

Research on Spatial Sustainability of Land-Use Patterns in Urban Fringe: A Study on Erxianguan Region, Shenzhen, China

Wen Zhou Zhong, Southeast University, China

The Asian Conference on Sustainability, Energy & the Environment 2016
Official Conference Proceedings

Abstract

With the rapid development of China's urbanization, the urban land has been spreading to the rural areas, leading to an increasing evolution of the land use pattern in urban fringe. The sustainability of land use in urban fringe is supposed to be significant to urban spatial expansion, urban function realization, urban economic development and ecological environment construction, while the evolution process and mechanism of land use, and problems such as "urban village", ecological destruction, waste of land resource, remain unsolved. This paper takes Erxianguan region as its research object, which has been serving as the boundary of Shenzhen Special Economic Zone for 30 years since Chinese Reform and Opening up. Based on statistics via field research, interviews and literature research, the historical changing of land use in Erxianguan urban fringe is arranged. The spatial form of land use in Erxianguan is analyzed emphatically, and two types of land use patterns are proposed: Closed street block developed from above to below; Informal patches self-organized from bottom to up. Comprehensive evaluation of the two land use patterns is conducted in consideration of social function, utilization of resources, ecological environment and cultural heritage, which aims to classify the sustainability degree, and put forward the improved direction and optimization of sustainable development of urban fringe land use.

Keywords: Land use, sustainability, urban fringe, planning, self-organization

iafor

The International Academic Forum
www.iafor.org

Introduction

Since the founding of new China, the number of China's urban population and urban has been increasing gradually, as well as the urbanization rate, however, behind the rapid process of urbanization, there is a lot of problems. Especially after the reform and opening up, the process of urbanization in China has been significantly speeding up, into the urban rapid expansion, which is a new stage of social and economic structure of the rapid transformation. Development of space brought many problems: urban sprawl, waste land, landscape construction disorder, loss in the history and culture, the rural population flows, the regional cultural identity loss and deterioration of the ecological environment etc.

Urban fringe is a unique geographical entity, which turns out to be a result of the urban development to a certain stage, located between the city and its rural hinterland, being a main area for the expansion of urban space. Urban fringe has the biggest change scale and fastest change speed in the urban spatial expansion, as well as the most sensitiveness to environmental changes. Urban fringe has not only witnessed the expansion of the city, but also carrying the problems existing in the expansion. As the link between urban fringe area, as a core area of the city and the rural hinterland contact, urban fringe can complete display process of urban space.

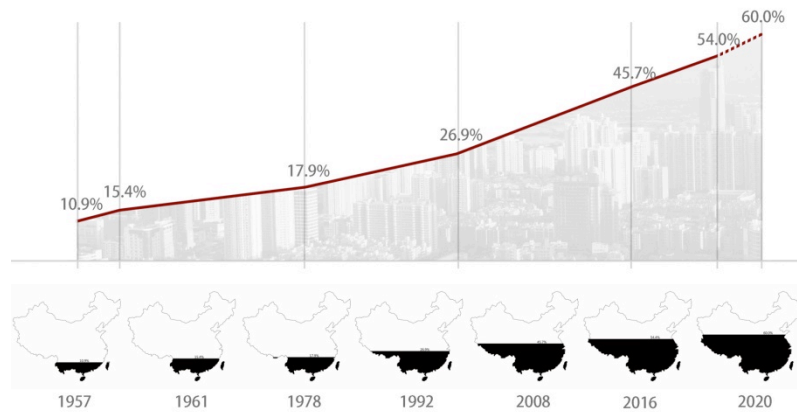


Figure 1: China's urbanization level from 1957 to 2020

Moreover, the urban fringe is the concentrated reflection of the regional man land relationship, which is under the pressure of urban development, are facing or experiencing a dramatic spatial evolution and the modern transformation and its spatial evolution is different from other regions of the rules.

Therefore, the sustainability of land-use in urban fringe is of significance to the urban space expansion, realization of the functions of cities, urban economic development and ecological environment construction. This paper takes Erxianguan region, Shenzhen, China for example, analyzing the characteristics of urban fringe land use, in terms of space, society and economic features, classifying the prototype according to the characteristics, and describing in detail the life history of the settlement of the urban fringe, and finally constructing the analysis framework of the evolution of urban fringe space settlement.



Figure 2: Erxianguan region as the urban fringe of Shenzhen

Urban fringe with urban and rural land-use

Urbanfringe was first discovered by a German geographer Louts, researching city form and region structure in Berlin, showing that part of the original rural area is occupied and gradually becomes part of the city built area, which is known as the “urban fringe”. Golledge pointed out that the spatial characteristics of urban fringe is due to the interaction of formation of city and region rural land use form.1975 Los Umm put forward the regional city structure, including the core area of the city, urban fringe area, urban affected zone, part of the rural hinterland. Urban fringe area is usually located in the periphery of the core area of the city, having its land use turning from agricultural land to city land. With the city development direction factors penetrating to the area, Urban fringe is the main area that urbanism exists.

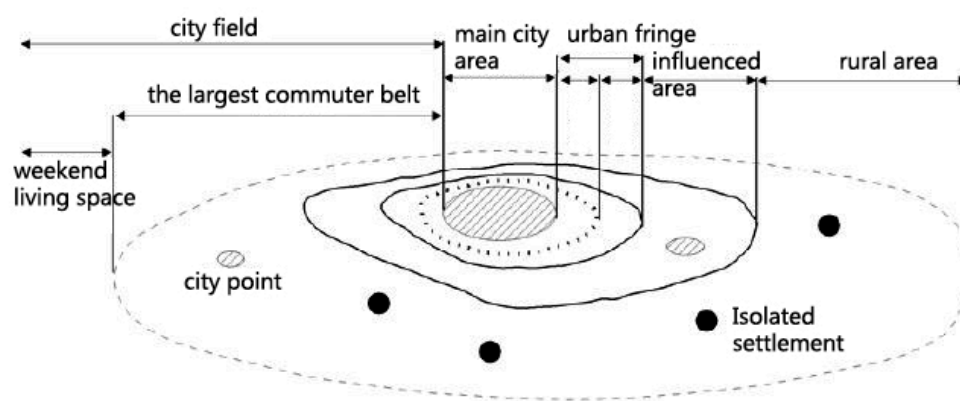


Figure 3: City structure pointed out by Los Umm

Urban fringe area, as a result of dynamic urban expansion, leads to a most obvious change in land use. Land use form in urban fringe area becomes the main content of urban sustainable development. The dual economic structure of developing countries, in the process of urbanization in cities and country boundaries become increasingly blurred, closely linked to agricultural activities and non-agricultural activities, urban and rural land use is mixed with each other. Therefore, there is a different urban regional space pattern from that in western developed countries.

With 30 years' rapid development of city and economy, Shenzhen turns out to be a frontier window of Chinese reform and opening up, which becomes a miracle city. In February, 1979, Baoan County to Shenzhen City, as an export production base combining industry and agriculture; in May 1980, Shenzhen was officially designated as a "special Economic Zone". At that time, the urban population is only 10 thousand, the rural population is 300 thousand, the urban area was only 3 square kilometers; Urbanism level of 1980-1984 rapidly increased from 23.91% to 66.1% years, then entered a stage of stable growth in 1993-2003, increasing from 66.1% to 91.25%. Erxianguan region, which is urban fringe of Shenzhen, has been serving as the important boundary of Shenzhen Special Economic Zone. Erxianguan region not only witnessed the development of the special zone, but also covers the city stratification.

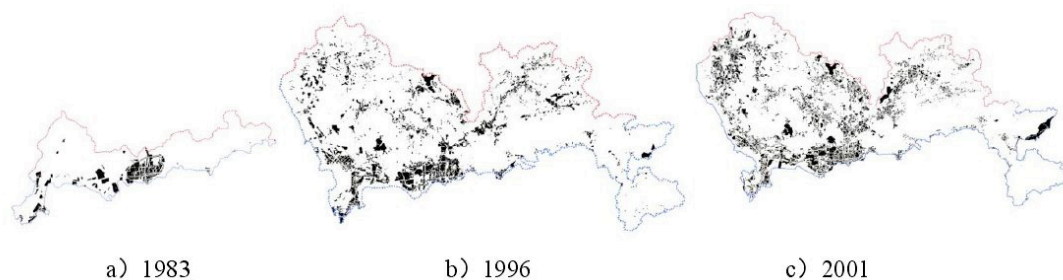


Figure 4: Urbanization of Shenzhen

From the point of spatial structure, there are smaller rural settlements in Erxianguan region, as well as concentrated contiguous urban residential area, which show significant differences in the size. From rural area to the urban core area, the urban fringe settlements are mainly from the agricultural landscape, to the scene of the workers, peasants and mixed view, to the gradient variation of the total urban landscape. Urban fringe area turns out to be of irregular landscape and extreme fragmentation, due to the discontinuous intervention of industry, residence, and commercial land.

From the point of economic structure, there is a gradient variation in urban fringe from agricultural land to the non-agriculture land, which is obvious in the gradient of time and space of urban fringe area. Moreover, non-agricultural employment in urban fringe has a considerable degree of dependence on land rental income and rental income is considered to be influenced by location greatly, so that the locational differences bring the vast difference between the incomes of residents in urban fringe district.

From the point of social structure, the household composition is more complex due to diversity of land use types and the large number of floating population, therefore, mixed urban and agricultural household are largely existed. With the development of the city, registration transformation from agricultural household to non-agricultural household is the main trend. Traditional rural settlements are closely linked mostly due to genetic and geographical links, while the city is showing loose and weak social relations, causing collision between urban and rural life and ideas.

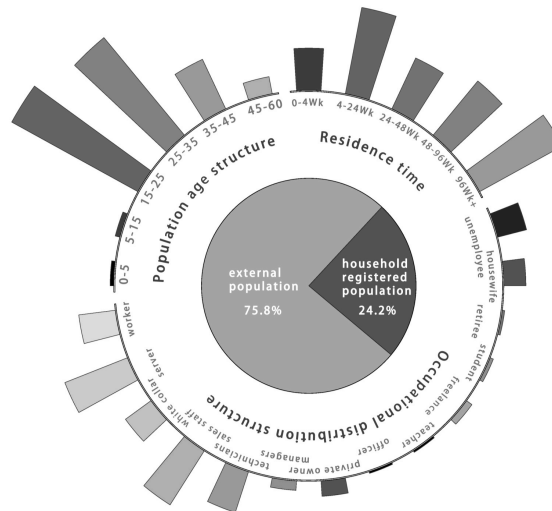


Figure 5: Social structure of Shenzhen

Types of land use in urban fringe

Urban fringe land use morphology can be summed up as two types: closed street block developed from top to bottom, such as the high-grade residential areas, villas, factories, schools, and hospitals; Informal patches developed from bottom to up, such as urban villages, urban outskirts, cultivated land and wild land.

Closed street blocks and informal patches have obvious difference in spatial characteristics and social attributes. In terms of spatial characteristics, closed blocks are state-owned and closer to the city land; Informal patches are self-organized and closer to collective land. While in the dimension of time, since 1970s, due to the transformation of urban and rural spatial structure, the rural collective land property changed into the country land after the national expropriation, transition and relocation, which finally turn into closed street blocks. Some rural collective land has not been completely transformed because of the property rights and history problems, scattered in the city, which turns out to be shaped City enclave like "patches".

Characteristics of land use in urban fringe

The characteristics of land use in urban fringe can be summarized as transitional, mixed and para variable.

(1) the transitional nature of land use

Urban fringe has significant characteristics of gradient change in land use, social attribute, demographic characteristics, economic characteristics, which is reflected in the gradual separation of landscape space, mixed land use type, and plaque distribution of the construction area. In urban fringe of Shenzhen, land use types varies from urban land such as the suburbs Industrial Zone, residential area, urban external communication ports and stations, material distribution center and warehouse district, urban green space, and so on to agricultural land such as vegetable land, cultivated land and garden. There is a clear hierarchy in architectural form in terms of urban landscape.

(2) the mixed nature of land use

The evolution of the urban fringe intensity is much higher than in any other region. In the rapid expansion of cities, urban fringe land ownership changes acceleratedly, often appears with "mutation" in attributes. For example, the original rural residential land, directly converted to real estate, public infrastructure and other types of urban land in a short term.

The driving force of dynamic changes of the urban fringe in Shenzhen is urbanization. In early stage of land conversion, the suburb agriculture transfers mainly from grain crops planting to mainly in fruits and vegetables. With the development of the city and the outward diffusion of industrial city, industrial land increases rapidly and a lot of agricultural land change for the industrial land, forming a certain scale of industrial zone. With industrial diffusion, living land passively migrates to the outskirts of the city, promoting the development of commercial for shift outside.

(3) the para variable nature of land use

With the development of the city, urban fringe in Shenzhen shows an order change. In terms of dynamic spatial evolution, there are two ways: epitaxial expansion and jump diffusion. The two regional diffusions form multi-level outlying areas of the city land space structure, the inner peripheral area near the city is more general, high residential land. Often the middle peripheral area become large industrial enterprises, the establishment of the new economic development zone and the choice of location large institutions, the low efficiency of the farmland to the original this kind of high income form of land conversion: between the inner peripheral area and middle peripheral area in a certain period of time still retains a high yield vegetable, recreational parks and outlying areas: the outer There are large tracts of woodland and nature reserves and suburban parks in the periphery.

Land conversion in urban fringe

The life course of the Land in urban fringe is a process that traditional rural land converts to urban land. Canadian scholar Pond proposed the process model of "rural urban transformation", the model visually show characteristics of structural changes in urban fringe land use. There are several processes in transformation from rural to urban.

First of all, City Industrial Zone takes advantages of low land prices and more convenient transportation benefit in urban fringe district. Residential land and cultivated land is used as part of the leasing industrial land; As a result, agricultural proportion of the city fringe area declines, agricultural planting structure and employment of farmers changes; In addition, the development of the industry brings most of the foreign population, a large number of associated infrastructure needs, and life services immediately rise, leading to the villagers' housing rental ratio increases gradually; Industry increases the proportion of farmers' employment expansion mode, increases the income of farmers. As a result, farmers have the ability of residential construction, coupled with increased demand of house renting, resulting in the whole village space changes; With a further increase of population, the building density increases gradually, the level of land use from the extension of the way gradually

transformed into vertical growth. Thus, high density city village barrier was born, causing the city life space debris; With capital, industry, and further transfer of population, village prices gradually rise, further increases the density situation. Urban villages, which is messy, crowded, dilapidated, and in the high cost of demolition and complex property relations, making the government difficult to reform urban villages; Finally with the development of city and improvement of economy efficiency , the income of village reformation will be higher than the cost of it, so there is possibility of demolition and renovation. In this stage the industrial land begins to pay the higher rents and gives way to business land, villagers' rental income continues to rise, the role of the market economy has gradually transformed collective land into state owned land, the transformation of urban villages comes into implement, and finally the urban village changes into the urban community.

At the beginning of the reform and opening up, the special zone has just started, only in the center there is part of urban land, most of the land is for the agricultural use, with a low proportion of industrial land. In the 1990s, with a rapid urban expansion, a lot of industrial land set up around the boundary and form an industrial enclave. However the living land is in low proportion, so factories and rural residential form detailing contrast, reflecting typically the dual structure in urban and rural.

In 1993s, Baoan and Longgang District were formed, promoting a further expansion of the city. Local areas developed faster with good traffic condition, such as Buji, Longhua, etc. These areas increased the proportion of industrial land use greatly, driving residents shift outside, when the farm land ratio decreased rapidly. For example, in 1996s agricultural land in Buji remained 9.3 square kilometers, accounting for 17%, and industrial land is more than 35% of the total.

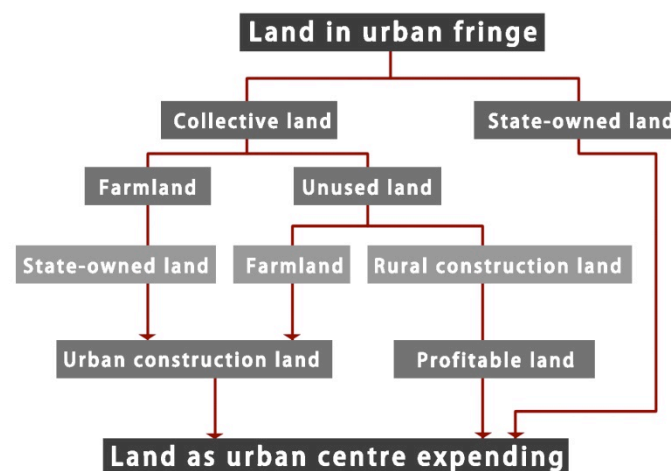


Figure 6: Land conversion in urban fringe

Spatial pattern evolution mechanism of urban fringe

Research on Mechanism of urban fringe area and its influencing factors are widely concerned about social and political factors. Community school claims that urban expansion essence is the reflection of the human social and economic activities in space. Urban spatial structure is the cumulative results in the process of long-term

human space activities and location selection. They think that the market is the driving force of land use change. Political economy school thinks that behavior right force is the driving force of urban land use change.

Urban fringe land use pattern evolution is influenced by the two space process. First is the spatial expansion process in the center of urban, second is the rural spontaneous space transformation process. The two spatial processes can be respectively considered as top-down administrative dominant and bottom-up market leading, respectively, the birth of a group to develop the closed block and self-organized growth of informal patches, covering different mechanisms of land use type.

Market forces acting on the urban fringe land use, the main way is to optimize the allocation of various resources, to play the maximum economic benefits. The process turns out to be rise in the city land price, causing industrial relocation, changing industrial structure. However, bottom-up mechanism brings fragmented, heterogeneous miscellaneous land use for the reason that reactions of each individual to the market forces are not the same.

The role of administrative power in urban fringe area urbanization development, mainly through system reform and macro-control means. The land policy, urban planning, urban development strategy and spatial development related policy making directly affects the urban space expansion. New rural policy, for urban and rural areas of development strategy and other administrative power through macro-control intervened free allocation of resources is to promote the urbanization process of a security and. However, government group often develop a whole block, which is not very friendly to urban public living, for the reason that administrative power is usually too strong.

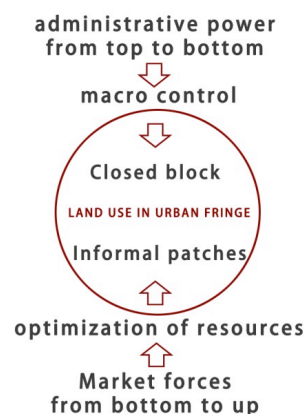


Figure 7: Evolution mechanism of urban fringe

Problems of land use in urban fringe

- (1) The contradiction between urban construction land and non-urban construction land

Urban fringe of Shenzhen is area that growing rapidly outward the city, as well as all kinds of urban land rapidly extending outward, it also contains ecological protection space such as water, cultivated land, garden land, woodland and garden plot.

Strain on the resources of land, arable land, woodland, water area in the city will continue to spread in the process of gradually being eroded. In Shenzhen land resources are scarce, there is no scientific planning and management if only rely on the market economy regulation, and land use is bound to the economic benefits of high land type transformation, bringing many serious consequences. In a short span of five years of 1994-1998, , construction land of Shenzhen Longgang District increased from 108 square kilometers to 132 square kilometers, with the Land Bureau and becoming more and more serious. Moreover, woodland and arable land are eroded by urban construction land and illegal construction, and as a result, agricultural land has been 40% reduced.

(2) ecological deterioration

Urban fringe is a zone where non-agricultural land has risen sharply, reducing the primary production function of ecosystem; the waste of land resources, weakened the ecological function of land system; the severe soil erosion, ecological environment is threatened; aggravated environmental pollution and ecological environment deterioration.

(3) Low quality of living environment

In terms of the nature of land utilization, strength, regional spatial structure and geographical landscape square, there are both urban construction land and non-urban construction land in urban fringe, with a mixed and staggered spatial distribution of land use. Residential and industrial area mixed together, causing the complex pattern “urban villages”.

There are a large number of illegal buildings and an increasing number of low quality housing in urban fringe, which leading to infrastructure overload operation, poor living environment, and the floating population increasing. All of these factors caused urban fringe unsustainable, affecting the coordinated development of the whole city.

(4) Urban construction land structure imbalance

There is a serious lack in urban fringe in Shenzhen of infrastructure and public facilities construction. Present situation is that the construction land is used mainly for industrial warehousing, business administration and public facilities land are considered to be small proportion, single function. Moreover, the infrastructure is backward, can't meet the economic development need. Lack of urban public facilities and public buildings cause inconvenience to urban life, seriously affect the city's further development.



Figure 8: Problems of land use in urban fringe

Strategies for sustainable development of land use in urban fringe

In view of the above problems, four strategies for sustainable development of land use in urban fringe are proposed.

(1) Sustainability of public life

Firstly, urban public space meets the continuous communication between human being, nature and society. In today's densely populated urban land resources, public space is not only a sign of urban development, but also one of the driving force for sustainable urban development. The comprehensive functions in the urban fringe should be focused, including time, space, communication, activities, to restore the pedestrian system, so that people become the master of the city rather than the vehicle.

(2) Sustainability of industry

Secondly, the sustainable development of urban fringe is facing difficulties, mainly in: the land property right is not clear, the land resources use efficiency is low, and the traditional industrial structure is challenged. In order to promote the sustainable development of the urban fringe, the property right of land and house should be clear, industrial structure and its development spaces should be rebuilt, and administrative power and market force should be balanced.

(3) Sustainability of ecology

Thirdly, the original ecological landscape of the urban fringe should be preserved and strengthened, and the urban ecological landscape system should be improved. The traditional agriculture should change into ecological tourism agriculture. Solid waste and domestic sewage should be comprehensively treated, including garbage collection and utilization, waste conversion.

(4) Sustainability of livelihood

And finally, Livelihood sustainability refers to the ability, assets and income activities of individuals or families to make a living for the improvement of their long-term living conditions. The most important core of sustainable livelihoods is justice. Landless farmers have made contributions and sacrifices for the city, only their livelihood can continue, their contribution and sacrifice is to be considered fair treatment.

References

RONG Yuefang, GUO Siwei, ZHANG Yunfeng, J. (2011). A review of researches on urban fringe. *Urban planning forum*, 04, 93-100.

LI Shifeng, D. (2005). *Study on evolution mechanism and development strategies of metropolitan fringe*. China Agricultural University.

CHENG Deli, J. (2008). Research on the scientific development of urban village in china—in perspective of land-losing farmer's sustainable livelihoods. *Urban studies*, 03, 68-79.

GU Fengxia, D. (2011). *An investigation of spatiotemporal evolution regularity of and use patterns of ecological cities*. Shandong University of Science and Technology.

SHEN Ying, D. (2003). *Current situation and transition of living modality of "urban village"—study case of Xi'an*. Xi'an University of Architecture and Technology.

LI MengYiXin, D. (2011). *The study on the country park pattern and the conservation of urban fringe*. Beijing Forestry University.

Contact email: zhongwenzhou@163.com