PERI-URBAN NODALITIES
PERI-URBAN NODALITIES
A take on rural-industrial urbanities in China
Tomaz Pipan, Landscape Urbanism, Architectural Association, School of Architecture, 07/08
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1. 400 New Cities

1.1. Project brief

Adopted and modified for project needs from: Prospectus 2007-08, Architectural Association, School of Architecture, London 2007, p. 93

China’s economic boom, combined with migration from the rural areas, is fueling a high-speed urbanism that is producing cities in the shortest imaginable time and completely changing the face and the character of the country’s older towns.

This directional urbanization from the coastal zones perturbing into the countryside, has brought even the smallest villages face to face with the phenomenon of globalization, foreign capital and generic architecture.

In parallel, the place and scale of development, particularly in the megacities of Beijing, Shanghai or Guangzhou, has highlighted the interrelated problems of mass migration, pollution and loss of arable land. The lack of overarching urbanisation policy means that there are no mechanisms of negotiation between economic interests, cultural traditions, development pressures and existing ecologies. At a large scale, China risks seeing its urban identity swamped by a generic pattern of indiscriminate urban sprawl.

In 2000 the former civil affair minister of China, Doje Cering, formulated a plan to build 400 new cities by the year 2020, to accommodate the migration from countryside into urban conglomerations. According to this plan 20 new cities need to be established each year.

This formulation is taken as a framework and departure point of the project, testing the applicability of Landscape Urbanism methodology to the limit, than adjusting and reformulating it.

The result is a proto strategy for new large-scale agglomerations as a way of critically addressing the phenomenon of mass-produced sprawl urbanization in China. The testbed of the project is peri-urban area 15 km East of Dongguang in the Pearl River Delta - the first ‘production power house’ area of China.
1. 400 New Cities

1.2. Project synopsis

Kilometres of fragmented, unstructured peri-urban fabric – interlocking low-end housing, industry and agriculture – is a chronic symptom of rapidly developing production oriented, peri-urban areas in China.

The project hypothesis replaces the linear economical model of consecutive production sectors with a hybrid model, where different mix ratios of sectors determine the modal tendency of a specific organization, achieving a more sustainable environment socially, spatially and economically.

Local material intelligence is infused with an adaptive design strategy that puts forward hybrid clusters as nodal mechanisms for controlling growth, direction and programmatic orientation of new fabric. At the same time, clusters introduce hierarchical differentiation that structures and consolidates existing urban and rural ecologies.

The project concludes with a research attempt to deliver a processual tool for development and management of urban strategies in these peri-urban areas.
Apart from bustling new cities of China that permeate into a domain of conurbations - economic centers of new Chinese development - there exists another kind of reality. This reality is in the shadow of prosperous new cities, and if it were entirely up to the Chinese themselves, it would be hidden far, far away from foreign sight. We are talking about places without which Chinese economical powerhouses would not be possible at all - places of intense industrial production that fuel the Chinese march toward global economy. These areas confronted are mixtures of agriculture, industry and low-end housing. We are talking about the domain of hard working people, laboring day and night in assembly and production plants. This is a home to China's strength - lower class diligent workers and farmers, the production force of new Chinese economy.

Dongguan basin is one of such places. These lands are a dense weave of kilometers of industrial plants mixed together with village-like housing and agricultural patches. As the economical standard of people living here is not great, the consequences ripple throughout the social and spatial landscape. Scarce and degraded public spaces with only rudimentary services and no leisure activities are combined with only basic education facilities - no universities, no theaters or cinemas. A vast population of millions, that can easily rival any European city in area and density alike, is living in village-like conurbations.

This unique condition, endemic to China, has not been seen anywhere else in the developing countries. The basis for existence of these vast peri-urban production areas is a complex mix of geographic, cultural and historical (political) reasons. Let us examine a few of them that led Dongguan basin to what it is today.

The geographical position of the Dongguan area (see page 8) contributes substantially to this socio-spatial condition. Its strategic location between the Shenzhen urban basin and agricultural rural hinterland ticks all three boxes for successful industrial production areas: good infrastructural connections to Shenzhen and thus Hong Kong, cheap land for new industrial developments and abundance of cheap labour workforce from the north agrarian provinces.

The other important reason is a much more complex mix of history and policies. Main actors of this reasoning are the communistic past, Chinese “social economy” and a unique business organizational model called Town Village Enterprise (TVE) that was born in Dongguan.

China’s communistic regime had to come up with regulations of the market and goods that would not resemble capitalism. Instead of talking about market economy, the operating concept was “material balances” where basic needs were collectively provided, thus inhibiting the role of currency as mechanism of the capitalistic market. This had severe
repercussions on Chinese organization, one of them being China's self-sufficiency and autarkist economical production. China had to survive without foreign investments, hence needing a high internal rate of savings (Ad lib.: Friedmann, 2005: 10-11).

The core of savings came from hard working rural areas that fueled the industrialization of cities. That was strictly managed by the communistic regime by means of employing several policies to manage the flow of goods. Two more important policies were the institutionalized commune system and household registration system – Hukou. The commune system, with its smallest part called “work-unit”, was a socialistic masterpiece of “teaching” people how to live, thus creating a socialistic society. “The work-unit compound serves as the locus for organization of many facets of life...” (Ibid.: 13). The Hukou system tied the farmers to their land and urbanites to the “machinic” cities geared toward industrial production, hence enabling management of industrial production in cities and agricultural in the rural areas. It prohibited farmers to migrate to the cities in search of better life.

The communistic regime realized that small economical yields of food production and inflexible state owned industrial complexes can not sustain the material balances. To battle this, they adopted some of the already happening phenomenon and made them official: bigger regional self-governance and shift from food to industrial production as the national economic base, thus allowing for industrialization of rural areas. The communes were disbanded and the land went into family ownership with assigned production quotas.

The conditions outlined above led to a unique Chinese form of local group entrepreneurship called Town Village Enterprise (TVE):

“They arose in the 1980s in response to the de-collectivization of agriculture, which freed a number of underemployed villagers for other occupations. At the same time the central government passed on responsibility to the local level to manage the new labour available [...]. Rather than passing into a private enterprise system, this encouraged the development of a local state corporatism [a lecture learned from rural commune system].” (Walcott, 2003: 92-93)

The TVE lifted individual villagers and local officials from poverty over night, giving them immense wealth and power. The TVEs operate in a gray zone between private and state ownership that well accommodates personal favors and corruption. This condition also propels the uncontrolled development of peri-urban industrialization with all of its social and spatial implications mentioned above.
The Project focuses on a peri-urban area, 60 km north from Shenzhen and 15 km East from Guangzhou. The geographical position contributes substantially to the socio-spatial condition of the area. Area’s strategic location between the Shenzhen urban basin and agricultural rural hinterland ticks all three boxes for successful industrial production areas:

- good infrastructural connections to Shenzhen and thus Hong Kong,
- cheap land for new industrial developments and
- abundance of cheap labour workforce from the northern agrarian provinces.
2. Peri-urban condition

2.2. Location: Geographical position

This peri-urban condition consists of unstructured interlocking of low-end housing, industry and agriculture.

Area evolved from villages into industrial production areas.

Agricultural patches are surrounded with industry-village condition.
2. Peri-urban condition

2.2. Location: Villages

When China started to industrialize, the agricultural land that the farmers were cultivating was taken from them. As compensation they were allowed to build up their villages and make their income by letting out the newly acquired space.

Once rural, villages are now being transformed into so called ‘urban villages’ - areas of low-end housing for workers in the industries.

Intricately connected and interwoven public space of a village is disappearing bringing inhibition of the so specific communal living pattern characteristic to rural China.
2. Peri-urban condition

2.2. Location:
New low-end housing

New lower class housing grows between industry and villages. The ‘checker’ blocks are usually 4 to 6 storeys high with just a few meters in between.

The new typologies disregard the traditional spatial and social practises, furthermore, because of low economical capability of the population and therefore no interest from the developers to invest, the area has only rudimentary services and badly defined open space.

Most common public space is the street, dominated by trucks and cars.
2. Peri-urban condition

2.2. Location: Industry

Industrial areas are economically efficient with a complete disregard for design of open – public space.

Everything is engineered for efficient production and transport.

The industrial complexes develop into monofunctional areas that are completely detached from human scale.
Remaining agricultural land is threatened by the industrialization.

Low economical efficiency of agricultural land can not compete with industry, therefore it is being slowly replaced.

Additional problem presents ever increasing pollution of water from the new industries.

2. Peri-urban condition

2.2. Location: Agriculture
The “traditional” urbanization model (see page 20) advocates for transformation of society on the basis of primary production from agricultural through industrial into post-industrial. It follows the logic of economy and capitalism and could be argued is a linear progression model where agricultural production is replaced by industrial and sequentially by services and tertiary sector production. The leap from one stage to the next only happens when the current mode of production is not economically suitable anymore, thus, a more profitable one is needed in order to sustain its development. In the case of peri-urban industrial areas of Dongguan, this has not yet happened; the industrial production is still the main vehicle for development, hence no need for establishing a new one.

There are many repercussions of this kind of urbanization; the particularly obvious one is pointing out that the agricultural and industrial stages’ social and spatial structure is really poor. The farmer’s and worker’s financial situation is not sufficient enough for development of sophisticated leisure and services. Another serious problem is the monofunctional orientation of areas, thus being economically and spatially unsustainable. For example, car industry in the United States until the late 1970s gave rise to a vast amount of industrial cities, of which Detroit is the most famous one. When the car industry crashed, the repercussions on the social and spatial strata were devastating.

By understanding this process, a different kind of urbanization model can be envisioned that accommodates for better social and spatial conditions, thus enabling a more sustainable development strategy.

This sustainable model has to start to blur the sharp boundaries between phases and work against the short-sighted economical drive. By dissolving the boundaries, different phases of the model start to mix and interact, which creates a model of better spatial and economical sustainability and social inclusion. This is done through means of tying the now separate production of different stages into one interdependent loop (see page 21 and 22) where each stage contributes to the final product of the other stage or, in turn, use the product of other stage. By doing so, the linearity of urbanization model, where the next stage occurs when the previous one ends, is broken. This model argues for a dynamic and interdependent side-by-side development of three basic production sectors, wherein the different mix ratios of sectors determine the modal tendency of a specific organization.
3. General objectives
3.1. Modification of the socio-economic model

For this model to be applicable in this case study, definition of the programs of each sector that are able to permeate other sectors and connect to them is needed. In the cases of agriculture and industry, that would translate into production of industrial crops which could be used in industry instead of production of food. The argument works also in the other direction; production of industrial goods that use industrial crops, such as bamboo or industrial hemp, can replace traditional resources usually imported from elsewhere.

The biggest social, spatial and sustainable gain happens by introduction of the tertiary sector into the mix (see page 22). By adding the educated and economically better situated class, an environment that is economically more capable is generated; therefore, it brings about better service sector and consequently better amenities and open spaces. This is in turn beneficial also to lower classes. The most suitable program for the integration of tertiary sector is R&D (research and development) geared toward innovation. By dealing with the industrial and rural environment, this innovation has to be accordingly targeted; it should focus on research of industrial crops, agricultural cultivation and industrial production techniques.

The romanticism of the outlined sustainable model can not be disputed as there are numerous obstacles that must be overcome.

The more apparent drawbacks are as follows:

• Spatial proximity of sectors from economical point of view is irrelevant as the contemporary technological advancements in transportation and communication can more than compensate.

• Higher educated classes have little interest in living in peri-urban areas and mixing with the workers.

• R&D and science parks need premier research universities as innovation generating institutions (Walcott, 2003, 176), something that production oriented areas like Dongguan chronically lack.

• The only input to R&D comes from educated classes, thus the importance of the worker class is diminished.

On the surface, it seems that the presented model is indeed hopelessly idealistic, but the switch from capitalistically based “natural selection” model to a sustainable one requires acknowledgment of more profound benefits that are not immediately visible, such as:

• Innovation works best if it is recognized that knowledge is imbedded in the culture whereby the cultures are regional and specific.
3. General objectives

3.1. Modification of the socio-economic model

- By retaining agriculture and industrial production in the mix, crucial inputs are retained in the form of skills that inform the innovation environment geared towards research of these sectors.

- Retaining agriculture reduces food miles.

- By dispersing the focus from one sector onto three, area gains in economical sustainability as an urban form; new fabric has more flexibility. This flexibility comes from retaining differentiation that can battle the forces of global economy and balance itself without depending on other areas.

- By bringing workers and farmers into the R&D process they are being educated, thus helping the local economy.

- By relocating R&D into economically less desired environments, the costs and living expenses are much lower which should benefit the middle class.

- Furthermore, preserved natural environment of semi-rural areas has a quality of nature which is alluring to the middle class as it represents a luxurious living ideal opposed to the completely built up urban agglomerations, such as Shenzhen, that lost this quality.

Even with all of these benefits, it should be taken into account that R&D in this kind of environment could not be expected to produce great breakthroughs right away. It is rather a long term strategic investment. Nevertheless, informed rationale would seem to favor the latter over the former model of urbanization.

All of the mentioned benefits can largely be seen to happen through setting up policies, as this course of action is the easiest way to render the problem of implementation resolved. Nevertheless, policies tend to get implemented in a variety of ways, meaning, they do not always achieve the desired goal. Therefore, the challenge is to employ the design of built space as a carrier of implementation of sustainable urbanization model. In this aspect examination of tools and mechanisms needed for construction of the sustainable model is in order.
3. General objectives

3.1. Modification of the socio-economic model

Sustainable model 02

social structure

workforce

phase / modality

production

sector percentages

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3. General objectives

3.2. Formation of a ‘new’ urbanity

The urbanization and development of peri-urban areas is largely perceived on a big scale. This is in part due to the fact, that industry and agriculture as production sectors require big areas to operate. Consequently, planning of such areas follows the same logic. One of direct repercussions is formation of big, monofunctional areas that are not particularly suited for small scale - urban living.

Further problem with this kind of planning and urbanization is that the in-between spaces - stitches between these vast areas - stay unresolved. These are the spaces that are the most hybrid, varied and mixed, that spawn hierarchy and differentiation. Similar spaces in the city environment take the most prominent role as generators of public, urban space, but in the peri-urban condition are overlooked, largely because of the scale at which these areas operate.

City ‘construction’ and definition is derived from a much smaller scale. This is in part possible due to the fact that the tertiary sector elements that usually create urban space (bank, post office, church, shop, cinema,...) are not so space demanding, hence generating a lot of activity on a very limited area, in turn creating ‘urbanity’, nodality, hierarchy...

To create a better structured and denser peri-urban environment, it should be structured and defined more like a city. The important parts of the peri-urban fabric should be resolved on a smaller scale with finer detail.

Industry and agriculture, being spatially demanding, is hard to envision to be broken down into smaller areas. Instead, we must look into processes within the sectors that could be taken out of these areas and put together into tighter spatial relation. We should start to understand industrial and agricultural processes that are spatially undemanding and flexible as parts that generate dense experience space - a new kind of urbanity, something similar to the urban spaces in the city.
4. Local material intelligence

4.4. Regional corridor vs. local corridor

On a basis of the fabric organization we can define two types of growth.

First, called the regional corridor accounts for freight transport and regional connections. It accumulates mainly production - industries, sometimes also linear mid-end housing. Elements are organized adjacently to the corridor.

Second, called the local corridor accounts for all the non-production activity and dwelling. Although badly connected it could be understood as a local armature for daily purposes. Elements are organized sequentially along the corridor.
4. Local material intelligence

4.4. Regional corridor vs. local corridor

Corridors account for the differentiation between production and dwelling. When they intersect they tend to develop new organizations that usually account for rudimentary services and can be seen as beginnings of ‘urbanity’.

This mixing condition areas can be understood as nodes where both corridors can connect. Furthermore, they can be used as nodal elements through which both systems could be controlled simultaneously.

In this way a mixing condition designed as a node can be redeployed as growth control mechanism of new corridors.

Legend

- local corridor
- regional corridor

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4. Local material intelligence

4.5. Local corridor

Intermediary parts:

The intermediary parts can sometimes be badly defined - they become a residue space of urbanization. In other occasions they are ponds or even rudimentary tertiary sector (primary school).

They only bring together similar elements - different typologies of housing. The area stays completely monofunctional.

If we would like to use this principle for construction of mixing nodes, the elements that come together should be much smaller, varied and more interconnected, to account for finer grain and resolution of space.

Legend

- intermediary parts
- dwelling
- industry
4. Local material intelligence

4.6. Regional corridor

**Permeability of the clusters:**

The permeability would enable much more varied and interconnected environment where parts of different production sectors create 'urban environment' together with housing and services.

### Legend

- **agriculture**
- **housing**
- **services**
- **industry**
5. Proposing new corridors

5.1. Mixing condition as growth control mechanism

The nodal mixing elements researched beforehand give already existing instruments to control the growth through correct positioning and programming of these new spatial elements.

The mixing should bring together different production sectors and resolve them on a fine scale to create dense urban condition.

The mixing nodes therefore also function as hierarchical differentiation of the fabric, giving it consistency.

Legend
- housing
- industry
- agriculture
5. Proposing new corridors

5.5. Regional and local nodes

To establish hierarchy, the nodes have different importance.

The main nodes that control the growth and where the corridors come together, are the regional nodes with greater mixing variety and with more prominent programs in the mix.

The additional local nodes are deployed in 10 minute intervals, to create local variety, hierarchy and human - local scale of the fabric. They are less prominent with more local programs in the mix, resulting in a node that is used by the local population.
6. Definition of a node

6.1 Definition of agricultural node

From the definition of a cluster and understanding of the permeability issues, we can start to construct a new mixing node for the new corridors.

The following example of the process of construction is done on the local agricultural node.

**First**, there are generic rules and relations that each of the local nodes have to follow, depending on the node:

- We are creating a local public node, where agriculture starts to mix with services and dwelling.
- The node has to be contained so that the mixing programs do not spill into the surrounding fabric, with that a critical mass is ensured.
- It has to include the street to connect the agricultural production with the rest of the environment.
- It should be permeable toward agriculture and less permeable toward the built fabric.

**Second**, it is necessary to define the elements and parts of the agricultural process, that are spatially not so demanding and can be detached from agricultural land.

These elements can be than put together in a node as generators of public space - generators of the new urbanity.

Agricultural elements:
- hydroponics,
- allotments,
- rice milling process
- crop storage and, preparation
- tools storage.

Additional elements:
- Local food market,
- Global food redistribution center.
Food production cycle:

To define the mixing node, the organization and workflow of the processes has to be understood.

An example of such a process is depicted here - an organizational principle of food production cycle that is connected to local distribution (market) and global distribution (wholesale).

The systems are kept separated so that the global distribution does not obstruct the local market activities.

The hydroponics act as mediatory element to make this separation possible.
6. Definition of a node

6.3. Public armature of a node

On the basis of described systems ‘public’ (production oriented) armature of the node is constructed.

Because of transverse permeability of the nodes, a secondary infrastructure can begin to emerge, that connects the nodes across the agricultural land.

One of the advantages is that all the products that are generated in the local corridor can be shifted into the regional corridor and distributed from there.
6. Definition of a node

6.4. Communal living model

To further define the agricultural node and the surrounding fabric, housing and dwelling customs are taken in as design parameters.

These peri-urban areas have strong tradition of communal living. Historically developed fabric is usually structured to maximize the social interaction, with very differentiated, gradated and interconnected open space.

Contemporary (western) living models combined with economical exploitation is rendering the diversity of urban space non-existent.

The Social interaction diagram is staying the same, but the Urban organization diagram has shifted to that of a Nuclear living model.
6. Definition of a node

6.5. Designing community, permeability and density

**Permeability and public space:**

To accommodate for the permeability and social public component, the self developed ‘urban village’ typology has to be reexamined.

The aim of the new spatial organization is to accommodate for the gradation of public space, permeability and bigger density than the traditional village.

Furthermore, the new typology has to integrate the agricultural production elements as parts of the new urban experience.

**Legend**

- dwelling
- hydroponics
- allotments (or semi private space)

---

**Technical specifications of 1 unit:**

1 unit = 2 families

- 1 family works in agriculture
- 1 family works in industry

=>

- hydroponics = 100m²
- allotment 125m²
- rooms = 4x10m²
- common area = 2x30m²

---

**Stacked-up model**

This model does not enable the permeability and interconnectivity of public space, creating disconnected private open spaces.

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**Intertwined model**

This model accommodates for interconnected public space and it’s gradation, furthermore it enables multiple connections and is highly permeable.

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7. New urbanity

7.2. Performativity of the new corridors

The new corridors are now composed of two types of nodes; regional (where two different corridors meet) and local (in 10 min distances).

Corridors account for separation of traffic and general inclination toward production or toward dwelling.
8. Instrumentalizing the strategy

The following tool is an attempt to instrumentalize the outlined urban strategy and apply it in a domain of dynamic multi-nodal growth scenarios.

With such an instrument it is possible to trace different growth patterns evolving from differentiation of input elements.

On the basis of the outlined urban strategy, the input elements are:
- node position
- node type and importance
- differentiation of the corridors (dwelling / industry)

Additional constraints are:
- growth speed depending on the corridor differentiation
- growth of nodes depending on the type and importance

General principles of fabric generation are:
- multi-nodal hierarchical growth to achieve differentiation
- permeability control of the built fabric depending on the stage of the growth (sparser organizations have bigger permeability towards agriculture - being more agrarian, denser organizations have bigger permeability towards the rest of the built fabric -being more urban)
- densification and organization of open space through thickening of the public ground

To define the general principles, a propagation matrix of different stages of fabric is generated (see page 59).
PROPAGATION MATRIX

housing components | local corridor nodes | industrial components | regional corridor nodes

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8. Instrumentalizing the strategy

8.2. Scenarios

The growth scenarios are scripted in Excel as constrained cellular automata.

They follow a simple growth pattern that is additionally defined by a set of parameters that control type of developing fabric, its density and type of generated nodes.

The Corridors are modeled in Rhinoceros as meshes. Each mesh has certain amount of cells that coincide with cells in Excel. Into each cell, depending on a population matrix, certain component from previously defined component matrix (see page 58) is ascribed.

Basic parameters explained:

In the unwrapped Node Definition Matrix the position and class of the nodes is defined.

Mix Matrix defines what part of the population matrix will be used to populate each specific cell.

Population Matrix is a matrix of all of the generations of the fabric. It specifies which component from the component matrix (page 58) will be ascribed to which cell of the corridor.

Step Number for Node Activation defines when a certain node becomes active and starts the growth.

Growth Cut Step defines when the propagation reaches the terminal state and does not evolve any more. Without this parameter, the propagation would result in complete entropy and homogeneity with no spatial differentiation.

Node Change Interval defines when the node changes and builds up.

Growth Step of Components defines how fast will a fabric buildup happen from one generation into the next.

Component Classes defines the intervals into which to fit certain components from the component matrix.
8. Instrumentalizing the strategy

8.2. Scenarios

8.2.1. Scenario 01

First scenario is showing a simple linear growth of both corridors.

Growth starts in a mixing node where new corridors meet.

First, a primary node is created, than the fabric grows laterally from that node.

Secondary nodes start to form in the 6th step.

Tertiary in the 15th.

There is a clear separation between local and global corridor organizations.

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8. Instrumentalizing the strategy

8.2. Scenarios

8.2.3. Scenario 03

This scenario explores the possibility of slightly faster and more pronounced development of dwelling and tertiary sector.

The growth of dwelling and local nodes is faster. The regional corridor, where the industry is developing, starts to develop with a delay, therefore dwelling components start to permeate the regional corridor in certain places.

This scenario also explores possibility of growth of the nodes. In certain steps, nodes start to grow laterally, replacing the already built components.
8. Instrumentalizing the strategy

8.2. Scenarios

8.2.3. Scenario 03

Two population matrixes are created, one for the fast growth pattern and one for the slow growth pattern. A mixing matrix is devised, on basis of which the two matrixes get converted into one.

Mix matrix specifies which growth pattern will be followed in a specific part of the final matrix.

With the mix matrix we are also controlling mixing / separation of the main sectors of the corridors - dwelling on one hand and industry on the other.
8. Instrumentalizing the strategy

8.2. Scenarios

8.2.3. Scenario 03 / Step 01

Tertiary nodes of local corridors start to emerge from existing fabric.
Because of higher growth, the housing components start to permeate the regional corridor.
8. Instrumentalizing the strategy

8.2. Scenarios

8.2.3. Scenario 03 / Step 27

The fabric, where the corridors meet, becomes much more mixed and varied.
Peri-urban nodalities
A take on rural-industrial urbanities in China

Research / design thesis by Tomaz Pipan, Landscape Urbanism, Architectural Association, School of Architecture, 07|08