A Study on the Path of Building Hefei as a Green Development City

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Abstract: With "improving quality, reducing total amounts and preventing risks" as the mainline, Hefei adheres to ecological priority and the concept of symbiosis between cities and lakes, accelerates the transition towards green production methods, lifestyles and consumption patterns, and strides into a beautiful Hefei where "all lands are green, all waters are lucid, all seasons are scented with flowers and all places are resonant with singing birds". This paper analyses the unique measures taken by Hefei for green development. On the basis of reviewing the main achievements and problems of Hefei's green development, it proposes suggestions for reducing the excessive consumption of resources, comprehensively promoting industrial upgrading, disseminating ecological culture, strengthening the rule of law, environmental protection and eco-governance, and pushing forward the continuous improvement of ecological and environmental quality, so as to provide the decision-making basis for building Hefei as a green development demonstration city which realizes comprehensive, coordinated and sustainable development on economic, social and ecological aspects.

1. Introduction

With "improving quality, reducing total amounts and preventing risks" as the mainline, Hefei adheres to ecological priority and the concept of symbiosis between cities and lakes, accelerates the transition towards green production methods, lifestyles and consumption patterns, and strides into a beautiful Hefei where "all lands are green, all waters are lucid, all seasons are scented with flowers and all places are resonant with singing birds".

Hefei promotes the green development of industry, optimizes the industrial structure, strengthens energy-saving technological reconstruction in key fields and processes, carries out energy-saving and emission-reduction campaigns among key energy-consuming enterprises and shuts down Maanshan Steel's (Hefei) smelting production line. The domestic waste is incinerated to generate power. The kitchen waste is harmlessly treated and comprehensively utilized. Feidong, Changfeng and Lujiang County accelerate the planning and construction of venous industry parks. Hefei's Chaohu Lake Basin has become the pilot demonstration zone for ecological civilization and implemented the fourth phase of ecological environmental protection and restoration projects. More than 120 rivers have been included in the "river chief system", and the centralized treatment rate of urban sewage up to 98%, the 34 township sewage treatment plants around the lake were put into trial operation. The average water quality of Chaohu Lake changed from the original V to the IV, and the average value of the eutrophication index of the whole lake decreased year by year. The nine major special rectifications of air pollution prevention and control were vigorously promoted. In 2018, Hefei had 40 days with...
excellent air quality and 215 days with good air quality. The percentage of days with excellent and good air each year was 69.9%. Inhalable particulate matter (PM10) and Fine particulate matter (PM2.5) were standing at 91.9 and 66 mg/m³ respectively, decreasing by 18.6% and 20.4% as compared to the previous year. The concentration of carbon dioxide, sulfur dioxide, carbon monoxide, and ozone meet the first-class air quality standards. The "Five Forests" project was energetically promoted. Consequently, the city has successfully established itself as a national forest city, with the forest coverage rate of the whole city increasing to 26.8%, and the green coverage rate of the urban built-up areas increasing to 46%.

2. The Problems with Hefei’s Green Development

Although Hefei has made some progress in the green practice, the deeper problems and contradictions in environmental protection still need to be resolved. The joint efforts of ecological construction and economic construction need to be further developed. The City of Hefei is faced with certain challenges in accelerating green development[2].

2.1. Ecological Environment

The ecological environment bears a lot of pressure. Although the traditional economic development model has created huge amounts of social wealth, it has also caused great overdraft of natural resources and ecological environment. For a long period, the city ecological deficit is significant: with regard to total water resources, the city lacks high-quality water sources, two thirds of it drinking water being transferred from the Dabie Mountains; with regard to the water environment carrying capacity, the overall water quality of Chaohu Lake falls into Class IV. It is on light eutrophication level. The main rivers entering the lake are inferior V water bodies, which include Nanfei River, Pai River and Shiwuli River[3]. Rivers and ditches flowing through the city and neighbouring towns are black and stinky, with no environmental capacity in most areas; with regard to the atmosphere environment bearing capacity, Hefei’s air quality also exceeds the national grade II. In 2018, 69.9% of the days have good and excellent air. The annual average concentration of PM2.5 is 89% higher than the standard. The air quality still largely depends on the change of weather conditions; As for the rural ecological protection, the comprehensive utilization of fertilizers and pesticides is not high enough, and the environmental source pollution in the rural areas has not been effectively controlled. The scale of the city is constantly increasing; the economic aggregate is increasing and the demand for natural resources for economic growth continues to grow, which will inevitably bring greater and more violent challenges to the carrying capacity of the ecological environment[4].

2.2. Transformational Development

The task of transformational development is very arduous. Affected by the economic situation at home and abroad, the downward pressure on the current economy of Hefei is relatively high. Thus, the task of transformational development of such traditional industries as home appliances manufacture is imminent. At present, the structural problems of the economy are prominent, and the industrial level is not high enough. Specifically, the proportion of the tertiary industry is low. The mode of economic growth has not been fundamentally changed yet, and the scale of strategic emerging industries is not large enough.

2.3. Innovation Capability of Enterprises

High-tech is the first productive force, and scientific and technological innovation ability is one of the important factors in urban development. With the rapid development of the economy, the industrial upgrading and the transformation of economic growth mode have put forward higher requirements for the independent innovation capability of enterprises. Enterprises are the main body of innovation activities, whose innovation ability determines the pace of industrial upgrading to a large extent[5]. In the context of resource-based transformation, industrial upgrading has been placed in a prominent position. However, the relatively backward capability of independent innovation of enterprises has
restricted the pace and progress of industrial upgrading. Although Hefei has abundant raw materials and a solid industrial base, the application of advanced technologies that can be in line with international practice is still relatively limited, resulting in low industrial performance. Since the "Twelfth Five-Year Plan", the ratio of large and medium-sized industrial enterprises with research and development activities in Hefei has shown a downward trend. The core components and technologies required for the enterprise development are highly dependent on imports, reducing the profits of the industries concerned by as high as 30%~70%. Hence, it is urgent to enhance the independent innovation ability of enterprises and enhance their industrial competitiveness[6].

3. The Strategy of Green Development in Hefei

At present, Hefei should hold fast to ecological civilization construction and green development, and the concept of ecological civilization should become the spiritual guidance for green development.

3.1. To create a Hefei model of green transformation and upgrade via “adjust, transfer and promote” driven by innovation

3.1.1. Comprehensively push for the structural adjustment, development transfer and upgrade promotion. To promote the healthy development of strategic emerging industries and advanced manufacturing industries by building a strategic emerging industrial agglomeration development base. To transform and upgrade traditional industries with advanced energy-saving and low-carbon environmental protection technologies. To actively develop tourism products such as sightseeing, leisure vacation, rural tourism, and cultivate new cultural formats such as cultural originality and digital publication. To vigorously develop modern finance, third party logistics, scientific and technological information, e-commerce, service outsourcing and other producer services, and promote the development of consumption industry such as health and pension. To strictly implement national investment and industrial policies, prohibit the approving or recording of new capacity projects in industries with serious surplus production, strengthen efforts of eliminating backward production capacity, and carry out equal or reduced replacement of new capacity in cement and other industries. To guide powerful enterprises to accelerate the pace of "going out", promote international production capacity and equipment manufacturing cooperation, support overseas mergers and acquisitions, and cultivate a number of key enterprises with international competitiveness and market development capabilities[7].

3.1.2. To develop green industries. To vigorously develop energy-saving and environmental protection industries, compile energy-saving and environmental protection plans, with a focus on three key areas (energy conservation, environmental protection and resource recycling), and implement such key projects as the industrialization of energy-saving and environmental protection technology and equipment, semiconductor lighting, and the industrial upgrading of energy-saving and environment-friendly vehicles and home appliances. In the industrial field, to achieve rolling implementation of the "Five-One Hundred" special action of the energy conservation and environmental protection industry. To accelerate the development and promotion of the new energy automobile industry, and ensure that the whole vehicle and key component technologies can reach the international advanced level. To construct Hefei as the national new energy vehicle promotion and application city. The government should comprehensively promote green manufacturing, carry out trials and demonstrations of both ecological design of industrial product and remanufacturing of electromechanical products, and strengthen the development and application of green products. To actively cultivate manufacturing industry of new energy equipment, accelerate the development and promotion of new materials and equipment for clean energy and new energy, and build a demonstration area in Hefei for applying distributed photovoltaic power generation. To vigorously promote pollution-free agricultural products, green foods, organic agricultural products and geographical indication agricultural products, improve the quality and safety supervision system for agricultural products, and establish and improve the
cohesive mechanism between agricultural products production and market access. Hefei should fully promote the construction of the national leisure tourism zone of round-Chaohu Lake and accelerate the development of tourism as well[8].

3.2. To use resources sparingly and intensively, and to build Hefei as a model of green, low-carbon and cyclic development

3.2.1. To strongly promote energy conservation and emission reduction. Hefei plays a synergistic role in promoting energy conservation and emission reduction, and strictly implements the double-control system of total energy consumption and intensity. To carry out the plan for upgrading and reconstructing the energy-saving and emission-reducing system of coal electricity, and for efficiently utilizing the coal in a clean and efficient way. To ensure the implementation of environmental protection electricity price policy by utilizing the whole province's dispatching management system of energy-saving power generation. To increase the proportion of coal used for electricity, enhance the proportion of electric energy in final energy consumption, and boost the proportion of non-fossil energy in energy consumption. To accelerate the construction of green buildings, implement the building energy efficiency improvement project, improve the execution rate of energy-saving standards for new buildings, promote the energy-saving renovation of existing buildings, improve the energy consumption supervision system for public buildings, and introduce implementing scheme to promote the large-scale application of shallow geothermal energy, air energy, and photovoltaic power generation in buildings. To push forward the modernization of the construction industry. To intensively carry out the special actions of low-carbon transportation and the green and circular low-carbon transportation technology for 100 enterprises in the industries specializing in vehicles, ships, roads and ports. To encourage the use of highly efficient and energy-saving agricultural production equipment. To actively play the demonstrative and leading role of public institutions, building 200 demonstration units of conservation-oriented public institutions and energy-efficient leading units in the city, and establishing a citywide supervision system of public institutions with regard to energy conservation, consumption reduction and resource saving.

3.2.2. To focus on promoting low-carbon and circular development. To accelerate the development of wind energy, solar energy, biomass energy, geothermal energy, and continuously expand the scale of natural gas utilization. To actively control carbon emissions, explore the establishment of low-carbon development evaluation index system. To develop, promote and apply technologies for the effective control of greenhouse gas emission, use multiple methods such as optimizing industrial structure and energy structure, saving energy and improving energy efficiency, increasing carbon sink to increase emission control level.3 To actively carry out pilot and demonstration of low-carbon development, form a group of low-carbon cities and towns with distinctive characteristics, build a group of low-carbon parks and communities with typical demonstration significance, and promote a group of low carbon technologies and products with good emission reduction effects, and promote Hefei model of the green and low-carbon development. To vigorously develop circular economy, promote cyclic production among enterprises, cycle combination of industries and cycle transformation of parks, promote the circulation link of production system and living system, accelerate the construction of three venous industrial park, and continue to cultivate a batch of circular economy demonstration models, comprehensively promote the typical models of circular economy, and establish a preliminary resource recycling system covering all social sectors. 6To develop the establishment of demonstration city with renewable resource recovery system, formulate plans, and build a recycling resource utilization system covering the whole city. To continue to promote pilots of classified collection and disposal of municipal solid waste, resource utilization and disposal and recycling of construction waste. Wastewater reclamation and reuse need to be promoted as well. To promote the comprehensive utilization of solid waste, straw, livestock manure and other agricultural and forestry waste.
3.2.3. To strengthen the sparing and intensive utilization of resources. To strengthen the management of obligatory targets and strictly implement the double-control system of water consumption and total amount and intensity for constructing land. To implement the most stringent water resources management system, strengthen the management of water demand, strictly enforce the water resources assessment system, strike a balance between population, economy and water resources, and build a water-saving society. To strengthen the standardized construction of the management of water users' access to water, strictly control the management of water use plan and water consumption quota, and implement the reimbursable usage system on water resources. To promote the construction of various water-saving carriers, accelerate the water-saving technological transformation of industrial enterprises, the demonstration and promotion of high-efficiency water-saving sample in agriculture, the transformation of urban pipe network, the promotion of water-saving apparatus, as well as the development and utilization of unconventional water sources, and strictly control the disorderly water transfer and artificial water landscape[2]. To adhere to the most stringent land-saving system, implement control of total amount of construction land, establish and improve incentive mechanisms for mobilization of the existing and inefficient land, strengthen the supervision of land conservation and intensive use, and develop model cities. To implement the strictest farmland protection system, strictly assess the target and responsibility for protecting farmland, and implement the dismission audit of responsibility for farmland during protection during leading cadres term. To strengthen the reclamation of mine land to ensure that the reclamation rate of damaged land in mining areas reaches 100%. To accelerate the construction of green mining and green mines, carry out comprehensive exploration and evaluation of mineral resources, apply the system of monitoring and evaluating the mining recovery rate of important mineral resources, ore dressing recovery percentage, comprehensive utilization rate, actively apply for national pilot areas of green mine construction, and build green mining demonstration zones.

3.3. To protect and repair the ecosystem, build the Hefei model of beautiful hills and waters
In accordance with the regional functions and developmental orientation, build a stable regional ecological barrier to ensure the city's ecological security. To construct green ecological barrier like farmland shelterbelt nets, and shelterbelt nets of backbone roads, rivers and channels. 4To build green ecological corridors, promote "five-one "greening project, construct ecological green belt around the Chaohu Lake, green belt of Jianghuai watershed ridge, urban forest, suburban green space, and water conservation forest. To consolidate and expand the achievements of national forest cities and actively apply for national ecological garden cities. To protect and recover the wetland and the ecosystem of rivers and lakes, and restore its self-purification capacity. To carry out the protection and restoration of aquatic ecosystems, and strictly implement the ecological environment protection of important rivers, Chaohu Lake and reservoirs. To improve measures for emergent dispatching of ecological water volume, and gradually establish a guarantee mechanism of ecological water volume in rivers and lakes.

3.4. To comprehensively promote pollution prevention and control, and create the Hefei model with blue sky, clear water and pure land
3.4.1. To continue to promote air pollution prevention and control. To intensively carry out industrial pollution control, continue to promote clean production, comprehensively promote the upgrading and transformation of enterprises' desulfurization, denitrification and dedusting facilities, complete the reconstruction of ultra-low emission of coal-fired power plants, and comprehensively complete the rectification of the pollution of volatile organic compounds in key industries and enterprises. To strengthen the prevention and control of urban air pollution, implement relocation and transformation of heavily polluting enterprises in urban areas, comprehensively eliminate coal-fired boilers in areas where pollution is forbidden, and control urban dust and catering fumes. To strengthen the prevention and control of motor vehicle pollution and comprehensively eliminate yellow-label vehicles. To further carry out the ban on burning straw all the year round anywhere comprehensively. To
strengthen the joint prevention and control in areas of air pollution, and monitor and control PM2.5 in all corners of the city.

3.4.2. **To strengthen the prevention and control of water pollution.** To strengthen the comprehensive management of Chaohu Lake. To accelerate the implementation of ecological protection and restoration in areas around the Chaohu Lake. To vigorously carry out comprehensive management of Nanfei River, Shiwuli River, Pai River and Shuangqiao River, strictly implement the discharge limits of major water pollutants of urban sewage treatment plants and key industrial sectors in Chaohu Lake Basin, and make good efforts to upgrade and transform sewage treatment plants, and accelerate the construction of sewage treatment plants such as Qingxi water treatment plant and Hudaying wastewater treatment plant to ensure full collection and treatment of sewage. To intensify the efforts of preventing and controlling water pollution, improve the long-term mechanism of the “river chief system”, promote the rectification of urban black and odorous water bodies, strengthen the environmental protection of drinking water sources, delineate rural protection areas of centralized drinking water source and ensure the safety of drinking water sources.

3.4.3. **To strengthen the pollution prevention and control of soil, heavy metals and solid waste.** To formulate the implementation plan for soil pollution prevention and control in the city of Hefei, carry out a detailed investigation of the soil environmental conditions, protect the soil environment of cultivated land, strengthen the control of industrial contaminated sites, carry out pilot for controlling soil pollution and restoring the polluted land, and gradually establish a monitoring system of soil environmental quality. To set up comprehensive prevention and control plans for heavy metal pollution in Hefei, focusing on the source prevention and control, and strictly prohibit new, modified and expanded projects which increase emissions of heavy metal pollutants in key areas. To implement centralized production and pollution control in enterprises involving heavy metals, and promote the deep treatment of heavy metal wastewater and waste gas. To strengthen the prevention and control of industrial solid waste pollution and strengthen the management of hazardous waste and medical waste. To establish and improve environmental risk precaution and emergency management mechanisms for chemicals, persistent organic pollutants, and hazardous waste.

3.5. **To promote ecological culture, build an ecological civilization demonstration and create the Hefei model**

To actively cultivate ecological culture and ecological ethics, making ecological civilization a mainstream value of society and an important part of socialist core values. To bring into full play the role of the news media, organize and carry out various publicity and educational activities on ecological civilization to raise the consciousness of the general public towards ecological civilization. To advocate the green lifestyle and green development concept. To incorporate green development into the performance appraisal system of all levels of government, taking green development as the leading factor in the layout of major productive forces, and adding environmental evaluation indicators for key industrial projects and infrastructure construction. To increase the supply of green public goods and public services. To encourage the active participation of the public. To strengthen the democratization of ecological decision-making and protect the public's environmental interests and ecological environment to the utmost. To establish an effective communication and coordination mechanism between government departments and the public and enterprises, timely and accurately disclose all kinds of environmental information, and strengthen the public's right to know and supervise. To actively cultivate various social organizations in the field of ecological civilization construction, guide their healthy and orderly development, support them to develop ecological civilization public welfare activities, and actively and steadily carry out public interest litigation against environmental pollution and ecological damage behavior.
3.6. To advance the rule of law and build the Hefei model with a systematic and complete ecological civilization system

The laws and regulations that continuously improve the green development of the city are the weakest link in the sustainable development of Hefei City. Consequently, the government should use the institutional system to protect the ecological environment, guide, standardize and restrict the development, utilization and protection of natural resources, accelerate the establishment of a sound and complete legal system of urban ecological civilization, and establish an ecological environment compensation mechanism. It is necessary to constantly improve the supervision system of the ecological environment, strictly abide by the red line indicators of natural resources and ecological environment, and improve systems regarding the ownership of resource assets as well as the control of their use. At the same time, it is also needed to strengthen statistical monitoring and construction of environmental protection capacity, establish a comprehensive evaluation index system for ecological civilization, step up efforts in law enforcement and supervision, and implement “zero tolerance” for all kinds of violations of environmental laws and regulations with severe punishment.

4. Conclusion

This paper reviews the main achievements and problems of Hefei’s green development and proposes the strategy of green development, which means reducing excessive consumption of resources, comprehensively promoting industrial upgrading, promoting ecological culture, strengthening rule of law, environmental protection and eco-governance and pushing forward the continuous improvement of the ecological environmental quality in order to construct Hefei as a green development model city of comprehensive, coordinated and sustainable economic, social and ecological development.

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