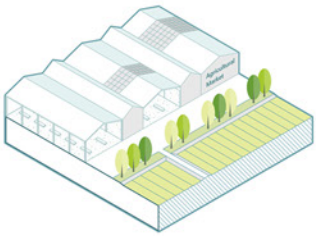


INCLUSIVE LIVING SPACE

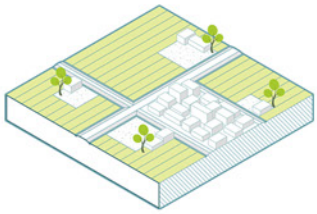
nt River dyke



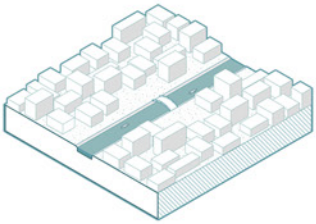
Factory renewal



Agritainment



Public space



5.4 SMART VILLAGES DEVELOPMENT FRAMEWORK

5.4.1 Regional development framework

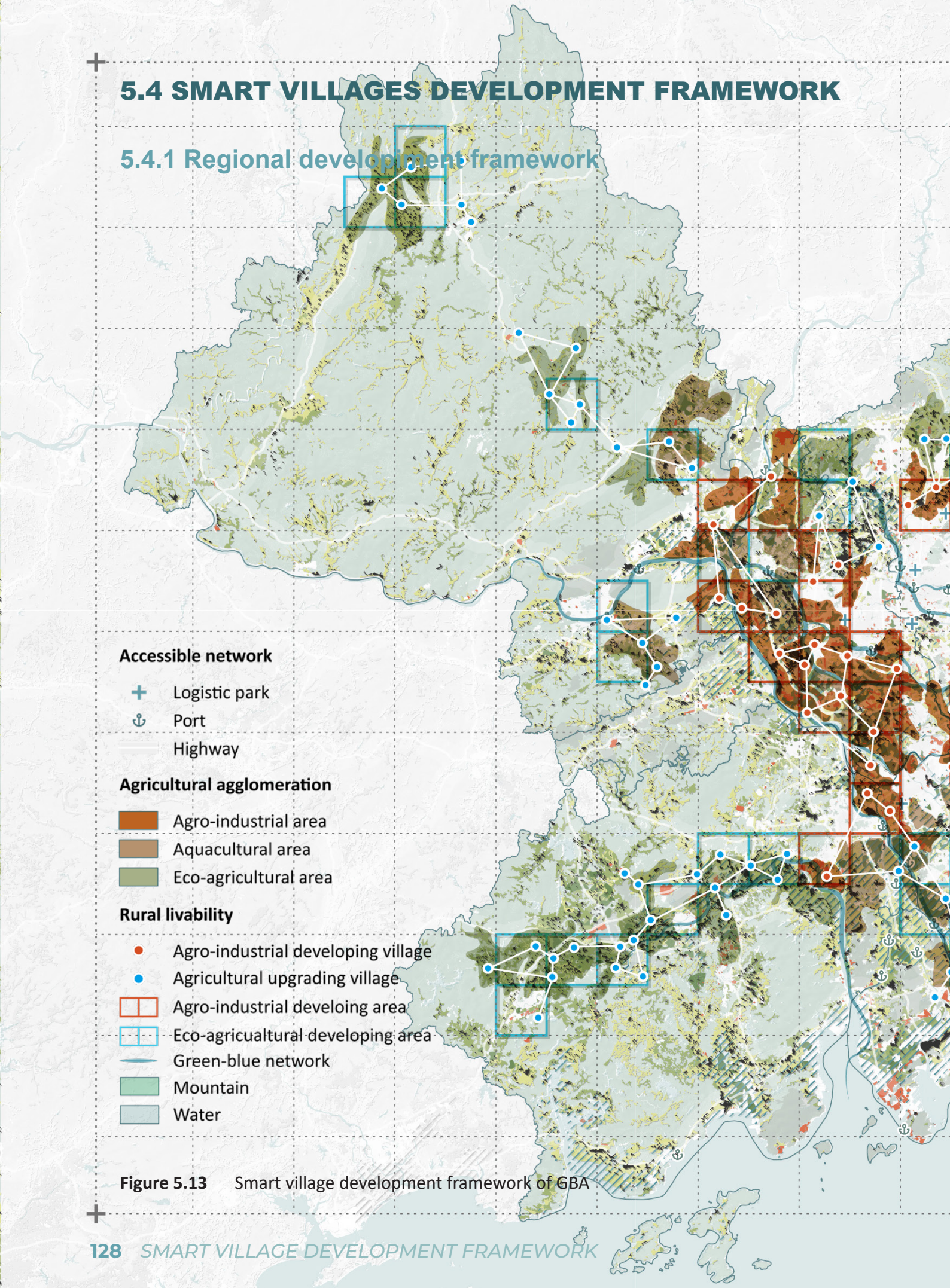
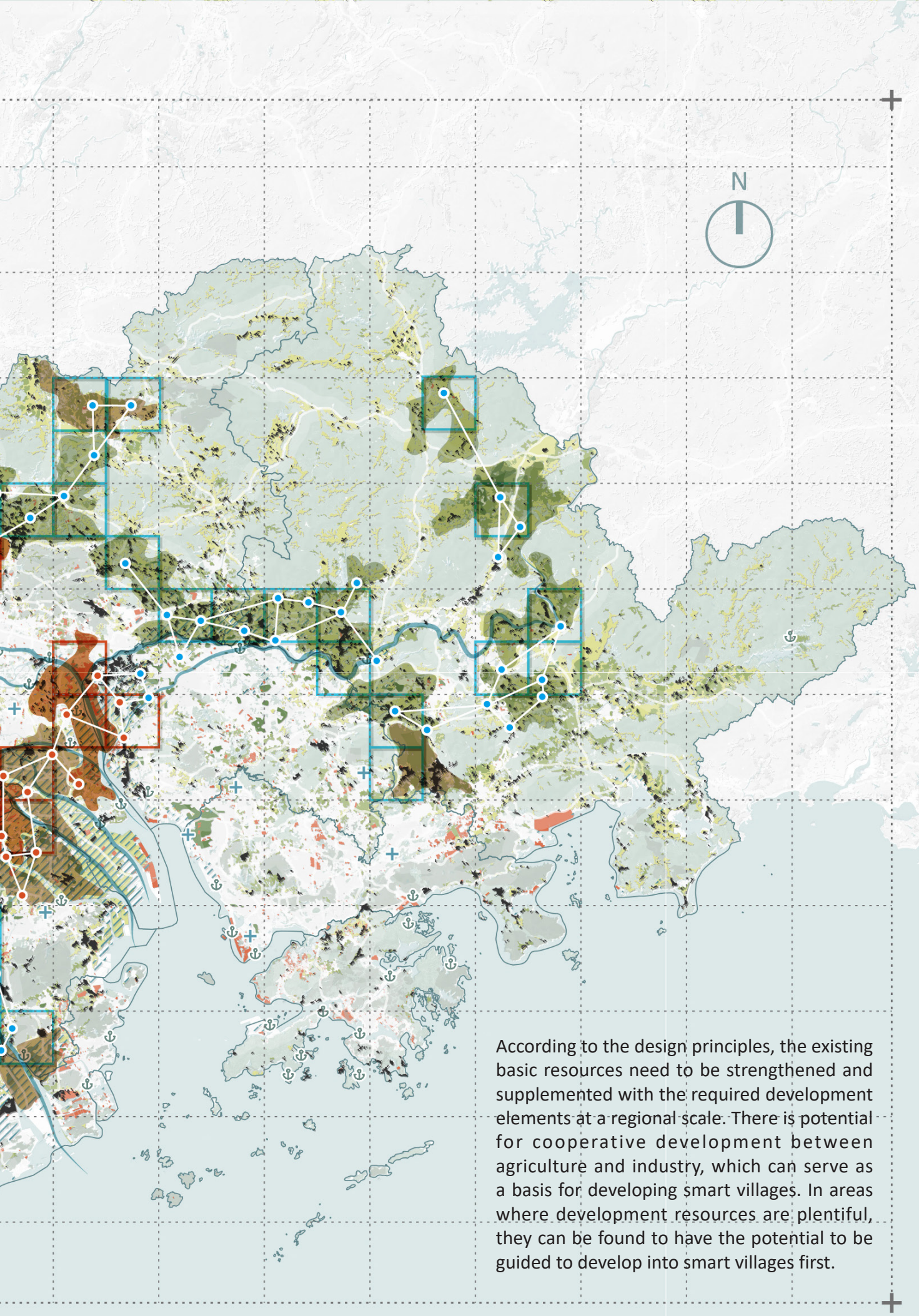


Figure 5.13 Smart village development framework of GBA



According to the design principles, the existing basic resources need to be strengthened and supplemented with the required development elements at a regional scale. There is potential for cooperative development between agriculture and industry, which can serve as a basis for developing smart villages. In areas where development resources are plentiful, they can be found to have the potential to be guided to develop into smart villages first.

5.4.2 Showcases of design strategies

The overall design strategy allows for classifying potential smart villages into two categories: a) villages based on agro-industrial cooperation, and b) villages that have been upgraded through the development of ecological agriculture. Different areas with the potential to develop into these two types of villages can be identified on the GBA scale, and two strategic areas have been selected to demonstrate the design strategy (figure 5.8). Xingtan in Foshan is chosen as the first showcase to illustrate the design strategy of agro-industrial development and to demonstrate the framework of smart village development. The second showcase, Chikan in Jiangmen, is chosen to showcase the development of ecological agricultural upgrading as a complementary design strategy.

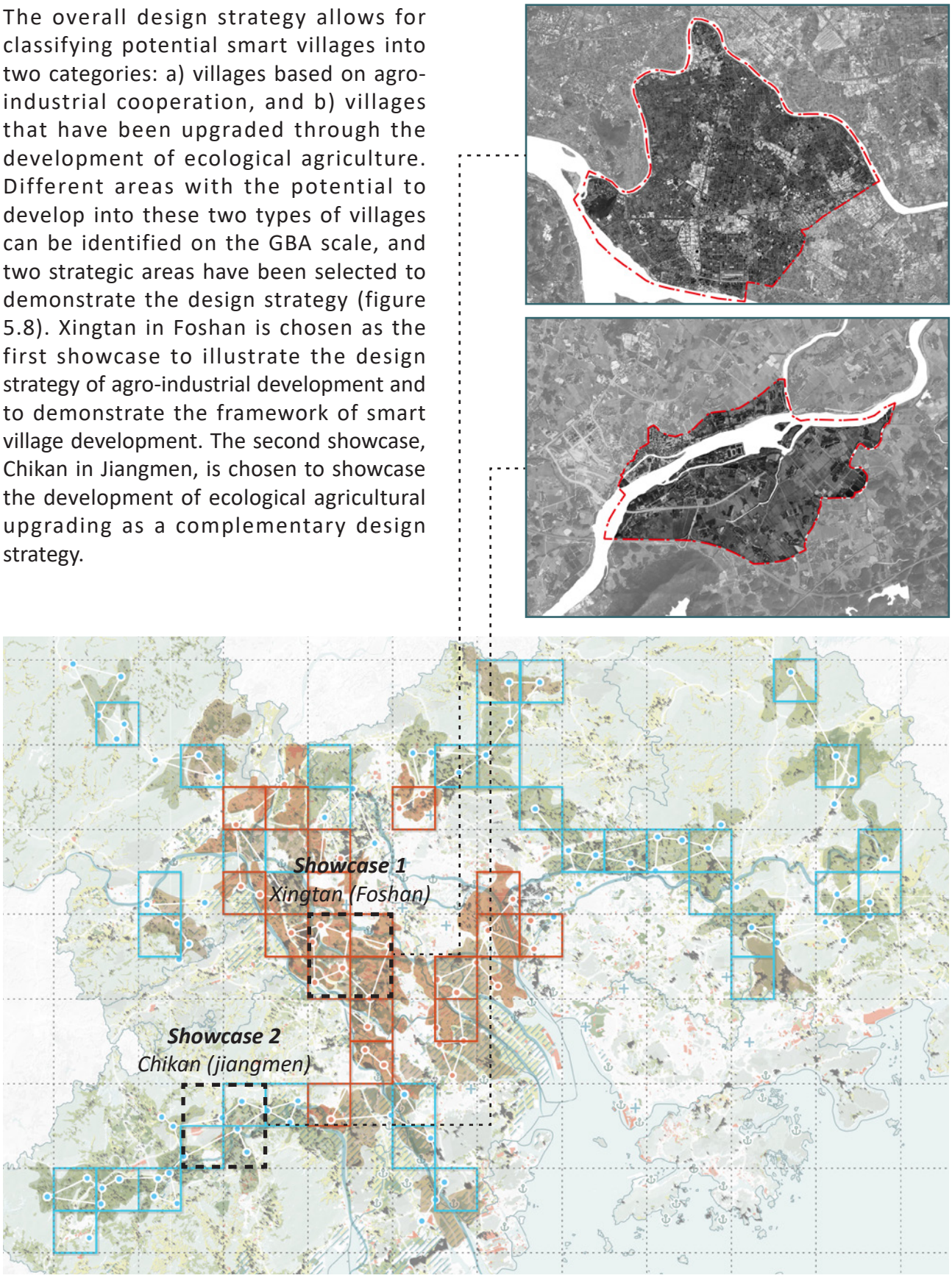


Figure 5.14 Location of selected showcases of smart village development

As the industrialisation of the countryside has already taken place extensively in the GBA, remedying and correcting the severe effects of historical development is one of the critical aims of future rural development. The strategy of agro-industrial development help transform industry and enhance the contribution of the primary sector to the rural economy, and therefore be the primary approach to rural development. In addition, rural areas that have already undergone industrialisation are generally in a better position to develop resources and are more likely to be led to develop into smart villages. Such villages generally have more industrial space and rely on the road system for development. The main development strategy is providing them with the space needed for digital development and more adequate transport facilities.

Developing the first category of villages can inspire the development of other rural areas. Large areas of countryside in the remote suburbs of the GBA can be developed with their resources, showing the possibility of a future where the countryside does not have to rely on resources from cities. The cooperation between ecological and agricultural spaces will be the main strategy in these areas. By developing eco-agriculture, the economic efficiency of agriculture is enhanced while protecting the rural environment. They are provided with more efficient transport and digital facilities for smart village development.

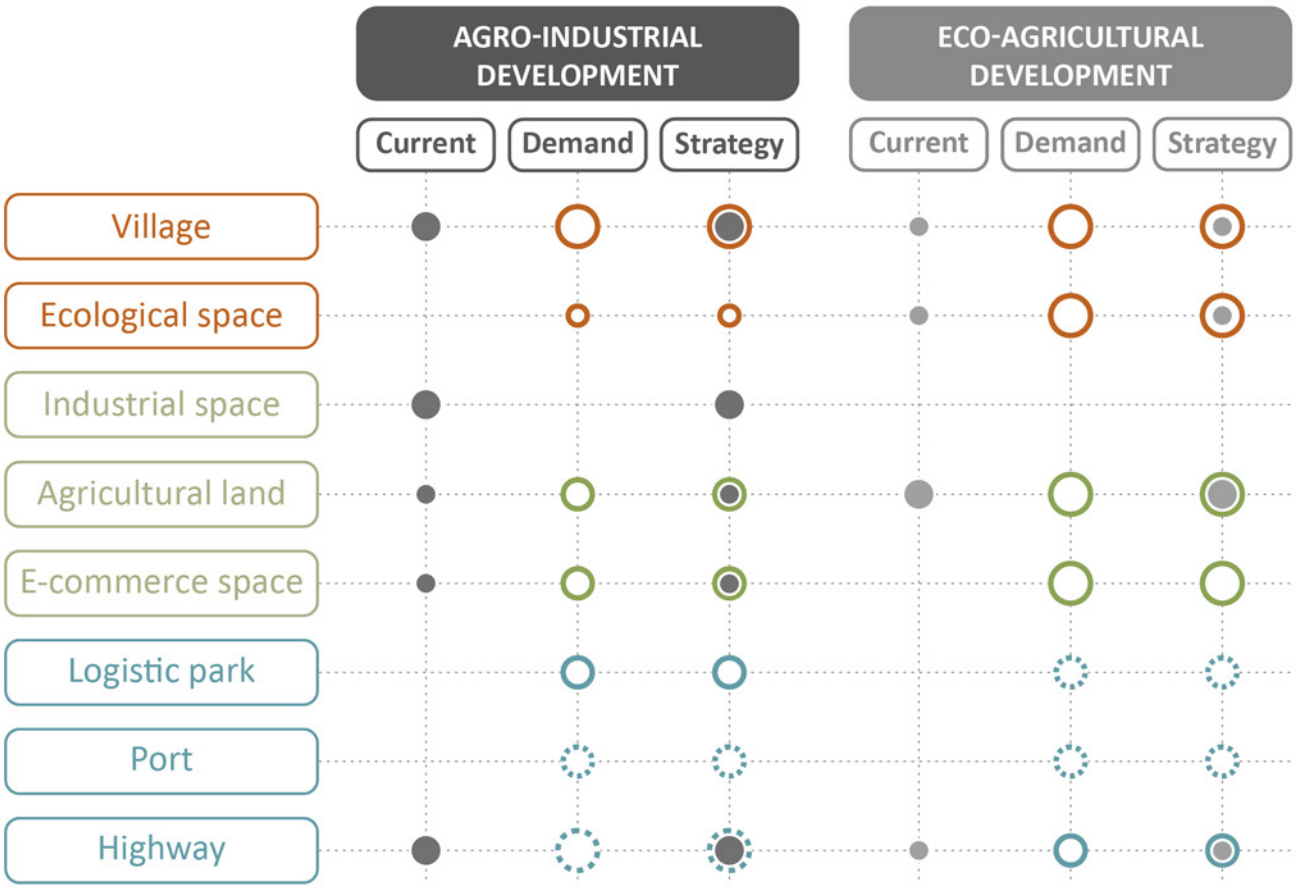


Figure 5.15 Different trategies of smart village devleopment

6

DESIGN STRATEGY FOR SMART VILLAGES

6.1 XINGTAN: AN INDUSTRIALISED RURAL AREAS

6.1.1 Background

In order to demonstrate the possibilities of agro-industrial cooperation in a smart village, the first showcase of the project was in Xingtan Town in Shunde District, Foshan. The rural area is located on the outskirts of the city and has a relatively well-developed infrastructure. It has suffered from rural industrialisation in the past decades, and as a result, there are many clusters of village industrial parks. Due to its proximity to the river, the abundant water resources have become the backbone of rural development. Fish ponds are the primary type of agriculture here.

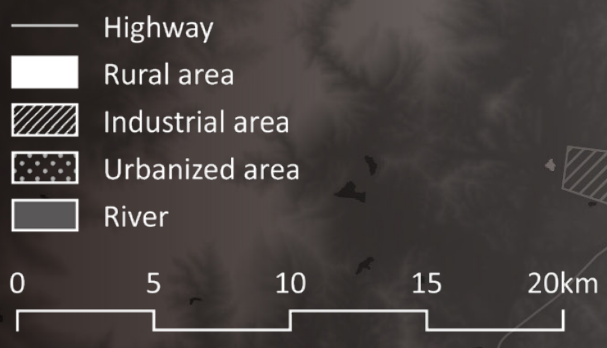
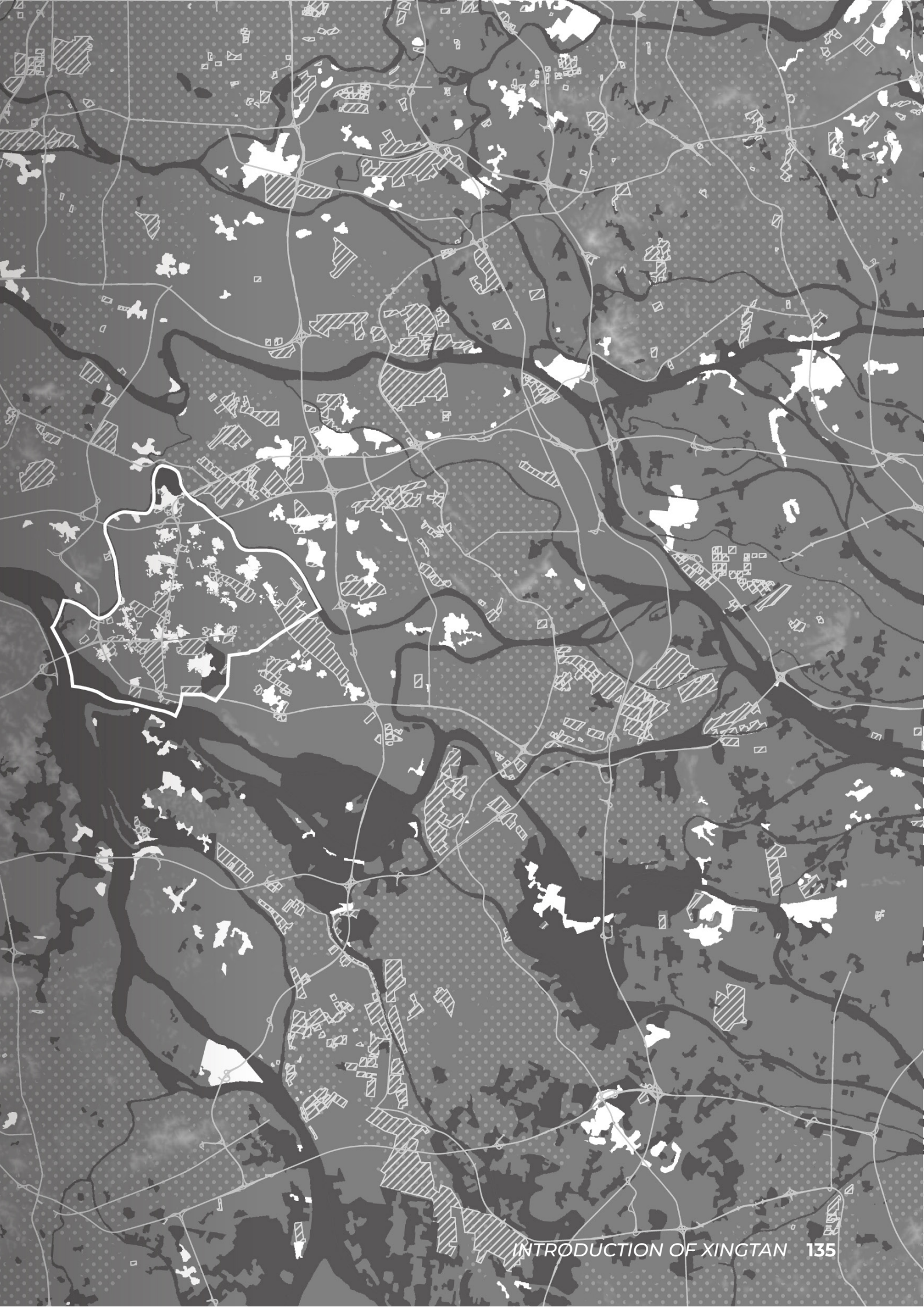


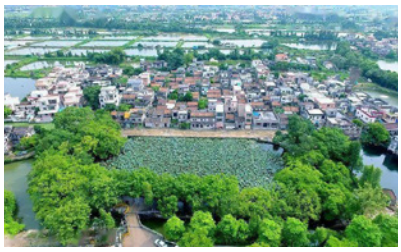
Figure 6.1 Location of Xingtan Town in Foshan



6.1.2 Villages developed rely on the water system

Dyke pond

Village



Taobao village

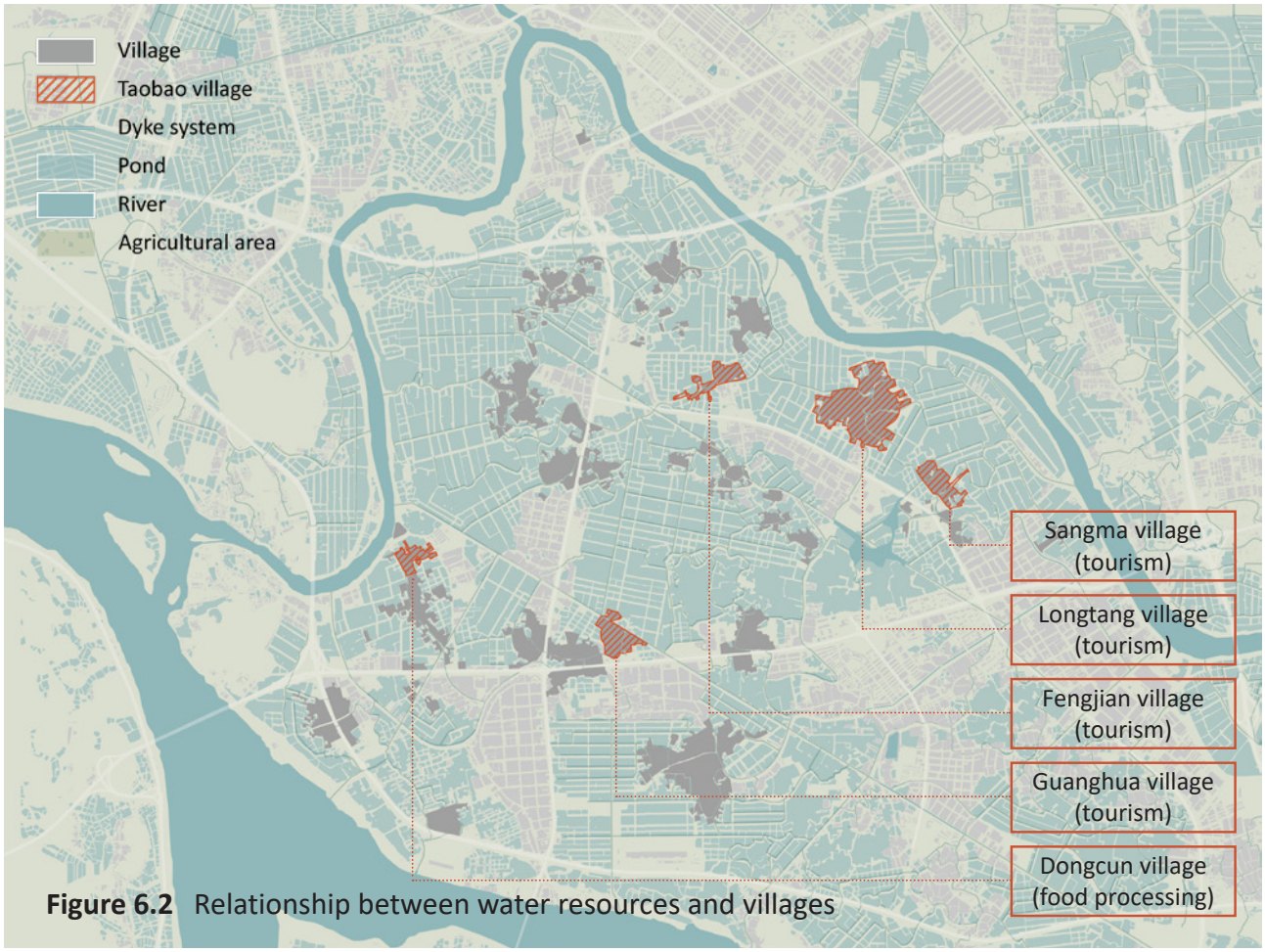


Figure 6.2 Relationship between water resources and villages

Since ancient times, human settlements have developed close to water sources. The GBA region is rich in water resources, so villages are often built on water. Traditional villages have a custom of facing a water pond, which is called a "feng shui pond" that carries the culture of the village. In Xingtan, bordered by a tributary of the Xijiang River to the west, people have developed mulberry-based fish ponds that rely on the waterway. The fish ponds not only feed the local villagers but also provide a high economic value for the development of the village. Five villages in this area have already developed into Taobao villages, including Sangma, Longtang, Fengjian, Guanghua and Dongcun. They form beautiful rural landscapes based on the river and attract many foreign visitors. The successful tourism development and ecological benefits are significant advantages of the area.

6.1.3 Industrialised rural area

Road network

Industrial area

TVE factory

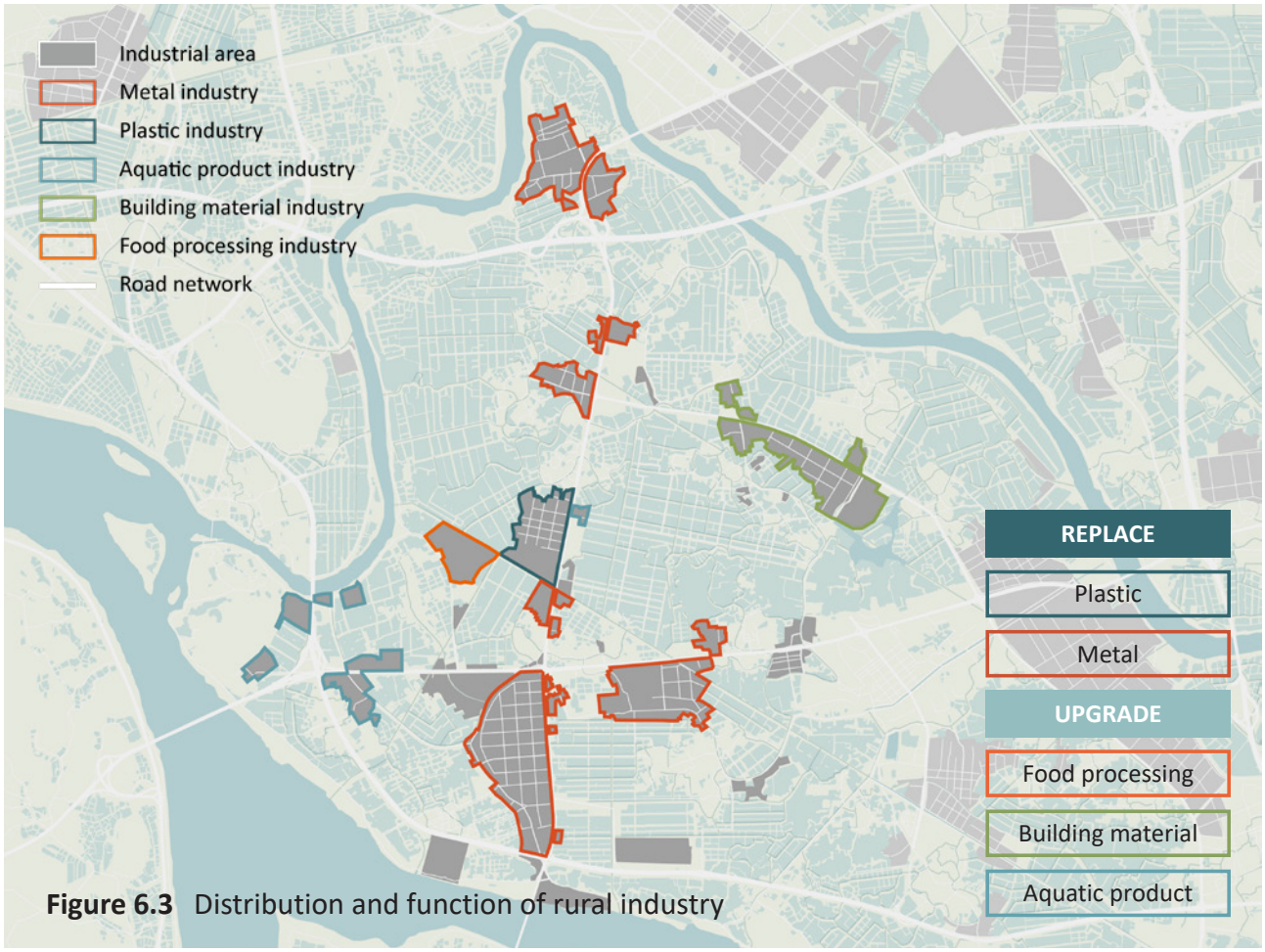
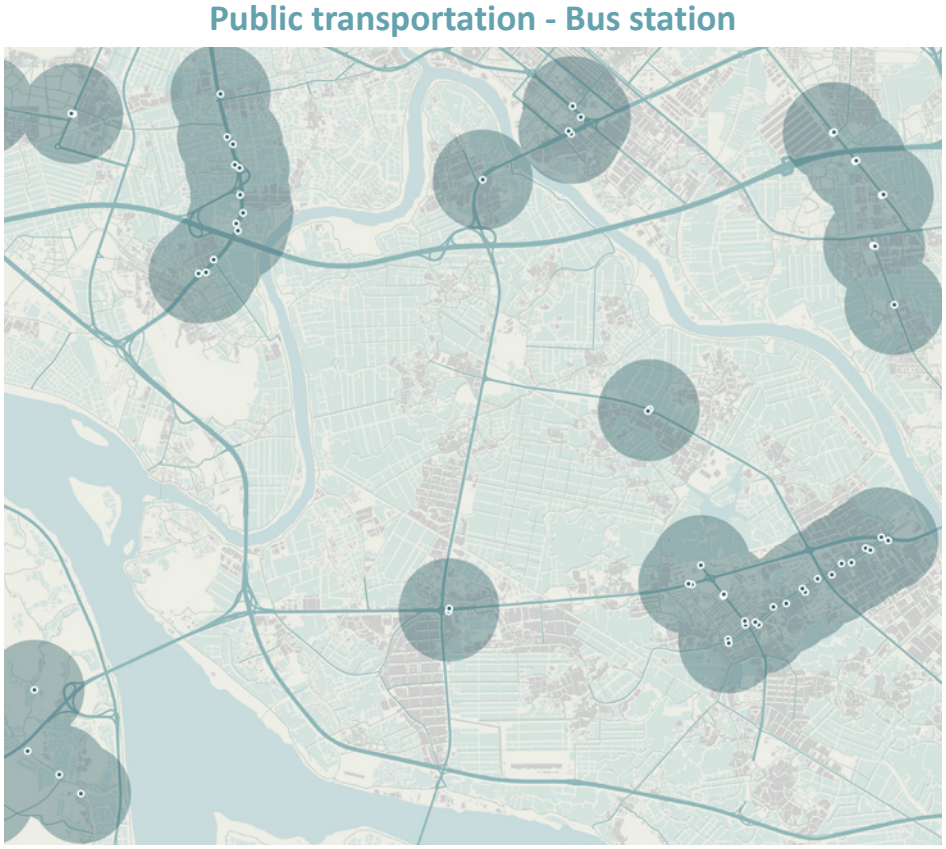


Figure 6.3 Distribution and function of rural industry

Due to its proximity to the town, the Xingtan area already has a well-developed road system, including an expressway and highway running through the site. With the wave of industrialisation in the villages, most villages have invested in their own village-level industrial parks. These industrial estates are mainly distributed and clustered along roads, mostly in the form of poor-quality tin factory buildings and rural self-built houses. The industries here are diverse, including metal processing, plastic manufacturing, food processing, building materials and aquaculture. In order to tackle the pollution caused by industrial development, heavily polluting industries should be gradually retired and replaced with sustainable industries.

6.1.4 Rural services

The area has some public services and these are the basic conditions for the development of the village. The village markets that carry economic activities are distributed among the villages and are small in volume and size. In terms of rural education, there are only primary and secondary schools in the region, and no higher education exists. In addition, public transport is mainly located in the towns, and very few bus stops are in the rural areas. The same situation applies to courier stations, which carry out logistics functions, with only one station in rural areas. Regarding the electricity network, the basic pipelines are insufficient in rural areas. Generally speaking, more is needed to enhance the local development resources.



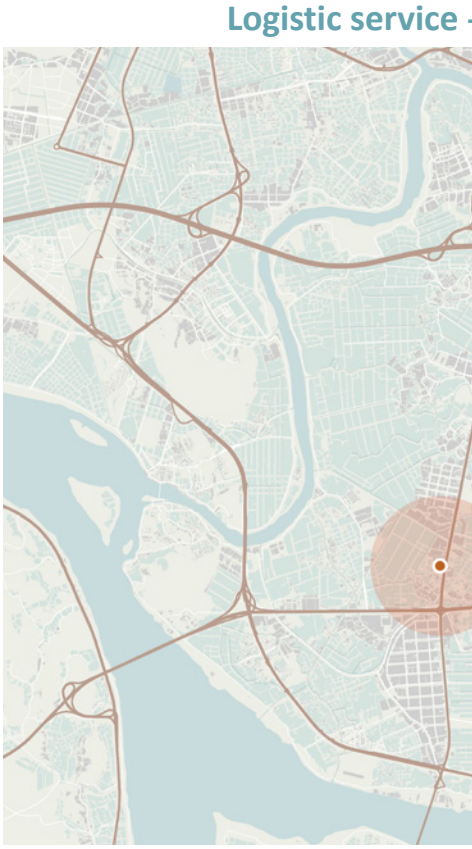
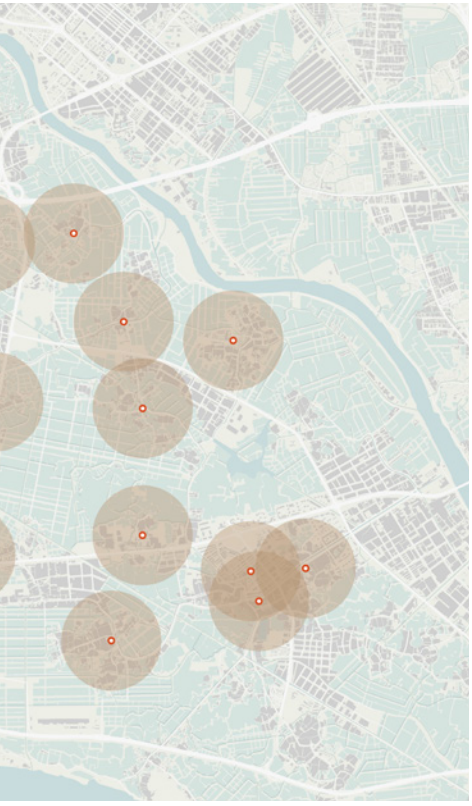
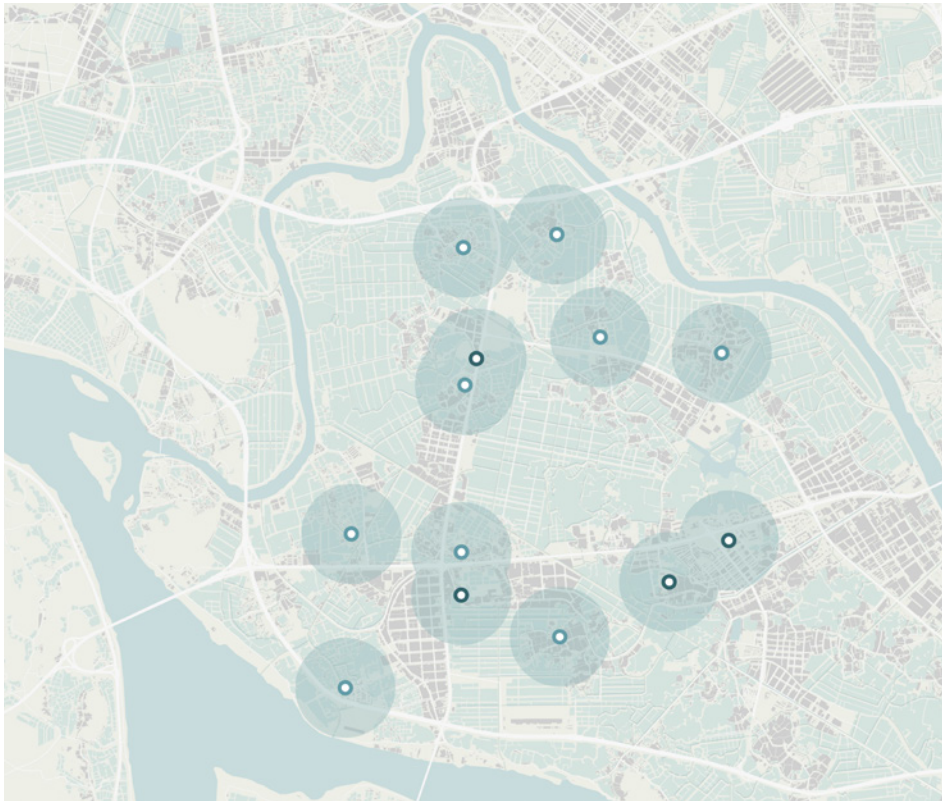


Figure 6.4 Service areas of public infrastrucuture in Xingtan

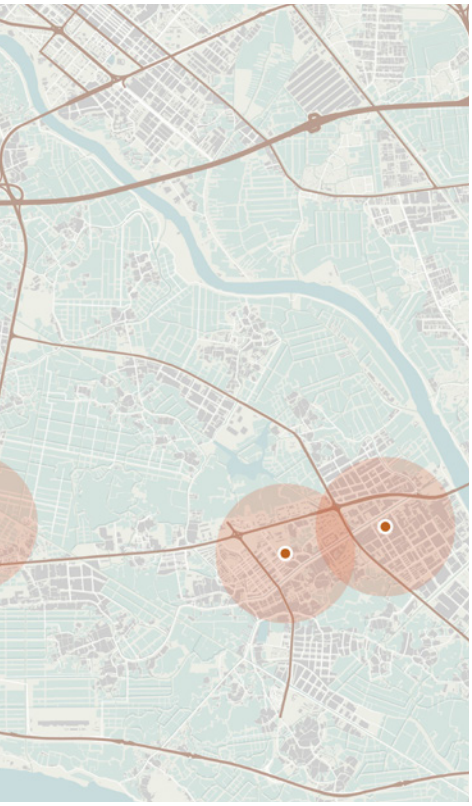
ivity - Market



Rural education - School



- Courier station



Basic infrastructure - Electricity network

6.2 DESIGN STRATEGIES FOR AGRO-INDUSTRIAL DEVELOPMI

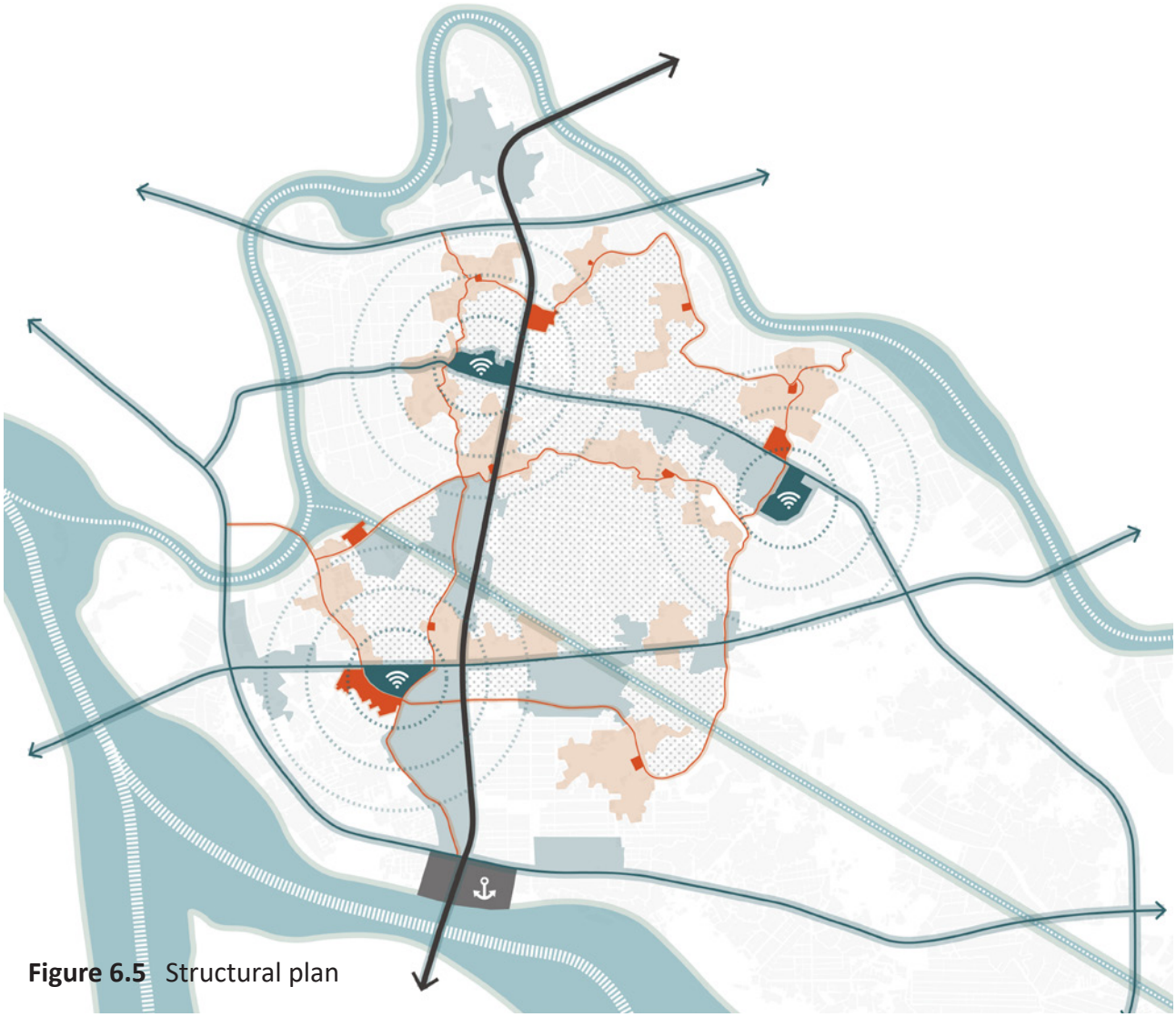


Figure 6.5 Structural plan

Based on the previously mentioned design principles for smart rural development and spatial implications, a vision for the future development of the area is proposed. As rural areas are a complex system, four layers of design strategies are proposed (figure 6.5), inspired by the concept of the layer approach and the network society. These strategies will serve as guidelines for the agro-industrial development type of village and will be applied with specific tactical strategies. The four strategies are applied to the Xingtan region and a structural framework is proposed for its development (figure 6.6).

Firstly, the substratum layer, which focuses on the ecological base of rural development; secondly, the productive layer, which is the economic support of rural areas; thirdly, the living layer, which focuses on the construction of human settlements and accessible networks; and fourthly, the cultural layer, which improves the digital development of rural areas.

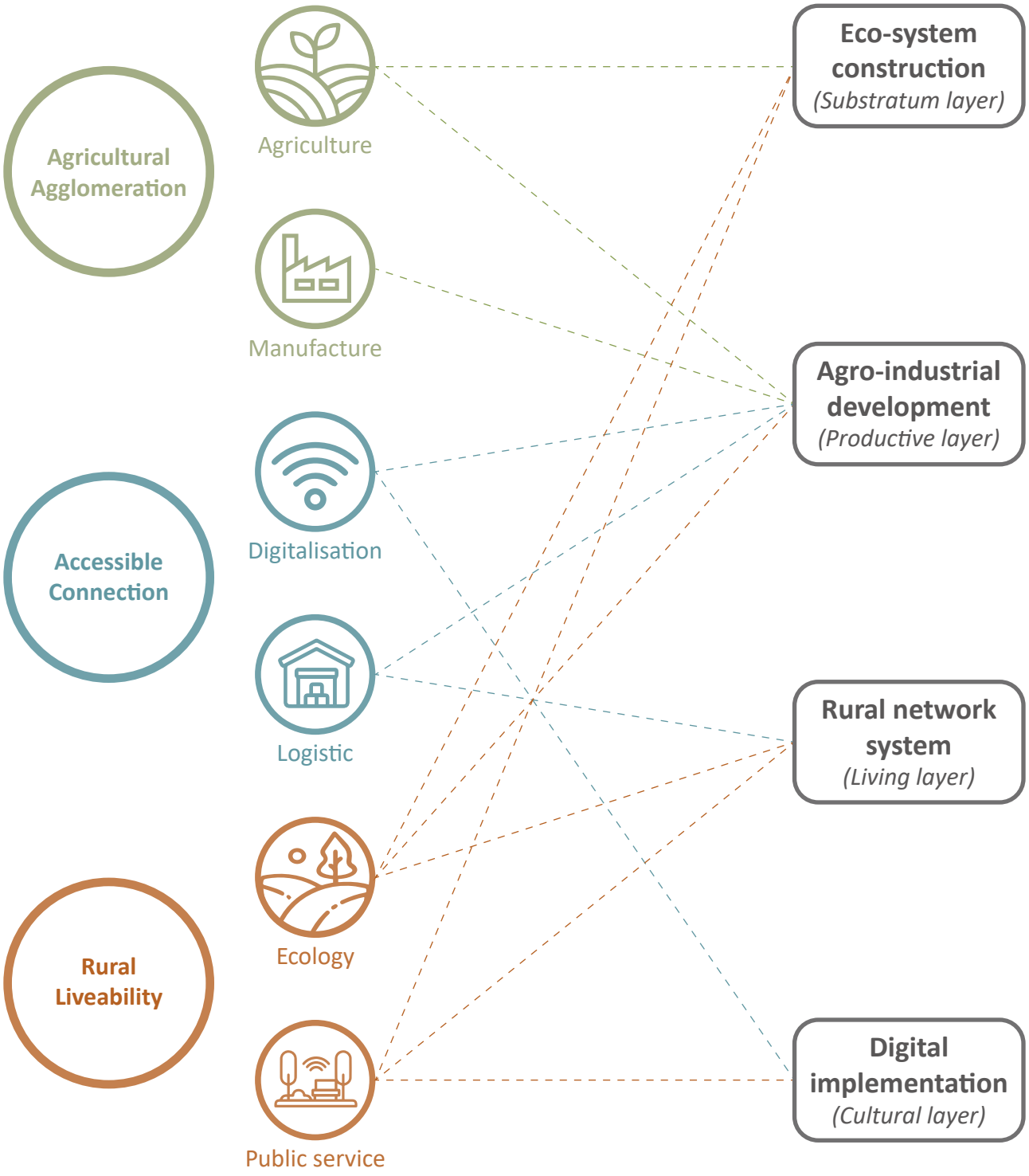


Figure 6.6 Design strategies related to different layers

6.2.1 Eco-system construction

TACTICAL STRATEGY	DESIGN COMPONENT			
Completed green-blue network	River	Wetland	Green corridor	Green space
Waterfront intervention	Wetland	Integrated dyke	Flood-resistant paddy field	

Figure 6.7 Structural plan of ecological restoration strategy

The ecological values offered by the natural environment are the strength of rural areas. The development objective of the ecological conservation strategy is to preserve the rural biodiversity and protect agricultural areas with green buffer zone. In addition, the proximity to the river and its location in the delta area make it necessary to prevent the threat of flooding risk.

Green-blue network

The green-blue network integrates natural and human factors to create a sustainable, interconnected system that enhances environmental benefits. By incorporating rivers, wetlands and other green spaces, the network helps to protect ecosystems, improve urban and rural landscapes, and promote a more sustainable rural living environment.

Waterfront intervention

By implementing waterfront interventions incorporating wetlands, integrated dykes and flood-resistant paddy fields, rural areas can improve the ecological integrity and flood resilience of their waterfront areas. These interventions contribute to the development of agriculture, promote harmonious interaction between human activities and water bodies, and create vibrant and resilient waterfront environments.

Green space

By incorporating green spaces in rural areas, communities can improve environmental quality, biodiversity and recreational opportunities for residents. These green spaces not only provide physical and mental health benefits but also help to preserve natural ecosystems and the cultural identity of rural areas.

Figure 6.8 Reference images of eco-system construction

6.2.2 Agro-industrial upgrading

TACTICAL STRATEGY	DESIGN COMPONENT			
Smart agriculture	Dyke pond	Greenhouse	Monitoring technology	The living lab
Reclaimed agricultural land	Water dyke	Cropland	Paddy field	
Industrial transformation	Factory	The living lab	Workshop	

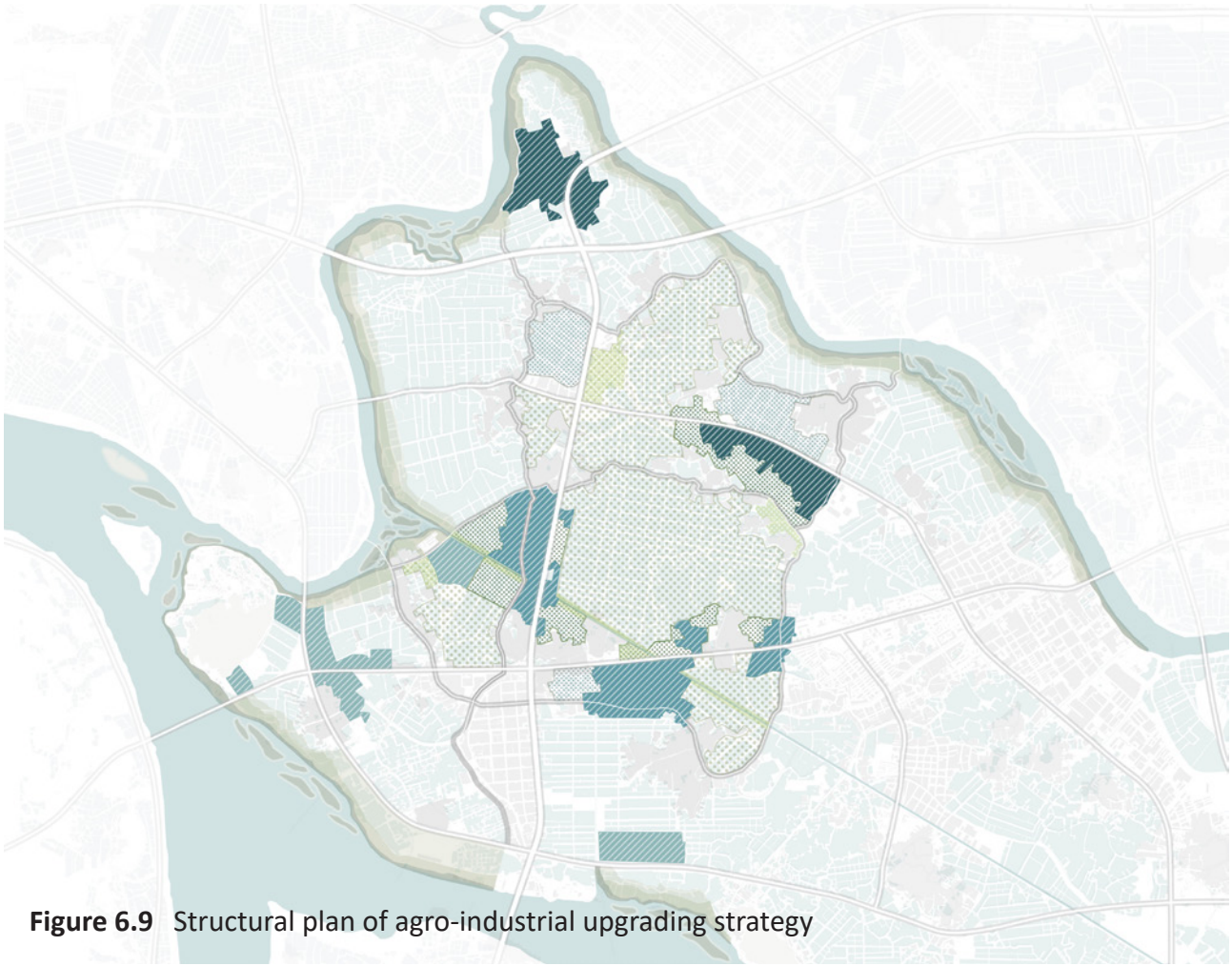


Figure 6.9 Structural plan of agro-industrial upgrading strategy

In order to upgrade primary industries and decommission high-polluting industries, encouraging cooperation between industry and agriculture is an effective method. Industries should be transformed into green industries with the most potential to work with agriculture according to the local strengths of the industries. The efficiency and productivity of agriculture is improved through the classification and precise management of farmland.

Smart agriculture

Smart agriculture offers opportunities to improve productivity, efficiency, and environmental sustainability in the agricultural sector. New technologies and methods empower farmers with real-time information, enable precise farming practices and contribute to developing a more resilient and sustainable food production system.

Reclaimed polder

Reclaimed polder land offers a promising solution for reusing agricultural land that has been polluted by rural industry. Through land reclamation techniques, such as the construction of dykes and the implementation of remediation measures, contaminated agricultural land can be transformed into productive and sustainable polder areas to raise livestock.

Agro-industrial transformation

Through agro-industrial transformation, traditional agricultural practices are modernised and diversified. The living labs allow for the innovative introduction of advanced technologies and the exploration of sustainable farming methods. This transformation not only enhances the competitiveness of the agricultural sector but also contributes to provide more job opportunities.

Figure 6.10 Reference images of agro-industrial upgrading

6.2.3 Rural network system

TACTICAL STRATEGY	DESIGN COMPONENT			
Logistic system	Highway network	Courier station	Logistic park	Cargo port
Public transportation	Bus station	Rural track	Passenger port	
Public activity	Agricultural market	Agricultural park	Agritainment	Open space

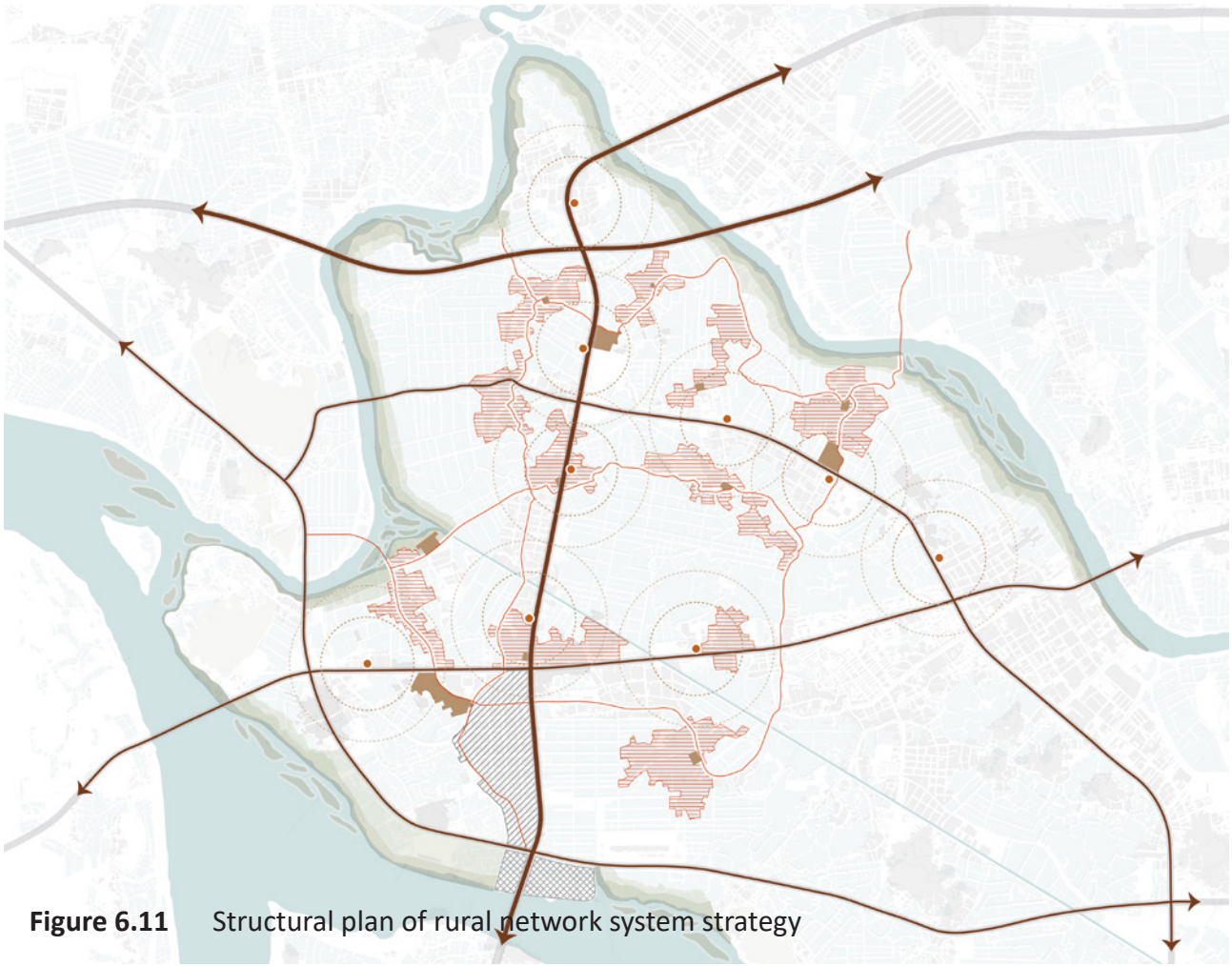


Figure 6.11 Structural plan of rural network system strategy

A fast logistics system is the basis for developing e-commerce and is an essential facility for the future smart village to enhance its economic value. Relying on existing river and road facilities can improve the construction of ports and logistics parks. In addition, constructing a slow traffic system separated from the logistics system can help improve the quality of life in the villages.

Logistic port

The cargo port area becomes an integral part of a well-connected and efficient logistics network through cooperation with the logistics park and motorway system. This cooperation enables efficient supply chain management and improves overall logistics performance, contributing to the economic development and sustainability of the region.

Transportation network

A public transport network enhances accessibility and promotes sustainable mobility options. It improves connectivity within and between communities and provides convenient public transport options for residents and visitors. A well-planned, integrated public transport network is essential to promote economic development, social inclusion and environmental sustainability.

Rural track

Rural track play an essential role in connecting public activities in rural areas. It will increase accessibility, promote tourism and contribute to the economic and social development of rural communities. By facilitating the movement of people and promoting connectivity, rural track support the vitality and vibrancy of rural areas.

Figure 6.12 Reference images of rural network system

6.2.4 Digital implementation

TACTICAL STRATEGY	DESIGN COMPONENT			
Digital culture	E-center	Labour training workshop	Internet course	
The living lab	Experiment lab	Experimental farmland	Workshop	Monitoring technology
E-commerce development	Virtural business space	Sharing office	Off-line market	

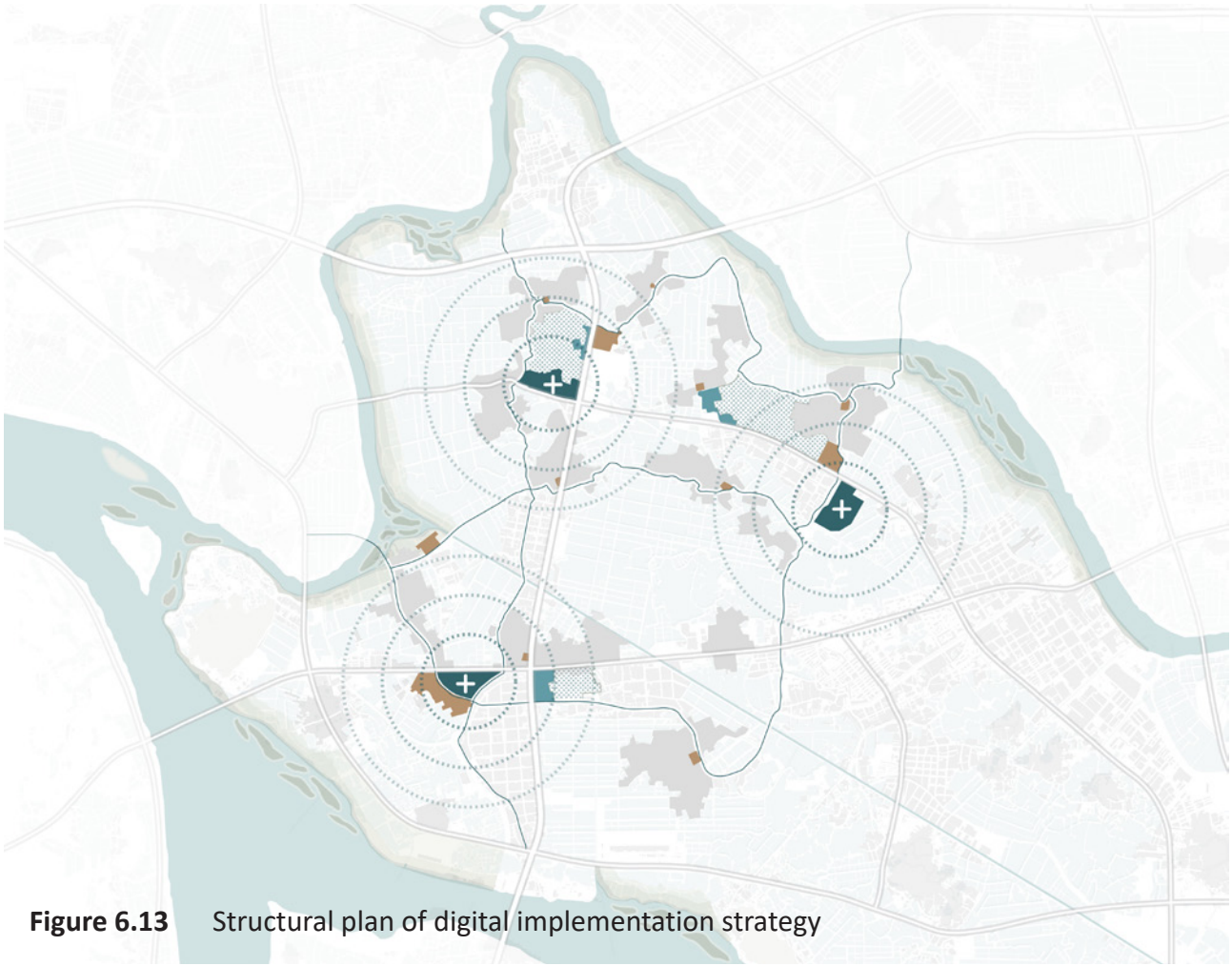


Figure 6.13 Structural plan of digital implementation strategy

Indispensable to the development of smart villages is the construction of digital spaces to aid the entry of e-commerce and digital knowledge. Village education can be introduced to improve the digital literacy of villagers and to train more workers who can do digital work. To achieve a sustainable digital village, local laboratories can develop the most appropriate technology for the local context.

Digital hubs: E-center

E-centres play an essential role in facilitating online sales and community engagement. They act as virtual spaces where individuals, businesses and villages can use digital technologies to enhance economic opportunities and gain digital skills. These hubs play a key role in bridging the digital gap, empowering rural areas and promoting inclusive growth in the digital age.

The living lab

By integrating experimental agricultural land, workshops and monitoring techniques, the Living Lab facilitates the exploration and adoption of cutting-edge solutions to address agricultural challenges and promote advances in sustainable agricultural practices. It fosters collaboration between researchers, farmers and other stakeholders, facilitating knowledge exchange and advancing sustainable agriculture.

E-commerce markets

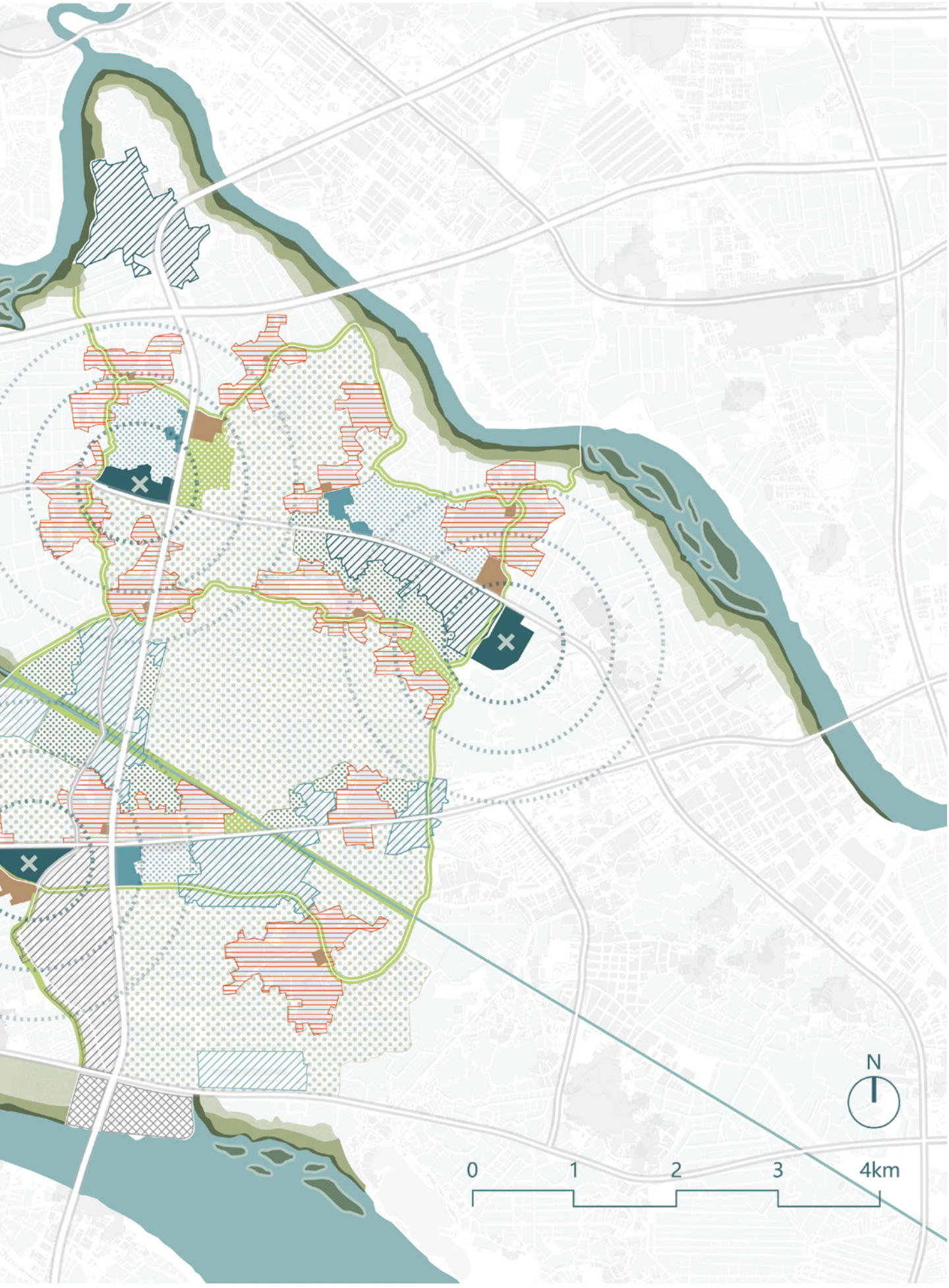
By integrating agricultural markets into an e-commerce framework, rural areas can harness the power of digital technology while protecting local agro-ecosystems. This integration promotes economic growth, empowers local farmers and improves access to fresh and local food for both rural and urban consumers.

Figure 6.14 Reference images of digital implementation

6.2.5 Design plan

Based on agro-industrial cooperation, the picture of the future of the smart village is one of an integrated network of villages that cooperate with each other and have a radical impact on the surrounding area. The E-centre becomes the main public space for the gathering of rural activities.

Figure 6.15 Developing plan


N
0
1
2
3
4km

6.3 STAKEHOLDER STRATEGY

6.3.1 Stakeholder relationships

Regional scale

The development of smart villages across the GBA needs to have a coherent agenda closely linked to the guidance of the public sector. At this scale, the various levels of government and the e-commerce companies that drive the digitalisation of the countryside are the leading players, and they need to work together to develop the infrastructure and provide the conditions for developing smart villages with the suggestions from the countryside.

Distric

The scale of regional development nee
guidelines and provide guidance fo
synergy between the different secto
players include municipal government
companies and related associations
They are representatives of the pub
private sector, and they consult each o
respective sectors in order to achieve

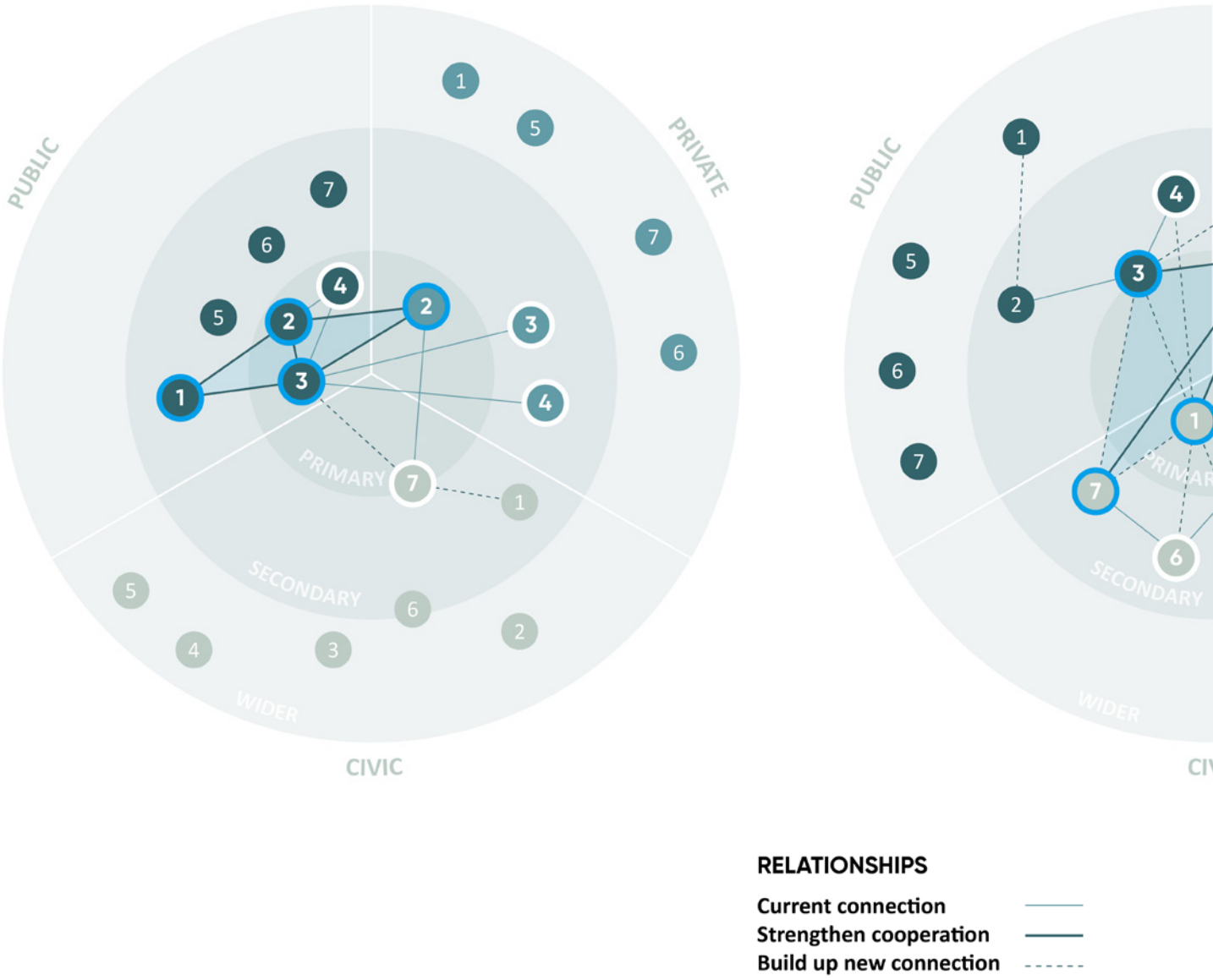


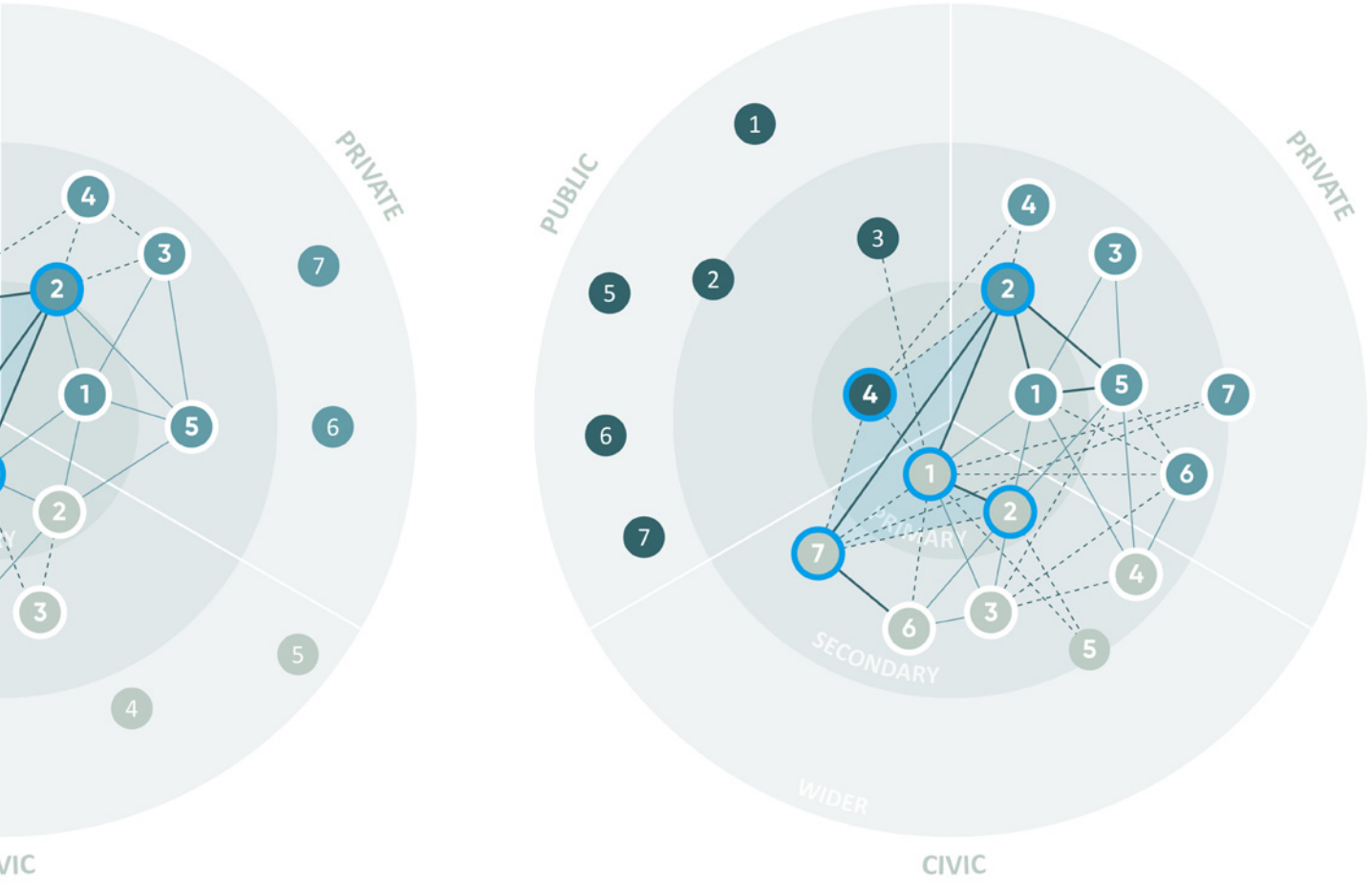
Figure 6.16 Stakeholder relationships in different scale

t scale

eds to follow the general development
r local village development, so the
ors is essential. The most significant
ts, village collectives and e-commerce
that promote digital development.
blic sector, the civic society and the
other after collecting the views of their
co-governance.

Local scale

The villages will still enjoy a high degree of autonomy when it comes to the specific design of the village. The village collective and the villagers will be in charge of the development of the smart village and their decisions will be made with the help of the planners. The construction of villages is closely linked to the collaboration of the private sector.



PUBLIC SECTOR

1 Central government
2 Provincial government
3 Municipal government
4 Planning institute
5 Ministry of industry and technology
6 Ministry of agriculture and rural areas
7 Ministry of human resources

PRIVATE SECTOR

1 TVE (township village enterprise)
2 E-commerce company
3 Logistic company
4 ICT provider
5 Local industry
6 New-in industry
7 Education institute

CIVIC SOCIETY

1 Village collective
2 Villagers
3 Farmers
4 Migrant workers
5 Tourists
6 E-commerce promoter
7 E-commerce association

6.3.2 Power-interest matrix of stakeholders

Figure 6.17 Power-interest matrix of stakeholders

The village collective, as property owners, have the most significant power and interest in the development of the village on the ground. In order to balance their power, the voice of migrant workers and farmers in village development decisions should be increased to some extent.

As this type of village has undergone rural industrialisation, the industry has a decisive influence on the development of the village. By developing agriculture and promoting industrial transformation, their ability to influence village development is reduced. On the other hand, as the largest group in village life, the voices of villagers should be heard and fully respected. They can help the decision-making process to be better grounded and thus improve the quality of rural living space.

6.3.3 Co-governance strategy for smart village development

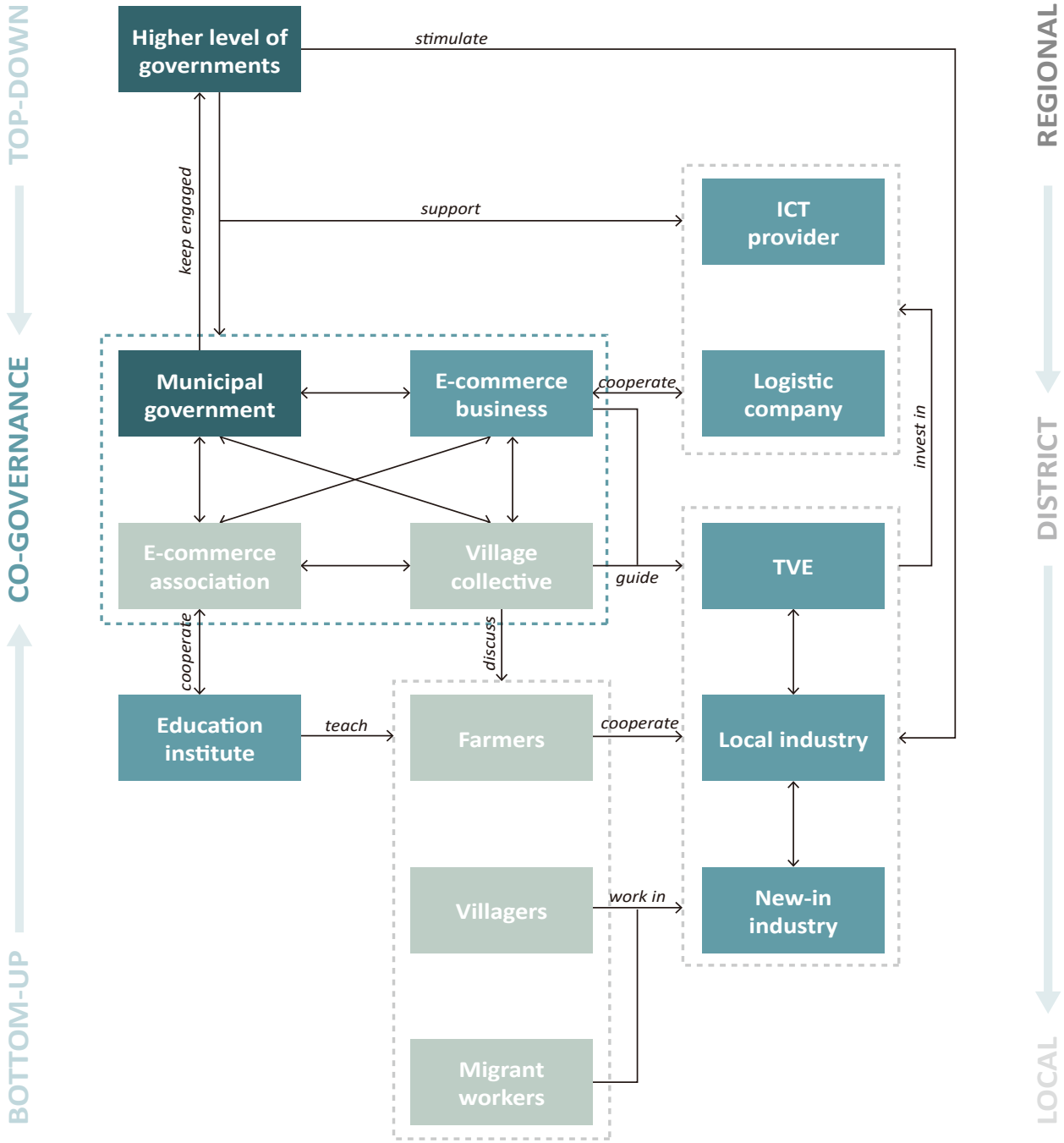
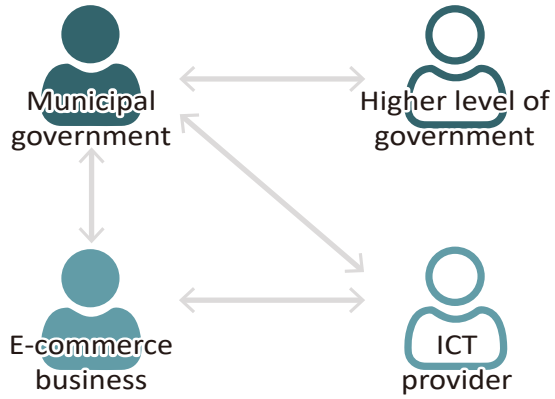
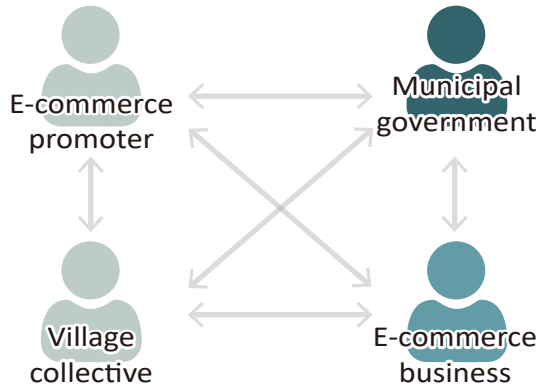
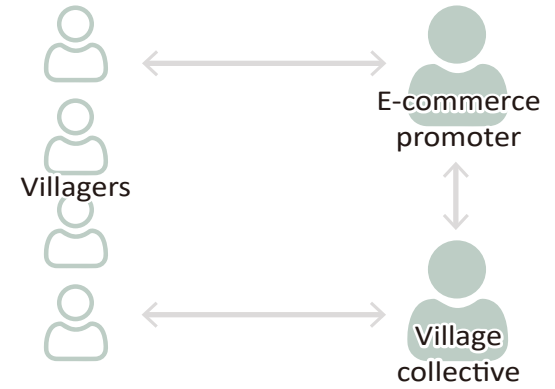
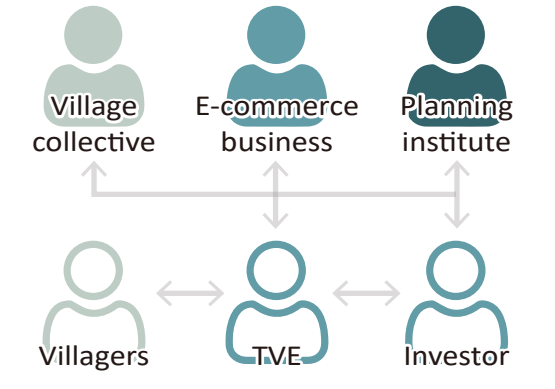


Figure 6.18 Co-governance strategy across scales

In general, developing smart villages requires forming a co-governance model, which can help villages develop a systematic planning and development path.

The municipal government, village collectives, e-commerce companies, and associations should be the main stakeholders of co-governance, serving as a bridge between top-down planning policies and bottom-up strategies. On the government side, their involvement in village development needs to be maintained. At the local level, village self-governance should be introduced in a co-manage way by village committees.

6.3.4 Instructions on co-governance strategy

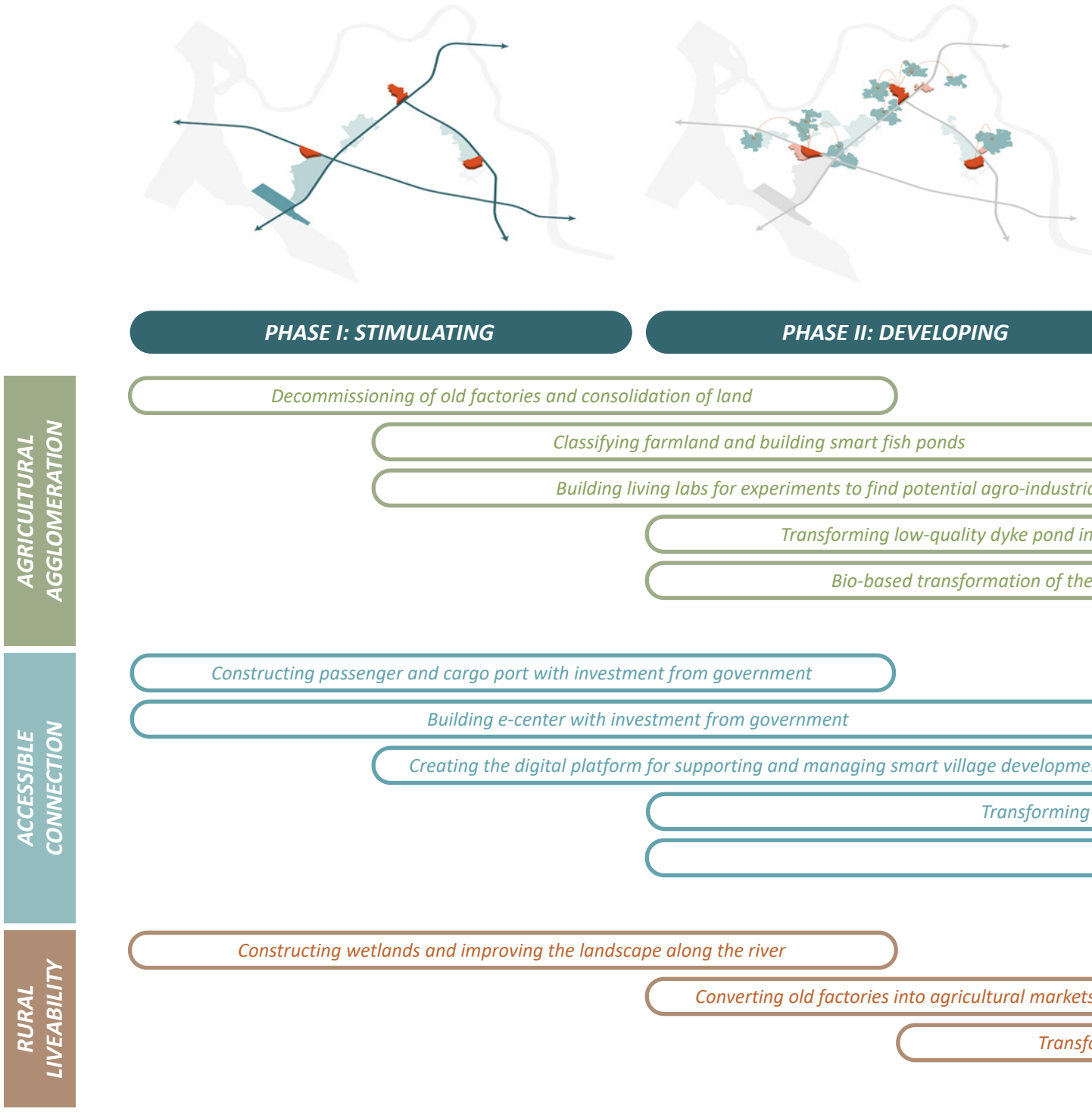
Engaged stakeholders	Strategies	P
	Keep engaged Co-create	1. C 2.
	Co-governance	1. Sy 2. On
	Build awareness Co-manage	1 2. 3. Votin
	Incentive Co-fund Co-create Hire	(Public pri 2. E-

ractices	Instruction
Conference Workshop	Programs completed through the co-governance process should be notified to higher levels of government by a meeting of the municipality, thus increasing the involvement of the central government. In order to complete the complement of network-related infrastructure, workshops can be conducted jointly with e-commerce and ICT companies to discuss the blueprint of future smart village development.
ymposiums line platform	As key stakeholders in shared governance, they can ensure transparency and equality in the exchange of information by convening a symposium. The representatives can express their own vision of development and mutually agree on a mutually satisfactory solution. The online platform can be a useful tool for sharing information and opinions, and can also assist in conducting online meetings.
. Lecture Hearings g participation decision	It is the responsibility of the village collective and relevant experts to convey and explain to the villagers the development program completed through the process of co-governance, and to hold hearings to respectfully listen to the voice of the people. At the same time, village representatives should be given some power to participate in the decision-making process to ensure their sense of ownership of the village.
1. PPP vate partnership) -commerce	The PPP model is a good opportunity for the development of a rural digital economy. Through the government's financial support, the market's cooperation and the villagers' work, together we can accomplish an e-commerce model with rural characteristics.

6.3.5 Phasing development

Phase one will start with a top-down strategy. With the investment and guidance governments provide, e-centre, logistic parks, and ports will be developed properly to stimulate the thriving of local e-commerce. Phase two continues from a bottom-up way. Village collective will encourage local industry to transform

Figure 6.19 Phasing timeline



and guide the smart village development under discussion with local people. Village collective will set up rules for permitting sustainable industries to move in. And the new-in industry will cooperate with local industry to develop better economic benefits. Phase three, the thriving of e-commerce, provides the opportunity and capital for villages to communicate with each other. Villages, industry and other public sectors will work together to construct the rural system. The area has developed in phase three and starts to influence nearby areas. More villages can join the rural network system spontaneously.

PHASE III: INFLUENCING

al cooperation

to reclaimed polder

local factory rely on local agricultural materials

Encouraging local and new-in industry to transform and cooperate with agricultural sector

nt

old factories into logistic park

Villagers learning digial knowledges from courses held in e-center by experts

Building rural track to enhance village accessibility and protect rural ecology

orming rural space to develop agritainment and parks

Influencing surrounding villages to join the digitalisation process on their own initiative

6.3.6 Stakeholder cooperation

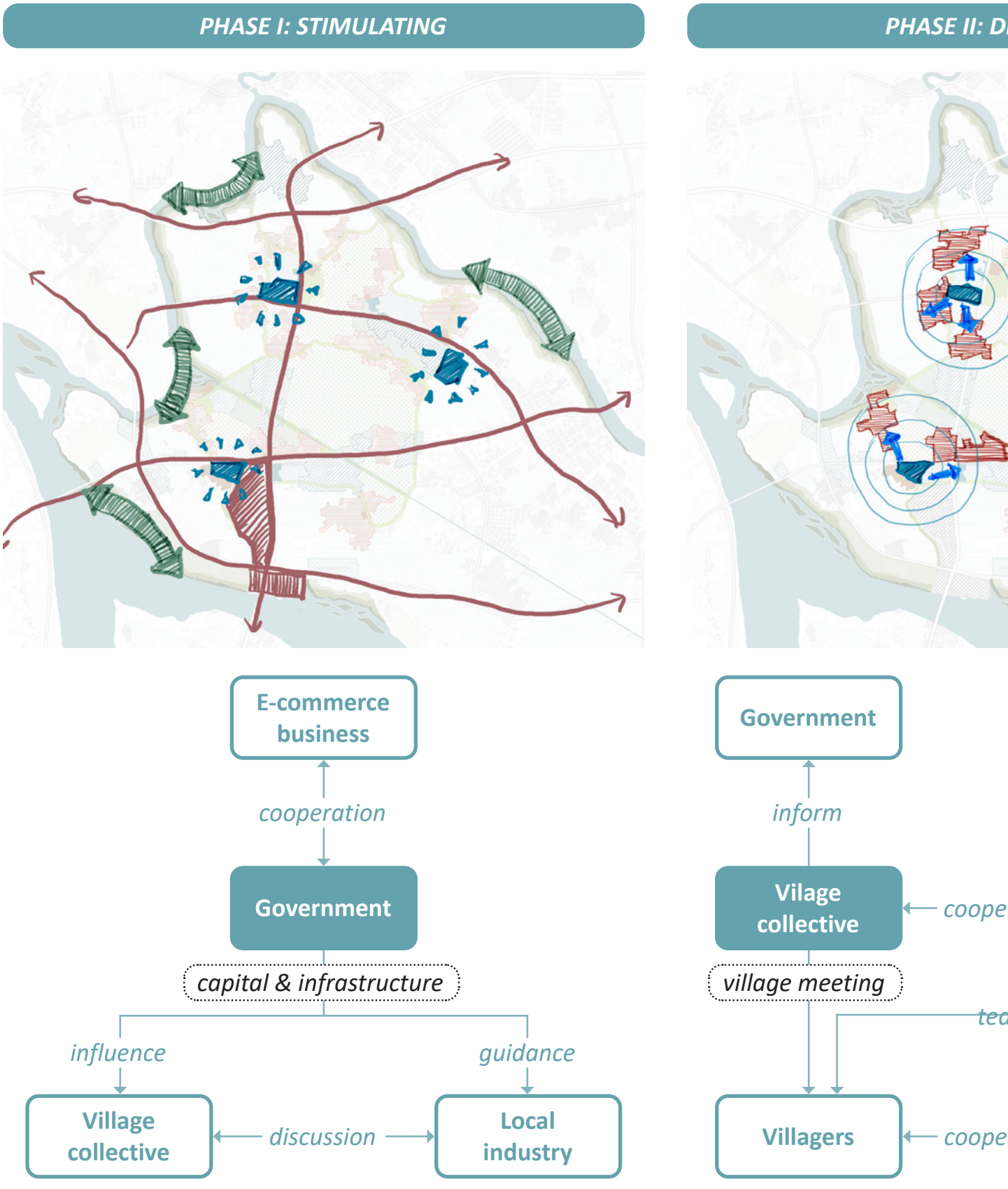
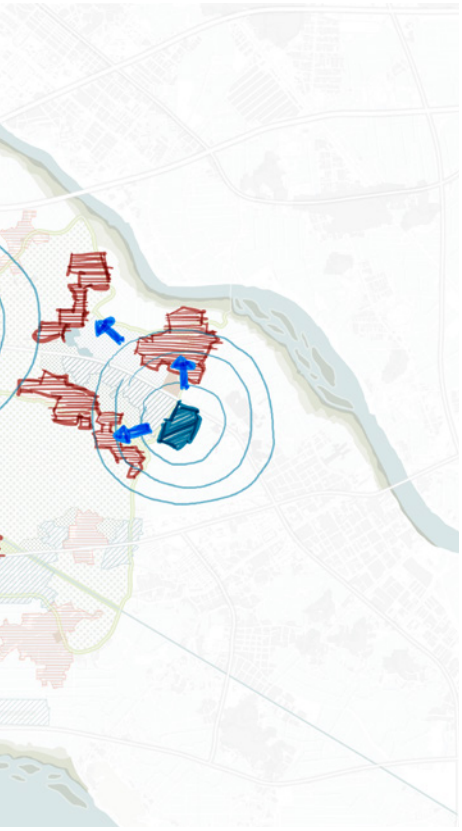
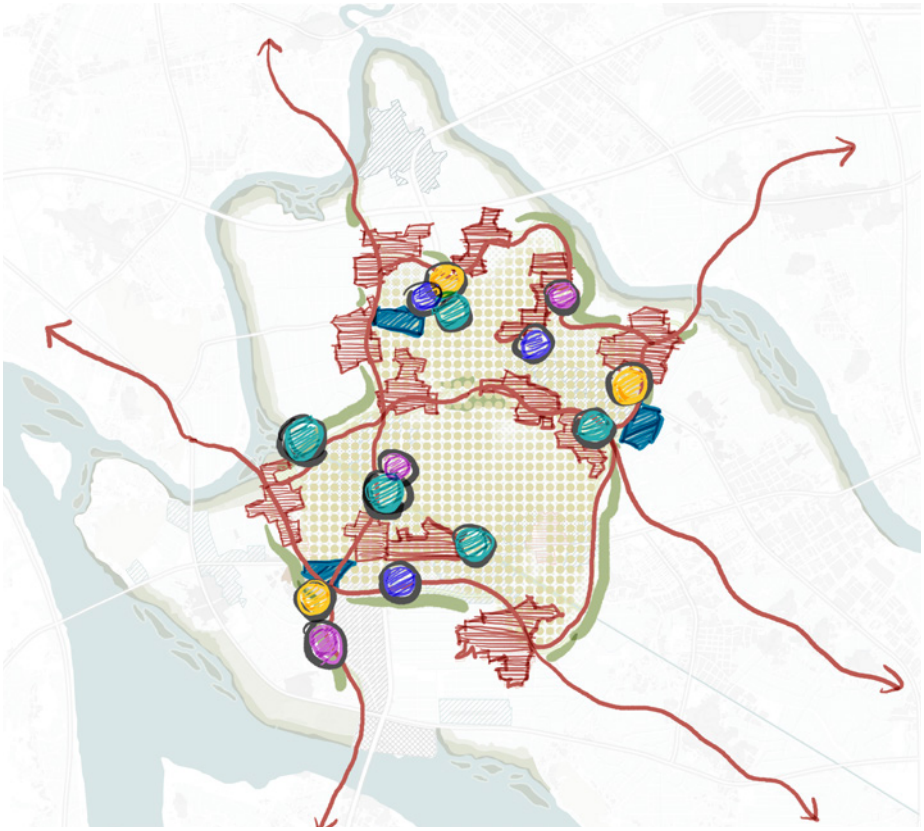


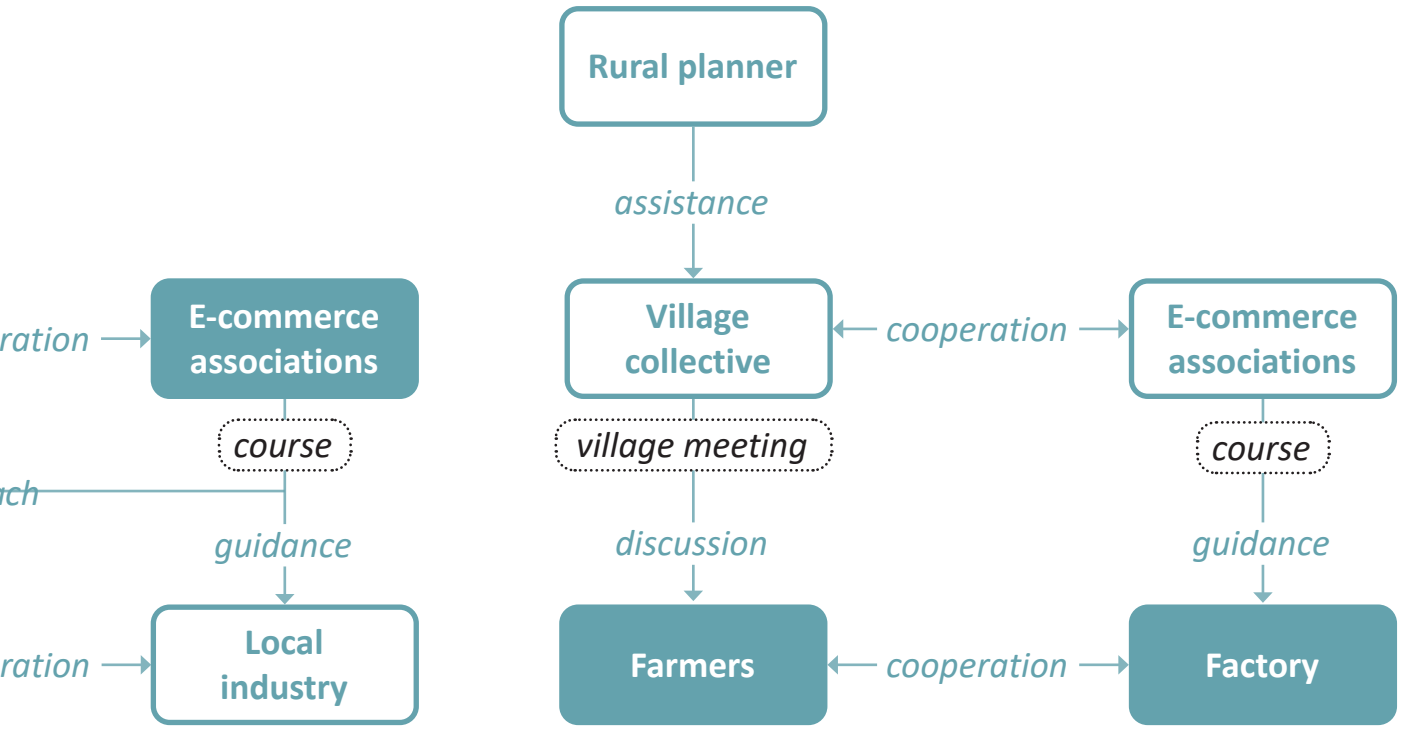
Figure 6.20 Phasing strucuture and stakeholder relationships

EVELOPING



PHASE III: INFLUENCING





6.4 DEVELOPING SYSTEMS

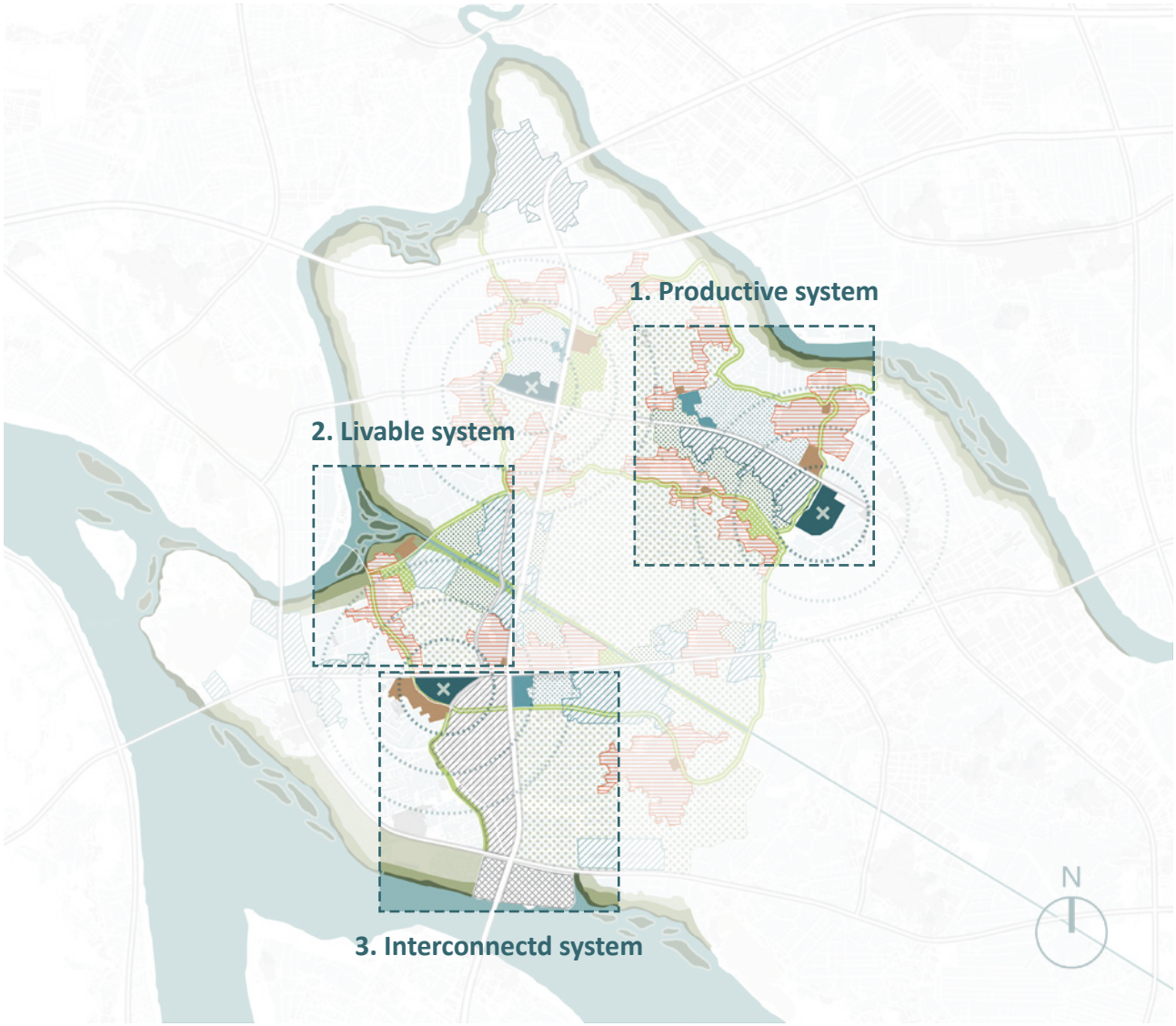


Figure 6.21 Detailed design to showcase the developing systems

The development of Smart Villages focuses on three areas, including agriculture-based agglomeration development, improving the spatial quality of the living environment, and creating a well-connected network. Regarding the system of rural development (figure 6.18), the development of the physical space is the basis for the digital development, while ICT technology can stimulate the development of the rural space.

In order to showcase the impact that the Smart Villages system brings to the physical space and the digital network, three specific areas were selected to demonstrate the detailed design of the project (figure 6.17). Each of these areas has distinct development priorities and highlights the changes brought about by the three systems.

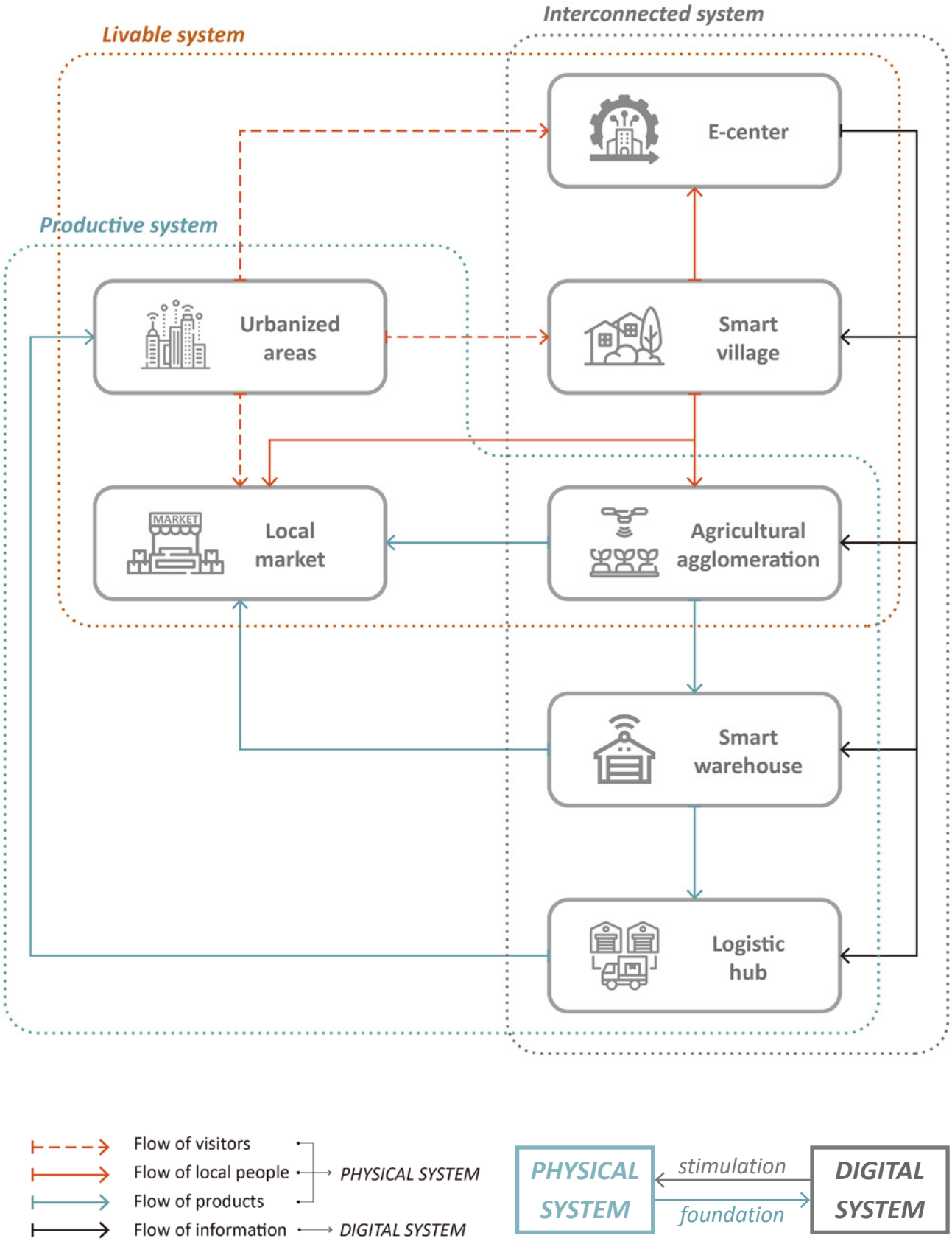


Figure 6.22 Developing system of smart village

6.4.1 Digitalisation supports smart village development

Digitalisation has played a key role in supporting the development of Smart Villages by providing a digital platform to facilitate the sharing of various types of information. The platform acts as a centralised virtual hub where villagers can access basic information about their own community, including infrastructure development, agricultural practices and other relevant data. It also enables them to engage in agro-industrial collaboration by connecting with potential partners and exploring business opportunities. Due to the high level of information transparency, villagers, businesses, village collectives, and governments can communicate on this platform, which promotes self-governance in Smart Villages.

For the Xingtan area, the digital platform helps independent farmers to sell their agricultural products online. Villagers can showcase their agricultural products on the platform and reach a broader customer base. Not only does this provide them with a more efficient and convenient way to sell, it also enables direct interaction with customers, fosters a sense of community and promotes transparency in the supply chain. Factories can use the platform to post the necessary agricultural resources, promoting collaboration between industry and agriculture.

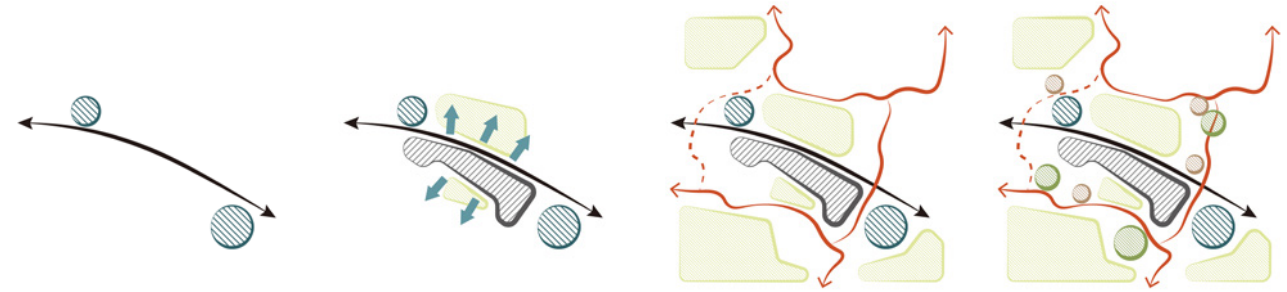
One of the essential features of the digital platform is the E-center, which offers online courses and digital resources to improve the digital literacy of villagers. These courses cover a wide range of topics, including agricultural technology, sustainable agricultural methods and business management skills. By increasing digital literacy, the platform enables villagers to effectively use digital tools and make informed decisions about their agricultural activities.

Figure 6.23 Digital platform for information sharing in

n smart village

6.4.2 Productive system

Developing stages



Implementation of e-center and the living lab

Upgrading of local industry to work with farmland

Construction of rural track to enhance cooperation

Emergence of rural activity related to agro-industry

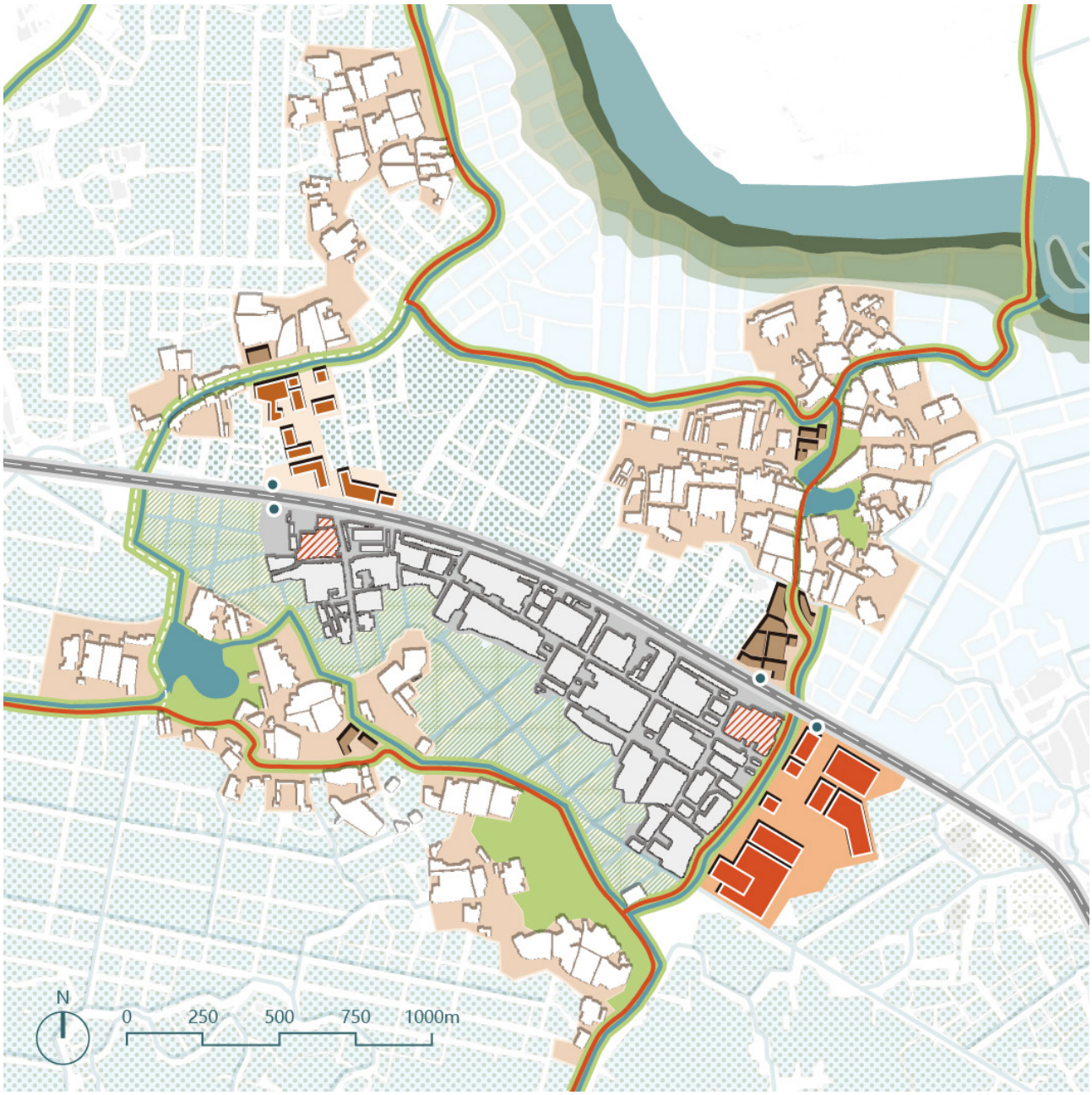
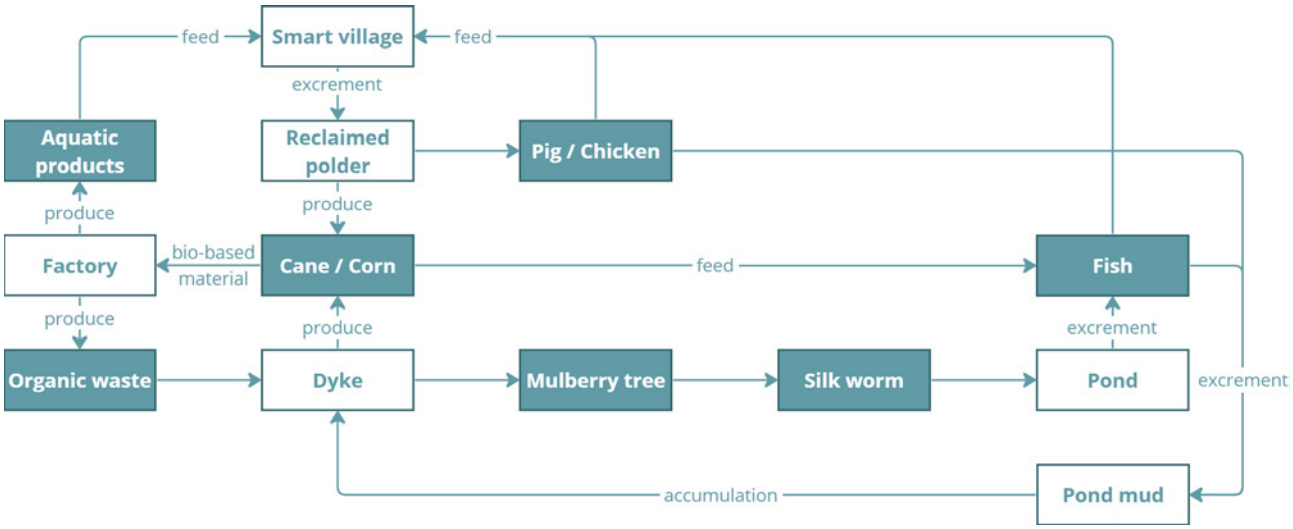


Figure 6.24 Detailed plan of the showcase of productive system

Circulation system of agro-industrial cooperation



The integration and advancement of productivity is the primary concern of the development of the rural economy. By introducing new technologies and innovative practices, the goal is to create an agro-based agglomeration in which industry, agriculture, and village are interrelated.

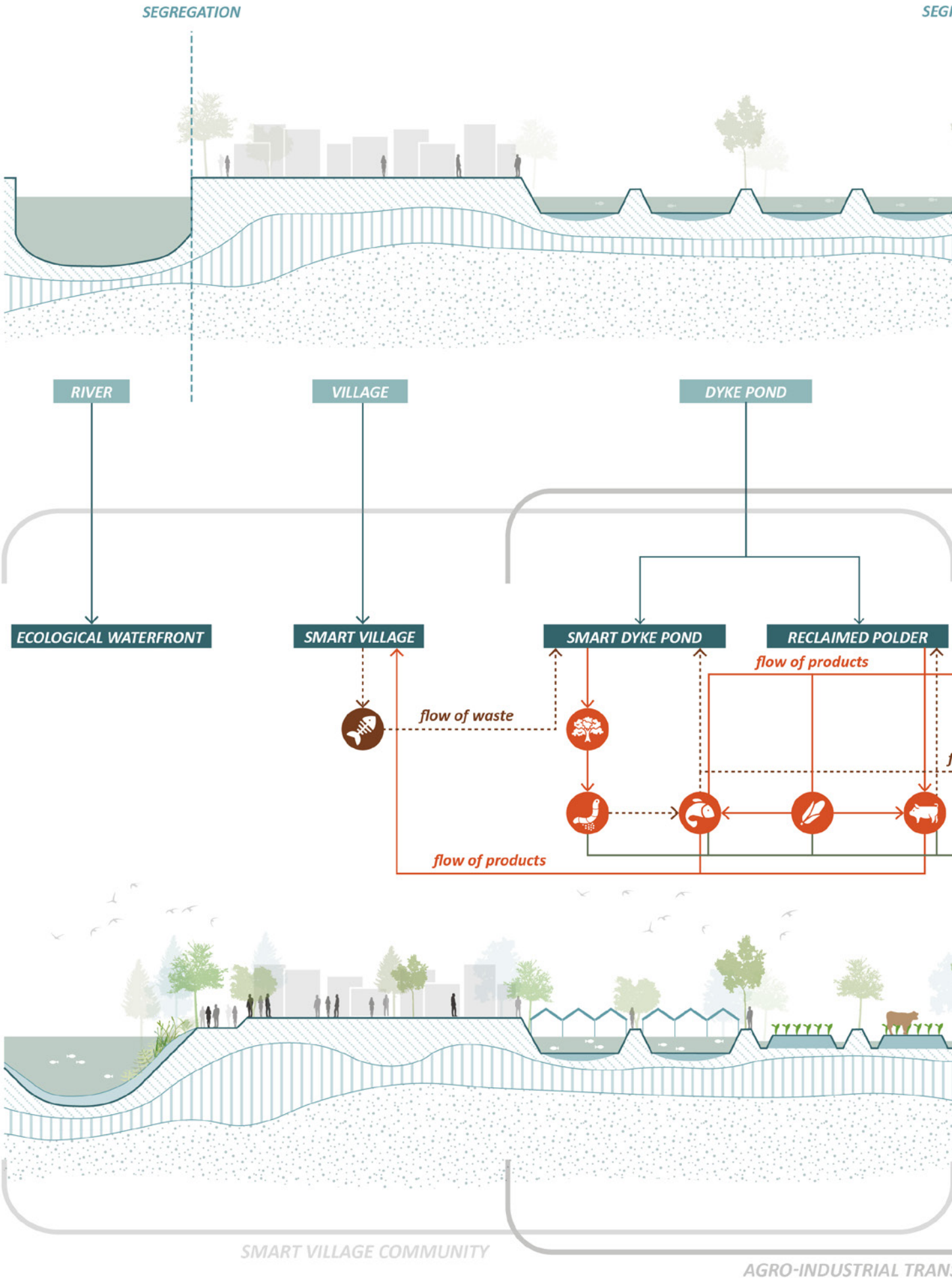
The circulation system of material flows generated in the space is the potential to increase rural productivity and provide more job opportunities. Developing productive systems still relies on well-constructed interconnected systems and aims to provide a more sustainable rural environment.

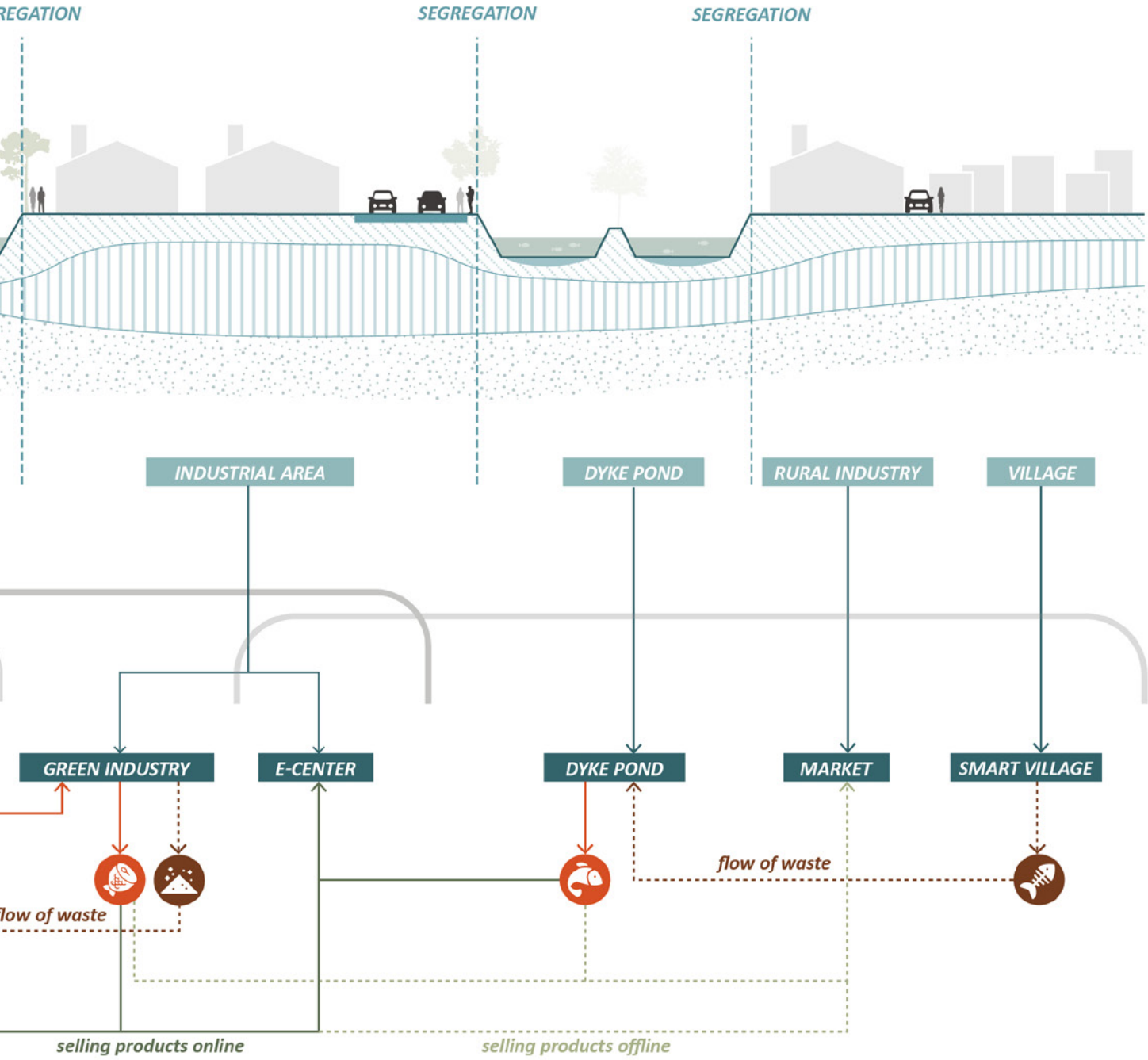
Stakeholder interests on specific spatial elements

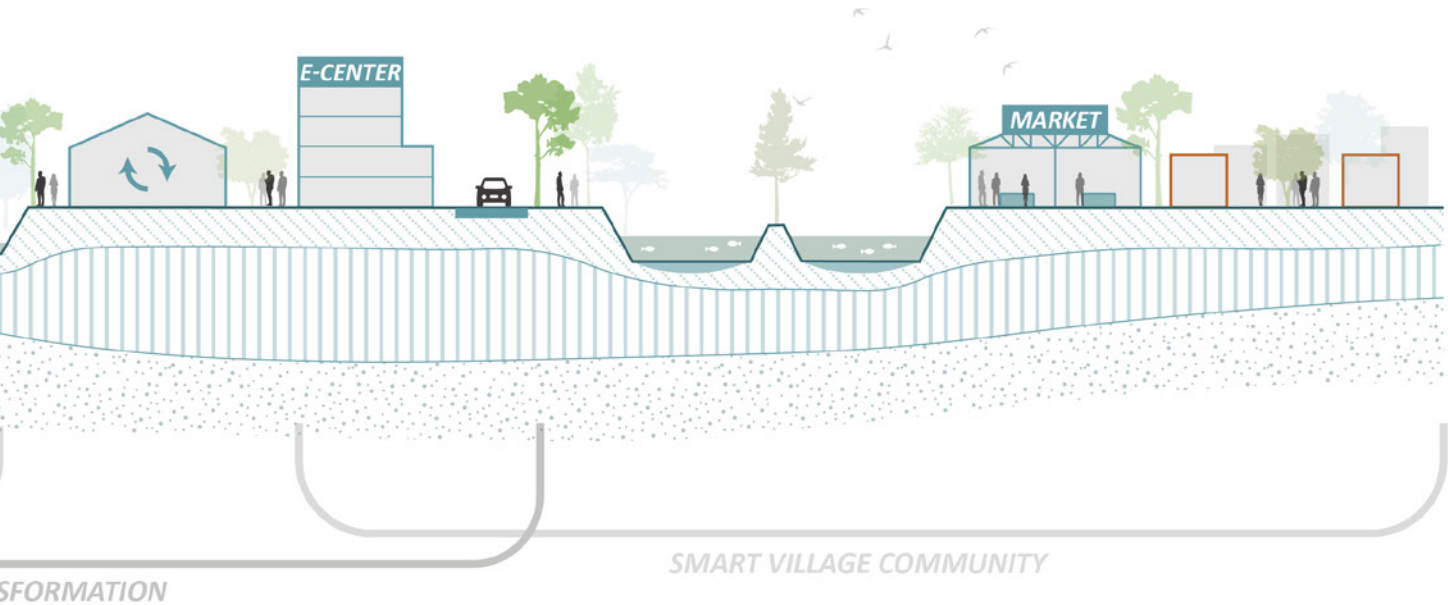
Spatial elements \ Stakeholder	PUBLIC SECTOR		PRIVATE SECTOR					CIVIC SOCIETY				
	Municipal government	Planning institute	ICT provider	Logistic comopany	E-commerce business	Local industry	New-in industry	Village collective	Villagers	Farmers	Migrant worker	Expert
Bus station	●	●	○					●	●	●	●	●
Road	●	●	○	○								
Rural track		○			○	○	○	●	●	●	○	
Waterway									●	●		
Dyke system									○	●		○
Lake	○							○	●	●		
Agricultural park								○	●	●		
Traditional pond									○	●		○
Smart dyke pond	●	●	●			○	○			●		○
Experimental pond	●	●				○	○			○		●
Reclaimed polder	●	●				●	●			●		○
E-center			●	●		●	●	●	●	●	●	●
Market	○	●	●		●	○	○	●	○	●		
The living lab	○	●	●					○		○		●
Courier station	○	●		●		●	●	○		○		
Green manufacturing	○					●	●	○		○	●	●
Smart village		●		○		○	○	●	●		○	●

● highly interested ○ interested

Figure 6.25 Spatial transformation and cooperation of the system







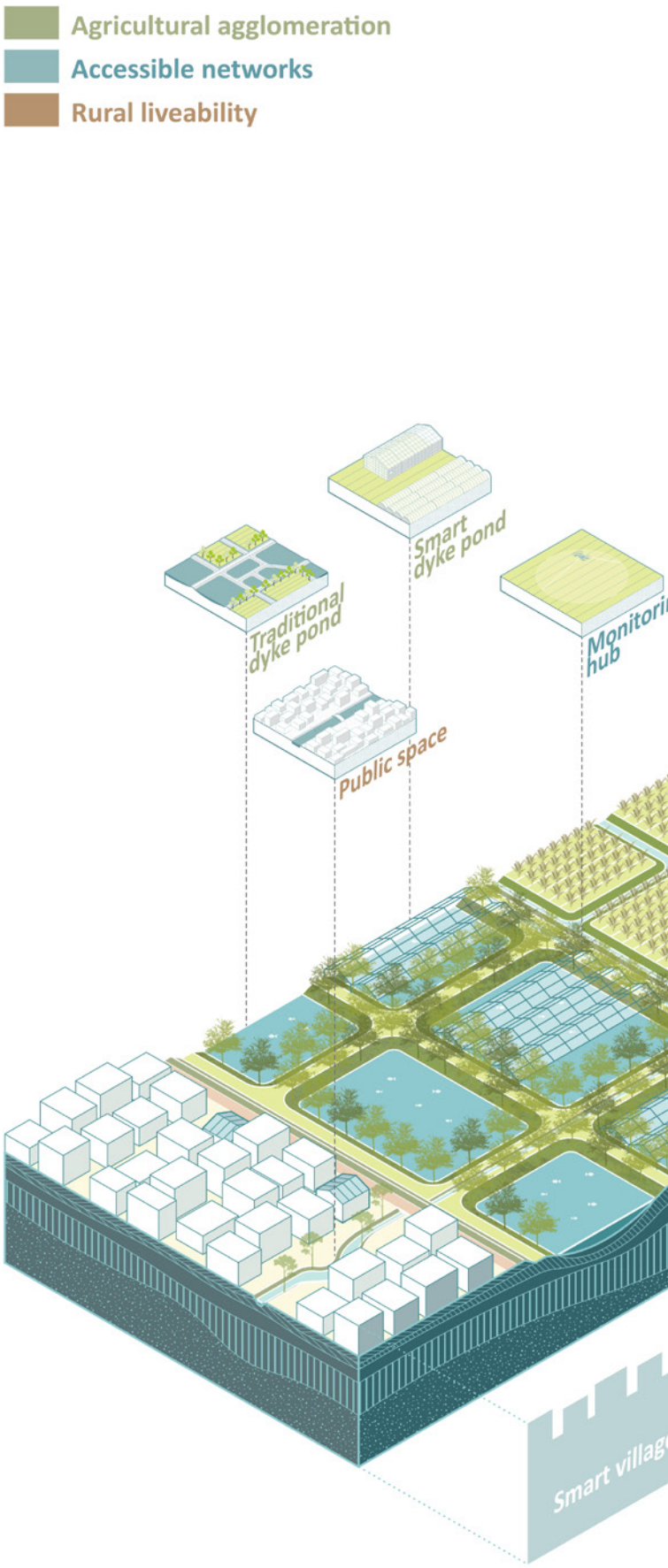
SMART VILLAGE COMMUNITY

SFORMATION

From principles to local stratetegies

The project is strategically designed by applying the concept of the principle level to the rural space. One of the most basic ideas is to develop and upgrade the agricultural substrate and industry in the countryside to enable them to cooperate. The agricultural areas are classified as reclaimed polders, traditional dyke ponds, and smart dyke ponds. The agricultural land close to industrial areas can be transformed into polders. Reclaimed polders can be used to grow crops and corn and to raise livestock, forming self-sufficient farms and pastures. The biomass can be supplied directly to nearby factories as bio-based material to stimulate the transformation of the factories. To protect the rural landscape and improve the quality of life in the countryside, the traditional dyke ponds will be protected. Technology can be used to create smart agricultural areas of the dyke ponds to improve the productivity and quality. Further, applying advanced technology enables monitoring farming conditions in real-time and helps farmers with basic tasks.

To ensure the success of a smart village, the implementation of crucial functioning areas is essential, including the e-centre and agricultural market. The e-centre serves as a hub for providing and sharing digital information relevant to rural areas. ICT technologies can support the communication of product information between farming and industrial areas to help agro-industrial cooperation. Additionally, the e-centre plays an important role in enhancing digital literacy within rural communities and empowering farmers. The agricultural market can take place in the renewal space of old factories close to villages. By revitalising these abandoned spaces, the rural market supports the growth of local businesses and promotes the consumption of locally produced goods.



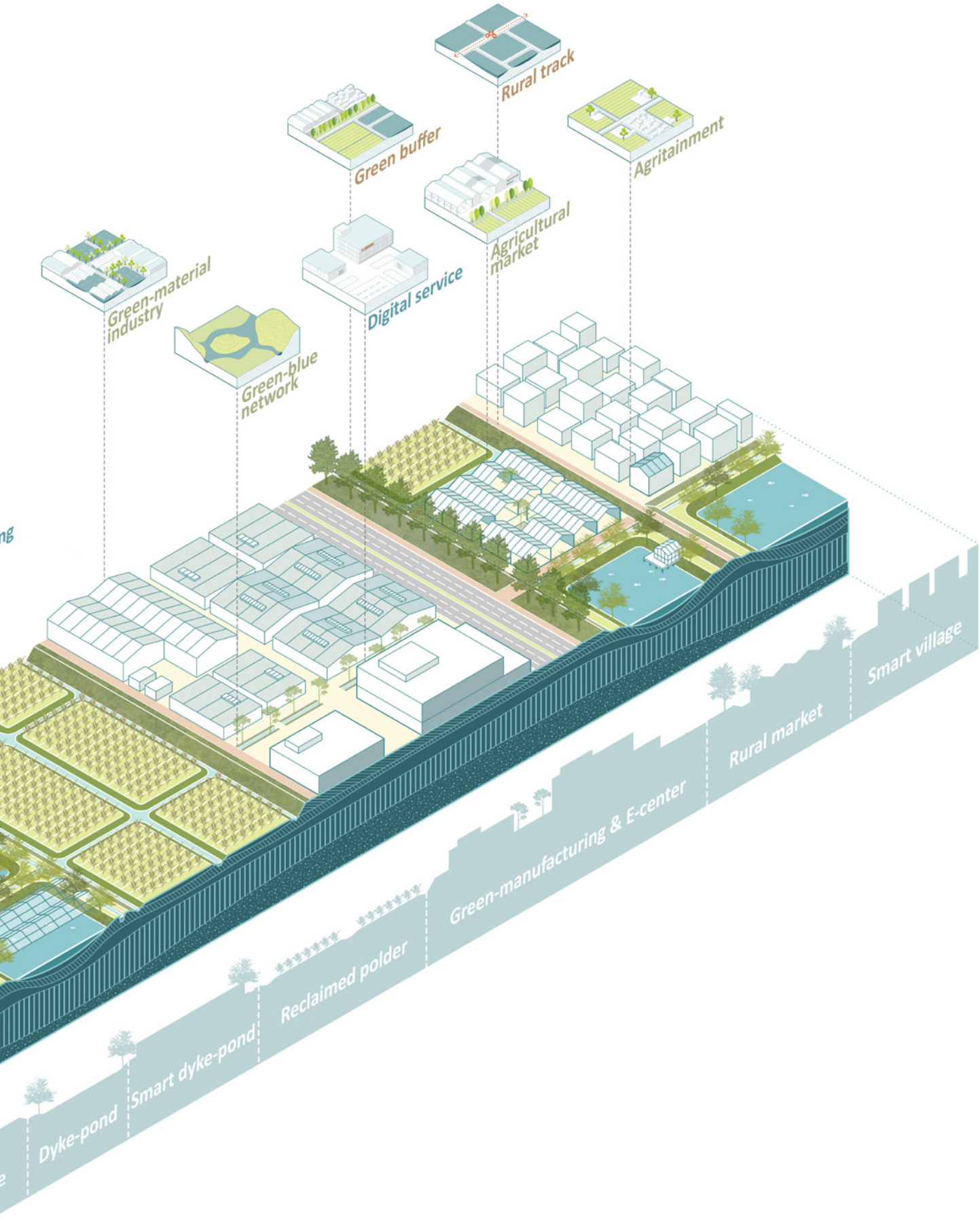


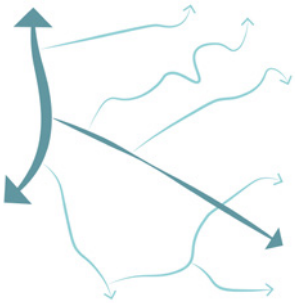
Figure 6.26 Design strategies of agricultural agglomeration


Crucian
(weight - 0.6 kg)
(length - 32 cm)

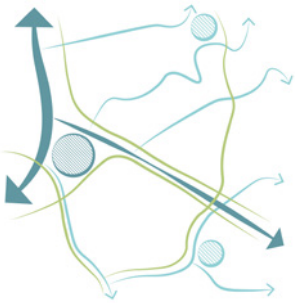

Large black-white pig
(weight - 110 kg)
(height - 50 cm)
(food - corn/cane)
Reed chicken
(weight - 1.4 kg)
(height - 25 cm)
(food - grass/corn)
Grass carp
(weight - 0.8 kg)
(length - 38 cm)

6.4.3 Livable system

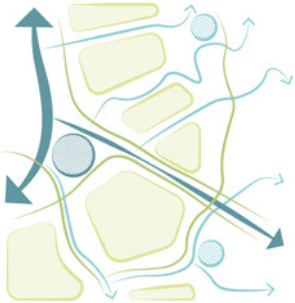
Developing stages



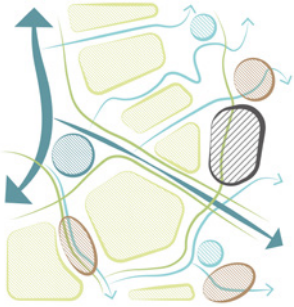
Connection between the river and dyke system



Development of greenways and landscape views



Classification and management of farmland



Improvement of the quality of rural spaces

Figure 6.27 Detailed plan of the showcase of livable system

Green-blue system as the backbone of rural developmet

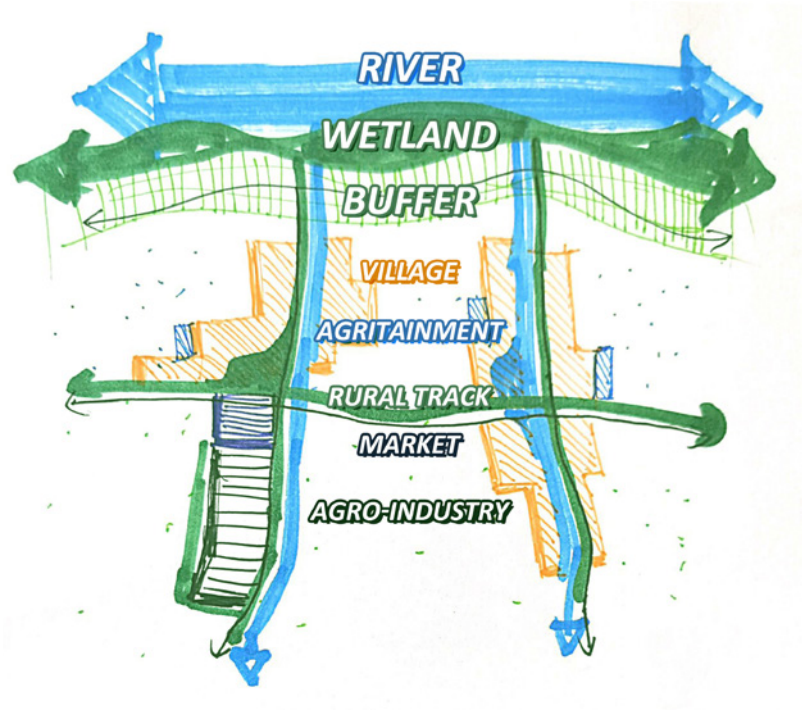


Figure 6.28 Ideal structure

In order to protect the biodiversity of the countryside, the construction of the blue-green system is crucial. The structural integrity of rivers and green spaces provides migratory networks for organisms and protects their natural habitats. On the other hand, a complete water network conserves the agricultural environment and ensures the sustainable development of dyke ponds.

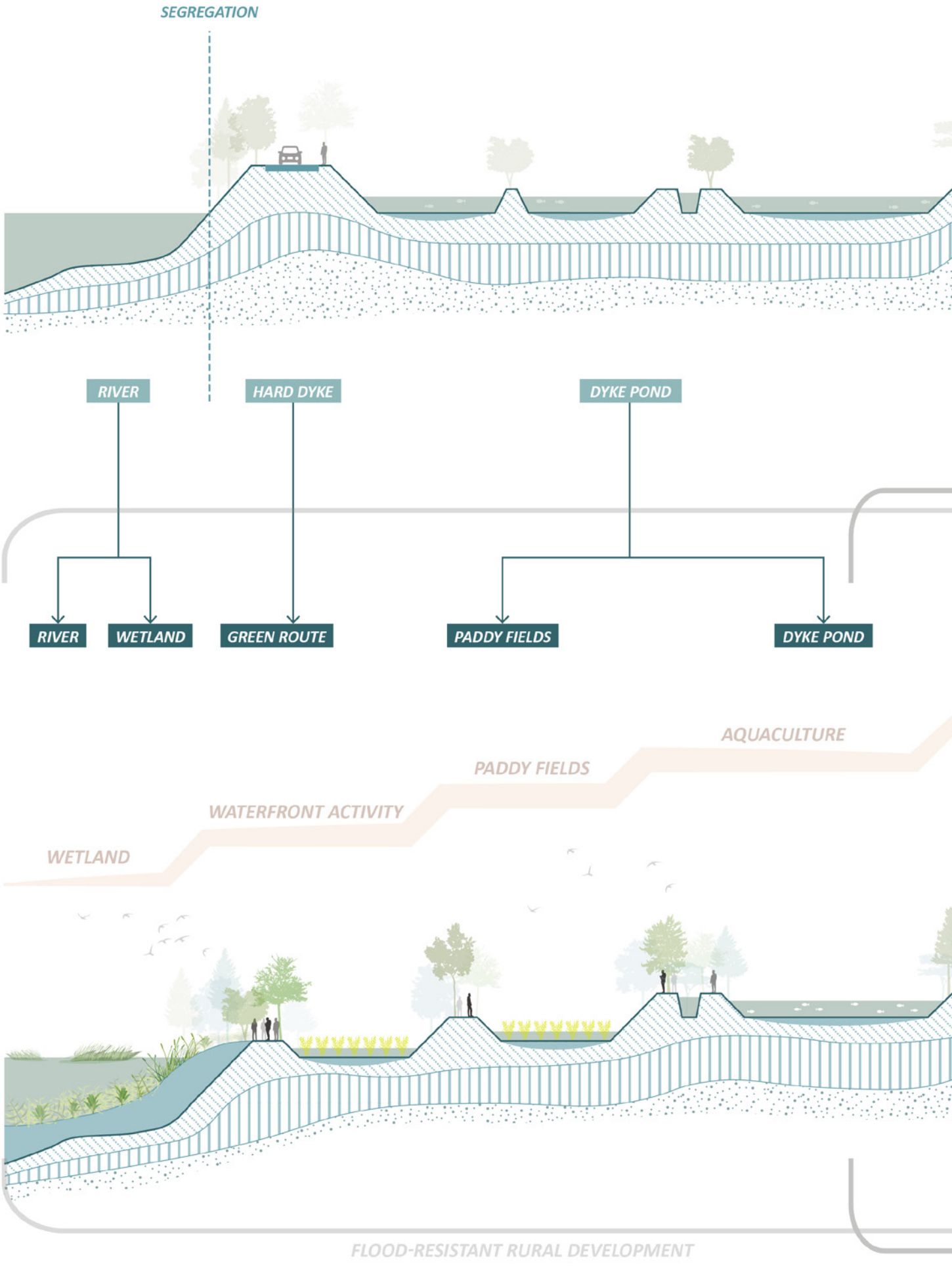
Since the birth of a village always depends on water resources, it should still be the skeleton of rural development. The rural slow traffic system can be built according to the blue-green system to communicate the living and natural environments.

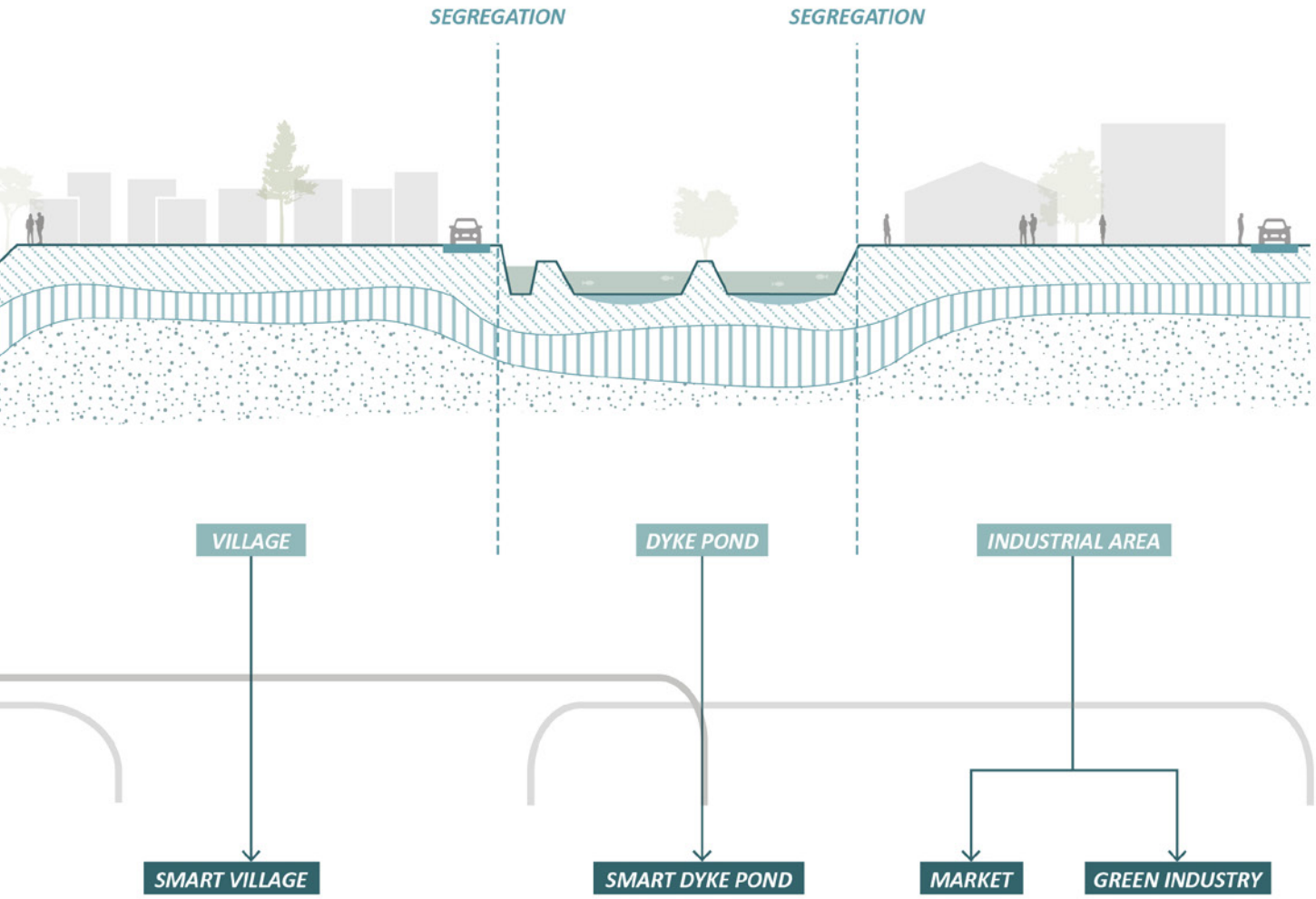
Stakeholder interests on specific spatial elements

Stakeholder / Spatial elements	PUBLIC SECTOR		PRIVATE SECTOR					CIVIC SOCIETY				
	Municipal government	Planning institute	Logistic comopany	E-commerce business	TVE	Local industry	New-in industry	Village collective	Villagers	Farmers	Migrant worker	Tourists
Bus station	●	●	○					●	●	●	●	●
Road	●	●	○	○				●				
Rural track		○			○	○	○	●	●	●	○	●
River	○	●						●	●	●		
Dyke system		○							○	●		○
Agricultural park		●					○	○	●	○		●
Wetland	●	●					○	○	○	○		●
Flood-resistant area	○	●					○	●	●	●		
Traditional pond	○	●			○					●		●
Smart dyke pond	○	●			○	○	○	●		●		○
Agritainment pond	○	●			○					●		●
Reclaimed polder	○	●		●	●	●	●			●	●	○
Market		○		●	●	○	○	●	●	○	○	●
Agritainment house				●				●	●	○		●
Aquatic industry	●	○		●	●	●	●	●		○	●	
Food industry	●	○		●	●	●	●	●		○	●	
Smart village	○	●		○	●	○	○	●	●	○	○	○

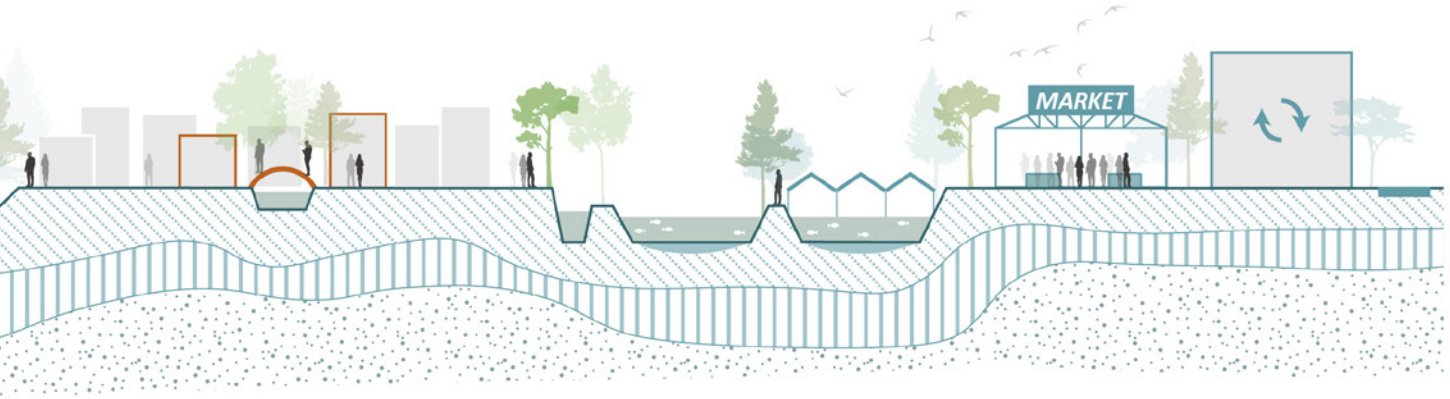
● highly interested ○ interested

Figure 6.29 Spatial transformation and cooperation of the system





AGRITAINMENT



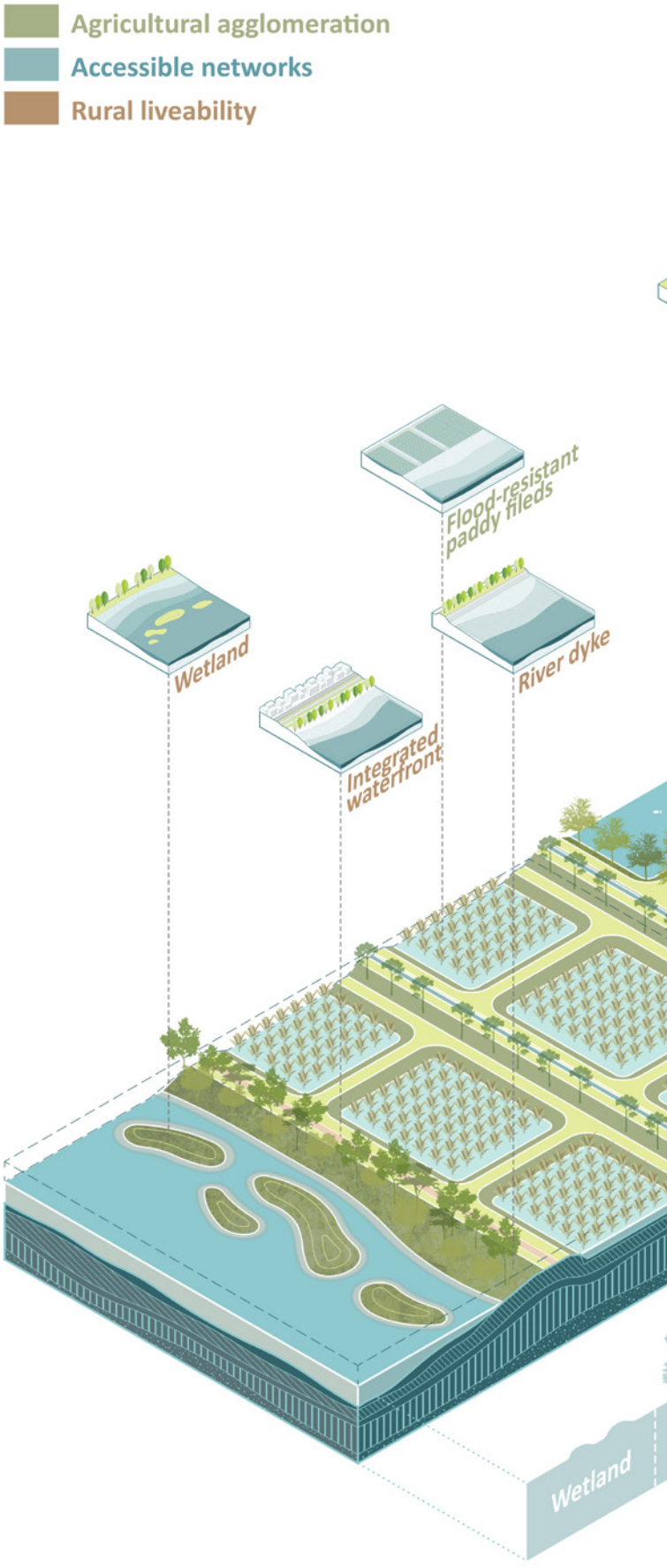
AQUA-INDUSTRY UPGRADING

THE WATERFRONT COMMUNITY

From principles to local stratetegies

Ecological protection is an essential strategy for enhancing the livability of the countryside and promoting environmental sustainability. In order to prevent the countryside from being threatened by flooding, an elevated spatial structure should be created from the river to the interior. The key components of this strategy include the construction of river networks. Wetlands are an important strategy for protecting ecosystems and can also help address pollution problems in rivers. The buffer zone becomes a protective area so that transient flooding does not directly affect the agricultural and rural areas. Flood-resistant paddy fields can be created for agricultural development in the buffer zone.

Ecosystem protection can support the development of more relevant daily activities in the countryside, thus improving the quality of life of the local population. These strategies include the followings: a) providing public spaces where community members can gather and promote social connections; b) establishing agricultural markets to facilitate the selling of local agricultural products; and c) agro-industrial initiatives to promote the development of sustainable and innovative agricultural practices that increase productivity and create employment opportunities. Together, these components contribute to the overall livability and well-being of rural communities.



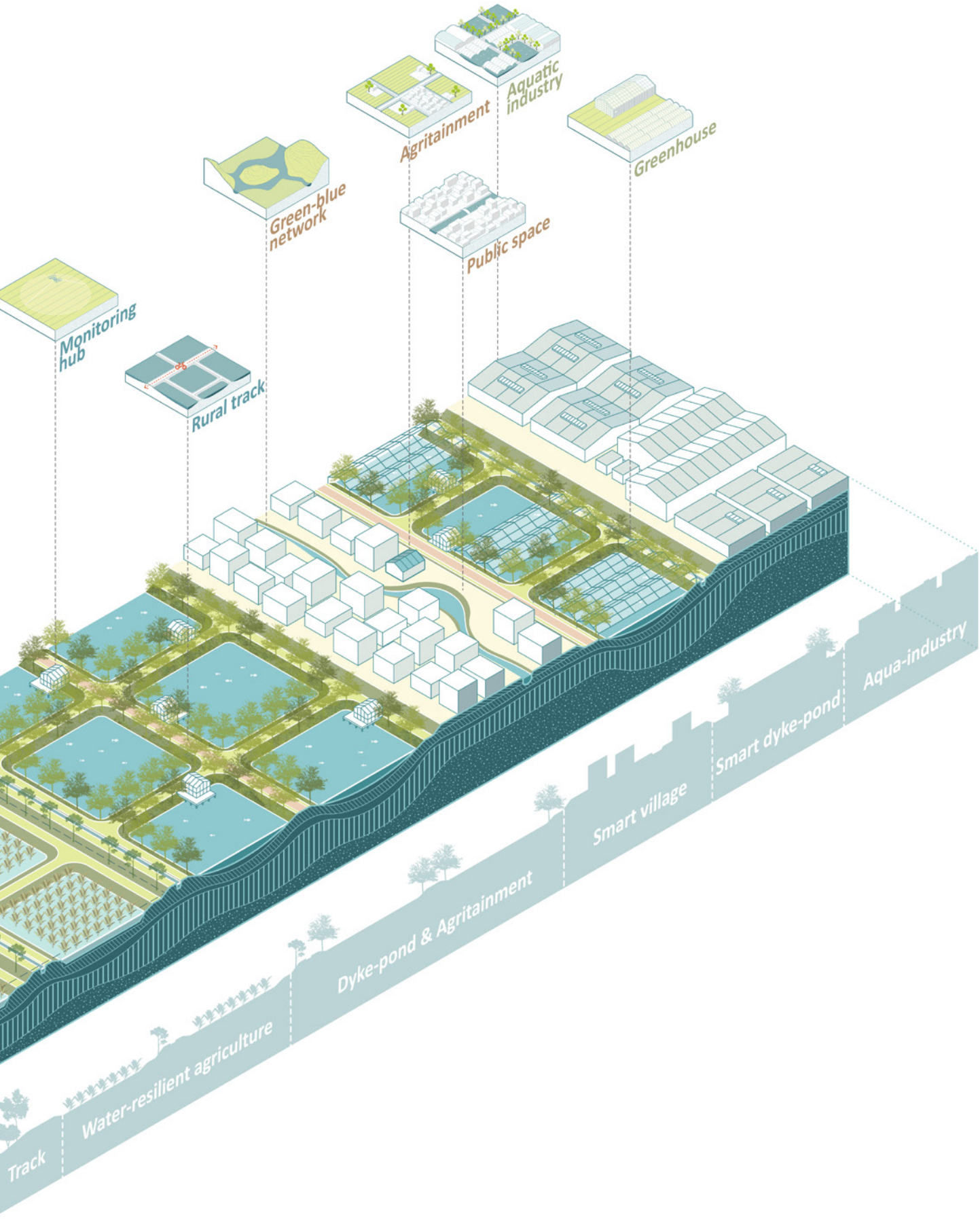


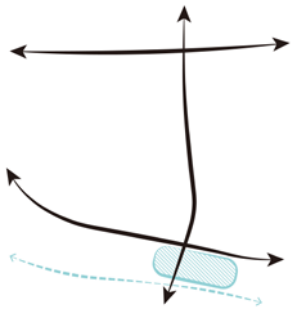
Figure 6.30 Design strategies of rural liveability


Yueqi Zhang
- Painter
- 60 years old
Maohan Zhang
- Villager
- 30 years old
PEICAN
SAFE WATER LEVEL

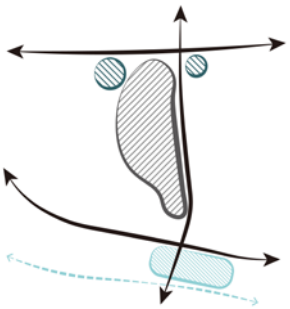

Mohan Qiao
- Agri-expert
- 25 years old
Xiaoge Huang
- Teacher
- 25 years old
Kemeng Zhao
- Farmer
- 24 years old
EGRETTA

6.4.4 Interconnected system

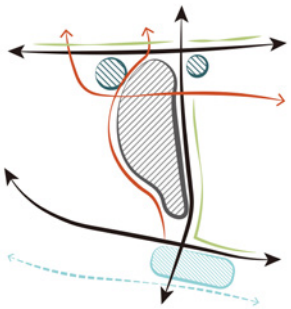
Developing stages



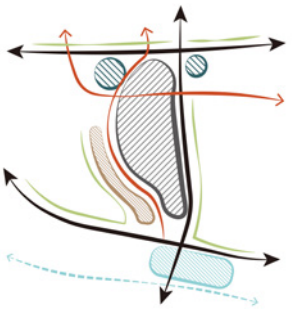
Complementation of road traffic and port facilities



Conversion of old factories into logistics park



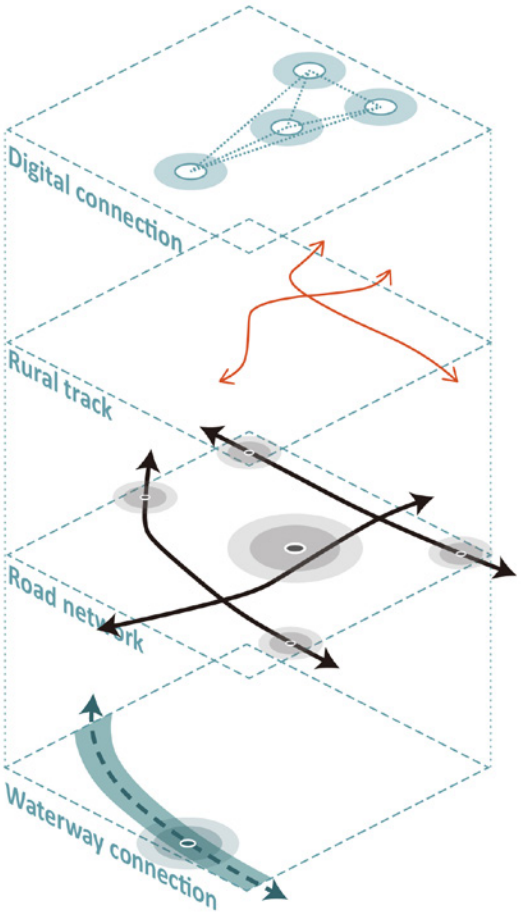
Construction of slow-traffic networks and infrastructure



Development of rural activities and green buffer

Figure 6.31 Detailed plan of the showcase of interconnected system

Integrated networks



Establishing an integrated communication system between different spaces is an important strategy for developing Smart Villages. An integrated communication network includes accessibility in physical space and connectivity in digital space. For productive spaces, a well-developed road network and a logistics and transport system are most crucial. Port nodes responsible for water transport also become an important part of this. For living spaces, independent slow-moving transport systems make communication between villages efficient and easy. For communication in smart rural areas, spaces such as e-centres that help to enable information exchange are vital components. The integration of all layers is the skeleton that supports the development of a network of smart villages.

Stakeholder interests on specific spatial elements

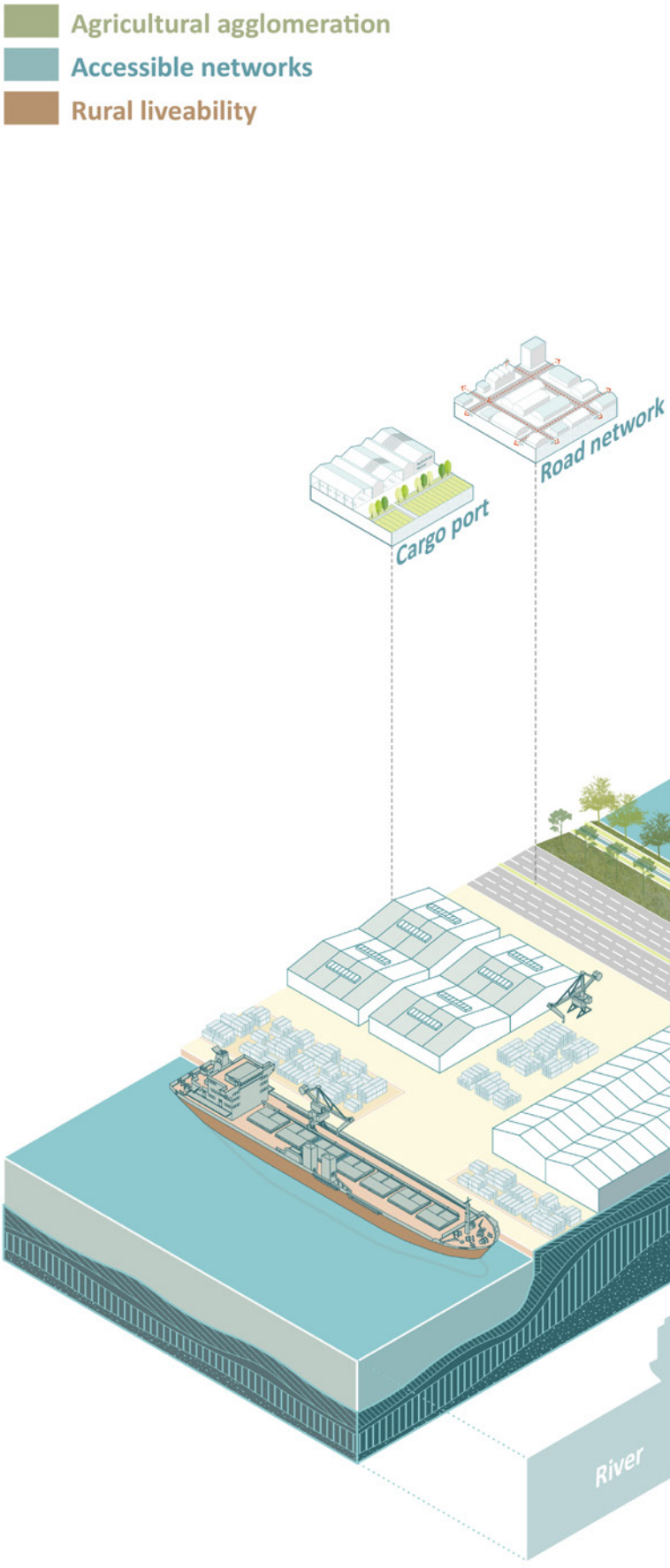
Spatial elements \ Stakeholder	PUBLIC SECTOR		PRIVATE SECTOR					CIVIC SOCIETY				
	Municipal government	Planning institute	ICT provider	Logistic comopany	E-commerce business	Local industry	Education institute	Village collective	Villagers	Farmers	Migrant workers	Tourists
Bus station	●	●	○	○				●	●	●	●	●
Road	●	●	○	●				○	○		○	○
Rural track		○			○	○	○	●	●	●	○	
River	○	●						●	●	●		●
Green buffer zone	○	●						●	●	●		○
Traditional pond		●				○		●	●	●		●
Smart dyke pond		●	●		○	○		○	●	●		○
Experimental pond		●	●		○		●	○	○	●		
E-center	●	●	●		●	○	●	●	●	●	●	○
Market	●	○			○	○	○	●	○	●	○	●
The living lab	●	●	●			○	●	○			○	
Logistic park		●	●	●	●	●	●				●	
Passenger port	○	●	●		○		●	●	●	●	●	●
Cargo port	○	●	●	●	●	●					○	

● highly interested ○ interested

From principles to local stratetegies

The four layers of the interconnected system emphasise accessibility, security, and connectivity, facilitating smooth movement for residents and promoting local interactions. For water transport, the port will be set up as a separate passenger and transport port, meeting travel and logistics needs. Public transport stations will ensure accessibility to the countryside, and the rural track system will carry out the function of slow traffic, communicating with the countryside while maintaining the rural ecological landscape.

The logistic park and e-centre collaborate to enable intelligent management of logistics businesses within the smart village, optimising logistics operations and enhancing efficiency. The living lab and smart dyke pond serve as spaces for on-site experiments and the development of new technologies. Researchers, entrepreneurs, and farmers collaborate to test and validate innovative solutions for various aspects of village life.



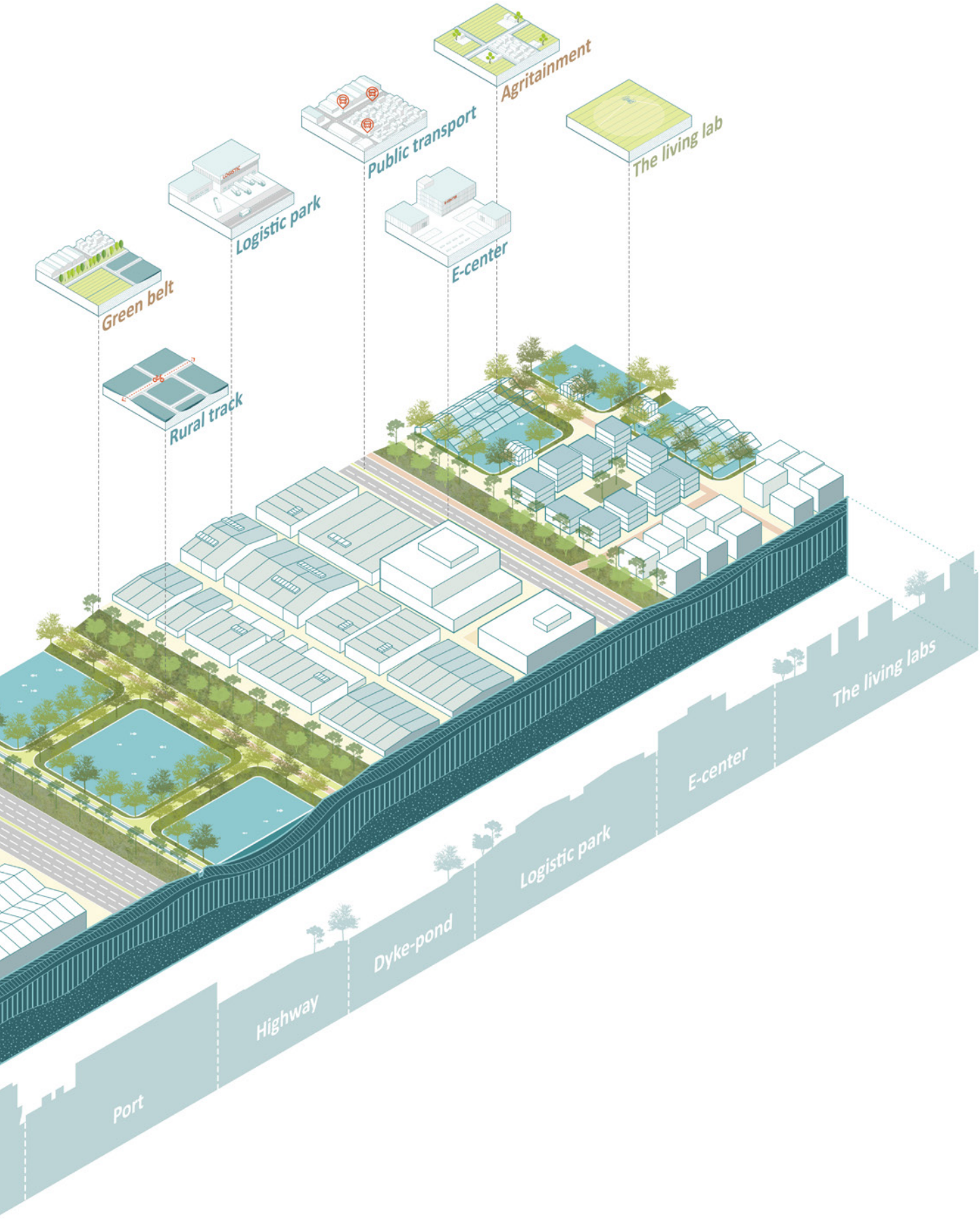
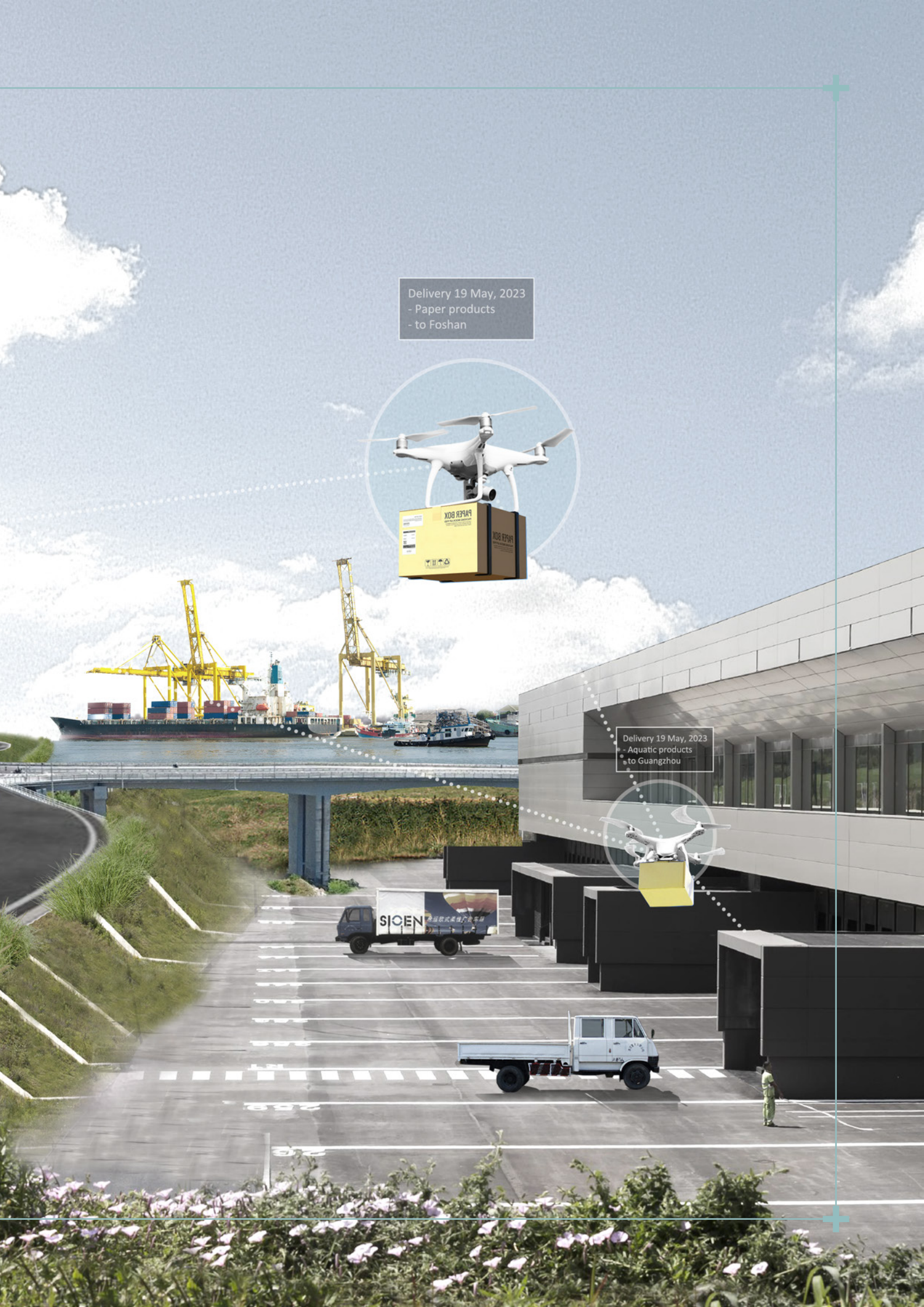


Figure 6.32 Design strategies of accessible networks


Delivery 20 May, 2023
- Daily products
- to Shenzhen


Delivery 19 May, 2023
- Paper products
- to Foshan
PAPER BOX
Delivery 19 May, 2023
- Aquatic products
to Guangzhou
SICEN

6.5 CHIKAN: AN UNDEVELOPED REMOTE RURAL AREAS

6.5.1 Background

The GBA also has many traditional villages in remote rural areas that have not experienced rural industrialisation, one example being the town of Chikan in Jiangmen. To demonstrate the potential of smart development based on traditional agriculture, Chikan was chosen as a showcase to illustrate a smart village strategy based on ecological agriculture. Due to the topography of the hills, the industry is rarely developed here, and cropland is the primary type of agriculture. Villages also take the form of small settlements as patches or develop along the rivers. In remote mountainous areas, infrastructure services such as roads are not yet developed properly, but have good ecological potential.

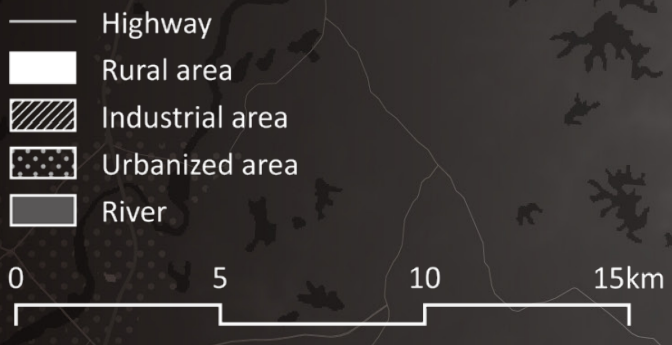
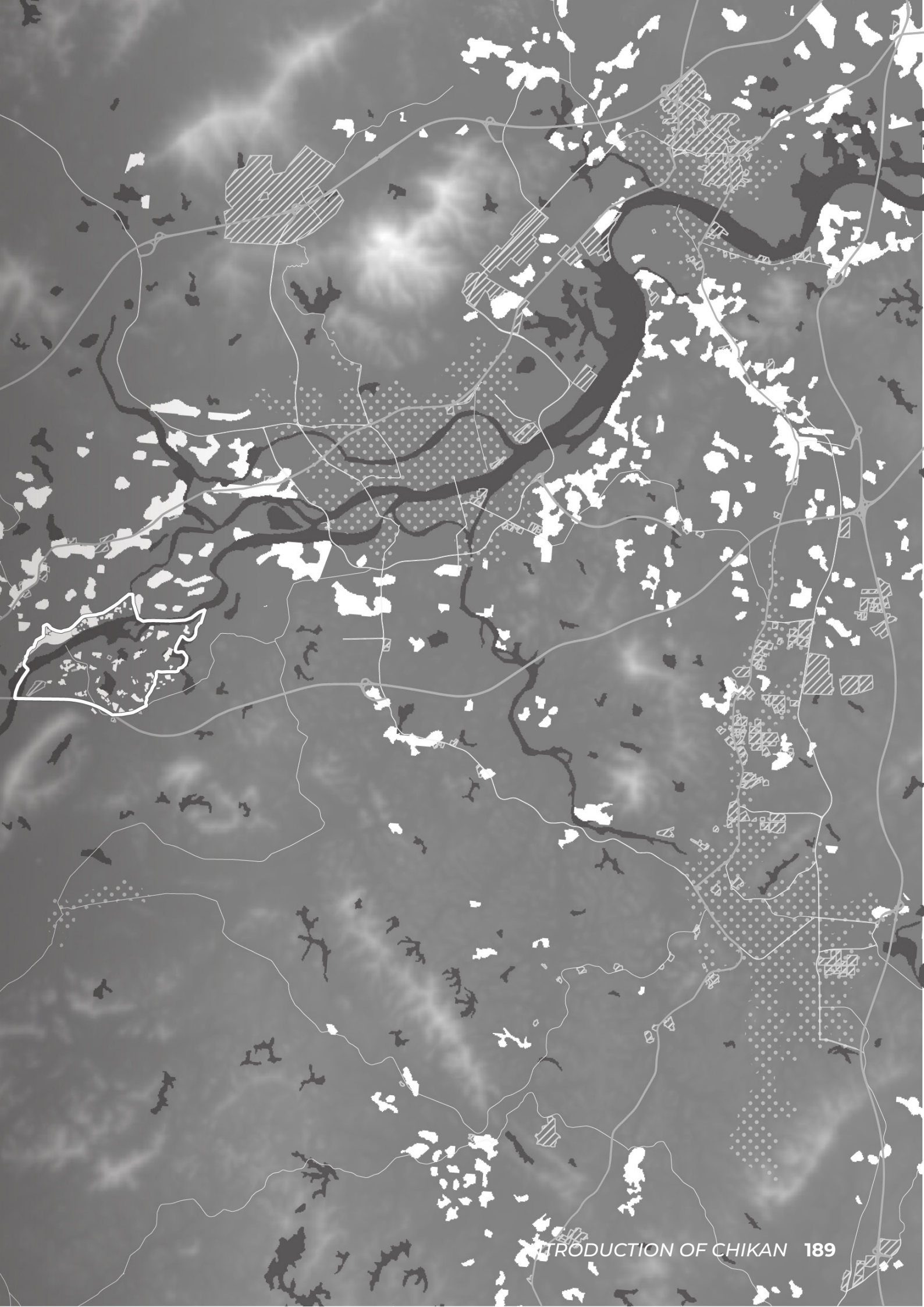


Figure 6.33 Location of Chikan Town in Jiangmen



6.5.2 Rural areas with great ecological potential

Figure 6.34 Current condition of Chikan area

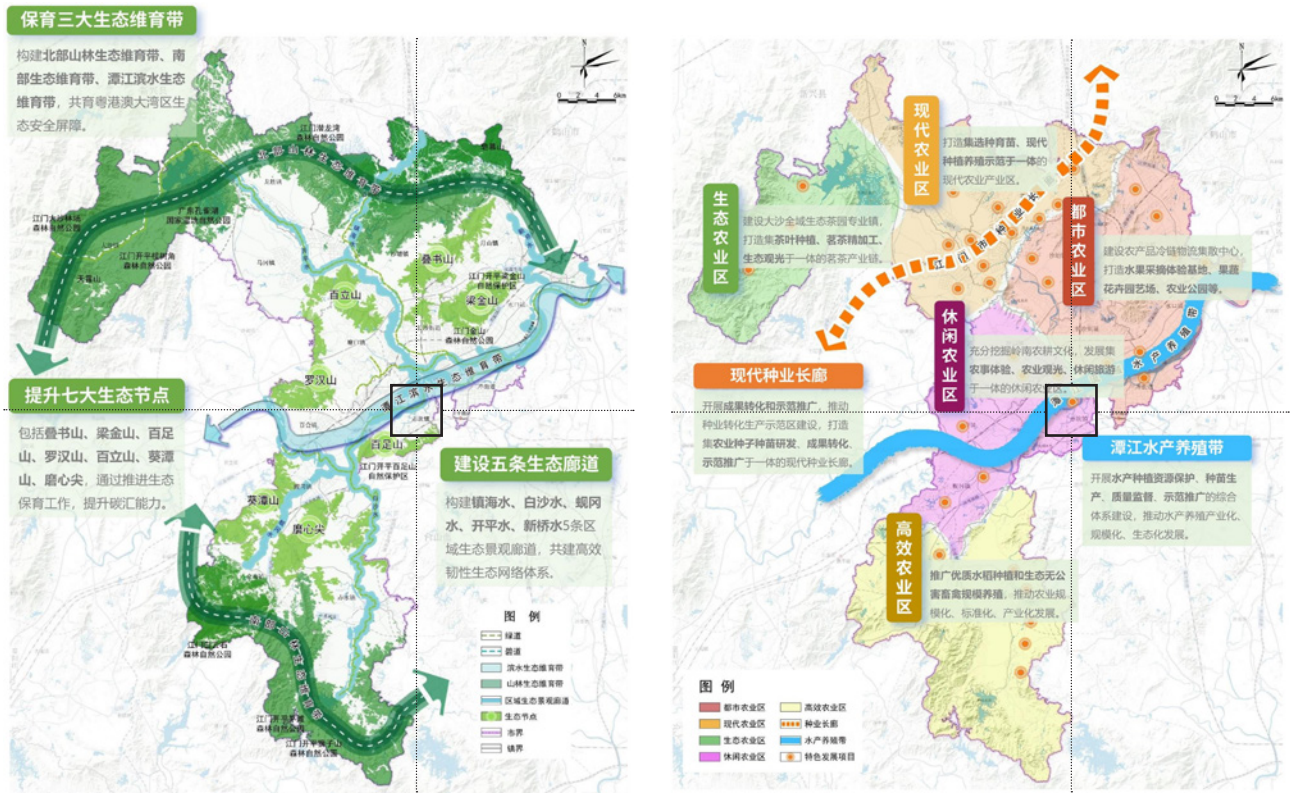


Figure 6.35 Regional blueprint of ecological and agricultural zone in Jiangmen

Chikan is located in the western part of the GBA, with hilly terrain and extensive cropland as the primary agricultural type. Villages are scattered across the agricultural landscape, showcasing the traditional rural developing form. Most traditional villages are laid out with their backs to the mountains, facing the ponds and surrounded by arable land. As a result, the villages in this rural area are small in size and have not yet developed as an agglomeration.

According to the regional planning documents issued by the government, the protection of ecological elements and the delineation of agricultural zones are priorities for development. Chikan is located in the Tanjiang river ecological corridor and has become an important part of the blue-green structure. In addition, the development of aquaculture and leisure agriculture has great potential in Chikan.

However, the current agricultural practice in Chikan is mainly monoculture. This not only limits the development of the agricultural industry but also reduces the biodiversity within the ecosystem. In addition, the spatial relationship between the rural areas and the nearby blue-green network is relatively segregated. Hard barges make the relationship between people and water not strong. There is also little connection between the agricultural areas and the mountains.

Therefore, the project plans to transform Chikan into a ecological rural community. By embracing sustainable agricultural practices and optimising the relationship between rural areas and the natural environment, Chikan can create a harmonious balance between agricultural development, ecological conservation and improved quality of life for its inhabitants.

6.5.3 Rural services

The availability of public services is fundamental to village life. Currently, rural services in Chikan are not yet well developed. Due to the small size and fragmentation of the villages, the rural market is only found in the town. Villagers need to rush through the town market to buy and sell. In terms of rural education, the facilities in rural primary schools are of low quality. There are a few small secondary schools in the town. In addition, the only public transport station is located in the town. When looking at the infrastructure through the electricity grid, it can be seen that only the town is equipped with relatively complete facilities. Due to the low level of development in the area, courier stations have not yet been established. This limits the development of the online economy in rural areas.

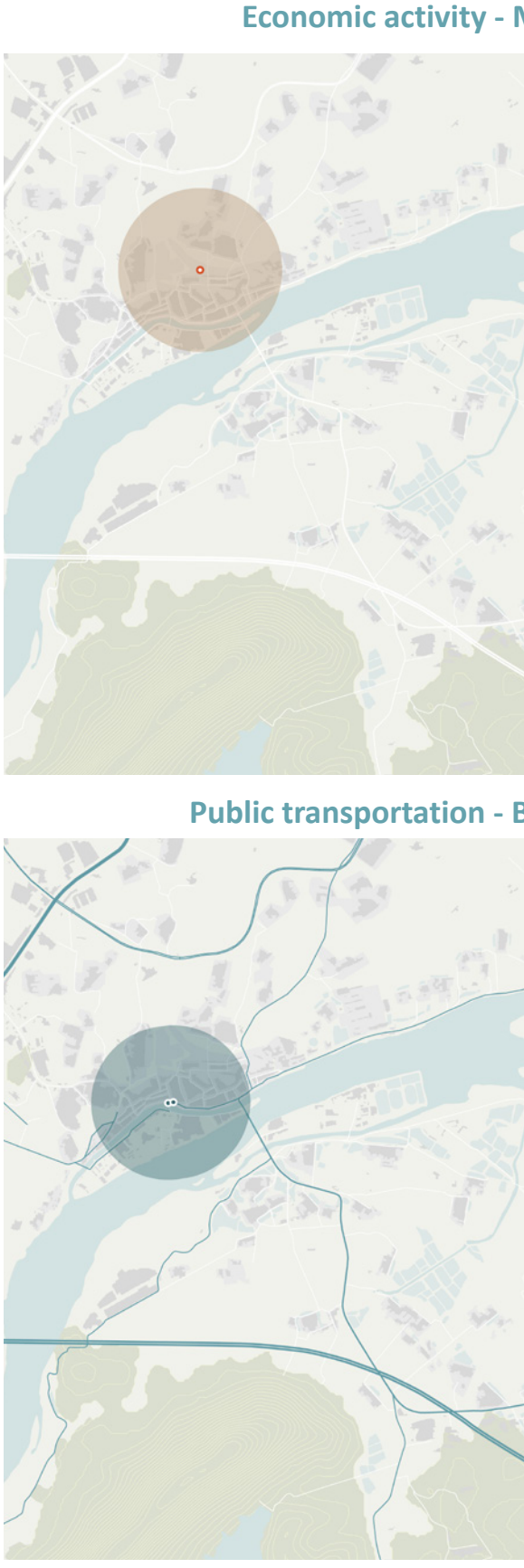
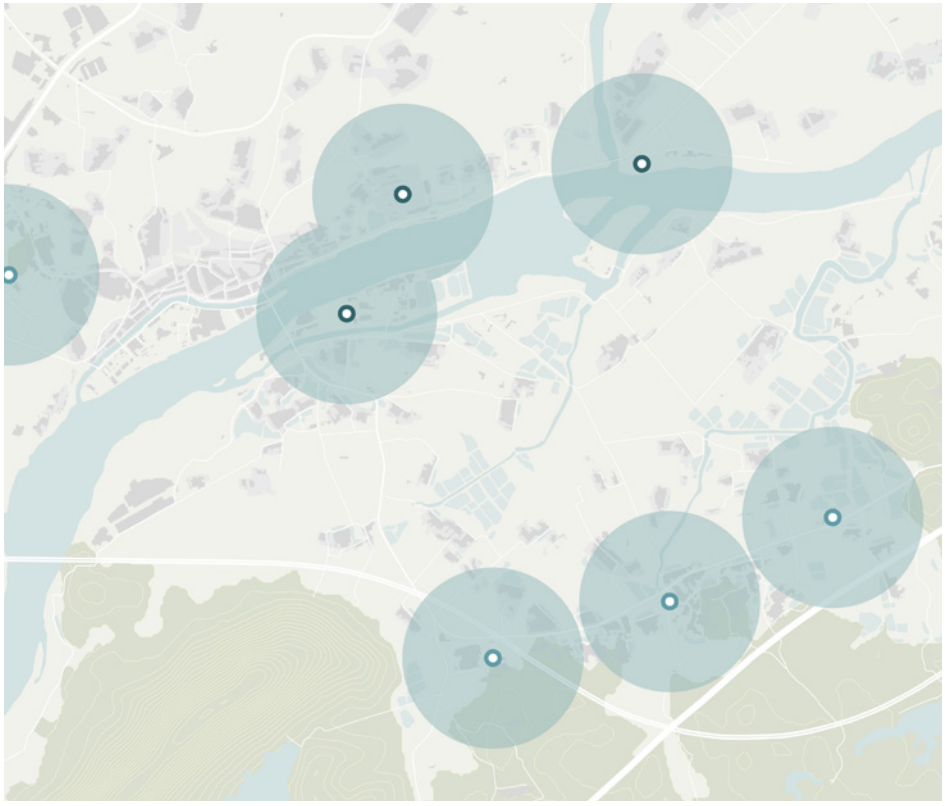


Figure 6.36 Service areas of public infrast

Market

Rural education - School



Bus station

Basic infrastructure - Electricity network

rucuture in Chikan

6.6 DESIGN STRATEGIES FOR ECO-AGRICULTURAL DEVELOP

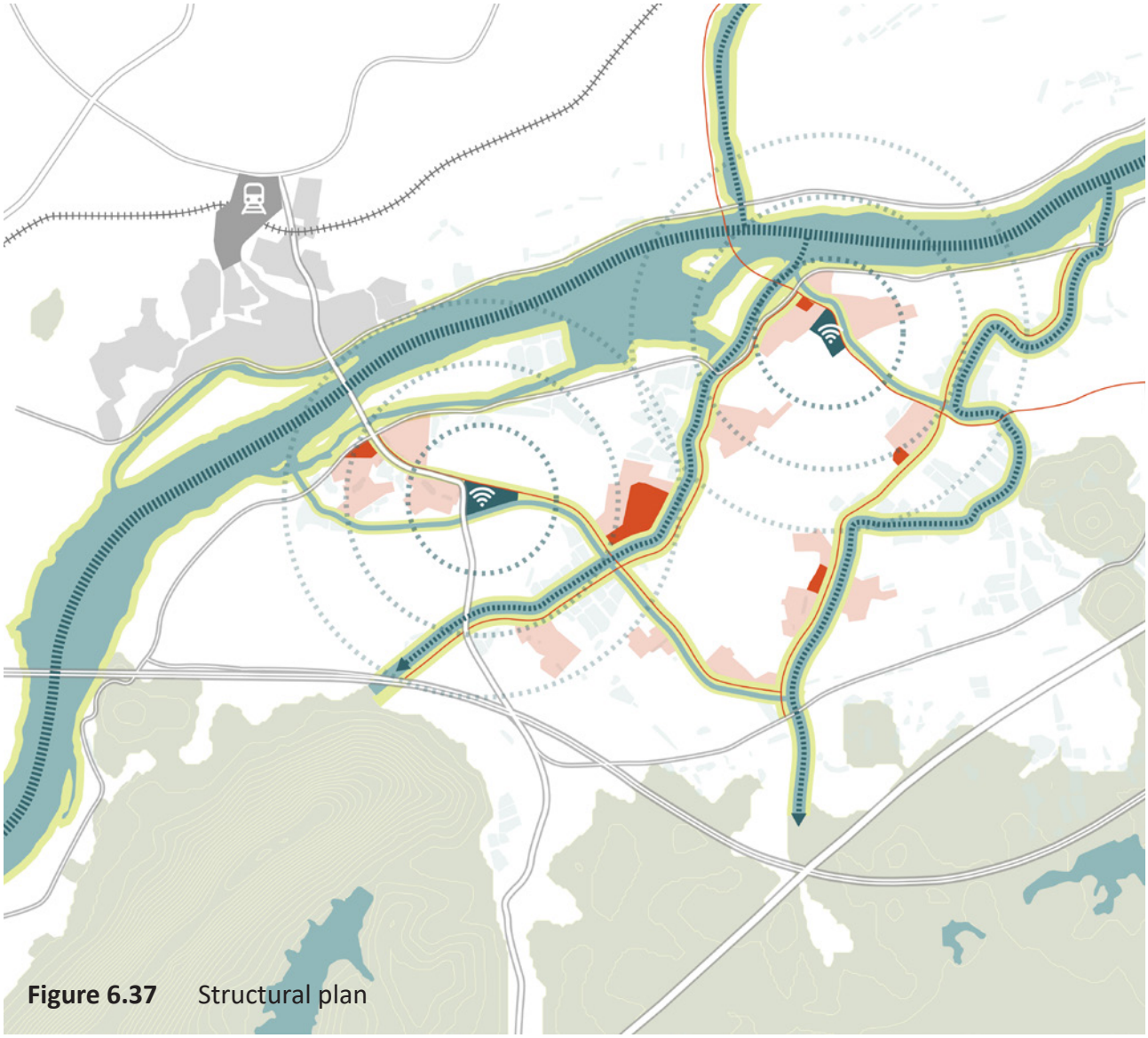


Figure 6.37 Structural plan

In villages in remote rural areas without an industrial basis, the design strategy for ecological agricultural development prioritises sustainable and environmentally friendly agricultural practices. The focus is on helping the agricultural sector to thrive while preserving the natural landscape and promoting ecological balance, which may benefit the rural economy. The strategies will also emphasise preserving traditional agricultural techniques, promoting local and sustainable food systems, and supporting rural livelihoods while ensuring ecological resilience. For habitat aspects, the design will revolve around creating and maintaining green buffers to safeguard rural areas from urban expansion and industrial pollution. Providing adequate transport network facilities and public services for rural areas is also a key strategy to promote smart development in remote areas.

In summary, agro-industrial development focuses on integrating agriculture and industry to enhance productivity and economic growth, while eco-agricultural development emphasises sustainable farming practices, environmental protection, and the promotion of local and traditional agricultural methods.

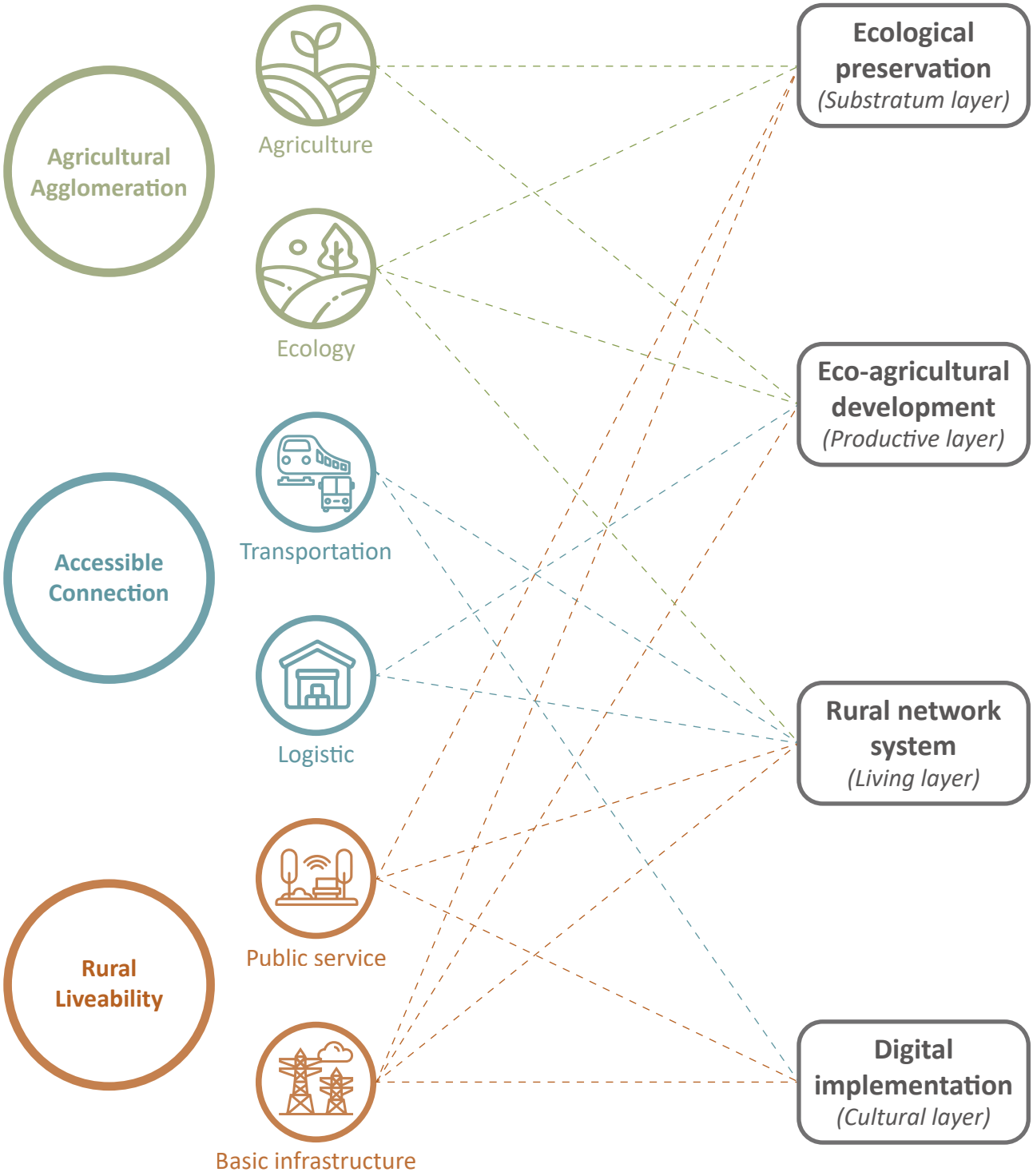


Figure 6.38 Design strategies related to different layers

6.6.1 Eco-agricultural development strategy

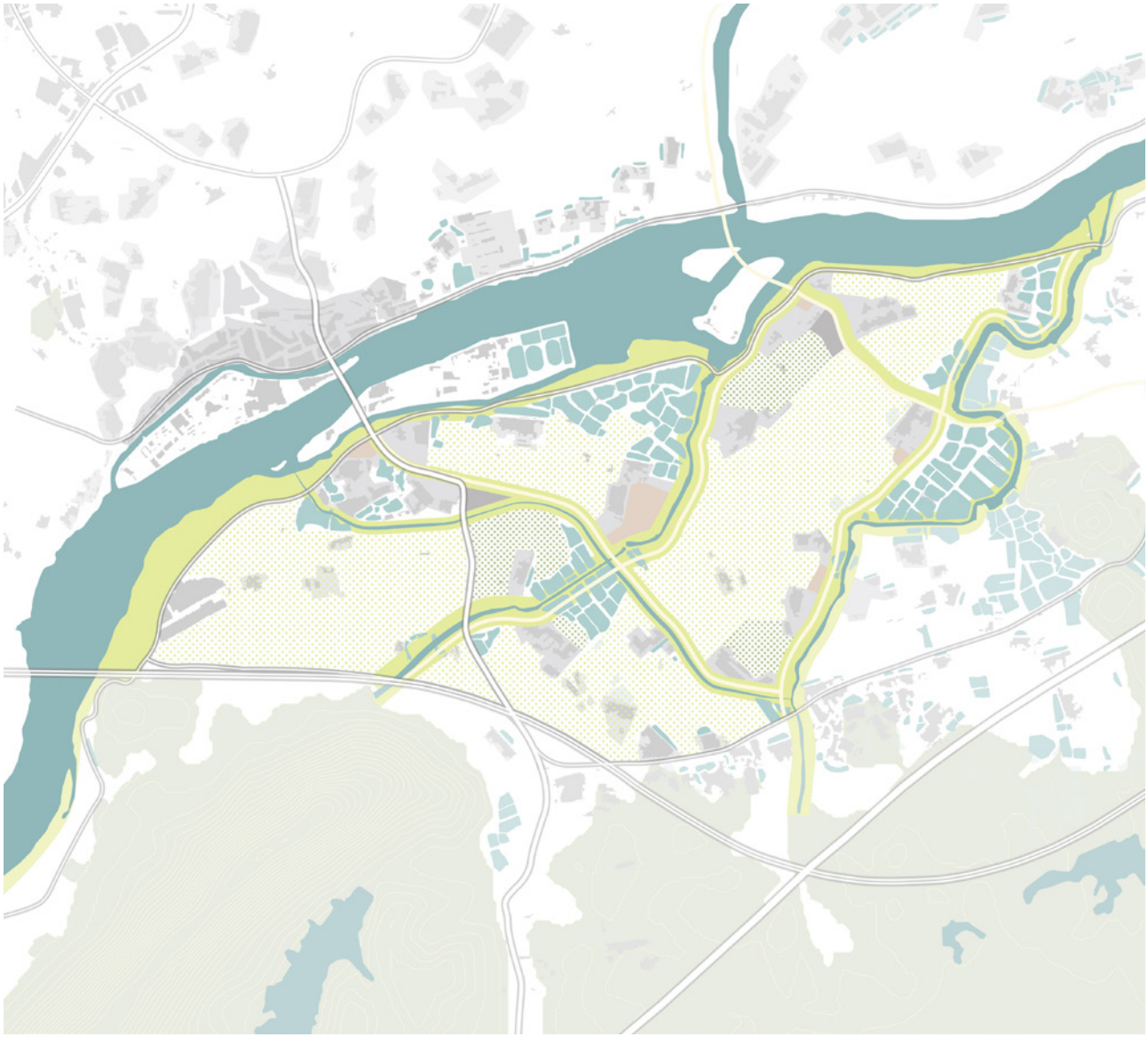


Figure 6.39 Structural plan of eco-agricultural development strategy

The most critical difference in the design strategy for the Chikan area compared to the Xingtan area is the promotion of ecological agriculture. This is the main complementary strategy for the development of Smart Village. Protecting the ecosystem will lead to richer soil and water resource, which will help to improve the quality and productivity of agricultural products. Green buffers can be built in areas close to rivers to promote the relationship between people and nature. The integration of agriculture and ecosystems will increase the biodiversity of the area, which feeds into the development of ecosystems. Thus, smart agriculture and agro-forestry have become the main design strategies.

TACTICAL STRATEGY	DESIGN COMPONENT			
Smart agriculture	The living lab	Greenhouse	Monitoring technology	
Agro-forestry	Agriculture	Forestry	Livestock farming	Fishery

Smart agriculture

By adopting smart agriculture technologies in croplands, farmers can optimise their operations, increase yields and improve profitability. These advances contribute to food security by ensuring a consistent and reliable supply of high-quality crops. In addition, implementing smart agriculture practices promotes sustainability, reduces the ecological footprint of agriculture and supports the conservation of natural resources.

Agro-forestry

Agro-forestry is a sustainable land management practice that integrates the cultivation of trees, crops and livestock on the same agricultural land. It provides a sustainable and holistic approach to land use, combining the benefits of agriculture and forestry. It promotes environmental stewardship, economic diversification and climate resilience, making it an effective and promising practice for sustainable agriculture and rural development.

Figure 6.40 Reference images of eco-agricultural development

6.6.2 Agro-forestry strategies

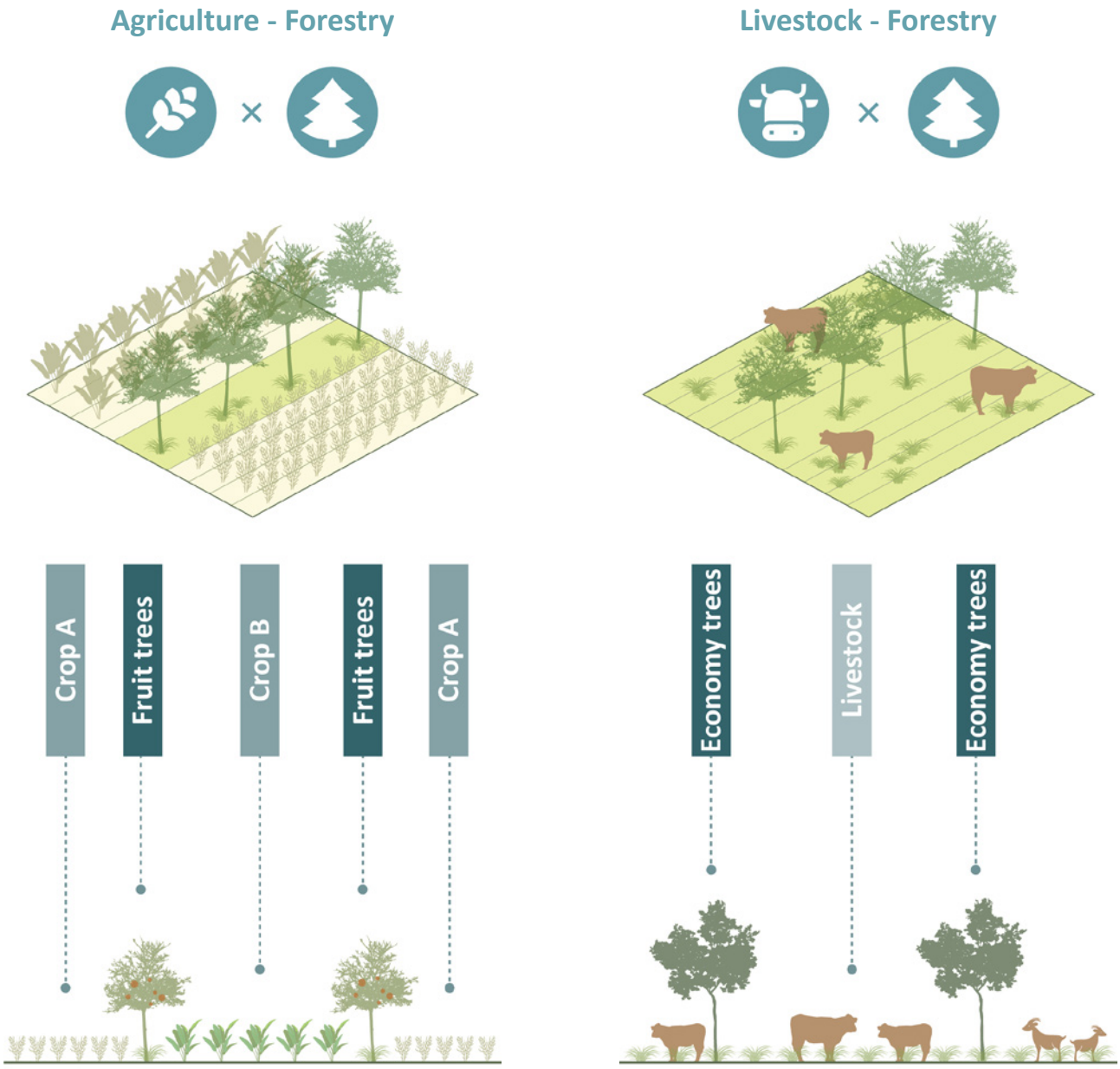
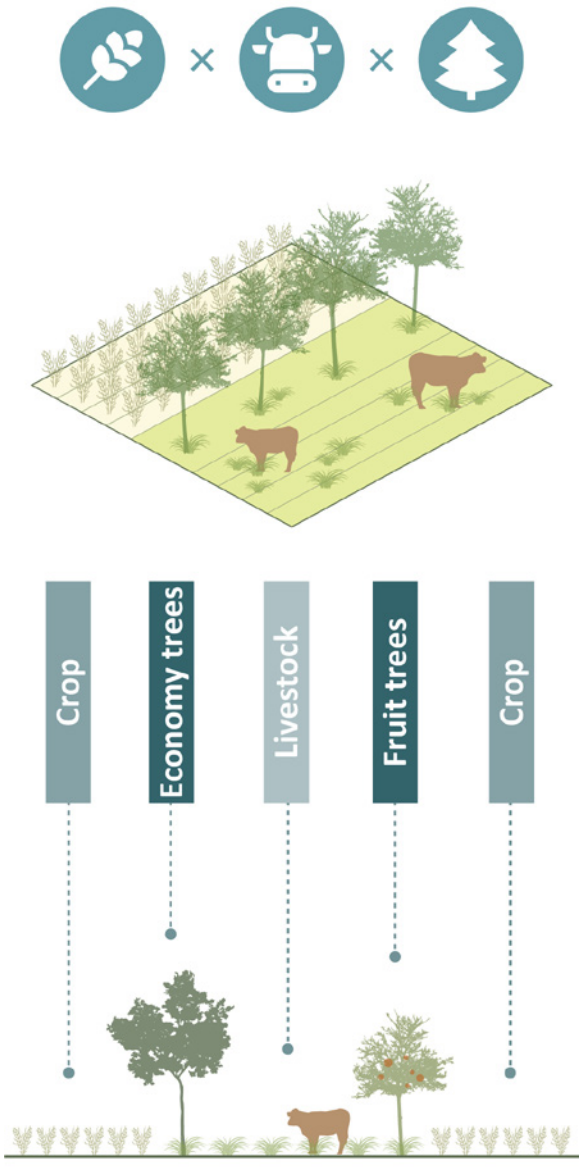


Figure 6.41 Spatial components of agro-forestry practices

According to H. Ren, Li, Shen, Li and Wang (2004), there are more than 500 agro-forestry systems in the GBA, which can be categorised into four main models. The most basic model is the cooperation between agriculture and forestry. It emphasises the maintenance of soil fertility through crop rotation of agricultural products and combining different tree species to enhance ecological diversity. Forestry can be economic forests or fruit forests, such as lychee and longan trees.

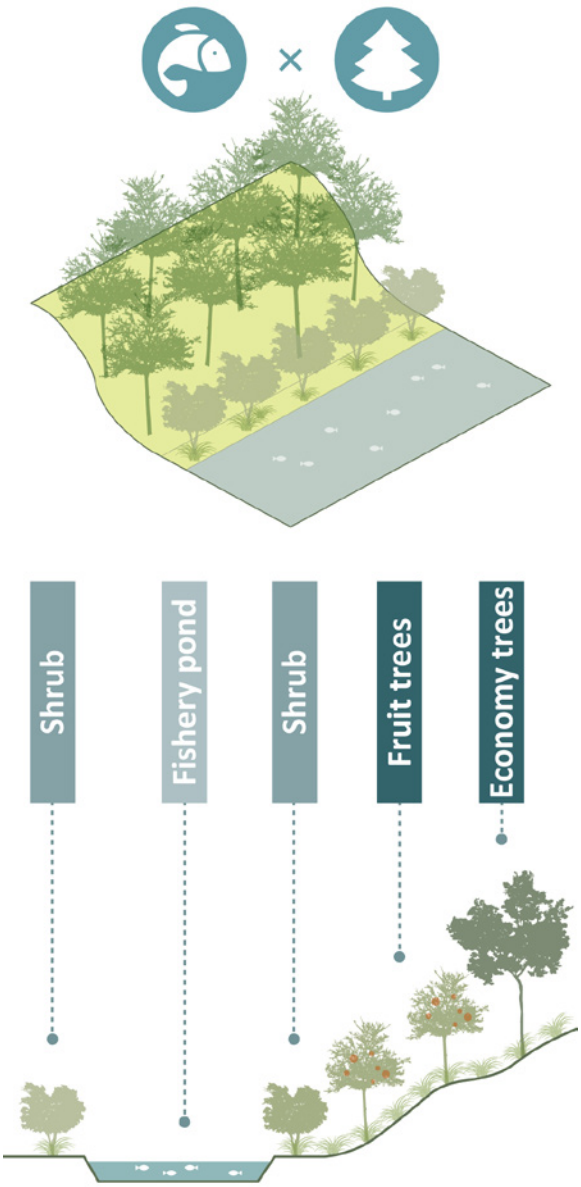
The cooperative system of livestock and forestry refers to cultivating livestock and grazing on forest land. Common livestock species in the area include yellow cattle, chickens and goats. The manure excreted by the animals is a natural nutrient for the forestry industry, which helps to increase the organic content of the soil. In turn, forestry feeds livestock, and the two complement each other.

Agriculture - Livestock - Forestry



Cooperation between agriculture, forestry and livestock is a holistic approach that recognises the interconnectedness of these sectors and seeks to maximise synergistic benefits. It also allows for efficient nutrient recycling and waste management. For example, animal manure can be used as organic fertiliser for crop production. Livestock can also play an important role in land clearing and maintenance, such as controlling weeds and pests in agro-forestry systems.

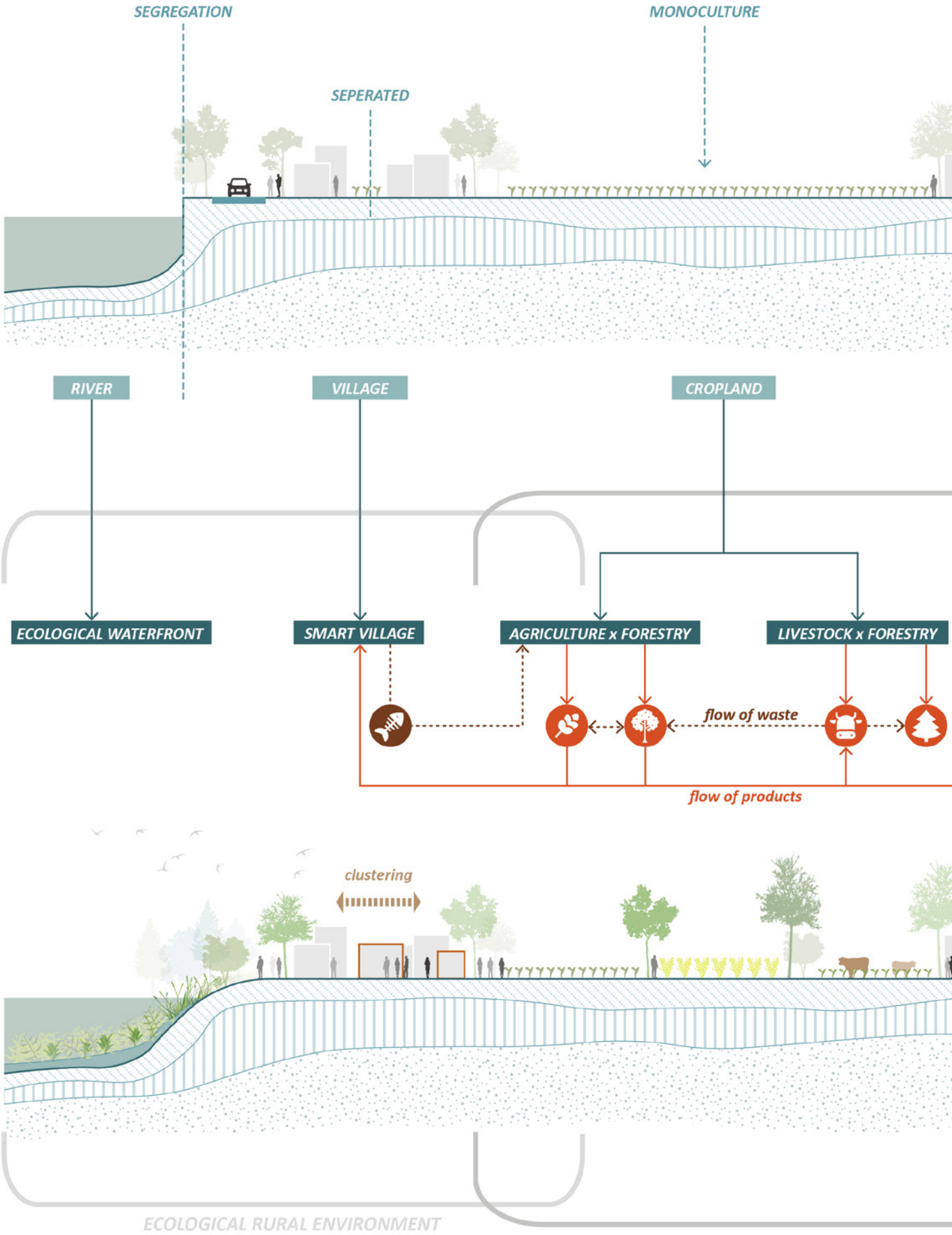
Fishery - Forestry

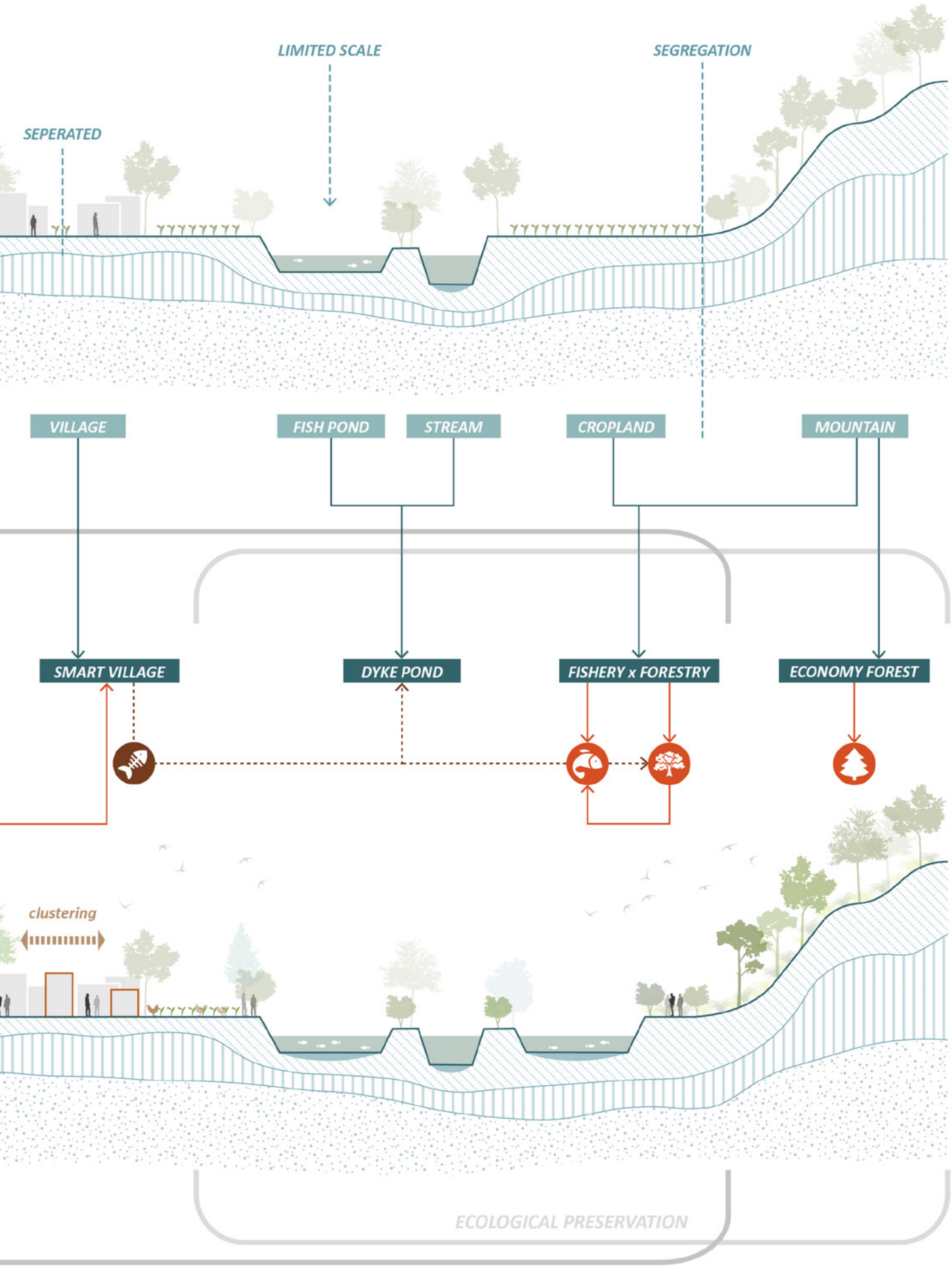


Cooperation between fisheries and forestry, particularly in relation to forestry on hills and ponds in the foothills, provides a mutually beneficial relationship that supports sustainable resource management and economic development. Hill forestry involves cultivating and managing trees and forests in hilly or mountainous areas. On the other hand, the foothill pond is a fisheries resource. It provides an ideal habitat for various fish species and supports aquaculture activities.

6.6.3 Spatial transformation

Figure 6.42 Spatial transformation and cooperation of the system



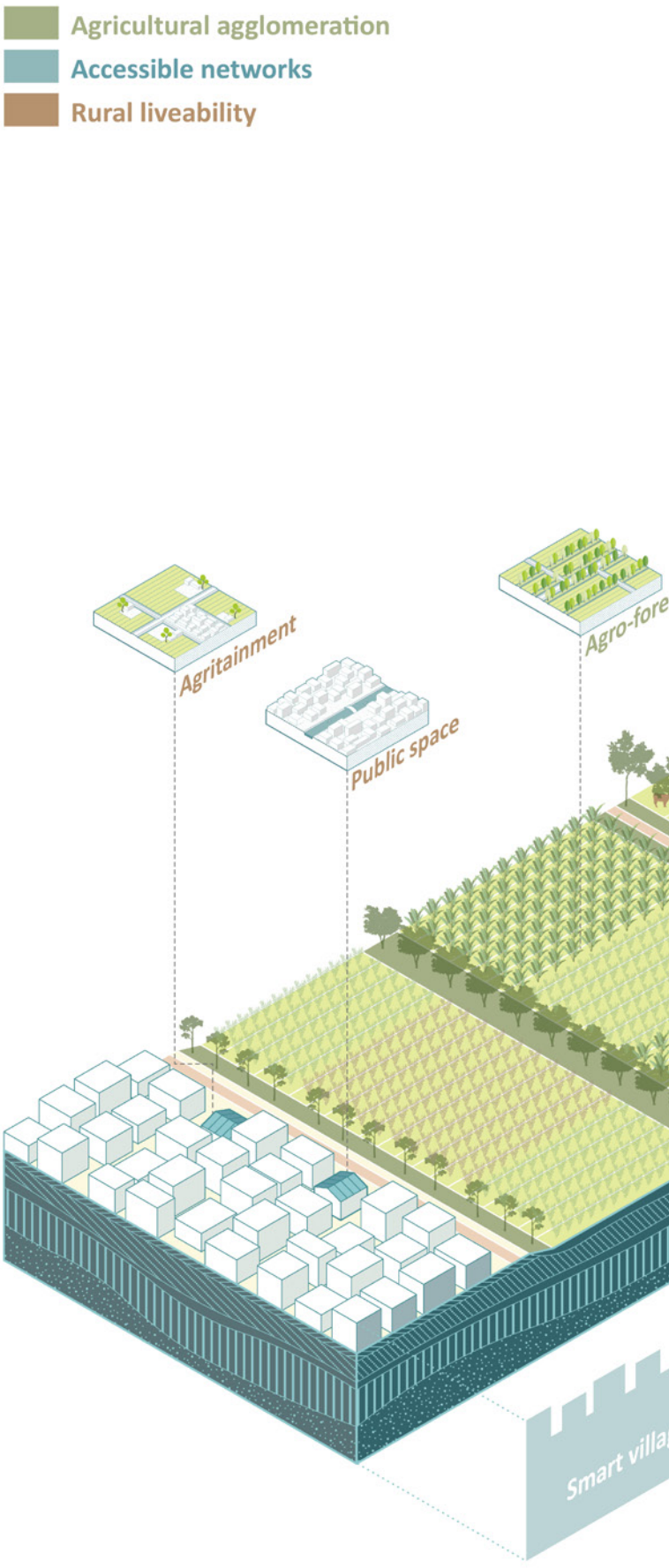

LIMITED SCALE
SEGREGATION
SEPERATED
VILLAGE
FISH POND
STREAM
CROPLAND
MOUNTAIN
SMART VILLAGE
DYKE POND
FISHERY x FORESTRY
ECONOMY FOREST
clustering
ECOLOGICAL PRESERVATION
ECOLOGICAL MULTICULTURE

6.6.4 From principles to local strategies

Agriculture in remote rural areas with mountainous features like Chikan relies mainly on monoculture farming. The application of agro-forestry strategies can increase the ecological diversity of these areas.

By assessing the soil conditions of farmland, crops can be mixed in different areas, promoting biodiversity and creating a more resilient agricultural system. Implementing crop rotations at different times of the year can further improve soil fertility and reduce the risk of pests and diseases. The introduction of woodland strips within farmland can carry the rural track, providing pathways for people to access the farmland and connect with the surrounding ecosystem. These belts can also serve various purposes, such as providing shade for farmers in hot weather, acting as windbreaks to protect crops and providing habitat for wildlife. In addition, farmland crossed by rivers shows the potential for the development of ponds. Expanding the area for the fishery industry by creating ponds not only helps the local economy but also enhances the blue-green structure of the area.

The expansion of villages in these remote areas may follow an agglomeration pattern, creating larger clusters of interconnected villages. This approach could create a continuous village space that provides better public spaces and services for villagers and benefits the village economy through the advantages of agglomeration. By expanding villages together, resources can be shared more effectively and economies of scale can be achieved.



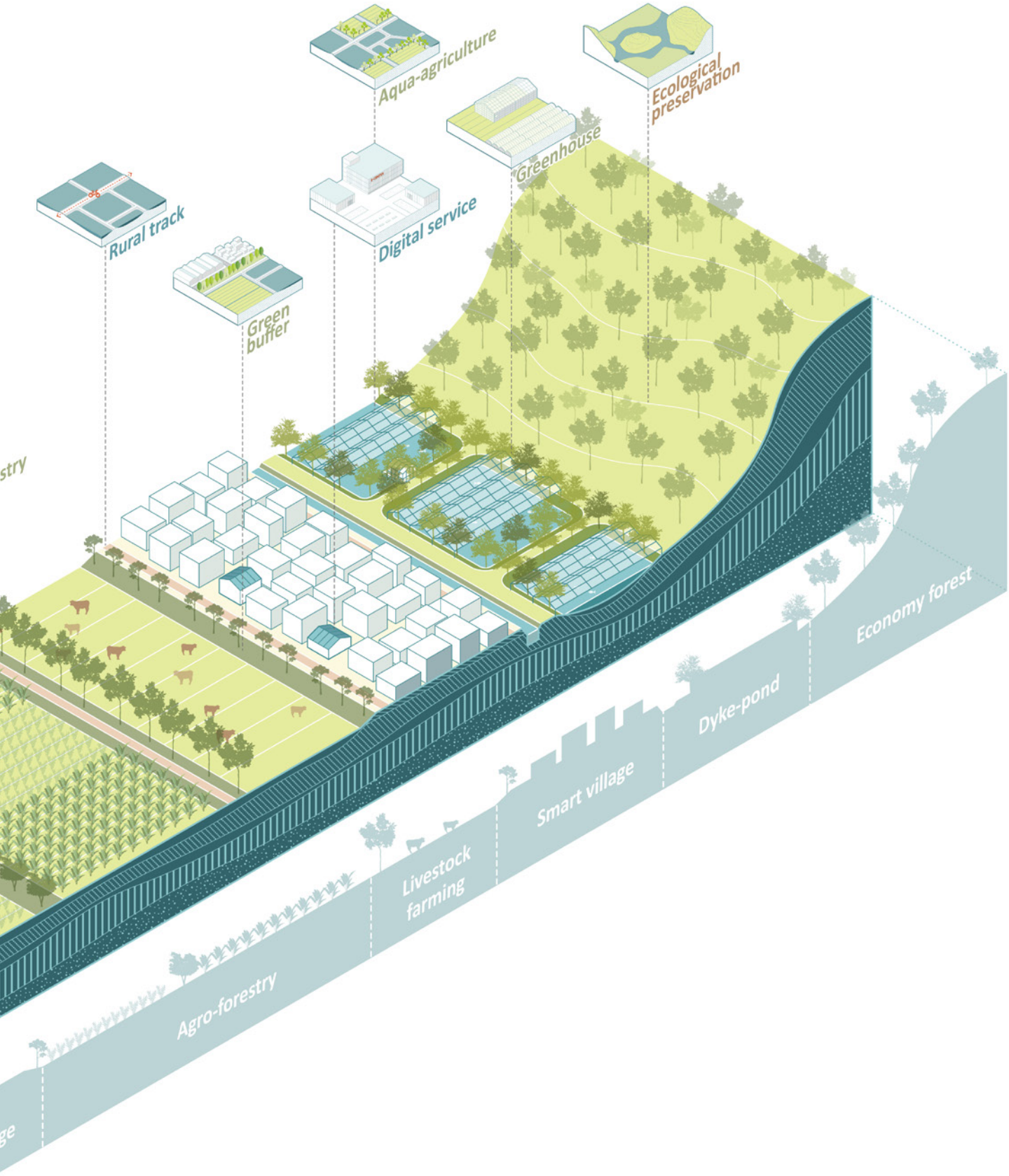


Figure 6.43 Design strategies of ecological agriculture

6.6.5 Digitalisation helps smart villages

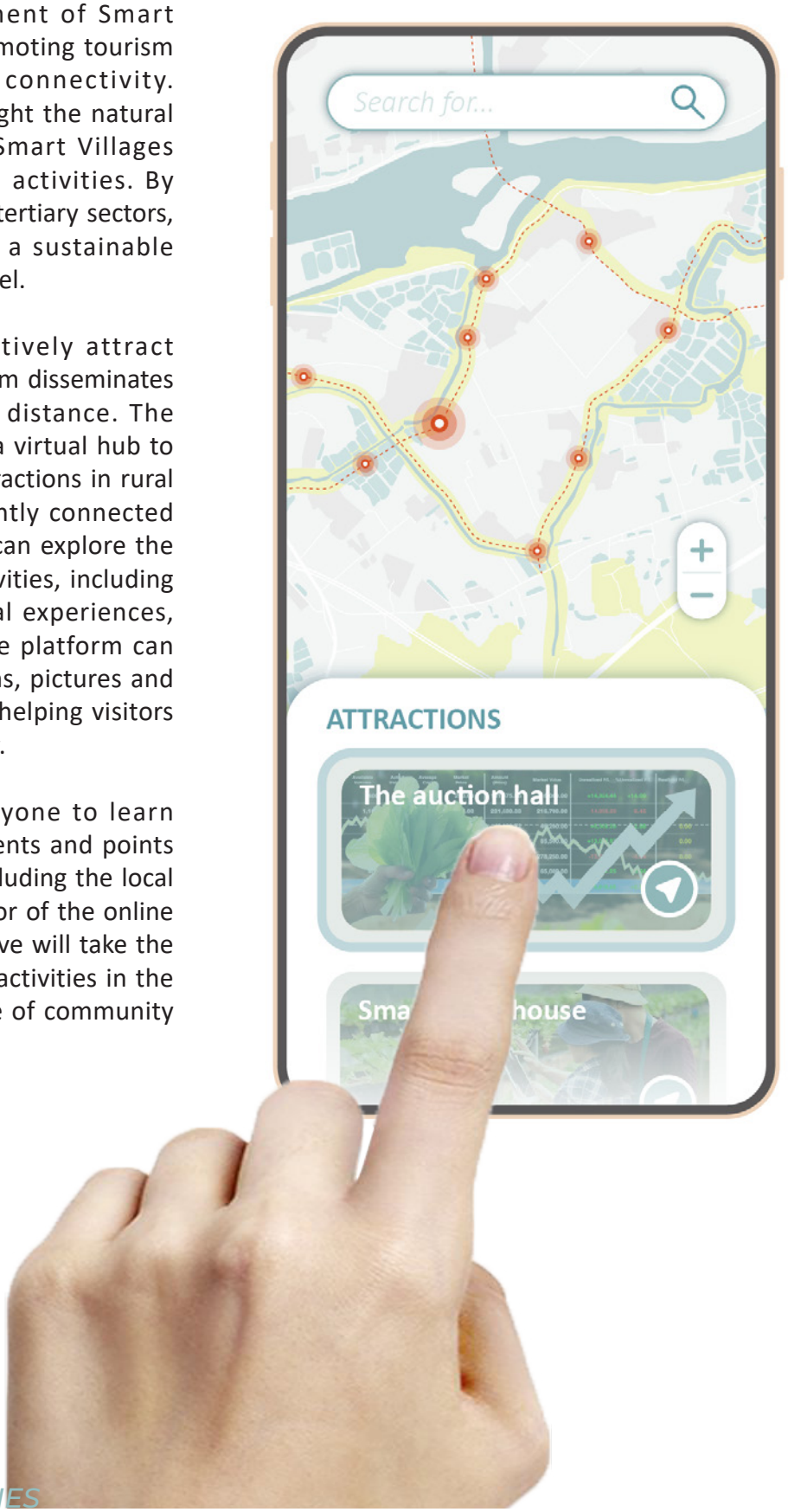
Platform for rural attractions

Digitalisation plays a crucial role in promoting the development of Smart Villages, particularly in promoting tourism and strengthening rural connectivity. Online platforms can highlight the natural and cultural heritage of Smart Villages and promote eco-tourism activities. By combining the primary and tertiary sectors, Smart Villages can create a sustainable economic development model.

Smart Villages can effectively attract visitors as the online platform disseminates information regardless of distance. The online platform can act as a virtual hub to showcase all the tourist attractions in rural areas, which are conveniently connected by the rural track. Visitors can explore the various attractions and activities, including cultural events, agricultural experiences, eco-tourism and so on. The platform can provide detailed descriptions, pictures and reviews of each attraction, helping visitors to plan their visit accordingly.

The platform allows everyone to learn about various activities, events and points of interest in the village, including the local villagers. As the administrator of the online platform, the village collective will take the initiative to upload various activities in the village, increasing the sense of community of villagers.

Figure 6.44 Digital platform of tourism



Online auction for healthy food

Figure 6.45 Platform of online auction

Digitalisation has indeed played a key role in transforming marketing agro-products in Smart Villages. The digital auction hall helps sell agricultural products online, expanding the economic benefits of the rural industry. Implementing an online auction platform offers many benefits to both farmers and buyers.

Through online auctions, farmers can showcase their products and provide real-time price information. The platform allows farmers to reach a broader market beyond their own rural area, breaking geographical limitations. By displaying samples of their products and sharing relevant information, farmers can build trust with potential buyers, thereby increasing their chances of making sales. Online auctions also promote a clustering effect among local farmers. By using the platform, they can sell their products collectively. This collaboration allows them to share knowledge and collectively negotiate better product prices.

For buyers, online auctions offer convenience and accessibility. They can participate in bidding and buy products from Chikan without travelling to the village in person. This widens the market reach of farmers and enables buyers from worldwide to get fresh and healthy food directly from the source.


Mohan Qiao
- Agri-expert
- 30 years old


Yueqi Zhang
- Farmer
- 30 years old
Minshi Zhang
- Tourist
- 27 years old

7

CONCLUSIONS AND REFLECTIONS

7.1 RESEARCH CONCLUSIONS

7.1.1 Overall research framework

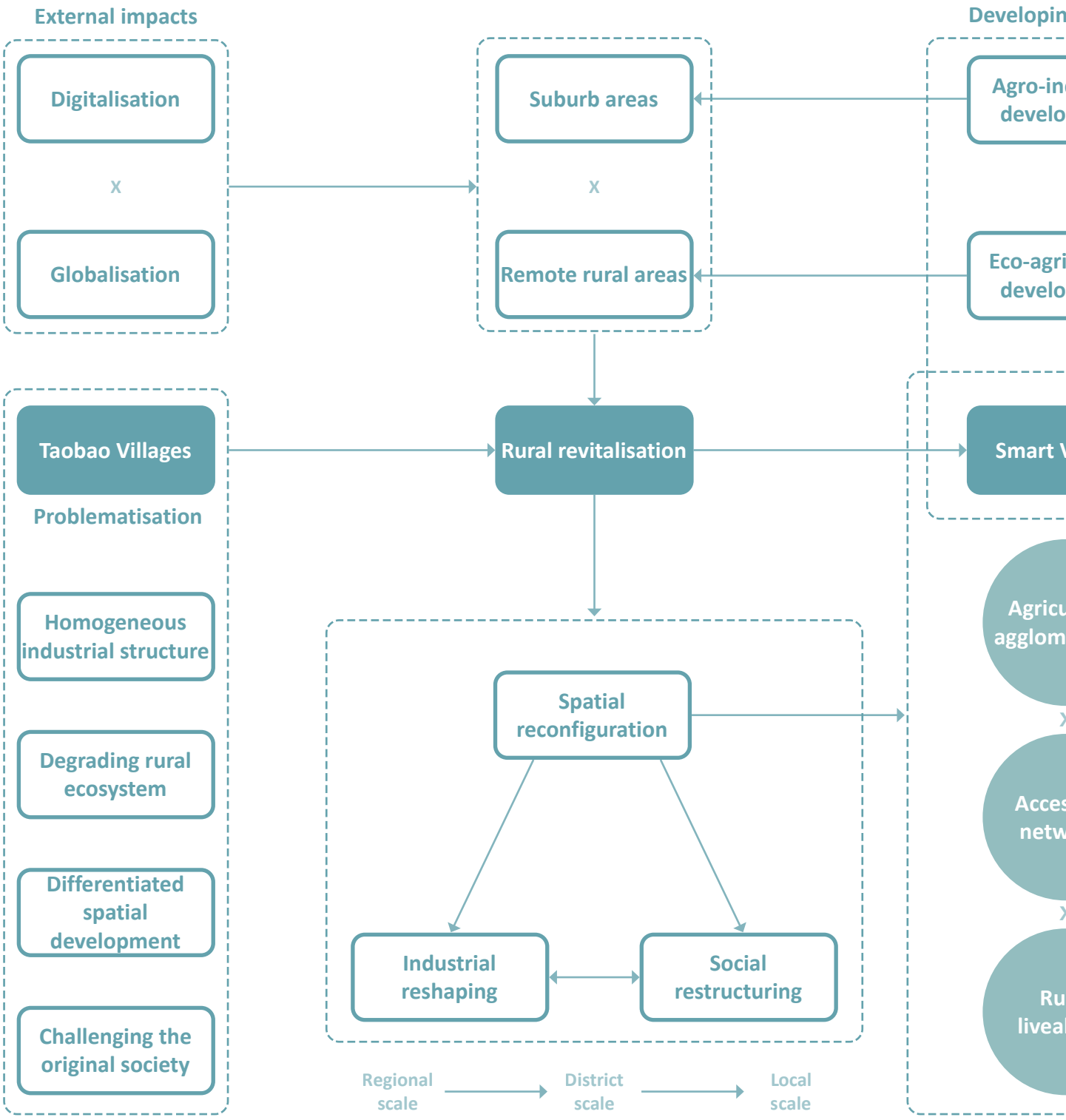
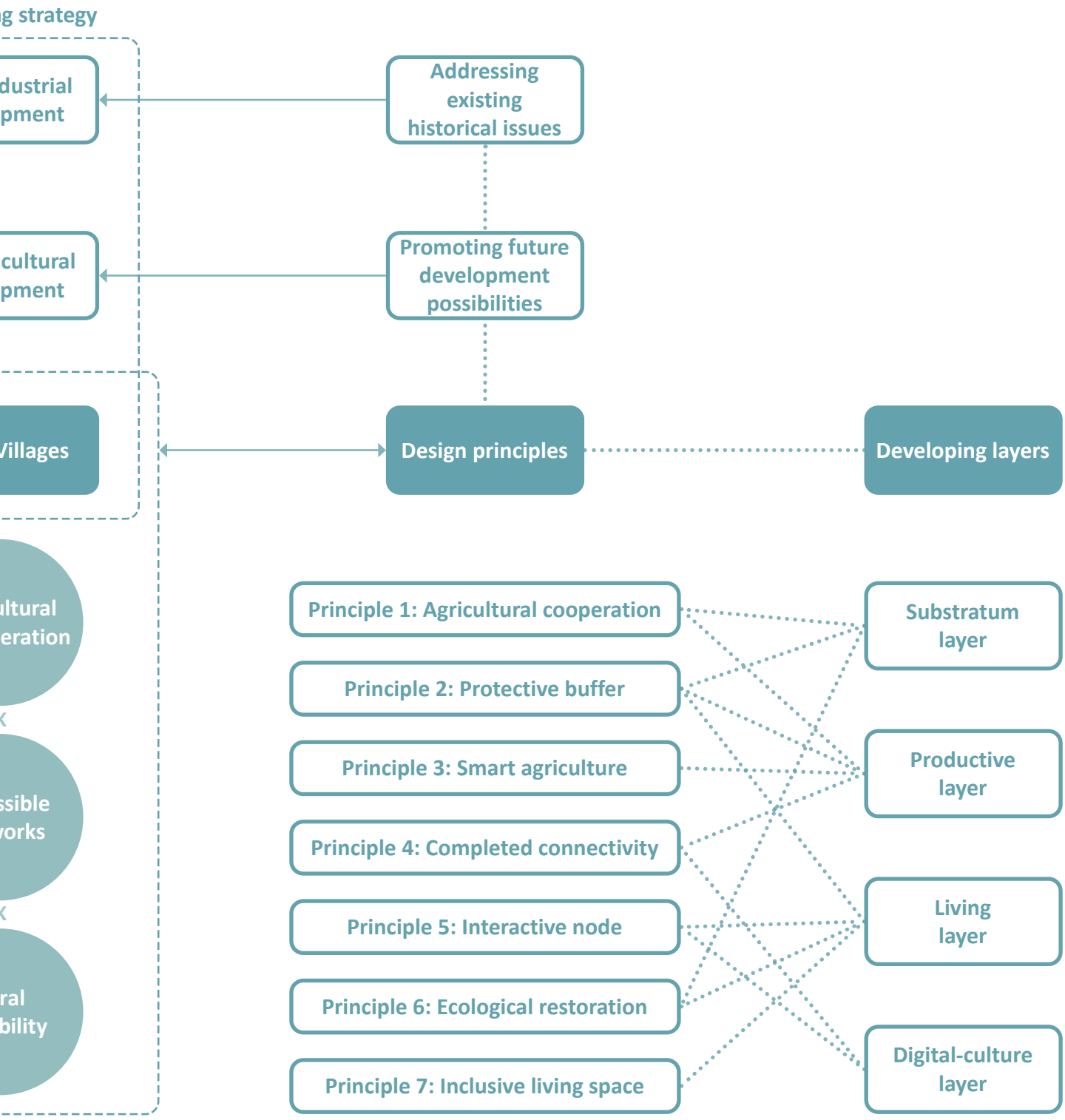


Figure 7.1 Research framework and conclusions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Villages
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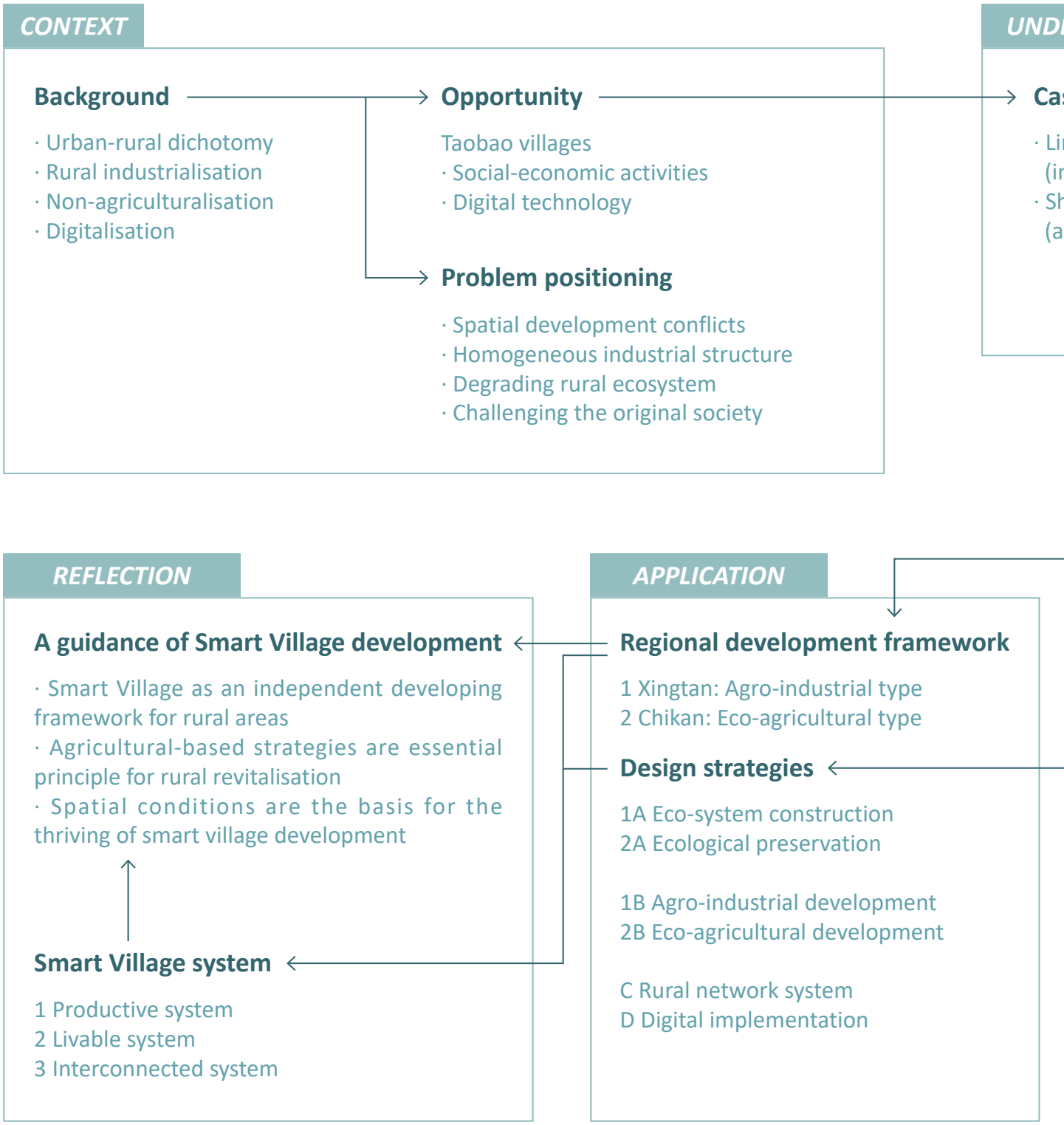
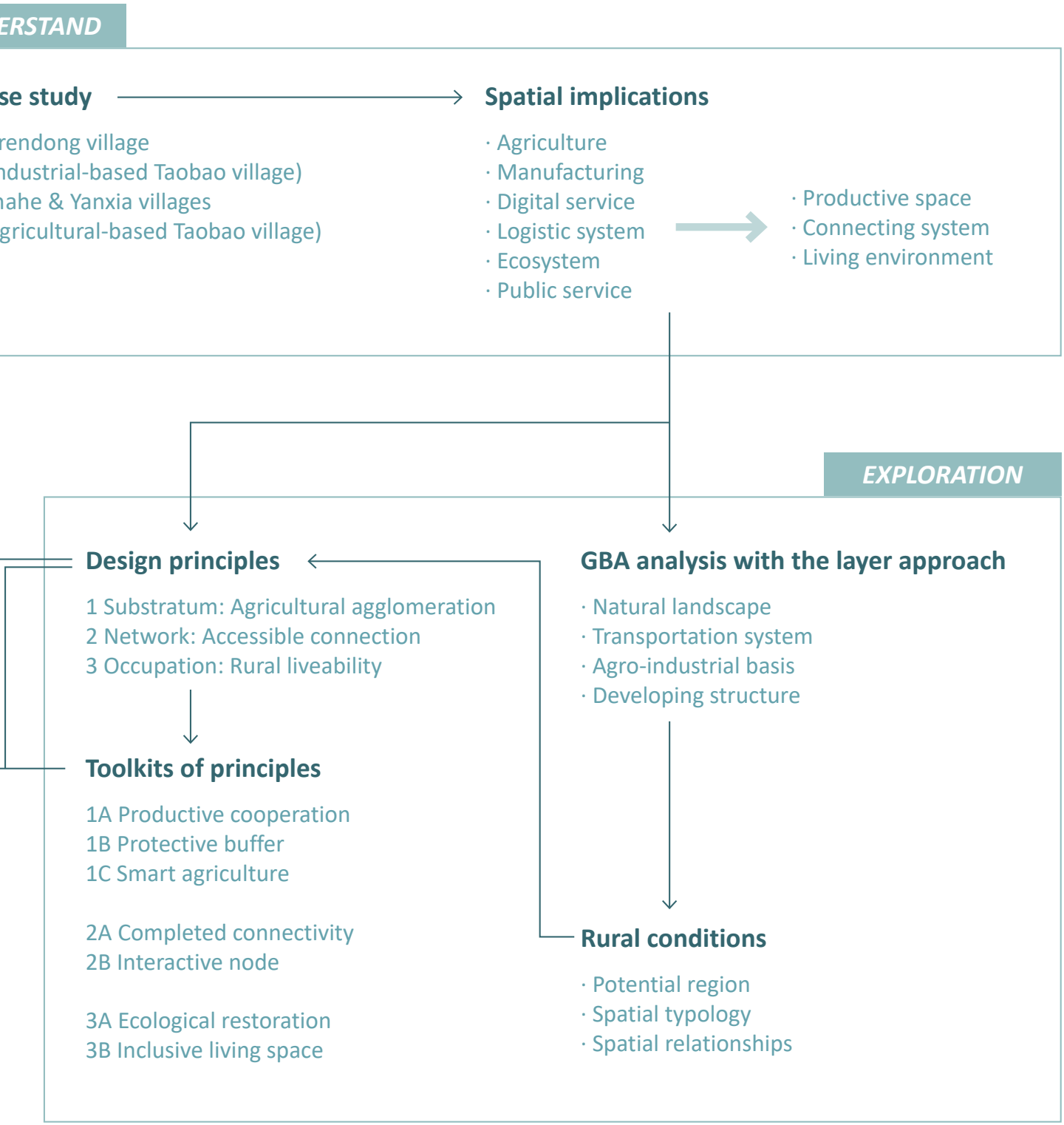
bility
Addressing existing historical issues
Promoting future development possibilities
Design principles
Developing layers
Principle 1: Agricultural cooperation
Principle 2: Protective buffer
Principle 3: Smart agriculture
Principle 4: Completed connectivity
Principle 5: Interactive node
Principle 6: Ecological restoration
Principle 7: Inclusive living space
Substratum layer
Productive layer
Living layer
Digital-culture layer

7.1.2 Research conclusions

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ndustrial-based Taobao village)
nahe & Yanxia villages
gricultural-based Taobao village)
Spatial implications
· Agriculture
· Manufacturing
· Digital service
· Logistic system
· Ecosystem
· Public service
· Productive space
· Connecting system
· Living environment
EXPLORATION
Design principles
1 Substratum: Agricultural agglomeration
2 Network: Accessible connection
3 Occupation: Rural liveability
Toolkits of principles
1A Productive cooperation
1B Protective buffer
1C Smart agriculture
2A Completed connectivity
2B Interactive node
3A Ecological restoration
3B Inclusive living space
GBA analysis with the layer approach
· Natural landscape
· Transportation system
· Agro-industrial basis
· Developing structure
Rural conditions
· Potential region
· Spatial typology
· Spatial relationships

7.1.3 Answering the research questions

How to construct 'Smart Village' based on the optimised Taobao Village model to upgrade the agricultural industry and improve rural liveability for future rural revitalisation in GBA?

Smart village as an independent developing framework for future rural areas

The countryside faces the challenges and opportunities presented by modernisation, including digitalisation and globalisation. The rapid growth and expansion of cities threaten the sustainable development of rural areas. However, rural areas should not be passively affected by changes in external systems but should actively explore ways of synchronising their development.

The concept of the Smart Village proposes an interconnected and mutually supportive rural development network that aims to break the traditional dependence of the countryside on urban resources. The project envisages rural areas as thriving ecosystem that can host cultural diversity and highlights the potential for modern development in rural areas. The concept of the Smart Village serves as a promising development framework that explores the cooperative and symbiotic relationship between the countryside and the city. By promoting sustainable agriculture, rural areas can use digital technology to develop their everyday activities and make the countryside a living ecosystem.

Spatial conditions are the basis for thriving digital development

The current industry approach to Smart Village development tends to place a transitional emphasis on digital infrastructure. However, this focus on digitalisation does not constitute a fundamental condition for developing Smart Villages. The study of the Taobao village in China concludes that the spontaneous development of villages requires the fulfilment of certain conditions, including productive landscape, interconnected system, and conducive living environment. The most important thing is to meet the necessary conditions for development in space.

For the countryside to flourish, the creation of agricultural agglomeration can increase productivity in the countryside. Increasing rural liveability by prioritising rural ecological conservation measures can help the countryside to develop sustainably. In addition, the creation of physically and electronically accessible networks connecting different strategies can help to enable the exchange of information and products, which is the key to making Smart Villages thrive.

Agricultural-based strategies are essential for rural revitalisation

Agriculture is the base of the countryside and a potential advantage that sets it apart from urban development. The project proposes two types of strategies for developing Smart Villages, including agro-industrial development and ecological agricultural development, which address different aspects of rural revitalisation and maximise the utilisation of the local rural resources.

The first type of strategy, which builds on the primary sector to promote the transformation of rural industry, addresses the historical problems rural industrialisation brings. It fosters agro-industrial cooperation based on local agriculture, stimulates the development of the rural economy and provides the countryside with the potential for digitalisation. The second type of strategy vigorously develops ecologically based agriculture and offers a vision for developing traditional villages. It emphasises the upgrading of traditional agricultural techniques and the development of sustainable agricultural systems. It safeguards rural areas from the ravages of urbanisation and reconciles agriculture and sustainable development. Both strategies actively imagine a picture of the future development of the smart village.

SQ 1: How to understand the spatial impact of the digital economy on rural areas and optimise the Taobao Village mechanism for rural development?

The spatial impact of the digital economy on rural areas is multifaceted. From the case study of Taobao Village, it is clear that the digital economy offers opportunities for economic diversification beyond traditional agriculture in rural areas. The emergence of new industry models can transform rural spaces. On the positive side, the digital economy allows for the spatial restructuring of economic activities. It breaks down the limits of geographical distance and reduces the dependence of the countryside on urban space. On the negative side, the presence of industry is bound to have an impact on the original ecological space and living space of the countryside.

Based on the concept of Smart Villages development, optimising the Taobao village mechanism requires consideration of factors such as ecological substrate, industrial base and infrastructure conditions. Village development should align with the needs and aspirations of the local community, maximising the potential of digitalisation to promote rural development. As the digital economy moves into the countryside, there is a need to actively guide the industry with indigenous agriculture to ensure the sustainability of the primary sector. At the same time, infrastructure development in rural areas is inextricably linked to the digital economy. Improved connectivity and access to digital services can enhance education, healthcare and culture in the countryside.

SQ 2: What spatial approaches need to be implemented to improve the quality of life and protect ecosystems in rural areas?

Within each of the three main principles of developing Smart Villages, there are essential spatial strategies to ensure the quality of life and protect ecosystems.

Firstly, sustainable upgrading of industries based on agriculture. Adopting sustainable agricultural practices in rural areas is essential for healthy food production and environmental protection. In rural areas that are already industrialised, the promotion of indigenous industries and the transition of newcomers towards bio-based industries can help reduce pollution. In remote rural areas, applying agro-forestry strategies can minimise the usage of harmful chemicals and promote biodiversity while protecting blue-green resources.

Secondly, the application of green infrastructure. The implementation of green infrastructure in rural areas helps to maintain and enhance ecological connectivity and ensure the conservation of ecosystems. Green infrastructure includes networks of green spaces, such as parks, wetlands and green corridors. When infrastructure is built, such as highways, wood strips can be installed as buffer zone to protect the rural environment.

Thirdly, the conservation and restoration of natural resources. It includes measures such as reforestation schemes, wetland restoration, sustainable water management and soil conservation, all of which are relevant to the development of agriculture. These initiatives can improve the health of ecosystems and support sustainable livelihoods for rural communities.

SQ 3: How can the network system positively impact the development of localised industrial structures and sustainable agriculture?

The creation of the Smart Villages development network will not only help the villages themselves but will also positively lead to a renewed change in their industrial structure.

With the support of digital technology, different villages can share village development strategies through village networks. Villages can voluntarily join the development network and rely on nearby spatial development resources for their own development, rather than relying on urban areas. This network is possible to help remote villages to develop their potential. By supporting and complementing development resources in remote rural areas, villages are enabled to work together to upgrade.

As the Smart Village development framework promotes the shared use of indigenous resources, it supports the transformation of local industrial structures and the development of sustainable agriculture. The network facilitates collaboration and cooperation among villages, enabling them to share best practices and work together to upgrade their industrial structures. This collective effort has revitalised local industries and paved the way for sustainable agricultural practices.

SQ 4: How to mitigate social segregation and help reconstruct social relations in the face of new populations entering rural areas?

The development of Smart Villages will inevitably attract newcomers to the area, which will impact the original acquaintance society. It is important to rebuild new social structures to mitigate social segregation in Smart Villages.

Participatory planning is essential for the sustainable development of villages. Local residents, farmers and other stakeholders should be involved in the decision-making process, and the voices of civil society should all be heard and taken into account. Community-based initiatives and co-management approaches foster a sense of ownership and responsibility, thus facilitating communication between the old and new populations.

As traditional villagers are usually not highly educated, providing adequate social services can prepare the existing population to adapt to the digital transition. Under the influence of the digital economy, the rural industrial structure will change, which means that jobs will change. In order to guarantee employment for the local population, training programmes for vocational skills should be provided. In addition, improving public services such as education, health, and recreational facilities will help reduce social disparities and improve the quality of life in the countryside.

7.1.4 Smart Villages development principles

In conclusion, the development of Smart Villages is guided by three main principles, including agricultural agglomeration, accessible networks and rural liveability. These principles are the basis for sustainable and prosperous rural communities. The design principles are reflected and tested by applying the principles to the design of two areas, Xingtan and Chikan. Through the research by design, the project concluded a better understanding of principles.

Agricultural agglomeration encourages cooperation between different industries to guide the rural development with an agriculture-based development strategy. It involves promoting sustainable agricultural practices, such as agro-forestry and agro-industrial cooperation. Under the influence of digitalisation, transformative changes in the spatial structure of villages are likely to occur since they will communicate with each other more frequently. The expansion of villages will move towards clusters to create the positive benefits of agglomeration economies.

Creating an accessible network is essential to the development of Smart Villages. It enhances rural connectivity through infrastructure development, including transport networks and Internet facilities. An efficient logistics system facilitates the smooth flow of goods and services, supporting the digital development of local industries. Digital interaction of information plays an important role in bridging the gap between different villages, facilitating access to resources, knowledge, and market opportunities.

Rural livability is a crucial consideration in the development of smart villages. It emphasises the promotion of sustainable land use practices and the conservation of natural resources. In addition, rural living quality and digital literacy can be improved by complementing public services. The future of Smart Villages encourages self-governing development, empowers local communities to participate in the decision-making process and fosters a sense of ownership and pride in their rural environment.

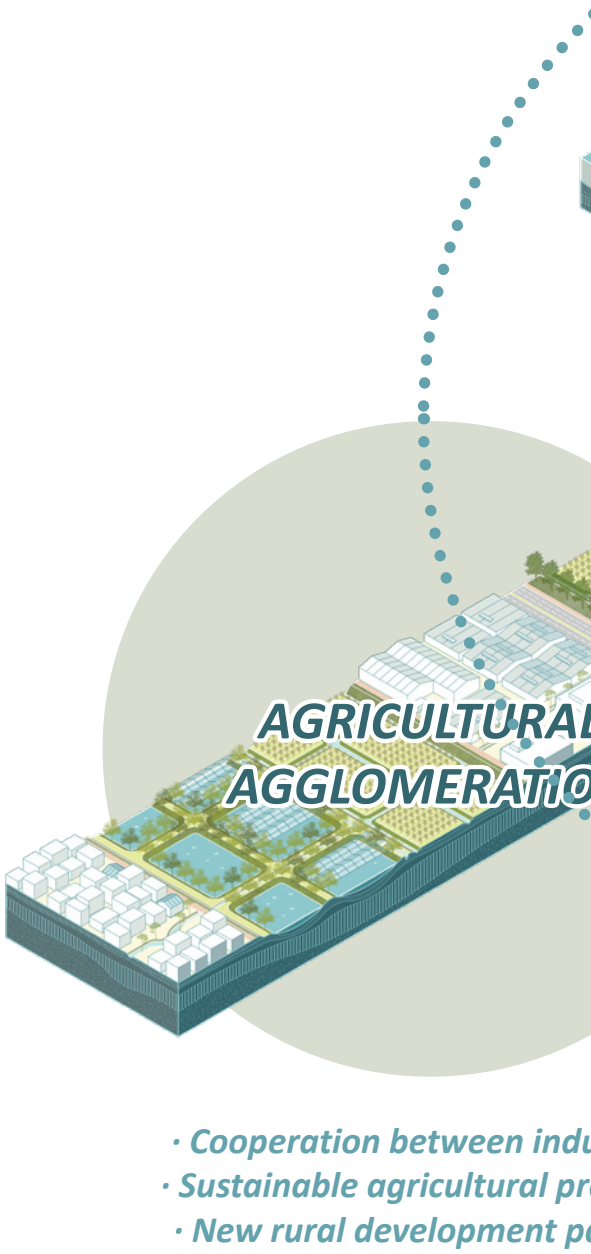
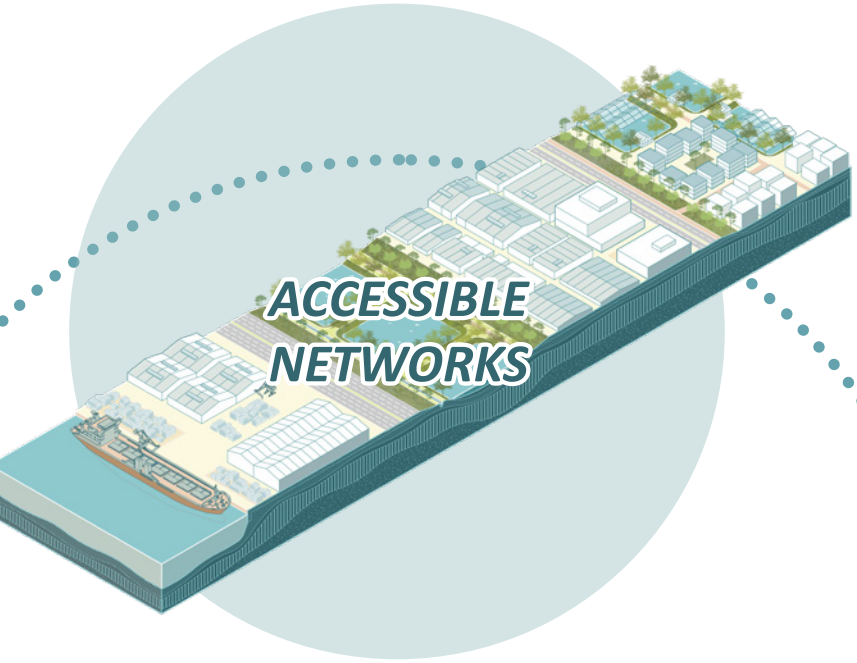
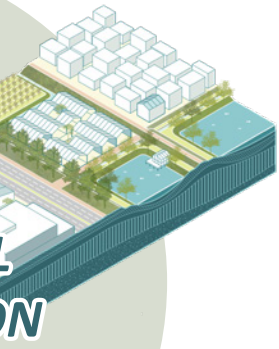
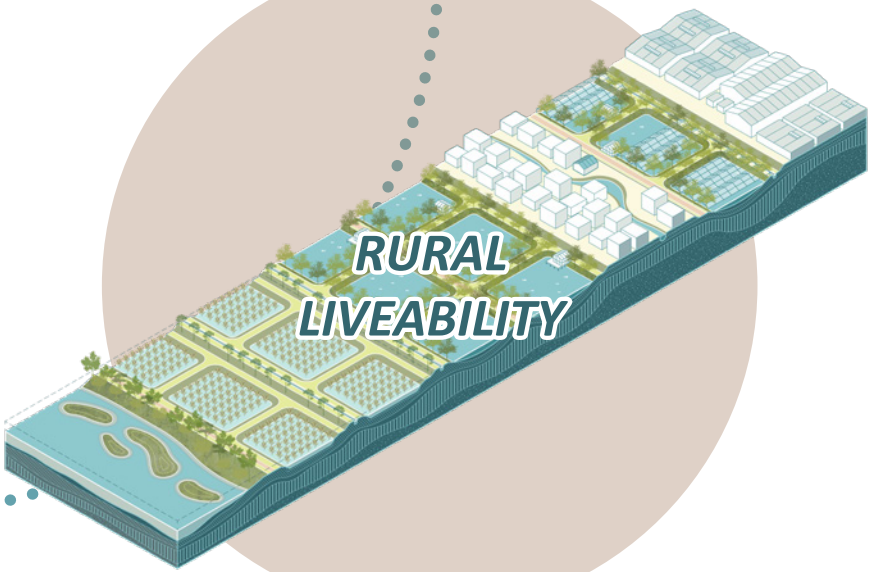


Figure 7.2 Conclusions on design principles o

· Rural connectivity
· Efficient logistic system
· Digital interaction of information







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· Ecosystem preservation
· Completed public services
· Self-governance development

of Smart Villages development

7.2 REFLECTIONS

Contribution to the Internet era

Focusing on the potential of digital revitalisation of rural areas, this project contributes to developing human settlements in the Internet era. Based on research on the Taobao village phenomenon, the project acknowledges digital technology as a catalyst for the development of rural areas. Rural areas can overcome geographical constraints to access information and resources through digital tools without relying singularly on urban resources.

Agriculture, as the fundamental resource for rural development, has the potential to upgrade transformatively with the help of digital technology. From the production side, farmers can use digital resources to access knowledge related to agricultural development. In terms of marketing, the Internet enables farmers to reach a broader market beyond their local communities, thereby facilitating e-commerce in agri-trade and creating new economic opportunities.

Regarding spatial development, digital technology plays an important role in optimising resource management. This can lead to efficient use of land, water, energy and other resources, promoting sustainability and resilience in the face of environmental challenges.

Regarding urban-rural integration, the digital village is meaningful in bridging the urban-rural gap. The Internet dissolves geographical boundaries and facilitates the equal sharing and exchange of knowledge, ideas and experiences. The project aims to alleviate the dichotomy between urban and rural areas through digital connections and platforms and promote a more balanced and inclusive society.

Impacts on the traditional rural areas

The digital potential for rural revitalisation project undoubtedly will significantly impact traditional rural areas. While embracing the many benefits and opportunities offered by digital technology and the Internet era, it also brings challenges and changes to the structure and lifestyle of traditional rural communities.

As a rural substrate, agriculture is inevitably affected by digital technology, resulting in a shift in farming practices, which aims to improve agricultural efficiency and productivity. However, this requires farmers to adapt to the new technologies and may require additional digital training. Due to the scarcity of educational resources in rural areas, the educational level of farmers is generally low. In such a context, it becomes a challenge for traditional farmers to accept and take the initiative to learn. The exclusivity of digital technology also limits its development in rural areas to a certain extent.

Another impact is the potential transformation of the rural economy. The integration of digital technologies can create new economic opportunities and market opportunities for rural areas. It could affect the traditional rural economy, and local trade dynamics and marketing strategies will have to be adapted. In addition, the rise of digital entrepreneurship may encourage the diversification of economic activities in rural areas, potentially changing the traditional rural landscape. Under the influence of new economic models, the trend towards economies of scale may lead to changes in the rural settlement space. Particularly in remote mountainous areas, scattered villages cannot meet the requirements of economies of scale and may develop towards clusters in the future.

Figure 7.3 Digitalisation in remote areas could bring learning opportunities to rural childs

Transferability

This project comprehensively understands the spatial situation of villages in China based on regional, district and local scales. Through the case study of Taobao Village, the project investigates and summarises the spatiotemporal relationships, industrial basis and social networks that underpin rural development. Based on these understandings, this project proposes a framework for Smart Village development, envisaging a village network system for the GBA region, a development strategy suitable for the Xingtan scale, and specific design for the local scale. Overall, the project presents different scales of design strategies based on common village characteristics analysed in the previous chapter as a reference for Smart Village development. The resulting design principles can be used as a reference for developing smart villages and applied to different rural areas. Specific design strategies are developed according to the specific rural characteristics and needs of the local area.

SDG assessment

Smart Villages have great potential to drive sustainable development, which is in line with the principles of the Sustainable Development Goals (SDGs). Smart Villages can address multiple SDG goals simultaneously, including poverty alleviation, food security, and sustainable infrastructure development. Through initiatives such as agro-industrial development, e-commerce development and ecological agriculture, Smart Villages can be empowered to promote rural economic growth and enhance social and environmental well-being. By harnessing the power of digital technology and sustainable practices, Smart Villages are able to create inclusive, resilient and prosperous rural areas that contribute to the broader SDG agenda.

Figure 7.4 Sustainable Development Goals

Relation between my graduation project and Urbanism

The Planning Complex Cities studio under the track of Urbanism seeks to study diverse urban landscapes through the lens of spatial resource analysis. And my graduation project focuses on the digital potential of rural revitalisation, particularly focusing on GBA in China. As human settlements are interwoven with the natural landscape, rural areas possess unique and complex systems that deserve to be explored in depth.

The main objective of this project is to analyse and study rural areas at a regional and local scale, aiming to understand the specific patterns of how spatial resources contribute to economic development. Furthermore, the persistent dichotomy between rural and urban areas remains an important aspect of regional development. By delving into the untapped development potential of the countryside, it is possible to bridge the gap between urban and rural areas and ultimately foster a more sustainable built environment for humanity.

Through this comprehensive exploration, the project hopes to contribute to the wider regional development discourse, highlighting the important role of rural areas in achieving balanced and sustainable rural-urban integration. By understanding and harnessing the digital potential of rural revitalisation, it is possible to foster more inclusive and resilient communities and create a harmonious and prosperous future for both rural and urban residents.

Academic value and contribution

To my understanding, the essence of Urbanism is a scientific discipline that delves into the processes of built environment development and uses spatial strategies to enhance its sustainability. In the complex cities studio, the city is understood as an intricate and dynamic system, and the methodology of spatial planning strategies aims to contribute to the understanding of the sustainability of the system. In the context of China's rapid urbanisation, the dichotomy between urban and rural areas is an important research topic, which has led me to consider the development potential and unique contribution of rural areas.

As the focus of this project, rural areas are also complex regions consisting of multi-layered systems. The project draws on the layer approach, which is developed in the Dutch context, to analyse rural areas. By understanding the unique ecological substratum, network systems, and occupation layers that distinguish rural areas from urban environments, the project proposes a methodological reference for studying rural areas in China. At the project design level, the project explores the potential areas of rural development by combining spatial planning and specific design strategies to envision the future digital development of the countryside. By providing the countryside with justified spatial conditions, the aim is to stimulate the spontaneous transformation of rural areas following a development framework rather than traditional resource allocation. This proactive approach seeks to understand the inherent possibilities in rural areas and pave the way for sustainable and dynamic development in the digital age.

Societal and ethical implications

The Chinese countryside is a traditional acquaintance society with a relatively simple network of relationships. The social network of villagers is confined to the village area and is rarely associated with the city. This project proposes a blueprint for the smart development of the countryside in the future, which will inevitably lead to the entry of foreigners and disrupt the existing stable social relationships. How will the social network of the village develop in the digital future?

Implementing the Smart Village system will help enhance communication and information exchange between villagers, thus contributing to the upgrading and development of social networks. The establishment of village networks allows villagers to extend their social sphere from one village to several nearby villages. In addition, the entry of new entrepreneurs and experts in related fields helps to enrich the social network of the village. Their involvement not only improves the digital literacy of the village community but also assists the villagers to better integrate into the new social relationships. Throughout this process, it is vital to ensure that the social rights of the indigenous people are protected. Village autonomy should be preserved, allowing them to retain their decision-making power under the guidance of the planners. As new social relationships are formed, the voices and perspectives of indigenous people must be given priority. Their input and participation should be actively encouraged, and inclusive and participatory decision-making mechanisms should be established. By providing opportunities for indigenous people to participate in transforming their villages, their social rights can be safeguarded, and their wishes can be taken into account.

Limitations and expectations

This project is based on a comprehensive and in-depth study, which has resulted in a general perception of the overall landscape of rural China. Based on the research findings and the author's impressions of the countryside, a vision of possible paths for future rural revitalisation is presented. However, this project still has some limitations that should be acknowledged.

Firstly, the impact of the worldwide epidemic and the strict quarantine policy made it impossible for the pre-project field research to be carried out as planned. The project lacked observations of the physical space and specific knowledge of the actual demands of the stakeholders, which may have limited the accuracy and comprehensiveness of the findings. In addition, village relations in the Chinese context are situated in a complex political system. Contradiction on land ownership is an inevitable topic in developing Chinese villages. However, due to the confidentiality of the relevant information, this project could not obtain and capture the actual relationships between villages in the study area. This limitation may limit the comprehensiveness of building a network of smart villages. Overall, these limitations are also issues that need to be considered comprehensively in the future revitalisation of villages in the quest for smart development.

SOURCES

Figure I Visual China Group
Figure II Visual China Group

CHAPTER 1

Figure 1.1 Visual China Group, https://www.vcg.com/
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Figure 1.4 Long, H., Tu, S., Ge, D., Li, T., & Liu, Y. (2016)
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CHAPTER 3

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Figure 3.29 Suichang E-commerce association
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CHAPTER 4

Figure 4.1 Author
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CHAPTER 5

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Figure 5.9 Author
Figure 5.10 https://cals.cornell.edu/agricultural-experiment-station
Figure 5.11 https://www.lift-fund.org/en/news/myanmar-looks-agroforestry-its-uplands
Figure 5.12 Author
Figure 5.13 Author
Figure 5.14 Author
Figure 5.15 Author

CHAPTER 6

Figure 6.1 Author
Figure 6.2 Map drawn by author; photos from Baidu Pictures and Google Earth
Figure 6.3 Map drawn by author; photos from Baidu Pictures and Google Earth
Figure 6.4 Author
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Figure 6.6 Author
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Figure 6.8 Google Pictures
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Figure 6.32 Author
Figure 6.33 Author
Figure 6.34 Map drawn by author; photos from Baidu Pictures and Google Earth
Figure 6.35 Jiangmen Kaiping City Territorial Spatial Planning 2020-2035, http://www.kaiping.gov.cn/kpszrzyj/ghgg/
Figure 6.36 Author
Figure 6.37 Author
Figure 6.38 Author
Figure 6.39 Author
Figure 6.40 Google Pictures
Figure 6.41 Author
Figure 6.42 Author
Figure 6.43 Author
Figure 6.44 Map drawn by author; photos from https://www.agrirs.co.uk/blog/2019/09/agricultural-recruitment-specialists-latest-blog-what-you-need-to-know-about-a-career-in-agricultural-marketing?source=google.com
Figure 6.45 Map drawn by author; photos from https://www.popsci.com/science/lychee-genetic-history/, https://zh.vietnamplus.vn/, https://www.hk01.com/

CHAPTER 7

Figure 7.1 Author
Figure 7.2 Author
Figure 7.3 https://www.ns-businesshub.com/technology/5g-rural-internet/
Figure 7.4 https://sdgs.un.org/goals

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