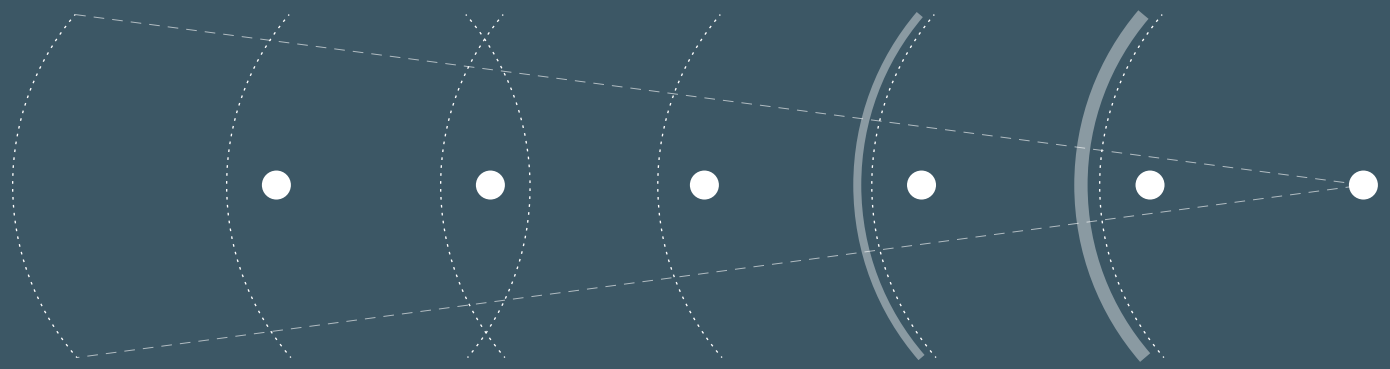
MSc. Urbanism
Gruadation Studio: Planning Complex Cities
Faculty of Architecture and the Built Environment
Delft University of Technology

RE-IMAGING

PERIPHERY



On Exploring Development Opportunity of North Anhui Based on Placed-based Circularity Transition

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Re-imagining Periphery

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On Exploring Development Opportunity of North Anhui
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keywords
integrated regional development, place-based circular transition, city collaboration, urban agglomeration

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Lastly, but certainly not least, I want to express my heartfelt gratitude to my faithful companion, my dog Max. Your loyal presence, unconditional love, and ability to brighten even the darkest of days have been a constant source of joy and comfort. You pushed me to balance work and life even in the most stressful days. At least two walks every day right, gal? One small request though: stop eating my ear buds. I really need them for quality sleep.

No journey is without its ups and downs, and mine was no exception. However, I am more than grateful for every obstacle, setback, and triumph that I encountered. Each challenge served as an opportunity for growth, resilience, and self-discovery. I have emerged from this experience stronger and more determined to pursue further academic and personal achievements.

I love you all.

Content

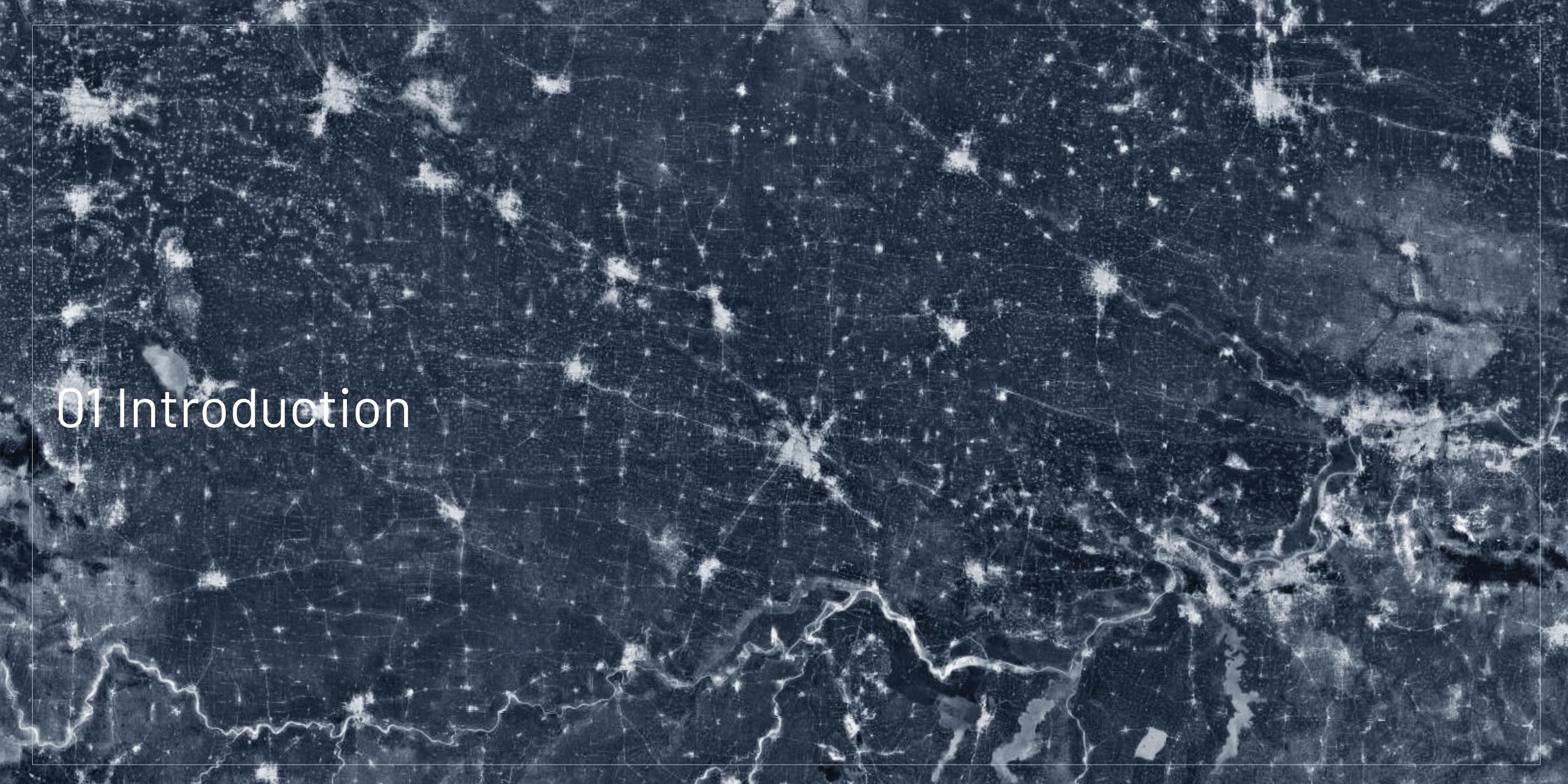
Preface

North Anhui 6 cities locate at the periphery of Yangtze River Delta (YRD) in the eastern part of China. Even though YRD are the country's most developed region, north Anhui are the most underdeveloped area according to Human Development Index in the region with only 1/5 of the core area's GDP per capita. Large population outflow and high take-up of primary industry are two key features of the area. All 6 cities are secondary cities (non-capital prefecture-city), with similar GDP total amount and different development momentum. The 6 cities' geographical location also lays in the middle ground of two urban agglomeration, Xuzhou urban agglomeration and Greater Shanghai Metropolitan Area, giving them opportunities to exploit the development opportunities offered by both.

Currently, the Yangtze River Delta is facing the urgency to transit its current industrial landscape into a carbon-neutral circular economy. A new industrial value chain is about to be implemented throughout the region which can be a chance for the north Anhui area.

The project thus raises the research question: how and to what extend can circular transition help develop peripheral area. By combining Stan Allen's infrastructural urbanism and Jo Williams' three pillars of circular development, the project proposes the concept of place-based circular transition which guide the strategy setting towards agro-industrial synergy, regenerative agriculture and distributive justice through designing hard, soft and organizational infrastructures. The project is thus not only a proposition of new way of looking at region development equality, but also discusses a missing yet important spatial aspect of circular transition.

Keywords: integrated regional development, place-based circular transition, city collaboration, urban agglomeration



01 Introduction

North Anhui 6 cities, Yangtze River Delta, China

A Decaying Periphery

Yangtze River Delta (YRD) is one of the most developed regions in China among other 2 mega urban agglomeration, the Greater Bay Area in southern China and Jing-jin-ji (Beijing, Tianjin, Hebei) in northern China. It takes up 24.1% of the national GDP contribution with 16.1% of its total population (NBSC, 2021). YRD covers an area of 360,000 square kilometer with a total population more than 200 million, more than the fifth largest country in the world, Pakistan (NBSC, 2021). Hence, it is also one of the most densified populated areas of the country which is 4.5 times of the national average density (NBSC, 2021).

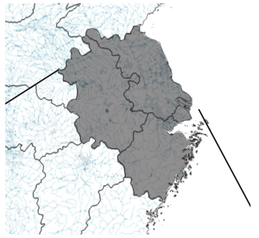
YRD urban agglomeration used to be considered the same as the greater metropolitan area of Shanghai, which, however, takes up only 40% of the current YRD area and is defined as the core area of the delta. In 2019, central government included the complete Anhui Province into the YRD of which previously only the capital city Hefei was part of. Now, the YRD is made up of three complete provinces and one directly governed city: Zhejiang Province, Anhui Province, Jiangsu Province, and Shanghai.

However, there is problem with growing evidence: the problem of regional development imbalance and the contrast between integration plan and lack of development momentum in North Anhui province, the most underdeveloped area of Yangtze River Delta. North Anhui is commonly recognized discriminately as "peasant workers' cradle", "underdeveloped and behind", and even "trash area". North Anhui 6 cities covers a total area of about 39,000 square kilometers, achieves a gross regional product of about 1,100 billion yuan in 2020, and has a resident population of more than 26 million. The proportion of Anhui reached 28%, 28% and 43% respectively. How to alleviate north Anhui cities, the peripheral area of Yangtze River Delta, to the same level and same pace of development as the average YRD cities is to the key of an integrated, balanced and hence sustainable regional development.

fig 1.1 Fuyang City Drone Photo, source: bilibili @zhifeijihangpai

fig 1.2 Fuyang City Drone Photo, source: bilibili @zhifeijihangpai

fig 1.3 Linquan County Countryside, source: bilibili.com @tiaotiaoxiaodoudou



Yangtze River Delta

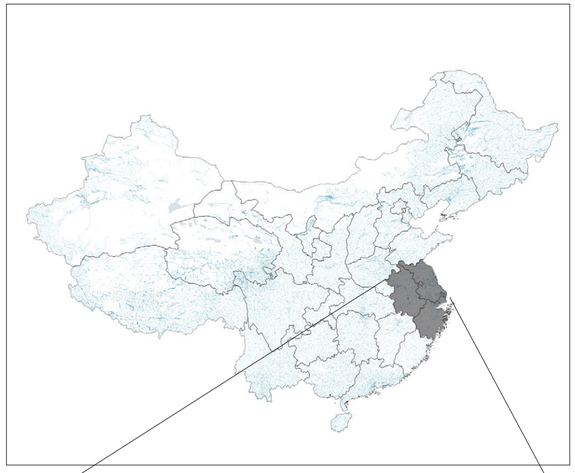
Area: 360,000 km²
Population: 236 million
Urbanization rate: 75.01% (2021)
GDP: c.a. $18.2 trillion (2021)

The Netherlands

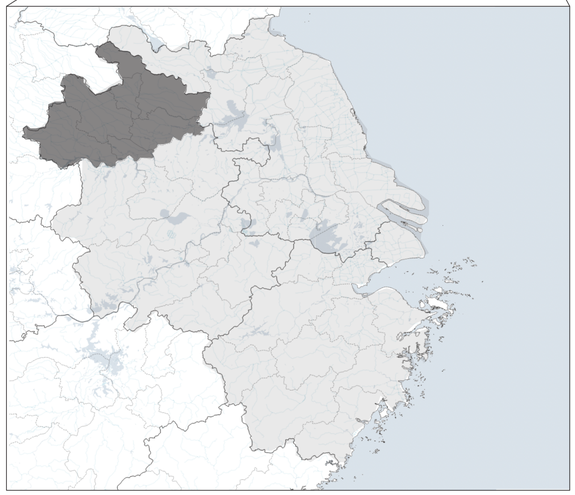
Area: 41,543 km²
Population: 17.53 million
Urbanization rate: 92.57%
GDP: c.a. $1.02 trillion (2021)

North Anhui 6 cities

Area: 39,000 km²
Population: 26 million
Urbanization rate: 59.39%
GDP: c.a. $1.1 trillion (2020)



location of Yangtze River Delta



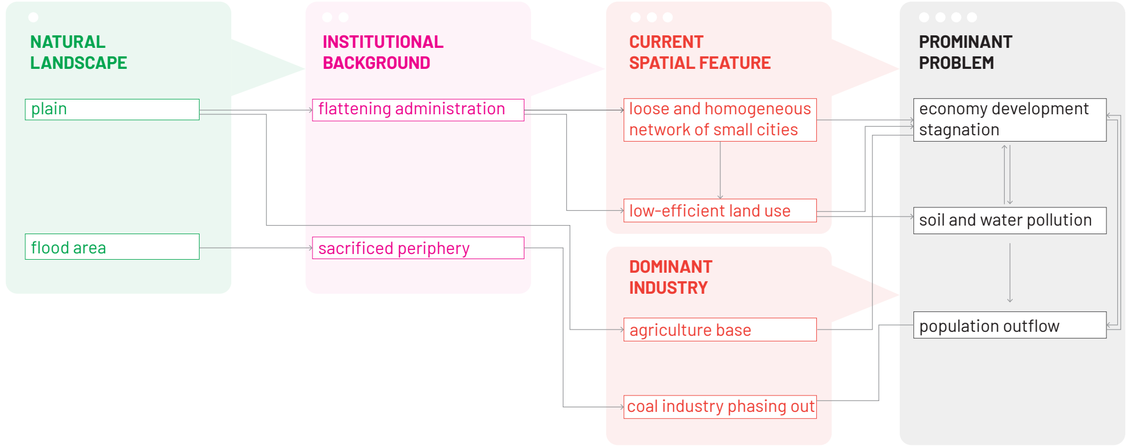
Location of North Anhui

02 Problematization

Problematization Framework

Understand the Problems by Chronological Layers

LOCATION North of Anhui Province, periphery of Yangtze River Delta



DEVELOPMENT OPPORTUNITY

Carbon Peak & Carbon Neutrality | 碳中和碳达峰

Urban Agglomeration as Policy Tool | 区域一体化

Natural Landscape

Plain for Agriculture

The predominantly plain landscape of North Anhui Province significantly contributes to its prominence in agriculture. The flat topography, characterized by expansive plains, plays a vital role in enhancing agricultural productivity and facilitating various farming activities. The following points highlight the significance of the plain landscape in the region's agricultural prominence:

Large Cultivable Area: The extensive plain land in North Anhui Province provides a substantial cultivable area for agricultural practices. These vast stretches of flat land offer ample space for cultivating crops, allowing farmers to maximize their agricultural output.

Irrigation and Water Management: The flat terrain of the plains simplifies irrigation processes and water management. It allows for efficient and uniform distribution of water resources across the agricultural fields, enabling optimal hydration for crops. The availability of water, combined with effective irrigation systems, enhances agricultural productivity and ensures stable crop growth.

Mechanization and Machinery Usage: The flat landscape is conducive to the adoption of agricultural mechanization and the utilization of machinery. Large-scale farming operations, such as plowing, seeding, and harvesting, can be efficiently executed on the plains using mechanized equipment like tractors and harvesters. The absence of significant obstacles or undulating terrain streamlines the use of machinery, thereby increasing productivity and reducing labor requirements.

Accessibility and Infrastructure: The flat terrain simplifies transportation and infrastructure development in the region. The construction of road networks, irrigation channels, and storage facilities becomes relatively easier on the plains compared to areas with rugged terrain. This accessibility facilitates the movement of agricultural inputs, machinery, and harvested produce, supporting efficient agricultural operations and market connectivity.

Homogeneous Soil Conditions: The flat landscape often leads to relatively uniform soil conditions across the plains. This uniformity is advantageous for agriculture as it allows farmers to have a consistent understanding of soil properties, fertility levels, and nutrient requirements. Consequently, farmers can implement appropriate soil management practices, including fertilization and soil amendment, to optimize crop growth and yield.

Large-Scale Crop Cultivation: The vast expanse of flat plains in North Anhui Province enables large-scale crop cultivation. Farmers can employ modern agricultural techniques, such as mechanization, precision farming, and crop rotation, to manage extensive agricultural operations effectively. The ability to cultivate crops on a large scale contributes to increased production, economies of scale, and a more robust agricultural sector.

In summary, the predominantly plain landscape of North Anhui Province provides a favorable environment for agriculture. Its large cultivable area, ease of irrigation, suitability for mechanization, improved accessibility, homogeneous soil conditions, and support for large-scale crop cultivation collectively contribute to the region's agricultural prominence.

TIME	*INFRASTRUCTURE*	*INTEGRATION OF YRD*	*POSITION OF N-ANHUI*	*MAJOR PRODUCT*
Ming and Qing dynasty (14-19th)	Jing-hang grand canal Yangtze River	Low integration status, solitary development	Grain supplier	Agricultural product, cotton
1876-1949	Jing-hang grand canal Yangtze River South-north railway	Early formation of integration and City division of labor	One of the major market and port (Bangbu city)	metal and coal
1949 onwards	Yangtze River Railway system Highway system High-speed railway	High-level integration in YRD core area, low at the periphery, inland enterprises became attached to ones in cities to the east	Grain supplier	Metal, coal, cheap labor

Fig 2.1 history of relationship between north Anhui and Yangtze River Delta source: author, based on https://baike.baidu.com/item/%E7%9A%96%E5%8C%97/5324230

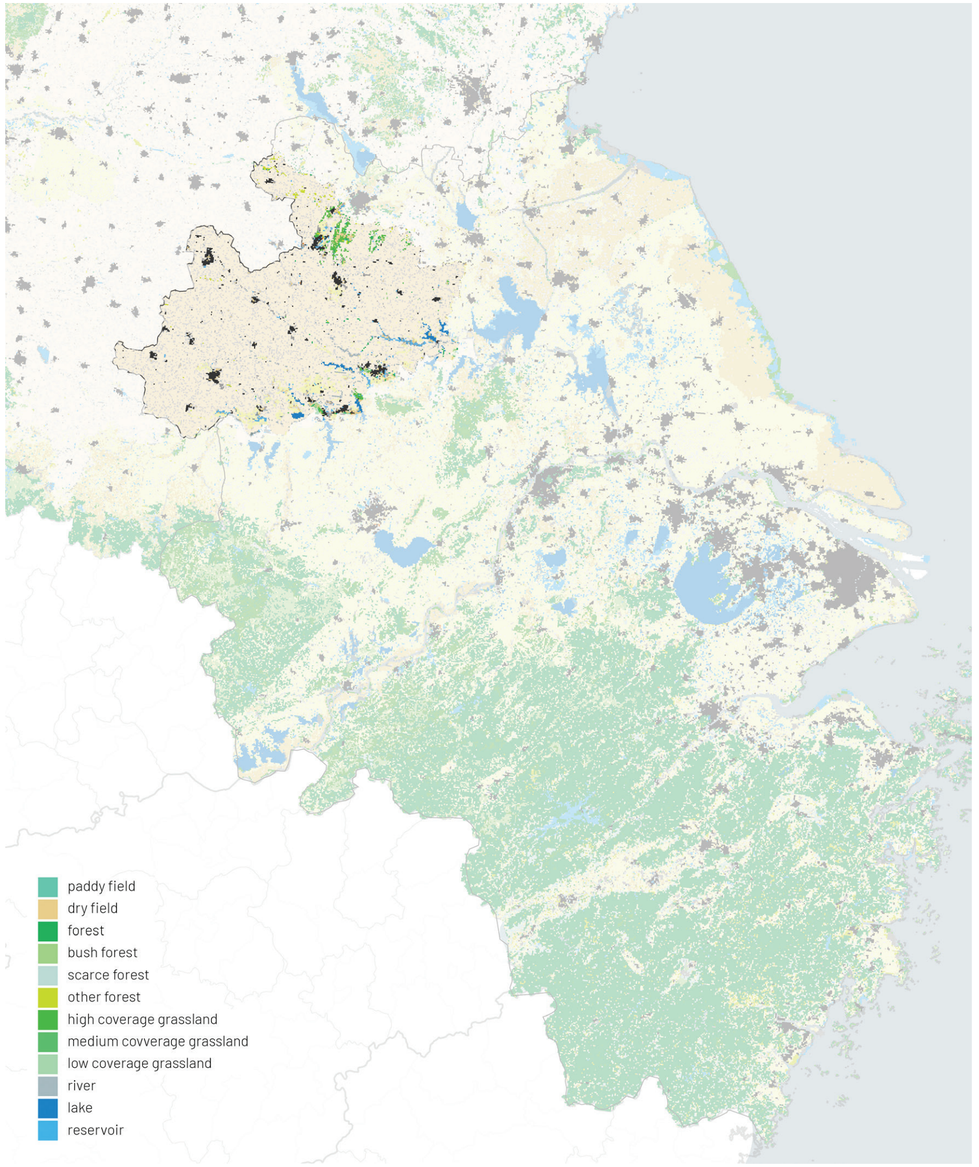


Fig 2.2 Land use remote sensing monitoring data source: author, based on data from RESDC

Sacrificed Periphery: Spatial and Social

Prefecture-level Cities in China: Secondary Cities

Secondary cities, or second-tier cities, are defined in the European context as non-capital cities, mostly medium-sized, "whose economic and social performance is sufficiently important to affect the potential performance of the national economy" (ESPON/SGPTD, 2012, p. 3). For the research purpose, the project uses the term "secondary cities" more generally and as academic term addressing not just second-tier cities (30 in total) but overall prefecture-level cities (337) in China.

Secondary cities are often neglected in regional study and planning. And second-tier cities face persistent disadvantages in comparison to first-tier cities. From the regional planning or urban agglomeration scheme of YRD or GBA, secondary cities are usually treated or appointed as supporter or leisure destination regardless of its intrinsic potential.

The size of these secondary cities in China can usually exceed a scale of 2-3 million people. The development possibility and strength embedded in the scale of city is too important to neglect or looked as affiliation. Several recent policy reports stress the need to invest in second-tier cities to rebalance territorial development and improve the national economic performance. With its geographical adjacency with big cities while relatively lower land price, secondary cities play important role in regional development if not more.

Secondary cities also play an important role as localized urbanization node absorbing migrants from surrounding countryside. This offers people a context with similar culture and shorter commuting distance. Yet due to the neglection of higher-level government, secondary cities do not receive as high-quality policy, public service assistance and economic development opportunities as big cities such as Beijing and Shanghai. These cities are now facing the dual pressure of population pressure and economic stagnation.

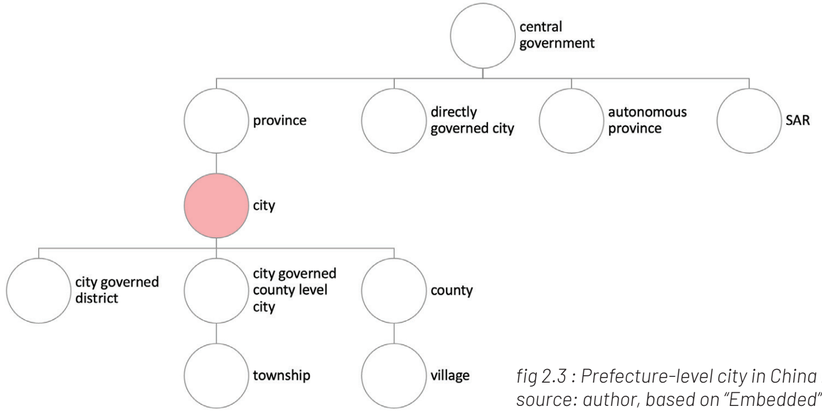


fig 2.3 : Prefecture-level city in China municipal system source: author, based on "Embedded" Power by Lan Xiaohuan

SPATIAL

The Core and Periphery model was developed in 1963 by John Friedmann, and it describes spatially how economic, political, and cultural authority is spread out in core and periphery regions. The Core-Periphery model works on many scales, from towns and cities to a global scale.

In China, the city region has emerged as an important form of regional development and governance. However, the dynamics of spatial inequality in city regions are misunderstood. Qin (2021) examines the Yangtze River Delta (YRD) to determine the spatiotemporal evolution of regional inequality across prefecture-level municipalities from 1990 to 2018. It finds that regional inequality has steadily increased since the 1990s but has declined somewhat in recent years. This is associated with faster growth and higher upward mobility of central regions in the early reform period and increases in the upward mobility of the periphery in recent years. The gradient-distance curve of the Shanghai-centered economy sharpened and then flattened, indicating the polarization of growth in the core regions, followed by the diffusion of development and improved regional integration.

However, the core-periphery remains stronger within provinces between provincial capitals and other regions. Despite regional integration and peripheral development, the problem of spatial exclusion and core-periphery structures persists. More attention needs to be given to the core-periphery relationship and the development of peripheral regions to promote regional integration and reduce spatial polarization.

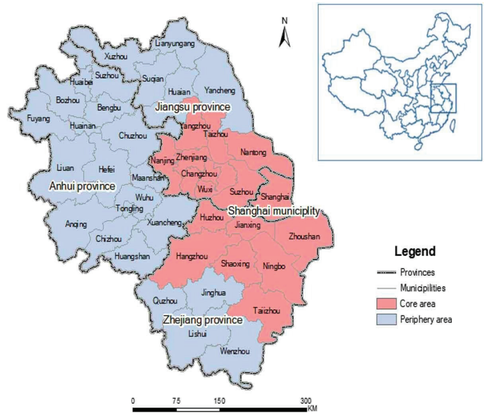


fig 2.4 : Location and geography of YRD, China source: Xianhong Qin, Yehua Dennis Wei, Yangyi Wu & Xu Huang (2022)

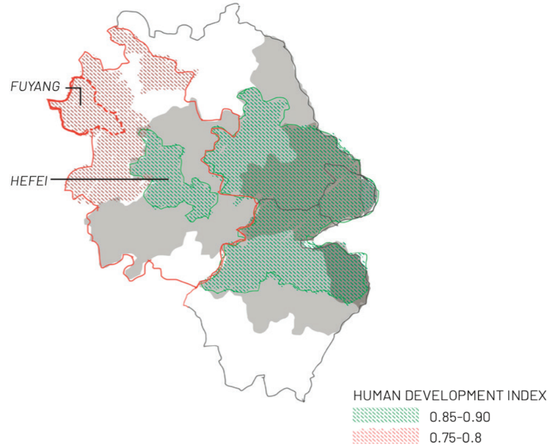


fig 2.5 : development inequality in Yangtze River Delta source: author, based on UNHDI report 2020

SOCIAL

Urban rural dichotomy is the biggest feature when describing the rapid urbanization process in China over the past 40 years and it is also one of the key issues marking the underdeveloped reality of the case study area. There is huge income gap between the urban and rural population, as in the rural population have only one fifth of the urban counterpart's annual income. There is also huge gap in terms of individual development opportunity such as access to high-quality education, healthcare which are normally restrained in cities and further induce people to migrate into cities from country-side. To understand the mechanism leading towards the situation, we first need to look into land ownership system and Huji system (residence registration system) in China.

LAND OWNERSHIP SYSTEM

In ancient time, Chinese people were categorized into four categories in hierarchy: scholar/governor, farmer, workers, and businessperson. This recognition of the importance and social status of agri-culture/farmers remained the same even early stage of the new China. In ancient China, land be-longed to landlords. The peasants rented the land of the landlords and paid rents and performed corvée work. This system inevitably led to excessive annexation of land and the increasing concen-tration of land in the hands of a few landowners, resulting in an extremely unequal distribution of the means of production.

After the founding of New China, the Communist Party of China led the nation in implementing agrarian reform, abolishing the feudal and exploitative land ownership system of the landlord class and realizing "land for the cultivator", as in the land was owned by all people. With the completion of the socialist reform, China adopted the socialist public ownership system, and rural land was collectively owned and operated by village as entity, which played an active role in improving the infrastructure conditions of agricultural production, promoting agricultural science and technology, and increasing the original accumulation of industrialization.

The industrialization and reform of opening-up then further attracted people to move to cities. The huge demand of urbanization urged the reform of land transaction legislation, allowing urban land can be "purchased/rented" at a price with tenancy of 50 or 70 years and can be transformed into land use type as commercial, retail, industrial production and so on. In the meantime, rural land cannot be transacted or transformed in land-use. This limited the function and hence the production of rural area.

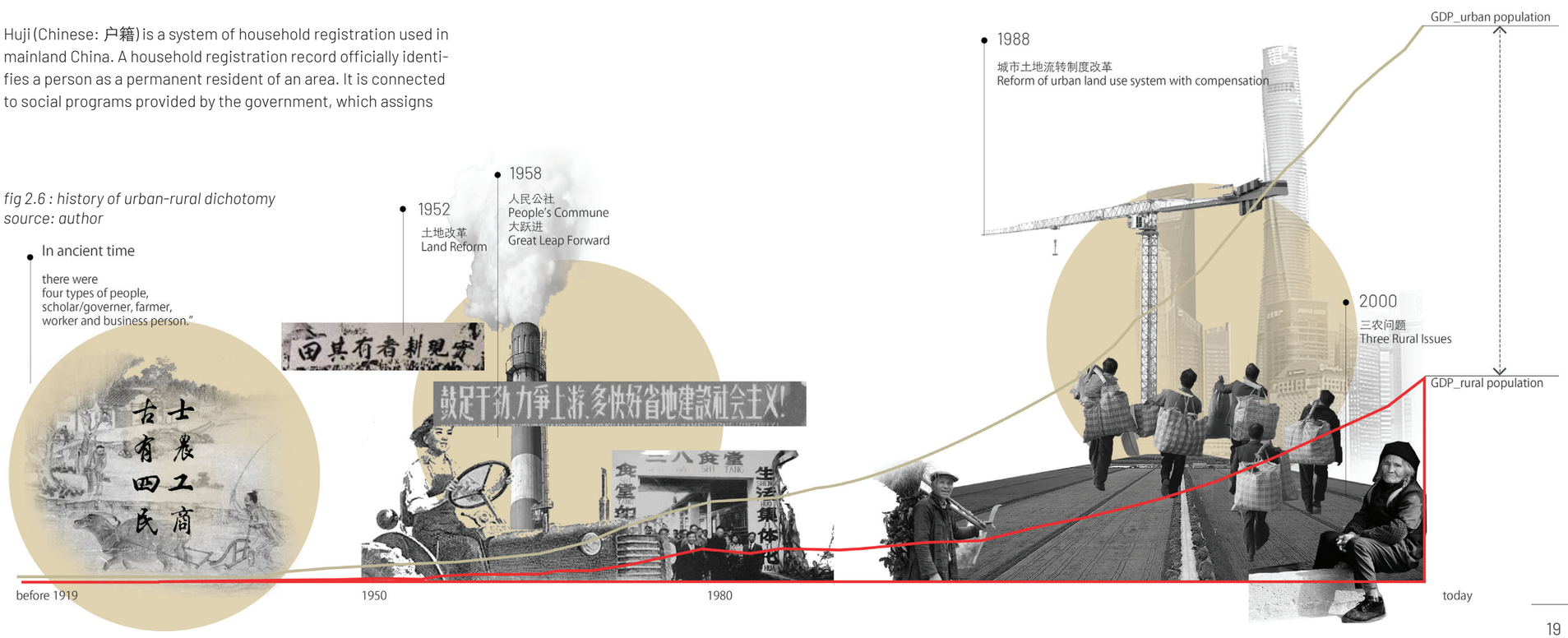
HUJI SYSTEM

Huji (Chinese: 户籍) is a system of household registration used in mainland China. A household registration record officially identifies a person as a permanent resident of an area. It is connected to social programs provided by the government, which assigns benefits based on agricultural and non-agricultural residency status (often referred to as rural and urban). It has been the source of much inequality over the decades since the establishment of the People's Republic of China in 1949, as urban residents received benefits that ranged from retirement pension to education to health care, while rural citizens were often left to fend for themselves. In recent years, the central government has begun to reform the system in response to protests and a changing economic system, while some Western experts question whether these changes have been of substance.

CONCLUSION

The land ownership system together with Huji system constrain farmers within rural areas. Lack of service like job education and job fair make them even harder to have a better life. Farmers in underdeveloped rural areas like north Anhui is a typical case. With very low income and later the pension being only ¥200 ($35) per month or even no pension at all, we can say that rural population are the one who bears the stability of the country while undergoing the most severe unequal treatment.

fig 2.6 : history of urban-rural dichotomy
source: author



Current Spatial Feature

Loose & Homogeneous Network of Small Cities

The city network characteristic of the North Anhui area, comprising six cities, is best described as a loose and homogenous network. Unlike some urban systems that exhibit a clear hierarchy and distinct division of labor among cities, the North Anhui city network lacks a prominent city that dominates over others and doesn't demonstrate a well-defined specialization among its constituent cities. The following points elaborate on these characteristics:

Lack of Clear Hierarchy: The North Anhui city network does not exhibit a clear hierarchy in terms of city size, influence, or economic dominance. Unlike urban systems with one or more major metropolitan centers, the cities in North Anhui demonstrate a relatively equal level of importance, with no single city significantly overshadowing others. This absence of a dominant city indicates a more balanced distribution of economic activities and administrative functions across the region.

Homogeneity in Development: The cities within the North Anhui area share similarities in terms of their level of development and economic activities. They tend to have comparable infrastructure, public services, and industrial sectors. This homogeneity suggests a relatively balanced distribution of resources and economic opportunities across the region, with no city standing out as a specialized or dominant economic center.

Limited Division of Labor: Unlike city networks characterized by clear specialization and division of labor, the North Anhui cities do not exhibit distinct areas of expertise or specialization. There is no significant concentration of specific industries or sectors in any particular city within the network. Instead, economic activities and industries are more evenly distributed across the cities, contributing to a relatively balanced development pattern and a lack of clear differentiation in terms of city specialties.

Collaborative Relationships: The loose city network in North Anhui encourages collaborative relationships and cooperation among the cities. Due to their relatively equal standing and lack of a dominant city, the cities are more inclined to collaborate rather than compete. This collaborative approach allows for resource sharing, knowledge exchange, and joint initiatives for regional development.

Regional Integration: The absence of a clear hierarchy and division of labor promotes regional integration within the North Anhui area. The cities in the network often work together on regional development projects, infrastructure improvements, and policy coordination. This collaborative approach fosters a sense of shared identity and a focus on collective regional progress rather than individual city competition.

In conclusion, the city network in the North Anhui area is characterized by a loose and homogenous structure, lacking a clear hierarchy and distinct division of labor among its constituent cities. The absence of a dominant city and the relatively equal level of development contribute to a balanced distribution of resources and economic opportunities across the region, fostering collaboration and regional integration.

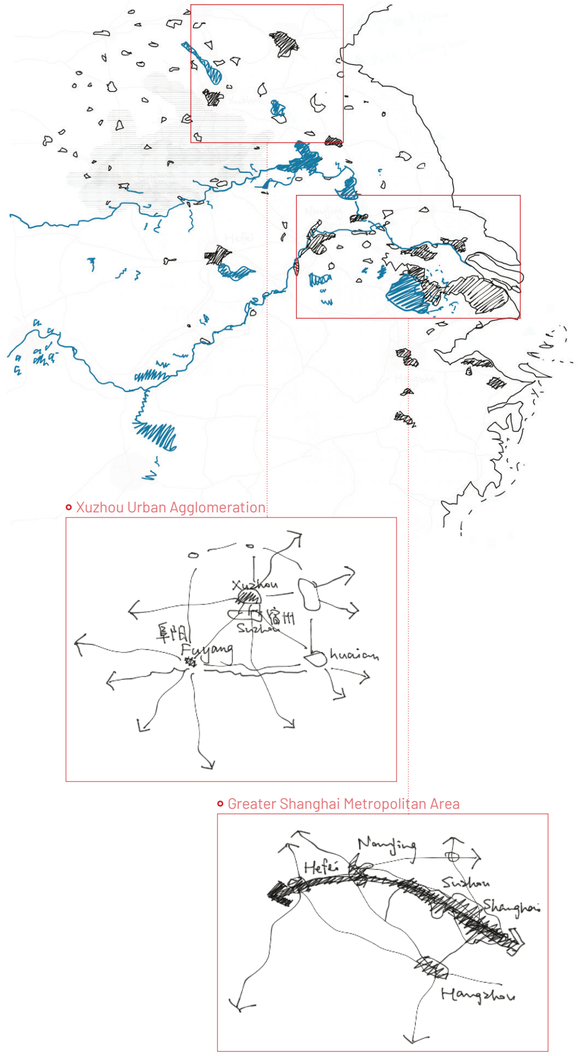


Fig2.7 Spatial System of north Anhui province
source: author

North Anhui, the underdeveloped YRD periphery

1 ECONOMY: provider of low value-add product to support core area

Despite the rapid growth and incredible development achievement of the Yangtze River Delta, there is severe gap and imbalance in terms of current development status and growth rate among all YRD cities. The 6 cities in north Anhui provinces have the lowest GDP per capita among all 41 cities in the YRD with a largest difference with the highest city of almost 5 times (see figure).

Despite the GDP, breaking down the GDP by three sectors, it is also noticeable that the primary sector take-up is relatively high. It is due to that North Anhui is appointed strategically by the central government as the crop production base for the entire country. The secondary sector is relatively low in share, and mostly focusing on low value-add and labor-intensive industries.

Typical industries in the region are agricultural production, coal mine and combustion electricity generation business and industry like telecom, metaling.

Meanwhile, the Two Huai Industrial Base, located in the northern part of Anhui province, holds immense significance for the local economy. However, the area also faces the threat of decarbonization, which can have significant implications. The following points discuss the significance of the Two Huai Industrial Base to the local economy and the challenges posed by decarbonization. The push for decarbonization and the transition towards cleaner and more sustainable energy sources pose challenges to industrial regions like the Two Huai Industrial Base. As global efforts to combat climate change intensify, there is a growing focus on reducing greenhouse gas emissions and transitioning to low-carbon industries. This transition can potentially impact the base's existing industries, particularly those reliant on fossil fuels and emitting high levels of carbon dioxide.

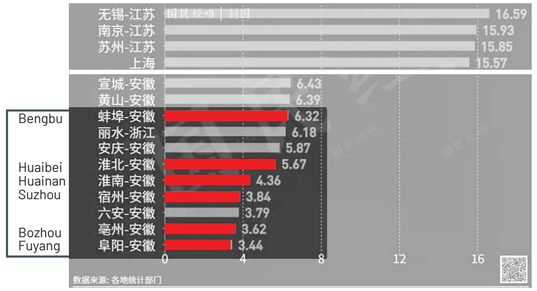


fig 2.8 Yangtze River Delta Prefecture-Level Cities GDP per capita (2020)
unit: 10,000 rmb
Source: Guo Min Jing Lue

city	Leading industry
Bozhou	Agriculture, agri by-product, telecom
Fuyang	Telecom, new material, new energy vihecles, high -end manufacture, new energy
Huainan	Equipment manufacture, telecom, new material, environmental protection
Huaibei	High-end metal material, fine chemicals, high-end manufacture, biology, bio-food
Suzhou	Agriculture, agri by-product, telecom
Bengbu	Metal smelting and rolling processing, biomedicine

fig 2.9 Leading industry of 6 cities (2021)
Source: National and Municipal Bereau of Statistic of China, drawn by author

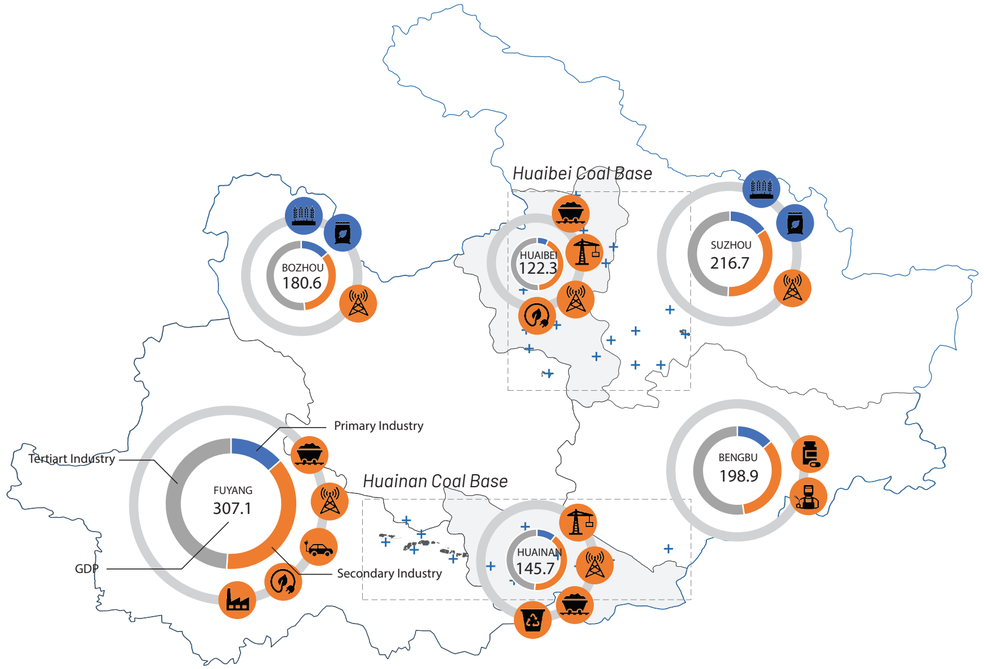


fig 2.10 GDP and key industries of 6 cities in North Anhui (2021)
Source: National Bereau of Statistic of China, drawn by author

2 ECOLOGY: bearer of the pollution left to the periphery

SOIL AND WATER POLLUTION

The severe heavy metal contamination in farmland in North Anhui can be attributed to the previous rough development of industries, inefficient land use, and a lack of effective management. Meanwhile, the water system in north Anhui rural area is also facing problem of pollution and eutrophication. Understanding the reasonging behind the issue, the following points highlight how these factors have played a role:

Rough Development of Industries: In the past, the industrial development in North Anhui might have been characterized by inadequate pollution control measures and the absence of proper waste management systems. Industries such as mining, smelting, metal processing, and manufacturing may have released significant amounts of heavy metals into the surrounding environment. Without adequate safeguards and pollution control practices, the contamination could have spread to nearby farmland.

Inefficient Use of Land: Inefficient land use practices, including improper zoning and insufficient separation between industrial and agricultural areas, can contribute to heavy metal contamination in farmland. If small-scale metal processing workshops were located in close proximity to agricultural lands without appropriate buffer zones, the potential for heavy metal pollution increases. Runoff, windblown dust, and emissions from these workshops can contaminate nearby farmland.

Lack of Management in Small-Scale Metal Processing Workshops: Small-scale metal processing workshops, commonly found as household businesses in villages and townships, may have operated without adequate environmental management practices. These workshops often engage in metal processing, fabrication, or recycling, which can involve the use of heavy metals like lead, cadmium, mercury, and chromium. Improper handling and disposal of metal waste, including the release of untreated effluents or improper storage, can lead to heavy metal contamination in the surrounding soil and water resources.

Absence of Proper Waste Disposal: The lack of proper waste disposal systems for industrial and household metal waste exacerbates the heavy metal contamination issue. Improper disposal methods, such as indiscriminate dumping or the use of open pits, can result in the direct release of heavy metals into the environment. Over time, these metals can leach into the soil and contaminate nearby farmland, posing risks to agricultural productivity and food safety.

LACK OF PUBLIC AWARENESS

In the research Investigation on China's Rural Water Pollution And Study On Treatment Countermeasures For Sustainable Development by XU Cheng-long et al., survey of the villagers' indicate that in terms of "residents' concern for ecological and environmental issues," "residents' knowledge of local water pollution," and "residents' contribution to water environmental protection," there are significant differences between residents in northern Anhui and those in the Shanghai suburbs. There is a significant difference between the residents of rural areas in northern Anhui and Shanghai, where the implementation of water pollution control and publicity is stronger and the results are better. For example, "Do you care about water pollution?" For example, 87% of Shanghai's rural residents chose "yes" to this question, compared to 39.9% in northern Anhui; and 20.2% of farmers in northern Anhui chose to spray a lot of pesticides for "how much do you use when weeding or removing insects? The answer to the question "How do you use pesticides in weeding and pest control", 20.2% of farmers in northern Anhui chose to spray a lot, 61.8% chose to spray low concentration pesticides, and only 9.8% chose not to spray, while no one chose to spray a lot and 28% chose not to spray in Shanghai. This indicates that there is still much room for development in the rural areas of northern Anhui in terms of publicity, education and concept development of water pollution and ecological agricultural production. This also has important implications for addressing rural farmland and water pollution management.

From the site visit, it is also noticable that many of the north Anhui household directly discharge household sewage to the nearby water and ditches. This can be because of lack of municipal sewage pipelines and processing facilities or villagers' unwillingness to pay for the sewage processing fee. Either way it points at the combinated problems of public education, lack of facility and management.

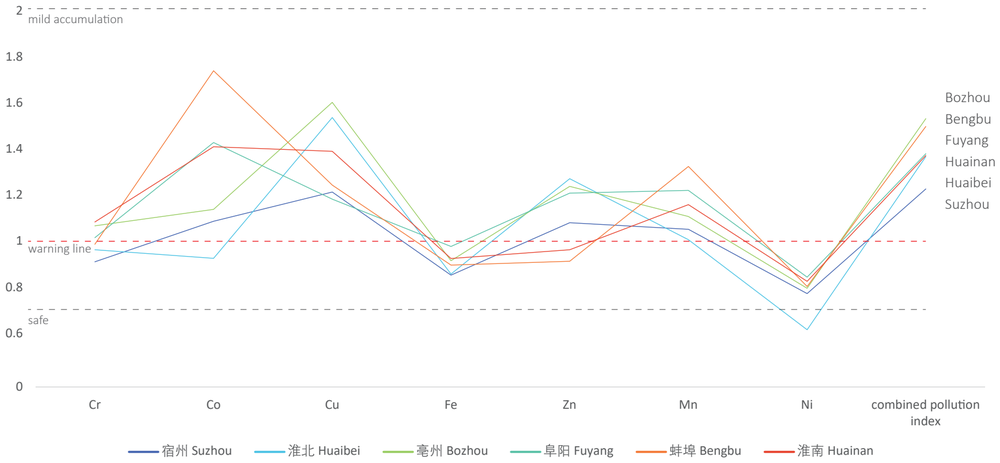


fig 2.11 Heavy Metal Pollution Index of Vegetable Fields in North Anhui
chart drawn by author
data source:[1]葛杨,方凤满,汪剑飞等.皖北农村零星菜地土壤重金属含量特征及污染评价[J].安徽师范大学学报(自然科学版),2021,44(03):244-249.DOI:10.14182/J.cnki.1001-2443.2021.03.007.

Eutrophication Of Waterbody

due to the direct discharge of farming and daily sewage, waterbody in north Anhui rural area has eutrophication status of various severity.

Direct Discharge of Daily Sewage

local villagers have the habit of washing clothes and prepare ingrediants like washing and defrosting in the washing table placed in the courtyard with direct pipeline discharging sewage to the river.

Lack of Management of Waste

Possible Solution: decentralized sewage plant

3 SOCIAL ASPECT: largest population out-flow

LARGEST POPULATION OUTFLOW AND RURAL DILUTION

North Anhui also undergoes large scale population outflow. Anhui is one of the highest populated provinces with a large proportion of migrant population outflow into other regions for work and living. In 2021, Anhui had a resident population of 61 million and a registered population of 71 million, with an overall outflow of 10 million. Top three migration destination for Anhui people is the other two provinces and the city in the Yangtze River Delta. For all cities in north Anhui, population outflow takes up around 20% of the Huji population.
While the core area enjoying the benefit of abundant and young labor force, this leads towards severe rural dilution. Thousands of houses being empty, leaving the old and toddlers behind. Scarce population cannot gain enough attention from the government and results in the lack of public service in rural area as a vicious cycle.

According to Chen and Yao, in recent 10 years, the rural dilution in north Anhui has been characterized with phased acceleration process. In the special context of urban and rural relationship, the combined action of urban system control and guidance, and rural system passive response promote the formation and extension of rural dilution.

If there are no more people, how can we develop the area? Hence it is vital for the project to look into what north Anhui people's need and towards what direction the area should evolve for people to stay or return.

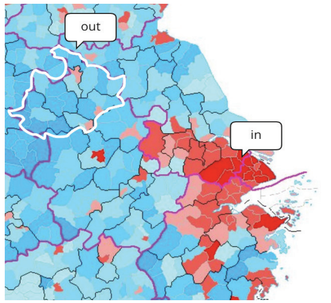


fig 2.12 China's in-and-outflow of population (2010)
Source: Zhi Hu

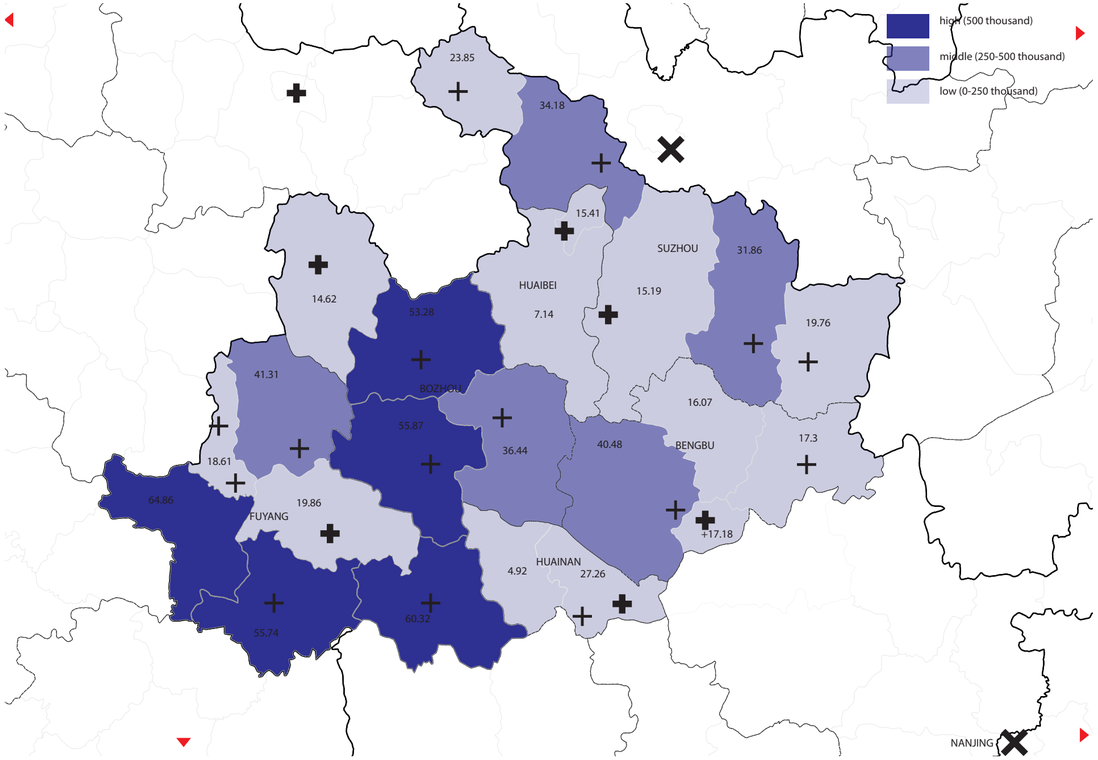
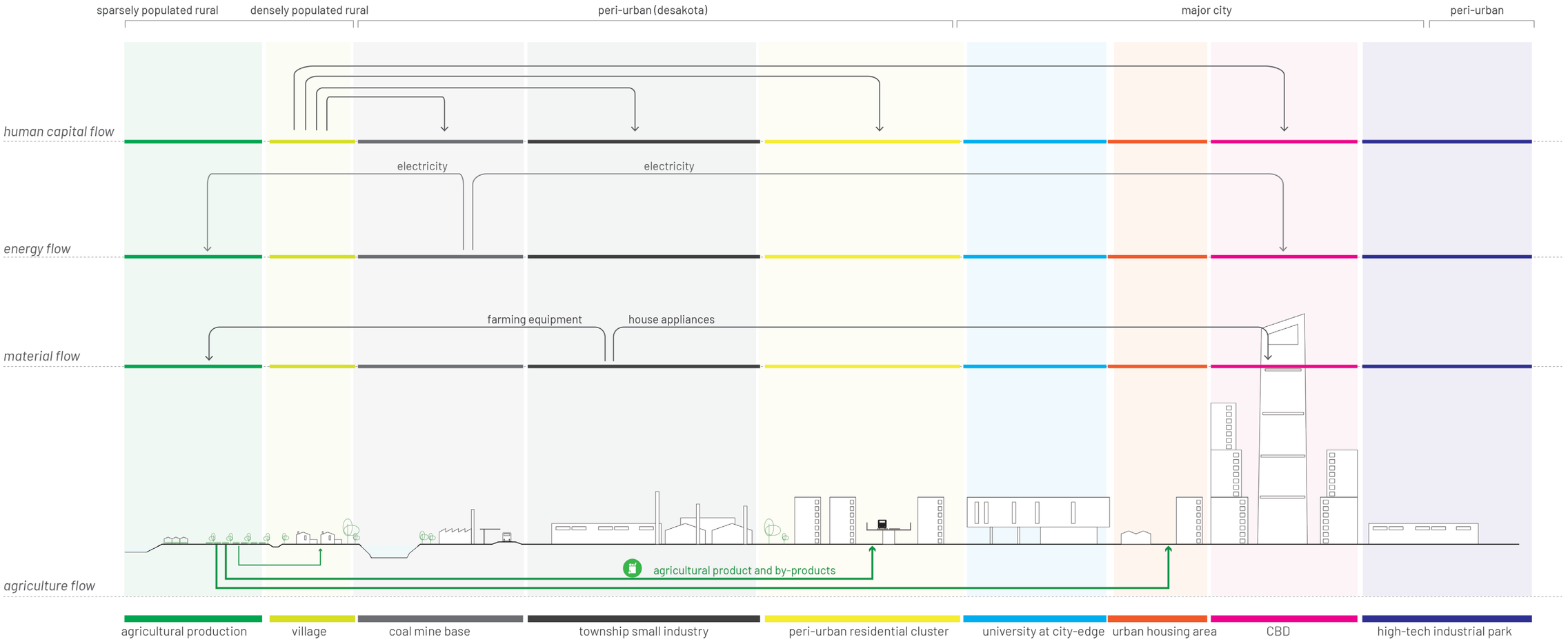


fig 2.13 population outflow county level (2020)
Source: Anhui Post, drawn by author

Problem Statement

The three problem of economically supplier of low-value add product to core area, environmentally bearer of pollution and socially supplier cheap labour has demonstrated north Anhui area as the deprived side of regional development. Looking at the problems from a systemic section, rural area in north Anhui is mainly the provider of food and cheap labour, while the industrial area in north Anhui supplies electricity and small household appliances and equipments. It is a one-way relationship and is difficult to complete the accumulation of resources required for industrial upgrading. It is difficult to develop such a region by relying solely on financial allocations and top-down policy guidance.



Circular Transition

On September 22, 2020, President Xi Jinping announced at the United Nations General Assembly that "China will strive to achieve carbon peaking by 2030 and carbon neutrality by 2060." As the world's largest emitter of carbon dioxide, this demonstration of China's strong commitment to decarbonization represents an important step forward in international cooperation on global warming.

Achieving carbon peaking and carbon neutrality is a broad and profound economic and social systemic change, and regional integrated development is one of the important ways to achieve the vision of carbon neutrality. As one of the regions with the most dynamic economy, the highest degree of openness and the strongest innovation capacity, the Yangtze River Delta region has gradually expanded its regional cooperation from economic cooperation at its initial establishment to a full range of cooperation covering ecology, science and technology under a sound institutional foundation and mature operation mechanism.

For north Anhui area, one of the key pillar industries is coal mining and processing. Decarbonization will certainly affect these industries and its related workers. How to properly utilize the brownfield, how can coal industry workers find new jobs are all among the challenges facing north Anhui in the next step of actual implementation of decarbonization.

fig 2.14: on July 16th 2021, Xi Jinping spoke on the APEC non-formal leadership: "China attaches great importance to addressing climate change."
source: CNR

Difference Between China's And European Circular Transition

TIME | 2060 in China (3060), 2050 in EU

CN: TOP-DOWN, POLICY, STATE INVESTMENT

The country is the largest greenhouse gas emitter in the world, so this is a significant commitment. To reach this goal, China is investing in renewable energy sources such as solar and wind power, as well as implementing measures to increase energy efficiency and reduce emissions from industry and transportation. China is also investing in carbon capture, utilization and storage technology as a way to reduce emissions from heavy industries such as steel and cement.

EU: POLICY-GUIDING MARKET APPROACH

European countries have set a goal to be carbon neutral by 2050. The European Union is a group of countries that have agreed to work together to reduce greenhouse gas emissions and tackle climate change. The EU is investing in renewable energy, energy efficiency, and low-carbon technologies, as well as implementing policies to reduce emissions from industry and transportation. The EU is also working to develop a carbon market to provide a financial incentive for companies to reduce their emissions.

In summary, both China and Europe have set ambitious goals for carbon neutrality and are taking similar steps to reduce emissions, but China has set a target date that is a little further in the future.

The different political systems and market mechanisms in China and Europe make it necessary to take special account of the differences in operating mechanisms and to make adaptations when discussing circular transformation, especially when using case experiences from the two regions.

03 Research Questions & Aims

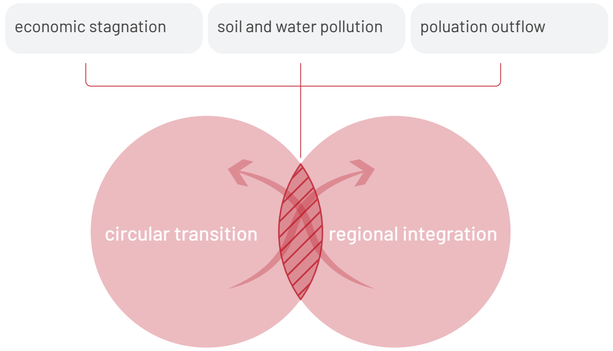
RESEARCH HYPOTHESIS

In the transition process of urbanization, developing a region like northern Anhui, the traditional use of its demographic dividend and vast land is no longer effective. This project proposes the hypothesis that, as urbanization enters the era of high-quality stock development, northern Anhui should actively take advantage of

1) China's economic transition to a circular economy, which provides new business and employment opportunities and allows for synergistic consideration of ecological and environmental issues, and the possibility of making systematic guidance and solutions to the three main development problems in northern Anhui;

2) the geographical advantage of finding the differences in positioning with the core areas of the Yangtze River Delta, and and to establish inter-city cooperation in a multi-systemic and multi-dimensional way through the coordination of higher-level management.

In order to fully exploit the opportunity, the synergy between circular transition and inter-city collaboration should be studies and explored through a systematic approach of urban theory, planning, design and governance.



hypothesis: synergy between circular transition and urban agglomeration

RESEARCH AIMS

Use the research of north Anhui area in Yangtze River Delta to identify development opportunity for peripheral region in the context of circular transition for wider range of imbalance development situation of the urbanization process of China.

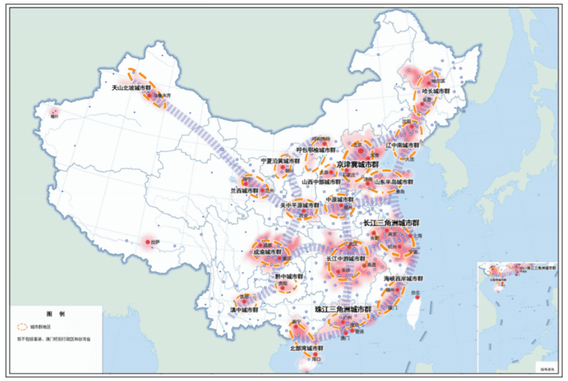


fig 3.1 19 Urban Agglomeration in China
source: Center for Regional and Urban Planning Research, Institute of Geography, Chinese Academy of Sciences

KNOWLEDGE GAP

How to utilize regional circularity development as an opportunity to develop peripheral area? In China, regional development scheme still largely focuses on economic growth and innovation in the core region, for the peripheral area, the understanding is still to "help", not to "integrate". Also, for circular development, current scheme mainly looks at it as a sustainable development goal instead a process. The potentials are not fully recognized from policy level and hence also the implementation level.

RESEARCH QUESTIONS

Main research question

how can place-based circular transition steer the sustainable development of north Anhui?

Sub research question 1

What resources and potential do north Anhui cities agriculture and related industry have in line with circular transition of Yangtze River Delta Urban Agglomeration?

Sub research question 2

What regional spatial planning and governance strategy are needed to build up regional circular transition?

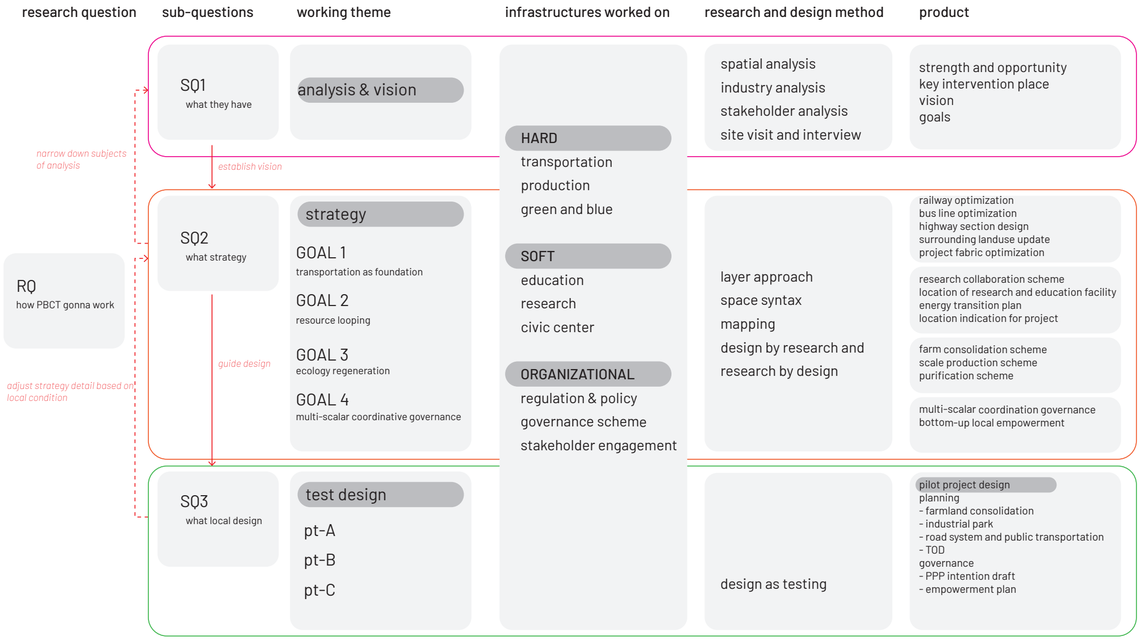
Sub research question 3

What corresponding spatial and engagement strategies at the local scale can secure the feasibility of the circular transition?

Fig 3.2 Typical North Anhui Village: Abandoned Houses and Diluted Villages
Source: ZhujiaBaixiaoSheng

04 Methodology

RESEARCH FRAMEWORK



exploration & problematization

desk research

P1

theoretical underpinning

literature review
mechanism summary

data collection / desk research

mapping
- infrastructure (railway, highway)
- industry location (wasted coal mine)
- education & innovation (higher education & research institute)
- natural resource (river, altitude)
- demography (migration, work labor, eduction status)
- urban/spatial configuration, fabric
- public service
- development scheme

power dynamic framework
- governance structure

quantitative analysis
- macro economic
- migration trend

VISION MAP V1.0
- regional spatial industry value chain planning

P2

Field Trip & Interview

cluster typology
- urban manufacturing
- innovation
- rural settlement
- county-level new industry

development potential pilot area
- combination of above

VISION MAP V2.0
[research by design | cross-examine] DRAFT

regional planning
- infrastructure
- nature
- new industry clustering

urban design
- pilot projects

P3

DESIGN

regional planning

spatial strategy

test field conceptual design

policy suggestion
- "NATO"
- nodality
- authority
- treasury
- organization

Report Writing

P4

RESEARCH QUESTIONS

Main research question

how can place-based circular transition steer the sustainable development of north Anhui?

Sub research question 1

What resources and potential do north Anhui cities agriculture and related industry have in line with circular transition of Yangtze River Delta Urban Agglomeration?

Sub research question 2

What regional spatial planning and governance strategy are needed to build up regional circular transition?

Sub research question 3

What corresponding spatial and engagement strategies at the local scale can secure the feasibility of the circular transition?

METHODOLOGY

Sub research question 1
What resources and potential do north Anhui cities agriculture and related industry have in line with circular transition of Yangtze River Delta Urban Agglomeration?

Scale
regional, city level

Question definition
Network is a collaboration type of higher connectiveness, in which each actor mutually contributes and gains in return from the collaboration. To actively join the network, north Anhui cities need to identify their own strength and resources. Secondary cities, though previously neglected in regional study and planning, actually can contribute uniquely to building towards an integrated region.

Methods to be applied
Mapping
Case study (history and spatial impact of big events)
Space Syntax (angular choice analysis)

Resource and material
case study
National Statistics Bureau of China and local government: Annual Economic Development Report
Land-use plans
Baidu map POI
News articles and online platform
development scheme

Research objectives
The objectives are two parts: first is to identify what kind of industrial landscape will take place in the future in YRD, secondly is to determine resources and development potential of north Anhui cities in align with the industrial upgrade. Determine also the role of secondary cities in regional development.

Expected outcomes
City specialization industry and part in value chain
Potential location of industrial clustering

Sub research question 2
What regional spatial planning and governance strategy are needed to build up regional circular transition?

Scale
regional

Question definition
City collaboration can naturally form but could be more stable and stronger through schematic design and governance implementation.

Methods to be applied
Mapping
Stakeholder analysis
Policy analysis

Resource and material
Baidu map POI
development scheme
stakeholder interview
field trip

Research objectives
Based on existing industrial clustering location and the demand of industrial upgrade, select location for newly built, renovation or scaling up. Design governance to engage stakeholders actively on board for the implementation feasibility.

Expected outcomes
Infrastructure planning (based on reality, i.e., station adding suggestion, not totally new proposal)
Clustering location choice
Stakeholder engagement proposal
Policy suggestion (NATO)

Sub research question 3
What corresponding spatial and engagement strategies at the local scale can secure the feasibility of the circular transition?

Scale
city level, street block level

Question definition
For the development can be sustainable, north Anhui cities need certain spatial and social schematic design to attract and retain talents and offer better living environment for local people.

Methods to be applied
Mapping
Field trip
Research by design

Resource and material
Land-use plans
Baidu map POI
development scheme
field trip photograph and sketches

Research objectives
Through field trip and desktop research, identify building cluster typology and their potential for the future usage. Design spatial outcome based on planning strategy. Use the outcome to double check the strategy and make amendment if needed.

Expected outcomes
Urban design of several pilot projects

Interview Design

The topic is about the strategic positioning and development enhancement of the six cities in northern Anhui in the context of the integrated development of the Yangtze River Delta. According to the theory of urban economics, people are the core of urban development, so in the process of research and strategy design, the study of what attracts people to come and what makes them stay is crucial, and interviews are one of the ways to obtain information for this study. This interview is intended to understand two main aspects: 1) choice of residence: the decisive elements that influence the interviewees' choice of where to live; 2) the local area: the interviewees' understanding of the lifestyle of the city they live in, focusing mainly on the living space environment, the distribution of public services and the understanding of job opportunities and status.

The questionnaire was designed based on the research framework of the spatial equilibrium approach (Glaeser, 2008).

Location choice = income + amenities - housing costs - transportation costs

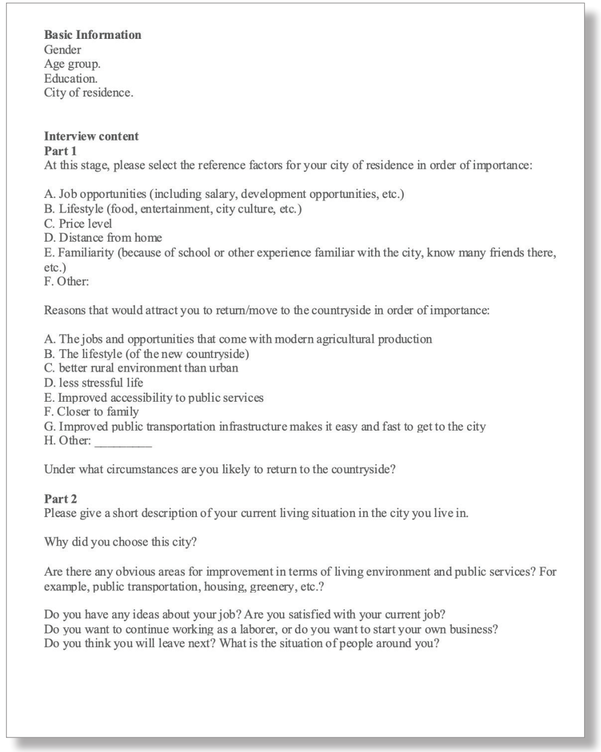
The questionnaire further specifies amenities as public services and business amenities, and transportation costs as commuting and distance to the family of origin.

Purpose of the interview

1. Understand the problem of current status from multiple stakeholders
2. Gather qualitative information and establish a solid ground to compare/synthesize key issues together with quantitative information

Chosen interviewee/stakeholder group

1. Urban residents
   a. Younger generation born there who now studies in other cities
   b. Middle age
2. Rural residents/farmer
3. Industrial worker/owner (small/rural/township factory)
4. Planning Experts



Basic Information
Gender
Age group.
Education.
City of residence.

Interview content
Part 1
At this stage, please select the reference factors for your city of residence in order of importance:

A. Job opportunities (including salary, development opportunities, etc.)
B. Lifestyle (food, entertainment, city culture, etc.)
C. Price level
D. Distance from home
E. Familiarity (because of school or other experience familiar with the city, know many friends there, etc.)
F. Other:

Reasons that would attract you to return/move to the countryside in order of importance:

A. The jobs and opportunities that come with modern agricultural production
B. The lifestyle (of the new countryside)
C. better rural environment than urban
D. less stressful life
E. Improved accessibility to public services
F. Closer to family
G. Improved public transportation infrastructure makes it easy and fast to get to the city
H. Other: _____

Under what circumstances are you likely to return to the countryside?

Part 2
Please give a short description of your current living situation in the city you live in.

Why did you choose this city?

Are there any obvious areas for improvement in terms of living environment and public services? For example, public transportation, housing, greenery, etc.?

Do you have any ideas about your job? Are you satisfied with your current job?
Do you want to continue working as a laborer, or do you want to start your own business?
Do you think you will leave next? What is the situation of people around you?

Field Trip Design

Location Selection

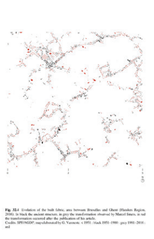
I choose Fuyang city and Linquan county (township & village) to as field trip destination. Fuyang City is the relatively most developed city among the 6 cities in north Anhui province. Linquan county is part of Fuyang and is known as the largest county by population. All cities share similarity in weather, industry types, governance hierarchy and culture. Moreover, since I am not clear about where to do the spatial design yet, I plan to gather information of typical elements and environment.

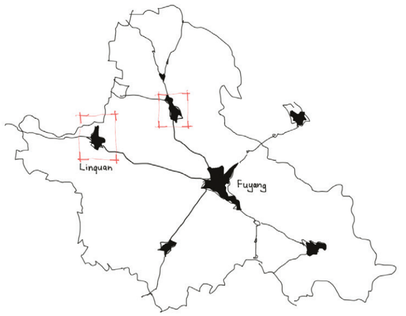
Expected outcome/product

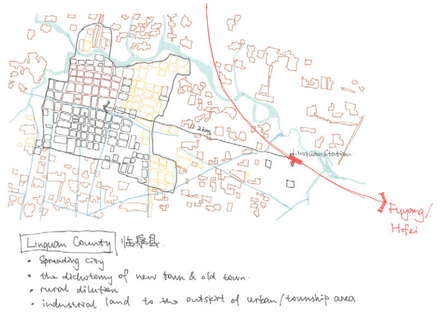
cluster typology: housing, factory, warehouse, commercial real estate | sketches
environmental quality | photography
stakeholder opinions | interview

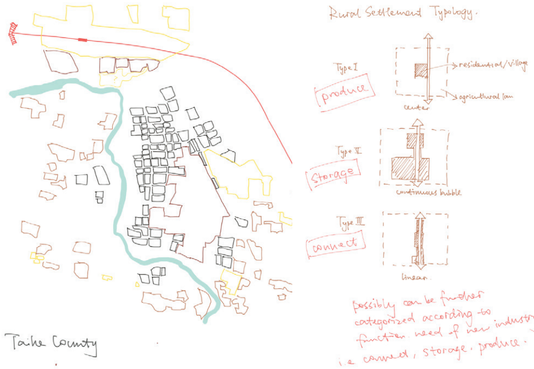
Field trip plan

Since the field trip goal is to collect enough material for typology instead of one specific area, I will first do desktop research to summarize and circle out destinations. Then, I will try online open source street view such as Baidu Street View or social media to see if I can save some work. After that, I will go for a half-day testing trip in suburban Shanghai and revise the field trip plan. Then is the actual field trip. Hooray! After the visit I will synthesize and visualize the typology of clustering for the further potential usage and design base on typology.









05 Theory & Conceptual Framework

Theoretical Underpinning

Place-based Circular Transition

BACKGROUND

Circular Transition as a development opportunity

The circular transition presents a compelling development opportunity for North Anhui Province. This region boasts several advantages that position it well for the implementation of a circular economy, including access to cheaper land and labor for recycling businesses and a rich agricultural base that can be leveraged to create relationships with industry. Additionally, the circular transition emphasizes ecological regeneration, which can help remediate the previous pollution caused by rough industrial development.

Compared to core cities in the Yangtze River Delta (YRD), North Anhui Province has distinct cost advantages in terms of land and labor for recycling businesses. As a result, this region can attract more recycling-related investment and innovation, potentially leading to the development of more sustainable and efficient recycling businesses. The availability of cheap land and labor can also provide a competitive edge in attracting industries that are seeking to reduce their environmental impact and adopt circular practices.

North Anhui Province also has a rich agricultural base, which can be utilized to establish relationships with industry. By developing partnerships between agriculture and industry, this region can create a closed-loop system that recycles and reuses materials, thus reducing waste and increasing efficiency. The assistance of innovation can further enhance the collaboration between agriculture and industry, facilitating the implementation of circular practices that can create mutual benefits for both sectors.

The circular transition also offers a unique opportunity for North Anhui Province to focus on ecological regeneration. This region has faced significant pollution issues due to previous industrial development, which can be remediated through the adoption of circular practices. By implementing strategies that prioritize ecological regeneration, North Anhui Province can reduce pollution, enhance environmental quality, and create a more sustainable future for its residents.

In conclusion, the circular transition presents a significant development opportunity for North Anhui Province. This region's access to cheaper land and labor for recycling businesses, rich agricultural base, and focus on ecological regeneration make it well-positioned to adopt circular practices that can lead to economic growth and environmental sustainability. Through strategic partnerships and innovative solutions, North Anhui Province can establish itself as a leader in the circular economy, driving sustainable development and creating a better future for its residents.

Regional Integration

The YRD regional integration development scheme can significantly boost the development of the North Anhui area. This scheme offers several advantages that can lead to economic growth, including the removal of obstacles to collaboration and support, the establishment of regional innovation networks, collaborative development opportunities through pairing cities, and business opportunities related to industrial transfer.

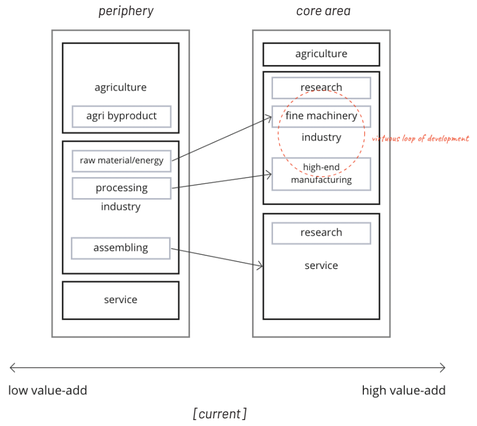
Previously, the North Anhui area faced difficulties in collaborating and receiving support from other parts of the YRD. However, with the implementation of the regional integration development scheme, such problems are no longer an issue. The scheme promotes collaboration and support among YRD cities, allowing North Anhui to benefit from the combined resources and expertise of the entire region.

Another advantage of the scheme is the establishment of a regional innovation network. North Anhui can leverage the innovation capacity of core areas in the YRD, such as Shanghai and Hangzhou, to enhance its own innovation capabilities. By developing collaborative relationships with these core areas, North Anhui can access cutting-edge technologies, research, and development, enabling it to develop innovative products and services and stay competitive in the global market.

Furthermore, the collaborative development opportunities offered by the pairing cities scheme can also benefit the North Anhui area. Through this scheme, cities within the YRD are matched with certain cities to jointly build industrial parks or other development projects. For example, Ningbo and Minhang district in Shanghai are matched with certain cities. These collaborative projects can lead to increased investment, job creation, and economic growth in the North Anhui area.

Finally, the scheme presents business opportunities related to industrial transfer. As the YRD develops, some industries may need to relocate from the core areas to surrounding regions, including North Anhui. This presents a unique opportunity for North Anhui to attract new businesses and investment, leading to job creation and economic growth.

In conclusion, the YRD regional integration development scheme offers significant opportunities for the development of the North Anhui area. With increased collaboration and support, access to a regional innovation network, collaborative development opportunities through pairing cities, and business opportunities related to industrial transfer, North Anhui can leverage the resources of the entire YRD to drive economic growth and development.



PUTTING AGRICULTURE IN THREE PROBLEM FIELDS

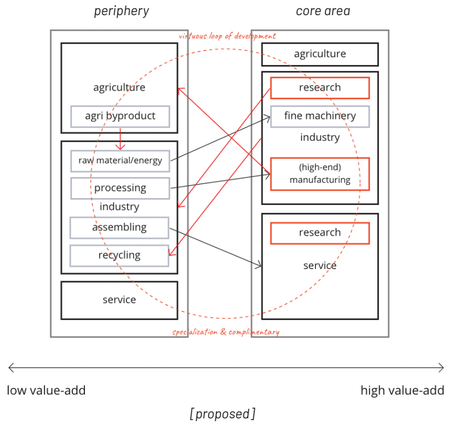
1)agro-industrial symbiosis

economy characteristic: agriculture, coal mine, small industry

The agriculture-industry symbiosis theory is a concept that describes the interdependence of the agricultural and industrial sectors in modern societies. The theory suggests that the two sectors can work together to achieve greater economic, environmental, and social benefits.

In this theory, agriculture and industry are seen as complementary systems that can share resources, knowledge, and technologies to achieve sustainable development. For example, agricultural residues such as straw, sugarcane bagasse, or livestock manure can be used as feedstocks for industrial processes such as biofuels, biochemicals, or biomaterials. Conversely, industrial byproducts such as waste heat, carbon dioxide, or nutrients can be recycled and used in agriculture to enhance crop productivity, soil fertility, and water efficiency.

The agriculture-industry symbiosis theory has gained attention as a way to promote circular economy, reduce waste and emissions, and enhance resource efficiency. It also highlights the need for cross-sectoral collaboration, innovation, and policy coherence to overcome the challenges of food security, climate change, and rural development.



2) regenerative agriculture
tecologic status: contaminated farmland soil and village river
Regenerative agriculture is a holistic approach to farming that aims to improve soil health, enhance biodiversity, and increase ecosystem services, while also producing healthy and nutritious food. Regenerative agriculture goes beyond sustainable agriculture by actively restoring degraded soils, building soil organic matter, and sequestering carbon in the soil.

Regenerative agriculture offers an alternative way to look at production and ecology. Instead previously changing ecology into productive land, it proposed productive-land-as-ecology. Through multiple intervention approach, can local ecology and agriculture better integrated.

The principles of regenerative agriculture include:

1)Minimizing soil disturbance: Regenerative agriculture practices avoid or minimize tillage, which can damage soil structure, disturb soil biota, and release carbon into the atmosphere. Instead, farmers use techniques such as no-till, strip-till, or reduced tillage, which maintain soil cover and minimize soil disturbance.

2)Maximizing soil cover: Regenerative agriculture practices aim to keep the soil covered with living or dead plants, mulch, or cover crops. This helps to reduce erosion, conserve soil moisture, and support soil microbiota.

3)Agroforestry and perennial crops: Regenerative agriculture practices include the integration of trees and perennial crops into agricultural landscapes. This can help to improve soil health, sequester carbon, and provide additional ecosystem services such as shade, wind protection, and habitat for wildlife.

4)Regenerating ecosystem services: Regenerative agriculture practices aim to restore and enhance ecosystem services such as pollination, pest control, and nutrient cycling. This can lead to reduced reliance on external inputs such as fertilizers and pesticides, and increased resilience to environmental stressors such as climate change.

Overall, regenerative agriculture principles focus on building healthy, functioning ecosystems that can sustainably produce food while also improving environmental health and promoting social equity.

3) distributive justice in rural area
social status: deprived rural population
In the context of rural development, the principles of distributive justice can be applied in a directive manner to ensure that resources and benefits are fairly distributed among rural communities. This can involve policies and programs that address the unique challenges facing rural areas, such as access to healthcare, education, and economic opportunities.

One example of how distributive justice can be applied in rural development is through the promotion of regenerative agriculture practices. By encouraging the adoption of regenerative agriculture principles, rural communities can improve soil health, increase biodiversity, and enhance ecosystem services, while also producing healthy and nutritious food. This can help to create more sustainable and resilient rural communities, where farmers and rural residents have access to the resources they need to thrive.

Other examples of directive applications of distributive justice in rural development might include policies and programs that provide access to affordable housing, healthcare, and education, as well as initiatives that promote economic development and job creation in rural areas. By prioritizing distributive justice in rural development, policymakers and planners can help to create more equitable and sustainable communities, where all residents have access to the resources and opportunities they need to lead fulfilling lives.

Circular transitionand regional integration development plan can serve together to provide a multi-systemic solid development opportunity for north Anhui region.

With the circular transition and regional integration serving as foundation, three theories from each of the three problem fields are proposed.

THEORY FOR SPATIAL INTERVENTION

Infrastructural Urbanism by Stan Allen
Stan Allen's concept of infrastructural urbanism emphasizes the importance of infrastructure systems in shaping urban form and function.

Hybridization: One of the key elements of infrastructural urbanism is the hybridization of different types of infrastructure systems, such as transportation, energy, water, and telecommunications. By combining these systems and creating more efficient and resilient urban networks, cities can become more adaptable and sustainable.

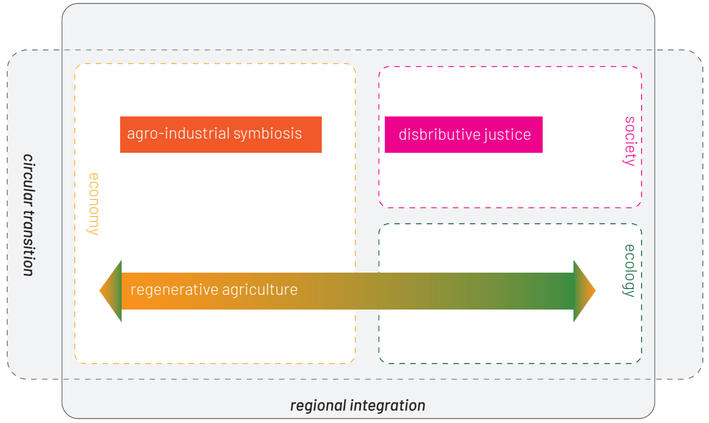
Incremental growth: Another important element is the idea of incremental growth, which means that cities should be built in a way that is responsive to changing conditions and needs, rather than relying on top-down approaches and fixed master plans. This approach allows for greater flexibility and adaptability in the face of changing circumstances.

Adaptation: Allen argues that urban infrastructure should be designed to be adaptable and responsive to changing conditions, rather than being fixed in place. This means designing infrastructure that can be easily modified or repurposed as needed.

Multiscalar thinking: Allen emphasizes the importance of thinking about infrastructure systems at multiple scales, from the neighborhood to the region. By designing infrastructure systems that work together in a coherent and effective way across different scales, cities can be more efficient and sustainable.

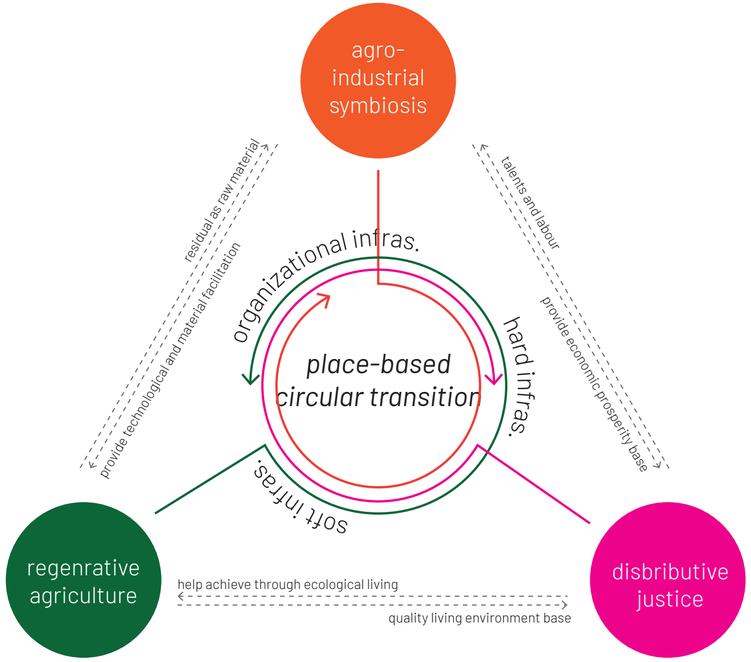
Ecological thinking: Allen advocates for a more ecological approach to urban infrastructure, one that takes into account the natural systems and processes that underpin urban life. This means designing infrastructure systems that work in harmony with the natural environment, rather than disrupting or damaging it.

Infrastructure as a design opportunity: Finally, Allen argues that infrastructure should be seen as a design opportunity, rather than a necessary but unremarkable component of urban design. By approaching infrastructure as a design challenge, cities can create more interesting and innovative urban spaces.



[theoretical framework]

Conceptual Framework

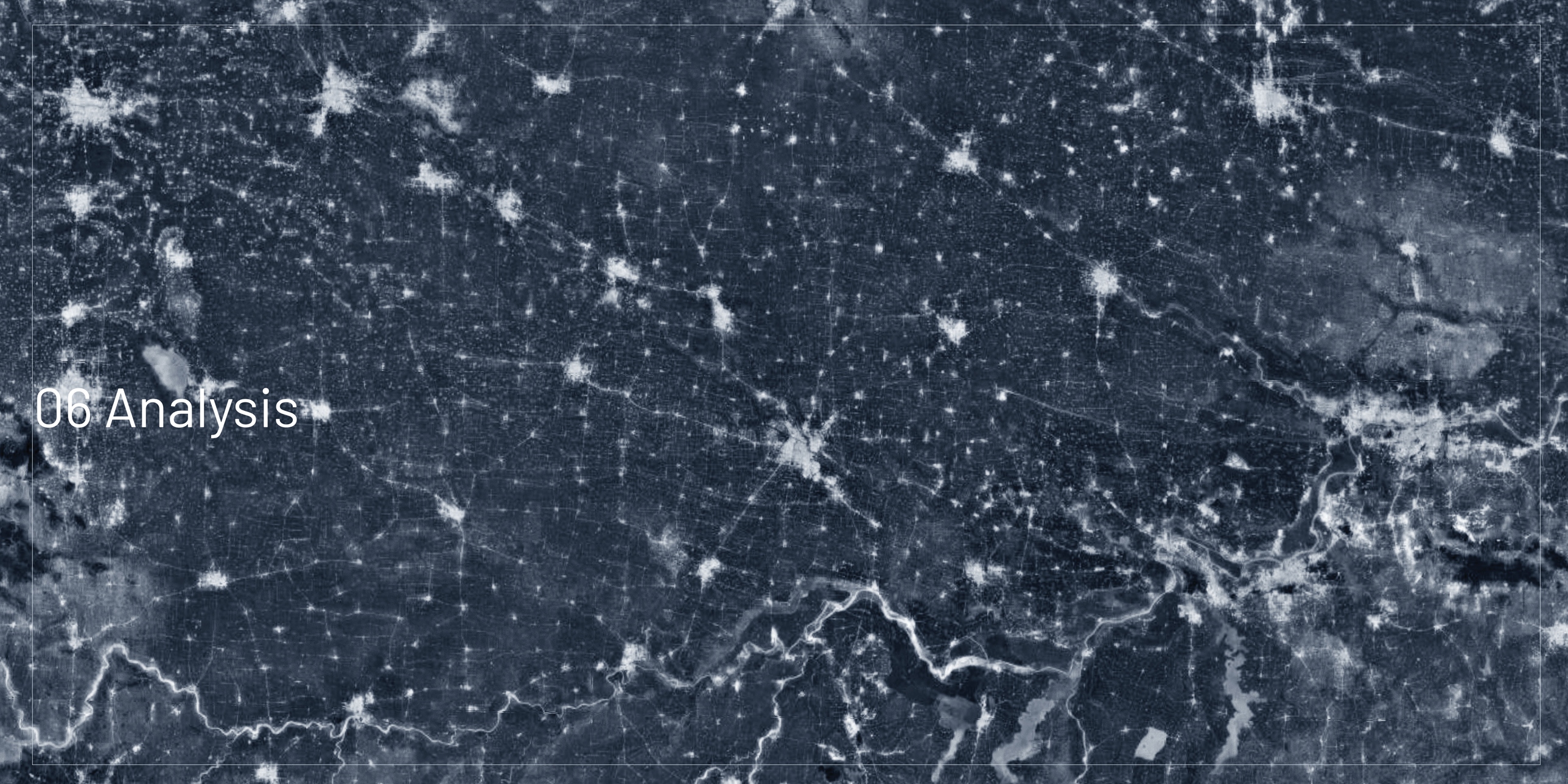


[conceptual framework]

For a region like North Anhui province, top-down and subsidiary development planning and policy prove their incapability in the past decades. In order to generate sustainable development capacity from the place and for the place, general concept "place-based circular transition" is proposed, aiming at utilizing what endogenous resources of the area and setting up strategies accordingly. In order to realize the concept, general design strategy at practical level "infrastructural circularity" is proposed on the basis of Stan Allen's infrastructural urbanism concept and Jo Williams' three strategy of circular transition. It is a systems-oriented, multi-scalar and incremental approach of circular transition foundation building. It focuses on how to create "direct fields" where agriculture-industry symbiosis, regeneration of ecology and distributive justice can "play themselves out" (Allen, 1999) through hybridization and adaptation of hard, soft and organizational infrastructure.

The way two main part of theory, Stan Allen's infrastructural urbanism and Jo Williams three pillars of circular development are combined in the following principle.The three pillars of circular development serves as a clear and comprehensive guidance for the direction of circular transition. However, it lacks an understanding and emphasis of place like many other discourses and theories in the field of circular transition which may result in a possible failure in the practicing field of large regional scope such as the case study area, north Anhui province, in the context of Yangtze River Delta integration development scheme. That is why Stan Allen's infrastructural urbanism is introduced into the conceptual framework in that it offers a good way of looking at space and place from a scope of infrastruture, as in all these spatial elements and regime related to space are foundations for events to take place if well designed and distributed. The practicality of Stan Allen's theory well fill in the gap of Jo Williams' theory. The combination of the two theories, place-based circular transition, is thus made for a balanced principle of both visionary and practicality for the according strategy setting.

The main principle of place-based circular transition points to the requirement of understanding local condition and develop place-situated strategies through the three kinds of infrastructure, hard infrastructure, soft infrastructure and organizational infrastructure, as the synthesis of systems related to circular transition from the scope of regional planning. Strategies will then be set according to the three theme of the conceptual framework, agro-industrial symbiosis, regenerative agriculture and distributive justice, answering directly and accordingly at the three main problems: economic stagnance, environmental pollution and large population outflow. These three themes also serve for the feasibility for each other. The arrows shown in the diagram are suggestions of possible relationship between the themes.



06 Analysis

step 1

Define the analysis aspects and scale

The analysis will first look at the overall spatial configuration as the canvas of urban and rural activities. The project starts the exploration with central space theories and the theory of desa-kota together with inter-system section drawing and analysis based on (agricultural) land price theory. These theories do not 100% fit into the Chinese context, so the use of them are altered according to reality.

We also need a framework to start evaluating and analyze city capacity or competitiveness. Urban asset bundles framework by Docherty is a relatively comprehensive and full-process, management-aspect understanding of city competitiveness. It breaks down the assets of city into four parts, legacy, hardware, software and orgware, which covers a wide range from industrial and commercial legacy, location, infrastructure, amenity to political leadership. And it is a more MECE (mutually exclusive collectively exhaustive) one, good for analyzing the city assets.

From the list, the analysis so far has been done are listed as follows:

Existing economic base 'legacy'
- -Industrial and commercial legacy
- -Location

Hard or tangible assets 'hardware'
- -Communications infrastructure
- -Cityscape
- -Talent/human capital
- -Education and R&D institutions

Soft or intangible assets 'software'
- -Public and business engagement in government and civic society

Organizational assets 'orgware'
- -Structure and capacity of local institutions
  - Vision
  - Sense of direction
- -Political and professional leadership

However, since I am more from a spatial urban planning background, in my project I will still use space as the core analysis element. Hence the analysis will start with urban agglomeration spatial configuration as a canvas. And the chapter will be organized also as the same structure. Then I will use SWOT mappings to conclude the problem and opportunity of the case study area.

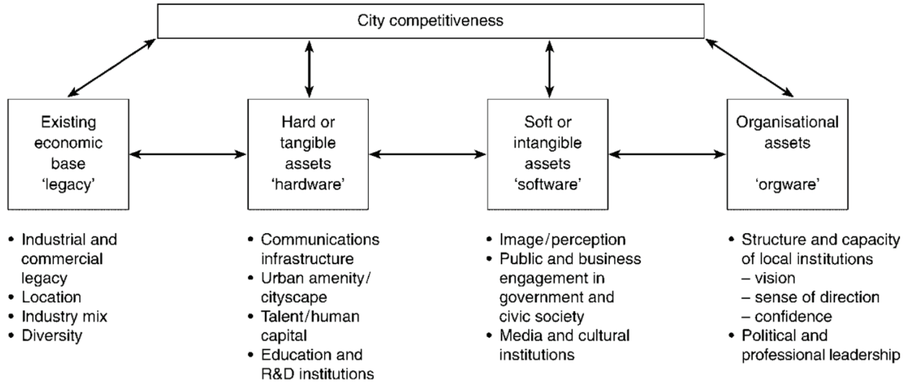


Fig6.1 Urban asset bundles
source: Docherty et al., Exploring the Potential Benefits of City Collaboration

step 2

Urban Agglomeration as Canvas

Understand Case Study Area Spatially: Central Space Theory And Desakota

The following theories in urban economy/regional economy help establish the basic understanding towards the relationship between production and space, intercity division of labour and industrial landscape for the project: Christaller's central space theory, land rent theory, and desakota by McGeeTo understand that we need to know the reason behind spatial pattern and phenomenon such as urban growth and shrinkage, series of space. In this project I mainly use central place theory on top of land price theory to understand the location of type of space and how hierarchical urban network emerges and thus possibility to alter. Desakota will be additional theory to adjust urban system in the context of China.

Central Place Theory

Christaller explained in Central Place Theory that a large number of small settlements will be situated relatively close to one another for efficiency, and because people don't want to travel far for everyday needs, like getting bread from a bakery. But people would travel further for more expensive and infrequent purchases or specialized goods and services which would be located in larger settlements that are farther apart. The result of these consumer preferences is that a system of centers of various sizes will emerge. Each center will supply particular types of goods forming levels of hierarchy. In the functional hierarchies, generalizations can be made regarding the spacing, size and function of settlements.

Applying central place theory to the case study area we can find out that it does have formed hierarchical urban system (see fig), but the number, configuration, and pattern per se do not really fit into the Christaller version of central place theory model. Moreover, there are continuous peri-urban belts surrounding some of the big cities. And McGee's research of Desakota is an efficient supplement to the understanding of formation of case study area's regional intercity network structure.

Land Rent Theory

Another theory/concept from urban economy contributes to the research of case study area's spatial foundation is land rent theory. The bid rent theory is a geographical economic theory that refers to how the price and demand for real estate change as the distance from the central business district (CBD) increases. It states that different land users will compete with one another for land close to the city centre. This is based upon the idea that retail establishments wish to maximize their profitability, so they are much more willing to pay more for land close to the CBD and less for land further away from this area. This theory is based upon the reasoning that the more accessible an area (i.e., the greater the concentration of customers), the more profitable. It helps form a horizontal understanding of relationship between different kind of places in a region.

Desakota

China has undergone several top-down large-scale political propaganda and policies which affected largely the special pattern evolvement process in China such as the rise of township small-to-medium-size enterprises in early 1980s among agricultural land use. Mix of land-use in suburban area around cities in Asia were identified as desakota by McGee in 1991. Ginsburg(1991) and McGee (1991) have argued that the classical urban models are not directly transferrable to Asian urbanization patterns and processes. Firstly, the rural–urban boundary is not as clear in Asian urbanization, since densely populated rural areas with a mixture of agricultural and nonagricultural activities are common. Secondly, expansion of these areas and the population growth in situ are not driven by suburbanization but by the local growth of manufacturing. And thirdly, residential buildings and light weight manufacturing units exist simultaneously in these areas. Mixed land-use types in these peri-urban areas are different from the primarily suburban areas of many Western societies. Thus, Ginsburg and McGee have advanced the desakota model to deal with the uniqueness of the urban patterns and processes of Asian urbanization (Ginsburg et al., 1991) McGee coined the term desakota from two Bahasa Indonesian terms — desa (village) and kota (town) — to stress the dual nature of urbanization process taking place in small villages and towns.

In addition to the general trend of spatial-economic changes, McGee defines three main desakota types according to various levels of economic drivers of the urbanization processes (Figure 2). North Anhui cities are more like type II desakota.

Type I means Asian countries, such as Japan or South Korea, that have experienced a rapid transformation of the spatial economy in terms of a rural-to-urban shift in population, although agricultural land use may remain quite persistent.

Type II includes countries, such as Taiwan or Thailand, that have experienced a decline of people in agriculture and a concurrent growth of small-to-medium-sized industries in rural areas.

Type III covers countries, such as China or India, that bear some spatial and economic resemblance to type II but are characterized by changes that occur due to high population growth and slower economic growth.

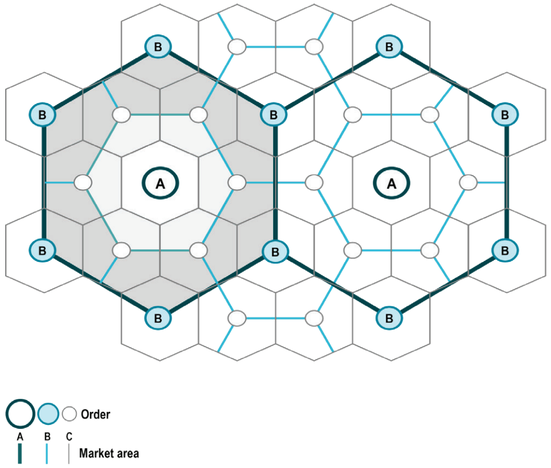


Fig 6.3 Diagram of Central Space Theory
source: The spatial organization of transportation and mobility, 2023

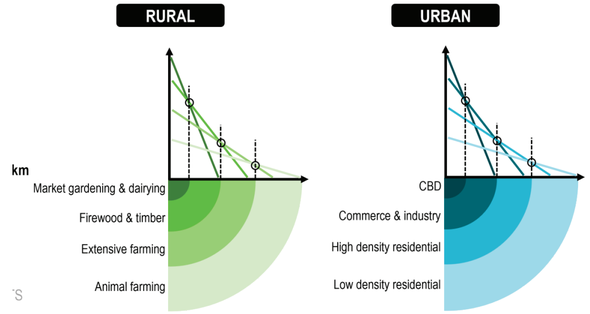


Fig 6.2 land rent theory
Source: Adapted from: Pászto V. (2020) Economic Geography. In: Pászto V., C. Jürgens, P. Tominc, and J. Burian (eds) Spationomy. Springer, Cham.

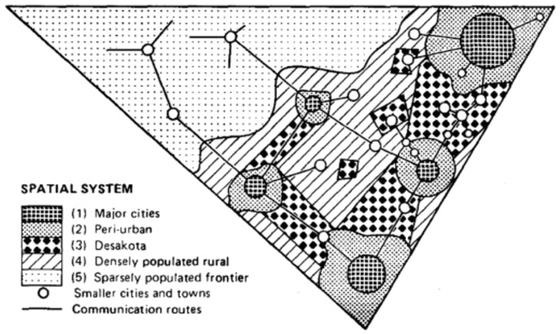


Fig6.4 Spatial System of Deskota in a Metropolitan Area
source: McGee, 1991

step 3.1

Existing economic base ‘legacy’

In 2019, the Yangtze River Delta region will have a GDP of 24 trillion yuan, accounting for 24% of the country’s GDP, and is the backbone of China’s economy. The total economic volume has been growing steadily. in 2000, the GDP of the Yangtze River Delta region reached only 2.2 trillion yuan, rising to 24 trillion yuan in 2019, accounting for 24% of the country (22% in 2000). the real compound annual growth rate of GDP in the Yangtze River Delta region reached 10.5% between 2000 and 2019, higher than the national average growth rate by 1.5 percentage points.

INDUSTRIAL STRUCTURE: CONTINUOUS OPTIMIZATION

During 2000~2019, the ratio of primary, secondary and tertiary industries in the Yangtze River Delta region gradually developed from 11:49:40 to 4:41:55, with significant optimization of industrial structure, among which the ratio of tertiary industries in Shanghai, Jiangsu, Zhejiang and Anhui increased by 21, 15, 18 and 18 percentage points respectively.

LEADS THE COUNTRY IN MANUFACTURING

In terms of industrial scale, the industrial operating income above the scale in the Yangtze River Delta region accounted for 26% of the country in 2018, which is 2 percentage points higher than its GDP share; among them, in terms of specific industries, the operating income of general equipment manufacturing accounted for 45% of the country, and electrical machinery and equipment manufacturing accounted for 42% of the country, with outstanding advantages.

From the perspective of major products, during the period from 2009 to 2018, the production of automobiles in the Yangtze River Delta region averaged nearly 5 million units per year, accounting for 21% of the country; the production of integrated circuits averaged 81 billion units per year during the period from 2015 to 2019, accounting for about half of the country, and the production of microelectronic computers averaged more than 100 million units per year, accounting for one-third of the country.

Typical industries in the case study area are agricultural production, agricultural by-product, telecom, equipment manufacture and metal processing industries.

INDUSTRIAL VALUE CHAIN FORMATION

Some industries in the region have gradually formed a complete industrial value chain.

From the perspective of the distribution of industries in the region, in terms of the national share of revenue of major industries in industries above the scale in 2018, Jiangsu Province has an outstanding advantage, with the national share of general equipment and electrical machinery and equipment manufacturing industries exceeding 20%. Relatively speaking, Shanghai contributed more in areas such as automotive and Anhui in electrical machinery and equipment manufacturing. From the three provinces and cities of the industrial industry composition and the distribution of listed companies can also reflect a certain degree of variability.

CARBON NEUTRALITY TRANSITION

Anhui 2017 to the production capacity of coal mines to fully stop production and exit capacity of 7.05 million tons. According to the person in charge of the Energy Bureau of Anhui Province, the province issued in June this year, “on the implementation of the work to resolve excess capacity in the coal industry in Anhui Province in 2017 to achieve the development of the implementation of the views”, plans to close the provincial and local coal enterprises mine 4 in 2017, respectively, the annual capacity of 4 million tons of Huainan Mining Group Xinzhuangz coal mine, the annual capacity of 1.2 million tons of Huabei Mining Group Daihe coal mine, the annual capacity of 1.4 million tons of Wanbei Coal and Electric Group Liuqiao a mine and 450,000 tons of Huaibei City Xinguang Group Jinshi Mining. Capacity of 1.4 million tons of the Wanbei Coal and Electric Group Liuqiao a mine and annual capacity of 450,000 tons of the HuaiBei City Xinguang Group Jinshi Mining.

It is understood that the above four coal mines to capacity has been completely shut down, exit capacity of 7.05 million tons. Huaibei Xinguang Group Jinshi Mining has ceased production at the end of April this year, and completed the shaft closure and filling in mid-July to achieve full withdrawal. Huainan Mining Group Xinzhuangzhi, Huabei Mining Group Daihe, Wanbei Coal and Electricity Group Liuqiao a mine and other 3 coal mines have also ceased production by the end of August, into the underground equipment asset recovery phase, are scheduled to close and fill the shaft by the end of November.

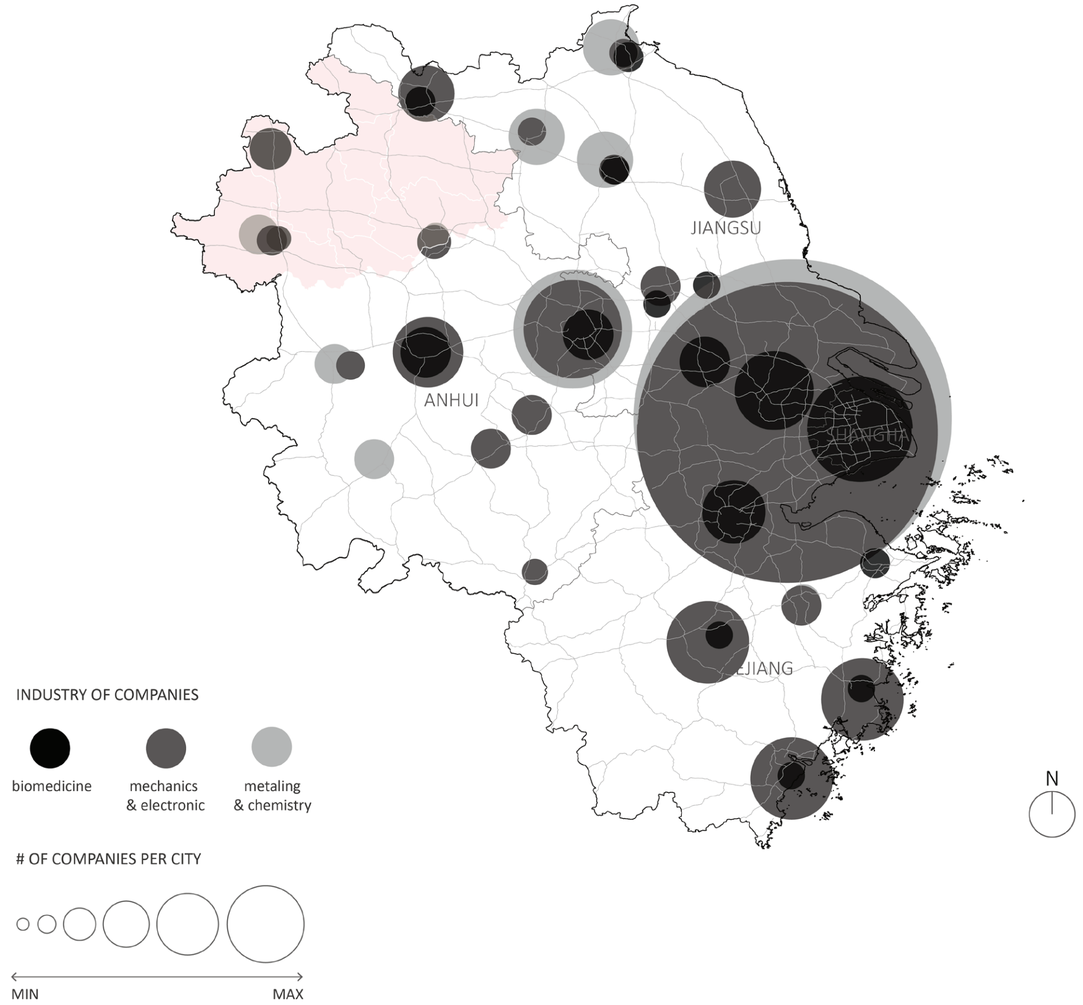
fig 6.5 Huainan Mining Group Xinzhuangzhi Coal Mine
source: baidu baike

fig 6.6 Image of Coal Mine Workers off work
source: baidu baike

SPATIAL DISTRIBUTION: INDUSTRY

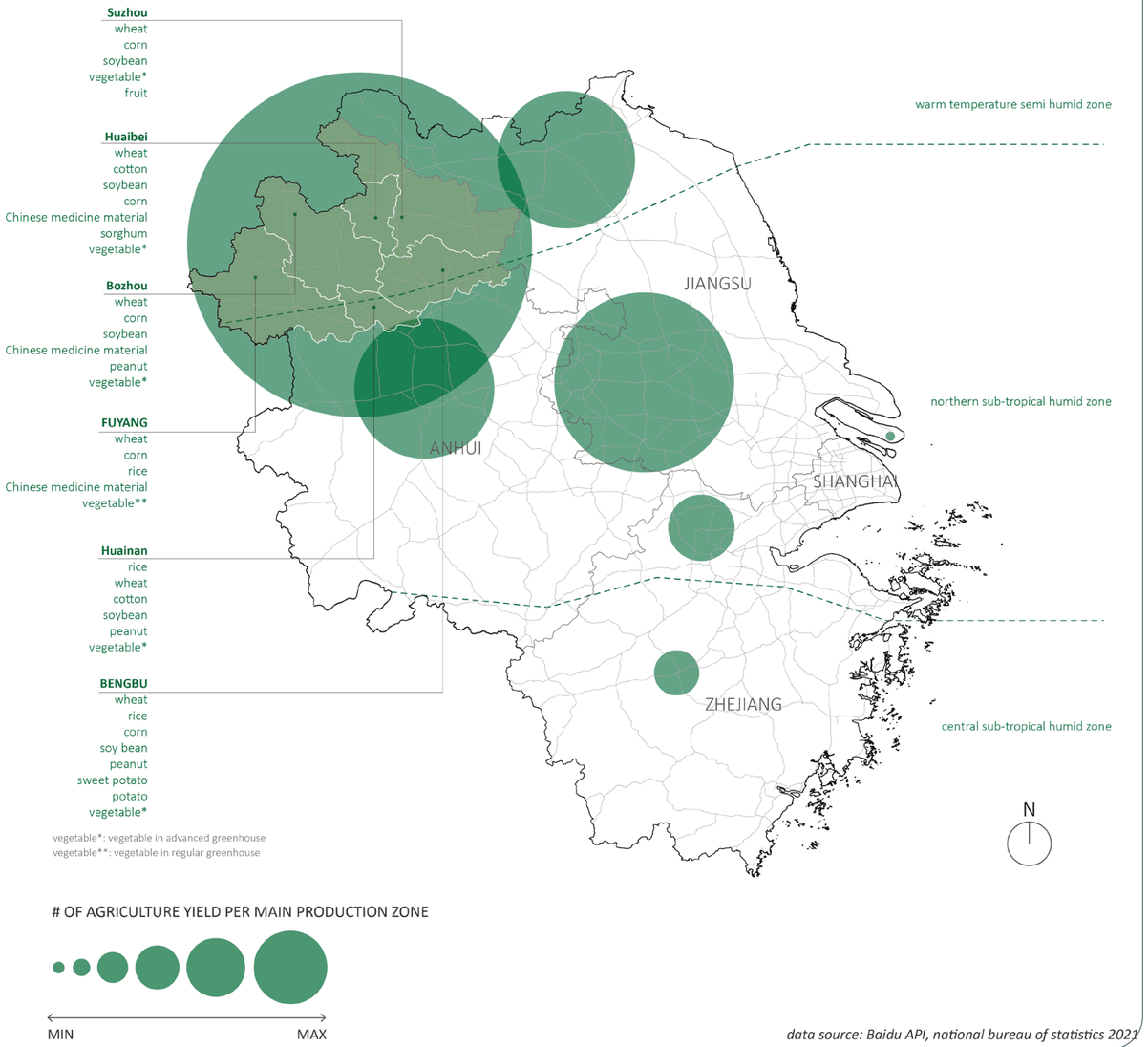
Industries in northern Anhui mainly focus on low value-added metal processing industry, home appliance industry and coal-fired power generation mainly from coal mines. By analyzing the poi heat map of three typical industries in the Yangtze River Delta (biomedicine, machinery and electronics, and metal chemicals), it can be seen that the main production center of gravity is still in the core area of the Yangtze River Delta with Shanghai, Suzhou, Hangzhou, and Nanjing as the leading cities.

In addition, from a certain degree of overlap in the specific spatial distribution of these three industries, it can be found that there is some correlation in the distribution of these industries. For example, biomedicine will not appear in a particular industry alone unless there is already a certain degree of local concentration of machinery and electronics or metal chemicals. This provides a certain reference for the future industrial development or transformation in northern Anhui.



SPATIAL DISTRIBUTION: AGRICULTURE

A large part of the industrial characteristics of the northern Anhui region is its agriculture as a major grain base in China. The transformation of circular economy for agriculture firstly needs to identify the main crops, production methods and distribution in the region. The poi of the distribution of agriculture-related companies shows that the main production of agricultural products in the Yangtze River Delta is concentrated in the northern part of Anhui. The six cities in northern Anhui are very suitable for growing grain crops such as wheat, corn and potatoes due to their location in the warm temperate semi-humid zone. At the same time, agriculture in northern Anhui also features the cultivation of Chinese herbs, mainly concentrated in Bozhou.



data source: Baidu API, national bureau of statistics 2021

step 3.2

Hard or tangible assets ‘hardware’

COMMUNICATIONS INFRASTRUCTURE

Same clustering pattern also applys to connection infrastructure: more stations and lines in the core YRD area. Within the case study area, Fuyang and Huainan are with higher connectivity among all 6 cities. With more future lines in Fuyang, it can be a regional node casting impact on the surrounding areas even towards Zhengzhou.

In the next five years, the Yangtze River Delta is expected to double its high-speed rail mileage to more than 10,000 km. Convenient intercity transportation and upstream and downstream clustering of industry chains will accelerate population movement. The three core cities of Shanghai, Nanjing and Hangzhou will continue to strengthen as regional focal points. Cities that are currently not connected by high-speed rail but have strong business ties, or regional hubs where high-speed rail lines are expected to increase in the future, are of particular interest.

Although it is also a provincial capital city, Hefei’s influence on neighboring cities is much less than that of Nanjing and Hangzhou. Among the top 50 lines with the highest traffic, only one line, Maanshan to Hefei, has Hefei as its working destination. However, in the next five years, the number of high-speed rail lines in Hefei will increase significantly, with at least six new lines using Hefei as a hub node, making it more convenient to travel between Hefei and neighboring cities.

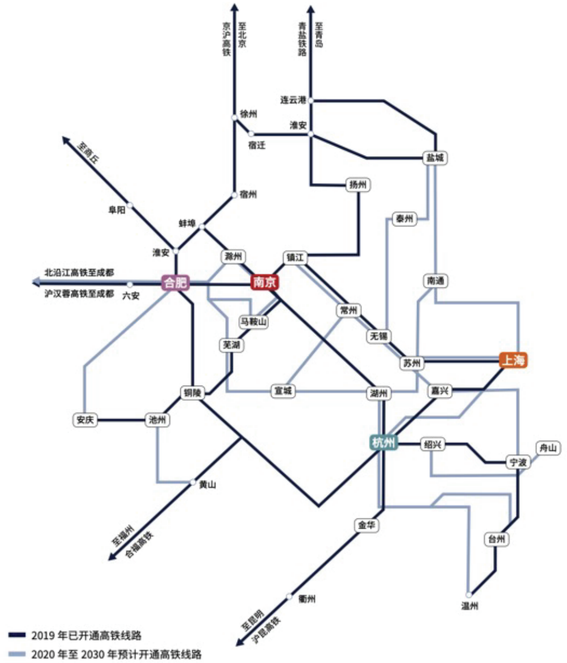


fig 6.7 YRD highspeed railway planning
Source: Cushman & Wakefiled

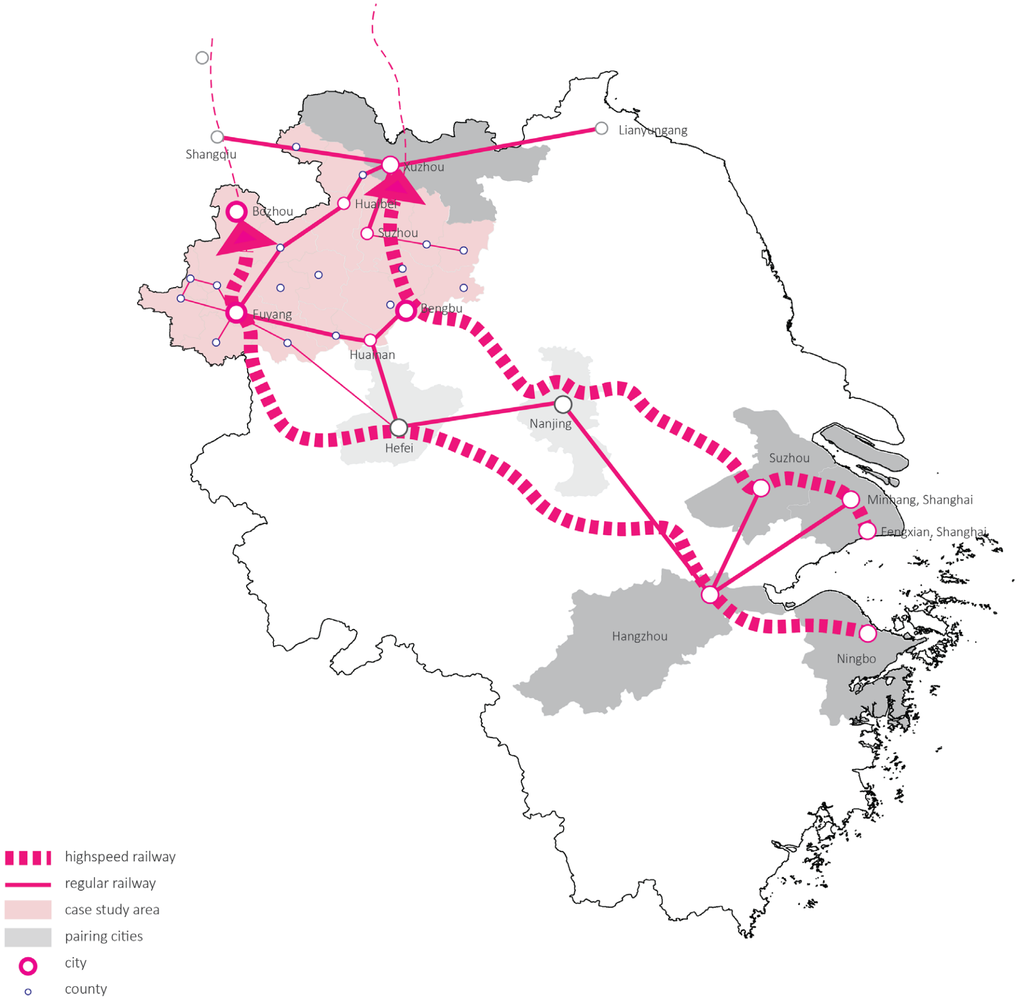


fig 6.8 YRD transportation accessibility
Source: drawn by author, data from baidu map open POI and openstreetmap

Soft assets ‘software’ | talent & human capital

EDUCATION AND R&D INSTITUTIONS

Education wise, universities are also concentrated in the YRD core. There are also three national-level universities and research institutes in the capital city Hefei, giving possibility of technology and innovation support.

National government also promotes a strategy called G60 innovation corridor in order to encourage the innovation collaboration in YRD. The “Yangtze River Delta G60 Science and Innovation Corridor Construction Program” announced on the official website of the Ministry of Science and Technology is clear: by 2022, the construction of the science and innovation corridor will show initial results, the construction of advanced manufacturing and strategic emerging industry clusters will be at the forefront of the country, the number of listed enterprises will increase by more than 100 per year, the number of high-tech enterprises will increase by about 3,000 per year, and the introduction of high-level talents, fresh college graduates and other types of talents will be no less than 200,000 per year; by 2025, the science and innovation corridor with international influence will be basically built, a number of world-class manufacturing clusters will be formed, and it will become an important source of innovation in China.

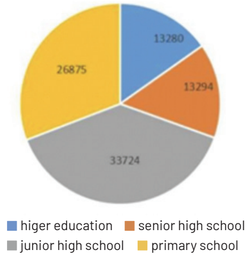


fig 6.9 Anhui Province’s education status (unit: people/100,000)
source: Anhui Government Annual Report

WEAKNESS

Education inequality:
The percentage of people with primary school education or below is relatively high in all six cities, indicating a potential education inequality issue that may need to be addressed.

Aging population:
Although the percentage of people aged 65 and over is relatively low in all six cities, it is still a significant portion of the population, suggesting that there may be a need to plan for healthcare and social services for the elderly population in the future.

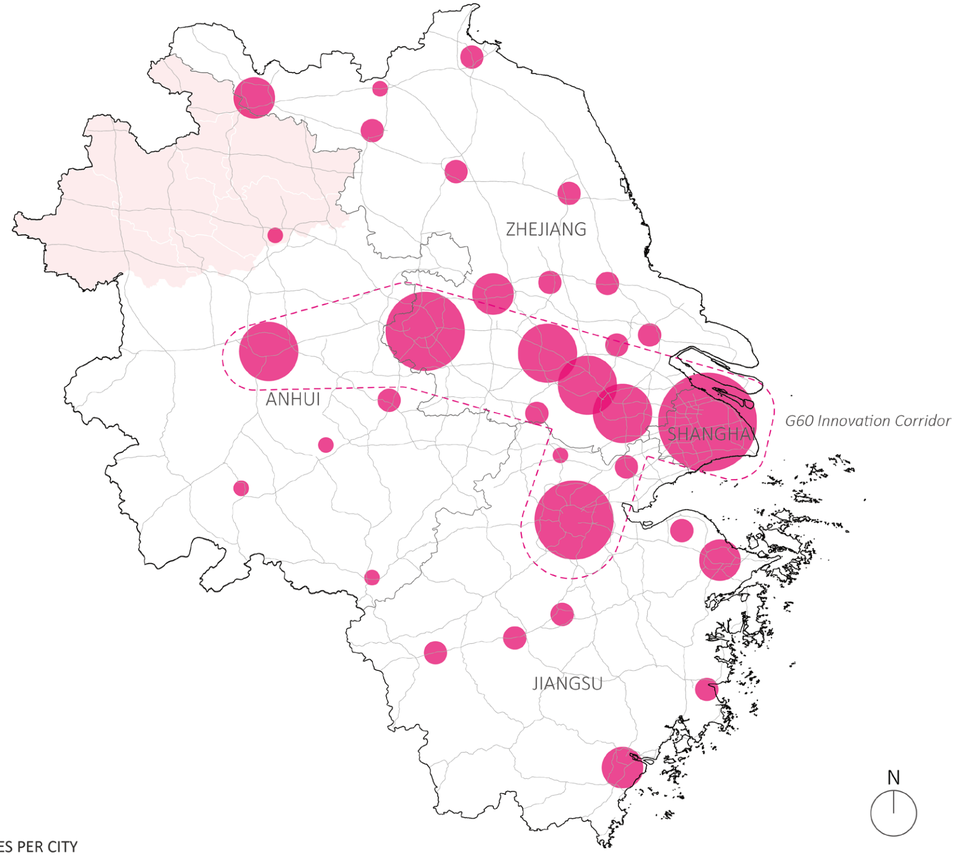
Potential for brain drain:
The percentage of people with college and above education is relatively low in all six cities, indicating a potential for brain drain as highly educated individuals may leave the region in search of better job opportunities elsewhere.

POTENTIAL

Potential for economic growth:
The high percentages of people in the 15-64 age group in all six cities suggest a potential for economic growth, as this age group typically represents the workforce and has the highest potential for productivity.

Potential for educational development:
The relatively high percentages of people with senior high school, vocational school, and college education in all six cities indicate a potential for educational development and a skilled workforce.

Potential for future healthcare demand:
The percentage of people aged 65 and over is relatively low in all six cities, suggesting a potential for future healthcare demand as this age group is likely to require more healthcare services.



OF R&D FACILITIES PER CITY

data source: Baidu API

step 3.4

Organizational assets ‘orgware’

STRUCTURE AND CAPACITY OF LOCAL INSTITUTIONS

Vision

Sense of direction

URBAN AGGLOMERATION AS POLICY

In this year’s 14th Five-Year Plan, the country has once again updated the deployment of urban clusters. At present, the development of China’s urban agglomerations has changed from the regional concentrated development mode of Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta to the coordinated development mode of 19 major urban agglomerations proposed in the 14th Five-Year Plan.

According to Chinese government and planning authority, urban agglomerations are expected to be groups of cities with network spatial characteristics formed within a certain geographical area based on the linkage mechanisms of transportation, population, industry and trade, with the central city as the core radiating to the surrounding area. Urban agglomerations are an important organizational basis and regional spatial pattern formed by the enhanced spatial role and close connection mechanism between cities after the urbanization process has entered an advanced stage.

Since the 11th Five-Year Plan, the strategic position of “urban clusters as the main body of urbanization” has been mentioned in several important documents. With the continuous improvement of urbanization level, the development strategy of China’s urban agglomerations and their influence on the evolution of the spatial pattern of urbanization have become increasingly significant. At present, the development focus of China’s urban agglomerations has changed from the regional concentrated development mode of the three major urban agglomerations of Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta to the coordinated development mode of 19 major urban agglomerations proposed in the outline of the 14th Five-Year Plan.

In terms of the development approach of urban agglomerations, the relevant policies have undergone a transformation from core city-driven urban agglomeration development to urban agglomeration development driven by synergistic development of metropolitan areas. Also, In the process of evolution from industrialization to informatization, the economic geography of the flow of various resource elements of people, logistics, information, innovation and capital has become a key force in reshaping the regional spatial strategy of urban agglomerations in the future. Moreover, upgrade of connection infrastructure (high-speed railway system, intercity public transportation and telecom infrastructure) is considered the key foundation of urban agglomeration construction. Hence, the national government is investing heavily into the construction of infrastructure.

In the future, what challenges need to be solved for the strategic transformation of China’s urban agglomerations include:
First, regional imbalance is still the primary factor limiting the development of China’s urban agglomerations. Second, the hindering effects of reverse population mobility and population aging are growing. Third, the lagging reform of the three major systems of household registration, land and social security has a significant hold-up effect. Fourth, the mechanism of administrative division adjustment and government function transformation is inflexible.

Affecting the case study area, there are majorly two urban agglomerations: Xuzhou urban agglomeration and Yangtze River Delta integration strategy. Since Xuzhou city in its capacity and competitiveness is not enough to carry the role as leader of such a large-scale urban agglomeration, the development of case study area will still mainly rely on the Yangtze River Delta integration scheme.

Positioning of “Yangtze River Delta Integration”: According to the Outline of the Plan (Yangtze River Delta Integration Plan/ Strategy), “Yangtze River Delta Integration” includes not only the “integration” of regional development, science and innovation industry, infrastructure, ecological environment, public services and other areas in terms of layout, construction, operation and management, but also the “integration” of reform, opening and other mechanisms and institutions.

Stakeholder Analysis
a case study of Fuyang City

The stakeholder analysis follows the basic framework of three scopes: public sector, private sector, and civic society.

Public sector, namely the government system in this case, refers to not only the government of each relevant cities but also its higher governmental level. In China, governance system is made up in a hierarchical way consisting of five levels in total: central-province-city-county (and county level city)-town. State-level strategic regional development program such as Yangtze River Delta Integration Project will cast profound influence on power dynamic and resource allocation within the administrative area. Also, the hierarchical system has an appraisal system which guarantee the overall conformance of decisions from the higher-hierarchy level.

In this case, Fuyang city is not getting enough policy attention from Anhui province government in terms that there is no synergetic development scheme regarding the city. In the meantime, due to China's political appraisal system, Anhui province naturally form a competitive relationship with Zhejiang province and Jiangsu province. Without regional integration scheme, it is unlikely to naturally form a collaboration model.

The private sector in Fuyang has majorly two parts closely related to the development: real estate and industrial sector. Real estate companies, like many places in China, contribute largely to the local economic growth to the local economy while resulting in high-rise low-quality gated community, eliminating street life and historical context. For the industrial part, there has already been some collaboration between Fuyang and Hefei as the function division. Also, the local government has put effort in the industry upgrade in supporting new technology start-ups following the growing trend of more and more people going back to the hometown and start own business after working in big cities for years. The effort can be further strengthened to exploit the trend and opportunity.

The further development fundamentally lies in the improvement of civic society in the power dynamic. For the civic society part, there is conflict between migrant workers in the city and the local citizens even though migrant workers contribute to the growth of local economy. Also, there is no sufficient institutional support formation in terms of villagers migrate into urban context, as in the urbanization process essence per se. Combined with the Huji system (municipality registration system), this points to the embedded risk of underutilized human resources and potential of even more imbalanced development of the region. For urban citizens, the land economy-based development caused street being too wide, disappearance of street life, and mono-function but high-density housing area. These may all lead to an unsustainable urban development.

CRITIAL TENSION

Competition not collaboration awareness between cities

Land-economy based urban development and low-quality urban space and land-use

INTERVENTION NEED

1. Spatial planning design and legislation with participation of multiple departments includes department of economy, transportation, and Housing and Construction

2. Policy support in guarantee and clarification of responsibility and goals of regional coalescion

3. Financial incentive for industry development and upgrade

4. Regulations to guarantee and support social mobility

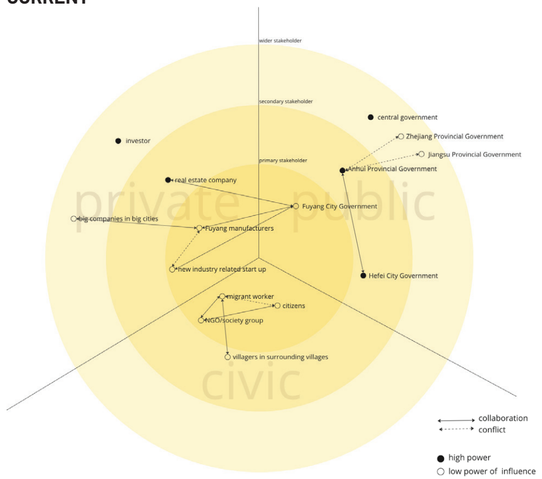
OPPORTUNITIES FOR ENGAGING STAKEHOLDERS

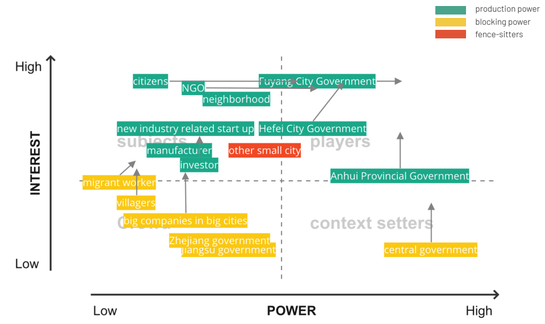
1. Trend of moving back to hometown for career development

2. Central government's plan of further development of the Yangtze River Delta region

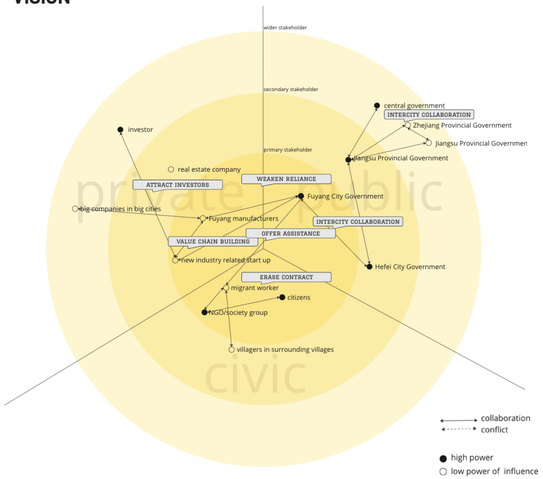
3. Land economy transition -> urgency of a more comprehensive multi-revenue stream urban development model

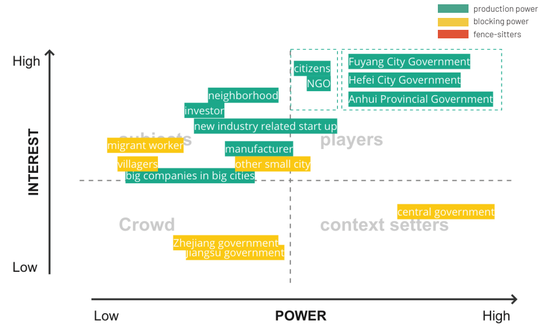
CURRENT





VISION





step 4

SWOT ANALYSIS AS CONCLUSION

S

- flat plain and enormous area of existing farm land
- relatively high mechanization rate (82.1%, 2021)
- skilled industry worker [industrial clusters]
- ample space for development = nature, living and industry = relieve urban pressure
- area potential for development

W

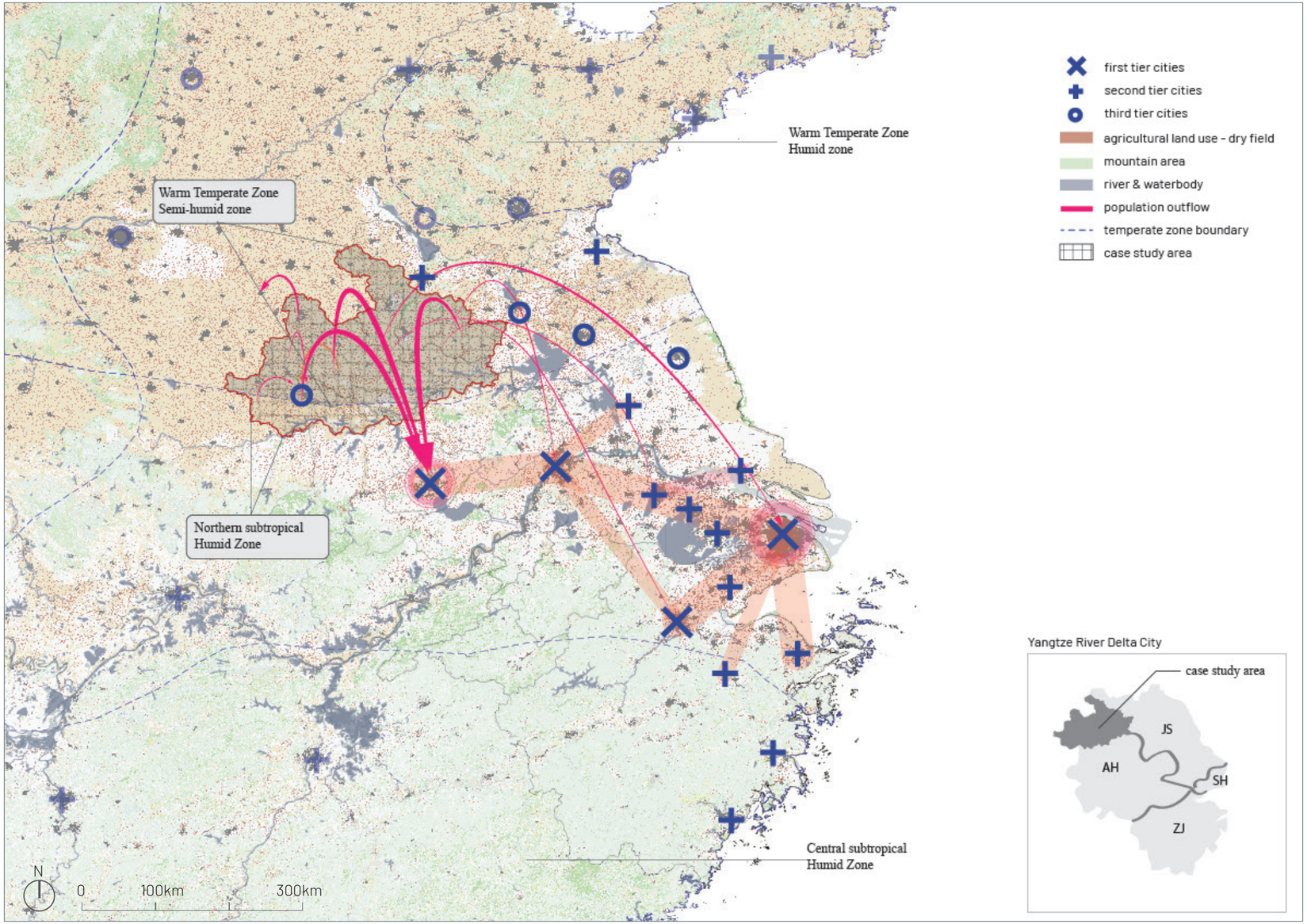
- education level is relatively low, 2/3 under high school
- precipitation rate is relatively low, crop type selection is constrained
- lack of railway transportation planning in the middle part
- small and scattered —> need economy of scale
- only medium farmland production potential

O

- YRD integration development plan
- G60 innovation corridor [high tech base, g60]
- sustainability development: "3050" + peak carbon dioxide emissions
- circular economy [place specific opportunity, put it on the map]
- back-flow of mobile population to birth place and migration within the province increased 148.9% in the last decade
- development schme support: Xuzhou Agglomeration + Yangtze River Delta Integration (中原城市群战略+徐州城市群+长三角一体化)

T

- extreme weather: drought, freeze, heat wave...
- the growth of capital city Hefei attracts young talents and leaves few for the north
- national development focus swift to other place
- aging population



step 4

SWOT MAPPING

Problematization

ECONOMY DEVELOPMENT STAGNATION

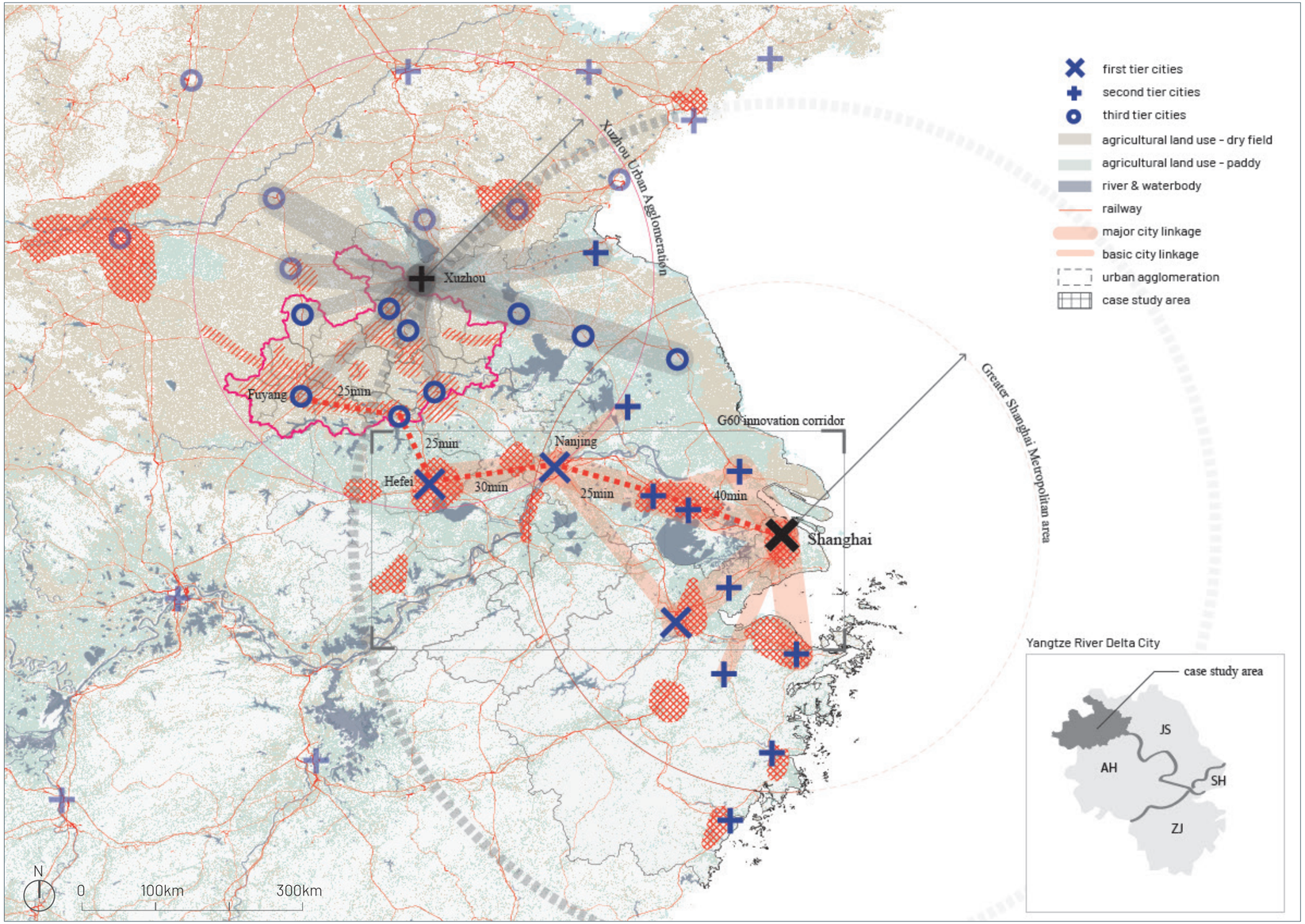
agriculture production base
coal mine base
sacrifised periphery

SOIL AND WATER POLLUTION

heavy metal sendimetation
coal mine impact on surround-
ing water system

LARGE POPULATION OUTFLOW

heavy metal sendimetation
coal mine impact on surround-
ing water system



step 4

SWOT MAPPING

Development Potential

SOLID AGRICULTURE DEVELOPMENT FOUNDATION

large area
GDP contribution
mechanisation rate

INDUSTRIAL FOUNDATION

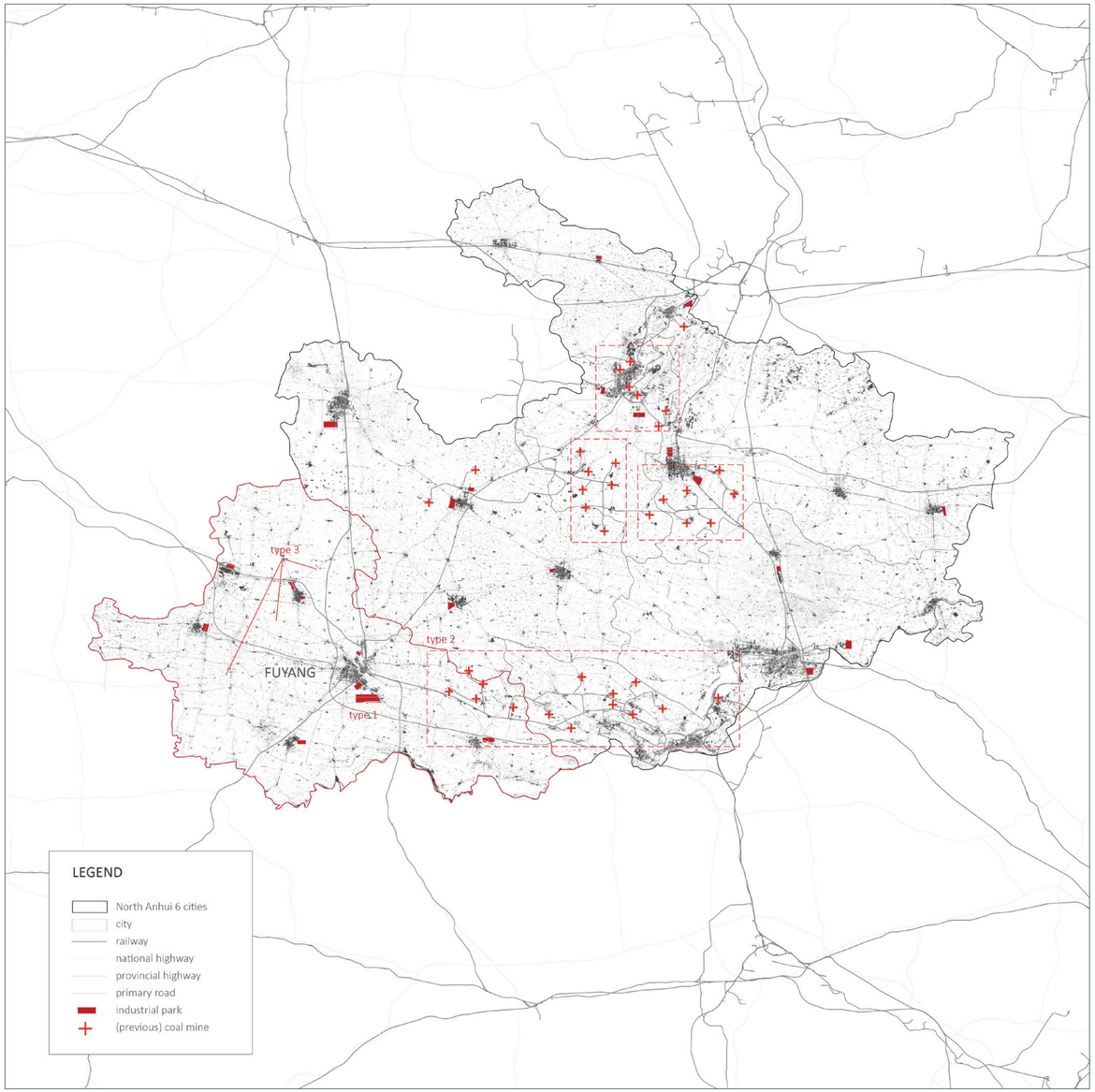
skilled labour
coal mine bases

INNOVATION CAPACITY FROM CORE

strong research capacity in core
YRD

POTENTIAL TO CONNECT

highspeed railway to YRD core



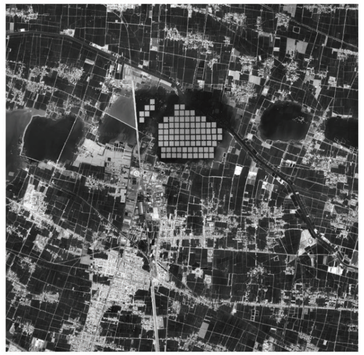
step 5

LOCATING INTERVENTION SCALE

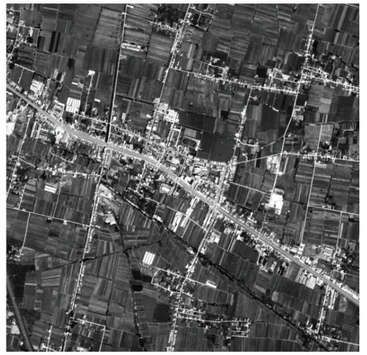
Typical Built Environment

BUILT ENVIRONMENT TYPOLOGY

CO-OP INDUSTRIAL PARKS



PREVIOUS COAL MINES



RURAL INDUSTRY

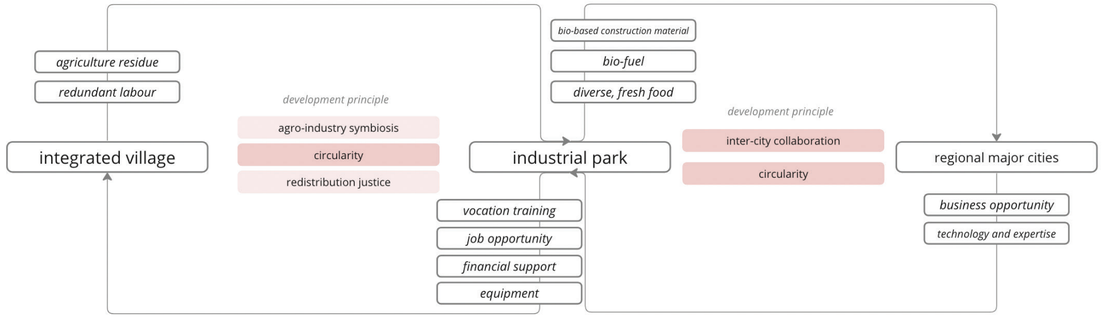


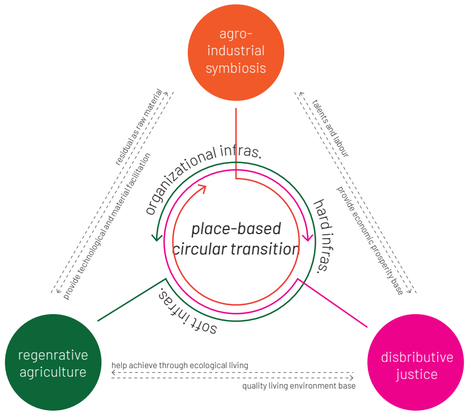
image source: google earth

07 Vision & Goals

PRINCIPLES & VISION

Four principles are made here to lay foundation for the development of north Anhui area: prosperity, livability, sustainability, and social justice. The four principles point at four aspects of the thesis goal, to overall improve performance of the area in economic development, life and living environments quality, sustainability and fair distribution of development results.

Based on the four development principles, the project establishes its vision statement as “towards a thriving periphery through place-based circular transition”. Here, thriving is used to describe the desired result of development as in the area gains its own capacity of sustaining and growing from within, responding the general development concept as place-based circular transition.



[conceptual framework]

DEVELOPMENT PRINCIPLES

PROSPERITY

A thriving and virtuous cycle of economic activity in the case study area leads to value growth and provides sufficient capital to support quality development.

LIVABILITY

Pollution control, more greening and activity space, and improved living environment. Create a high-quality living environment so that people want to stay.

SUSTAINABILITY

To build a circular economy system, including the use of clean energy to replace traditional thermal power generation, increase the recycling of agricultural residuals, and at the same time regenerate the local ecological system.

SOCIAL JUSTICE

Guarantee a people-oriented reciprocal decision-making process with an organic combination of top-down and bottom-up to achieve fair spatial justice of distribution of amenity and development result.

VISION STATEMENT

VISION STATEMENT

“
TOWARDS A THRIVING PERIPHERY

THROUGH PLACE-BASED CIRCULAR TRANSITION
”

GOALS & STRATEGIC OBJECTIVES

GOAL 1 Connect for Opportunity

strengthen regional connectivity and improve logistic efficiency

1.1 optimize existing transportation infrastructure to align with the development zone and needed connection
1.2 hybridization: connect adjacent transportation points for higher efficient transportation network

GOAL 2 Go Circular and Extend

catalyze synergetic development of local agriculture and industry

2.1 establish multi-scalar innovation collaboration as foundation for place-based circular transition
2.2 Support the phasing out of coal mine industry with place-based agriculture-integrated methods
2.3 Complete agriculture production value chain with circular production infrastructure

GOAL 3 Produce while Regenerating

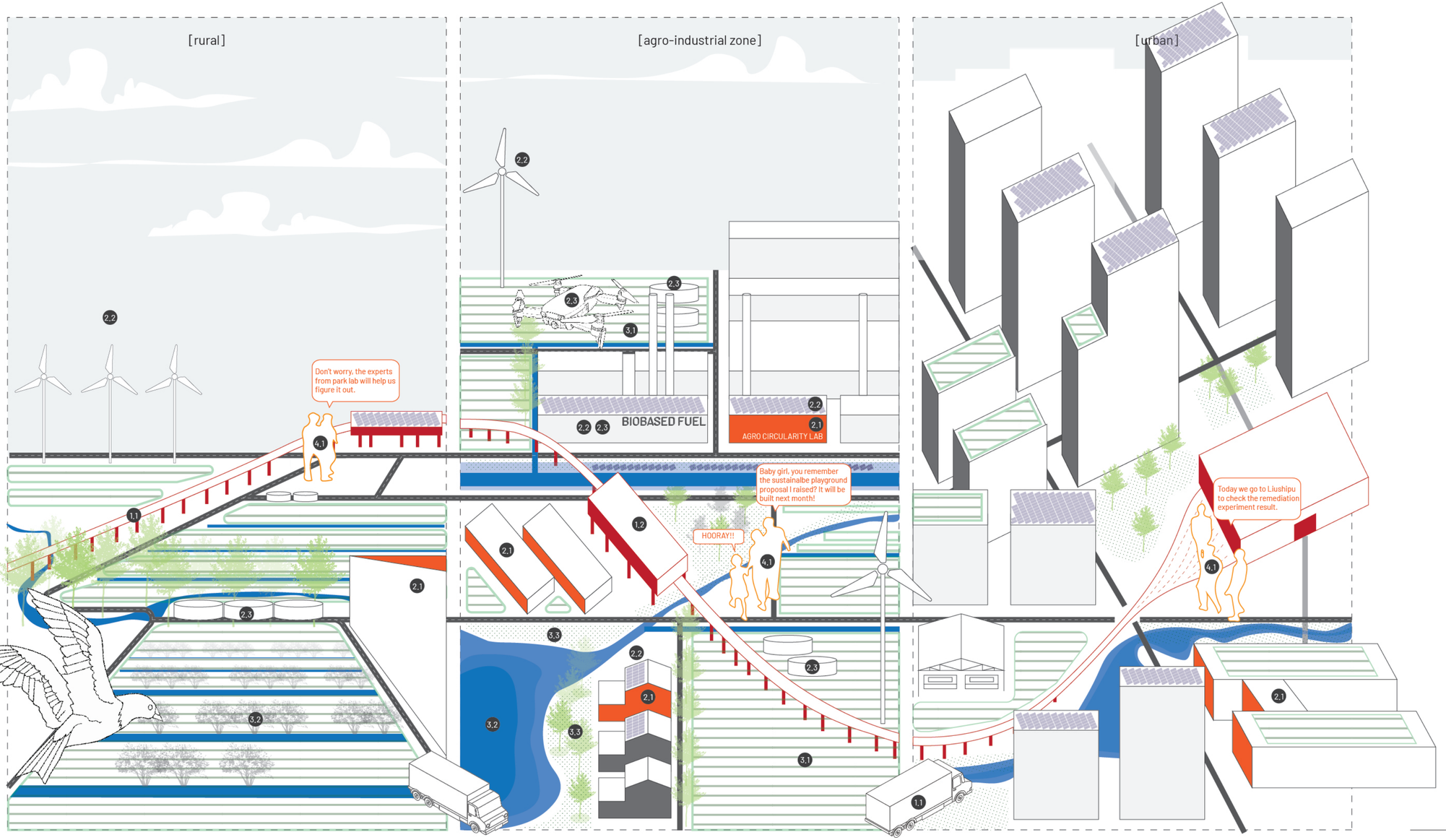
production activities as opportunities to repair and regenerate local eco-system

3.1 consolidate and scale up agriculture production
3.2 purfiy polluted soil through a multi-method approach (cover-crop and mine-pit resolution)
3.3 improve waterfront ecologic sustainability

GOAL 4 Start Here, Start Together

communitarian governance for realization of place-based circular transition in rural periphery

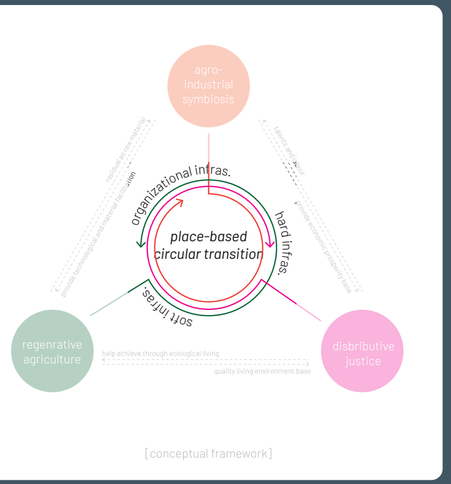
4.1 initiate development momentum at local level
4.2 establish multi-scalar coordination



08 Strategy

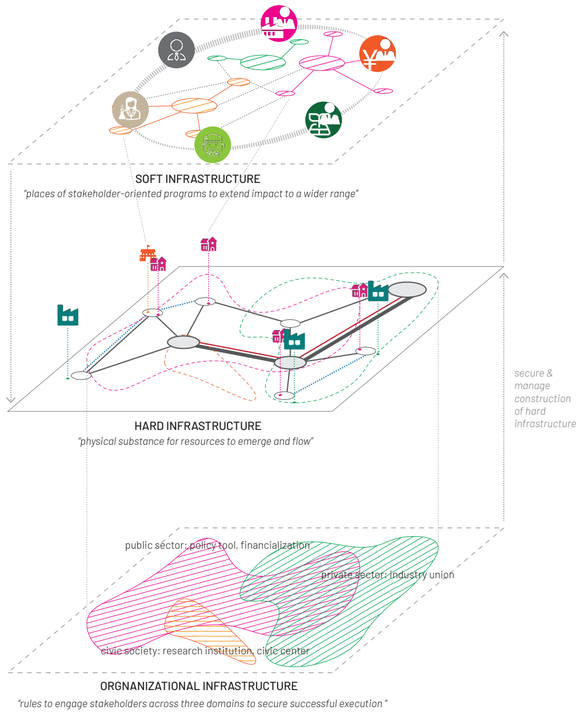
GENERAL CONCEPT

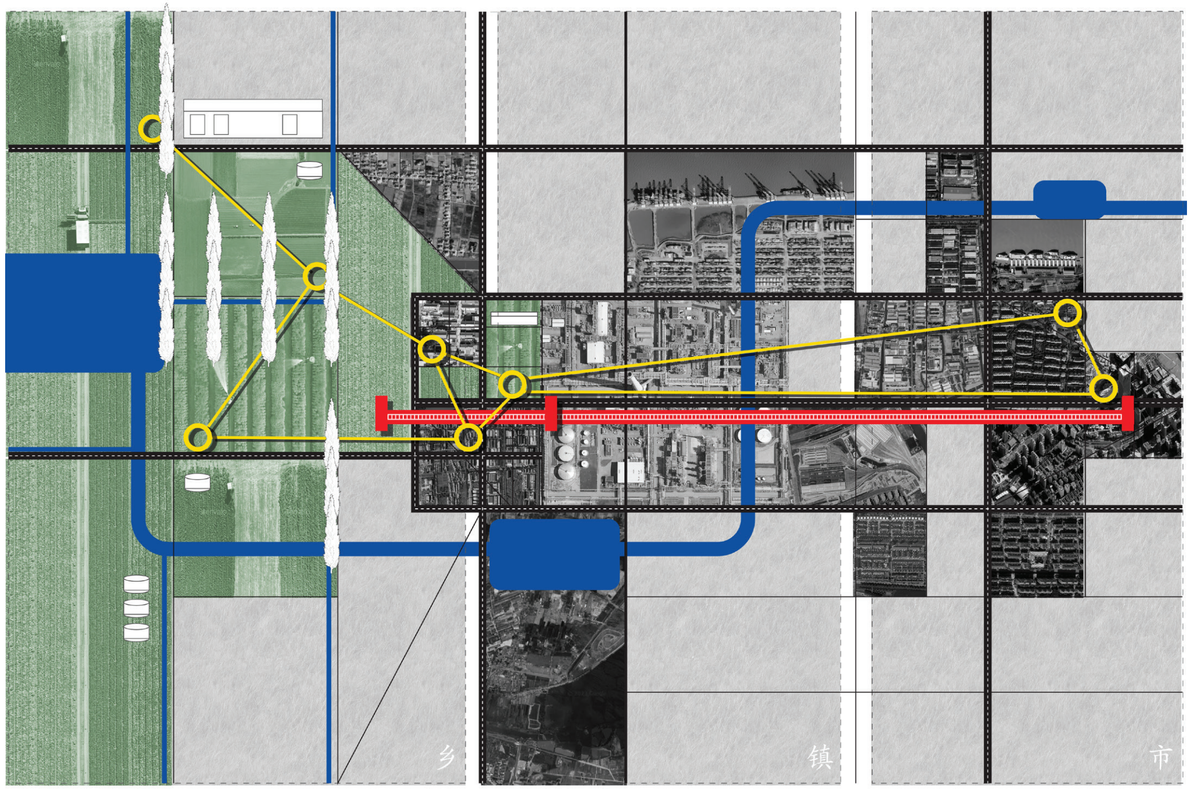
INFRASTRUCTURAL CIRCULARITY



[conceptual framework]

The strategy "infrastructural circularity" is proposed on the basis of Stan Allen's infrastructural urbanism concept and Jo Williams' three strategy of circular transition. It is a systems-oriented, multi-scalar and incremental approach of circular transition foundation building. It focuses on how to create "direct fields" where agriculture-industry symbiosis, regeneration of ecology and distributive justice can "play themselves out" (Allen, 1999) through hybridization and adaptation of hard, soft and organizational infrastructure.





[SYSTEM-ORIENTED]

SCALE OF DESIGN

Understanding the problem in the scope of region, the scale of design will have mainly three scales: regional, semi-regional and local, namely the Yangtze River Delta urban agglomeration area, north Anhui 6 cities, and project area. The project area refers to the strategic intervention places based on the potential and problem mapping of north Anhui area in the previous chapter.

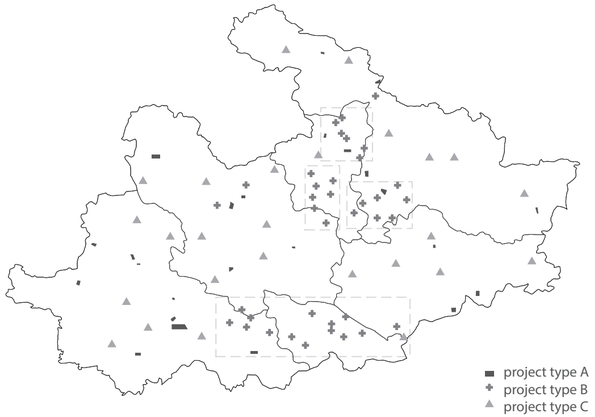
The reasons why three scales are needed are:
1) problems in North Anhui are the result of regional imbalance development and need to be analyzed and also solved from the regional perspective
2) cross-scale and continuous strategies can best exploit the development potential across space and systems
3) in the design process, each scale offers a check for the other scales in improving strategies feasibility

YRD

Yangtze River Delta

NA

North Anhui area



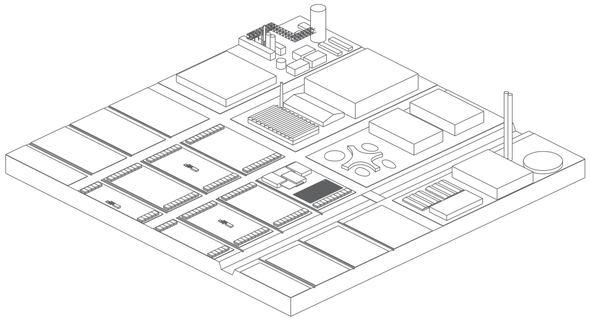
PT - x

Project Area

project type A

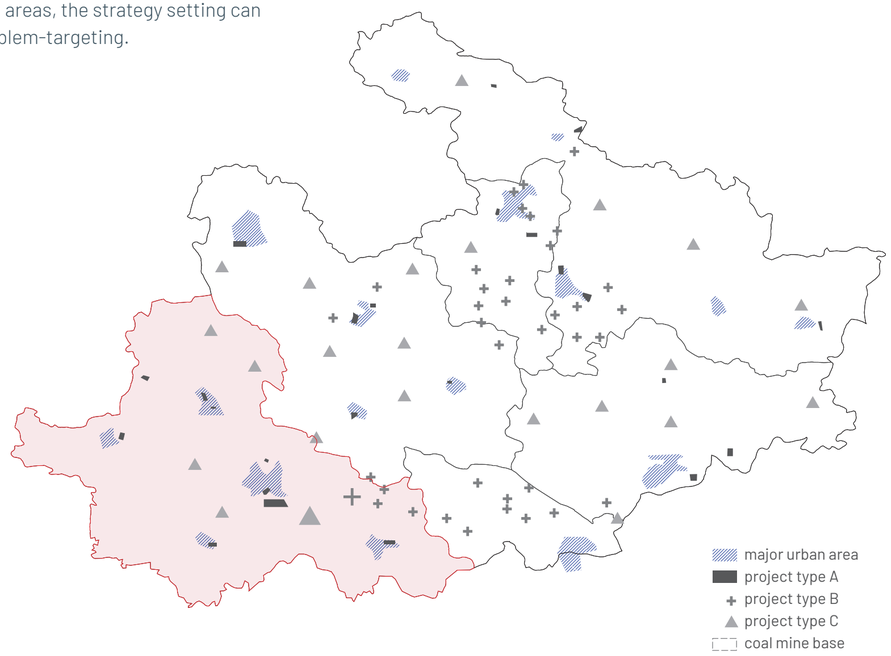
project type B

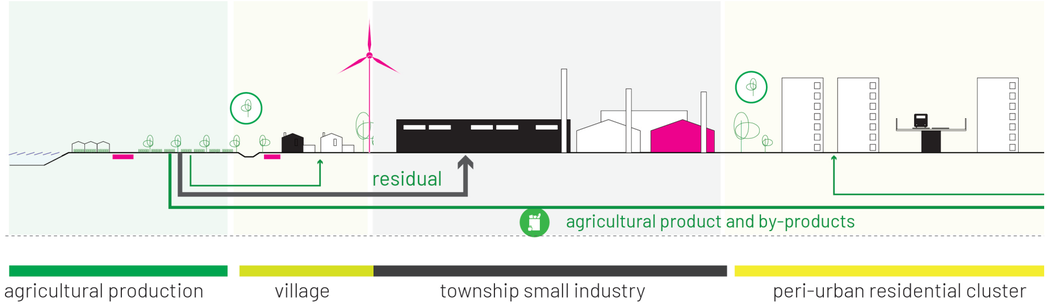
project type C



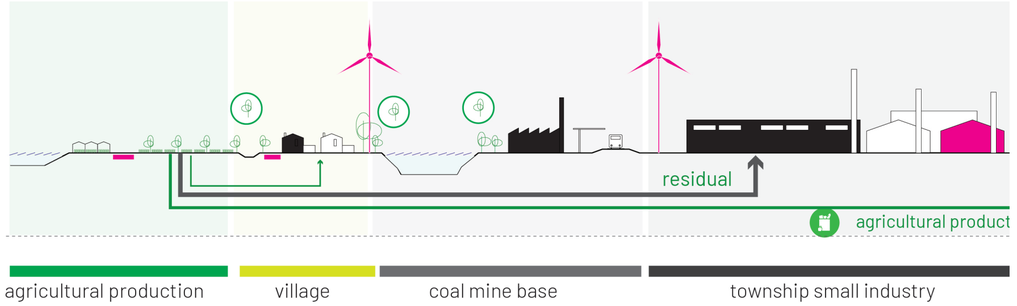
PROJECT TYPES

Three types of project types are also selected based on the built environment typology study. “Projects” in this thesis refer to certain locations as the local scale strategies practice field. There are three typical types. Project type-A locate at the periphery of urban area, consist of industry park and rural land. They are closer to urban core, partially the land owned by the municipality, hence with larger development capacity. Type B locate in the coal mine area. As coal business being crucial part of north Anhui economy, the transition of coal mine area into circular landscape needs attention and thus are listed as a type of project area as well. Type C represent the vast rural area. They locate in townships, consist of family-oriented small workshops and agriculture production as major part of local economy. By selecting and looking at specific project areas, the strategy setting can thus be more specific and problem-targeting.

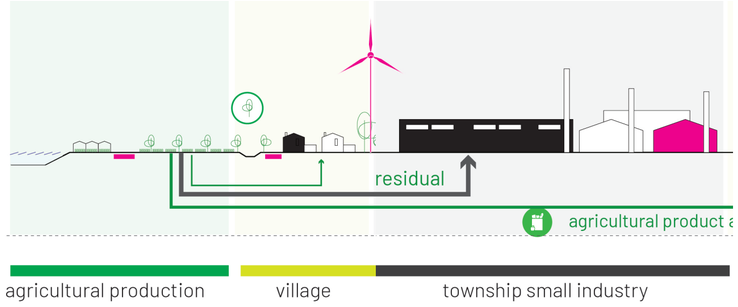




[project type - A]



[project type - B]



[project type - C]

GOAL 1

Connect for Opportunity

strengthen regional connectivity and improve logistic efficiency

North Anhui

Transportation for both passenger and logistic purpose is essential in promoting peripheral development due to its essence of activating physical flow and non-physical impact accordingly. Moreover, transportation network also serves as a strong spatial foundation for a regional city network. By starting with research and improvement of transportation network of railway, bus routes and highway, all development strategies can then therefore be applied with operable spatial lean-ons.

Strategic Objectives for Goal 1

1.1 Optimize existing transportation infrastructure to align with the development zone and needed connection

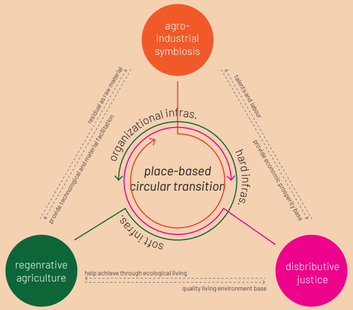
1.2 Hybridization: connect adjacent transportation points for higher efficient transportation network

Infrastructures to Intervene

- railway
- bus
- highway
- landuse

Proposed Key Indicator

- prosperity
- livability
- social justice



[conceptual framework]

image: ©Zhang Kechun, *Between the Mountains and Water*

Strategic Objectives 1.1

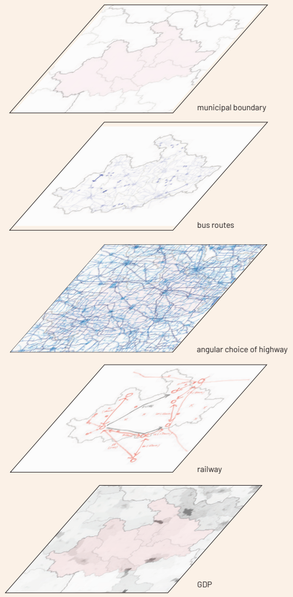
Optimize existing transportation infrastructure to align with the development goal

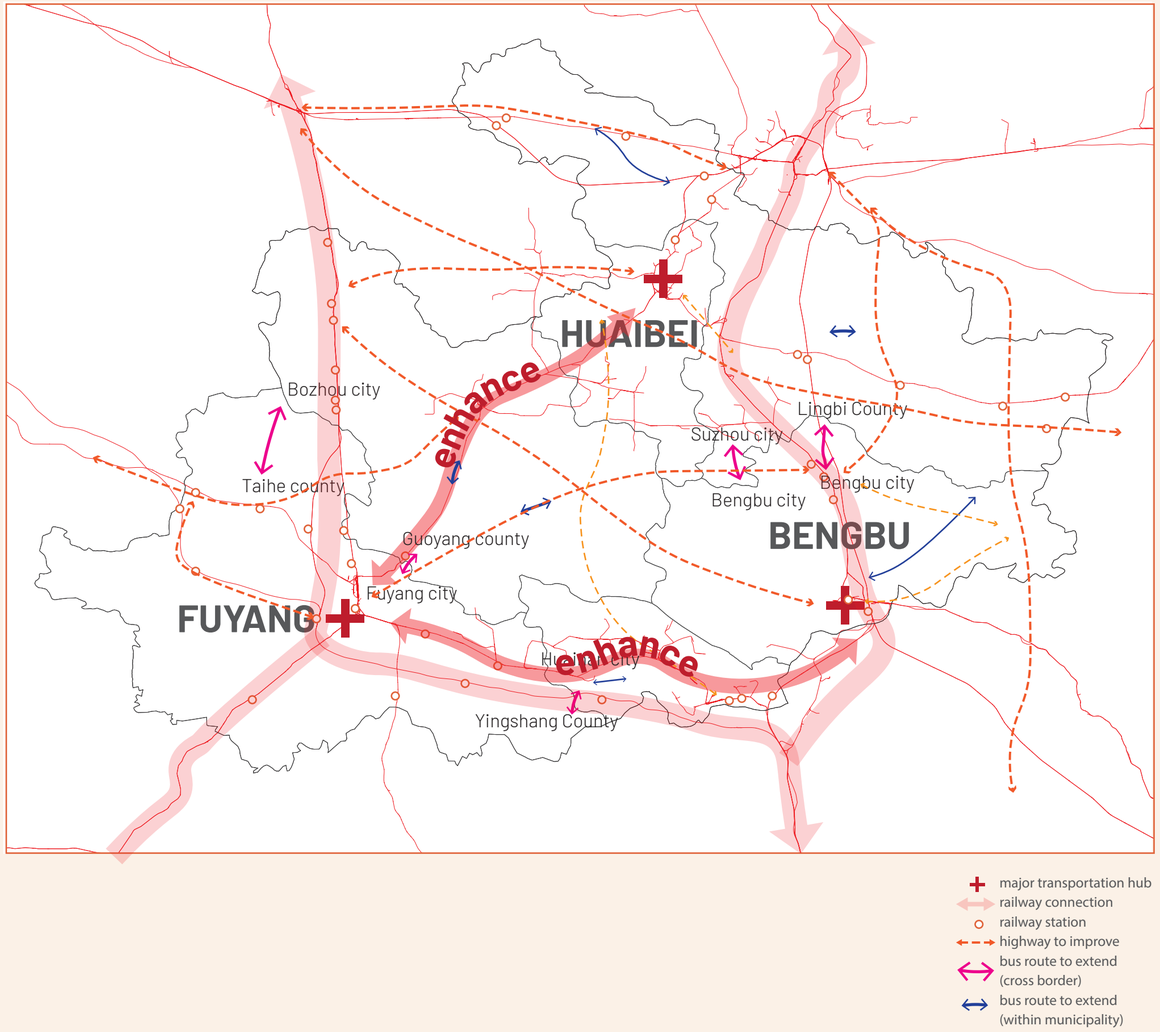
North Anhui

1.1.1 add up train connection between Fuyang-Bengbu and upgrade railway tracks between Fuyang-Huaibei

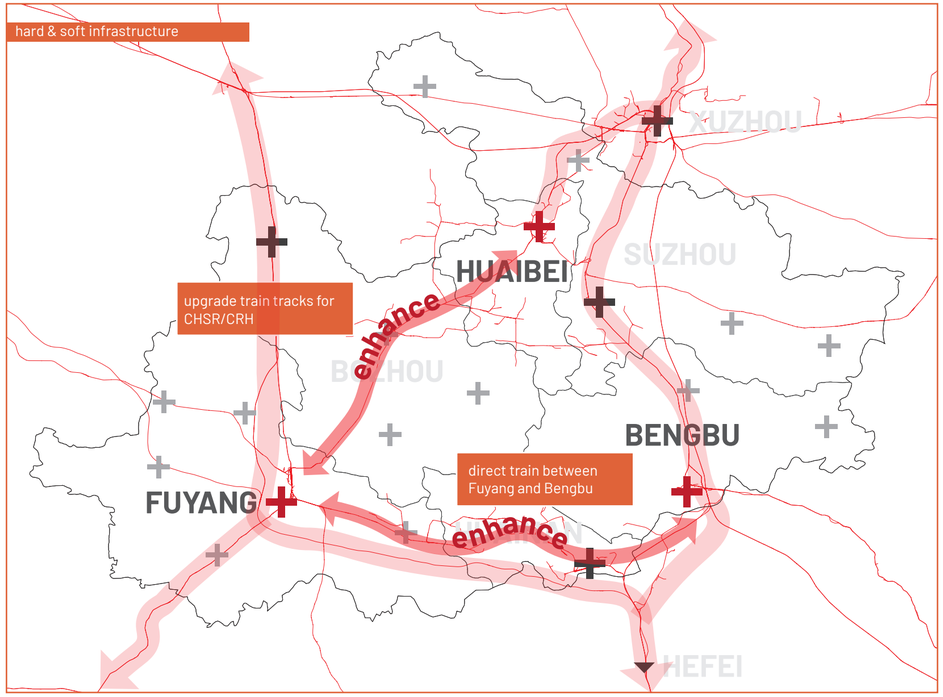
1.1.2 connect border spaces with bus lines (Taihe county-Bozhou, Guoyang county, Wuhe county-Huainan city)

1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis





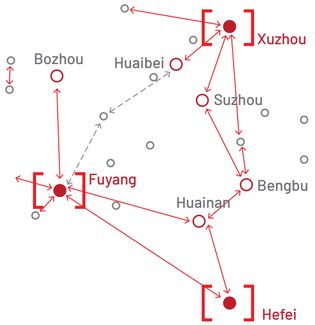
1.1.1 Add up train connection between Fuyang-Bengbu and upgrade railway tracks between Fuyang-Huaibei



From the analysis, Fuyang is the regional transportation hub for north Anhui region based on current status and existing planning. However, the connection between Fuyang-Huaibei and Fuyang-Bengbu is lacking in CHSR/CRH, making the commuting between Fuyang and the two cities costing an exhausting almost 4 hours and 2 hours. This is blocking the region from forming a more connected city network. Hence, it is necessary to upgrade the train tracks between Fuyang to Huaibei and Bengbu.

The enhance plan for Fuyang-Huaibei is to high-speed railway ready standard tracks because currently there are only normal fast trains running through. The enhance plan for Fuyang-Bengbu is to add direct CHSR/CRH between the two cities (going through Huainan, using existing high-speed railway tracks).

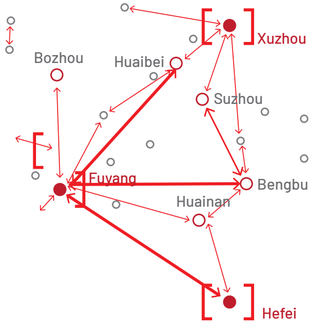
CURRENT



	CHSR*	CRH**	direct	extra fast	fast	total	time(least)
Fuyang - Bozhou	31		1		11	43	00:26
Fuyang - Huainan	40	1			14	55	00:33
Huainan - Bengbu	12				2	14	00:17
Fuyang -Bengbu					5	5	03:38
Fuyang - Huaibei					5	5	01:53
Huaibei - Xuzhou	16				7	23	00:34
Xuzhou - Suzhou	53			3	6	64	00:18
Suzhou - Bengbu	40			3	9	54	00:23
Huainan - Hefei	60	1			12	73	00:27
Fuyang - Hefei	69	2	1	1	16	89	01:02

*CHSR: China High-speed Railway c.a.300km/h
**CRH: China Railway High-speed c.a.200km/h

PROPOSED



	CHSR*	CRH**	direct	extra fast	fast	total	time(least)
Fuyang - Bozhou	31		1		11	43	00:26
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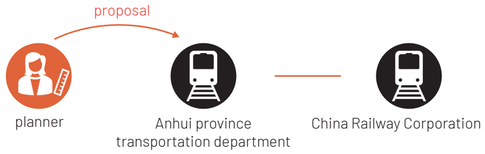
Huainan - Bengbu	12				2	14	00:17
Fuyang -Bengbu	10				5	15	00:40 ***
Fuyang - Huaibei	10				5	15	00:15 ***
Huaibei - Xuzhou	16				7	23	00:34
Xuzhou - Suzhou	53			3	6	64	00:18
Suzhou - Bengbu	40			3	9	54	00:23
Huainan - Hefei	60	1			12	73	00:27
Fuyang - Hefei	69	2	1	1	16	89	01:02

*CHSR: China High-speed Railway c.a.300km/h
**CRH: China Railway High-speed c.a.200km/h
*** estimated time

organizational infras.

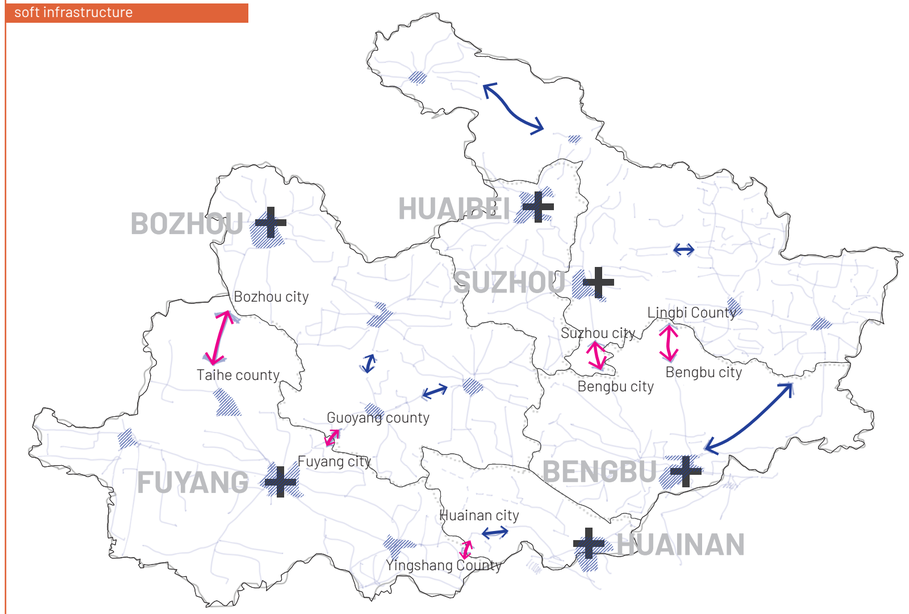
PLANNING VALIDATION OPERATION



In order to achieve this goal, it is necessary for the traffic planner to analyze and make a proposal for a specific route map and implementation plan, which will be submitted to the traffic department of Anhui Province for consideration and approval, and then the local branch of China Railway Group will execute the construction or make additions and adjustments to the relevant operating routes. This involves the cooperation between government departments and state-owned enterprises, which should be an easy step to take if the state-owned enterprises are well-funded. However, the CRL Group has a very high debt burden at the moment, so the next steps will be to explore the financial opportunities that public-private partnerships and tod development models can bring for this purpose.

1.1.2 Improve accessibility by public transportation and connect border spaces

soft infrastructure



city
county
in-city bus line
cross boundary bus line
existing bus route

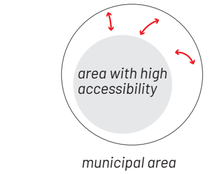
As public transportation is mainly undertaken by state-owned transportation companies in north Anhui area, and the management structure of these transportation companies is generally divided by cities, the coverage of bus routes is cut by administrative boundaries. The severe lack of public transportation accessibility to some villages and towns located at the border locations poses a great challenge to human resource mobility for future development.

Therefore, the report proposes that new routes be added to fill the junction areas through cross-city cooperation and by placing them under the operation of state-owned public transportation operation companies or third-party, private bus companies if necessary. It is important to note that the junction areas in this case include both urban and rural junction locations within some municipal administrative divisions.

CURRENT

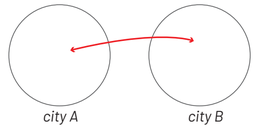
Intercity passenger transportation in northern Anhui currently relies heavily on rail transportation, however, in some border areas, railroads are not directly connected and lack of bus line connections makes the marginal areas less accessible and limits development. The Anhui government has proposed the goal of busing intercity passenger transportation in the hope of creating a more closely connected intercity relationship. However, this plan does not effectively address these issues. There are currently only a few inter-city bus routes operating such as Suzhou to Si County.

PROPOSED



TYPE 1
in-city bus line optimization

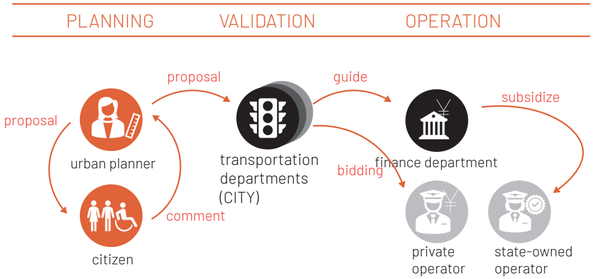
For areas within the city limits that lack transportation connectivity, additional bus routes are provided.



TYPE 2
cross-border bus line optimization

For cross-city areas, additional cross-city bus routes are provided through partnerships with private bus companies to increase accessibility to fringe areas and inter-city connectivity. Provide a basis for integrated regional development.

organizational infras.



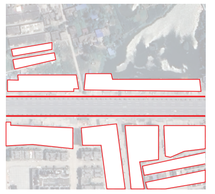
The organizational infrastructure for this strategy embodies the principle of citizen-centered planning. The whole process is as follows: first, the urban planner puts forward a proposal for improvement and submits it to the public for consideration and extensive consultation with the people in the area concerned; after revision, it is submitted to the joint resolution of the two or more local transportation departments for adoption, and then the state-owned bus company is directed or, if necessary, outsourced to the public through public bidding. Then, we will direct the state-owned bus company or, if necessary, outsource to a third-party private transportation company for construction and operation.

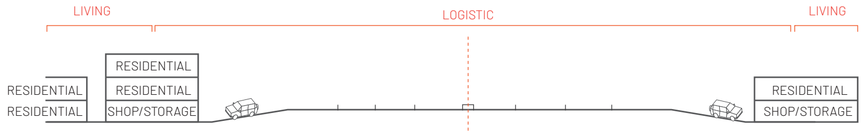
1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis

city
county
railway connection
highway to enhance

According to angular choice analysis, partial highways have higher conneting capacity despite their position in the hierarchical highway system. For example, the highway between Fuyang city and Guzhen county in Bengbu city is a provincial highway, however it is among the highest angular choice result. A road with high angular choice typically refers to a road or intersection where multiple directions or turns are available for motorists to choose from. It suggests that there are numerous possible paths or routes that can be taken at that particular location. This also means that the development of towns and industrial parks along such roads is chosen to maximize the spread of the impact of each intervention point to a larger area, and also to connect these points more effectively, so that the effect of some improvement is maximized to radiate to the whole area.

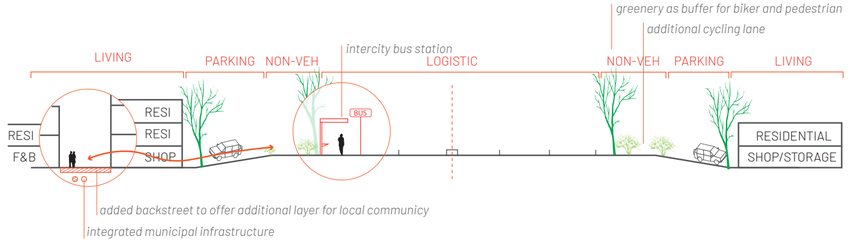
CURRENT





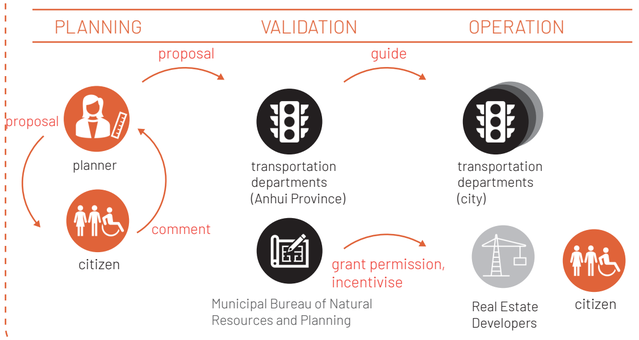
The current status of these roads is a two-way three-lane direct cut through the town with a design speed of 80km/h and a lack of non-motorized lanes. Yet as a major local traffic artery, pedestrians and non-motorized vehicles choose to use this highway, which is very dangerous. There are businesses along the road, mainly auto repair, metal parts fabrication and furniture stores.

PROPOSED



The section design uses greenery to isolate non-motorized lanes and provide greenery that the town lacks, while establishing stops for intercity buses in the center of the town. In addition, the town's internal roads parallel to the main highways are opened on both sides to create an additional layer of vitality with stores for living services. In addition, municipal corridors will be added during the road renewal process.

organizational infras.



To achieve this goal, cooperation between the transportation sector and local natural resource and planning authorities is required. The transportation department is responsible for the consideration and adoption of the design of the road section plan, and the natural resources and planning department adopts the adjustment of the nature of the site. In the implementation stage, it is necessary to involve the private sector developers in the renovation and construction of new houses, and to actively engage the local villagers in the construction process.

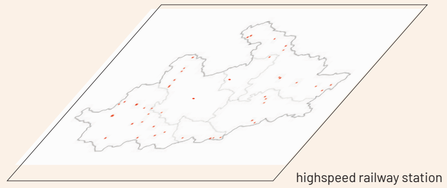
Strategic Objectives 1.2

Hybridization: connect adjacent transportation points for higher efficient transportation network

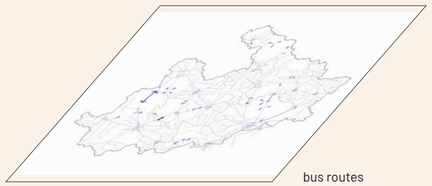
North Anhui

1.2.1 railway + bus: extend bus lines around certain train station(Linquan, Gucheng, Tangshan, Huangkou, Guzhen, Liancheng)

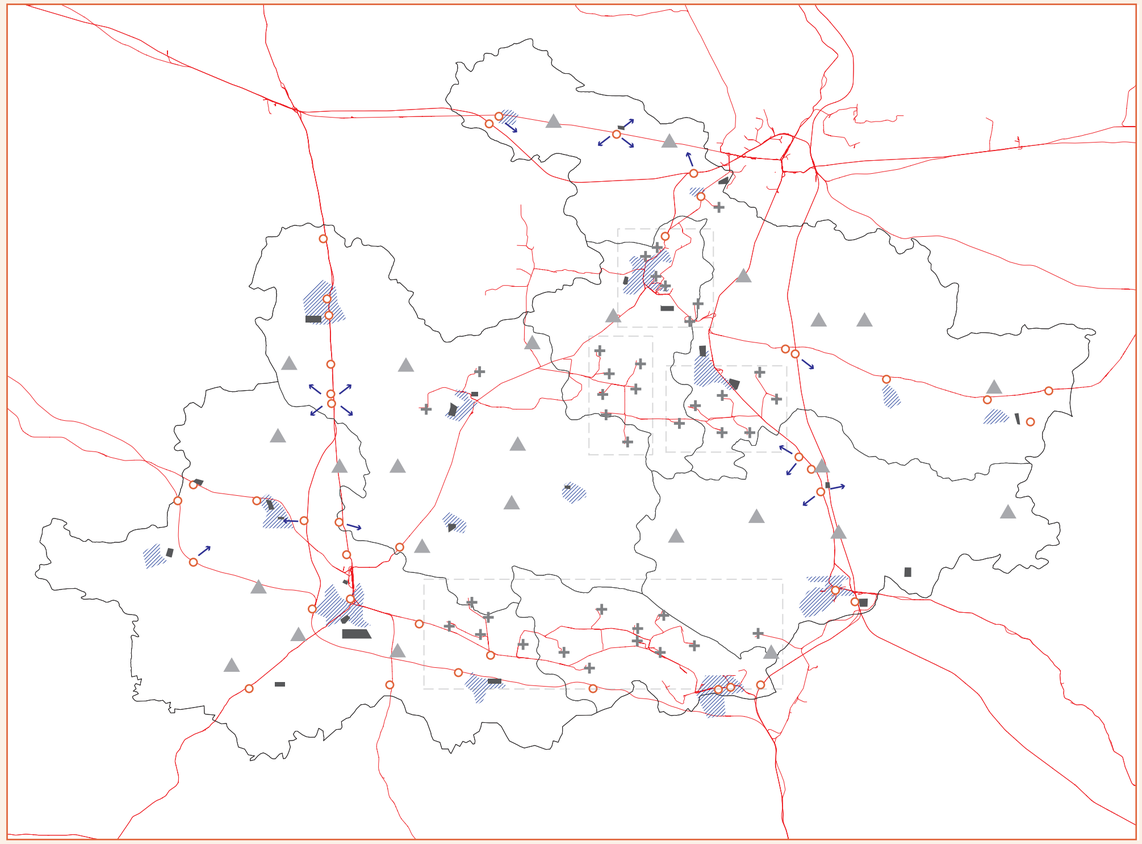
1.2.2 road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution



highspeed railway station

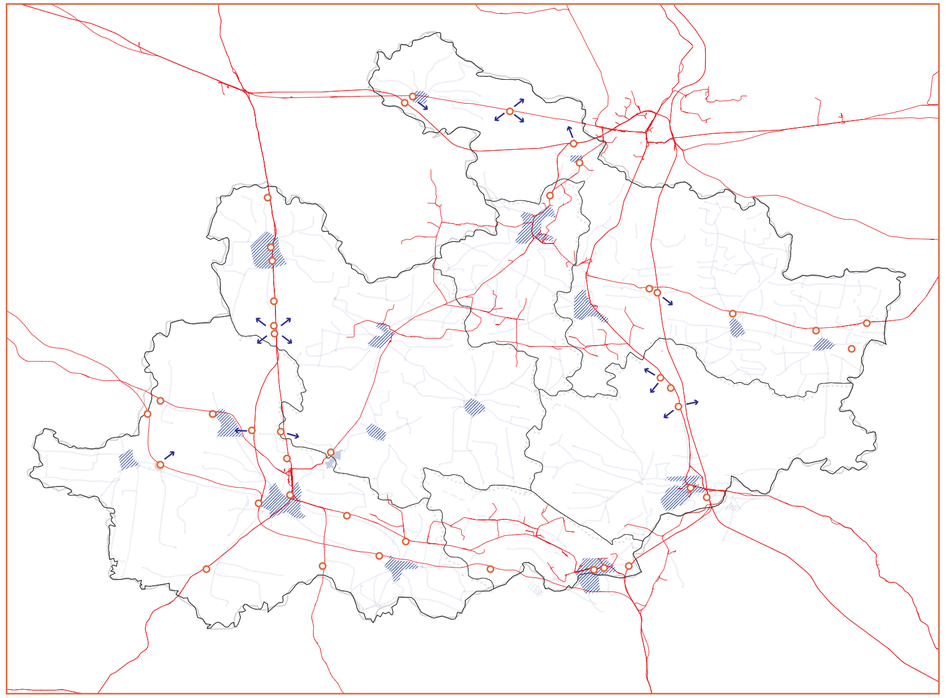


bus routes



project type A
project type B
project type C
railway station
railway line
bus route extension

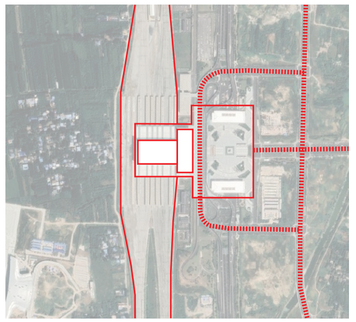
1.2.1 railway + bus: extend bus lines around certain train station (Linquan, Gucheng, Tangshan, Huangkou, Guzhen, Liancheng)



high-speed railway station
bus connection direction
railway
city
bus route

The development of TOD (transit-oriented development) is also needed to enable better division of labor and efficient connections between regional cities on the basis of the existing transportation facilities network. This includes two components, one is the hybridization of rail and transit, and the other is the integration of stations and urban functions.

CURRENT



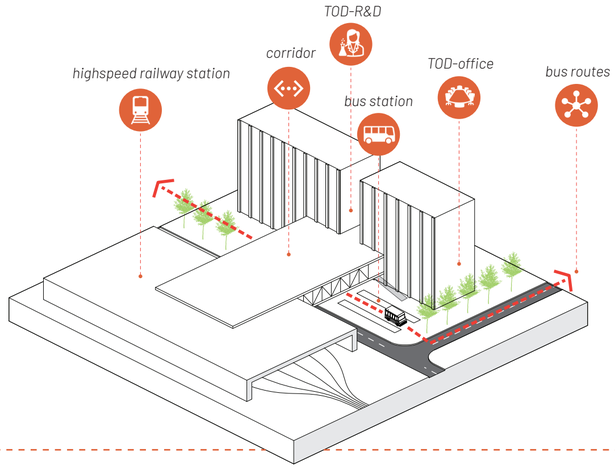
The current situation is that the construction of high-speed railway stations in northern Anhui has become a "high building in the desert": in the urban fringe, a two-way six-lane or even wider road is set up in the middle of farmland, and the huge station square is empty. Surrounded by farmland and villages, the village fabric and high-speed railway station formed a stark contrast. Such stations often have less than ten trains a day, yet they are built with large financial allocations and place a burden on local finances. The greater opportunity for connectivity that comes with high-speed rail is overlooked and wasted in this design.

Fuyang West Highspeed Railway Station

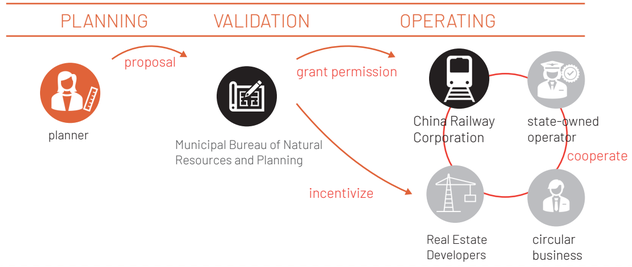
PROPOSED

In the propsed situation, the highspeed railway station will be integrated with bus route to further its connectivity to wider range of the city. Next to the railway station will be office space for circular economy related busienss, R&D cetner and headquarters. Also, architecture as conneciton will also be added such as overhead corridors.

Land-use plan of the station surrounding area hence needs revision to support and encourage proposed construction.

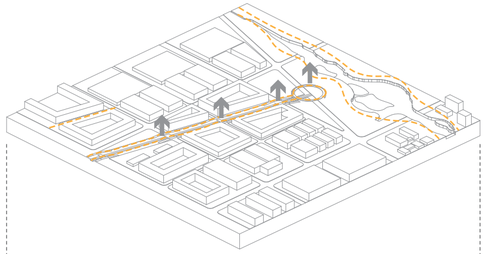


organizational infras.

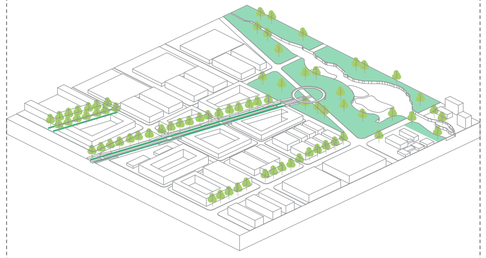


The construction of TOD needs to be done on the basis of land restructuring by the land resources department, and the operation of infrastructure is done through the cooperation of railroad companies, real estate developers and transit operators. In order to achieve industrial clustering, it is also necessary to initially attract circular business to locate in these areas through some tax exemptions or other financial incentives.

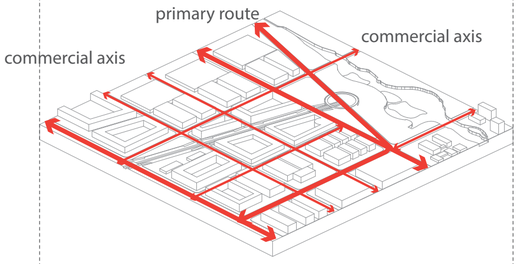
1.2.2 road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution



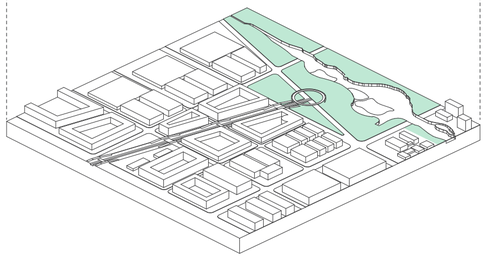
Pedestrian-friendly and only routes will be set for leisure and amenity purpose mainly alongside green and blue corridors for better walking experience and improving accessibility of these nature elements to the public as well.



Each project area will have several nature plots where lake, naturalized waterfront and greenery reintroduced to the area extended by ditch system to the wider range of rural area.



Road system will support a hierarchical and purpose-specific logistic flow. For example, there will be logistic routes for trucks and vehicles to pass efficiently and smaller road for amenity.



GOAL 2

Go Circular and Extend

catalyze synergetic development of local agriculture and industry

Yangtze River Delta | North Anhui | Project Area

Another key aspect of circular development is resource looping. In north Anhui area, rich agri-culture resources and industrial base of metaling and coal mine business offers opportunity of establishing a synergetic development. Cayalyzing such a change will bring to the region new business, education, and job opportunity under the topic of circularity. In this way, transition into circularity means opportunity, not obstacles.

Strategic Objectives for Goal 2

2.1 Establish multi-scalar innovation collaboration as foundation for place-based circular transition

2.2 Support the phasing out of coal mine industry with agriculture-integrated methods

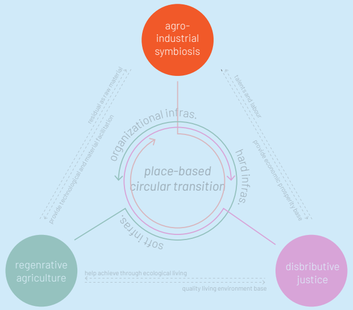
2.3 Complete agriculture production value chain with circular production infrastructure

Proposed Key Indicator

- prosperity
- livability
- sustainability

Infrastructures to Intervene

- ● education
- ○ local government
- ○ village committee
- ○ PPP
- ● energy
- ● industry
- ● waterway
- ● road
- ● industry



[conceptual framework]

image: ©Zhang Kechun, *the Yellow River*

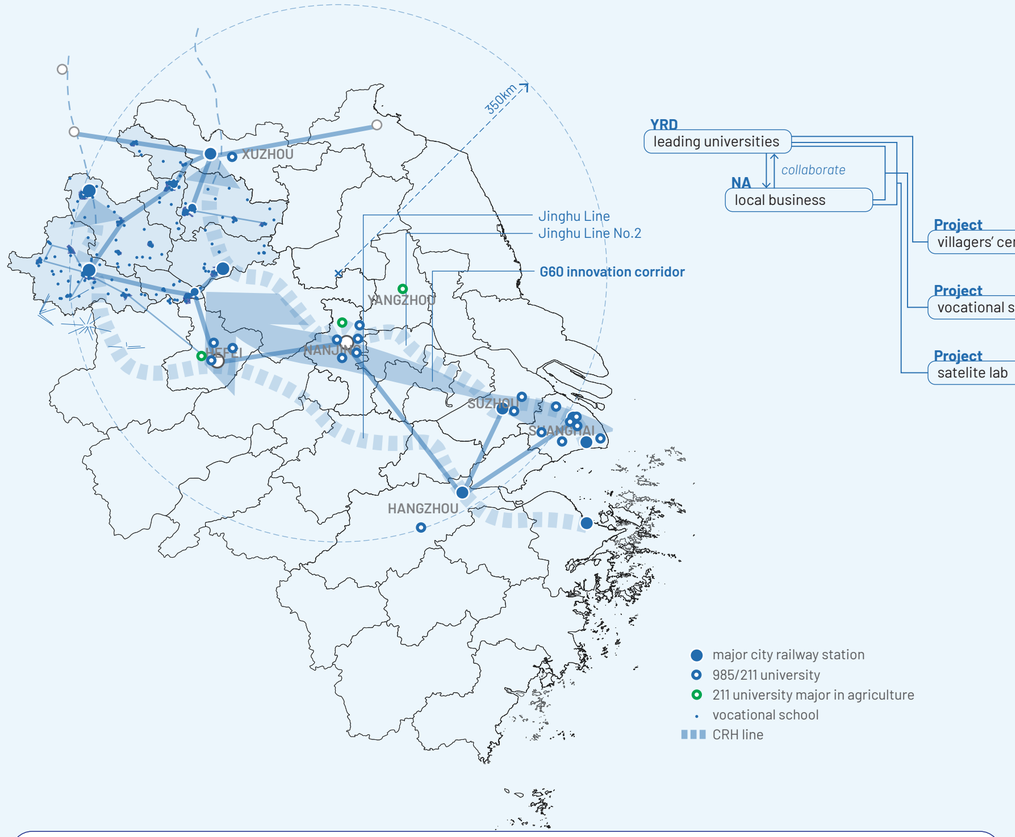
Strategic Objectives 2.1

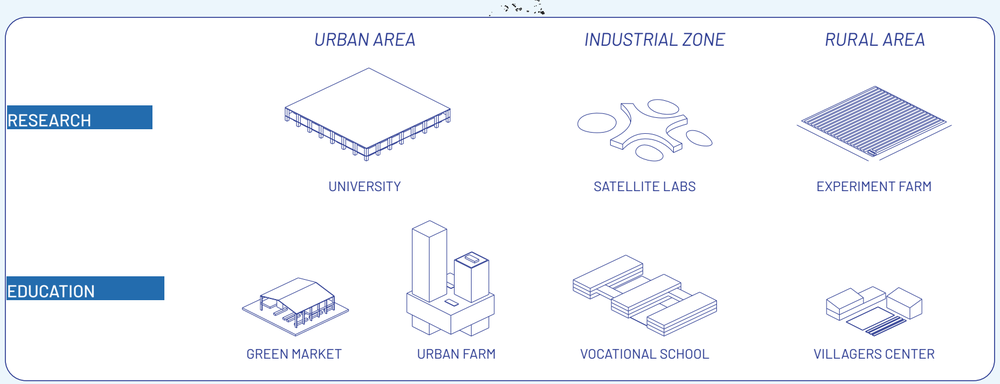
Establish multi-scalar innovation collaboration as foundation for place-based circular transition

Yangtze River Delta | North Anhui | Project Area

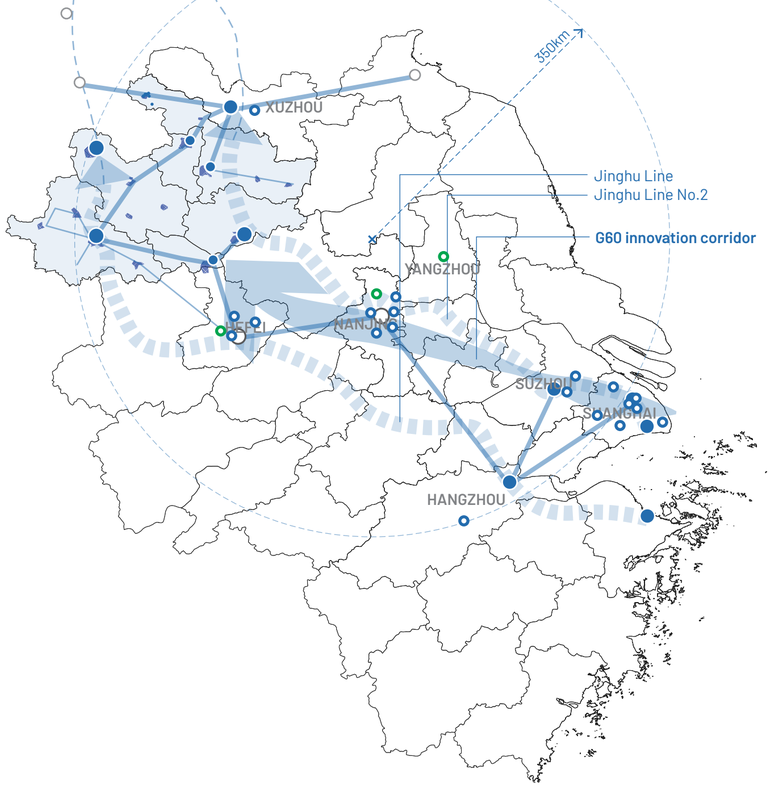
2.1.1 RESEARCH: establish research league for circularity transition AND set up satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses

2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy





2.1.1 RESEARCH: Establish research league of circularity transition and satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses

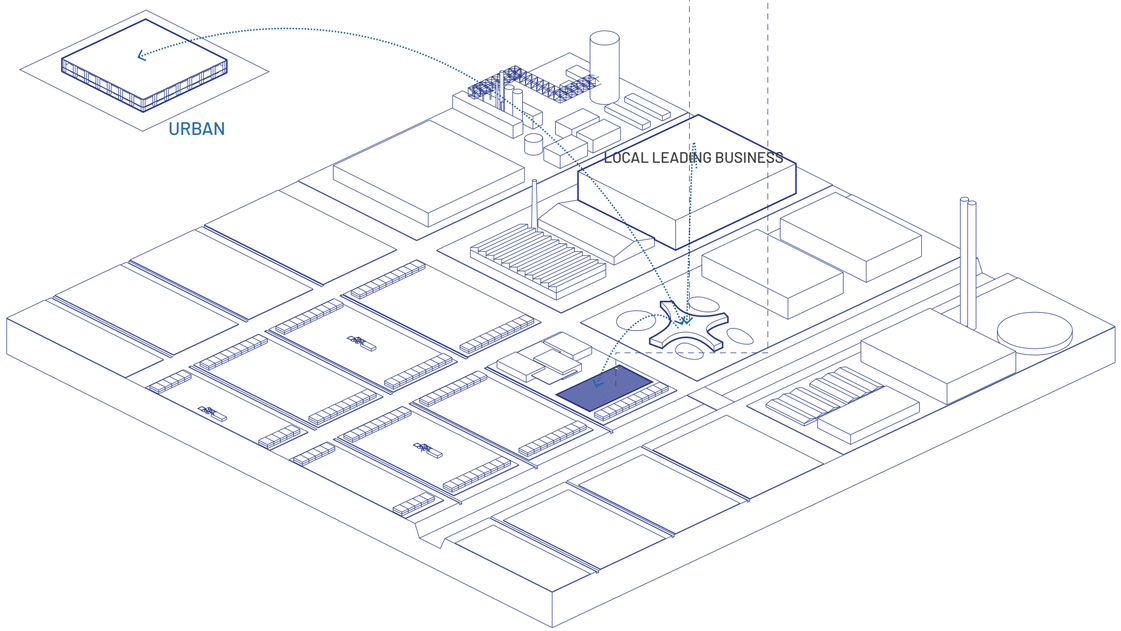


major city railway station
985/211 university
211 university major in agriculture
vocational school
CRH line

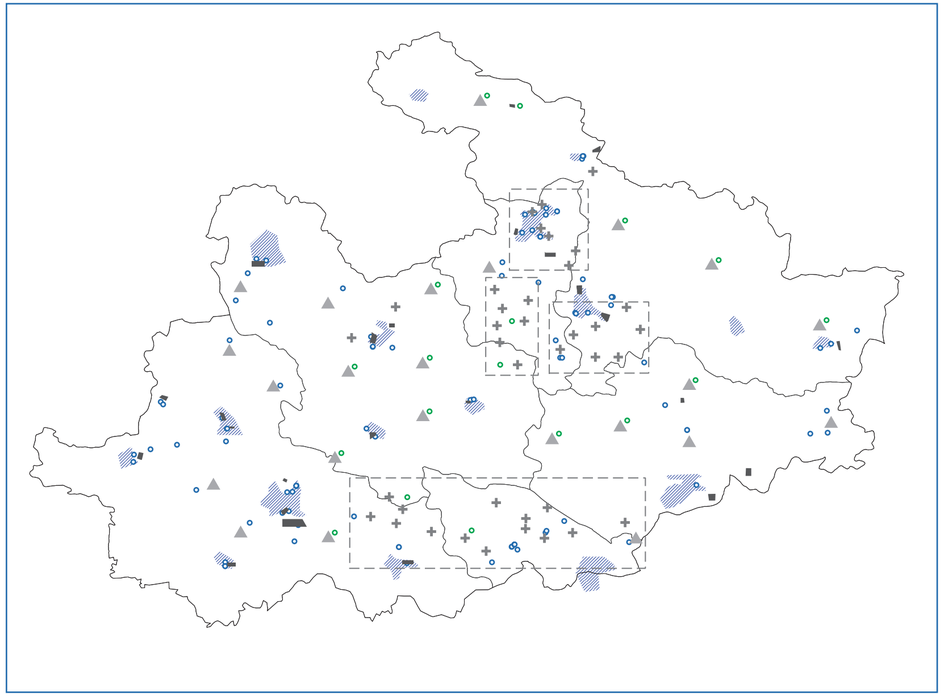
The current research capacity of the Yangtze River Delta is concentrated in the regional core area, mainly in Shanghai, Suzhou and Nanjing. There is currently a regional research cooperation project *G60 Science and Innovation Corridor*, but this project is still mainly aimed at strengthening the cooperation between universities in the cities of the core region, and does not effectively benefit the northern part of Anhui. Therefore, it is necessary to take advantage of the existing high-speed rail lines and regional transportation hubs to develop a regional research cooperation network. By setting up a satellite laboratory in the project area in northern Anhui as a carrier of the core regional research capacity, and by establishing some experimental farming sites in the area to test some new circular economy innovation technologies and to get timely testing and feedback from the field.

RESEARCH

	URBAN AREA	*INDUSTRIAL ZONE*	*RURAL AREA*
	UNIVERSITY	SATELLITE LABS	EXPERIMENT FARM
Building Area	8,000 sqm	1,000 sqm	200 SQM
Site Area	10 ha	2,000 sqm	16 ha
Programme	education, research	research	testing
Service Radius	/	/	/



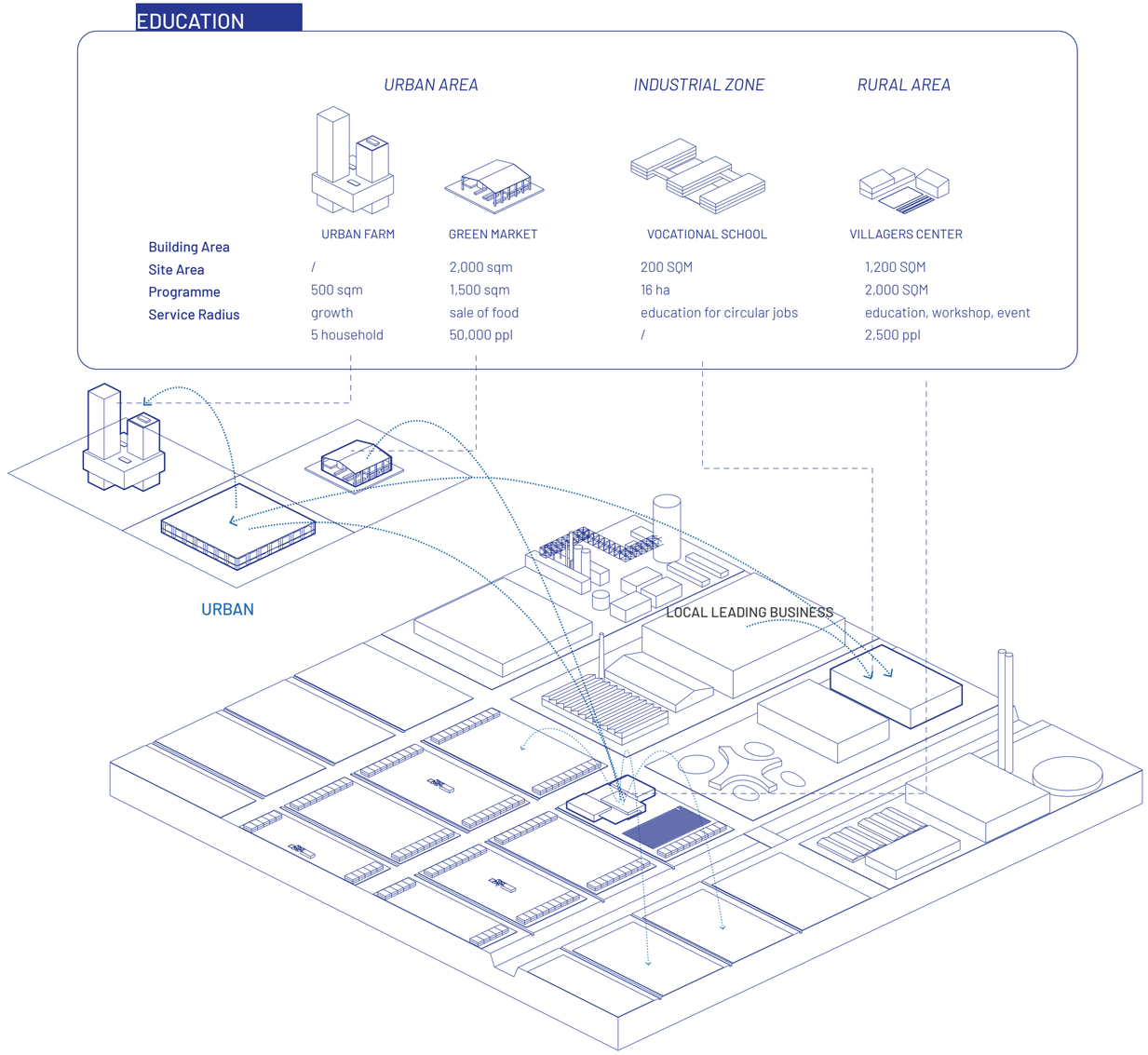
2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy



- vocational school: upgrade
- vocational school: new build
- major urban area
- project type A
- project type B
- project type C
- coal mine base

The second point actually builds on the previous point. 2.1.1 is to bring the scientific research power of the core region to the northern Anhui area, and 2.1.2 is to spread this scientific research power horizontally to a larger area and penetrate vertically to a larger range of people, such as local farmers, unemployed miners, and people in small-scale family metal workshops, so that they have more real-time market information, sustainable transformation related to skills, healthier lifestyles, etc. This will be achieved through programs and activities at the villagers center and the vocational school.

And in the process, technology from the countryside will also re-influence the city. Through green markets and urban farming, people in the city will reconnect with their natural lifestyles. Ideologically, people will realize that there is no longer a single relationship between developed and backward areas, but that the countryside also contains the wisdom of life and a deeper culture and history.

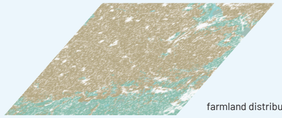


Strategic Objectives 2.2

Support the phasing out of coal mine industry with agriculture-integrated methods

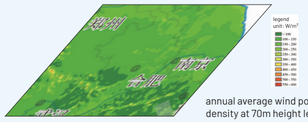
North Anhui | Project Area

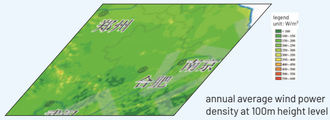
2.2.1 build wind and photovoltaic generating infrastructures in NA based on energy production potential
2.2.2 introduce circularity business to the coal mine region
2.2.3 offer job education in previous coal mine area in collaboration with new businesses


farmland distribution

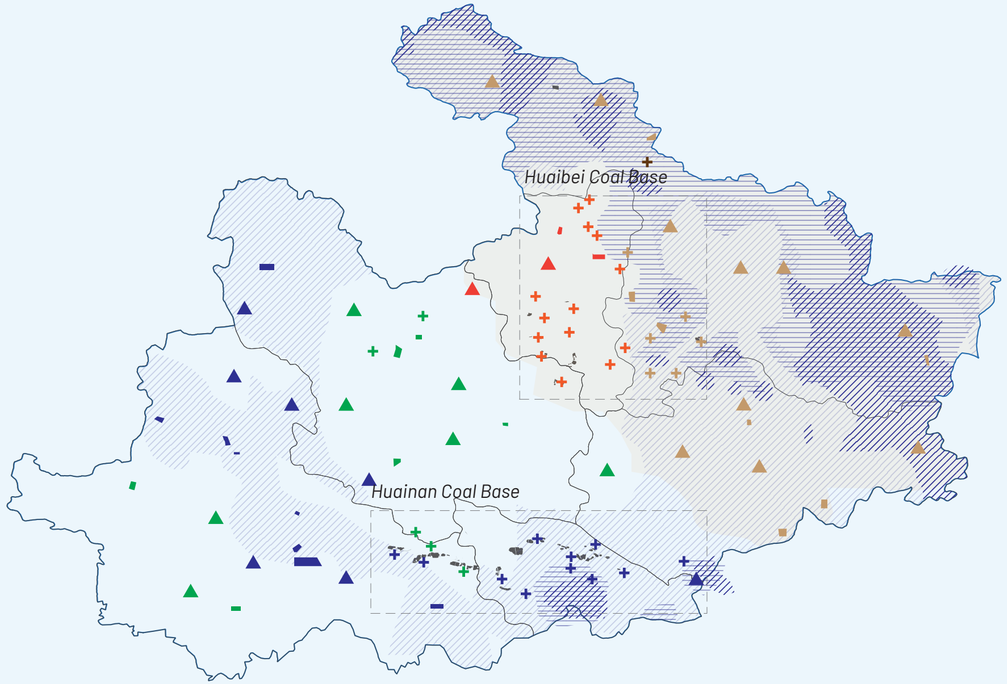

water network


major cable & power plants


annual average wind power density at 70m height level


annual average wind power density at 100m height level

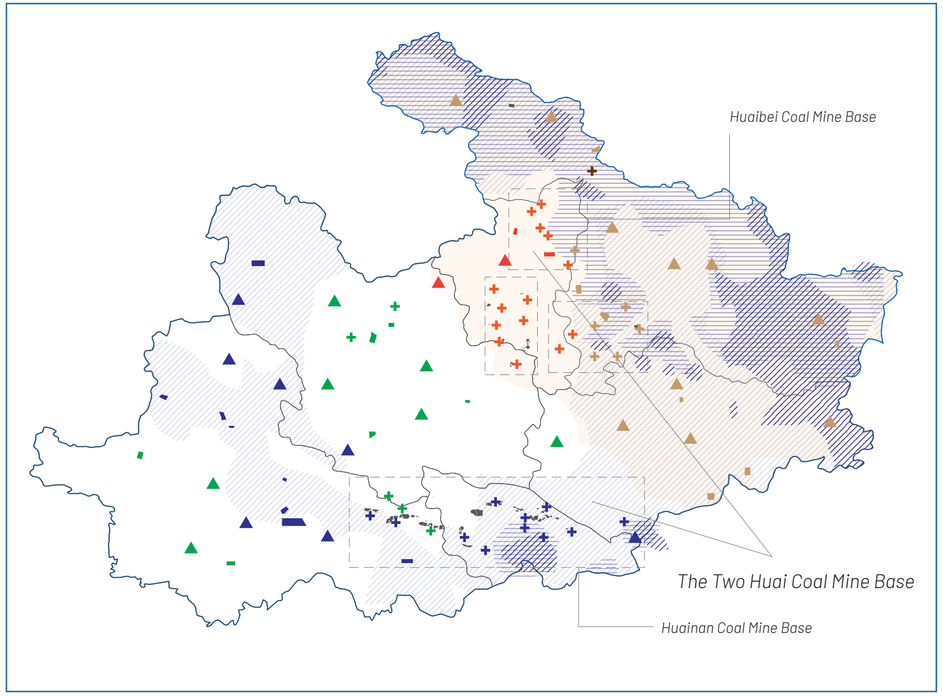

total annual irradiation of the best slope for fixed PV power generation



ENERGY

URBAN AREA	INDUSTRIAL ZONE	RURAL AREA
ROOFTOP SOLAR	BIOBASED ENERGY PLANT	LOCAL BIOGAS PLANT
	MINE-PIT SOLAR	ROOFTOP SOLAR
		WIND TURBINE

2.2.1 build wind and photovoltaic generating infrastructures in NA based on energy production potential



** 5-6.5m/s wind speed at 70m/100m level*
*** 1501-1600kWh/m2 total irradiation in horizontal plane*
source: CMA Wind and Solar Energy Center
China Wind and Solar Energy Resources Bulletin

An important part of the circular transition is its contribution to the replacement of coal-burning energy sources. Although sustainable transition and circular transition are two different concepts, at this level we can say that circular transition has such positive externalities: the sustainable energy component helps to achieve sustainable transition, control greenhouse gas emissions, and achieve carbon neutrality as soon as possible. In this project, based on the wind and solar energy resources in the northern Anhui region, four sustainable energy alternatives are proposed with the project area as a vehicle. They are high solar and wind energy area, high solar energy area, high wind energy area and no obvious potential area, corresponding to the corresponding scenarios of solar, wind and bio-based energy. Among them, retrofitting in combination with existing infrastructure is the main design principle. Examples are the placement of wind farms in combination with agricultural land and the addition of solar panels on the roofs of rural premises. This has the advantage of making the best use of existing land, reducing the environmental impact, and the higher accessibility also controls the logistical costs during construction and operation and maintenance.

estimated project area energy production

67.1 billion *kWh*

which can replace

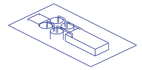
40%

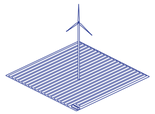
of the total coal generation capacity of Two Huai coal base

*detail modeling please see appendix

ENERGY

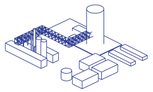
RURAL AREA


LOCAL BIOGAS PLANT


WIND TURBINE

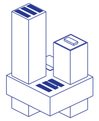

ROOFTOP SOLAR

INDUSTRIAL ZONE

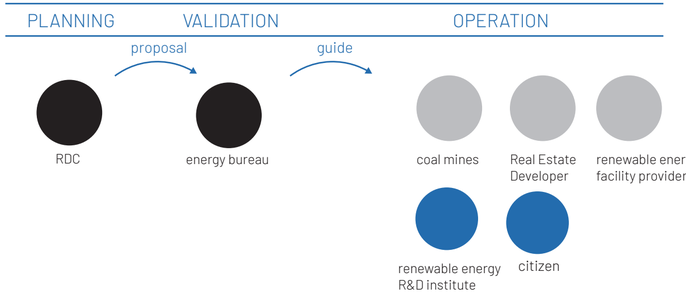

BIOBASED ENERGY PLANT


MINE-PIT SOLAR

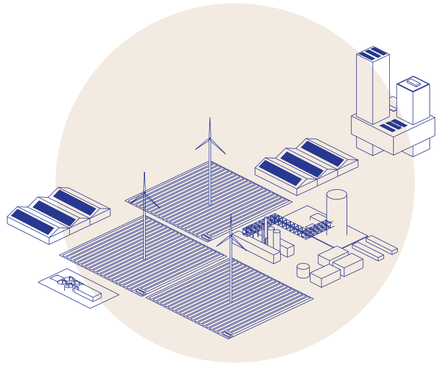
URBAN AREA


ROOFTOP SOLAR

organizational infras.



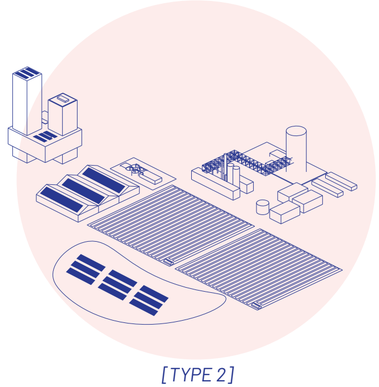
The organizational infradstructure needed to be established in realizing this goal really lies in the operation periodin which the private sector and civic society need to closely collaborate in order to renew the entire energy landscape for this project. Specific policy tools will be further explained in the goal 4.



[TYPE 1]

WIND + SOLAR + BIOMASS

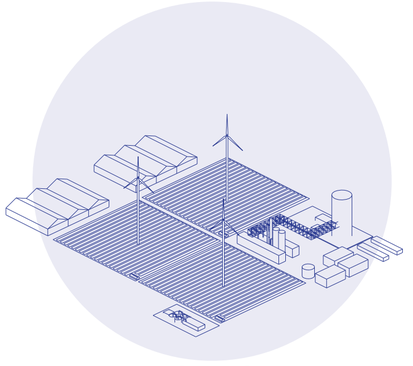
Type 1 suits the area with rich wind and solar energy potential, mostly in the western part of the case study area. Potentially we can put wind turbines to form a hybridization of agriculture production and wind energy capture. This kind of attempt has already been widely tested in countryside of Shanghai, on Chongming island. So the mature technology can be more easily learned, acquired and thus transferred. Additionally, due to the rich sunshine as resource in the area, rootfops of village houses or factories can be added with solar panels. Solar farms can also be placed in large-scale open spaces such as alongside riverbank. Lastly, as part of closing the loop for agriculture production, biomass plant and de-centralized ones in villages can also be constructed as supplement.



[TYPE 2]

SOLAR + BIOMASS

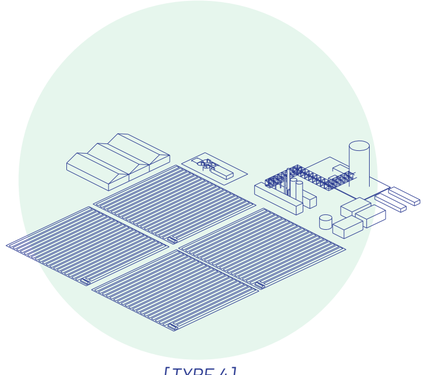
Type 2 suits the area with solar energy. They mostly locate in the eastern half of north Anhui province. Apart from the types of solar energy capturing adaptation, because part of coal mines fit in this category, there will also be aquatic solar farm on mine-pit lakes. This kind of approach can utilzie the vast area of mine-pit lakes while creating sheds for the water body to prevent algaes from rapid growth.



[TYPE 3]

WIND + BIOMASS

Type 3 suits area with rich wind energy resources. Hence like mentioned in type 1, wind turbines can be introduced into the SPU (sdandardized production unit) and generate wind energy not just for local but for the region. Type 3 mainly locate in the eastern and middle west part of north Anhui provinces.

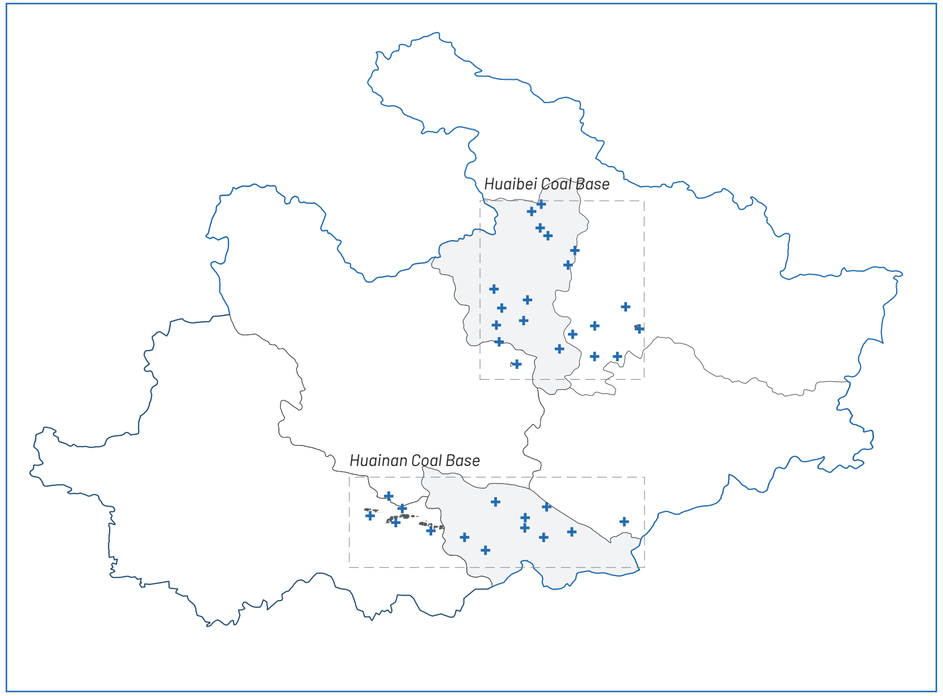


[TYPE 4]

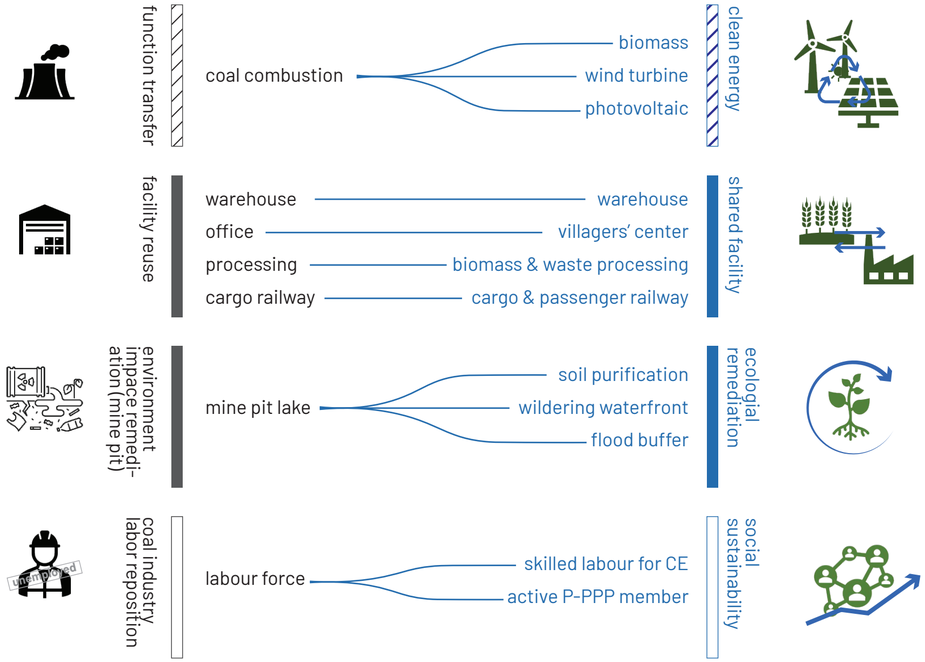
BIOMASS

There are still area with no significant wind or solar energy potential. However, with its vast area of agriculture production land, bio-based energy can still be a way out for these area. Large-scale biomass plant and de-centralized biogas/biomass plants can provide equivalent clean and renewable energy.

2.2.2 introduce circularity business to the coal mine region



To ensure a rapid and smooth transition from coal mining economy and coal-fired power generation, the two Huaihe bases also need to ensure "regeneration after extinction". In this strategy, emphasis is placed on finding circular economy business types that are synergistic with the existing coal mining economy, and guiding and encouraging coal mining SOEs to bring capital into the circular economy in the form of capital injections and strategic mergers and acquisitions. In this way, not only will the circular economy have strong financial support, but these coal mining SOEs will also be able to have new revenue streams and development possibilities. In this way, we can ensure the feasibility of the transformation of the coal economy of the two Huaihe bases.



organizational infras.

coal mine corporate (state-owned enterprises)

strategic collaboration

possible ways of collaboration
- synergetic investment
- strategic merger
- strategic acquisition

circular business (private)

China Resources

Huaibei Mines

China Coal

Huainan Mines

Energy Recovery and Utilization

Convert coal mine waste or residual coal into renewable energy sources such as biomass fuels, biogas, or biomass power generation. This not only reduces environmental pollution but also provides clean energy for the region

Water Resource Management

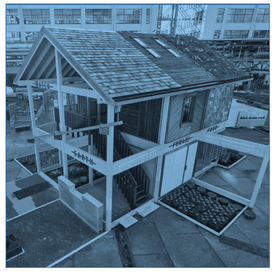
Coal mine areas often face water resource challenges. Introduce water circular economy businesses such as establishing water treatment facilities to treat wastewater for agricultural irrigation or industrial use while recovering and reusing water resources.

Waste Management and Recycling

Establish waste management facilities to sort, recycle, and reuse mining waste. The waste can be used for the production of building materials, renewable energy, and other applications.

Ecotourism and Ecological Restoration

Utilize the natural resources and unique landscapes of former mining areas to develop environmental tourism. Through ecological restoration and environmental conservation measures, offer experiences such as eco-tourism, hiking, wildlife observation, attracting tourists, and creating employment opportunities.



New Material Production

Develop the production of new materials in former mining areas, such as renewable materials and environmentally friendly construction materials. This helps reduce dependence on traditional mining resources while promoting sustainable development.

Agriculture and Bioeconomy

Utilize the land resources of former mining areas to develop organic farming, agricultural processing, and bioeconomy industries. For example, grow crops such as grains, vegetables, and herbs using organic farming practices or establish biomass fuel production facilities.

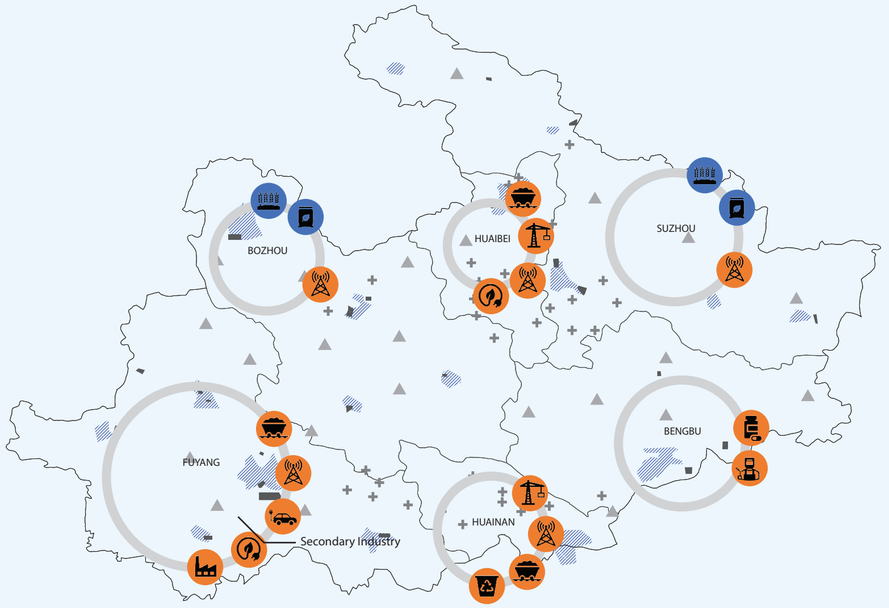
image source (from top left to bottom right)
https://rb.gy/usdva; https://rb.gy/vfjir; https://rb.gy/kw4e2; https://rb.gy/r0d4b; https://rb.gy/q6zbg

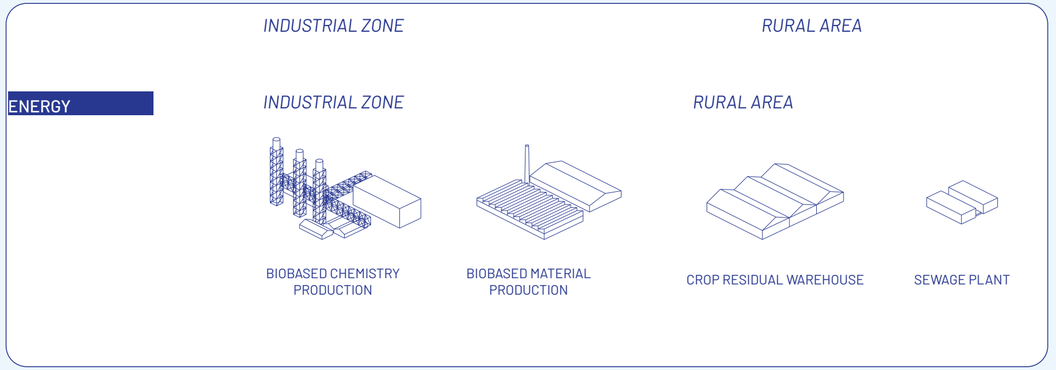
Strategic Objectives 2.3

Complete agriculture production value chain with circular production infrastructure

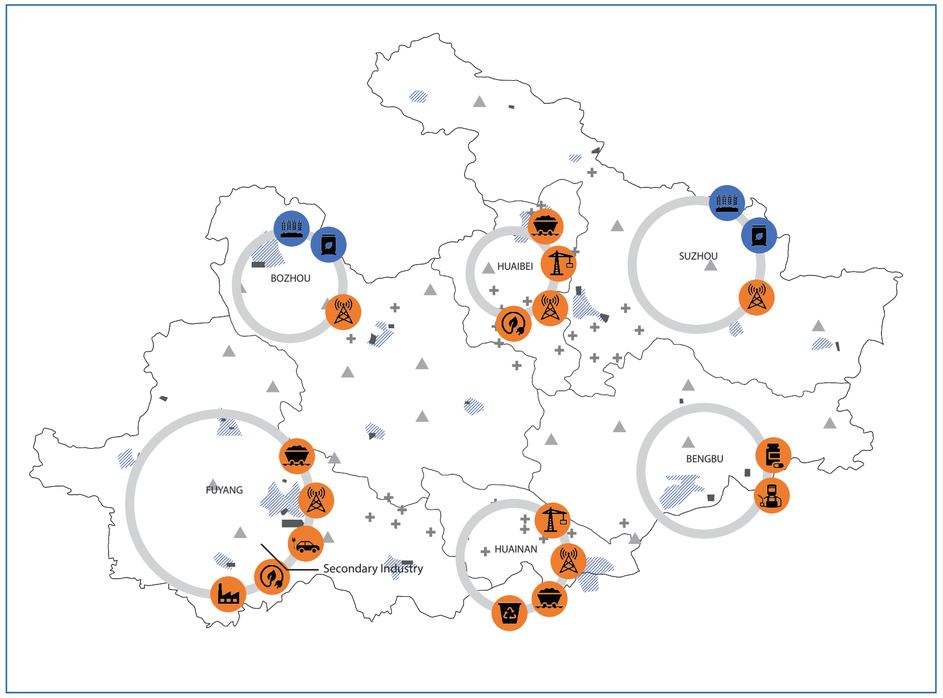
Project Area

2.3.1 reconstruct road and waterway system in project area
2.3.2 build biomass and waste processing facilities in industrial park next to farmland and villages in project area
2.3.3 add small scale sewage plant in needed villages





2.3.2 insert biomass and waste processing facilities



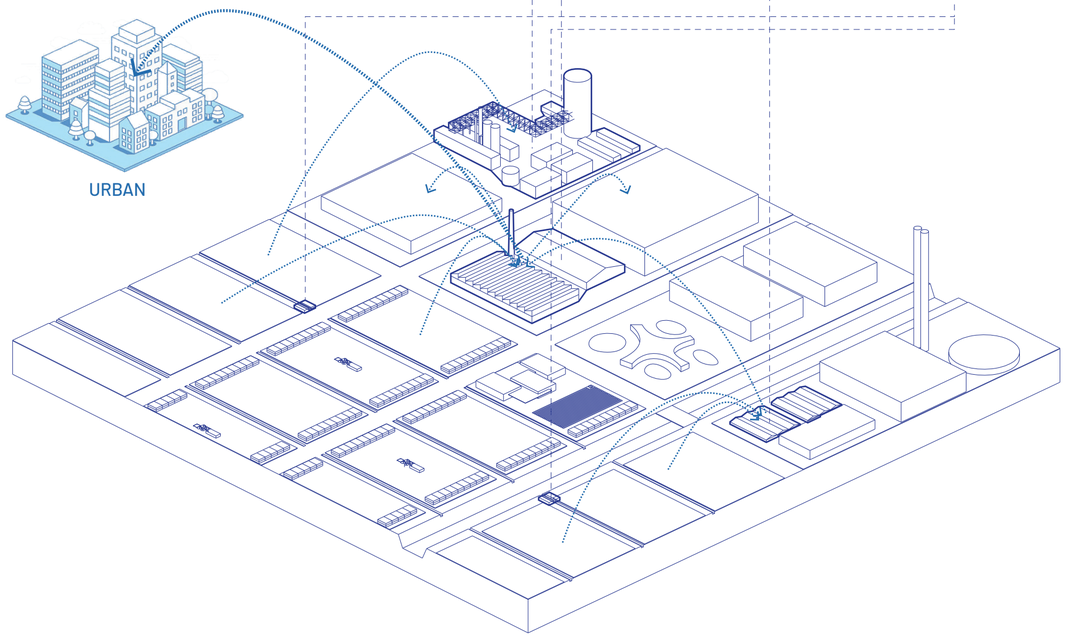
major urban area
project type A
project type B
project type C
coal mine base

organizational infras.

PLANNING VALIDATION OPERATING

CIRCULAR PRODUCTION

	INDUSTRIAL ZONE		*RURAL AREA*	
	BIOBASED CHEMISTRY PRODUCTION	BIOBASED MATERIAL PRODUCTION	CROP RESIDUAL WAREHOUSE	SEWAGE PLANT
Building Area	2,000 sqm	2,000 sqm	1,500 sqm	80 sqm
Site Area	1 ha	1 ha	1,200 sqm	100 sqm
Programme	chemistry production	biobased material	crop residual storage	household sewage process
Service Radius	/	/	10 SPU	800 households



URBAN

PROJECT AREA

GOAL 3

Produce while Regenerating

production activities as opportunities to re-pair and regenerate local eco-system

Project Area

Goal 3 tackles with the second pillar of the circular transition according to Jo Williams: ecology regeneration. The current condition of north Anhui agriculture production lacks in efficiency in both land-use and production way. The following strategies aim to improve land-use efficiency and regenerate local ecoloy through property right integration and a cross-disciplinary purification method.

Strategic Objectives for Goal 3

3.1 Scale up agriculture production

3.2 Purfiy polluted soil through a multi-method approach

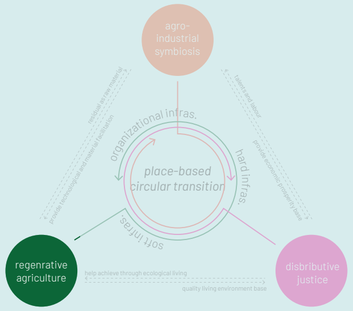
3.3 Re-naturalize waterfront

Infrastructures to Intervene

- landuse
- agricultural production
- green
- waterway

Proposed Key Indicator

- prosperity
- livability
- sustainability



[conceptual framework]

image: ©Zhang Kechun, *the Yellow River*

Strategic Objectives 3.1

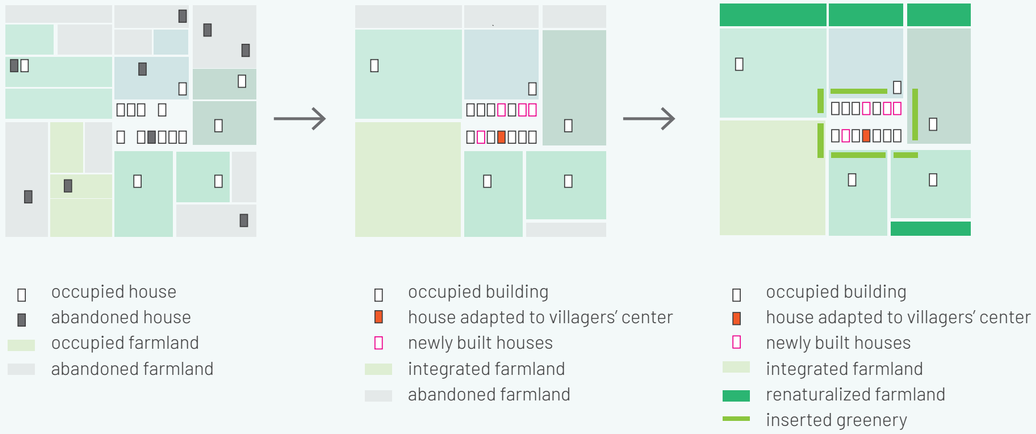
Scale up agriculture production

PT-A PT-B PT-C

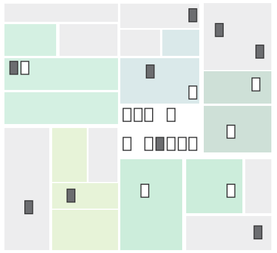
3.1.1 integrate fragmented abandoned farmland into standardized production units (SPU)

3.1.2 introduce scale production infrastructure (sewing, harvesting, sensoring and watering facility)

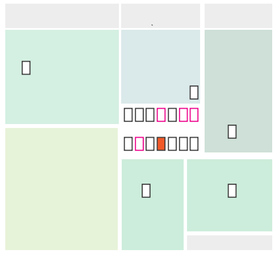
3.1.3 transform redundant farmland into ecologic pad



3.1.1 integrate fragmented abandoned farmland



occupied house
abandoned house
occupied farmland
abandoned farmland



occupied building
house adapted to villagers' center
newly built houses
integrated farmland
abandoned farmland

organizational infras.

PLANNING VALIDATION OPERATING

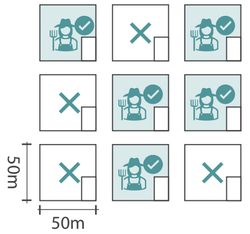
In China, the concept of homestead land, known as "宅基地" (zhái jī dì), has been instrumental in providing residential plots to rural households while maintaining the agricultural nature of the countryside. However, the exodus of people from rural areas to larger cities in search of better economic opportunities has led to the scattering of homestead land, posing challenges to agricultural efficiency. To address this issue, a collaborative approach involving village committees, local governments, and the private sector has emerged to integrate and consolidate scattered land into larger units, enabling more efficient scale agricultural production.

The village committee, acting as a representative body of rural residents, assumes a mediator role in facilitating the coordination between the will of villagers and the private sector, ensuring effective communication and collaboration.

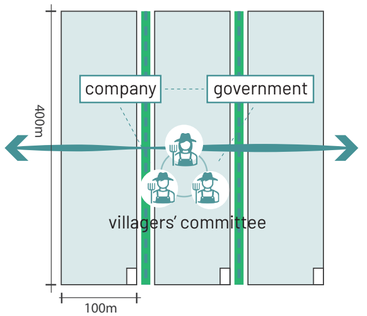
In the process of transformation and development, priority should be given to the interests and aspirations of the villagers. Their needs and perspectives should guide decision-making, fostering inclusive and participatory development practices.

The local government plays a crucial role by providing legal assistance, granting necessary permissions, and offering subsidies to attract companies and investments. These measures aim to facilitate the integration of scattered land and promote sustainable agricultural development in rural areas.

Private companies, such as 盒马生鲜 (Hema Fresh), a leading grocery wholesaler in China, are considered key players in this context. With their substantial scale and expertise, they possess the capacity to guide farmers in responding quickly to market demands. These companies can contribute by introducing modern farming techniques, promoting value chains, and enhancing agricultural productivity to meet evolving consumer needs.t

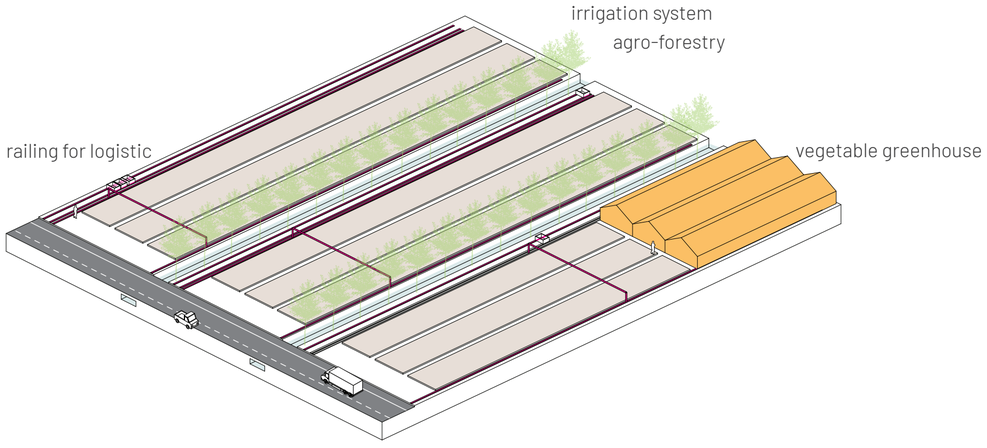


[scattered, partially abandones lands]

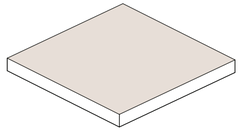


[organized, standardized production unit operated by a collaboration of stakeholders]

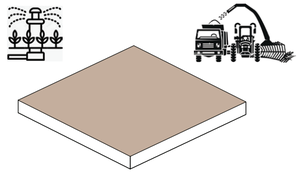
3.1.2 introduce scale production infrastructure (sewing, harvesting, sensoring and watering facility)



[standardized production unit]



soil preparation
planting
growing
harvesting
prepare to sell



soil preparation
planting
growing
harvesting
prepare to sell

agroforestry

a production system where woody crops are combined with agricultural crops and/or animals on the same plot. This kind of mixed cultivation is expected to have economic and ecological advantages as compared with monoculture. Agro-forestry can help with water management by reducing nutrient and soil surface runoff which leads to cleaner water4. Trees can help reduce water runoff by decreasing water flow and evaporation and thereby allowing for increased soil infiltration. Compared to row-cropped fields nutrient uptake can be higher and reduce nutrient loss into streams.

cover crop

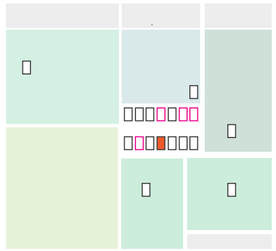
There are three main categories of cover crops depending on their properties and options for use: grasses, legumes, and broadleaf non-legumes. Common cover crops include legumes such as clover, cowpeas and alfalfa; grasses such as oats, rye and ryegrass; brassicas such as mustards, radishes and turnips.

agriculture machanization

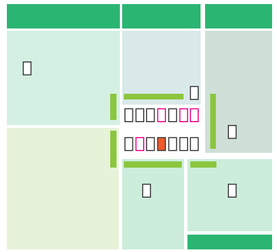
Agricultural mechanization refers to the use of machinery and equipment in various agricultural activities to improve efficiency, productivity, and profitability. It involves the application of mechanical power and automated processes to perform tasks that were traditionally carried out manually or with animal power. The benefits of agricultural mechanization include increased productivity, reduced labor requirements, improved efficiency, cost savings, and the ability to scale up agricultural operations.

image source: wikipedia, https://sustainable-secure-food-blog.com/2019/04/22/what-are-cover-crops/, https://www.ecomatcher.com/what-is-agroforestry/

3.1.3 Transform redundant farmland into ecologic pad



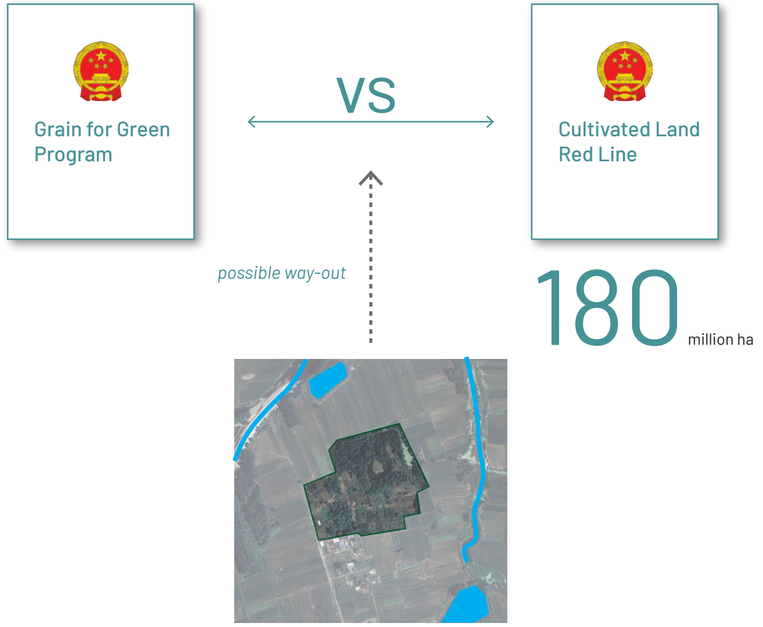
occupied building
house adapted to villagers' center
newly built houses
integrated farmland
abandoned farmland



occupied building
house adapted to villagers' center
newly built houses
integrated farmland
renaturalized farmland
inserted greenery

organizational infras.

PLANNING VALIDATION OPERATING



scale production makes room for renaturalized public green

The conflict between China's Grain-for-Green Program, which aims to preserve arable land for grain production, and the Grain-to-Green Program, which focuses on ecological conservation and reforestation, arises from the tension between agricultural needs and environmental objectives. Balancing sustainable agricultural practices with land conservation is key to resolving this conflict. This can be achieved through modern farming techniques, high-yield crop varieties, and technological innovations that optimize land use and enhance productivity while minimizing environmental impacts.

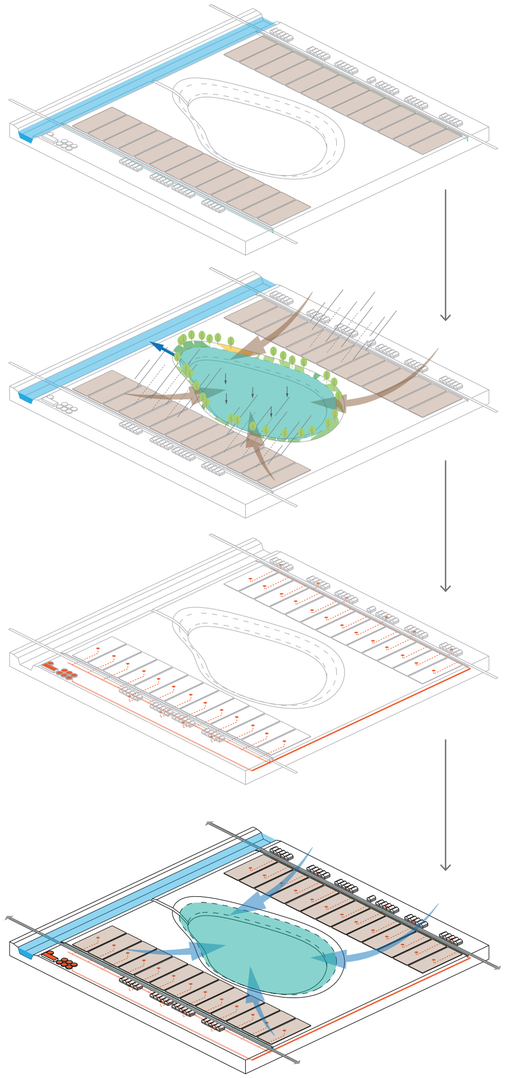
Strategic Objectives 3.2

Purfiy contaminated soil through a multi-method approach

PT-A PT-B PT-C

3.2.1 adjust local ditch system in a minimized manner to form mine-pit resolution system

3.2.2 introduce purifying crops and plants



irrigation

Irrigation system will be a combination of both nature stream and mechanized irrigation facilities to maximize accuracy and efficiency.

surface run-off

Surface runoff of rainfall is separately guided to flow into the nearby mine-pit lake, where the depth of mine-pit can allow pollutants to settle to the bottom of the lake.

integrated pipeline system

Construct new sewage system to further control farming and household sewage to be processed.

multi-method purification strategy

In this new multi-layer system, the pollution of North Anhui rural area can be effectively controled and remediated.

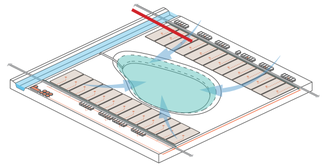
Strategic Objectives 3.3

Renaturalize riverfront

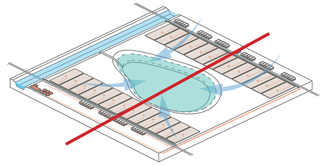
PT-A | PT-B | PT-C

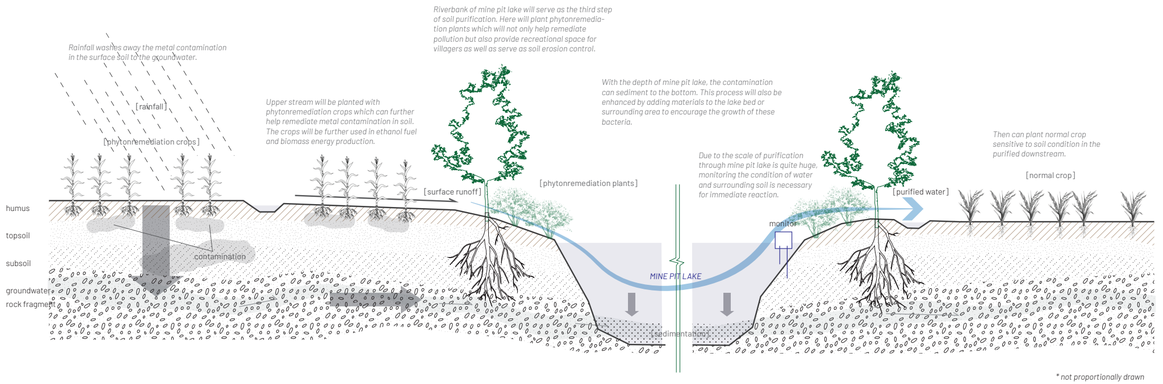
3.3.1 naturize waterfront for soil erosion control and additional recreational purpose

"nature" the riverfront



"nature" the mine-pit lake waterfront





** not proportionally drawn*

GOAL 4

Start Here, Start Together

communitarian governance for realization of place-based circular transition

Yangtze River Delta | North Anhui | Project Area

Due to the project's complexity of transcalarity and cross-system, according governance design is also crucial for the success of implementation. The project adapts a communitarian approach of governance design, meaning to build a coordinative regional transcalar governance system through setting a common goal and participatory democraticy.

Strategic Objectives for Goal 4

4.1 establish multi-scalar coordination

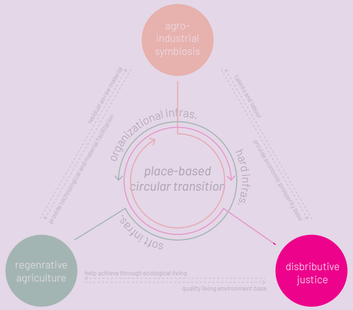
4.2 initiate development momentum at local level

Infrastructures to Intervene

- education
- governance
- PPP (public-private partnership)

Proposed Key Indicator

- prosperity
- livability
- social justice

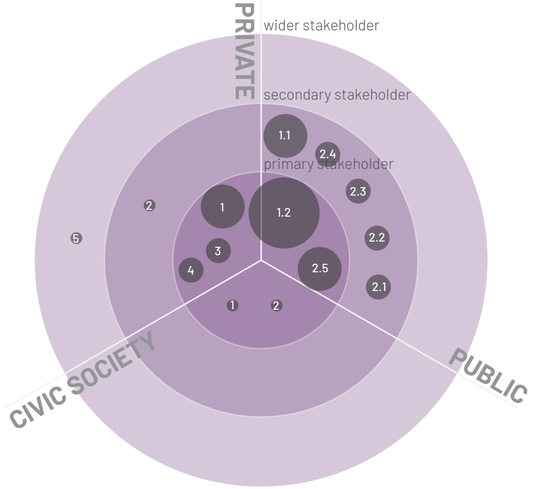


[conceptual framework]

Stakeholder Engagement Scheme of GOAL 1

Connect for Opportunity

strengthen regional connectivity and improve logistic efficiency



PUBLIC

1 provincial

1.1 Provincial Administration of Transportation

1.2 Anhui Provincial Development and Reform Commission (Provincial Railway Construction Office)

2 city-level

2.1 Municipal Transportation Bureau

2.2 Municipal Water Resources Bureau

2.3 Municipal Housing Bureau

2.4 Municipal Bureau of Natural Resources and Planning

2.5 Municipal DRC* (Provincial Railway Construction Office)

PRIVATE

1. China Raiway Corporate
2. private bus line operator
3. City Traffic Construction Group Co.
4. real estate developer
5. circular business

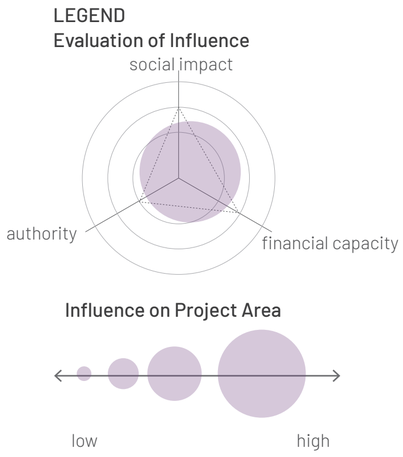
CIVIC SOCIETY

1. villagers
2. citizens

** DRC = development and reform commission, it is a continuous multi-level government organization transformed from previous Planning and Economic Committee*

Stakeholder Overview

From the analysis, we can see that for all the stakeholders related to realizing goal 1, overall it is an inbalance situation with concentration in the public and private sector. To further elaborate, public sector has largest power and involve multiple departments at both provincial and municipal scale. It can be a strength for certain strategy to be performed in a continuous manner for better effect. Meanwhile, private sector has the monopoly situation of China railway company and city traffic construction group. The China railway company is an SOE privatized from previous national railway bureau due to its high debt issue. After privatization, it is still facing super high debt issue and for this reason, certain collaboration with other private sector stakeholders in achieving the construction or upgrade of railway lines and station area is necessary. As for the civic society, currently stakeholders from this sector are constrained in influence capacity even though they are directly relate to the development.



Power-Interest Analysis

By listing out the stakeholders in a power-interest quadrant based on their power to influence, interest in the goal, and attitudes, it is easier to see which groups of stakeholders to collaborate with and which quadrant some of the stakeholders should move towards. Based on the analysis, there are four major changes that need to be made.

Firstly, it is crucial to strengthen public-private partnerships (PPP) and joint efforts. To leverage the power between scattered stakeholders in the public and private sectors, collaboration is key. By utilizing PPP and fostering cooperation among private sector stakeholders, we can ensure the feasibility of the project and achieve shared objectives.

Secondly, fostering collaboration between cities is essential. By promoting intercity cooperation and knowledge sharing, we can harness the collective strength of multiple urban centers. This collaborative approach allows for the pooling of resources, expertise, and experiences, leading to more effective and efficient solutions to common challenges.

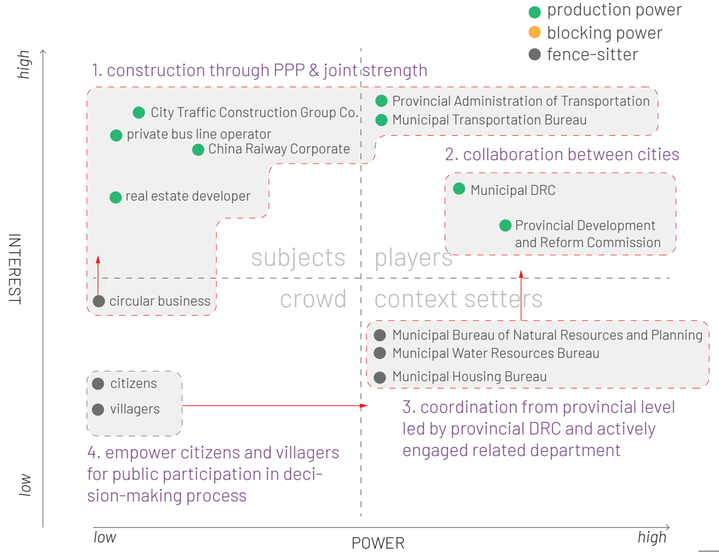
Thirdly, coordination from the provincial level down to the local level is paramount. Development and reform committees at all levels should actively engage relevant departments to ensure smooth and cohesive implementation of the project. This coordinated effort guarantees that all stakeholders are aligned, resources are optimally allocated, and potential bottlenecks are addressed promptly.

Lastly, empowering citizens and villagers to participate in the decision-making process is vital. By involving the public in shaping policies and projects, we tap into a broader range of perspectives, ideas, and local knowledge. This inclusive approach enhances transparency, accountability, and overall legitimacy, while also fostering a sense of ownership and responsibility among the people directly affected by the project.

Principles of Stakeholder Engagement in Goal 1

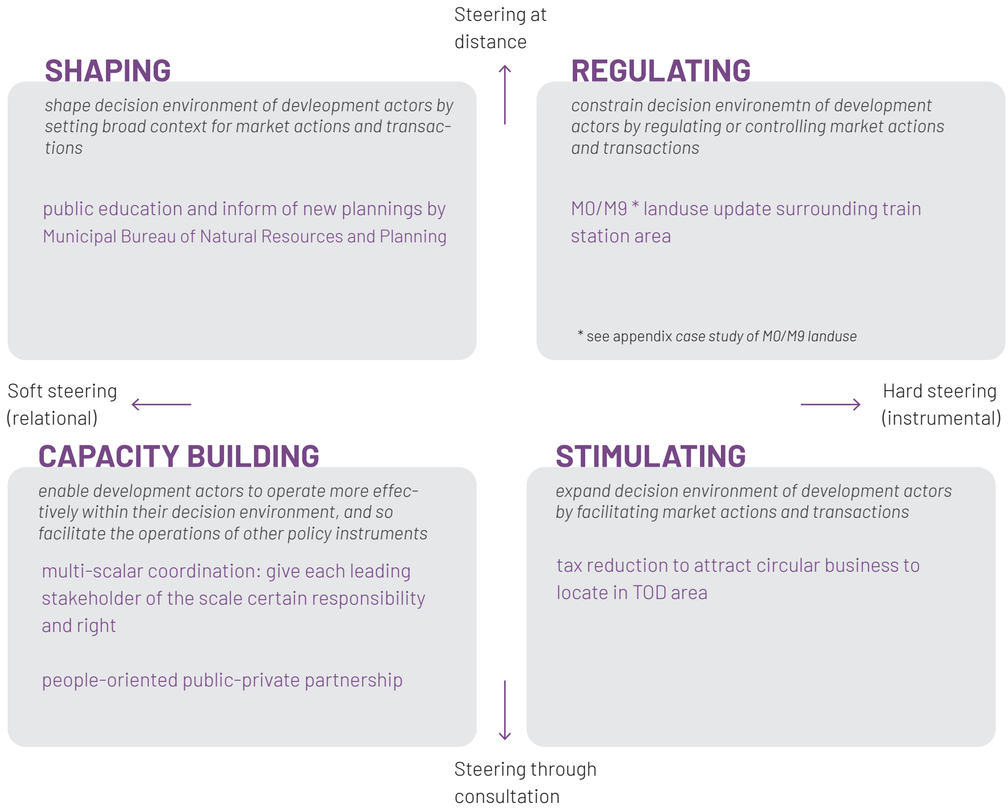
1) multi-scalar coordination:
with at least one role in charge at certain level to take innitiative for all sorts of events

2) marketization:
actively utilize the capacity of private sector in terms of service provision



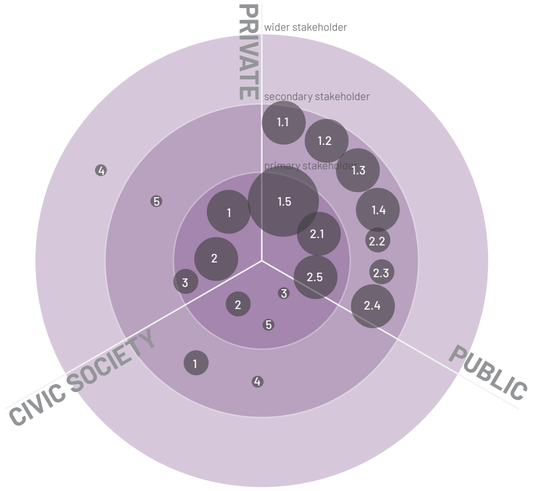
Engage through Quadrant Policy Tools

Certain policy tools are then applied to optimize the stakeholder dynamics, engage, and realize the goal. Here the four types of stakeholder engagement policy toolsframework of Verheul, W.J. et al. are adopted.



Stakeholder Engagement Scheme of GOAL 2&3

Go Circular and Extend
Produce while Regenerating



PUBLIC

1 provincial

1.1 Administrationof Science and Technology of Anhui Province
1.2 Provincial Energy Administration
1.3 Provincial Administration of Ecology and Environment
1.4 Provincial Administration of Natural Resources
1.5 Anhui Provincial Development and Reform Commission

2 city-level

2.1 Economic and Information Bureau
2.2 Municipal Rural Energy Bureau
2.3 Municipal Bureau of Ecology and Environment
2.4 Municipal Bureau of Natural Resources and Planning
2.5 Municipal DRC*

PRIVATE

1. Huainan Mining (Group) Co.
2. Huaibei Mining Hldgs Co
3. Industrial Park Management Committee
4. local SMEs
5. circular business

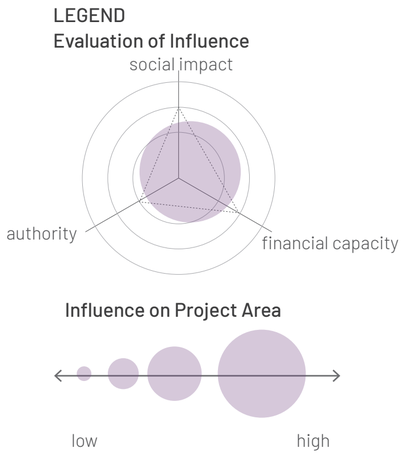
CIVIC SOCIETY

1. leading universities
2. villagers' committee
3. villagers
4. vocational school
5. coal mine labours' union

Stakeholder Overview

Since both goal 2 and goal 3 tackle with the circular transition issues, namely the agro-industrial synergy and regenerative agriculture, the stakeholders of the two issues largely overlap with each other. Hence the stakeholder engagement design of the two are considered simultaneously.

From the analysis, we can see that for all the stakeholders related to realizing goal 2&3 has a significant concentration in the public sector. In the private sector we have significant stakeholder: two mining companies. Both are SOEs with large local economic influence as major job creator and GDP contributor. They also take important strategic role in terms of power provision. In order to achieve a circular transition, circular business and research capacity are crucial. However in terms of actual locating in north Anhui, both circular industry and research institutes are not very fond of the idea.



Power-Interest Analysis

To facilitate the circular transition in North Anhui Province, a comprehensive governance design should be implemented. This design will be based on two key principles: enhancing cross-department coordination within the public sector and promoting cross-sector collaboration involving government, civic society stakeholders, and private sector stakeholders. Additionally, the establishment of an intermediary role, such as industrial park committees supported by the government, can facilitate the implementation process. Here is an explanation of the governance design:

Enhancing Cross-Department Coordination within the Public Sector:
To achieve a successful circular transition, it is crucial to enhance coordination and communication among various departments within the government. Currently, departments such as the Ecology Bureau or Economic Bureau primarily follow the guidance from the mayor's office. However, by promoting cross-department collaboration, these entities can leverage their respective expertise and resources to achieve synergy during the implementation of circular practices.
a) Coordination Mechanisms: Introduce coordination mechanisms, such as regular interdepartmental meetings or task forces, to facilitate information sharing, joint planning, and decision-making. These mechanisms will help align policies and strategies across departments, ensuring a cohesive approach towards circular transition.

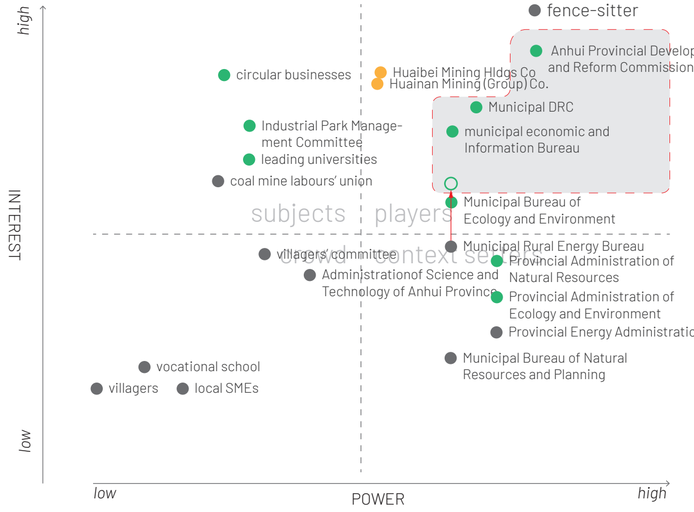
b) Data Sharing and Integration: Encourage departments to share relevant data and information with each other, promoting a more comprehensive understanding of the challenges and opportunities related to circular practices. Integrated data systems can assist in identifying potential areas for collaboration and better policy formulation.

c) Training and Capacity Building: Organize training programs and workshops to enhance the understanding of circular principles and practices among government officials. This

Principles of Stakeholder Engagement of Goal 2&3

1) cross-department coordination
active communication and collaboration between different departments of government

2) cross-sector collaboration
active collaboration between civic society and private sector through organization of the government



will promote a common understanding and language across departments, fostering collaboration and coordination.

Enhancing Cross-Sector Collaboration:
To effectively utilize research capacity and promote circular business innovation, collaboration between the government, civic society stakeholders, and private sector stakeholders is essential.
a) Public-Private Partnerships: Foster partnerships between the government and private sector stakeholders to incentivize circular business innovation or start-ups. This can be achieved through various means, such as providing financial incentives, access to resources, or streamlined regulatory processes for circular initiatives.

b) Research Collaboration: Encourage collaboration between research institutions, universities, and government agencies to harness their research capacity for circular transition. Research findings can inform policy decisions, identify best practices, and guide the implementation of circular initiatives.

c) Stakeholder Engagement: Actively involve civic society stakeholders, including non-governmental organizations, community groups, and local residents, in the circular transition process. Engage them through consultations, public forums, and partnerships to ensure that their perspectives and knowledge are integrated into decision-making processes.

Role of Industrial Park Committees:
To serve as intermediaries between the government and circular businesses, industrial park committees can play a crucial role. These committees, supported by the government, can facilitate the implementation of circular practices and provide support to circular business innovation or start-ups.
a) Facilitation and Support: Industrial park committees can provide guidance, resources, and technical assistance to businesses in adopting circular practices. They can offer mentorship, access to networks, and facilitate collaboration among businesses within the industrial park.

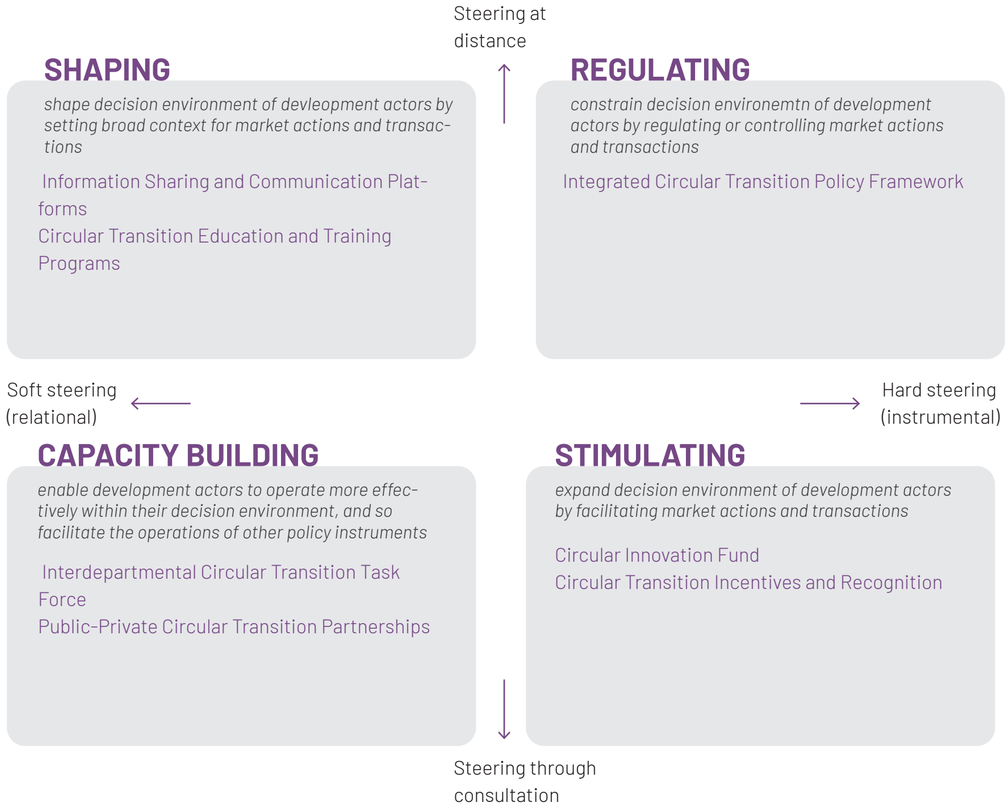
b) Policy Advocacy: Act as advocates for circular practices by working closely with the government to propose policy changes or incentives that promote circular business models. Industrial park committees can represent the interests of circular businesses and provide feedback on policy implementation.

c) Knowledge Exchange: Facilitate knowledge sharing and exchange of best practices among businesses within the industrial park. Organize workshops, seminars, and networking events to foster collaboration, innovation, and learning.

By implementing this governance design, North Anhui Province can enhance coordination within the public sector, promote cross-sector collaboration, and establish an intermediary role to support the circular transition. This comprehensive approach will facilitate the effective implementation of circular practices, harness research capacity, and stimulate circular business innovation, ultimately leading to a more sustainable and resilient economy.

Engage with Quadrant Policy Tools

Certain policy tools are then applied to optimize the stakeholder dynamics, engage, and realize the goal. Here the four types of stakeholder engagement policy toolsframework of Verheul, W.J. et al. are adopted.



SUMMARY

INFRASTRUCTURE TYPE

- ● **HARD INFRASTRUCTURE**
  transportation
  logistic
  green and blue
  energy
  industry (production and processing)
- ◍ **SOFT INFRASTRUCTURE**
  agriculture information and knowledge
  job education
  agriculture big data
  municipal service
- ○ **ORGANIZATIONAL INFRASTRUCTURE**
  inter-city collaboration platform
  legal and regulatory

SCALE OF INTERVENTION

- YRD — Yangtze River Delta
- NA — Case Study Area - north Anhui 6 cities
- PT a — project type A | city edge industrial park
- PT b — project type B | previous coal mine base
- PT c — project type C | middle size township

GOALS	STRATEGIC OBJECTIVES	IMPLEMENTATION ACTIONS	INTERVENTION SCALE	INFRAS. TYPE
1. connect for opportunity: strengthen regional connectivity and improve logistic efficiency	1.1 optimize existing transportation infrastructure to align with the development zone and needed connection	1.1.1 add up train connection between Fuyang-Bengbu and upgrade railway tracks between Fuyang-Huaibei 1.1.2 connect border spaces with bus lines (Taihe county-Bozhou, Guoyang county, Wuhe county-Huainan city) 1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis	NA	● transportation ● railway ● bus ● highway ○ landuse
	1.2 hybridization: connect adjacent transportation points for higher efficient transportation network	1.2.1 extend bus lines around certain train station(Linquan, Gucheng, Tangshan, Huangkou, Guzhen, Liancheng)	NA	
		1.2.2 road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution		
2. go circular and extend: catalyze synergetic development of local agriculture and industry	2.1 establish multi-scalar innovation collaboration as foundation for place-based circular transition	2.1.1 RESEARCH: establish research league for circularity transition AND set up satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses 2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy	YRD NA	◍ education ○ local government ○ village committee
	2.2 Support the phasing out of coal mine industry with agriculture-integrated methods	2.2.1 build wind and photovoltaic generating infrastructures in NA based on energy production potential 2.2.2 introduce circularity business to the coal mine region 2.2.3 offer job education in previous coal mine area in collaboration with new businesses	NA PTb	● energy ● industry ● waterway ◍ education ○ PPP
	2.3 Complete agriculture production value chain with circular production infrastructure	2.3.1 reconstruct road and waterway system in roject area 2.3.2 build biomass and waste processing facilities in industrial park next to agricultural land and villages in project area 2.3.3 add small scale sewage plant in needed villages	PTa PTb PTc	● road ● industry ● waterway
3. produce while regenerating: production activities as opportunities to repair and regenerate local eco-system	3.1 consolidate and scale up agriculture production	3.1.1 integrate fragmented abandoned farmland into standardized production units(SPU) 3.1.2 introduce scale production infrastructure (sewing, harvesting, sensoring and watering facility)	PTa PTb PTc	○ landuse ◍ production
	3.2 purfiy polluted soil through a multi-method approach (cover-crop and mine-pit resolution)	3.2.1 adjust local ditch system in a minimized manner to form mine-pit resolution system 3.2.2 introduce purifying crops and plants	PTb PTc	● green ● waterway
	3.3 improve waterfront ecologic sustainability	3.3.1 naturize waterfront for soil erosion control and additional recreational purpose 3.3.2 transform redundant farmland as green patches for villagers' recreation and local micro natural system	PTa PTb PTc	● green
4. start here, start together: communitarian governance for realization of place-based circular transition in rural periphery	4.1 establish multi-scalar coordination	4.1.1 set up multi-scalar (NA, city, project area) coordination committee circular transition and development with local political autonomy 4.1.2 people-oriented public-private partnership	PTa PTb PTc	◍ education ○ governance ○ PPP
	4.2 initiate development momentum at local level	4.2.1 empower rural population through villagers' center and satelite lab for knowledge spreading, information sharing and co-decision making 4.2.2 establish connection between job education and local enterprises through policy support 4.2.3 empower local startups through policy and financial support	YRD NA	○ governance ○ PPP

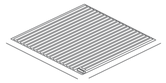
RESEARCH

EDUCATION

ENERGY

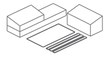
CIRCULAR PRODUCTION

RURAL AREA



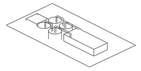
EXPERIMENT FARM

Building Area	200 SQM
Site Area	16 ha
Programme	testing
Service Radius	/



VILLAGERS CENTER

	1,200 SQM
	2,000 SQM
	education, workshop, event
	2,500 ppl



LOCAL BIOGAS PLANT

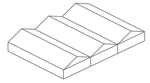
	/
	800 SQM
	biogas production
	2,500 ppl

WIND TURBINE

	/
	/
	power generation
	5MW

ROOFTOP SOLAR

	/
	/
	power generation
	10kW



CROP RESIDUAL WAREHOUSE

	1,500 sqm
	1,200 sqm
	crop residual storage
	10 SPU

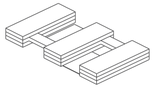
SEWAGE PLANT

	80 sqm
	100 sqm
	household sewage process
	800 households

INDUSTRIAL ZONE

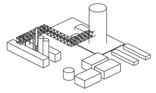
SATELLITE LABS

Building Area	1,000 sqm
Site Area	2,000 sqm
Programme	research
Service Radius	/



VOCATIONAL SCHOOL

	200 SQM
	16 ha
	education for circular jobs
	/

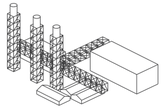


BIOBASED ENERGY PLANT

	4,000 SQM
	0.5 ha
	biobased energy
	70 mW

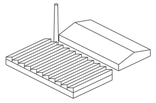
MINE-PIT SOLAR

	/
	/
	power generation
	50MW



BIOBASED CHEMISTRY PRODUCTION

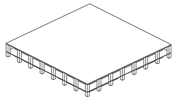
	2,000 sqm
	1 ha
	chemistry production
	/



BIOBASED MATERIAL PRODUCTION

	2,000 sqm
	1 ha
	biobased material
	/

URBAN AREA

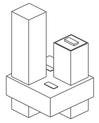


UNIVERSITY

Building Area	8,000 sqm
Site Area	10 ha
Programme	education, research
Service Radius	/

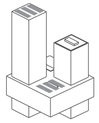
GREEN MARKET

	2,000 sqm
	1,500 sqm
	sale of food
	50,000 ppl



URBAN FARM

	/
	500 sqm
	growth
	5 household



ROOFTOP SOLAR

	/
	/
	power generation
	20kW

PHASING

GOAL 1

Connection As Opportunity

1.1 optimize existing transportation infrastructure to align with the development zone and needed connection
1.2 hybridization: connect adjacent transportation points for higher efficient transportation network

GOAL 2

Go Circular & Extend

2.1 establish multi-scalar innovation collaboration as foundation for place-based circular transition
2.2 replace coal mine industry with renewable energy
2.3 insert shared infrastructure for both industrial basic production and village livelihood

GOAL 3

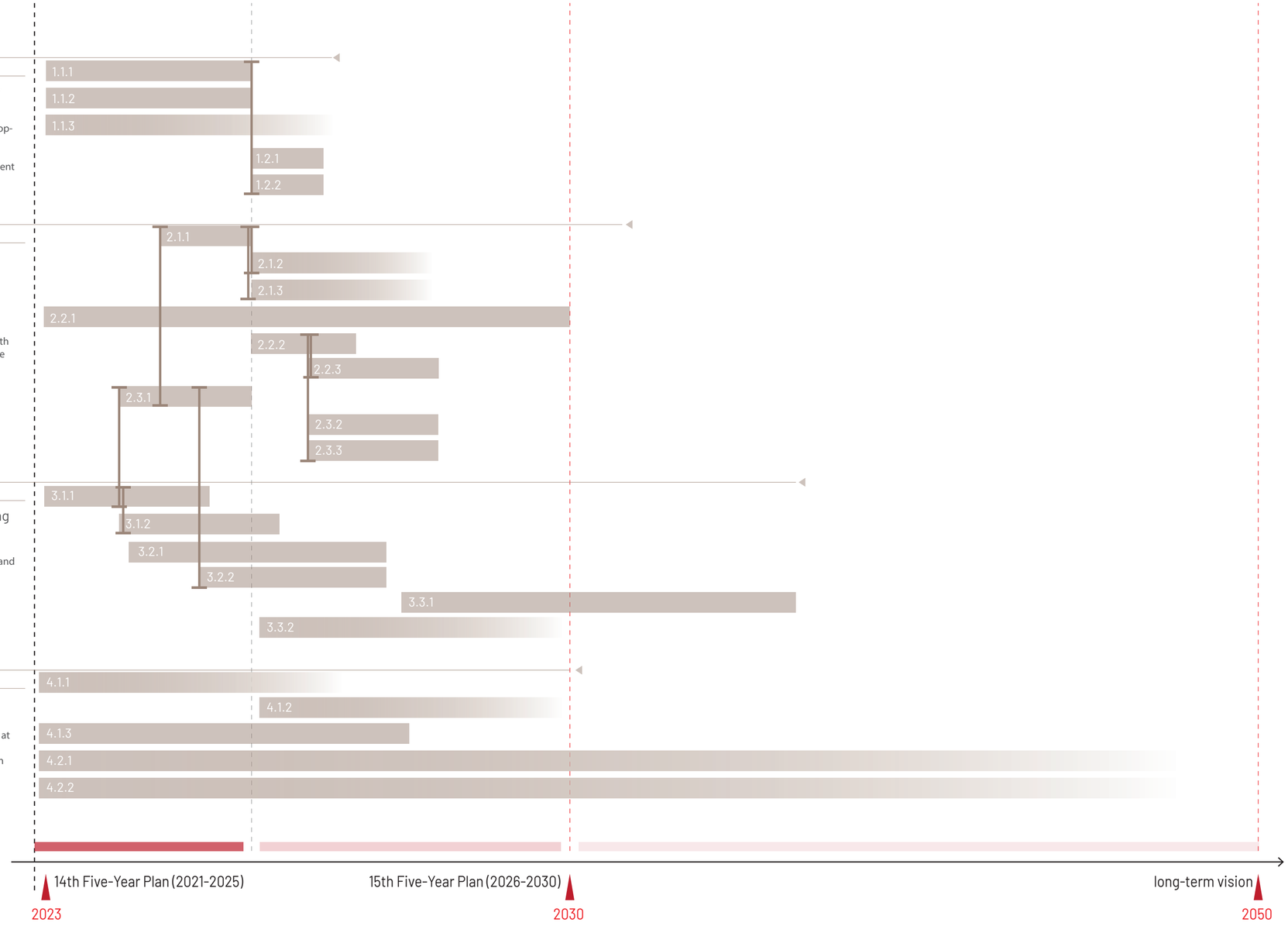
Produce While Regenerating

3.1 scale up agriculture production
3.2 purfiy polluted soil through a multi-method approach (cover-crop and mint-pit resolution)
3.3 improve waterfront ecologic sustainability

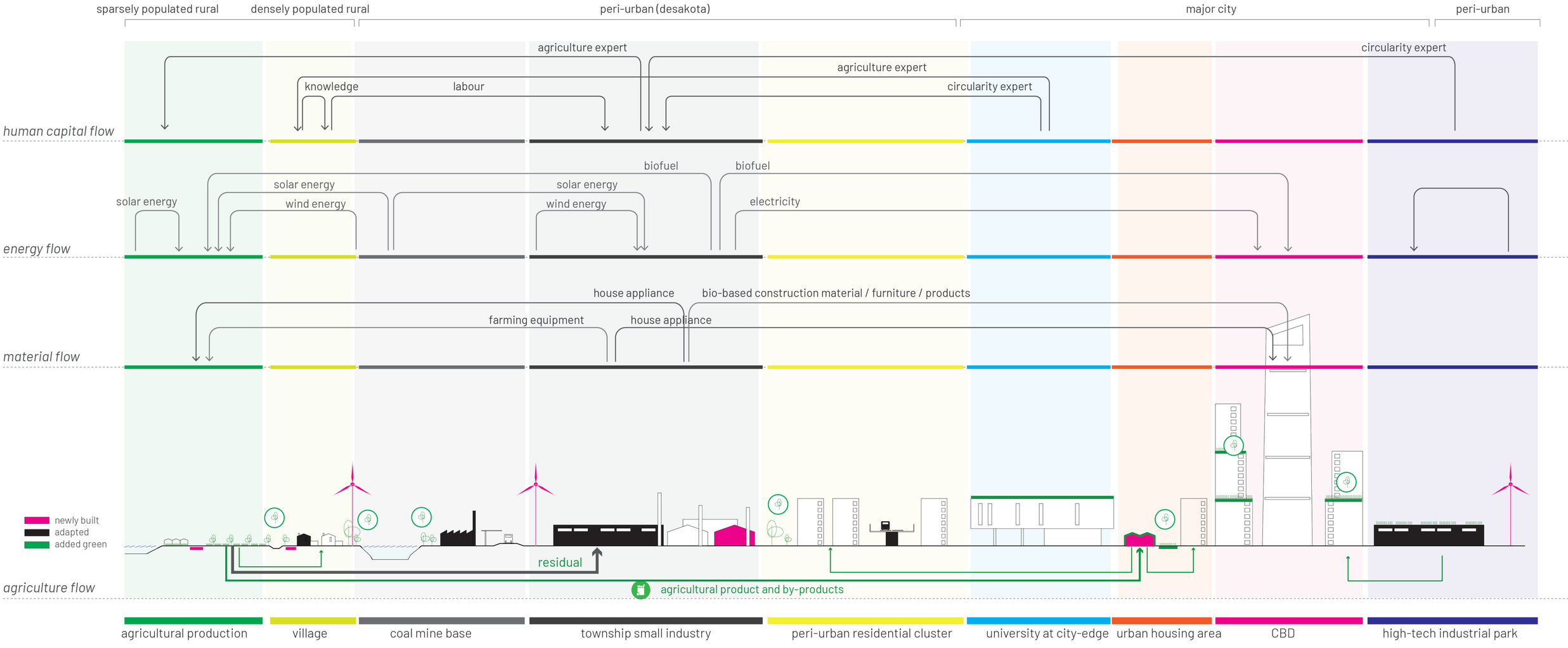
GOAL 4

Start Here, Start Together

4.1 initiate development momentum at local level
4.2 establish multi-scalar coordination



SUMMARY

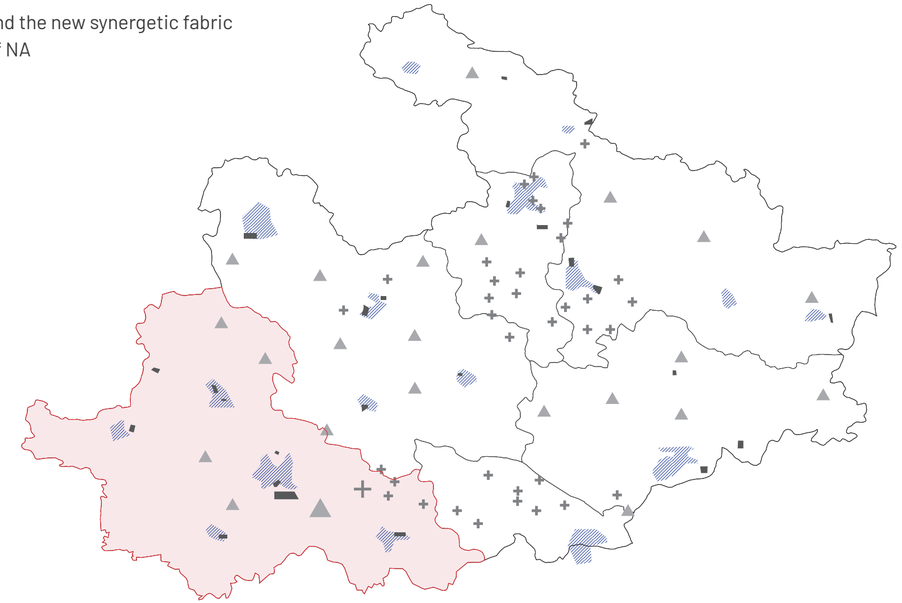

sparsely populated rural
densely populated rural
peri-urban (desakota)
major city
peri-urban
agriculture expert
circularity expert
agriculture expert
knowledge
labour
circularity expert
human capital flow
biofuel
biofuel
solar energy
solar energy
solar energy
wind energy
wind energy
electricity
energy flow
house appliance
bio-based construction material / furniture / products
farming equipment
house appliance
material flow
newly built
adapted
added green
residual
agricultural product and by-products
agriculture flow
agricultural production
village
coal mine base
township small industry
peri-urban residential cluster
university at city-edge
urban housing area
CBD
high-tech industrial park

09 PILOT PROJECTS

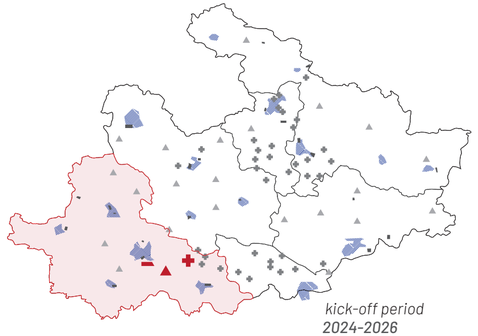
Pilot and generalize

project area kick-off: insert series of shared facilities of innovation, education and agri-industry synergy according to place condition and spatial requirement

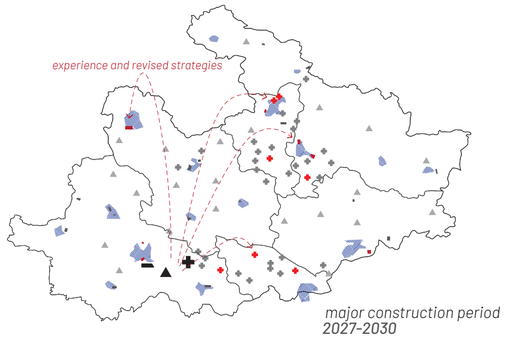
generalize: extend the new synergetic fabric to wider range of NA



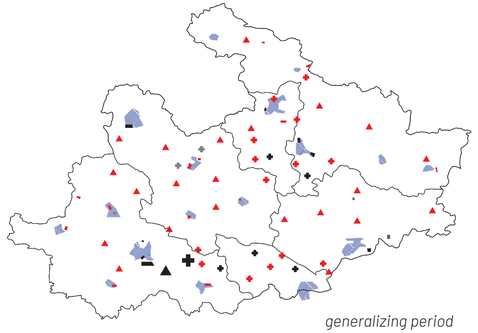
major urban area
project type A
project type B
project type C
coal mine base



kick-off period
2024-2026



major construction period
2027-2030



generalizing period
2031-2035

OVERVIEW

Apart from regional strategies at Yangtze River Delta level and north Anhui area level, projects are another crucial part of the overall development scheme as the intermediary agent between regional strategy and local condition.

Three types of project area are selected based on typologies of agriculture-industry interfaces in north Anhui area to explore the place-based circular transition in rural periphery potential: industrial parks at city edges, previous coal mine bases, and major towns alongside highway with highest accessibility potential based on space syntax analysis.

PROJECT TYPE A | CITY EDGE INDUSTRIAL PARK
PILOT PROJECT: Fuyang-Hefei Industrial Park

Located in the south-east periphery of Fuyang city, Fuyang-Hefei Industrial Park is a collaboratedly joint built industrial park funded by both Fuyang and Hefei municipality as part of the joint industrial parks program. It is built to utilize the capacity and strength of multiple cities and serves as a spatial container for economic and innovation collaboration. Currently, the construction of the park is still half way, leaving opportunity for further design to explore the agriculture-industry synergetic development.

PROJECT TYPE B | PHASING-OUT COAL MINE BASE
PILOT PROJECT: China Coal Xinji Liuzhuang Coal Mine

Located in Yinshang County (颍上县) in the east part of Fuyang municipality, China Coal Xinji Liuzhuang Coal Mine is in the phase of gradual closure. The previous mine pits are now filled with water with uncontrolled lake bank intruding surrounding farm lands. One of the biggest mine pit is now covered with solar panels with an energy generating capacity of c.a. 50 MW as part of the coal mine company transformation attempt to answer Dual-Carbon Goal (carbon neutrality and carbon peak).

PROJECT TYPE C | STREET TOWN
PILOT PROJECT: Liushipu Town

Located also in Yinshang, Liushipu Town is a typical “street town”, linear town alongside highway, with commercial programs facing G106, national highway going through it. Small-scale family oriented workshops of industries such as metalling and processing can be found here in the ocean of farm land.

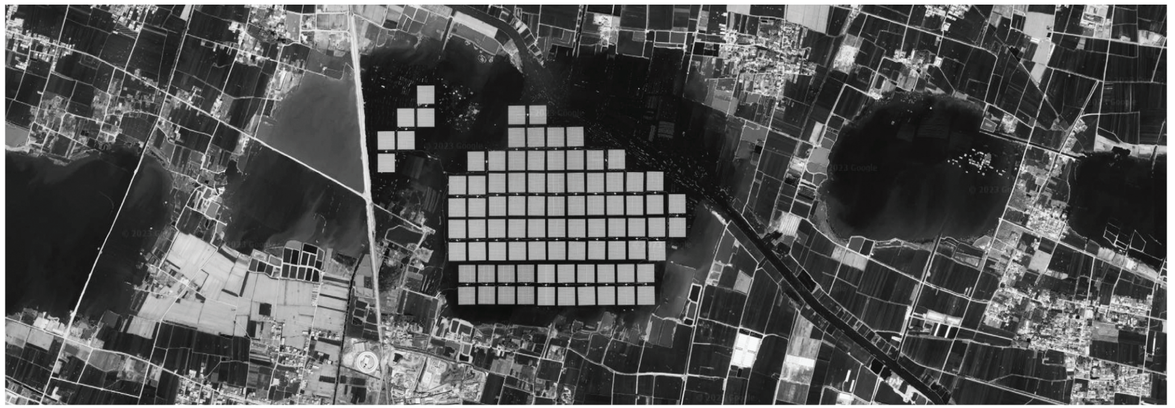


image source: google earth

PILOT PROJECT TYPE A

FUYANG-HEFEI INDUSTRIAL PARK
阜合工业园

Located in the south-east periphery of Fuyang city, Fuyang-Hefei Industrial Park is a collaboratedly joint built industrial park funded by both Fuyang and Hefei municipality as part of the joint industrial parks program. It is built to utilize the capacity and strength of multiple cities and serves as a spatial container for economic and innovation collaboration. Currently, the construction of the park is still half way, leaving opportunity for further design to explore the agriculture-industry synergetic development.

The thesis project uses pilot project type-A as a testing design to double check if all the strategies can be applied at local scale. During the design, some actions of the goal are double checked to create policy environment, infrastructural foundation for the lcoal scale design to have better feasibility.

GOAL 1 | CONNECT FOR OPPORTUNITY

1.1.2 connect border spaces with bus lines

1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis

1.2.2. road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution

GOAL 2 | GO CIRCULAR AND EXTEND

2.1.1 RESEARCH: establish research league for circularity transition AND set up satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses

2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy

2.2.1 build biobased power generating infrastructures in NA based on energy production potential

GOAL 3 | PRODUCE WHILE REGENERATING

3.1.1 integrate fragmented abandoned farmland into standardized production units(SPU)

3.1.2 introduce scale production infrastructure

3.3.1 naturize waterfront for soil erosion control and additional recreational purpose

3.3.2 transform redundant farmland as green patches for villagers' recreation and local micro natural system

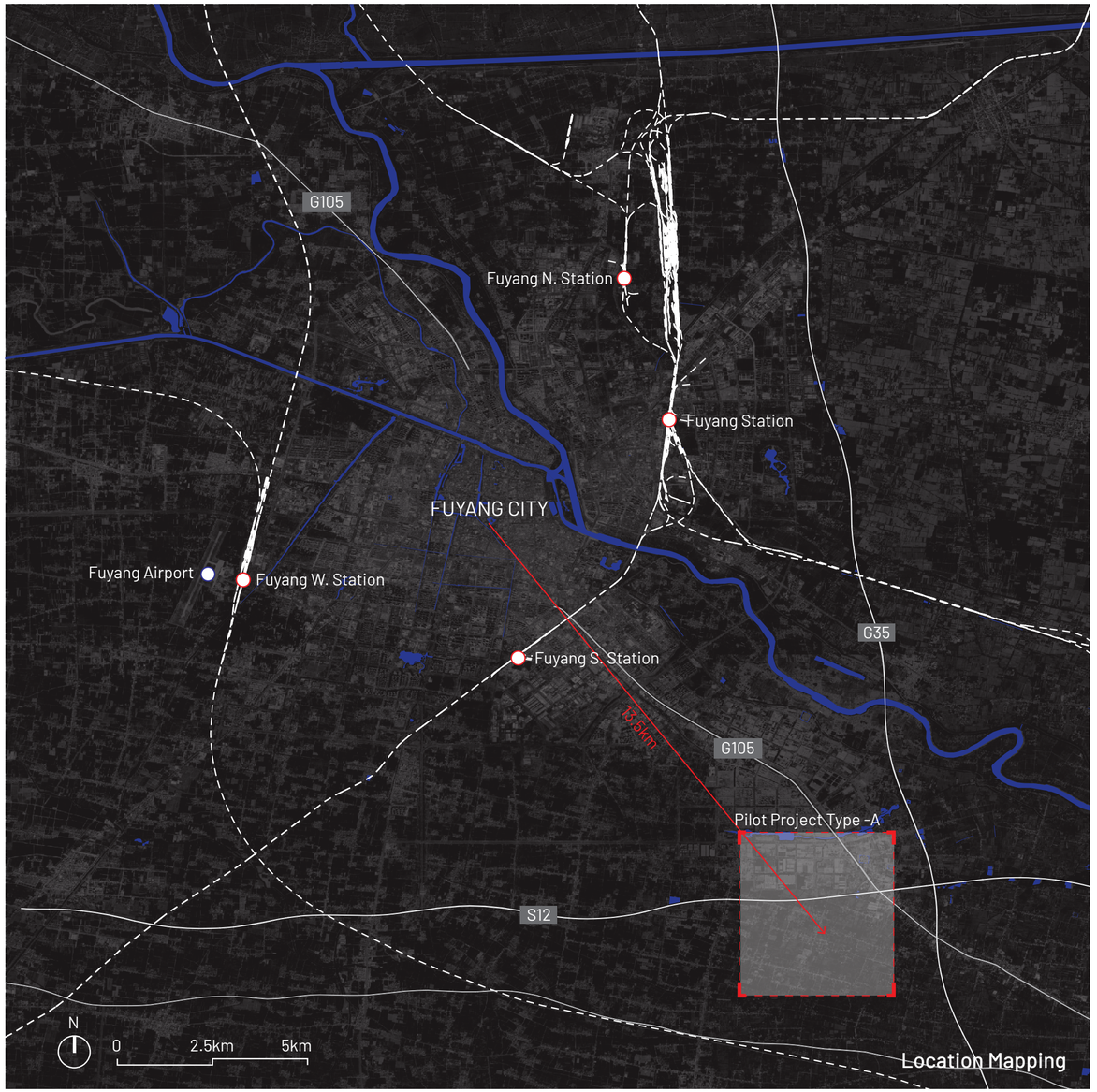
GOAL 4 | STAKEHOLDERS TO ENGAGE

PUBLIC: county/district government, city government, provincial government, city_planning, YRD_planning, industrial park management committee

PRIVATE: traditional industry enterprises, circularity-related new business, agriculture production related companies, small business owner

CIVIC SOCIETY: research institute, vocational school, farmer, worker, village committee

informed by design



Location Mapping

Current Situation

N 0 0.5km 1 km

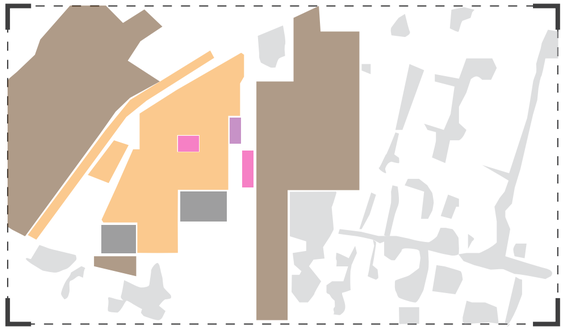
Connected to the city by highway G105.

High-density commercial real estate however remain vacant.

The construction of the industrial park sprawls into agricultural land.

SPATIAL ANALYSIS

Land-use

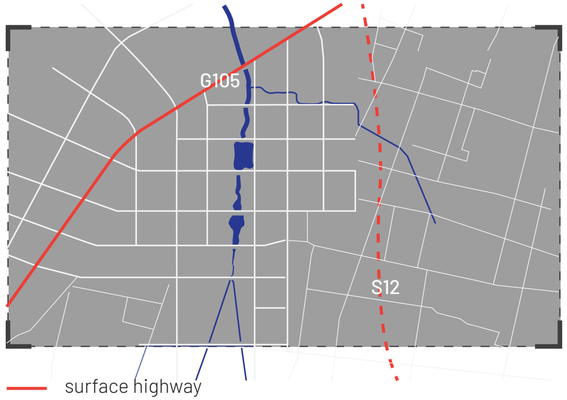


- B2 industrial landuse
- R2 high-density residential landuse
- R1 low-density residential landuse (village)
- innovation and education
- public amenity
- construction land

INDUSTRY VS. AGRICULTURE

The land-use condition of the pilot project type A area is a clear juxtaposition of new town construction and rural condition. The construction of new town takes up and re-write local fabric in a brutal manner. Meanwhile, huge amount of high-density residential real estate is also introduced to this area. Currently, due to the remote location and lack of public transportation, and hence the weak connection to the urban core, pilot project type A area's occupancy rate is not great.

Road Network



- surface highway
- elevated highway
- primary road
- secondary road
- water surface

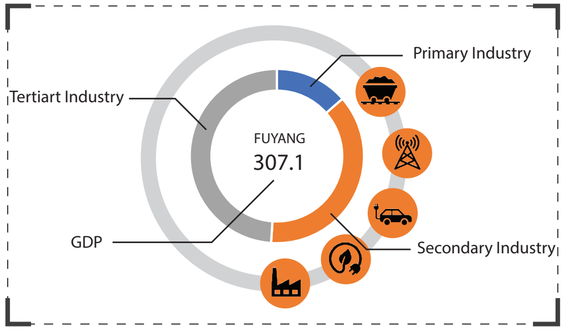
HUGE GRID VS. RURAL FABRIC

The juxtaposition is also reflected in the road network. The new town and industrial park area has a orthodox grid system while the road network in the rural part is more organic, following the topography, informed by the river network.

Two highway emcompass the pilot area, G105 and S12. G105 is a surface highway with 6 lanes (3 lanes per direction). The part of S12 crossing site area is in the form of elevated highway. Though offering opportunity for the connection between the north and south, still more attention of design need to be taken to remediate the issue.

NON-SPATIAL ANALYSIS

Industry



POSSIBILITY OF CIRCULAR TRANSITION

[local leading business] — [estimated GMV*]

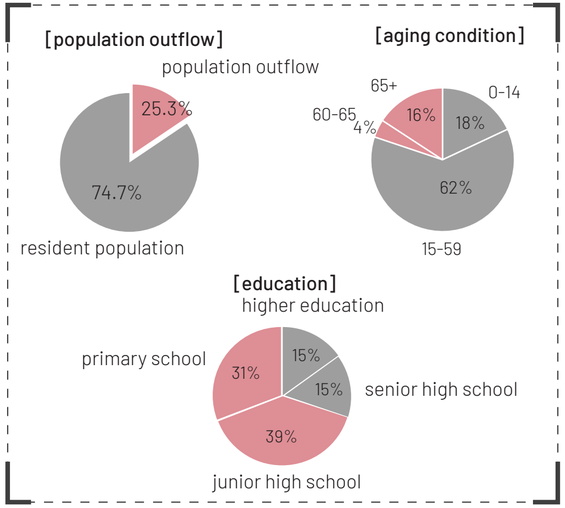
- automobile — 530 mln
- construction material — 200 mln
- new material — 15 mln
- animal feed and fertilizer — 30 mln

[Possible circularity business]

- biobased material
- biogas/biomass energy

*GMV: total sum of market value of companies in certain industries and located in Fuhe industrial park

Demographic



LARGE POPULATION OUTFLOW

Due to the similarity between land-use take-up of the pilot project area and the overall situation of Fuyang city and cannot directly get access to the exact data of the pilot project area, here I use the data from Fuyang city as a reference. Data indicates that the area has severe population outflow taking up over a quarter. Series of actions should be taken to retain people.

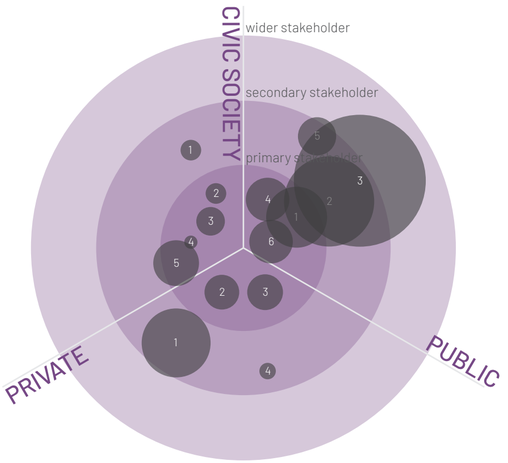
MEDIUM AGED SOCIETY

The aging situation is also quite severe. 16% of the total population is over 65, considered as medium aged society. Meanwhile also need education facility for the 0-15 age group.

LOW EDUCATION LEVEL

The education status of the population is relatively low. Lack of quality higher education causes competition and stress of local, resulting in difficulty in getting into higher education and forcing people to quit at an early age.

STAKEHOLDER ANALYSIS

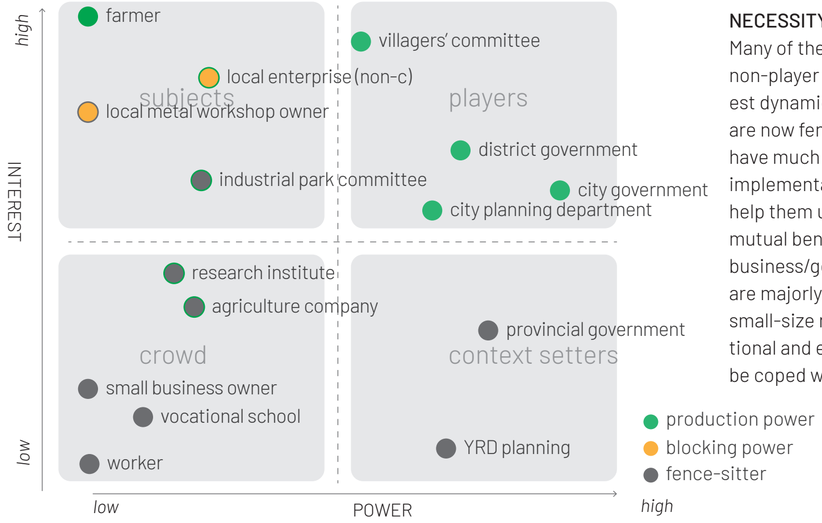


CONCENTRATION IN PUBLIC SECTOR

PUBLIC
1. county/district government
2. city government
3. provincial government
4. city_planning
5. YRD_planning
6. industrial park management committee

CIVIC SOCIETY
1. research institute
2. vocational school
3. farmer
4. worker
5. village committee

PRIVATE
1. traditional industry enterprises
2. circularity-related new business
3. agriculture production related companies
4.small business owner

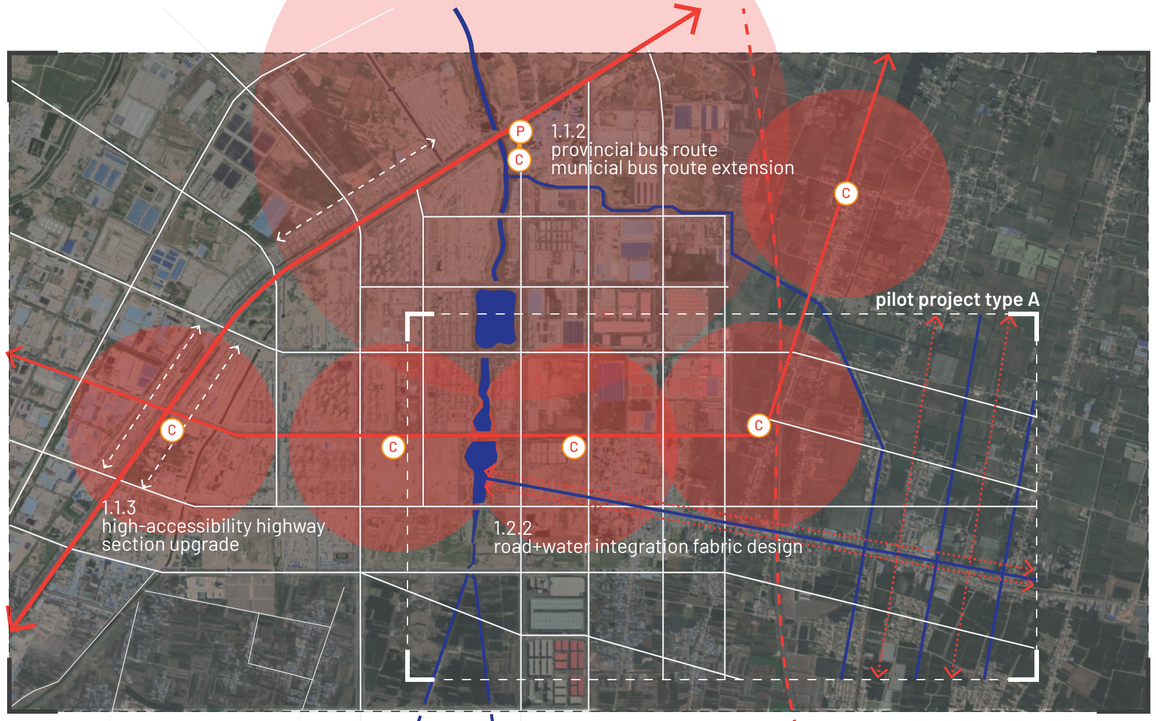


NECESSITY TO MOTIVATE

Many of the stakeholders currently remains non-player situation according to the power-interest dynamic analysis. Most of these stakeholders are now fence-sitters, meaning that they do not have much willingness to actively together push the implementation. Certain strategies need to take to help them understand the urgency and realize the mutual beneficial relationship between their own business/goal and the circular transition. Also there are majorly two blocking power here as in the local small-size metal workshop owners and local traditional and even polluting industries which need to be coped with as well with policy tools.

GOAL 1 Connect for Opportunity

strengthen regional connectivity and improve logistic efficiency



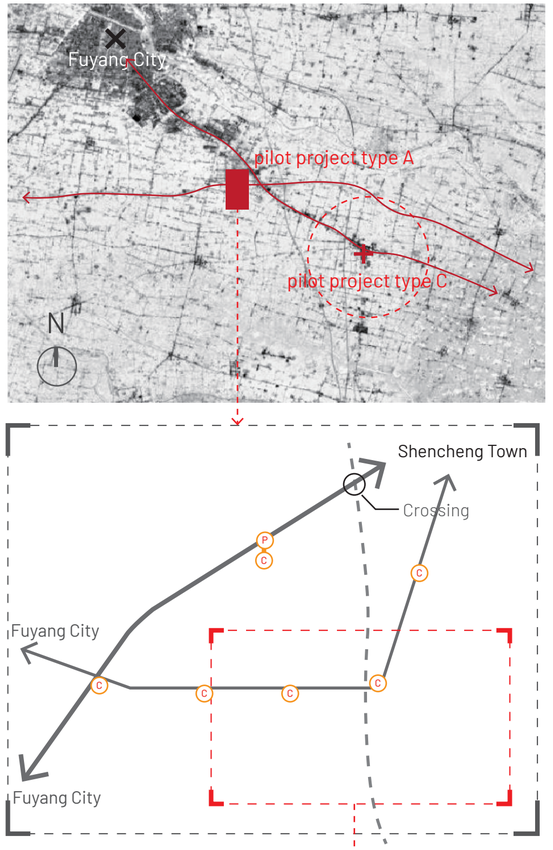
1.1.2 connect border spaces with bus lines

1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis

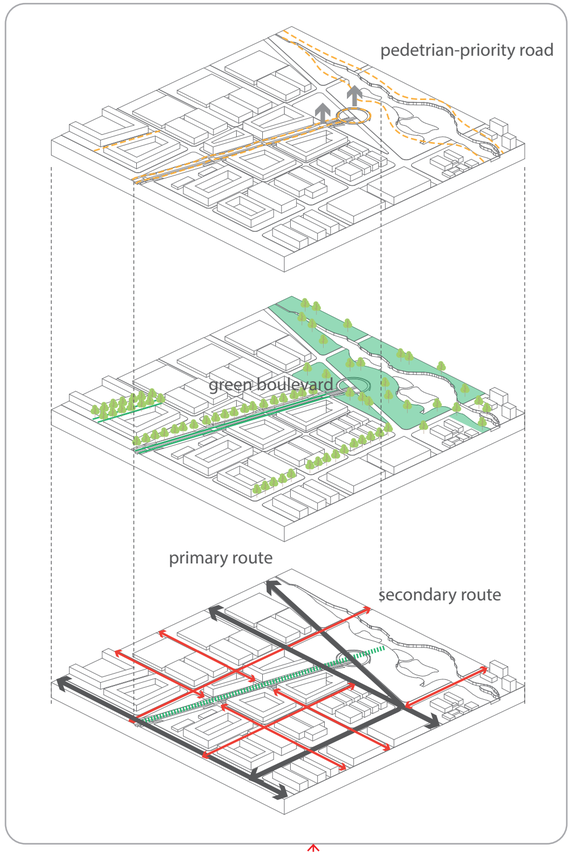
1.2.2. road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution

By establishing the connection between project sites and within project site area, opportunity are created. To be more elaborate, optimized road network can increase the logistic efficiency for circularity activities. Higher walkability also increase the accessibility of public service and amenity for both villagers in the rural part and workers in the industrial park.

Connection between Project Sites

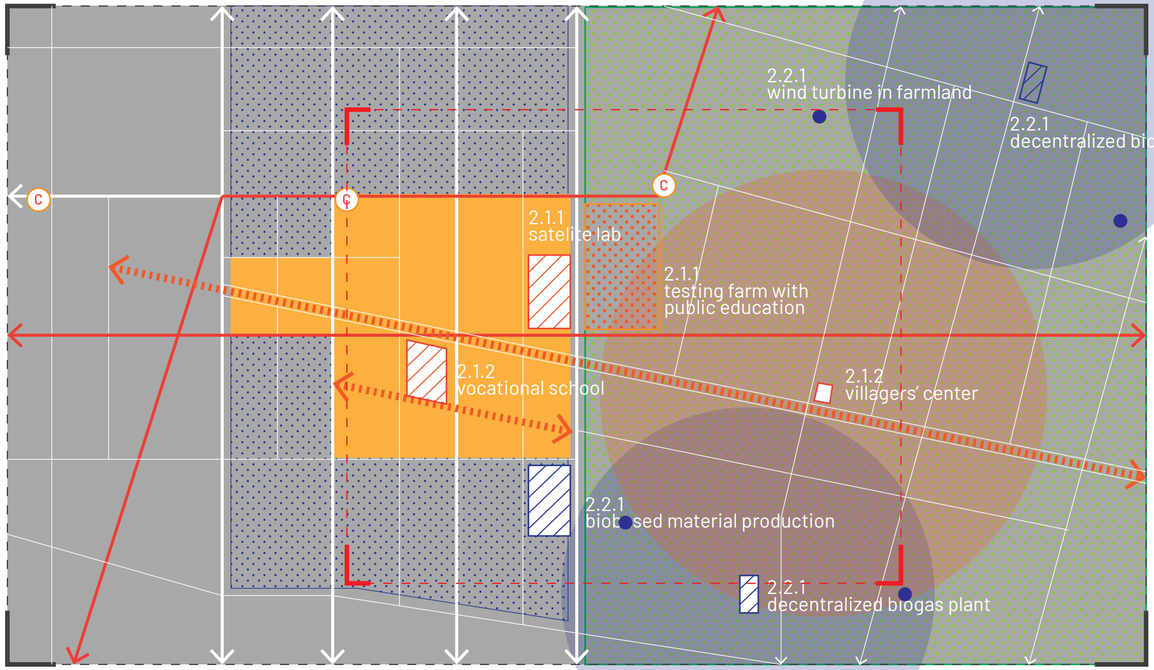


Connection within Project Site Area



GOAL 2 Go Circular and Extend

catalyze synergetic development of local agriculture and industry



2.1.1 RESEARCH: establish research league for circularity transition AND set up satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses

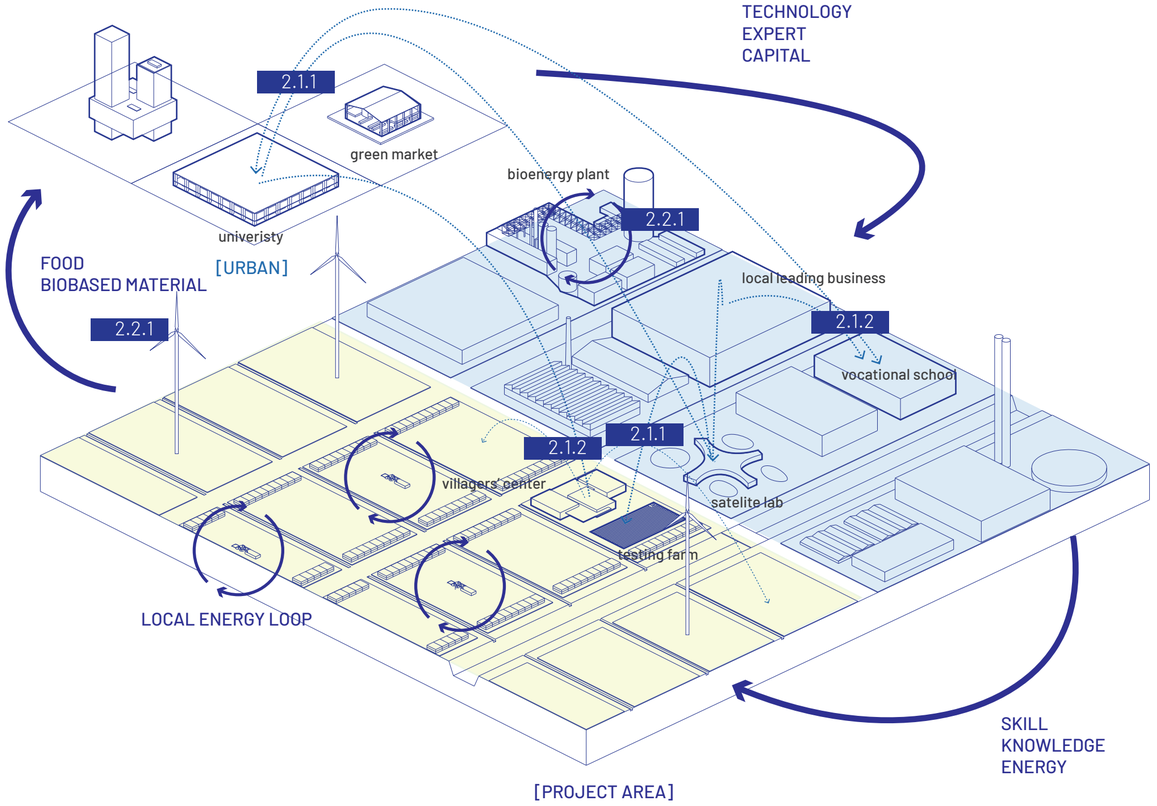
2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy

2.2.1 build biobased power generating infrastructures in NA based on energy production potential

Supported by universities in the urban core, satellite lab is built in the industrial park. The village will offer a small part of land as the testing field of the lab. In return, the village can practice the research result in time. The university will also help build the villagers center together with farm companies. Here villagers and farmers can get the most up-to-date market information and planting technique, as well as sustainable lifestyle.

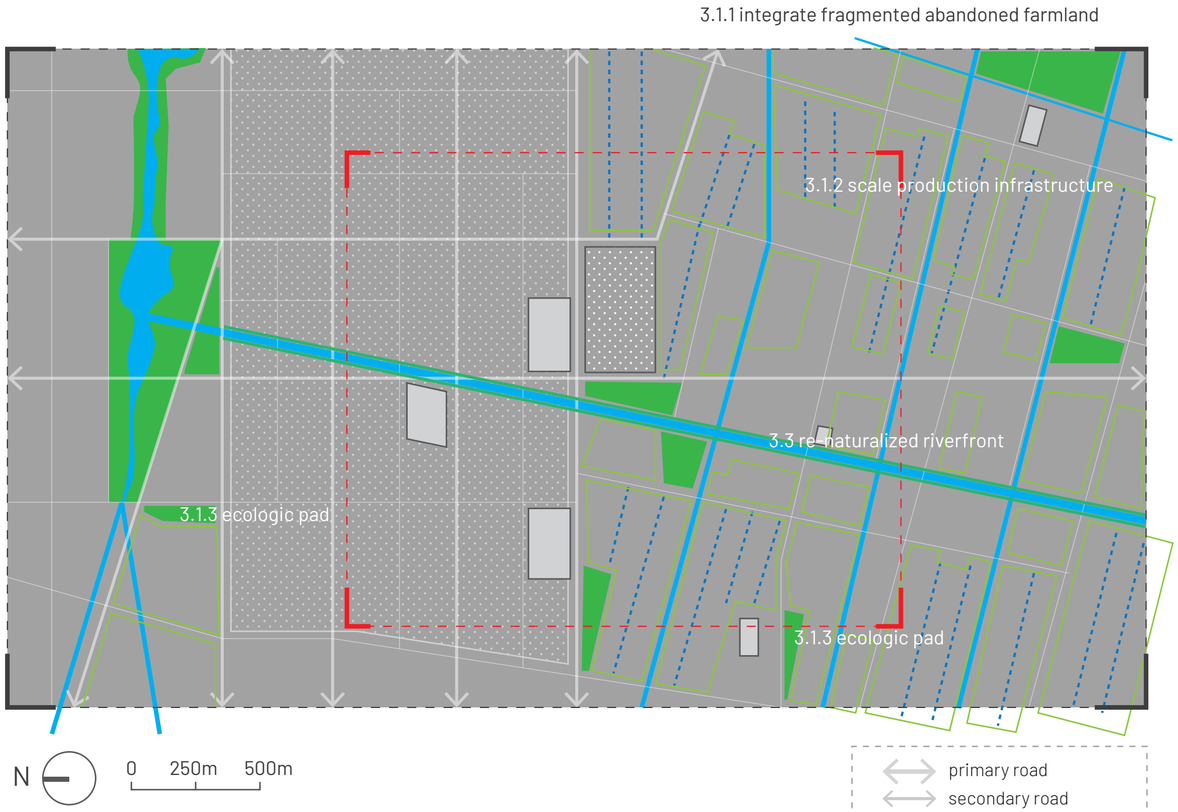
Vocational school also establish solid collaboration with the leading local business. And more circularity targeted courses are designed to prepare local people to be ready for the transition. This can also help them find position with higher salary. In this way, project area can retain more people.

Wind turbine and local biogas plant help to create energy closed loop on-site. This can bring additional revenue stream for energy companies and motivates them to willingly involved in the circular transition.



GOAL 3 Produce while Regenerating

production activities as opportunities to repair and regenerate local eco-system

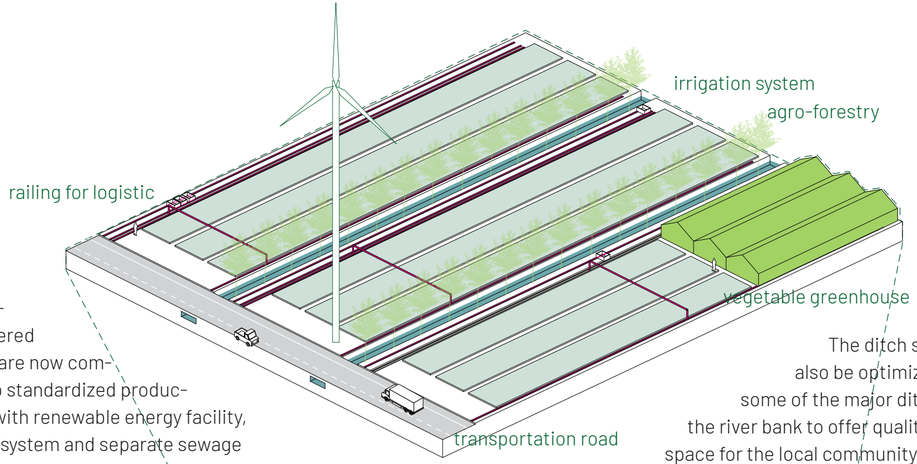


3.1.1 integrate fragmented abandoned farmland into standardized production units(SPU)

3.1.2 introduce scale production infrastructure

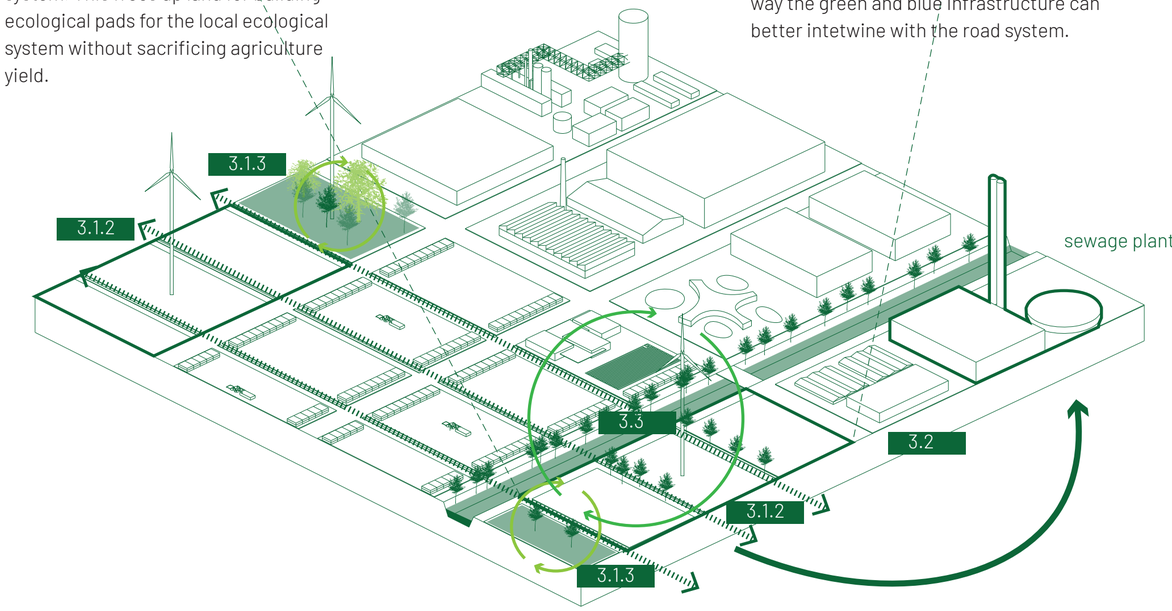
3.3.1 naturize waterfront for soil erosion control and additional recreational purpose

3.3.2 transform redundant farmland as green patches for villagers' recreation and local micro natural system



The previous scattered farmland are now combined into standardized production unit with renewable energy facility, irrigation system and separate sewage system. This frees up land for building ecological pads for the local ecological system without sacrificing agriculture yield.

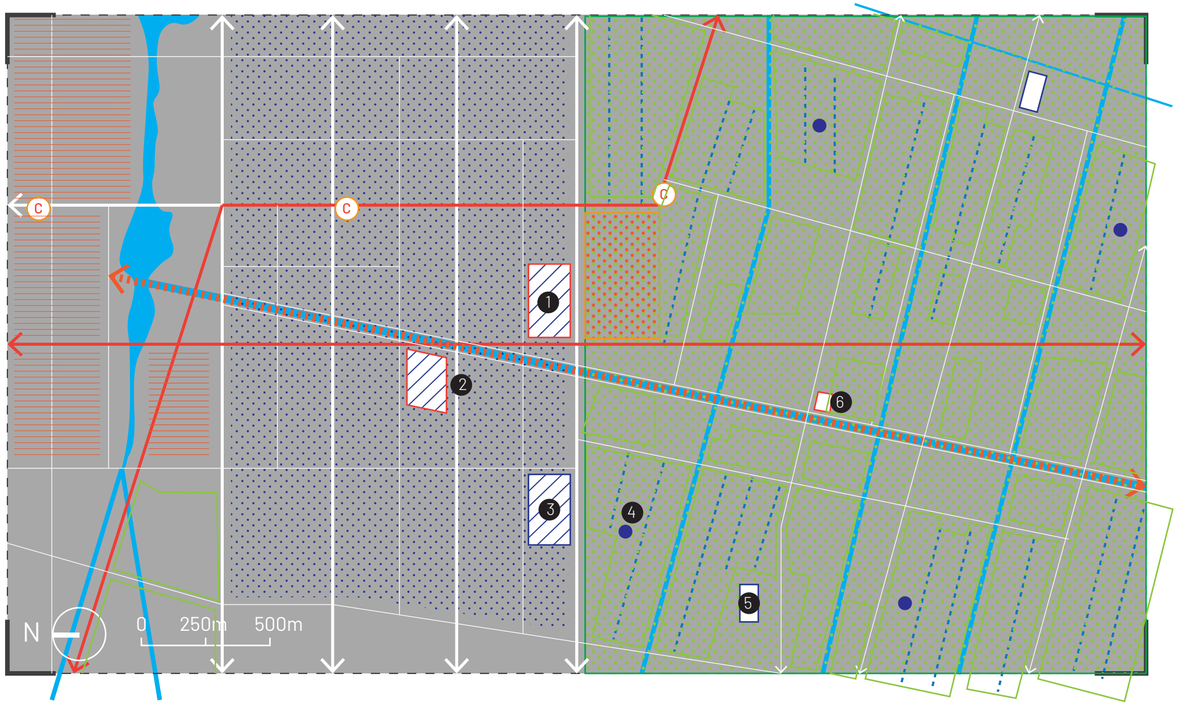
The ditch system will also be optimized. Widening some of the major ditch and nature the river bank to offer quality green open space for the local community. And in this way the green and blue infrastructure can better intetwine with the road system.



[PROJECT AREA]

GOAL 4 Start Here, Start Together

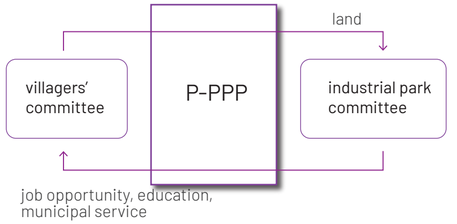
communitarian governance for realization of place-based circular transition in rural periphery



	villager	agriculture company	traditional business owner	CE industry owner	park committee	citizen	transportation company	R&D institute
1 satelite lab				●				●
2 vocational school	●		●	●				
3 biobased material		●		●	●			
4 wind turbine		●		●				
5 decentralized biogas	●			●				
6 villagers' center	●							●

With the previous govenrnace design in terms of laying the organization infrastructure for the three goals to be realized in regional and provincial level, further local-scale governance design are also needed to complete "the last mile":

Collaboration for Feasibility: P-PPP



share construction of
- villagers' center
- municipal service
- road and public space
- ... [can be further negotiated]

A P-PPP agreement is people-oriented public-private partnership. It could be a good collaboration model for building such an agro-industrial synergetic development zone. In this project, a P-PPP well mainly be established between local villagers' committee, industrial park management committee as the two representatives for villagers and business. Special care needs to be given attention to make up sure villagers' voice not to be neglected as in they are normally on the weakers side during the urbanization process. Under the agreement, industrial park will be able to get land from the village at a lower price through offering bio-based material processing service, energy supply, job opportunity and training for local villages. Also, the PPP due to its contribution to the carbon neutrality, certain subsidy and policy favor can be given to the industrial park and tenant companies by the Fuyang municipal government economic and development bureau. In this sense, the overall feasibility can be more secured.

"We can thrive here, no need to leave!": soft infrastructures to serve the local and supported by the region

@villagers' center
courses for kids
workshop for family

kids
companion of parent(s)

@vocational school
circular business training
direct connection with industry

adults
job opportunity

@satelite lab
advanced agriculture
knowledge and skill
on-site research

adults
business opportunity

@quality green
leisure and healthy
environment

the olderly
amenities and environment

A New Urban Edge

BEFORE

1. Fuhe Park
2. pedestrian footbridge
3. hybrid function zone with public service and amenity
4. satellite lab
5. circularity business R&D department
6. renaturalized riverbank
7. biobased material factory
8. villagers center
9. ecology pad
10. test farm
11. ditch
12. newly built housing

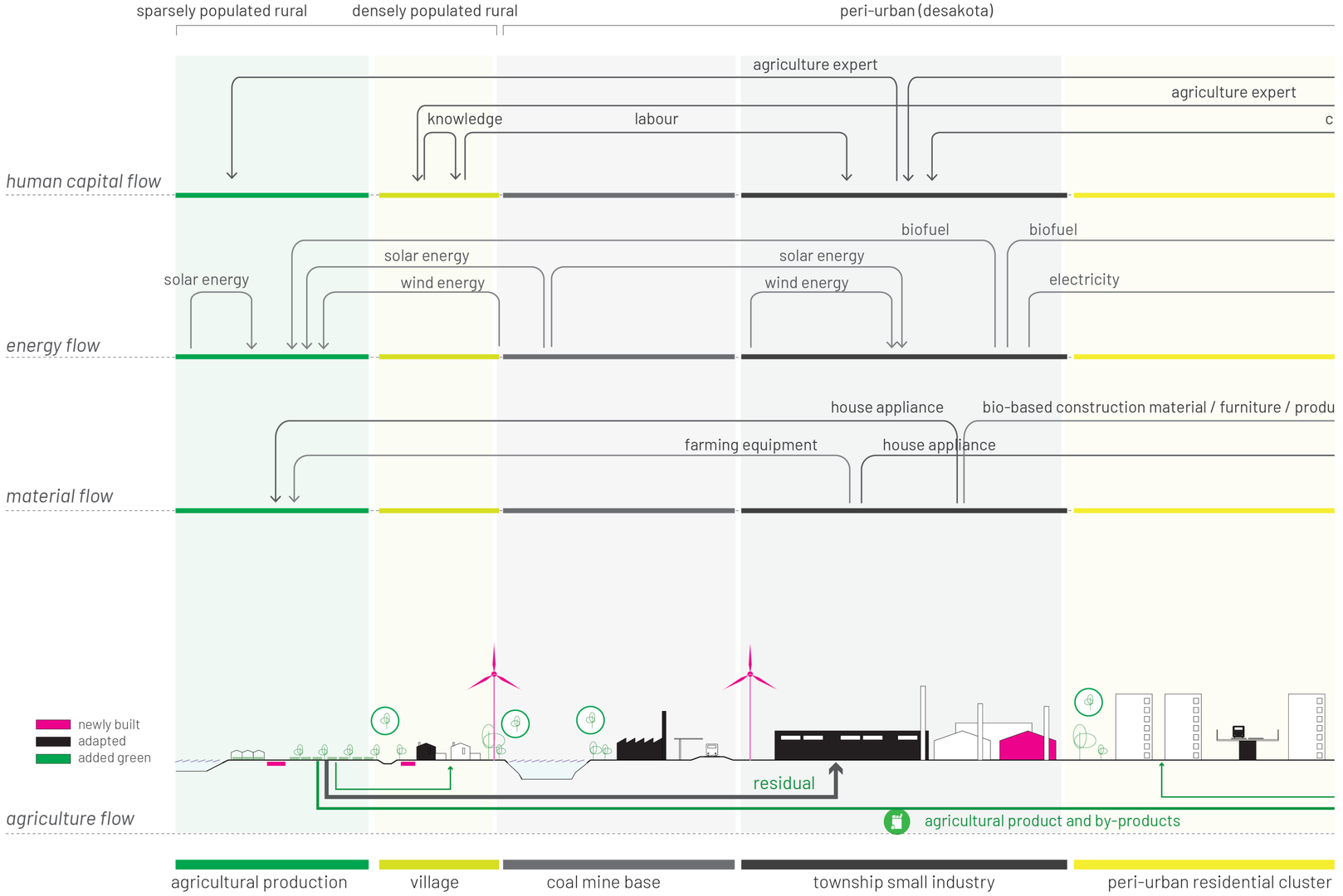
LEGEND

- industrial park
- hybrid function zone
- road
- pedestrian route
- green space
- waterbody
- farmland
- existing building
- newly built
- soft infrastructure

N

0 200m 100m 400m

A New Urban Edge of Circularity



A New Urban Edge to Thrive

After the implementation of all the spatial strategies and with the collaboration and active efforts of all stakeholders, a new future can thus be realized for the Fuyang city periphery. Younger generation do not have to leave their hometown to big cities just to make a life. They can learn the edgy circularity related business skillset and help continue develop the place nurtures them.

Pollutions are getting gradually cleansed through the river system and newly constructed sewage syste. Here you can find modern agriculture fields next to river with quality green river bank. Both villages and workers from industrial parks can enjoy the open space.

After work, villagers can gather at the villagers' center for workshop or events. Talking about the work, share experience in tackling with any wicked issues. Meanwhile, the waste are being processing in the decentralized biogas plant, providing energy for the production and life.

After the collection of this season's crop, residuals are transported to the biobased material factory in the industrial park where they get to transform into furniture, containers and building material. Farmers are also happy with additional income and their contribution to the carbon neutrality.

This is the future of Fuyang city, also the north Anhui province.

Perhaps, it can benefit even more...

10 Conclusion & Reflection

Conclusion

The thesis starts from a big goal: to realize circular transition at a regional scale. A region itself is a complex system, composed of a vast range of area, society of millions of people, trillions capital in value. Not to mention the complexity brought about due to its scale in all the sub-systems supporting the function of it such as transportation, investment, business actions, river, air quality, waste circulation... Looking at currently the difficulty and slow pace of circular transition not just in China but also world-wide, we need alternative ways of thinking and planning other than the current approach. Hence, in the thesis, I explored two ways of thinking: designing infrastructure and principle of place-based.

1. Feasibility: understanding systems, designing infrastructure

Vision is important, it reflects the ultimate good wish of human-being of pushing the world a step further to become a better place. However, having only vision (or some so-called strategy but really scattered and not systemic) is far from enough. This is happening right now in terms of circular transition. Many countries are promoting the ideology of circular transition. But there is a gap between good wish and actual change. My thesis project is an attempt to explore how systemic way of thinking can help link circular transition as a goal to implementation. And that's why "how it works" is given a lot of attention in the project, beyond mere discussion about "what to do" and "where to do".

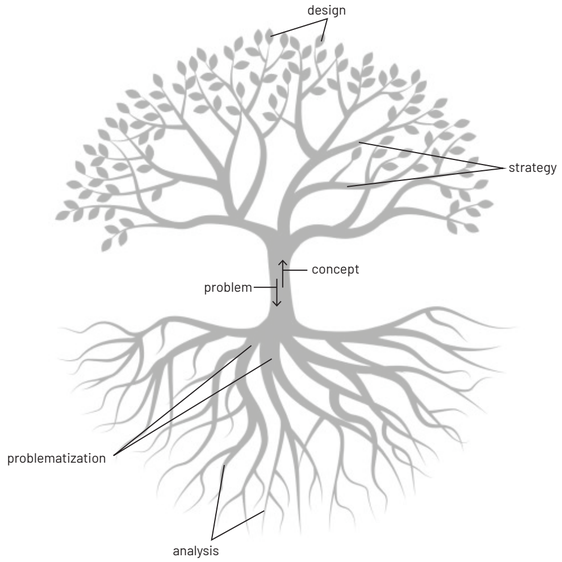
In the project, inspired by Stan Allen's infrastructural urbanism, I tested an alternative way of planning focusing on feasibility through understanding systems and designing infrastructures. The whole process is like a tree, grasping nutrition and water from the root, combining in a trunk, and growing into numerous branches. Moreover, in most of the cases the roots should be the same size as the canopy, just as the relationship between analysis and strategy, or research and design.

Firstly, is to understand the problem in a systemic way. I analyzed the problem of being the underdeveloped periphery in three aspects, economy, ecology, and society. It is the first step of growing roots. And then the analysis further expands into more sub-systems such as industrial landscape, demography, and transportation system for insights supporting later strategy.

Then based on the problematization and analysis, the result once again goes back to the trunk and starts to grow out the strategies. Similar structure, but not same. In this part, inspired by Stan Allen's infrastructure, the strategies are set from the point of view of infrastructure. They serve as a platform for certain actions to take place in the purpose to offer room for on-site adjustment and even incremental trivial changes to maximize feasibility.

And this is a reciprocal process, just like how the tree grows: root grows, trunk thickens, canopy expands, but they are still one. The understanding of the problem and the sharpening of the concept is thus enhanced again and again over the time with the root and canopy.

"research by design, design by research"



2. Principle of being Place-based:

Another crucial aspect I explored in the thesis is to be place-based. Being place-based means two things: 1) understand local condition, 2) use place as the media to organize systemic strategies in a multi-scalar way.

Circular transition is not a manifesto, case study area is also not a blank canvas. The goal and current situation need to be organically linked through strategies. This requires a careful and respectful understanding of the local condition. Being underdeveloped does not mean everything there is wrong or worthless. And experiences from more developed region also does not mean can be directly applied to the region. To respect the region, to actually talk to local people. To feel with them and think with them. Do not just judge from numbers.

For example, during the field trip, I talked to a 17-year-old barber apprentice. He mentioned his junior high-school calendar, having only one day off every month. Even under this circumstance, chances are little for them to get into a good university. And in China, graduating from a good university is essential if you want to climb up the social ladder. I immediately feel the desperation from his words and expression. If you merely look at numbers, such as education status or universities numbers, you cannot imagine what they really need is job opportunity and possibility of prosperity. Under the circumstance, building more high schools cannot solve the problem, but place-based solution, understanding their true need, and solve through systems of solution. In this case, maybe circular transition, and collaboration with core area to set up circularity vocation training can actually help them in the next phase of development.

Second aspect of being place-based is to use place as the media which means locate the problem and opportunity to its exact location and scale of intervention through series of mapping, and from there, design necessary governance and phases. This is in the first place a way to organize my thoughts during the thesis because I deal with multiple systems, from spatial design to social design and phase design. Being oriented in place really helps. Later on, I realize that it also fills in a knowledge gap of the missing spatial aspects in the discussion of circular transition and spatial aspect could be a tool to improve the feasibility of circular transition.

Thirdly is the multi-scalar approach of strategy setting. The relative peripheral area of northern Anhui relative to the Yangtze River Delta as a whole, from another perspective, also means that through certain strategies, development can be carried out by using the region's resources to make up for the lack of its own resources. And how to connect the resources of the region to the less developed peripheral areas requires some cross-scale spatial strategies.

In this program, the three areas of transportation, energy, and science and innovation are examples of integrating regional resources across scales. For example, at the transportation level, by using the existing Beijing-Shanghai line to connect the core region of the Yangtze River Delta with the northern Anhui region, a physical connection base is created for better talent and investment flows. local level designs, including the township texture design to maximize the use of road connectivity to enhance local living services and logistics efficiency, and the TOD design, which brings inter-city network composition through rail connections. All of these require appropriate strategies at different scales and continuity across scales. Thanks to the cross-system nature of the project itself, cross-scaling can be made more feasible through governance and stakeholder engagement.

In the process, the concept of circular transformation has been somewhat localized through an understanding of China's policy system and unique market system.

Reflection

Relationship between the Project, the Studio Topic, and Master Track of Urbanism

Planning Complex Cities graduations investigate planning schemes, governance arrangements, and civic engagement in regions and urban areas, how these influence the transformation of spatial structures, and how they can be enhanced to achieve more sustainable and just socio-spatial outcomes. The main focus of the studio is on trans- disciplinary approaches that integrate knowledge from the fields of design, planning, the political sciences, and geography.

My graduation project is to unveil the mechanism leading towards the poverty situation in north Anhui area, the periphery of YRD. It is a study from regional level all the way to village and rural settlements and will always try to analyze the spatial configuration in a cross-scale mindset, from region to block. We can say that it is mostly a planning problem under the very top-down and all-planned governance system in China. However, to understand the question cannot be achieved by only from planning perspective, but a combinate work of regional economy, migration study and policy study. Further, to crack down the problem, it thus is also not a work just of planning and design but a complex work with assistance from governance arrangement, ecology, and market. In this sense, my project matches the aim of the studio in study object's scale, study approach and methodology.

Thus, the project can only be fully executed and guided under the track of urbanism, which is about everything spatial, and with space as the core, the mechanism behind and further non-spatial impact they could generate.

Scientific and Societal Relevance

My graduation work focuses on regional inequality and the development of the YRD periphery, typical agriculture-based, poor area with large population outflow. It is a story about a typical area and population representing the 600 million farmers in China who are unequally treated compared to its urban population. It is about city losing its competitiveness and losing younger generation to big cities. It is about diluted rural area, empty houses, unwell distributed farmland. Other than spatial issues, it is about an institutionally deprived group of people, working hard, but having little security of income and public service, Chinese farmers. So it is not just the story of north Anhui, but about the farmers in China, left behind in the process of rapid development. Through the study, the strategy for north Anhui, can be strategy for a hopefully 600 million. To find a way, re-balance the relationship between urban and rural, periphery and region. I sincerely hope this can be a meaningful exploration for both China and other regions facing similar issues.

In terms of professional and scientific framework, it situates itself in filling the gap between circular economy transition and its spatial impact in the context of China's urban agglomeration, focusing on regional integration and poverty alleviation in particular. And it will mainly be done by introducing the concept of regional industrial value chain and agri-industrial symbiosis, which are both originally from the field of industrial ecology and given emphasis on the role of space in the evolving process while being studied by urbanists. Meanwhile, the graduation project will challenge the existing planning principles in China, a way of top-down and "game of color-filling". Instead, the project will find a way to truly integrate the endogenous potential of the local and merge it into the scope of region.

Moreover, the project will explore for the next decade how under the circumstance of limited funding from government, alteration from land economy, we can find another way of quality development for rural China. In the project, people-oriented public-private partnership is chosen as an experiment for North Anhui development governance principle. In P-PPP, not only the financial foundation can be established with an additional help from the private sector, but also "people" here is given a position of the center.

Limitation and Solution

The thesis certainly has its own limitation due to timespan, my knowledge skillset and personal experience. The listed following are the limitation I confronted and attempt I took to solve.

I obtained my bachelor's degree in architecture. Compared with my other colleagues from planning background, I certainly lack in academic and professional planning theory and skillset. It is quite challenging at certain points during the graduation thesis. However, my past 7 years was a journey of my own unique establishment of understanding and exploring Chinese urbanization problems with an orientation of the relationship between people and space. Training from architecture made me sensitive towards how certain space can be formed and am good at linking it to a wider range of systems, social, economic, or political. Also, training from track Urbanism further equipped me with better systematic thinking and strategy setting skills.

Different from typical Chinese professional urban planners, my way of working is "thinking out of the box". I have my own way of identifying problems based on actual phenomenon while normally their way of working is solving an appointed question. If you cannot identify the problem well, then all the work can be useless. Also, I talk to local people and they are my clients. This makes my strategy setting to be from the people and for the people.

During the research, I also tried angular choice analysis for regional road network, a quantitative analysis method used mostly in urban design scale. The result was very interesting in unveiling the potential and problem of current highway network. Then, compared to the current using condition of the highways with highest choice, I proposed place-based improvement strategy to further expand connectiveness to wider rural area. Although due to the limit of time, the input data may not be most clean and accurate. The attempt shows the transferability of spatial analysis tools across scale.

Meanwhile, China has the problem of low transparency ranked almost bottom globally in data disclosure and GIS data in particular. During the thesis, I tried several ways of data collection: collecting from other research paper result and re-trace manually, use alternative ways of resource and adjust by experience such as for land use territory-wise, I cannot get accurate GIS data, hence I use remote sensing data (10km raster) together with satellite image from google. This makes me also realize that sometimes we can also be creative in finding and using source data. We need to be flexible in terms of what to use and how to use as long as being assertive towards the result and research purpose. This can also improve efficiency.

Another problem I have is that I do not have much understanding in the inner side of Chinese governments at related level. The source data for understanding government mechanism in China is in-depth sociology and political economy research and monographs:

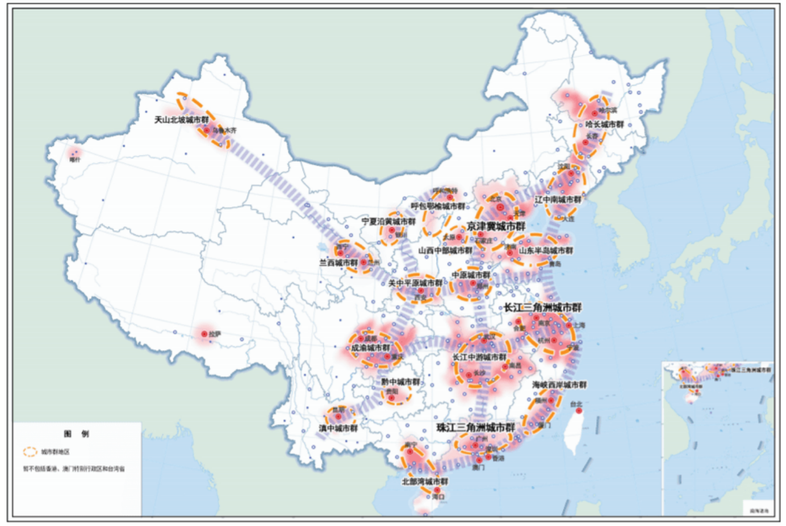
Ming Lu et al., Great Power Governance: The Spatial Political Economy of Development and Balance (大国治理：发展与平衡的空间政治经济学)
Xiaohuan Lan, Staying in the thick of things: The Chinese government and economic development (置身事内：中国政府与经济发展)
Yi Wu, Small Town Hustle: The Interpretation and Explanation of a Township's Political Operation (小镇喧嚣：一个乡镇政治运作的演绎与阐释)

Transferability

The thesis explored how place-based circular transition can help empower underdeveloped peripheral area and kick-off its development momentum. This can be transferred to similar Rural, periphery region in other urban agglomeration in middle and east China (plain area with strong agriculture and industrial base) such as North Hebei in Jing-jin-ji (Beijing-Tianjin-Hebei) and Middle China urban agglomeration.

To further elaborate, the following parts of the thesis have transferability of different degrees:

Methodology: fully transferable
Goals: fully transferable
strategic objectives: partially
implementations actions: partially



GOALS	STRATEGIC OBJECTIVES	IMPLEMENTATION ACTIONS
1. connect for opportunity: strengthen regional connectivity and improve logistic efficiency	1.1 optimize existing transportation infrastructure to align with the development zone and needed connection	1.1.1 add up train connection between Fuyang-Bengbu and upgrade railway tracks between Fuyang-Huaibei 1.1.2 connect border spaces with bus lines (Taihe county-Bozhou, Guoyang county, Wuhe county-Huainan city) 1.1.3 upgrade highway with additional non-vehicle and service to the alongside villages based on angular choice analysis
	1.2 hybridization: connect adjacent transportation points for higher efficient transportation network	1.2.1 extend bus lines around certain train station(Linquan, Gucheng, Tangshan, Huangkou, Guzhen, Liancheng) 1.2.2 road + water: intertwine and weave road and water system through urban design to offer quality open space and efficient amenity spatial distribution
2. go circular and extend: catalyze synergetic development of local agriculture and industry	2.1 establish multi-scalar innovation collaboration as foundation for place-based circular transition	2.1.1 RESEARCH: establish research league for circularity transition AND set up satelite labs in NA with support from top universities in core YRD, collaborating with local leading businesses 2.1.2 EDUCATION: set up knowledge center in local villages, support vocational school launch courses to prepare labour for circular economy
	2.2 Support the phasing out of coal mine industry with agriculture-integrated methods	2.2.1 build wind and photovoltaic generating infrastructures in NA based on energy production potential 2.2.2 introduce circularity business to the coal mine region 2.2.3 offer job education in previous coal mine area in collaboration with new businesses
	2.3 Complete agriculture production value chain with circular production infrastructure	2.3.1 reconstruct road and waterway system in roject area 2.3.2 build biomass and waste processing facilities in industrial park next to agricultural land and villages in project area 2.3.3 add small scale sewage plant in needed villages
3. produce while regenerating: production activities as opportunities to repair and regenerate local eco-system	3.1 consolidate and scale up agriculture production	3.1.1 integrate fragmented abandoned farmland into standardized production units(SPU) 3.1.2 introduce scale production infrastructure (sewing, harvesting, sensoring and watering facility)
	3.2 purfiy polluted soil through a multi-method approach (cover-crop and mine-pit resolution)	3.2.1 adjust local ditch system in a minimized manner to form mine-pit resolution system 3.2.2 introduce purifying crops and plants
	3.3 improve waterfront ecologic sustainability	3.3.1 naturize waterfront for soil erosion control and additional recreational purpose 3.3.2 transform redundant farmland as green patches for villagers' recreation and local micro natural system
4. start here, start together: communitarian governance for realization of place-based circular transition in rural periphery	4.1 establish multi-scalar coordination	4.1.1 set up multi-scalar (NA, city, project area) coordination committee circular transition and development with local political autonomy 4.1.2 people-oriented public-private partnership
	4.2 initiate development momentum at local level	4.2.1 empower rural population through villagers' center and satelite lab for knowledge spreading, information sharing and co-decision making 4.2.2 establish connection between job education and local enterprises through policy support 4.2.3 empower local startups through policy and financial support

Appendix

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Energy Transition Modeling

type 1						
project type	energy type	quantity/area(sqm)	efficiency(kW)	1 day	project number	total (kWh)
a	wind	8	2,000	384,000	7	16,464,000
	solar	800,000	0.12	768,000		
	biomass	2	25,000	1,200,000		
b	wind	8	2,000	384,000	6	32,544,000
	solar	4,000,000	0.12	3,840,000		
	biomass	2	25,000	1,200,000		
c	wind	5	2,000	240,000	10	16,080,000
	solar	800,000	0.12	768,000		
	biomass	1	25,000	600,000		
type 1 total						65,088,000
type 2						
project type	energy type	quantity/area(sqm)	efficiency(kW)	1 day	project number	total
a	wind	0	2,000	-	2	2,736,000
	solar	800,000	0.12	768,000		
	biomass	1	25,000	600,000		
b	wind	0	2,000	-	11	48,840,000
	solar	4,000,000	0.12	3,840,000		
	biomass	1	25,000	600,000		
c	wind	0	2,000	-	2	1,968,000
	solar	400,000	0.12	384,000		
	biomass	1	25,000	600,000		
type 2 total						53,544,000
type 3						
project type	energy type	quantity/area(sqm)	efficiency(kW)	1 day	project number	total
a	wind	8	2,000	384,000	7	6,888,000
	solar	0	0.12	-		
	biomass	1	25,000	600,000		
b	wind	8	2,000	384,000	11	53,064,000
	solar	4,000,000	0.12	3,840,000		
	biomass	1	25,000	600,000		
c	wind	3	2,000	144,000	7	5,208,000
	solar	0	0.12	-		
	biomass	1	25,000	600,000		
type 3 total						65,160,000
type 4						
project type	energy type	quantity/area(sqm)	efficiency(kW)	1 day	project number	total
a	wind	0	2,000	-	6	7,200,000
	solar	0	0.12	-		
	biomass	2	25,000	1,200,000		
b	wind	0	2,000	-	3	15,120,000
	solar	4,000,000	0.12	3,840,000		
	biomass	2	25,000	1,200,000		
c	wind	0	2,000	-	7	8,400,000
	solar	0	0.12	-		
	biomass	2	25,000	1,200,000		
type 4 total						30,720,000
total						183,792,000

coal combustion	
annual	167,750,000,000
1 day	459,589,041

total replace	40%

data reference:

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LAND-USE SUPPROT – A CASE STUDY OF M0/M9

Since 2013, a new type of industrial land (M0) represented by Shenzhen has been widely explored in the country. Since it has the advantage of lower cost of industrial land, and also has the characteristics of R&D, production and sales complex function, it has been hotly sought by investors once it was launched.

However, in terms of actual results, the development of new industrial land does not seem to be as satisfactory as it should be. The government's claim for the new industrial land is to attract strong technology-based enterprises to settle in the land by giving away part of the land revenue at a price advantage, in exchange for long-term benefits such as production value, tax revenue and employment. However, such "good intentions" let many enterprises take advantage of the loopholes, and the chaotic phenomenon of "land acquisition in the name of industry, real estate development" has been repeatedly prohibited.

Recently, the Opinions on Land Use Management to Support the Development of New Industrial Park in Guangzhou Nansha New Area (Free Trade Zone) (Draft for Comments) (hereinafter referred to as "Draft for Comments") issued by Guangzhou Nansha came into the public's view, which innovatively put forward the concept of innovative industrial land (M9) and upgraded the industrial access, supporting ratio, property rights division, sales transfer and performance supervision on the basis of the original new industrial land.

The initial emerging industrial park site was not called M9, but continued to be called new industrial land (M0). It was not until November 2021 that the Guangzhou Municipal Bureau of Planning and Capital issued a land auction transaction announcement, and a subsidiary of the listed company Aofei Data (300738) won the land use right of plot 2021NGY-25 in the Qingsheng Hub area of Nansha District, with the planned use of the plot as an emerging industrial park site (M9). The emerging industrial park site M9 only appeared in front of everyone publicly for the first time. According to the plan, the site will be developed into a headquarters community, mainly for self-use, while introducing upstream and downstream companies to build it into an ecological headquarters.

Another representative (M9) project is the Yuexiu-iPARK Sui-Hong Kong Industrial and Academic Research Base. The announcement shows that on February 21, 2022, Yuexiu Real Estate successfully picked up the 2022NGY-1 Emerging Industrial Park site in Nansha Qingsheng Block, which covers an area of 41,000 ㎡ and a building area of 138,000 ㎡ (of which the proportion of building-accountable floor area for industrial use is ≥98% and the proportion of building-accountable floor area for commercial use is ≤2%). The construction of the emerging industrial park site (M9) includes industrial R&D building, R&D production base, gas pedal, incubator, shared space, etc., and introduces enterprises that meet the industrial access standards of Guangzhou and Nansha District.

Conclusion:

1) The new industrial land has been relaxed in terms of supporting ratio, planning conditions, property form and other conditions, providing a more flexible carrier for future industries on the one hand; at the same time, it also puts forward higher requirements for new industries.

2) The industry should not only conform to the superior industrial planning, but also meet higher requirements in terms of investment intensity, land output rate and tax revenue.

3) Small and medium-sized technology enterprises that do not have the conditions for independent land acquisition need to actively seek cooperation with industrial resources and acquire land in a group to meet the requirements for post-project evaluation.