On the activation strategy of villages and towns from the perspective of catalyst- Take Jingfu Town, Santai County, Mianyang City as an example

Yuanyuan Li1*, Yifei Ge2, Yuwen Tan3, Xinhai Peng4, Qi Huang5
1 Nanhua University, Hengyang, Hunan, 421001, China
*Corresponding author’s e-mail: 2013001261@usc.edu.cn

Abstract. With the continuous development of society, as a transitional level between rural and urban areas in urban system, towns are facing a series of problems such as ignoring ecological environment, unreasonable planning content and lack of public space. In this paper, from the perspective of "urban catalyst", taking Jingfu town of Santai County as the research object, the concept of catalyst is introduced by investigating the existing problems of the site and respecting the local natural and cultural environment. It has a certain reference value for the activation and development of urban and rural towns to integrate and update the site resources, select the appropriate space of catalyst to promote the activation of surrounding areas, and promote the sustainable renewal of small towns through the framework of catalyst space system.

1. Concept of catalyst
Catalyst is another name for "catalyst". Its function is to change the rate of certain chemical processes, so as to achieve the desired results[1]. In 1898, American architects Wayne Otto and don Logan first put forward the concept of "urban catalyst" in the book "American urban architecture: the catalyst of urban design". Since then, the theory has been widely applied and put into practice in western cities. The catalyst theory has experienced the development and evolution from separation to integration, from permanent to temporary, from rigid to elastic, and its application has gradually transplanted to the landscape field from a single architectural level[2]. Urban catalyst can be understood as a new element that can promote urban change and accelerate or change the speed of urban development and construction[3].

In this paper, the definition is applied to the renewal of towns and towns, and new elements with catalytic effect are implanted to activate the surrounding areas to cause a series of positive chain reactions. Catalyst elements are integrated and resonated together to form a positive linkage reaction, which will affect a wider range of areas, promote the gradual and sustainable development of the current towns and stimulate the vitality of the towns[4].

2. Site status
The base is located in Jingfu Town, Santai County, Mianyang City, Sichuan Province. It is the central town in the south of the county. The design plot is about 220 hectares (see Figure 1). The town is located in the transitional area between urban and rural areas. In the past, following the urban growth planning, the site has some problems in the early stage of urban development. In terms of natural landscape, especially the vegetation coverage, it is lower than the rural environment. Through a period
of investigation, the existing problems are summarized: in terms of ecological environment, the littoral shops and residents are disorderly arranged to pollute the river, and the high cost of garbage treatment leads to low frequency of treatment; in planning, the districts are disorderly, most of the space is idle, people and vehicles are congested in streets and lanes, and the residents in the small town lack a real sense of public leisure space (see Figure 2).

The development of small towns in the western region is relatively slow. In the process of small town renewal, more pragmatic practice of township transformation is needed. Combined with their different characteristics and resources, it is emphasized that measures should be taken according to local conditions and township. In terms of design strategy, the best choice is to deal with the site with a small amount of intervention, to avoid the impact of large demolition and construction on the original spatial structure of the town, and to retain the architectural layout and local feelings of the original site to the greatest extent.

3. Introduction of catalyst strategy
In fact, the process of "urban catalyst" is to respect the existing resources of the site and update it gradually and controllable through the catalyst design of public space. After the catalyst effect is produced, the subsequent strategy guidance is carried out[5]. It mainly includes the following aspects: first, the transformation of space nodes, such as the transformation of river revetment, the shaping of river public space, the transformation of building entities, and functional replacement. Make use of the abandoned site of the town.
There are three types of catalysts in this site: point catalyst, line catalyst and surface catalyst. In the selection of vitality factors, we should consider the resources that can produce positive value for the future development of the town, such as historical culture, industrial culture, etc. They are linked into "lines" through rivers and streets, thus driving the ecological activation of "surface".

3.1. Treatment of catalyst point
Determining the node is the first step, and the spatial node is the carrier of activities, bearing the residents' lifestyle and historical context. Its unique shape and functionality are conducive to shaping the space scene and atmosphere of the site. From the perspective of the demand nature of the crowd, the determination of the point is mainly in the square, single building, green space and other spaces. The flow of people distribution square is set in the East, West and northeast corner, which eases the congestion caused by the surrounding villages and towns; The leisure and fitness venues are designed along the river and near the three main green areas. The scattered leisure and fitness venues are integrated and new venues are provided for use. The direction of linear catalyst space form is very clear, and each space is linked by ecological landscape line along the river and street reconstruction line. A linear space composed of several point shaped catalysts. Finally, the large-scale surface space composed of several point catalysts and line catalysts is the surface catalyst, which promotes the lasting and gradual reform of the town structure. (Figure 3) the design focuses on functionality and the needs of the town residents, so that the town can gradually adapt to the open space changes of urban expansion.

3.1.1. Large catalyst point
From the point of action range, it can be divided into two parts: the first is the larger catalyst, that is, the original catalyst point; the second is the potential small catalyst elements in the site. Specifically, according to the selection of small towns suitable for the construction of larger catalyst points, the location conditions and the radius of their influence range are measured. The function selection should complement each other with other catalysts and connect with the functions of surrounding plots. It mainly includes cultural and leisure business district, mountain park, old street comprehensive area and central vegetable market. (see Figure 4) the river in the middle of the town is an important vein of Jingfu, carrying the history and memory of the site, and making full use of the space on both sides of the river to create a public space. To create a dynamic outdoor communication space, the cultural and leisure business district on both sides of the river will become the renewal catalyst to activate the development of central China.
Figure 4. Selection and treatment of catalyst point

The old street is one of the main axes of Jingfu town's development. The 2000 meter long street from east to West connects the old area lacking vitality. Repair or demolish old, old and dangerous buildings to improve traffic conditions and environmental quality. As a folk commercial street in the small town area, it has good accessibility, which will inject new vitality into the old area; in the middle of the East-West trend, between the new area and the old area, the original vegetable market will be replaced, the environment will be updated, and it will become an important catalyst to promote the cultural development of the town.

3.1.2. Smaller catalyst point

The second step is to determine the potential small catalyst points, through the transformation of the old elements or implanted new elements in the town, carry out specific strategies to achieve a larger scale of renewal and a wider range of catalyst effect. Starting from the integration of the old resources, the underground space of the new market, the shop appearance of the main road and the space along the river outside the middle school have the advantages of transformation. Sufficient flow of people can bring high utilization rate, and the renewal cost will be reduced to a certain extent. The main roads on both sides of the road will be integrated with the traffic media on the main roads and roads. In the setting of new elements, more consideration will be given to the intersection of people flow. The New Street on the south side is the main axis of the town's spatial development. Many commercial, leisure, traffic and cultural nodes are set up at the intersection of the new street and the river bank, school, old Street, mountain park and vegetable market, making it the spatial development axis around the node. The selection of catalyst sites should fully consider the development needs of the site and the conditions of the plot itself, which has a strong practical significance.

3.2. Construction of catalyst system

After analyzing the two node elements with different influence radius, it is necessary to deal with the catalyst space system. The catalyst space system is a system of point and line combination, including updating catalyst points and their influence channels. They connect the scattered nodes with the road network and waterfront as clues to connect the building, landscape, space and other elements, so that the site can be organically combined to form a large "surface" shape. It can promote the development of the whole region while improving the regional environment through function updating. In the town ecological activation, spatial resources integration, landscape reconstruction and stimulate the vitality of the town will have a more obvious performance. By means of spatial integration, it effectively expands the influence scope of the catalyst, improves the overall landscape and living environment of...
the town, promotes the catalyst elements to play a more lasting force, and drives the vitality of various
regions in the town.

This is the catalyst space system, which promotes each other and complements each other. The
linkage effect generated will greatly stimulate the continuous renewal of the old city space[6].

4. Conclusion
The positive impact of catalyst on the town is continuous development and gradual impact. A benign
catalyst effect will bring positive promotion and guidance to the town. The project introduces the
urban catalyst theory, uses the form of point line surface combination to update catalyst points and
establish catalyst space system. It provides a new angle of design to solve the problem of town
renewal. On the basis of the original building complex, new landscape nodes are embedded, and the
connection and bonding between clusters are carried out combined with road network. The missing
functions are added, and the public space is increased, so as to activate the interior of the site. In order
to meet the needs of the residents inside the site, it can also attract foreign people, aiming to create a
dynamic town with comprehensive functions and suitable for living and traveling.

In the whole strategy, the feasibility of updating mode is guaranteed to the greatest extent, and the
operability of the scheme becomes stronger. It provides a useful exploration for the application of
catalyst theory in the specific renewal design of small towns, and provides a new idea for changing the
renewal mode of small towns and realizing the sustainable development of town space.

References
[1] Huang Xiao. Development and design of metro station complex based on "urban catalyst"
theory [J]. Railway Survey and design, 2012 (03): 40-43.
[2] Sun Jing. Research on the design strategy of interactive pocket park under the theory of
urban catalyst [D]. Qingdao University of technology, 2018.
[3] Wang Jinwen. Research on the internal mechanism of urban catalyst effect caused by
public art since the 1990s [D]. Central Academy of fine arts, 2018.
[4] Guan Yujun. Research on Renewal Strategy of traditional villages in Beijing suburbs from
the perspective of catalyst effect [D]. Beijing University of architecture, 2018.
[5] Ji Shaozhu. Research on public space design of Beijing fangcaohu complex based on urban
catalyst theory [J]. Journal of Beijing Jianzhu University, 2014,30 (03): 20-25.
[6] Yun Yingxia, Tian Jian. Exploration of multi win win mode of old city renewal under the
guidance of catalyst Theory -- Taking Hengshui old city renewal as an example [J].
Urban development research, 2012,19 (10): 60-66.