

EXPLORATION OF FORMING AN ECOLOGICAL ECO-ENVIRONMENT PROTECTION PLANNING SYSTEM: TAKING THE SUINING CITY AS AN EXAMPLE

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ABSTRACT

In recent years, environmental protection is attached great importance in our country. Beginning with San Ya's pilot in December 2015, our country has spread out a series of works about "Urban dual maintenance" by President Xi with "ecological restoration and urban renovation" as the core. After that in February 2018, "Park City" has been promoted first in Chengdu, a lot of cities followed, which achieved good results in sustainable development.

In the procedure of urban planning and construction, Suining highly emphasized ecological protection and attached attention to various urban disease. Through the construction of "sponge city", which seen as an important means to realize the idea of "Urban dual maintenance" "Park City", and played an important role in urban planning management was completed. Suining has a strong will to form an Ecological Environment Protection Planning System, and it's certain that Suining has finished and achieved several results in the protection of urban ecological environment.

This article focuses on the work of environmental protection in recent years of Suining, especially centering on the planning and construction measures of "Park City". The measures implemented in the planning management, the environmental protection strategy in the planning preparation, and the promotion of the "sponge city" are also summarized. Through the comprehensive evaluation of the environment in Suining, some other small and medium-sized cities on the waterfront like Suining can get experiences in environmental protection. In the long run, to build an Environment Protection Planning System is meaningful for small and medium-sized cities. Summarizing characteristics, analyzing problems, summing up experience, putting forward suggestions, and concluding the core ideas of "Park City", so the means and systems applied to some other small and medium-sized cities in the future can be summarized.

KEYWORDS

Eco-environment protection, Park City, Sponge city, Ecologic infrastructure, Spacial planning

1. INTRODUCTION

1.1. Research Background

Recent years, countries like China highlight ecological protection, and try a lot of practical work to research a series of new theories, new minds, new strategies for ecological protection. In May 15th, 2015, the promulgation and implementation of Opinions of the CPC Central Committee and

the State Council on Accelerating the Ecological Civilization Construction strongly push forward the construction of ecological civilization. At the same year, the Ministry of Housing and Urban-Rural Development issued Guiding Opinions of the General Office of the State Council on Advancing the Construction of Sponge Cities, and pilot construction of “Urban dual maintenance”, “Sponge city” started, which promoted the construction of ecological civilization cities. In February 2018, when Chinese President Xi Jinping inspected Chengdu, he emphasized the need to highlight the characteristics of park cities and take into account the ecological value. The concept of park cities was first proposed.

Suining, as a city lying beside rivers and mountains, started to explore the way of construction in environment protection system from 2015. In order to improve the quality of the ecological environment, it highlighted “park city” as a core idea for urban plan and construction, and focused on construction of sponge city. The Bureau of Natural Resources strongly incorporated the concept of “park city” into the planning and construction of Suining City, and took the task of building a strong green economy city in the Chengdu-Chongqing economic circle as a big deal. Besides, combining with local condition, Suining actively explore the practical path of “park city”, promote “Multiple plan integration” and implement ecological environmental protection to actively demonstrate the idea of sustainable development. After so many measures, Suining has made great achievements in ecological environment protection, and has initially formed a planning system with the “city of ecological gardens” as its core, which has been implemented in the construction process, and has also formed rich construction results. The system results of this planning and construction are of great significance to a considerable number of cities in the construction process of sustainable development and ecological development in the future. Therefore, the details of Suining's ecological protection plan will be summarized in detail.

1.2. Research Significance

Recent year, sustainable development ways for our world is a subject under discussion, these questions -global warming, congestion, air quality, climate change- we have to face. In report of the World Bank in August 2013, considering about the risk of sea level rise and land sinking, global flood will result in an average annual loss of \$52 billion in 2050. And in the report of WHO in 2014, New Delhi in India is the city with the worst air quality, whose PM 2.5 is 575 micrograms per cubic meter Patna in India is second. Zabor, Iran is the worst and the second and third places are Assam and Allahabad in India in the report of 2016. Urban agglomeration, infrastructure problems, water shortage etc. are critical questions the modern cities which have to face with. Due to water resource problems caused by weather, power rationing in some cities in China cause many inconveniences in 2022. In 2013, a research from Columbia University Water Resources Center post in The Huffington Post said that more than one third of Africans have no access to safe drinking water, and it forecast that only we make some changes, the land suffering from drought by 2050 will be five times more than today.

China is promoting the revolutionary green transformation. In 2014, China has strengthen the Environmental Protection Law. The R&D and construction of smart grid, wind power generation and electric vehicles are in full swing. With the establishment of the Ministry of Natural Resources in China, the progress of territorial and spatial planning is carried out step by step. Eco-environment protection is the main work for the new round spacial planning, and we should make deeply research in this area. As an attribute of the basic unit of planning, planning for Eco-environment protection has become a priority to be explored and implemented in spatial planning at all levels. Suining, a city full of water and beautiful sights, is very a typical city in China and even in the world.

Planning and land use, the basic work for Eco-environment protection, play a necessary role. Therefore, it has good practical significance for the completion and summary of the basic work, and can sort out excellent points, good measures and valuable experience for promoting the protection of the ecological environment. This research analysis the plannings and manage measures for Eco-environment protection in recent years. Mainly summarizing the basic requirement for the Eco-environment Protection Planning System and what the specific measures Suining using in this area. Besides, we also summarize the deficiencies. By this research, we can clearly see what and how much Suining had done in past years. We can see it as an practical experience for other cities in China or in the world, and we can take it as an example to make full use of its advantages and make up for some deficiencies.

1.3. Basic Overview of Suining

Suining is located in the east of Sichuan province, covering an area of 5,325 square kilometers. It is about 150 kilometers away from both Chengdu and Chongqing, taking about one hours by High- speed rail, which is an important node city and secondary comprehensive transportation hub between Chengdu and Chongqing. The Fu Jiang River runs across the city, and two mountains are on the left and right sides of the city, which brings beautiful scenery and forms two core scenic spots. Suining is a hilly low mountain area in the middle of the Sichuan Basin, rich in rivers, creatures. Suining is actively building a strong green economy city, and try its best to form an Eco- environmental protection system.

Suining City has a beautiful natural environment, and it's a city with beautiful scenery surrounded by mountains and rivers. The Sichuan Provincial Government has added Suining into the Chengdu Economic Circle and clearly supported to construct Suining to build as a strong green economy city on the main economic axis of Chengdu-Chongqing.

2. THE REQUIREMENT OF BUILDING A GOOD ENVIRONMENTAL PROTECTION SYSTEM

2.1. Eco-Environmental Protection Planning should be Promoted Systematically and Globally

Nowadays, China has become the worlds second largest economy. The urbanization rate has exceeded up to 65%. It is an inevitable choice for cities to do a good job in ecological civilization construction and take the road to sustainable development. Urban territory managers should attach more importance to the management of ecological environmental protection and systematically promote the planning of ecological environment.

Each city has its own environment, but a sustainable urban ecological environment should be rich in natural resources such as green plants, animals, wetland, and water systems. All of these ecological environment spaces are involved by the whole city and should have a large area, interspersed in urban space or independently located in the suburbs of the city. To create good ecological environment space needs to make a whole systematical work plan and form a good system - an Eco-environmental space protection planning system - to maintain the sustainable development of the city. So, cities must promote the construction of an Eco-environmental space planning system, build a spatial pattern of ecological environment based on the entire planning area of the city, formulate a good work plan, and focus on space planning.

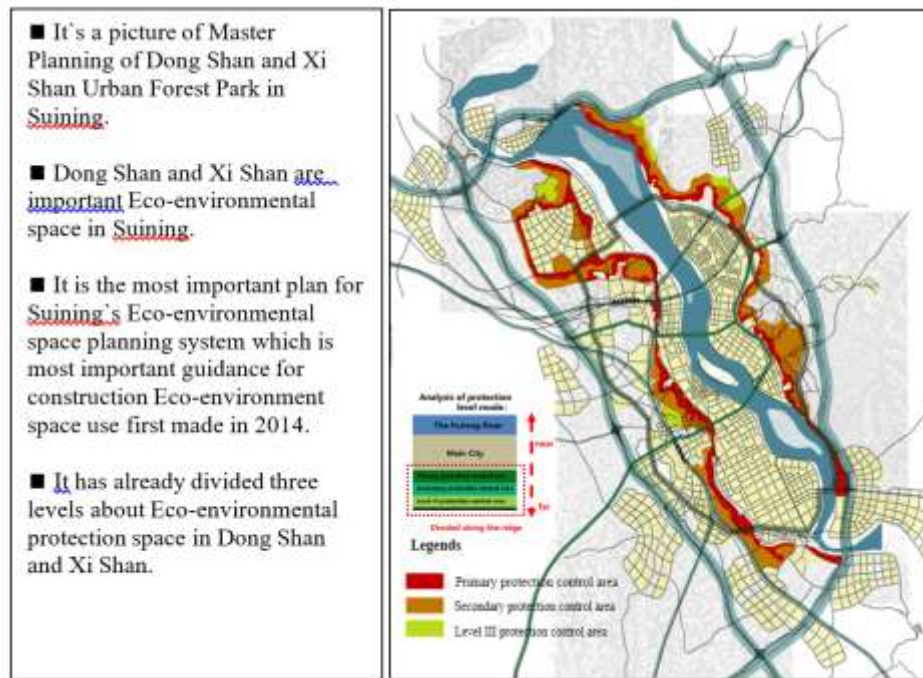


Figure 1. The Eco-environmental protection space of Suining, Source: Master Plan of Dong Shan and Xi Shan Urban Forest Park in Suining(2013)

2.2. To Promote Eco-Environmental Protection by Refining the Eco-Infrastructure

To form an ecological environmental protection planning needs the support of ecological infrastructure. It is necessary to fulfill the urban planning about ecological infrastructure for ecological environmental protection and sustainable development. So, the special planning of water supply and drainage, integrated pipe corridors, integrated pipelines and other infrastructure play a significant role in the city's ecological infrastructure construction. The technology of sponge city construction involves sponge ditch, seepage bricks, rain gardens, and sunken green spaces in the which is good conditions for the Eco-environment construction. So special planning for a sponge city construction is needed as well. All these planning forms a good Eco-infrastructure planning system. An Eco-environmental space protection planning system and an Eco-infrastructure planning system can work out a good city environment and become an Eco-environmental protection planning system.

Besides, the core idea of “park city”, highlights the ecological value of green water and green mountains, need to restore the mountain, improve the infrastructure, and control water pollution, which is good for protecting the environment. Only by making good planning of the ecological infrastructure and implementing the detailed requirements of the “park city” to make it as a guidance can consolidate the basic work of the Eco-environmental protection planning system.

2.3. Eco-Environmental Protection must Start from the “Spatial Planning”

The construction of Eco-environmental space protection planning system is overall work. Senior planning is not enough because of different standards for land use classification in planning from different departments in the past. The construction of the Eco-environmental protection planning system should be implemented in the space, and the specific implementation can play necessary role of ecological environment management.

The work of "Spatial Planning", which stands at the top of all planning, is solution for dealing with different planning implementing. The Ministry of Natural Resources of the People's Republic of China set up in March, 2018. Then, the planning department in different cities merged with the national land department step by step, becoming the natural resources management department ,The Bureau of Natural Resources. At the same time, the "Spatial Planning" work is accelerated promoted. These actions break the administrative constraints, aim at space optimization and control, and strive to unify the major spatial planning.

"Spatial Planning", whose tasks including completing the space planning, limiting the abuse of land space, and transforming incremental planning into inventory planning, is an important means of Eco-environmental construction. Starting from the top level, it will be gradually spread out to make a "Spatial Planning" plan. From using the top-level planning- a "Spatial Planning" plan - to control to make specific detailed planning to construction, that will generate a series of projects to promote the implementation of Eco-environmental utilization and protection, step by step, advance conditionally and steadily, which is the only way to achieve ecological environmental protection.

2.4. The Establishment of an Eco-Environmental Space Protection Planning System should be a Continuous Dynamic and in-depth Study

The city is a complex giant system, whose development contains a lot of uncertainty and uncontrollability. The urban Eco-environmental protection work is affected by these uncertain and uncontrolled factors as well. Such factors as changeable natural environment, various economical condition, residents` awareness of environmental protection etc. can influence the work. Besides, the progress of urbanization also plays an important role in urban ecological environmental protection.

Therefore, the environment is changing, and the ecological environmental protection work should be always linked with the dynamic development of the city. And with the improvement of living standards and the further requirements of sustainable development, the core idea of environmental protection planning should go higher and deeper. It is necessary to constantly update the environmental protection requirements. After the construction of "park city" and the "sponge city", more concepts and methods should be applied, more in-depth research on forming Eco-environment space protection system should be done. Refining control indicators and measures, integrating environmental protection into green space, infrastructure, and other content, will continue to promote the establishment of an Eco-environmental space protection planning system.

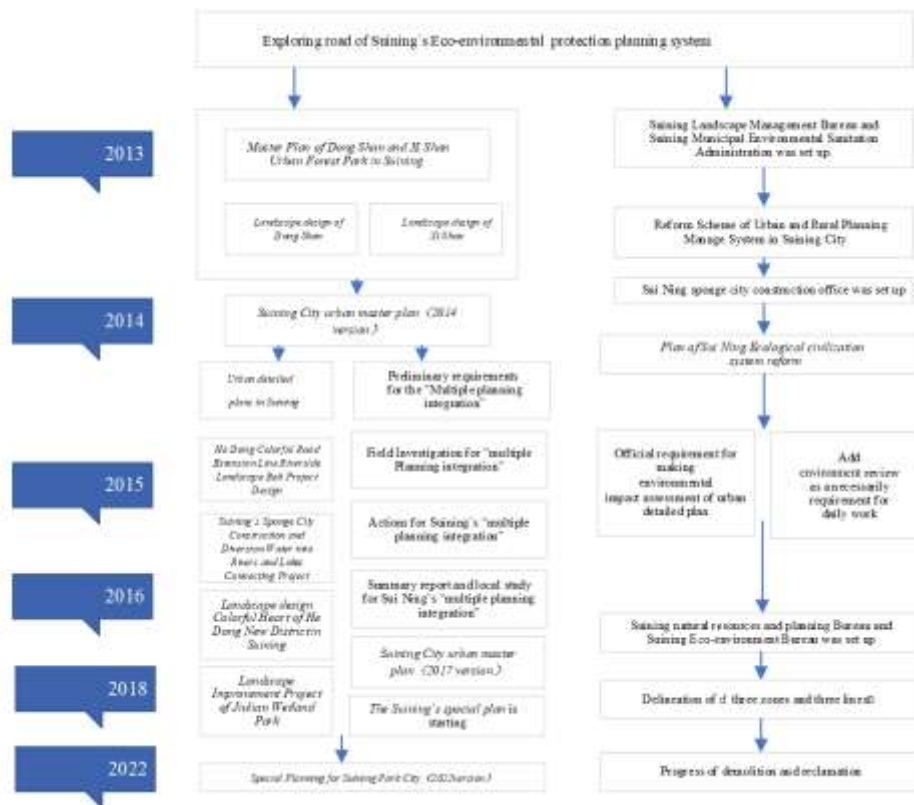


Figure 2. The Exploring road of Suining`s Eco-environmental space protection planning from 2013 to 2022
Source: authors

2.5. Eco-Environmental Protection must be Controlled by Both Governmental Manageable Mechanism and Civilian Supervision

The construction of an Eco-environmental protection planning system relies on good regulation and rules to supervise and implement. To establish a conduction mechanism responsibility of city managers, but not just for them. As participants in urban space activities, residents, developers, and spatial planning organizations should fully understand their role in ecological environment protection. The city`s managers should strengthen its propaganda methods by making full use of radios, televisions, mobile media and other forms in public and education to enhance the public's awareness of ecological environment construction protection, make full use of other citizen`s abilities to advance strengthen Eco-environmental protection work. To encourage the whole people participate to utilize various ecological environmental protection measures, and the citizens also clearly know the importance of protecting the environment, take the initiative to take the responsibility of protecting the environment, then a good mechanism can be formed.

3. PROBLEMS OF EXPLORING WAYS IN ENVIRONMENTAL PROTECTION SYSTEM

The National Opinions of the CPC Central Committee and the State Council on Accelerating the Ecological Civilization Construction have been promulgated for three years, and systematically proposed tasks for the protection of natural Eco-environmental resources. Many cities have formulated corresponding planning tasks according to its requirements and carried out detailed

actions. However, because of involving a large number of departments and a lot of specific heavy tasks, and the methods are still explored, there are still many problems.

3.1. “Spatial planning” Integration is Still not Perfect

Although tasks such as Eco-environmental planning protection and administrative reform centered on “Spatial Planning” have already been promoted, with the establishment of the Ministry of Natural Resources of the People’s Republic of China, the inter-departmental administrative constraints have been reduced, the task of converting space coordinates is still difficult to achieve and the constraints between the natural resources department and other departments still exist. Many factors such as complicated administrative functions, large financial support, technical barriers, and the epidemic situation of COVID-19 etc. affect the progress of “Spatial Planning”. To complete the work of “Spatial Planning” in cities and countryside still need in-depth actions.

3.2. Unbalanced Coverage of Ecological Infrastructure

The different construction conditions of ecological infrastructure between new district and old district in a city is obvious. Due to the large number of people contained in the old urban district and many interests involved, it is difficult to construct and an implement ecological infrastructure plan. Besides, the established space is small to reconstruction, and the per capital infrastructure resources are insufficient. Relative to the new urban district, due to the new wide space and less interest involved, there are already complete plans before the construction, the infrastructure construction is complete, and the transformation of the infrastructure is easy to advance, but the population of the new urban area is not dense, so the infrastructure is not fully used.

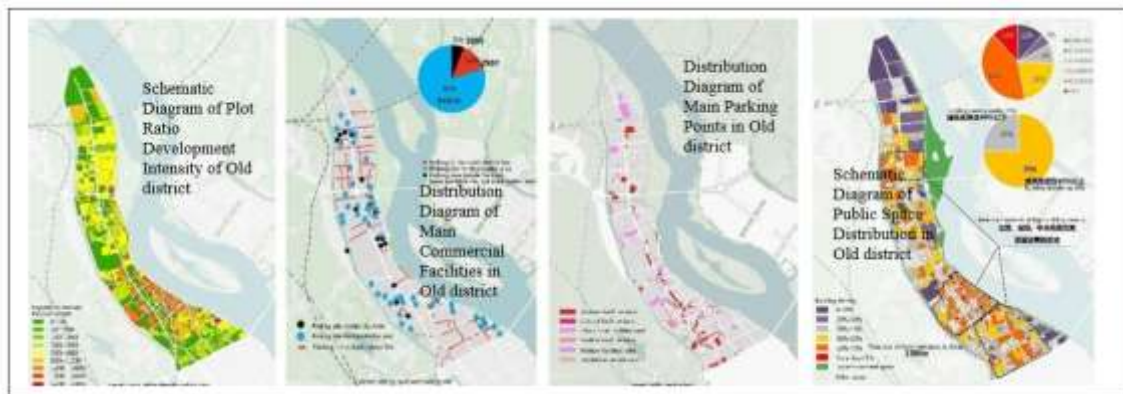


Figure 3. The current conditions for Suining’s old district Source: Detailed planning for Suining’s old district(2018)

3.3. Smart Technology Means Still Need to be Improved

The platform construction of spacial planning and governmental management has not been finished yet. Smart technology, which should be used to protection of urban environment, is not so simple as people think to apply practically. Lacking of unified coordinates or and standardized vectorization image files of relevant planning become the basis difficulties for fulfilling the definition of ecological environmental protection space. The information sharing among administrative units, the citizens, and the planning-design institutes are not perfect. It is a big difficulty to maintain the relationship between confidentiality of information and exchange of information. The technical means need to be more concise and convenient so that the leaders of

all ages and levels can make full use of. In addition to the above basic work handling difficulties, there are still some difficulties, like the requirement of CIM, which is also a big deal because the BIM and the LOT is not complete yet. The CIM system needs the foundation of the the BIM and LOT, which is still on air in most cities like Suining.

4. SUINING'S PRACTICAL EXPERIENCE

4.1. Basic Information of Suining's Eco-Environment

There are many rivers in Suining city's central urban area, and the water resources are mainly from the Fu Jiang River, running through the entire city. Within the central urban area, the Fu Jiang River, the Qu He River and the Lian Meng He River run through the city. The pattern of "one Jiang and two He" constitutes an important water Eco-system of the city, therefore Suining is known as the "Western Water Capital". The wetland park beside the Fu Jiang River has built a green coastline, whose length is more than 70 kilometers, for Suining's central city. It is an important area for citizens' leisure and entertainment activities. The Qu He River and the Lian Meng He River are also important ecological water resources of the city, and ecological greenways are built around the rivers for the leisure movement of the citizens. From the perspective of vegetation coverage, the east-west mountains are the main bearing body of plants, and plants are mainly divided into two types of vegetation cover, mountain and farmland, with the mountain area of 90.8km², About 32% of the total area; Farmland area 86.1km², About 30.4% of the total area. The vegetation species are mainly conifers, including hemlock, cypress, larch, etc; Other tree species include camphor, phoebe, sassafras eucalyptus and other evergreen broad-leaved trees, oak, elm, beech and other hard broad-leaved trees; Birch, poplar, willow, linden, alder, paulownia and other soft-leaved trees; And other tree species such as bamboo shrubs. Fujiang and Dongxishan are the most important ecosystems in the central city, which should be utilized on the basis of implementing the protection requirements. The eastern and western mountains are important urban forest-covered areas, which can be linked to the main built-up areas of the city to build chronic trails and bicycle lanes, and provide entertainment and leisure services for citizens.

In recent years, Suining has vigorously promoted the construction of urban green spaces, and won many national-level Eco-environment construction awards. The total area of green land and square land in the downtown of Suining is 236.3 hectares, and the per capita green space and square land are 3.65 square meters, accounting for 3.93% of the current urban construction land. In fact, although some ecological wetland parks and mountain country parks have not been included in the park green space, they have played the role of park green space. With high landscape quality and complete infrastructure, to integrate these kinds of green areas adjacent to urban built-up areas into urban park green space accounting, the per capita park green area has reached 10 square meters. The main urban green space of Suining includes: the Wo Long Mountain Park, the Ling Quan Mountain Country Park, which is based on the two provincial-level scenic spots of "Guang De" and "Ling Quan", and the Bin Jiang Park beside Fu Jiang River, the Colorful Road Wetland Park and the Qu He Park. There are 18 small parks such as the Chuan Shan Park, the Jin Hua Garden, and etc.



Figure. 4 The current river conditions in Suining Source: Suining City master plan(2013version)

4.2. Specific Measures for Eco-Environment Protection

In order to implement the requirements of urban Eco-environmental space construction, strengthen natural environmental protection, cities` government should take full use the master planning chiefly, control the land use by detailed planning and designs, and constantly refine or transform the governmental functions. It is necessary to design a better Eco-environment protection system to guide the construction actions and specific implementation.

Suining takes comprehensive deployment of “Park City”, and controls directions of city development by master planning, master design for central city. It sorts out the green space system structure, highlights the key points of urban ecological space, and proposes landscape construction and environmental protection requirements to overall conduction of the Eco-environment protection construction. It tried hard to complete the detailed planning of important Eco-environment infrastructure of the city, refine the detailed planning of the important ecological space in city, and propose specific implementation plans for the protection and utilization of Eco-environment. Also, it tries its best to establish a legislative protection and management system for the space environment, sets up a mechanism to supervise environmental

protection construction, and uses specific actions and missions to effectively promote urban construction and implement the content of ecological civilization construction.

4.2.1. Enhancing Guidance, Integrating Deployment

Suining actively promotes spatial planning and related work. In order to rationally arrange urban and rural space, effectively allocate land resources, and achieve the goal of forming a complete urban and rural spatial planning system and making an Eco-environment protection system. Before spacial planning, Suining vigorously promotes the “multiple planning integration” process in 2014 and started its own Suining’s “multiple planning integration” plan in 2018 to promote the data arrangement, coordinate transformation and image vectorization of important departments planning, besides, special reports for population size, industry, infrastructure, and ecological environment were demanded, and the lines for urban limited constructed districts were required to delineate. It is the basic work to form a powerful Eco-environmental system. In February 2019, By the emergence of Suining Municipal Bureau of Natural Resources and Planning, which is the combination of the urban planning department and national space department like other cities in China, further broke the administrative constraints. In September 2019, Suining has done a lot of work for image vectorization, learn and promote the work electronic application for 3D model construction. Several works had started, such as mine geological environment Protection, geological disaster resource investigation, cultivated land ecological restoration, which benefited from departmental consolidation. Although COVID-19 has influenced a lot of daily work of Eco-environment protection, Suining also realized more connection between different department. In 2020, by deepening the reform of “release, management and service”, and promoting the reform of “integration of multiple tests” in engineering construction projects. Only two approval materials are submitted, including the application form and the “integration of multiple tests” mapping results report. The time limit for handling the commitment is from 20 working days to 5 working days. In September 2022, by the help of Municipal Bureau of Surveying and Mapping, 55 villages (communities) in the city have their own “self-portrait”. The scope of the village, the main roads, the distribution of residential, the mountain water system, the distribution of characteristic industrial projects, the location of tourist attractions and other information are included.

4.2.2. Full Coverage of Ecological Planning for Whole Region, Highlighting Key Points

First, making full use the Suining City master plan to guide the construction of the whole region and strengthen the control of the ecological space. Early in 2014, based on the master plan, Suining pays attention to the protection and utilization of the ecological environment, defines the spaces of the planning area, highlight the importance of the landscape environment to keep the environment of the Fu Jiang River, the Dong Shan Mountain, and the Xi Shan Mountain. So, the master planning has designed a green space system of “one lake, two mountains, three corridors, five wedges and multiple points” and a landscape system of “Green come up with the Fu Jiang River, Seven Stars shiny, Sleeping mountains show green, Curved river Around the City”. “One lake” means the Guanyin Lake, which is the part of the Fu Jiang River that flows though the central city. The green park, wetland park around the river and the four ecological islands in the river are also included. “Two Mountains”, that are the eastern and western parts of the central city, which run through the two mountains -the Dong Shan Mountain and Xi Shan Mountain- in the north and south. These two mountains are the natural green barriers of the overall landscape pattern of the central city, which can be used to meet the needs of leisure tourism in the suburbs of cities. “Three corridors”, that is relying on the three rivers of the Lian Meng He River, the Qu He River and the Qiong Jiang River, to create a waterfront belt green corridor to form a natural waterfront coastline and belt public space. “One lake, two mountains and three corridors” lively draws a picture for the most important part of environmental construction, and becomes the

strong cornerstone of green space construction and environmental utilization. “five wedges” refers to five green spaces shuttle through the main city. “multiple points” means multiple street parks, pocket parks and landscape nodes in city.

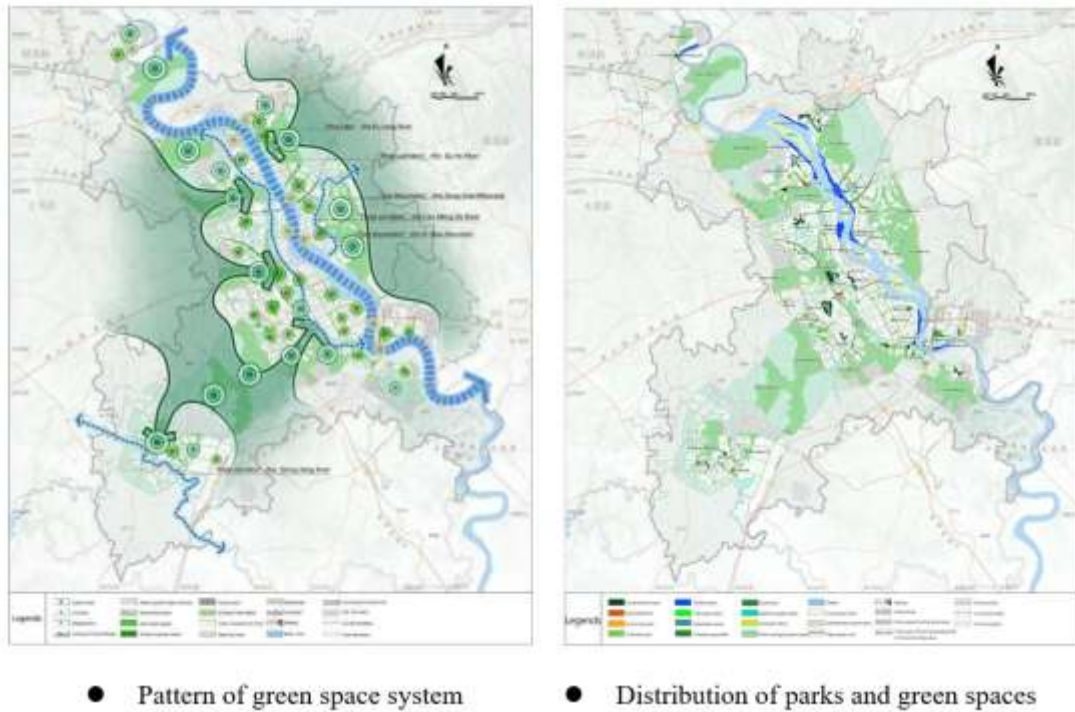


Figure. 5 The landscape system in Suining , Source: Suining City master plan(2017 version), modified by authors

The second is to fully spread the work of sponge city construction. To achieve the requirement of ecological restoration, by the construction of sponge city and refining the ecological functions and repairing ecological space with the construction of sponge city infrastructure. Relying on the pilot construction of the sponge city beginning in 2015, Suining prepares a Suining city sponge city plan, covering the whole urban area, has been completed efficiently. The plan has become an important means for ecological infrastructure construction and ecological environment restoration. The way to construction of ecological infrastructure, such as permeable asphalt, is including in the plan. Based on the division of different district of the central city, the construction recommendations and statutory plans for the sponge city are proposed for these districts of the central city, and the legalization procedure for the sponge city planning has been done. It is highlighted that in the progress of pilot city construction, the core concept of sponge city should be applied to the whole area of the city.

		
<p>Permeable asphalt</p> <ul style="list-style-type: none"> ● Thermal island effect relief: low ● Initial cost: high ● Maintenance: Vacuum cleaner cleaning ● Life length: 10-30 years 	<p>Permeable concrete</p> <ul style="list-style-type: none"> ● Thermal island effect relief: Low to medium (depend on colour) ● Initial cost: High ● Maintenance: Vacuum cleaner cleaning ● Life length: 10-30 years 	<p>Splice permeable brick</p> <ul style="list-style-type: none"> ● Thermal island effect relief: Low to medium (depend on colour) ● Initial cost: High ● Maintenance: Vacuum cleaner cleaning ● Life length: 10-50 years
		
<p>Special permeable materials</p> <ul style="list-style-type: none"> ● Thermal island effect relief : Medium ● Initial cost: Medium ● Maintenance: Vacuum cleaner cleaning ● Life length: 10-50 years 	<p>Gravel pavement</p> <ul style="list-style-type: none"> ● Thermal island effect relief: Medium to high (depend on colour) ● Initial cost: Medium to high ● Maintenance: Add gravel ● Life length: 10-20 years 	<p>Named grass brick</p> <ul style="list-style-type: none"> ● Thermal island effect relief: High ● Initial cost: High ● Maintenance: Add gravel ● Life length: 20-40 years

Figure. 6 The landscape system in Suining Source: Suining Sponge City Plan(2015), modified by authors

The research scope of the Suining city sponge city plan for the construction of Suining sponge city should divide into four levels. The first level was from the perspective of “big sponge” to the rivers and lakes, the pits and ponds of 5325 square kilometers in the administrative region of city, whose purpose is to comprehensively apply the sponge city construction concept and requirements into all levels of planning. The second level is the scope of the urban planning area of 1317 square kilometers determined by the master plan of Suining, which optimized the delineation of the blue line (line to limit construction near the waters), proposed three-level control of the water system, identified ecologically sensitive areas and develop a full river basin management plan for the river. The third level focused on the analysis of 160 square kilometers of urban construction land. All proposed construction requirements for low-impact development, achieving source reduction. The fourth level highlighted the planned construction of the sponge city during the pilot period of 25.8 square kilometers, equivalent to the recent construction of sponge cities, which provided project support for the pilot implementation of the sponge city. Completing setting the construction goals of the sponge city fulfilling the formulation of the project list, and decomposing the specific sponge city indicators. Suining also combines the Suining city sponge city plan with the green space, water system, road, vertical, municipal and other special projects in the statutory planning, and make a good coordination. Besides, the six functions of storage, seepage, stagnation, net, use and discharge of sponge city promote the

utilization of environmental resources, water resources protection and climate regulation while improving the infrastructure. Residents have realized the planning and construction of sponge city, which become an important cornerstone for the implementation of the “urban dual maintenance”, are important methods and important part of the ecological environment protection and restoration of the central city. In 2016, after finishing this plan, Suining started a lot of urban road reconstruction projects and several park reconstruction projects, achieving the plan’s requirement. By the end of 2019, almost all of the main roads had finished the reconstruction. 2023 has started, sponge city construction is also a necessary role played in the planning system. The third is to promote the urban design of the whole area. In 2018, the work of “Urban design pilot” taking urban design as an important means to guide urban space utilization, especially for three-dimensional space. Suining will fully promote urban design work, and do a good job in coordinating ecological environment space. Suining starts the urban design of the whole city within the scope bases on the master planning, and controls the urban style with the “master city-style planner system” by hiring senior engineer to guide the urban space construction. Implementing the “Urban design pilot” in three-dimensional space by the design, to consider the skyline, the skin texture, the culture, significantly the spirit of Suining, will make a better urban landscapes. In the early 2023, after several round work, an official document called “General Urban Design of Suining” has carried out, which is an overall urban design of Suining downtown. It delineated the characteristic style and feature zoning of mountains and rivers, built an orderly three-dimensional shape order with high and low levels, and focused on creating the characteristic style and feature of “Western Water Capital” around the urban area around the lake.

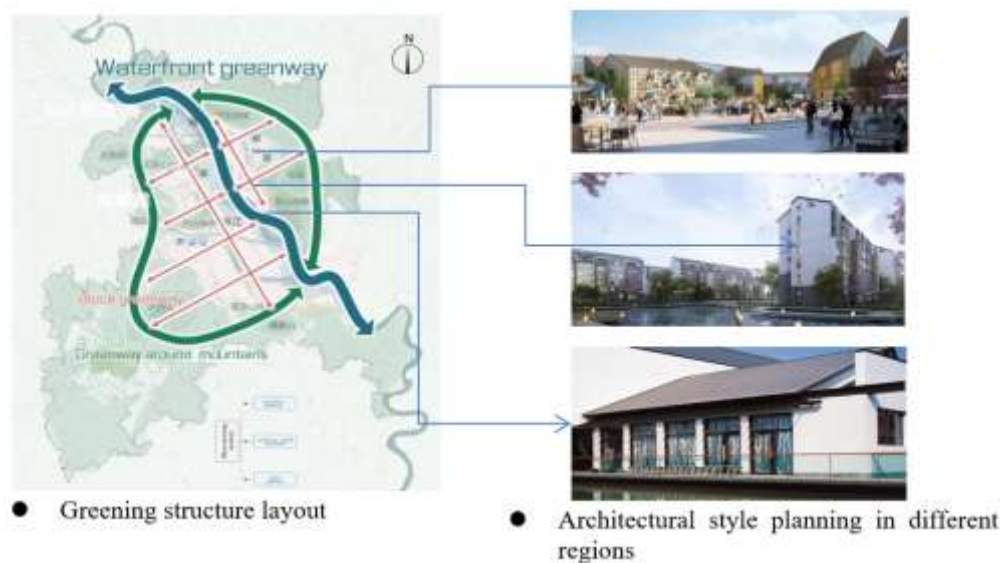


Figure. 7 The landscape system in Suining Source: General Urban Design of Suining(2022)

4.2.3. Specific Tasks, Depth Conduction

According to the Suining City master plan, the Suining city sponge city plan, other construction guidelines for Eco-infrastructure planning system. Suining realized its Eco-infrastructure system gradually by making the specific planning related to ecological environment protection in urban planning area. By the end of 2017, It has completed the special plan for more than 10 important special plans of urban ecological infrastructures such as Green Line (line to limit construction near the green space) Planning for Urban Areas in Suining Central City, Blue Line Planning for Urban Areas in Suining Central City and Planning for Underground Integrated Pipelines in Area of Suining Central City. Through systematic in-depth planning and construction of ecological

infrastructure, Suining have completed the construction of a series of ecological infrastructure construction. It had completed project like Project of Suining Sponge City Construction by Connecting the Guanyin River and Dong Hu Lake, Design of Zhenjiang Temple District by urban duel maintenance and Sponge City construction Comprehensive Reconstruction, and accelerated projects like Transformation of Ling Yun Road by Sponge City Construction in He Dong New District, Suining City and others, totally the number of them more than 20. Besides, the number of urban reconstruction plan is more than 30 by the end of 2018. These projects promoted the planning and design of the sponge city construction in the old area, the new city center and the urban park. Suining has turned the overall conduction into the specific district construction guidelines, which do well in both the old-city refinement and environmental protection. On December 30th, 2022, the municipal government organized and studied the land reclamation of 121 abandoned well pads in Suining, natural resources departments at the municipal and county levels participated in the study, which started a new work for Eco-environmental protection.

Early in 2013, Suining also completed the Five two overall planning and the Guan Yin Lake landscape concept planning, The architectural design and landscape design plan of the core area of the Lotus Garden Expo Park in Suining City, Controlled detailed planning and construction of major building communities of Sheng Ping Island, He Dong Colorful Road Extension Line Riverside Landscape Belt Project Design and etc.. The number of landscape designs like these is more than 15 by the end of 2018. These are landscape designs formed important part of the Eco-environmental space protection planning system, which have realized the ecological green space utilization of “One Lake, Two Hills, Three Corridors” and other important urban landscape nodes. Positioning, space utilization, protection requirements, key control elements, and specific construction content of Suining’s central city are concluded. By finishing the plans and designs of the ecological landscape, the protection and utilization of the Eco-environmental space was improved. Moreover, these projects scientifically related to the sponge city plan’s content, which played a good role in the actual construction. By 2022, the basic construction of riverside green space in He Dong New Area has been completed, which continues the connotation and control requirements of the planning and forms a unique green space system.

4.2.4. Clear Responsibilities, Strong Supervision

First of all, clarifying job responsibilities in Eco-environmental protection planning system. According to the early documents spirit and requirements like the Sichuan Province Environmental Protection Work Responsibilities Division Plan, the Suining City Environmental Protection Work Responsibility Division Plan and the Implementation Plan of Three Major Campaigns for Environmental Pollution Prevention in Suining City, all major departments actively implement their duties of environmental protection work. In 2015, the Planning department integrates environmental protection into the strategies for urban development, rationally arrange the infrastructure like plan urban sewage treatment, garbage collection, transit transportation treatment and other facilities, and strengthen plans and reviews of ecological facilities. Strictly implementing the relevant provisions of the examination and approval, incorporating the relevant requirements into the examination and approval of planning or construction projects, and issuing license for site selection, land use and construction-that are the “Planning and Siting Opinions”, “Planning permit of construction land”, and “Planning permit of construction engineering”- only to make the construction project meet environmental requirements.

In the site selection of the project, the environmental protection requirements shall be included in the necessary conditions for review. In the project approval, the environmental protection requirements shall be strictly implemented, and the space for green belts must be reserved. In 2018, The planning department also assist other departments like the agriculture, environmental

protection to establish a unified database of soil environmental basics including the implementation of construction land pollution risk prevention actions, soil pollution control and restoration operations. Besides, in order to implement the duties of their work, a special party group meeting on environmental protection work was held in the department, and a leading group for environmental protection grid management was established. The Environmental Protection Work Implementation Plan was researched and formulated, and the tasks were decomposed into various departments and sub-bureaus, which strictly enforce responsibilities.

Secondly, arranging the management of special organizations. Suining has its own subordinate organs for the Eco-environmental protection in Suining City Housing and Urban-Rural Construction Bureau, such as Suining City Landscape Administration, Suining City Environmental Sanitation Administration and other ecological environment protection and management organs, which are fully responsible for the planning, construction and program review of urban ecological greening, as well as urban environmental sanitation protection, garbage disposal, road cleaning and other issues. In May 2015, Suining City Urban Style Planning Management Center was set up to optimize the urban style and features, review the style and features of building schemes, and review the style and features of construction projects. In order to promote the process of sponge city construction and Eco-civilization city construction, Suining sponge city construction office was set up in 2015, which hired sponge city construction experts and senior engineers major in sponge city planning. They particularly managed sponge city construction affairs, studied rational methods of sponge city construction, examined the construction project plan of sponge city construction, and comprehensively managed other facilities about sponge city of Suining. The task of construction has become a strong pusher for the implementation of sponge city planning, and actively promotes the sponge planning of “one city, two districts and five groups” in the central urban area.

The third is to enhance legislative control. Managers of relevant departments should improve their learning skills, ensure that the idea of environmental protection requirements can be realized in place, and promote to take the environmental protection laws and regulations such as the “Environmental Protection Law”, and the “Division of Work for Environmental Protection in Sichuan Province” as must-learn content, which will be a good benefit to improve the city managers’ environmental protection mind. In order to strengthen the control of environmental protection using the legal and regulatory in aspects of the green space and water system in the city, the “Management Measures for Urban Green Lines in Suining City” and “Management Measures for Urban Blue Lines in Suining City” were passed in 2018, which combined the content of the “Urban green line plan of Suining Central City” and the “Urban blue line plan of Suining Central City”. They make more than 20 items of regulation on the urban Eco-environment space protection, and the two measures will be transferred to water conservancy, landscaping departments, which will carry out the next stage of planting pile solidification work, promote the supervision of the whole people, and become the perfect integration of system management and construction management. In 2021, “Measures of Suining Municipality on the Administration of Urban Style and Features” was promulgated, natural resources and Eco-environmental protection as one of elements for urban style are mentioned, reflecting the requirements of ecological civilization and historical and cultural heritage, and effectively protect the city's ecological pattern and historical buildings.

The fourth is to strengthen the planning environmental assessment. Suining attaches great importance to the preparation of important contents for urban and rural planning, and implement the environment protection requirements by environmental impact assessment. It highlights the special review of plans about urban construction, green space, landscape system, environmental protection, and sponge city, strictly implements the environmental protection goals and content of the Suining City master plan and the Suining city sponge city plan, especially pay attention to

detail optimization and feasibility study. The implementation of environmental protection requirements in the urban and rural spatial layout, rational distribution of production, living, ecology spaces, especially in the layout of industrial land, substation, sewage treatment plants etc. It strictly implements the relevant legal requirements for the environmental impact assessment. Before the completing the master plan of Suining, an environmental impact assessment called the Environmental Impact Assessment Report for Suining`s central city had been done, and Suining completes the master plan according to the conclusions of the report, then the final plan was approved by the provincial government, fully reflecting the environment. On this basis, Suining will deepen the requirements for environmental protection, strictly guide the preparation of relevant environmental protection chapters in the planning of various districts in Suining, and actively promote preparation of the environmental assessment for the urban detailed plan in Suining, especially in industrial land areas and ecologically sensitive areas. These actions were seen as a prerequisite for planning review, which ensure the implementation of the plan meets the requirements of environmental protection. The construction project that may have bad environmental impacts must make a project environmental assessment report when the project is submitted to the special committee for review. In recent years, “Tang Jia Du Electric Navigation Bridge”, “Cheng Nan Wastewater Treatment Plant”, “Long Feng Gas Station”, “Golden Hong Ye Papermaking”, “Skyworth Western Industrial Park” and other projects have all made environmental impact assessments to meet environmental protection requirements.

5. SUMMARIES

Suining now has formed a good organization, completed the organizational reform as quickly as possible, and promoted the Suining`s spacial plan with strong force. Suining coordinated the planning of eco-friendly space, and promoted the Eco-environmental infrastructure with the “sponge city” as an important means. With the Suining City master plan and the Suining city sponge city plan as the overall guidance of the Eco-environmental space and ecological infrastructure, the implementation of the urban Eco-environmental protection space and ecological infrastructure design and construction will be gradually implemented. At the same time, in line with the functional duties of the unit, with a good supervision system, a preliminary ecological environmental management control system was formed, which effectively extended the connotation of ecological environmental protection work.

However, the current work is still infancy and needs to be gradually improved. The basic work of coordinate unification, planning vectorization is still advancing, and the barriers and constraints between administrative agencies and other organization still exist. “Spacial Planning” involves many departments, which is still difficult to lead by planning management departments alone. More power of government leaders is needed. Data transformation still requires a lot of procedures. At the same time, the implementation of the concept of “park city” still needs to systematically sort out the infrastructure. It is difficult to implement the construction of the sponge city in the most needful areas such as the old urban areas, as well as other infrastructure and green space in the old urban space. There are so many problems in the planning and construction of space, in addition, the system and methods of smart planning management needs to be more simplified and convenient. People in relevant departments complained about difficult procedures in smart technology using. The key point of promotion and implementation for Eco-environmental protection planning projects still require the decision-making by governmental managers, so more convenient delivery and operational procedures is needed indeed.

6. FURTHER SUGGESTIONS

Through a lot of work, the construction of the Eco-environmental protection planning system in Suining City has begun to take effect. However, we have just opened the door to the research in this area, in order to improve the quality of urban and rural Eco-environmental space, promote the quality of urban space, improve the construction of ecological infrastructure, and make reference for the construction of environmental protection systems in similar cities, some suggestions and prospects are proposed.

6.1. Fully Promote The Suining`S Spacial Planning Making

It is necessary to fully promote the Suining`s spacial planning work. The planning and design of the Suining`s spacial planning and platform construction shall be fully improved. Because of the COVID-19, the progress of spacial planning has been put off. Now, China has been completely unsealed, a series of work should be done to promote the optimization and adjustment of the administrative structure, coordinate the spatial planning with the Bureau of Natural Resources and Planning. No effort should be spared to advance the spatial planning process. By fully study, promoting the combination of industry, education and research, gathering the strength of researchers from all parties, expanding their horizons, brainstorming to explore the implementation of spatial planning, an ecological planning protection system can establish well. At the same time, trying best to timely implementation of national requirements and standards, improving the establishment of a unified spatial planning system and standards as soon as possible, doing a good job in the preparation of spatial planning, and promoting the delineation and implementation of the ecological red line. Suining need to finish its our spacial planning system in 1 or 2 years and complete its ecological protection content with the latest development requirements.

6.2. To Set Up an Eco-Environmental Protection Planning System with Good Measures and Complete Infrastructure

To construct a complete Eco-environmental protection planning system covering the whole Suining area in city with Eco-environmental space protection measures and Eco-infrastructure. Step by step, summarizing the characters of waterfront space, mountains, and other important green space to make a systematic plan to restore the Eco-environment. Creating multidimensional mathematical models to determine the resilience index, Promoting technologies such as wasteland reclamation and reuse, and build a good modern agricultural and rural industrial development planning scene. To promote the development of healthy industries and green economy, sort out ways of green sustainable development, develop green energy storage technology, establish green power grid, optimize green transportation system, etc. Comprehensively forming a green and circular economic development infrastructure. The city managers should spare no efforts to promote the utilizes of the sponge city technology combining with the local conditions scientifically.

At present, this part of the work in Suining is not yet mature. According to the above requirements, it is recommended to complete the planning of the integrated natural gas industrial park in Suining-Tongnan as soon as possible, and to complete the planning of implanting advanced green industries as soon as possible this year, as well as the planning of pipelines. At the same time, the construction of sponge infrastructure will continue to be implemented in the new urban area to ensure the city.

6.3. Actively Promote the Application of Smart Planning Methods in the Field of Ecological Environmental Protection

To promote the construction of smart spacial planning, which can be done well in Eco-environmental protection. Although the Eco-environmental protection planning system has been initially established, clear functions, explicit direction, specific guidance for wisdom construction or development guidance should be formed in the prominent aspect, beyond the basic content. That is to say, a more in-depth and specific development model-oriented research should be made, and a more complete guiding concept can be made for the implementation of the industry, the attraction of talents, and the construction of the business format. In fact, the land use in the current spatial planning use the technology of data integration, such us “one map”. But these methods are still limit in urban planning and design. In core smart-development industrial policy support, there need more. First of all, E-Governance in urban planning is needed, despite a supportive context to increase the use of information and communication technologies in public decision-making, government agencies in small and medium-sized cities like Suining do not widely adopt formal policy-backed strategies for them. Actually, E-Governance can bring more voice from different people, but this is also a double-edged sword, more information means our Talent introduction measures, and guaranteed projects can all be put forward systematically, and more innovative planning can be carried out in terms of means, broadening the horizons of talents, deducing planning and packaging methods to activate sleeping resources, and conceiving Internet+ in the industrial smart planning, WiFi coverage, the Internet of Things transportation, smart production, site recommendation, multimedia promotion and other forms are guaranteed, so as to add the wings of the 5G+ to the development of city.

6.4. Promote the Establishment of a Unified and Convenient Planning Work Platform

To promote the construction of the planning management platform, and form a good interoperability with smart planning management and government service system. Researching easier system operation and convenient administrative efficiency. Technical coordination mechanism should be carried out to solve these environmental problems, and the construction of the technical coordination mechanism should adhere to the combination of theory and feasibility, not only to ensure that the establishment of the coordination mechanism can solve the problem of current non-standard coordination but also to adapt to the current management system and solve the problem in a timely manner. It is also necessary to share the technology of this area to reduce the impact of institutional barriers on technology transfer. It is necessary to make the use of new technologies and techniques in planning and planning management, especially modelling techniques for the information identification and the space control. It is necessary to establish data and information on the planning plane and space, strengthen the cultivation of technical personnel knowledge and promote more convenient technical applications.

6.5. Promote and Improve the Fund Incentive and Guarantee Mechanism

Eco-environment protection work also need financial support, and poor financial conditions are always difficulties. The funds of ordinary prefecture-level municipal governments are very limited, which cannot be compared with provincial capitals. So, we should use more methods to broaden the source of its funds. First of all, the provincial government and environmental and natural departments can increase the investment and allocation of funds for environmental protection and standardize the process of fund use. Secondly, we can form a cooperation mechanism with relevant enterprises and institutions, including industry-university-research cooperation mechanism, to strengthen the transformation and application of achievements.

Thirdly, we should also consider rewarding risky R&D investment at the back end of the technological innovation cycle in order to provide additional incentives for individual innovation. Financial incentives should be strongly encouraged to provide support for relevant industries, especially for major scientific research achievements and measures.

Funding is the foundation of construction, so it is recommended to make good use of the industry-university-research cooperation model in place like Suining-Tongnan Industrial Park, and start this work in this year, make some basic results, and display publicity in a timely manner, strive for provincial and national funds, and form overall cooperation. While feeding back the research results to relevant scientific research enterprises, the development of enterprises will promote the progress of urban green industries, form political achievements, and develop into a virtuous circle.

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