



Evaluation on the Socio-economic Development and Eco-environmental Protection in Chengdu

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Abstract. Green development and green lifestyles are necessary for the implementation of the new development concept. Acting on the principles of prioritizing resource conservation and environmental protection and letting nature restore itself, we should develop spatial layouts, industrial structures, and ways of work and life that help conserve resources and protect the environment, striving to achieve the synergy between socio-economic development and the ecological environment and creating a favourable environment for peoples' production and life. [1] This article analyzes Chengdu's socio-economic development and highly effective eco-environmental protection and dissects existing problems to propose recommendations. The article takes eco-environmental protection as a breakthrough, and focuses on the battle of pollution prevention and control to promote the positive interaction and coordinated development between regional environment and economy, driving win-win situation of socio-economic development and eco-environmental protection.

Keywords: Chengdu · Socio-economic Development · Eco-environmental Protection · Evaluation

1 Introduction

The report of the 19th National Congress of the Communist Party of China pointed out: "The modernization that we pursue is one characterized by harmonious coexistence between man and nature. In addition to creating more material and cultural wealth to meet people's ever-increasing needs for a better life, we need also to provide more quality ecological goods to meet people's ever-growing demands for a beautiful environment." [2] High-quality development is more people-centered. A good ecological environment is the most inclusive wellbeing of people. High-quality development should highlight the uplift of quality and efficiency, the improvement of quality and efficiency, the coordinated development of economy, society and ecological construction, and pays more attention to the people's sense of gain, happiness, and security. [3] We must insist on ecological benefits for the people. We advocate a simple, moderate, green and low-carbon lifestyle, hereby realizing the cyclical link between the production system and the living system. We should improve the economic system of green and low-carbon circular

development, and strive to make green development a common norm, forming a new pattern of modernization in which man and nature develop harmoniously. The Sichuan Provincial Government thoroughly implements the Party and the State's instructions, and actively explores a coordinated mechanism for regional socio-economic development and eco protection. The Government unswervingly follows the path of ecological priority and green development. [4] It resolutely promotes transformation and development, resolutely eliminates outdated production capacity, resolutely guards the green waters and lush mountains, focuses on building a comprehensive transportation corridor, drives innovation-driven industrial transformation and upgrading, and actively promotes new urbanization. At the same time, the control requirements such as ecological protection red line, environmental quality bottom line, and resource utilization online are integrated into the decision-making and implementation process to promote high-quality economic development in eco protection.

2 Socio-economic Growth and Progress of High-Level Eco Protection

During the “Thirteenth Five-Year Plan” period, Sichuan government constantly emphasized the need to actively implement the call of the Party and the State, unswervingly implement the new development concept, insist on protecting during development and developing while protection. And on the basis of focusing on ecological environment protection, we should coordinate the construction of comprehensive three-dimensional transportation corridors, industrial transformation and upgrading, expansion of opening and deepening cooperation to form a new pattern of large scale protection, extensive opening, and high-quality development. At the same time, with the promotion of green, circular, and low-carbon development, in-depth implementation of innovation-driven development strategies, we should vigorously promote supply-side structural reforms, the addition of new energy and the elimination of backward capacity to build a strong manufacturing province and a clean energy demonstration province and a strong province with green economy [5].

The Chengdu Municipal Government actively responded to the call of the national and provincial governments. During the “Thirteenth Five-Year Plan” period, it proposed to focus on the development of a green economy from various aspects, build a green foundation for the city, stimulate green power, and add green advantages. In March 2018, the Chengdu Development and Reform Commission, Chengdu Economic and Information Commission, Chengdu Science and Technology Bureau, and Chengdu Ecological Environment Bureau issued the “Chengdu Implementation Plan for Promoting Green Economic Development”, insisting on taking the supply-side structural reforms as the main line, focusing on enhancing the competitive advantage of the green industry and expanding the application of the green economy, taking the green economy development ecology as the guarantee, building a green and low-carbon circular modern industrial system, accelerating the formation of green production and lifestyles, and promoting continuous transformation of growth and high-quality development. In July 2018, Chengdu proposed to use eco protection as a breakthrough point, clarified its ideas for promoting

high-quality development, and studied how to transform the blueprint for eco protection deployment in Chengdu into actions to promote high-quality development, so as to seek new impetus for high-quality growth for the city that fully reflects the new development concept. In March 2020, the Chengdu Municipal People's Government issued the "Implementation Opinions on Building a "Carbon Benefiting Tianfu" Mechanism", guided by the principles of "government guidance, market operation, openness and fairness, and benefiting the people extensively". The government rewards the public with carbon emission reduction points, encourages projects of cutting carbon emission, expands the public's low-carbon scenarios, builds carbon emission reduction absorption mechanisms, innovates operation and management models, and accelerates the construction of a self-growing and sustainable carbon inclusive ecosystem. The measures to implement ecological priority and green development will create a new business card of "carbon efficiency Tianfu" for Chengdu. And Chengdu will become a new model for the construction of a domestic carbon inclusive mechanism.

3 Socio-economic Growth and Effects of the High-Level Eco-environmental Protection of Chengdu

3.1 Results of the Socio-economic Growth During the Thirteenth Five-Year Plan of Chengdu

- (1) New stage of comprehensive economic power. Since the Thirteenth Five-Year Plan, total GDP has been growing rapidly, and economic growth is shifting from high speed to quality and efficiency. In 2019, the city achieved a regional GDP of 1,701.265 billion yuan, an increase of 59.6% from the end of the "Twelfth Five-Year Plan". It ranked seventh in the country, accounting for 1.72% of the country's total. Its comprehensive competitiveness was significantly enhanced. The economy is accelerating the transition to high-quality development. In 2019, the per capita GDP reached 10,338 yuan, entering the ranks of high-income economies. The total labor productivity and total factor contribution rate reached 173,000 yuan per capita and 46.1% respectively, compared with the Twelfth Five-Year Plan, an increase of 45,000 yuan per capita and 3.3% (Figs. 1 and 2).
- (2) New achievements of the construction of a modern industrial system. During the "Thirteenth Five-Year Plan" period, centering on the construction of a "5 + 5 + 1" modern and open industrial system, the government planned 66 industrial functional areas in accordance with the concept of an industrial ecosystem, and launched the demonstration of key industrial ecosystems circle such as integrated circuits and new displays. The circle is to innovate the ecological chain, reform the economic organization mode, and promote the organic integration of the industrial chain, value chain, supply chain, and innovation chain. The new economy started high, and the industrial structure continued to be optimized. The ratio of the three industries was adjusted from 4.0:44.2:51.8 in 2015 to 3.6:30.8:65.6 in 2019. The contribution rates of the three industries to economic growth reached 1.1%, 34.5%, 64.4%.

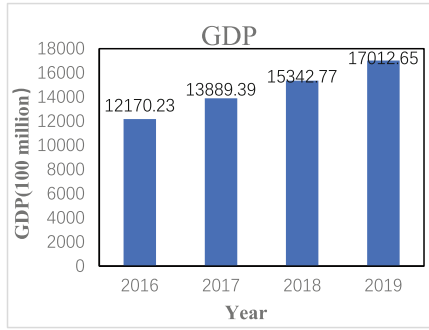


Fig. 1. Regional GDP in 2016–2019

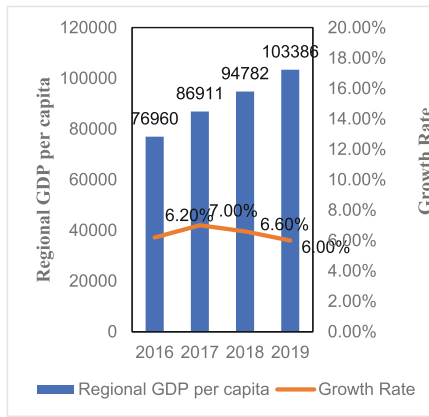


Fig. 2. Gross regional product per capita and its growth rate in 2016–2019

- (3) New enhancements in technological innovation capabilities. Taking the comprehensive innovation reform experiment as the starting point, Chengdu has systematically promoted the urban innovation system and capacity building, and the city’s innovation vitality has continued to be stimulated. In 2019, the city’s innovation capability index, innovation index and entrepreneurship index ranked first in the central and western regions. The government layouts the innovation chain based on the industrial chain, and deploys the technology chain based on the innovation chain. In 2019, the high-tech industry revenue exceeded 940 billion yuan. In 2019, there were 4,149 national high-tech enterprises. The total number ranks the forefront of central and western cities. National key laboratories and national engineering research center and other national-level innovation platforms have exceeded 110. The industrial function zone has in-depth cooperation with the national key laboratory and other innovation platforms, realizing the effective connection with 725 technological achievements and 288 school-enterprise cooperation projects. Innovative achievements continue to emerge. Chengdu have been approved as national

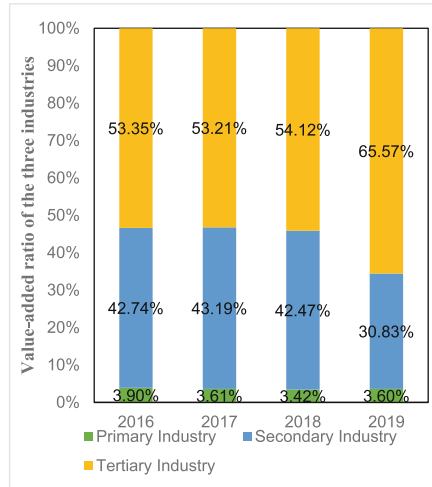


Fig. 3. Value added of three industries as a proportion of GDP in 2016–2019

digital economy and new generation of artificial intelligence innovation development pilot zone, and national intellectual property city. The innovative ecological environment has been continuously optimized. 12 new policies for talents have been introduced. The brand of “Jingronghui” and “Chuangjiao Fair” has been highlighted. Innovation and entrepreneurship have been promoted in an all-round way, and the accumulation of various innovative elements has accelerated.

- (4) The construction of “Three Cities and Three Capitals” has achieved initial results. The government resolutely uses culture to lead cities to leap to “world-class”. Landmark buildings, strengthening functions, and shaping brands and “three cities and three capitals” have accelerated and achieved results. The attractiveness of consumer centers was further enhanced, and the influence of world-famous cultural cities was greatly enhanced. The government speeded up the construction of a world famous cultural and creative city. In 2019, the added value of the cultural and creative industry was 145.98 billion yuan, accounting for 8.58% of the regional GDP. It accelerated the construction of a world-famous tourist city. In 2019, the total tourism revenue reached 466.35 billion yuan, an increase of 128.6% against the end of the “Twelfth Five-Year Plan” period, and it was selected as the “World’s Best Tourism” destination city.
- (5) New achievements of people’s well-being. The city has put people first, actively promoted the development of social undertakings, and accelerated the promotion of the people’s livelihood and welfare society inclusive balance. It ranked first in the “China’s Happiest Cities” for 11 consecutive years. Investment in improving people’s livelihood continued to increase, and expenditures on basic public services accounted for 55.1% of public fiscal expenditures, 1.5 percentage points higher than the end of the “Twelfth Five-Year Plan” period. The income of urban and rural residents maintained rapid growth, and the average annual per capita disposable income of urban and rural residents increased by 8.4% and 9.4% respectively,

which were 0.5 and 1.5 percentage points higher than the average annual growth rate of GDP. The government promoted high-quality and targeted poverty alleviation and the fully completed the task of eliminating absolute poverty ahead of schedule. 25,336 filed and registered poor households reached a per capita annual income of RMB 10,102 in 2019, which was 2.7 times the poverty alleviation standard in Sichuan Province. The “one hundred villages and ten thousand households” was finished excellently. The social security system has been continuously improved. “Zero employment” families have been dynamically eliminated. The country’s first batch of healthy city pilot projects have been launched. Education and health services have been developed with higher quality and in a more balanced way. A basic public service system covering urban and rural areas for all that is high-quality, balanced, fair and sustainable has basically been formed.

3.2 Achievements Made in Eco-environmental Protection in Chengdu During the Thirteenth Five-Year Plan Period

Since the 13th Five-Year Plan period, Chengdu has acted on the spirit of the 18th National Congress of CPC, the 3rd, 4th, 5th and 6th Plenary Sessions of the 18th Central Committee of CPC, the spirit of important speeches made by General Secretary Xi Jinping, the strategic layout of the central government’s Four-pronged Comprehensive Strategy, the strategic requirements of the Provincial Party Committee’s Three Developments and the overall strategy of the Municipal Party Committee. Led by the construction of ecological civilization, it has put better environmental quality at the center of what they do and worked on environmental security as the impetus. Therefore, the city has taken stronger measures in ecological protection, such as making great efforts in the air, water, soil pollution prevention and control, coordinating pollution control, total emission reduction, risk control, making environmental management more systematic, science-based, consistent with law, refined and IT-driven. In a word, Chengdu has strived to build a complete system of modern environmental governance. As a result, its efforts were paid off with visible effects in environmental protection.

- (1) Environmental quality has seen an obvious improvement. Chengdu launched 10 critical battles of pollution prevention and control to consolidate and enhance the effectiveness of campaign of treating water, air, soil and increasing green coverage. In 2019, the number of days with good air quality (the number of days with air quality index less than or equal to 100) was 287, an increase of 73 days compared with the end of the 12th Five-Year Plan period. Indicators of SO₂, CO, PM₁₀, and O₃ were all up to standard, meaning it was the first time to eliminate heavy polluted weather. PM_{2.5} average concentration decreased by 25.8% compared with the end of the 12th Five-Year Plan period (Fig. 3–7). 90.7% of 107 surface water had good sections in the city (Fig. 3–8), indicating that it was the first time to eliminate all the poor performance of V regarding the sections. In addition, black smelly water bodies disappeared in the urban built-up area and 100% of the county-level centralized drinking water sources were up to the standard of water quality. Soil environmental quality remained stable. The city’s eco-environmental quality kept

being enhanced, adding up to remarkable results achieved in eco-environmental efforts.

- (2) Pollution prevention and control continued to deepen. Achievements were made in the following aspects, such as the sound long-term mechanism for eliminating coal-fired boilers, the designation of high-polluting fuel ban zones, and significant improvement of clean production for industrial enterprises. The grid-based regulation mechanism for straw burning was put in place to ensure towns (township), streets and villages (community) to shoulder the responsibility of fighting against open burning in 100 days. The environmental protection detection, supervision and law enforcement related to motor vehicles were strengthened with better telemetry monitoring system of motor vehicle exhaust in Chengdu. Campaigns against dusts from construction sites and roads were launched by dint of online video installation and monitoring. Regarding drinking water, many outcomes were generated, such as cross-district coordination mechanism for drinking water sources, annual surveys and assessments of the environmental conditions of centralized drinking water sources, the installation of video monitoring facilities, the construction of online automatic monitoring stations for water quality, greater efforts in the emergency water source protection projects and special campaigns against centralized drinking water sources in villages and towns, and rectification of 12 environmental issues related to county-level centralized drinking water sources found by Ministry of Ecology and Environment. Water environment management proposals were developed for the sake of key watersheds such as the Fu River and Jiang'an River etc., to improve water environment of Jinjiang River, Tuo River and Jinma River etc., across the board. When it came to soil improvement, soil pollution prevention and control was incorporated into Outline of the 13th Five-Year Plan for National Economic and Social Development in Chengdu revision version, and much work was done to implement the "ten articles of soil treatment" and soil pollution prevention and control "620" project to the letter.
- (3) Steady progress has been made in energy conservation and emission reduction. In this regard, the period witnesses the establishment of volatile organic compounds emission list, the volatile organic compounds treatment in 77 key enterprises to meet the standards, the facilitation of the key industrial enterprises involved in phosphorus to improve the plant flushing water and initial rainwater collection system, the construction of standardized rainwater collection ponds, backwater pools, leachate collection ponds and emergency sewage treatment system. It also has updated the list of key pollution sources and released information on key pollution sources monitoring under state control and supervision and inspection. The ultra-low emission transformation of thermal power and iron and steel industries has been wrapped up successfully, and the transformation for the cement and flat glass industry has also gained ground. The dust disorganized emissions management has been strengthened in the iron and steel, foundry, brick and tile, ceramics and other key industries. In addition, it placed tighter constraints on industry standards, and brought in the market-oriented and routine-based phase-out mechanism of backward capacity consistent with the law. Chengdu has also cut grave capacity by eliminating small cement, water and fire power plants, water lime kilns, coal production, fireworks, steel and other long process smelting production.

- (4) The system of ecological civilization has gradually taken shape thanks to the great efforts. The achievements in this regard include the revision of the Regulations on the Protection of Drinking Water Sources in Chengdu, introduction of the Regulations on the Ecological Protection of the Xinglong Lake Region in Chengdu and the Regulations on the Protection of Longquanshan Urban Forest Park in Chengdu, as well as the Regulations on the Protection of Dujiangyan Irrigation District in Chengdu. In addition, it has driven forward the development of the Regulations on the Prevention and Control of Air Pollution in Chengdu, the Regulations on the Prevention and Control of Water Pollution in Chengdu, the Regulations on the Prevention and Control of Soil Pollution in Chengdu, and the Regulations on the Construction of Park City in Chengdu. Internal Work Standards for Environmental Administrative Law Enforcement and Detailed Discretionary Standards for Administrative Punishment of Environmental Protection in Chengdu have been enacted to strictly regulate administrative law enforcement. Other newly introduced policies include Chengdu Mintuo River Basin Water Environment Ecological Compensation Measures (Trial), Chengdu Drinking Water Source Protection Assessment and Incentive Trial Measures, Chengdu Ambient Air Quality Assessment and Incentive Measures (Trial), the Ten Articles of Reform for the EIA approval system which required to streamline the approval matters, release the EIA exemption list and optimize the online approval and parallel approval flows. With people's well-being prioritized, Chengdu's government has combined target management with inspection to implement a ranking notification system for special inspection of the air quality in districts (cities) and counties, and incorporated the rectification of environmental problems in drinking water source protection zones into special inspection as part of efforts to improve the regular inspection mechanism at the municipal level. The efforts have been translated into some other outcomes, such as the rollout of Chengdu Emission Permit Management Program (Trial), the launch of the Chengdu Emission Permit Public Information Platform and the Pollution Source Enterprise Information Reporting Platform, the development of the annual enterprise environmental credit evaluation system, the environmental credit information disclosure system, the environmental credit classified regulation and joint reward and punishment system, etc., with pilot evaluation organized. What's more, Chengdu Ecological Environment Bureau Network Management and Authoritative Release Platform has been up and running, and environmental protection social organizations management methods were introduced. Chengdu also has channeled more energy into information disclosure and rewards for tip-offs, and paid attention to public involvement in EIA approval.
- (5) Environmental risk prevention and control capabilities have been gradually improved. Chengdu has completed environmental risk assessment in all districts (cities) and counties, and environmental risk assessment of enterprises have been well underway. In addition, it has enriched the list of major environmental risk sources and the basic information database to make possible a visualized emergency prevention and control system for risk sources. Other outcomes include the wrap-up of the revision of Chengdu Emergency Response Plan for Heavy-Polluted Weather and the kick-off of the revision of Chengdu Emergency Response Plan for Centralized Drinking Water Pollution Emergencies, the issuance of Chengdu Solid

Waste Pollution Prevention and Control Three-Year Action Plan (2018–2020), the implementation of Clean Waste Action 2018, the rectification of problems found during Yangtze River Economic Zone solid waste check, rectification of hazardous chemicals, organization of city-wide training on solid and hazardous waste, and the completion of Chengdu Medical Waste Disposal Center Expansion project (the city's medical waste disposal capacity reached 120 tons/day).

4 Existing Problems Standing in the Way of Socio-economic Development and Eco-environmental Protection in Chengdu

Chengdu faces mounting pressure in the environmental pollution control efficiency and environmental quality. The air quality of Chengdu has not been up to the national standard of level 2, ranking the last in the Sichuan province for a long time. It is an uphill battle to continuously improve control ozone pollution and VOCs, and deal with VOCs as seasonal air pollution often occurs despite the headway made in PM_{2.5}.

Ecological civilization system construction and fundamental capacity building need to be improved. Ecological civilization institution and mechanism are not yet sound. Further steps need to be taken to ensure the responsibilities of eco-environmental protection to be fulfilled and to improve the ecological compensation mechanisms with coordinated control system unsound for the region. In addition, it shall do more to push forward the reform of environmental protection authorities and the vertical management system of monitoring, supervision and law enforcement.

Capabilities of environmental regulation and risk control are poor. The ecological environment in some areas is relatively fragile and vulnerable to ecological risks due to floods and geological disasters. Greater efforts need to be made in the day-to-day management of environmental emergency in industrial parks and enterprises with environmental risk prevention and protection measures compromised, and without the checklist of problems in place for some enterprises. Municipal government, the Municipal Bureau of Ecology and Environment emergency plan for environmental emergencies is pending revision, and emergency management can be more fine and science-based. More energy can be channeled into the assessment and prevention of potential risks of emergencies, IT-driven filing, emergency work coordination etc., to realize better and finer management.

5 Policy Recommendations for Socio-economic Development and High-Level Protection of Ecological Environment in Chengdu

Because Chengdu is facing increasing pressure on the efficiency of environmental pollution control and environmental quality in the process of high-quality development, stricter requirements for continuous improvement on the control of ozone pollution and volatile organic compounds, the construction of ecological civilization system and basic capacity needs to be strengthened, and the ability of environmental supervision and risk control is poor, it needs to be improved from the following aspects.

Speed up the shift from the traditional factor-driven economic development to innovation-driven. During the 13th Five-Year Plan period, Chengdu entered a critical stage of shift in growth drivers with a defining trend. However, innovation has not yet become the core driving force of economic development, and the development drivers need another round of transformation. The traditional economic growth drivers such as capital and labor are gradually declining, while new growth drivers are still taking shape at a faster pace. Innovation is still not catching up in terms of input, transformation and integration [6], pending to be the major driving force. On the one hand, the cost of labor, land and resource factors is rising, which means the traditional low-cost advantage is gradually weakening. As the headway has been made in new production factors such as Chengdu's innovation system, human resources quality, and big data etc., it is imperative to step up the shift of Chengdu's economic growth drivers from traditional factor-driven to innovation-driven. Harnessing the role as the leading city in Sichuan, it shall facilitate more cooperation and exchange with Chengdu-Chongqing city cluster and other cities in the province. At the same time, it should further optimize the division of urban functions and the structure of the urban system, improve the allocation of public service resources between cities and rural areas and among regions, and put in place the institutional mechanism for the flow of urban and rural factors. In this way, these measures can contribute to new industrialization, urbanization, ICT applications and agricultural modernization.

Step up the collaborative treatment of air pollutants. Dust, mobile sources, domestic sources of emissions are rising rapidly, while Chengdu is a late starter in volatile organic compounds treatment, which makes it an uphill battle. Chengdu's NO₂ concentration has long been high compared to other key cities across China, and regional compound pollution represented by PM_{2.5} and O₃ stands out. Since the 13th Five-Year Plan period, ozone concentration and the number of days when it is above the limit in Chengdu have steadily decreased, but it has loomed large to take a toll on air quality in addition to particulate matter. Driven by existing air quality objectives, Chengdu has developed a step-by-step roadmap to make sure it can be up to scratch in batches and by targets as a solution to deal with the compound air pollution represented by PM_{2.5} and O₃ [7].

Put in place a sound regional cooperation mechanism for collaborative control. As Chengdu and surrounding cities keep growing in size, air pollution between cities becomes prominent, evidenced by a trend of increasing air pollution emissions in the Chengdu Plain Economic Zone and salient regional pollution. Although the regional environmental protection cooperation mechanism and regional joint consultation mechanism of air quality have been up and running by the eight cities of the Chengdu Plain Cities Cluster with emission reduction measures rolled out including production suspension for key enterprises during major events, the efforts fails to be made on a regular basis and eight cities differ in the planning, standards, law enforcement, monitoring and early warning, as well as emission reduction measures. There are still major differences in policy protection and other aspects. Chengdu should work on the regional environmental protection cooperation mechanism to promote regional collaborative control. Being

committed to green development, it can explore new ways of modernizing ecological civilization governance in Chengdu, and comprehensively improve eco-environmental governance capacity. By doing so, tangible results can be achieved in the area of ecological civilization construction [8].

Establish a sound system of the pollution source supervision system and reinforce the supervisory capacity. As the environmental supervision capacity can't catch up with new situation and new requirements of environmental management, and the lack of monitoring capacity at the municipal and county levels is particularly prominent, some agricultural producing areas of Chengdu are exposed to a high degree of risk of heavy metals in the soil. Chengdu should further put in place a sounder database of the soil pollution prevention and control and the negative list management system of polluted land. What's more, it can explore the pollution source supervision system and reinforce the supervision capacity, as well as build a stronger environmental risk early warning capacity.

6 Conclusions

In order to promote social and economic development and ecological environmental protection in Chengdu, the following aspects should be strengthened. First of all, the organization should strengthen the leadership role, increase the leadership and coordination, and establish a clear division of responsibilities and collaboration between departments. At the same time, it should increase the investment guarantee of funds, and arrange the funds in a coordinated manner, and strengthen the management of funds to ensure the orderly development of social and economic development and ecological environmental protection. Secondly, we should improve the evaluation and assessment system, and take the environmental quality "can only get better, not worse" as the red line of responsibility, and conduct a comprehensive evaluation of the environmental management and ecological protection of each department and municipal government against the target responsibility book every year. Then, we should strengthen scientific and technological investment in environmental protection, rely on science and technology to improve the ability to treat pollution, vigorously carry out the application and transformation of scientific and technological achievements, and strengthen the creation, application and protection of intellectual property rights. Finally, we should actively carry out press coverage and encourage the whole society to participate in the construction process of synchronizing socio-economic development and ecological environmental protection by strengthening the information disclosure system, widening the information exchange channels and expanding the information communication platform.

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