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# Circular Economy Action Programs and Countermeasures for Small and Medium-sized Resource-based Cities of China- Case Study of Zibo City of Shandong Province

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## Abstract

The development of small and medium-sized resource-based cities is facing an important strategic turning point. Circular economy development model is the only way for their transformations. With Zibo city of Shandong province as an example, the paper sets forth the circular economy action program and countermeasures for resource-based cities. The paper is divided into five parts. The first is the introduction and the second part assesses the current situations and the conditions of circular economy in Zibo city. The third part puts forward the action program of the circular economy. In the fourth part, the paper brings up specific countermeasures from four respects. In the last part, the paper gives a summary.

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## 1. Introduction

The current global economic model is basically market-driven with manufacture industries as the main body of economic system, ignoring the capacity of basic ecological development. The misleading signals of market information to all aspects of economic life result in the evolution of regional economic development towards destroying environment support systems. In the context of this development, we must change the original development model, which is harmful to the ecological system, to circular economy. Circular economy is an ecological economy system characterized by clean production,

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recycling of resources and wastes. It will minimize resources consumption and pollution, reducing the ecological and social costs of the development, and harmonize ecological, economical and social benefits. Zibo City is a typical resource-based city, with its economy based on resources exploitation and utilization, and its economic growth has been driven by high input, high energy consumption and high pollution. After years of development, Zibo City's economy is now faced a bottleneck of economic growth. It is of great theoretical and practical significance to study how Zibo City can transform its economic development model from the traditional linear development model to recycling economy development model in the overall context of building a well-off society.

## **2. Assessment of Development of Circular Economy of Zibo City**

### *2.1. Achievements in the strategy of circular economy of Zibo City*

#### *2.1.1. The concept of sustainable development and eco-consumption concept deeply rooted*

Promoted by governments and the communities and with the rising level of public education and living standards, people's environmental awareness is growing. "Efficient" and "energy saving", and "green" type of products are gradually welcome by more and more consumers of all ages and "saving energy" and "reasonable use of water resources" is generally recognized and has become into their conscious actions. The formation of these ideas and awareness provides a guarantee for the city to implement the strategic development of circular economy.

#### *2.1.2. Wide spread application of cleaner productions in industry and agriculture*

In recent years, Zibo City has actively carried out clean production and improved the clean production processes and incentive policies. Zibo has also launched clean production voluntary initiatives to encourage enterprises to engage in clean production audit and has achieved the objective of "economize energy, reduce energy consumption, decrease pollution, increase benefits"

#### *2.1.3. Gradually implementation of ecological agriculture in rural communities*

Zibo City has implemented circular economy in the new rural construction and actively promoted eco-agriculture development and recycling consumptions, and has made great achievements. For example, based on natural conditions and socio-economic conditions, Huantai County has selected some most appropriate unit of the local ecological environment and built a farming-based industrial structure with aquaculture as the key, and agricultural and sideline products processing and utilization as the central link and formed an artificial ecosystem of good recycling of resources and full conversion of energies

### *2.2. Problems in the development of circular economy in Zibo*

Currently, Zibo City is at the initial stage of circular economy. The implementation of the pilot programs is mainly in a few large enterprises and the effect was not extended to the "line" and "face." Development of circular economy is facing some barriers to be addressed urgently.

#### *2.2.1. Inadequate awareness of and weak participation in circular economy*

Many departments, regions and firms blindly pursue GDP and lack of crisis sense of resources and environment. They have not accepted the ideas of full process control to reduce resources consumptions and pollutant emissions from the sources.

#### *2.2.2. Policies and mechanisms to guide the enterprises are not effective enough*

The current pricing structure and incentives can not guarantee spontaneous run of the circular economy in the current market condition. The rational rule of “Pay by the Polluters” has not been implemented and insufficient supervision and monitoring tools result in the ineffective pollution control and management. Recycling waste of resources still costs more than using the ready-made resources and the recycling of renewable resources becomes unprofitable.

#### *2.2.3. Inadequate technological development and application due to the lack of support policies*

Influenced by the traditional linear economy, business technology strategy is often fragmented and it is very difficult to form an inter-enterprises ecological productions model. In fact, no matter how optimized a single technology is, it is incomplete from the points of saving resources, reducing energy consumption and pollutants. Thus in the circular economy, new technology strategy can not be simply based on a single technology and should be arranged from the perspective of the overall technology system. In circular economy all technologies, which can reduce material consumption, close material flow and reduce waste, should be overall considered as a part of a technological system, not just as a single "clean" technology lists.

#### *2.2.4. Insufficient capability of the governments for the ecological society building*

The root causes of low efficiency of the overall resources utilization are the low level of technologies and equipments and backward of management. Pollution prevention and waste disposal capacity is still very weak. Many problems still exist in the managements of governments. The legal system and policy system of circular economy are still incomplete and some of them are difficult to put into practice; China has not formed a overall development and promotion plan for circular economy; resource efficiency indicators and accounting system are still to be perfected; the responsibilities among government departments need to be defined; effective incentive policies, recycling system and a reasonable fee mechanism has not yet been established; recycling economy promotion, education and training needed to be strengthened considerably.

### **3. Zibo City Action Plan of circular economy**

Zibo should implement circular economy development model and take it as an effective carrier and focus of sustainable development to accelerate economic restructuring and optimization of productive forces, to address the conflict among the protection of ecological environment, use of natural resources and the development of social economy. This will be conducive to establish a new development advantages, better protect and develop productivity and will revitalize the old resource-based industrial city.

#### *3.1. Transformation from resources-based pattern to ecological pattern agriculture*

Ecological agriculture can reasonably use the ecological resources and produce as many animal, husbandry and fishery products while maintaining the ecological balance. Development of ecological agriculture will promote the circular economy of Zibo City. First, the ecological agriculture is the key foundation of circular economy and the entire national economy of Zibo; second, from sustainable development perspective, the development of eco-agriculture with circular economy as the centre is realistic way to solve "three rural" issues. At the same time, the implementation of circular economy is the inevitable choice for sustainable development of agriculture.

#### *3.2. The implementation of clean production and building of eco-industrial parks*

The practices of circular economy in enterprises belong to a minor circulation, characterized by the micro-circulation of matter and energy within a single company. It is a kind of industry oriented by clean production with the production system and process designed in line with the circular economy idea to promote the circular utilization of material and energy with a company in Zibo. Meanwhile, Zibo should take more attention to build eco-industrial parks and encourage the petrifaction industry, porcelain industry, mechanic industry, electron industry, construction material industry and textile & silk industry to establish eco-industrial parks, so that a industrial “food chain” and “food net” just like those of the natural eco-systems can be established, a mutualism ecological networks can be formed, closed circuit in logistics can be realized, the utmost utilization of matter and energy can be guaranteed and the eco-production chain can be formed in economic development of Zibo.

### *3.3. Promoting the development of circular society*

Circular economy on the social level is to develop a circular society. In this level, the circular utilization of matter and energy is realized in the production process and consumption process by the recycling of wastes. Large circulation contains two interactive sides: the macro policy guide of the government and the micro living behaviour of the social public. Production with recycling resources can not only save natural resources but also consume less, discharge less.

## **4. Counter measures research on the development of circular economy in Zibo**

### *4.1. Strengthening the guidance on circular economy and establishing the policy-support system in the development of circular economy*

According to Scientific Concept of Development and the requirements of “Five Overall Arrangements”, we should treat developing circular economy as the important guidance and principle in the compilation of The 12th Five-Year Plan of Zibo and all the other special plans, regional plans and city plans, quicken the compilation of special research and planning in circular economy in every keystone fields, and promote the establishment of information and supervising system for the development of circular economy. Meanwhile, we should establish the economic incentive system for circular economy and the regional legal system tailored to the development of circular economy in Zibo. We also need to strengthen the technical support system of R&D and technological applications.

### *4.2. Establishing the inner-enterprise and inter-enterprise circular system and overall planning of circular industry development*

We should make sure the key role of circular economy and carry it out into every aspects of economic and social development. After several year’s effort, we should basically form an industry circular system adapted to the circular economy, realize the large circulation of resources in different industries and social areas, establish the circular links within and among enterprises, so that the production material and energy can be circulated in every processing technique and production phase and the resources can be utilized efficiently. The inter-enterprise circulation can be restructured on the foundation of the existing 18 industry parks and finally shaped as circular economy industry parks. At the same time, according to the thought of combination of the Point-Line-Surface, we should actively create circular economy demonstration enterprises, demonstration industry, demonstration eco-industry park and demonstration district and county, carry out of ISO14000 Environment Management System in enterprises, increase the proportion of authentication and standardize the implementation of green management of enterprises. We

should promote actively the adjustment of industry structure and product structure, push the development of eco-agriculture, develop actively eco-industry and circular economy in the tertiary industry step by step and build the overall circular system of the three industries in Zibo. We should emphasize and increase the support to vein industry which is characterized by the technique of converting waste into useful material, establish and perfect the resource recycling system and build a circular-style city.

#### *4.3. Advocating Green Life and Consumption and improving the quality of the population in circular economy development*

In order to develop circular economy, the public should establish values ethics and consumption philosophy in harmony with environment, choose voluntarily the Green Lifestyle and Green Consumption which are friendly to the environment, push the transfer of market toward circular economy. The news media, social organizations should play an important role in publicizing the idea and knowledge of circular economy, advocating eco-civilization. We should strengthen the circular economy awareness of the whole society, promote the participation of the public in Green Consumption and buying goods with environmental labels. We should strengthen the environmental awareness of the public, establish the right production ethics, consumption ethics and development philosophy, and develop circular economy constantly.

#### *4.4. Enforcing the adjustment of FDI and strengthening the cooperation and communication with foreign countries in circular economy area*

We should establish environmental criteria in attracting investment in Zibo. First, we should try to attract “three high and three low” (high technique, high knowledge and high value added with low material consumption, low energy consumption and low pollution) investments, and try our best to decrease three low, three high (high material consumption, high energy consumption and high pollution with low technique, low knowledge and low value added) investments; Second, we should carry out the environmental criteria strictly on the necessary resource intensive or labour intensive projects. The firms should equip with relative techniques and equipments for clean production to reach the requirements of environmental protections. We should make a scientific layout and systemic projects argumentations on the attracted projects, arrange them according to their different functions rather than letting the investors choose the sites freely to avoid disorganizing the function area layouts. At the same time, we should participate actively in the international cooperation and communication in circular economy, attract the advanced environmental technologies and management experience of the foreign countries to obtain useful thoughts and elicitation for the carrying out of circular economy strategy in Zibo.

## **5. Conclusion**

There are many problems and difficulties in the development of circular economy in small and medium-sized resource-based cities. We should analyze seriously the development basis of small and medium-sized resource-based cities and find out the advantages and disadvantages. As far as Zibo city of Shandong province concerned, the action plan of developing circular economy is to combine clean production, resources integrated utilization, eco-design and sustainable consumptions. It is the economic developing mode that can promote the harmony between human and nature. It turns the economic activities into a resource-product-recycling feedback flow in line with the bionomics principles. It takes pollution prevention as the starting point, the circular flow of matter as the characteristics, sustainable development of society, economy and the environment as the final aim to realize the effective utilization

of the resources and energy and decrease of the discharge of wastes. That is to say, it can realize low exploitation, high utilization, low emission, recycling, increase the utilization ratio of the resources, decrease the discharge of wastes to the minimum extent, increase the quality and effectiveness of economic development and protect the environment. In the process of developing circular economy in Zibo, we should depend on the efforts of the governments, the enterprises, the public and all the other external factors. The governments should create a good atmosphere for the development of circular economy, use scientific and far-sighted plan to ensure the development of circular economy. Enterprise should establish the circular system, at the same time implement clean production and take matching measures. The public should strengthen their awareness of circular economy and environmental protection, and put them into practice. We should pay attention to the environmental criteria in attracting investments and learn from foreign countries. Only by combining the four aspects together, can we make some achievements in the development of circular economy in Zibo.

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