

Reconstruction of the environment quality on “Chaotic Space”: Case study of Chaonan District, Shantou City, China

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Abstract: It is often the case that strong bottom-up power in the Desakota area (half-urbanized) leads to mixed functional space and poor quality of spatial environment. During this process, urban planning does not work. This study aims to report the reconstruction of the environment quality starting from the logic of space production, and analyze the “chaotic space” in the Desakota area. Key systematic thinking of spatial amelioration which is “dynamic planning framework and flexible smart design” based on Desakota “chaotic space” is explored.

Keywords: Desakota; chaotic space; production of space; Chaonan District; Shantou; spatial environment quality

1. The Space Production Theory and Localization Logic Description

1.1 Introduction to the Theory of Space Production: From the Perspective of Transformation of Space Production to the Production of Social Relations

There are many Chinese and western scholars and experts involved in relevant researches and work practice to tackle the problem of space and the theory of space production. It is the space production theory that emphasizes the internal contact philosophy to explain the space problem.

Space production theory can be traced as early as the 70s and 80s of the 20th century. It was put forward after a group of scholars of the western society studied space production. In Lefebvre’s classic book on space production, he put forward the theory from the angle of social space dialectics, “space is the society; the society is space”^[1,5,6]. Since then, new urban sociology scholars, represented by Harvey, put forth that “space is the focus of the society struggle”^[2,3] from the perspective of social capital and class. F KeWei, on behalf of post-modern sociology scholars, put forward the function of space, “space, which is the important mechanism of the right to practice”^[3,7] from the perspective of political rights. Represented by Su Jia, humanistic geography scholars put forward the partial and organic whole “third space”^[3,4] from the angle of systematic space.

Research by western scholars on space production theory reveals that the production of space is the essence of social relations. This is an important theoretical impetus effect, and it became an elaboration and analysis about the space between urban and rural areas, land, institutional, social and other related issues of “original theory”^[5].

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1.2 Space Production Theory Localization of Logic

1.2.1 Space Production Theory Pushes Forward the Space Development in China and is the New Perspective with the Theory of Social Relations

As the connotation of space production theory has been scholars' cognition, space production theory localization of thinking has been launched in China. Scholars have put forth philosophies and humanities theories about space production localization of research. Suping Wang^[8], Wu Ling^[9] combined our country's economy development from the perspective of Marxist philosophy of space production and put forth "to the equal rights and interests of space for the original meaning of spatial justice" as a local search, but also revealed the materials in the process of rapid urbanization in China and the lack of space. Sun Won^[10], from the angle of space production and urbanization, reflected the production of space in our country's administrative intervention and the contradiction between urban and rural areas, such as market turmoil and low-end production characteristics. Ye Chao *et al.*^[11] stated that capital, rights, and class in the characterization of performance in China's urbanization space are the symbols of Chinese urbanization in space production. The production of space in things also turned to the production of space itself. From the perspective of theory and philosophy, these scholars provided the space production localization of research.

1.2.2 From the Extension of Space Production Theory to the Functional Space Practice

In recent years, the localization of space production theory study not only limits to the aspect of theory analysis. Numerous human geography and urban and rural planning practitioners have production theories and combined materialization of the space function space with practice researches, and they are able to put forward new perspectives for the cognitive function of urban and rural space. With regard to residential function space, Yu Qi^[12] analyzed empirically the characteristics and evolution of urban residential space form distribution. Jingxiang Zhang^[13] discussed about a new residential society from the point of space performance analysis of the problem. Zhuwu Yi^[14] discussed about industry functional space and the microcosmic social network such as creative park social space heterogeneity under production. Pertaining to business function space, Jason Hu^[15] discussed on the subject of balanced game where the government needs to be in the production of space through the accurate positioning on behalf of the public interest. Tourism and landscape function space, according to Qingzhong Ming^[16], derived from the tourist landscape elements, the relationship of "three dimensions" and the reconstruction based on cultural tourism in the provincial capital of tourism landscape spatial pattern.

1.3 Summary: The Space Production Theory Localization Logic Can Better Explain and Deal with the Regional Planning Issues Under the New Normal

Space production theory reveals that people experience the changes of physical space processes. In fact, it is a form of the social change process where material space is behind the essence of social development, social power, relations and the changes of everyday life. Localization of the theory of space production in China can better explain physical space and social relations which would encourage systemic consideration, interpretation and analysis of the current problems which appeared in the process of rapid urbanization in China. For urban and rural development, space production for the logic of the proposed method of cognitive space between urban and rural areas will become a new and effective way of planning work in the future.

2. Half City and Township Regions of Space Production Logic and the Space “Chaotic”

2.1 Half City and Township Regions: Strong Characteristics from Bottom to Top

The concept of half and half township (or Desakota) was founded in 1987 by Canadian geographer T. G. McGee^[17]. He aimed at developing the Asia region after the study, keeping in mind the traffic corridor zone distributed between big cities, interaction with cities and non-agricultural industries which increased significantly and rapidly in rural areas. This is very different from western metropolis with a new type of space structure. This is through the transformation of rural township to a half and half urbanization process. Due to China’s reform and opening-up, many rural areas especially in the regions of the pearl river delta and Yangtze river delta, have appeared with the rapid urbanization and a combination of thought of “urban growth”, along with urban expansion in the recent 30 years. Some scholars call it “urbanization”^[18,19]. Due to a strong rural “gene”, urbanization or half city and township areas reflect the strong characteristics from bottom to top. Among these, Chaoshan area is the most typical one.

2.2 Half City and Township Regions of Space Production Relationship Under the Production of “Chaotic Space”

According to project researches and practice analysis of half and half township areas for many years, half and half township areas in China have a strong relationship between productions as a link “home economics” characteristic. From the perspective of space production theory, half city and township regions behind the space and social relations are more complex.

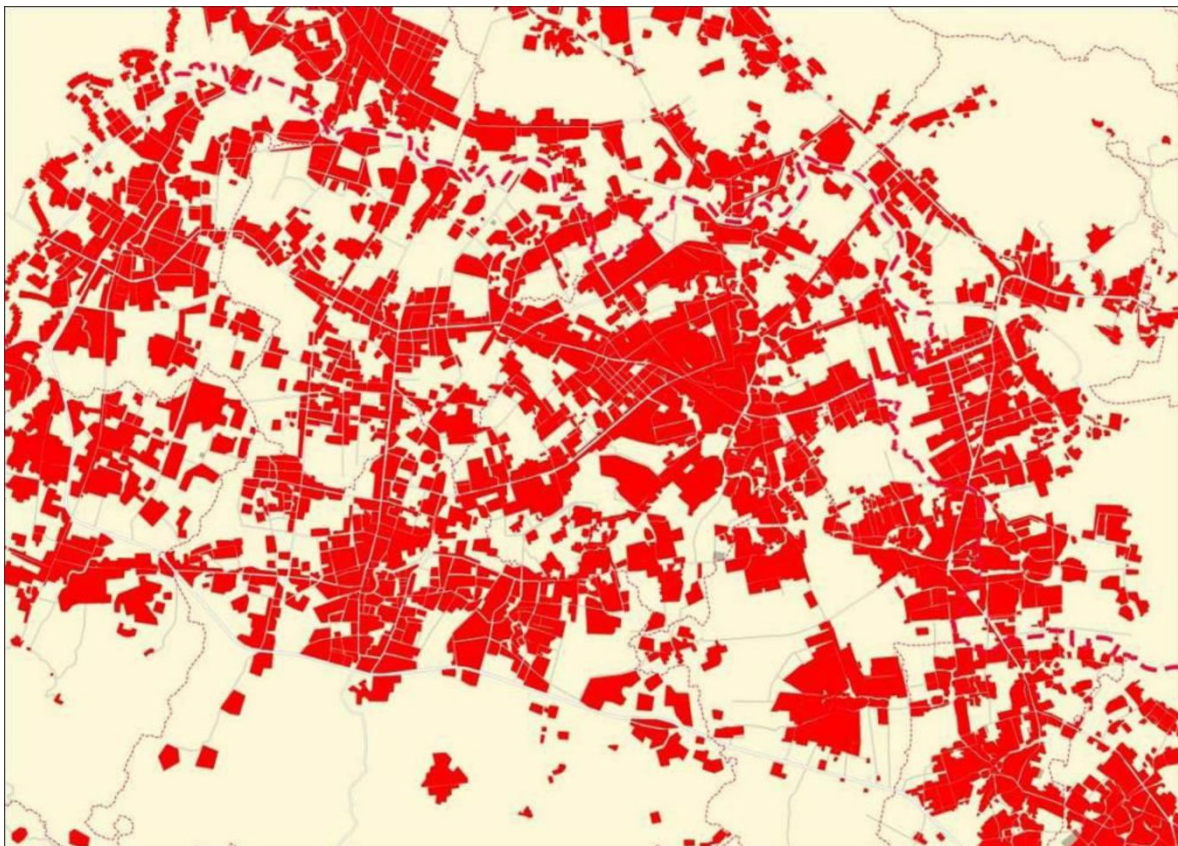


Figure 1: Half city and township regions of high density and fragmentation of urban and rural construction land

2.2.1 “Chaotic space”, vocabulary from Architecture to Urban Space Development, is the Core of the Half Urbanization Area Space

The word “chaotic space” first appeared in meteorology in 2002. The first appearance was in the literature of architectural space from Zaiyuan Zhang^[20,21]. Architectural design basis points in the direction of the future will tend to be “chaotic space”. “Chaotic space”, to a certain extent, formed two equally important aspects of time and space across tradition, and was constantly changing. He extended the diversification of mode to disorder in order, namely “hidden order”. These ideas explained exactly the self-organizing characteristics of half city and township regions of China highly and consistently. So the author attempted to first extend the interpretation of “chaotic space” between urban and rural areas and look for the breakthrough to solve the problem of complex ways.

2.2.2 “Chaotic space” Under the Performance Still Exist in “Hidden Order” Characteristics

Both in towns and villages, “chaotic space” is unordered and loose. There is lack of overall planning and design to guide the production. The life mixed functional partition and the architectural layout is mixed with external public health environment. In the eyes of the public, however, there is “disorder” and “the organization” is of low quality. Half and half township areas are formed over a long period of inner order, namely “hidden order”. By analyzing the characteristics of self-organization evolution model, we can get the “hidden order” features of half city and township regions:

(1) Urban and rural settlements and ecological space of “hidden order”: Distribution tends to be dominated by the water system and both highway lines. Because of the car traffic, the villagers have to rely on the ship as major traffic tools, so they choose water to increase water traffic convenience. In addition, domestic water and feng shui philosophy have become important location factors. After the water traffic gradually decreases, road traffic gradually become the main way of transport, so most of the development and construction are along with the main traffic arteries. From another point of view, the highlight of the background, the contradiction between human and land layout is due to the lack of guidance and the limitation of government investment in infrastructure. Hence, it allows the utilization of traffic of the half and half township area to reach “perfection”, but it can also be the restriction under the condition of the most effective means.

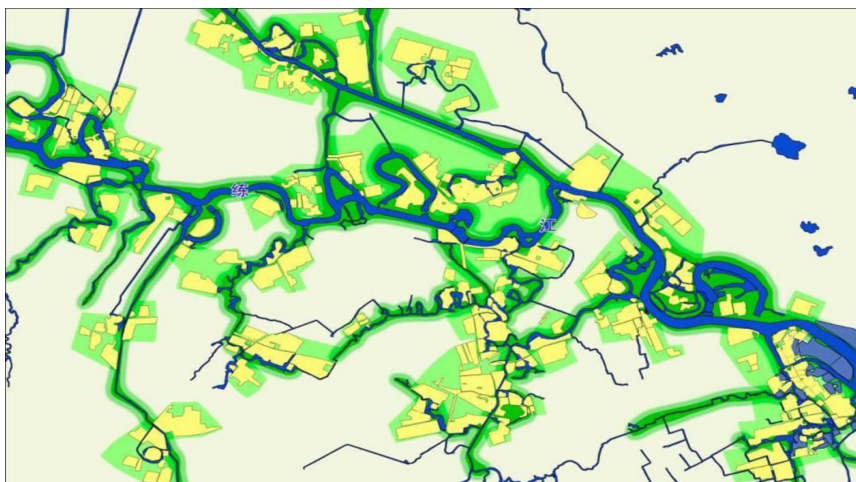


Figure 2: Half city and township regions under the guide of the layout of urban and rural settlements

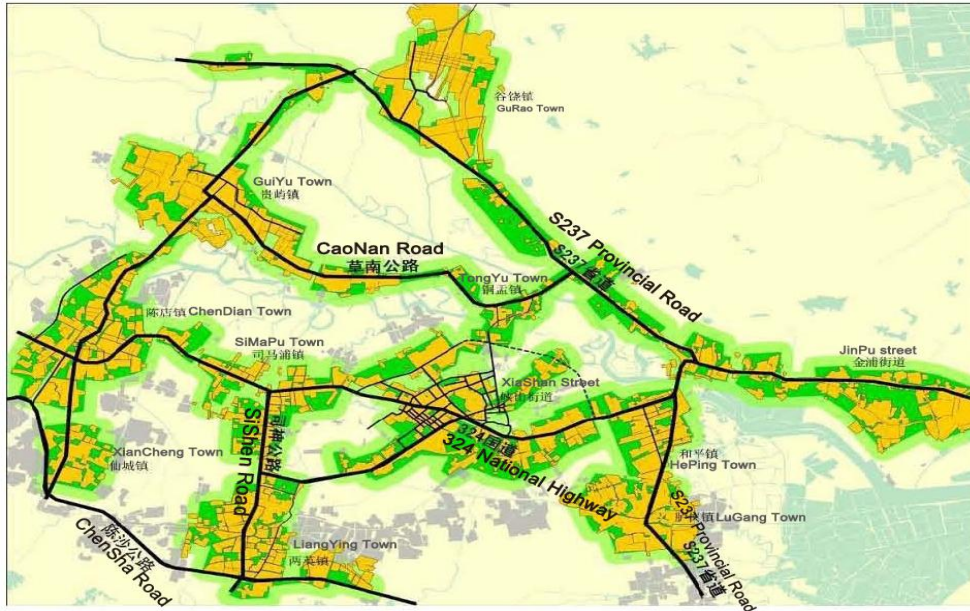


Figure 3: Traffic layout of urban and rural settlements guided by half and half township area

(2) The living space of the “hidden order”: The clan is the main unit in the village under the cultural characteristics of spatial agglomeration. Formation of the order is mainly due to the limitation of the collective village land ownership and the new land can only be within the scope of the village site. Even so, in order to improve the living environment of the newly-built housing, the villagers preferred to cling to the traditional settlements. In the small village inside the unit, the new living space choice was not disorderly, but is usually concentrated in one or two directions. In the collective village, the development space of the village played a guiding role consciously. Observing from the public service facilities, distribution features of the village is also treated as the main unit. Facilities at the village level are considered complete, but this is lacking in towns or the unified deployment of a higher level.



Figure 4: From half city and township regions of new living space to the aggregation of traditional settlements space

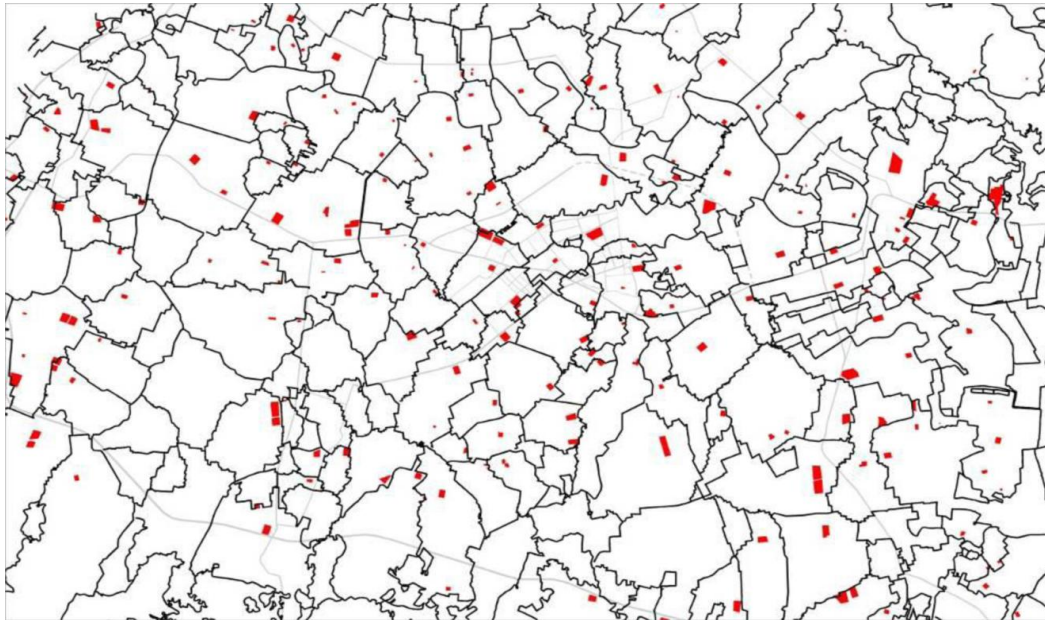


Figure 5: Half and half city for the unit with the village township in the distribution of public facilities

(3) The production of space “hidden order”: Active private economy for the unit with the village has created numerous “industrial zones”. Half and half township areas of industrial space are the choice of living space. They are more driven by local economic interests. Production space is relatively more concentrated, but overall, still a very scattered broken space at present. The scale of powerful ways of “self-organization” and “acquaintance society” bottom-up interest relations is not big, but the number of enterprise production relations is, and thus increased internal sticky “industrial zone” has a strong economy. However, the traditional local appeal, pro-business ideas and the pursuit of short-term profit tend to lead to the production space. Living space is highly mixed, even to the extent of greatly squeezing the original ecological space.

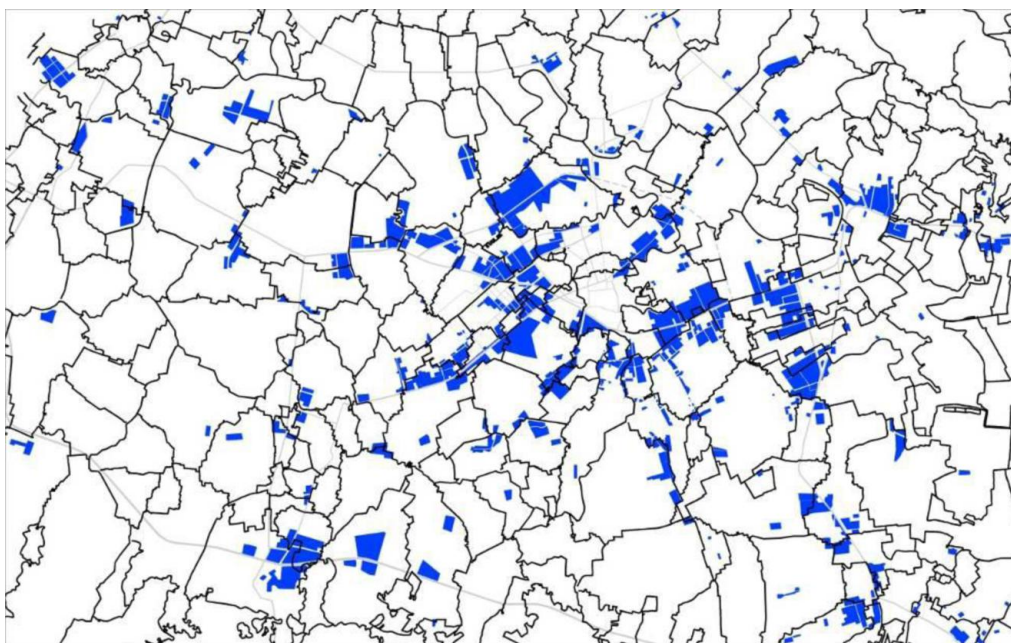


Figure 6: Half and half city for the unit with the village township area of “industrial zone” distribution

2.3 Summary: Ignore the “Hidden Order” of “Chaotic Space” System in Urban and Rural Planning Failure

Half city and township regions powerfully formed distinctive bottom to top “home economics”, but “chaotic space”, as the carrier of low quality environment space, often becomes the most intractable problem on planning and design. Once the solution is not good, it can cause planning failure, leading to the construction out of control. The main reason are the “hidden order” of “chaotic space” and its systematic neglect.

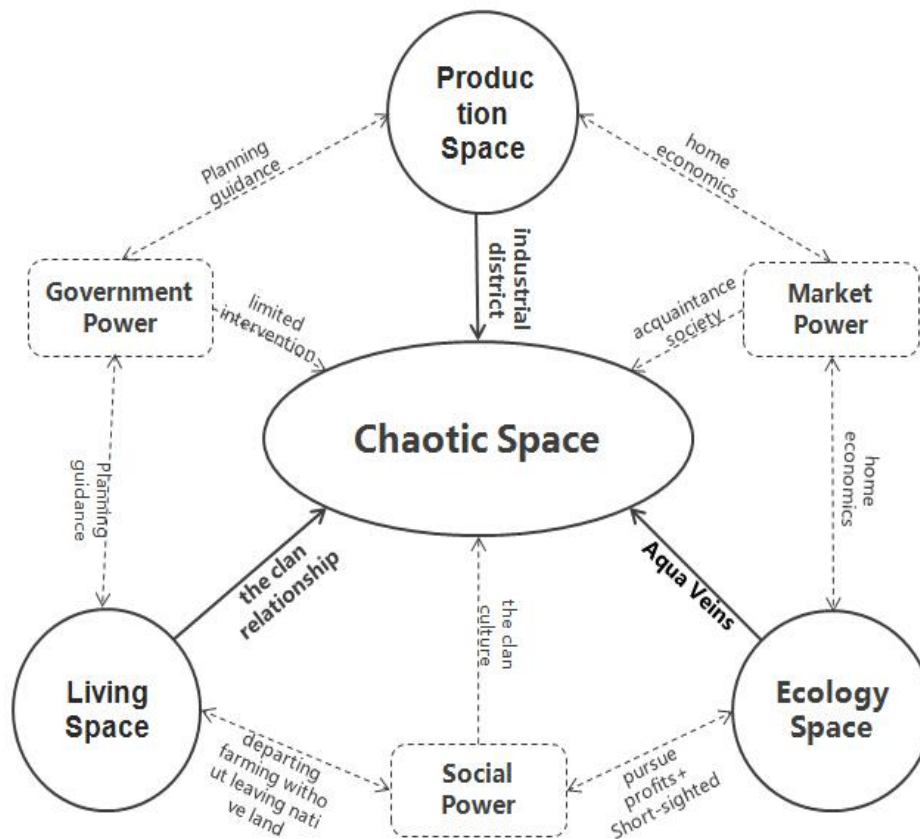


Figure 7: The “hidden order” of “chaotic space” in half city and township regions

“Chaotic space” form shows very distinct social space in the production of logic. This kind of order and new city district of “urban growth” construction also has obvious difference between general urban renewal and reconstruction of logic, because the “hidden order” of “chaotic space” does not only contain “ecology, life, production”, the three types of space order, but also contains the government, market and public order of strength. Top-down limited government power can only be three types of space limited intervention. “Acquaintance society” under the market force is unified on the local collective space. From the bottom up, very strong social power can be transmitted by the clan relationship to strong action signals. These elements formed an interconnected, closed system, and at the same time, each type of space has the power to the implementation of landing. Therefore, if you really want ascension half city and township regions of low environmental quality “chaotic space”, you will need to fully understand and respect the local “hidden order”, starting from the planning and design of systemic and sexual space reconstruction.

3. Planning Methods of Reconstructing “Chaotic Space” : To Reorganize “Hidden Order” of the Dynamic Programming Construct and Flexible Micro Easily-designed System in Desakota area

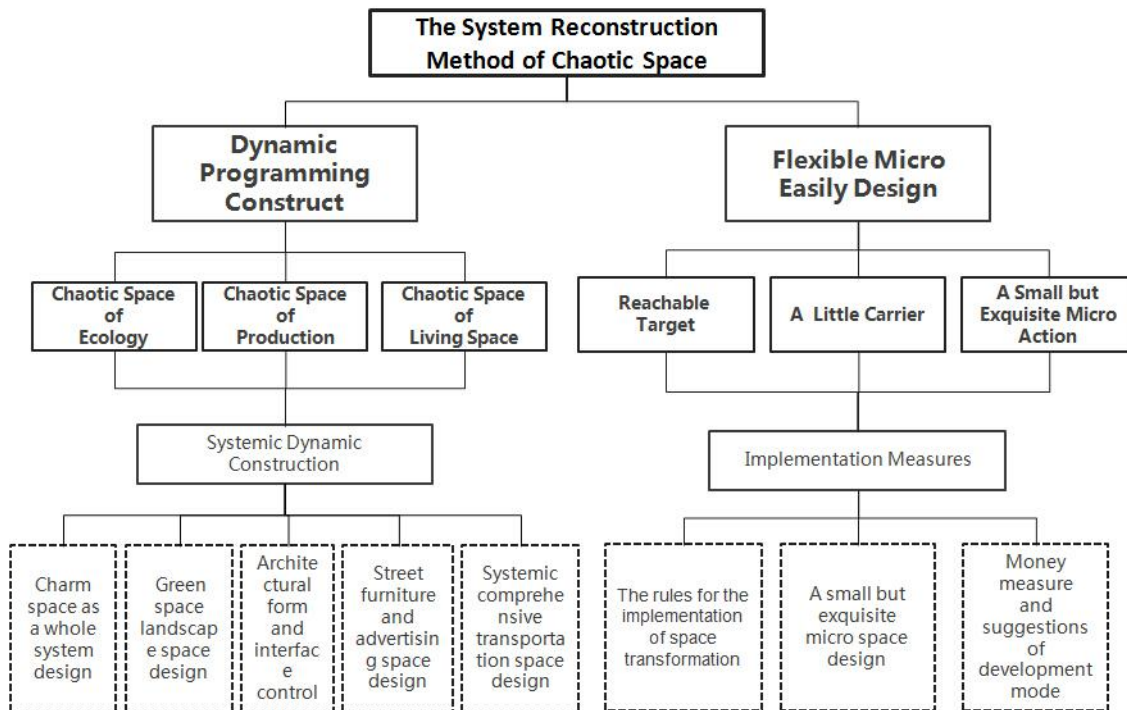


Figure 8: half city and township regions’ elastic micro dynamic planning construction and easily design of system reconstruction path

The main planning thought on reconstructing “chaotic space” can be concluded as two parts. A framework of planning, which includes “systemic dynamic construction” and “implementation measures”, is established. The significance of this framework is to show full respect of the bottom-up “hidden order” characteristics in the Desakota area, and a set of planning solutions and actions based on “chaotic space” amelioration are concluded as well, according to some recent project practices in Desakota area by the author.

In terms of “systemic dynamic construction”, the base of system should be first identified. Thus, a very detailed field investigation focusing on low quality “chaotic space” is required. Then, a series of key issues on ecology, production and living are also pointed out. These problems are directly related to the medium and long-term state of this area, and should be considered as the priority for solution. To form a systemic dynamic solution for long-term, five main spatial aspects need to be reconstructed at first, which are “the charm space as a whole system design, the green and landscape space design, architectural form and interface control, street furniture and advertising space design, systemic comprehensive transportation space design”.

For “implementation measures” part, a set of much short-term oriented solutions and actions are raised, which are more flexible and bottom-up based. These actions focus on implementation issues, and “an achievable target, a little carrier, a small but exquisite micro action” are concluded, comparatively referring to further detailed contents, which are “the rules for the implementation of space transformation, a small but exquisite micro space design, money measure and suggestions of development mode”.

No matter what the “systemic dynamic construction” parts are or “implementation measures” are, the key attempts are to ameliorate “chaotic space” and to let “the hidden order” get better organized, which are also the key solution to problems in Desakota areas

4. The Empirical Study: Shantou Chaonan area along the 324 National Highway of the Environmental Quality Improvement Plans for Construction and Elastic Design Practice

4.1 Project Overview

Chaonan area tides to 324 national road section, early as a main road. As the new state highway 324 moved, 324 national road downtown period of about 7 km national highway road will be transformed into urban main road. For many years, however, under the development of space along the national highway of self-organization in the power of the strong and weak force of government intervention, it formed the extremely typical production, living and ecological highly mixed low quality “chaotic space”. This work is based on “chaotic space” along the national highway 324. In-depth research analysis found out it mixed in space order and the key planning guidance, reflecting the overall systematic dynamic planning construction and implementation of operational flexibility micro design practice.



Figure 9: Shantou tide zone city 324 state road section position

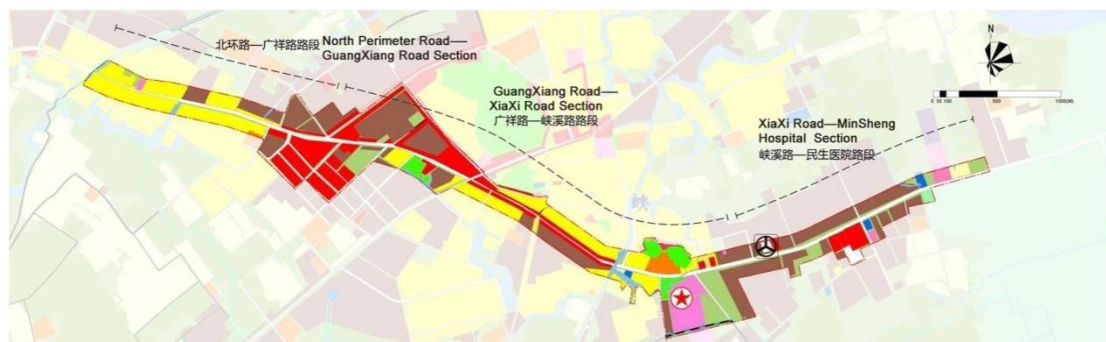


Figure 10: Along the 324 national highway planning and design scope and status “chaotic space” land

4.2 “Chaotic Space” along the National Highway 324 and its Logical Space Production

4.2.1 “Chaotic Space” along the National Highway 324: Three Types of Space at the Same Time under the Action of Space Production

(1) Ecological Production Logic: “Chaotic Space” has been eating into the “Justice” of Space that needs to be maintained

Being gradually eroded under the traditional agricultural space on behalf of the regional spatial structure of ecological boundary under self-sufficiency, regional ecological corridor between groups must be strictly protected space.



Figure 11: The status quo of ecological “chaotic space”



Figure 12: The status quo of ecological “chaotic space” layout

(2) The Production of “Chaotic space” Production Logic: Industry Transformation of Regional Long-Term Space to Update

Park space on behalf of the urban agglomeration guides the development of the national function, which changes after the “half astern into three” social space, but the recent update of industry transformation and transformation are extremely hard constraints.

A total of 254 titles were identified in database search, as presented in (Table 1). A second search by a clinical librarian did not add more identified titles.



Figure 13: The status quo of the production “chaotic space”



Figure 14: The status quo of the production “chaotic space” layout

(3) Life “Chaotic Space” Production Logic: Limited Space, Exquisite Production

Town center living space on behalf of the social and economic activities and the key space of modern life consumption is also the most intensive future urban activity space, but due to the historical formation of the road on both sides of the residents’ living space, business class random occupation planning road red line is very serious. The space will be the most difficult one to transform. We need to understand the historical origin, cultural characteristics and implementation difficulty, and put forward to take the drive and space environment interface of refinement micro easy design section and the path of installment.



Figure 15: The analysis of status quo of life “chaotic space” along the interface

4.3 Refactoring along the National Road 324 Space Environment Under the “Hidden Order” Chaonan Man's Path to “Home” + Elastic Micro-dynamic Programming Construction Design

4.3.1 Dynamic Programming Construct: Clear Space of Chaotic Space Order Production — Production, Living and Ecological Systematic Dynamic Programming

(1) The Whole Charm Space System Design (Mandatory)

To 324 national road ChaoNan area city section of the road to build homes for ChaoNan people, through all kinds of space reveal ChaoNan area along the systemic space of the traditional and modern, economic and cultural awareness, build long-term oriented, section highlights distinctive charm space system as a whole. To show charm city axis to National Road 324, from east to west portal metro style period, traditional style and fashion, the style of city center, paragraphs livable style paragraph four style, build “one axis and four, multipoint” the charm of the space system.



Figure 16: Overall charm space system design

(2) The Landscape Space Design (Leading)

To perfect the system of the 324 national highway greening landscape, in addition to gorge new road—JinGuanglu road, where the road space is difficult to meet the green condition, without greening greening, measures have been taken to combine various road sections and other land use characteristics on both sides, and make corresponding land functions of green space in a row, the west side of the government are retained only a green nodes, new 4 landscape green space planning.

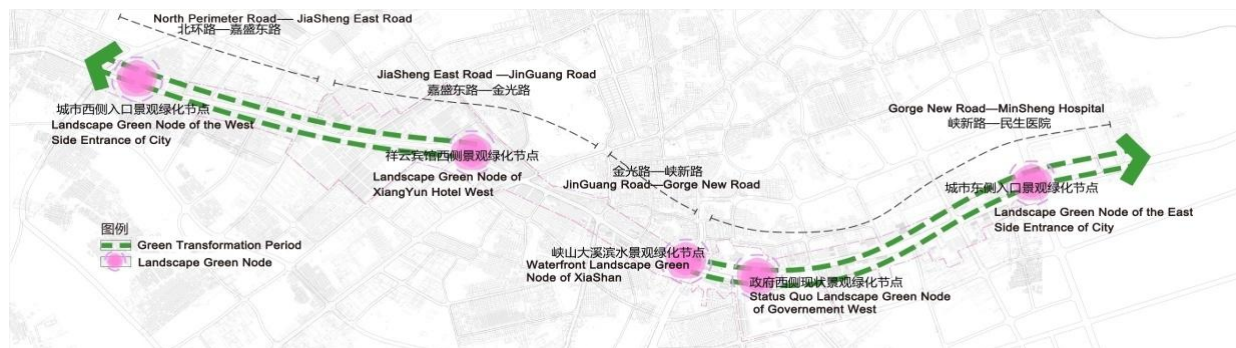


Figure 17: greening landscape space design

(3) Architecture Form and Space Interface Control (Leading)

Combined with the status quo and Chaonan region development needs, to the overall coordination, 324 national road along the street highly shape change orderly street space skyline.

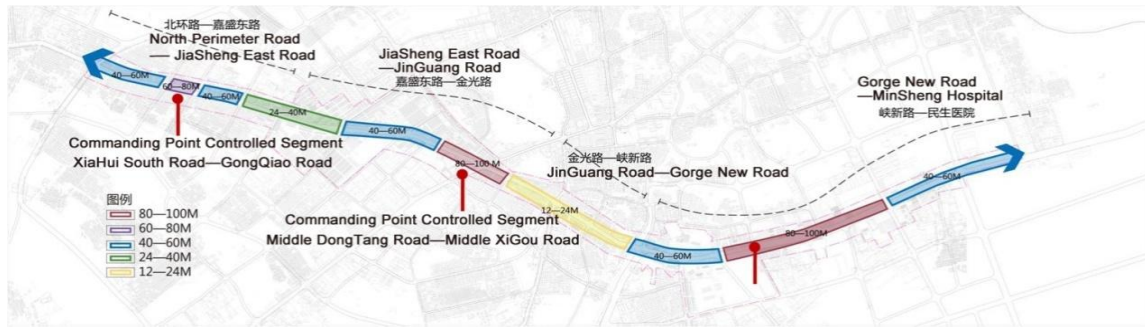


Figure 18: architectural form and space interface control

Height control on the future plot with updated development along the street, in addition to gorging the building height of the new road—Jin Guanglu considered the reality in multi-layer height control, where the building height of other sections give priority to small or high-rise and determined the three high ground is most the skyline of the overall control points, neighboring area as a landmark, height control gradually reduced.

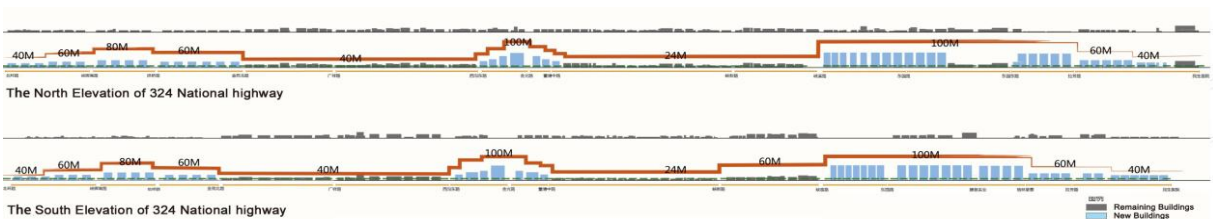


Figure 19: height control

(4) The Street Furniture Design and Advertising Space (Leading)

Advertising space of 324 national highway control reconstruction scheme is put forth, combined with modification for advertising, wall advertising, LED advertising, pillar type ads and urban furniture, etc. Six kinds of advertising forms were hence put forward. The corresponding Ad setup requirement combined with the characteristics of the various sections and controlled the various sections of types of advertising allowed.



Figure 20: street furniture design and advertising space

NH 324's city furniture put forward the basic principles of setting up the standards to guide the future layout and design of street furniture.

(5) Integrated Transportation Space Design (Leading)

Taking into account the present situation of NH 324's traffic problems, unclear road divisions, temporary parking problems and motor vehicle gateways complex intersection problems, it should put forward the construction of optimal solution, leading to NH 324 traffic environment.

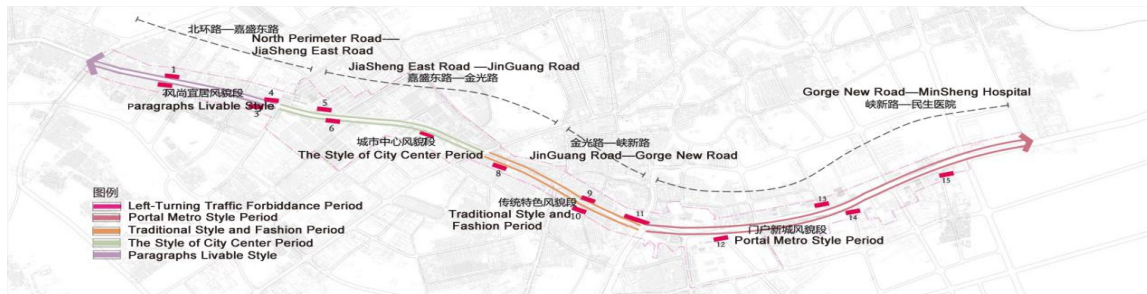


Figure 21: comprehensive transportation space design

4.3.2 Flexible Micro Easily Design: To Continuously Revise, Extend the Space Focused, Limited Target ++ Micro Easy Space Development Pattern for The Gripper

(1) Clear in the Near Future to Reach the Goal

Combined with the four characteristics of charm system build functional section, from the landscape features, streets, color, advertising control, green transformation four key content, detailed spatial transformation rules are put forward through the analysis of the entire section which covers specifically limited goal of space, and to implement the work target.

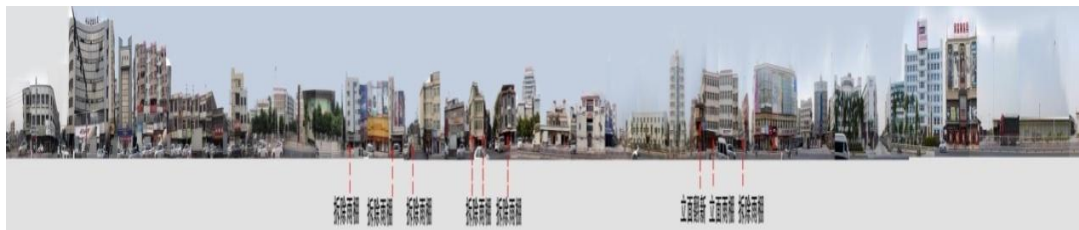


Figure 22: target action feature modification of space

(2) A Small but Exquisite Micro Space Design

In view of the recent micro space design; starting from the simple, small, concrete space transformation, through tiny space plane, elevation, landscape sketch, refinement of the interface design, implementation to node space environment quality improvement drive the surrounding areas more updates, on the segment space, realizing the vision of “let transformation happen, the quality improve”. The work choose four micro space node space design, puts forward the specific nodes.



Figure 23: micro easy space effect, Xiashan big nodes

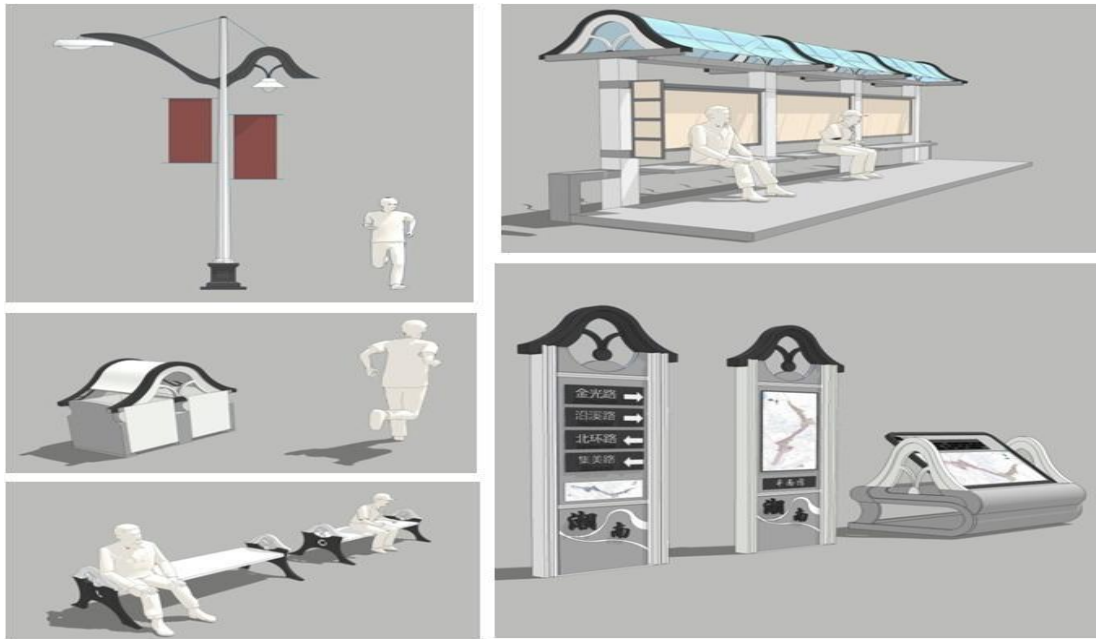


Figure 24: micro easy street furniture design

(3) The Money Measure and Suggestions of Development Mode Cost Calculation and Suggestions of Development Mode

Based on dynamic programming and flexible micro design, put forth for the near future, the construction sequence, and presents the overall, node JinYuanQi renovation budget.

Based on dynamic planning and flexible micro design, the budget costs of implementation can be calculated, which include node renovation budget as well as short-term and long-term budget.

Recent Budget Sheet					
project	unit-price		number	price	note
Road surface renovation cost	motor way	140	-	-	Already completed
	sidewalk	140	-	-	
Landscape transformation	Architectural paint	15000	36	540000	
	Dismantle Private Construction	1500	168	252000	
roadside shade trees	arbor	650	780	507000	<u>Roystonea regia</u>
	Tree Pool	500	780	390000	According to 10 meters planting distance planting
Advertising regulation	Dismantle Advertising	1500	170	255000	
	LED Advertising	1000	600	600000	
investment budget(yuan)			2544000		

Mid-term Renovation Budget Sheet				
project	unit-price	number	price	note
node design	The east entrance node	1459900	1	1459900
	XiaShan big node	5024000	1	5024000
	ShanMei road Jiasheng road node	5184800	1	5184800
	The west entrance node	1039900	1	1039900
landscape renovation Of not node-link	hard qualitative	260	70000	18200000
	Sculpture an feature wall	80000	0	0
	Union Bench	800	1000	800000
	Trash can	300	1400	420000
	Landscaping	75	105000	787500
	Wooden footway and wooden platform	450	500	225000
	Tree pool (not trees	800	700	560000
	Landscaping Pillar	20000	8	160000
	Landscape sketch	80000	0	0
	Guide Signs	1500	55	84000
investment budget(yuan) :	35097100			

The east entrance node				
project	unit-price	work amount	Total	
hard qualitative	m ²	260	3000	780000
Sculpture and feature wall	group	200000	1	200000
Union Bench	-	800	48	38400
Trash can	-	300	6	1800
Landscaping	m ²	75	4500	337500
Wooden footway and wooden platform	m ²	450	0	0
Tree pool (not trees)	1	800	24	19200
Landscaping Pillar	-	20000	0	0
Landscape sketch	group	80000	1	80000
Guide Signs	-	1500	2	3000
Investment budget(yuan)	1459900			

XiaShan big node				
project	unit-price	work amount	Total	
hard qualitative	m ²	260	9000	1300000
Sculpture and feature wall	group	80000	10	800000
Union Bench	-	800	50	40000
Trash can	-	300	10	3000
Landscaping	m ²	75	10000	750000
Wooden footway and wooden platform	m ²	450	2500	1125000
Tree pool (not trees)	1	800	0	0
Landscaping Pillar	-	2000	100	200000
Landscape sketch	group	80000	10	800000
Guide Signs	-	1500	4	6000
Investment budget(yuan)	5024000			

ShanMei road—Jiasheng road node				
project	unit-price	work amount	Total	
hard qualitative	m ²	260	13800	3598000
Sculpture and feature wall	group	80000	0	0
Union Bench	-	800	192	153600
Trash can	-	300	24	7200
Landscaping	m ²	75	18000	1350000
Wooden footway and wooden platform	m ²	450	0	0
Tree pool (not trees)	1	800	85	68000
Landscaping Pillar	-	20000	0	0
Landscape sketch	group	80000	0	0
Guide Signs	-	1500	12	18000
Investment budget(yuan)	5184800			

The west entrance node				
project	unit-price	work amount	Total	
hard qualitative	m ²	260	1700	442000
Sculpture and feature wall	group	100000	1	100000
Union Bench	-	800	68	54400
Trash can	-	300	18	4800
Landscaping	m ²	75	8000	375000
Wooden footway and wooden platform	m ²	450	200	90000
Tree pool (not trees)	1	800	35	28000
Landscaping Pillar	-	20000	8	160000
Landscape sketch	group	80000	1	80000
Guide Signs	-	1500	4	6000
Investment budget(yuan)	1039900			

Figure 25: node budget, short-term and long-term budget are calculated separately

At the same time, as the Chaonan private capital is abundant, a large number of private entrepreneurs and overseas Chinese follow villager's social returns home, draw lessons from and extend the west SFC (Street Furniture Concession) mode, and suggest the city Furniture, open space, road greening packaged with the corresponding advertising management, combined with the cultural image characteristics of different sections, being selective of the needs of entrepreneurs, overseas investment, overseas Chinese finance or operating way. The government in the style of packaging projects, put forward clear requirements under the premise of letting the operator to proceed with the design and construction.

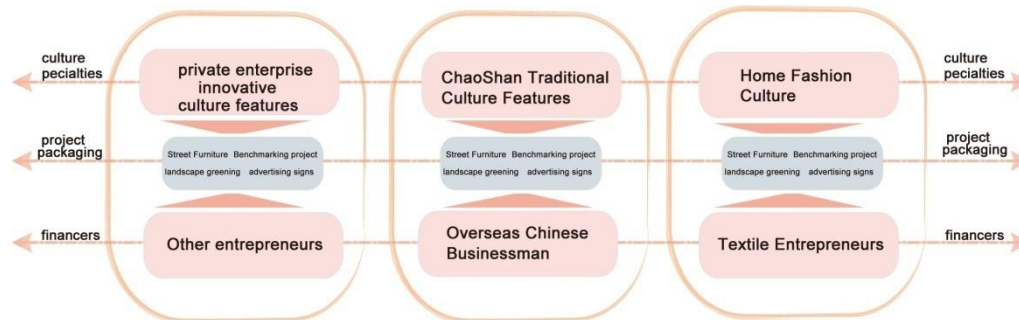


Figure 26: Chaonan area's quality promotion SFC development pattern

5. Conclusions and Prospects

In conclusion, this paper provides a new realization of “chaotic space”. In the Desakota area, traditional “chaotic space” is often considered as dysfunctional, synonymous with poor quality and disorder function. However, with the new understandings and analyses of this “chaotic space”, an inner logic of “hidden order” can be identified, which is a new perspective of space in the Desakota area. This paper makes a clear and appropriate explanation of development of a relationship on “chaotic space” from the angle of space production, which sources from traditional “urban supremacy” to a more practical way of regeneration with respect of bottom-up power. This understanding provides a relatively new way to recognize and make planning decisions in the Desakota area, not only for urban planners, but also for local government cadres.

A systematic and action-based planning method is raised as a solution of reconstructing environmental quality in the Desakota area as well. A working framework, including “systemic dynamic construction” and “implementation measures” is established as the main routes, from which a more effective planning coordination is also proposed. From the empirical study of Chaonan practice, this working framework experienced a good implementation, which is a meaningful exploration of how to make appropriate planning actions in the Desakota area.

Although some new methods have been raised in this paper, due to the limitation of author's experience, there are still some research gaps and further exploration that can be made. For instance, under this working framework provided in this paper, what will be the main differences of future land regeneration mode between short and long term? Will there be some new transition on responsibility emphasis by government, local people and company? What will be the effective way of capital pursue in Desakota? Under this working framework, how to provide acceptable and continuous planning services in Desakota area? etc. Considering from the perspective of spatial cognition on the Desakota area, this paper still gives a pilot exploration on “chaotic space” under spatial production, which is meaningful for future similar spatial problems..

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