

# Research on resource and environment evaluation of Qaidam Circular Economy Experimental Zone

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**Abstract.** China's economy is growing rapidly, and the demand for resources and its dependence on foreign countries continue to increase. Exploring the status quo between the regional economy, resource utilization, and environmental protection will improve economic development while protecting the environment and become sustainable development. This paper uses the economic data, "three wastes" emission data, enterprise resource data, and social resource data on the Qaidam Circular Economy Experimental Zone from 2005 to 2017, and uses the entropy weight method to weight the data and then uses the comprehensive evaluation method to evaluate the data. According to the current situation, it is concluded that the industrialized and green development of the experimental zone has achieved remarkable results, and the management and control of the experimental zone management committee is crucial to the development of the experimental zone.

## 1. Introduction

China's economy is growing at a faster rate, and resource demand and external dependence are increasing, but the renewable rate of resources is significantly reduced. The use of resources to develop the economy has become a top priority [1]. At the same time, in the process of economic improvement, economic development will pollute the environment, thereby affecting resource utilization, and how to protect environmentally sustainable development has become an important issue [2]. Finally, even if the above requirements are met, the mismatch of resources will lead to economic development [3]. To this end, the study of resources and the development of the environment in a certain region have important practical significance for improving the economic development of the region.

The greatest value of Qinghai Province is natural resources and pollution-free environment. The greatest potential is natural resources and pollution-free environment. The biggest responsibility is natural resources and pollution-free environment. Therefore, the high-quality development of Qinghai is inseparable from environmental protection and resource protection. The Qaidam Circular Economy Experimental Zone is located in the northwest of Qinghai Province. His economic development directly affects the economic development of Haixi Prefecture and indirectly affects the economic development of Qinghai Province. In 2018, the total production value of Haixi Prefecture ranked second in Qinghai Province's GDP with 62.527 billion yuan. In the same year, Qinghai Province relied on resource development of oil and natural gas mining, oil, coal and other fuel processing industries, coal mining and washing and mining industries to produce varying degrees of growth. Among them, the output of major industrial products such as raw salt, crude oil and potash, which are provided by Haixi Prefecture, covers the province's output and reaches 100% coverage. This shows the resource utilization of Haixi Prefecture for the utilization of resources in Qinghai Province. Finally, Qinghai



Province, as the source of Sanjiang, environmental protection is the first development. The Qaidam Circular Economic Zone relies on the Qaidam Basin and has natural features such as mountains, hills, Gobi, and plains, as well as non-renewable natural resources such as coal, oil, and salt lakes. The ecological environment is very fragile, so it is especially important to protect the environment.

In summary, regional resources are restricted to regional development and regional environmental impact to regional development. In this case, to develop a regional economy, a balance must be reached with regional and regional environments. In the Qaidam Circular Economy Experimental zone, where economic development, environmental protection, and resource utilization are required, it is important to analyze resource and environmental assessment research. Therefore, the objective evaluation of its development status should be carried out, and the specific implementation strategy of resource utilization, environmental protection and economic development in the Qaidam Circular Economy Experimental Zone should be formulated.

## 2. Empirical research

### 2.1 Construction of resource and environment evaluation index system in Qaidam circular economy test zone

In the existing literature, there are many literature studies on regional environmental protection and regional resource utilization evaluation. In the study of resource and environment in a certain zone, the entropy method is also used, such as studying regional resource and environmental carrying capacity [4], ecological efficiency and resource and environmental carrying capacity [5], resource and environmental stress measurement [6]. In these studies, the evaluation content is divided into economic indicators, environmental indicators and resource indicators. The minority is divided into economic indicators and ecological indicators. However, the allocation methods of these indicators are not enough to describe social resources other than natural resources. The impact of economic development and environmental protection. Social resources are usually dominated by manpower, material resources, financial resources, and social space. The government allocates resources mainly. These resources have regional restrictions and regional characteristics, and are also important resources that affect regional economic development. Especially for the Qaidam Circular Economy Experimental Zone, the endogenous power is insufficient, and the external thrust caused by the government resource allocation is an important factor in economic development.

Therefore, this paper divides the resource and environmental assessment system into four dimensions: economic development, pollution emissions, enterprise resource consumption, and social resource investment, and then divides it into 10 major indicators (Table 1). It should be noted:

(1) The economic development of Haixi Prefecture mainly depends on the economic level of the test zone, so the GDP of Haixi Prefecture is approximately equal to the economic level of the test zone.

(2) Since the energy consumption of Haixi is mainly for the production of enterprises in the test zone, the total energy consumption of Haixi is approximately equal to the total energy consumption of the test zone. The resource-based enterprises in the test zone account for the majority, and the energy consumed is mainly the various energy sources in the test zone, including but not limited to coal energy.

(3) The total power consumption reflects the overall power consumption of the test zone. The power consumption of Haixi can be roughly divided into three parts according to the use of electricity: one is the electricity consumption of residents in Haixi, and another one is the electricity consumption of Haixi enterprises, and the third is the electricity consumption of infrastructure in Haixi. Since most of the residents of Haixi Prefecture work or serve the test zone, the electricity consumption of this part of the population is also included in the electricity used in the test zone; the remaining residents who do not work or serve in the test zone have a small proportion of electricity consumption and do not constitute a data threat. As Haixi Prefecture protects ecological development, its affiliated enterprises are concentrated in the major industrial parks of Haixi Prefecture, namely the Qaidam Circular

Economy ExperimentalZone. Therefore, Haixi enterprises use electricity, where is, enterprises in the pilot zone. Finally, in the infrastructure electricity consumption of Haixi, the target population of the school electricity is mostly the children of the employees in the pilot zone or the children of the employees serving the test zone; the target population of the hospital electricity is mostly the employees and their families in the test zone or serve the test zone. Other electricity use, such as the use of solar power in Haixi, is mainly based on solar power, and does not belong to this indicator system.

(4) The number of employees refers to the number of people working in the secondary industry with residents of Haixi Prefecture, which can reflect the human resources input in the pilot zone. Due to the remoteness of the Haixi Prefecture, most of the employees in the secondary industry mainly work in the experimental zones. Therefore, the number of employees in the second industry in Haixi is approximately equal to the number of local residents in the pilot zone.

(5) Social fixed assets investment can reflect the investment in the construction of fixed assets such as factories, buildings and machinery in the test zone, which has a good effect on reflecting the anti-risk ability of the test zone and the stability of assets. At the same time, since the construction of Haixi Prefecture is mainly based on the pilot zone and supplemented by other industries, the investment in fixed assets of the whole state is equal to the investment in social fixed assets in the pilot zone, ignoring investment in other industries.

Table 1. Index system of resources and environment evaluation in the test zone

Dimension	Index	Indicator code	Indicator properties
Economic development	Economic aggregate(Billion yuan)	C1	+
pollutant emission	Total industrial wastewater discharge (10,000 tons)	C2	-
	Total industrial exhaust emissions (tons)	C3	-
	Total industrial solid waste emissions (10,000 tons)	C4	-
Enterprise Resources	Total energy consumption (10,000 tons/ standard coal)	C5	-
	Total power consumption (100million Kw/h)	C6	-
community resource	Employees(number)	C7	+
	Investment in social fixed assets (Yuan)	C8	+
	R & D investment (Yuan)	C9	+
	Land for transportation (m2)	C10	+

## 2.2 Data sources

All data are from the 2005-2017 "Haizhou Statistical Yearbook". The reason for choosing the 2005 data as the starting point is that the establishment of the Qaidam Circular Economic Zone in 2005; the 2018 "Haizhou Statistical Yearbook" has not yet been published. Some data are not available, so as of 2017.

## 2.3 Calculation steps

**2.3.1 Data preprocessing.** The units of the selected index data are different. In order to avoid the problem that different units cannot be summarized, dimensionless processing is specially selected. This paper chooses the range normalization method to perform dimensionless processing on the data:

$$C_{ij} = 1 + 9 * \frac{C_j - \text{Min}C_j}{\text{Max}C_j - \text{Min}C_j} \quad (1)$$

**2.3.2 Calculating weights.** In order to ensure the objectivity of the weights, the entropy weight method is specifically used to give weights. The calculation process is as follows:

(1) There are "m" time series and "n" evaluation indexes, and the index value is  $c_{ij}$  ( $1 \leq i \leq m$ ,  $1 \leq j \leq n$ ),

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^m x_{ij}} \quad (2)$$

(2) Calculate the entropy of the j-th index:

$$e_j = -k * \sum_{i=1}^m p_{ij} * LN p_{ij} \quad (3)$$

And,  $k = \frac{1}{LN(m)}$

(3) Measurement weight:

$$w_j = \frac{1-e_j}{\sum_{j=1}^n 1-e_j} \quad (4)$$

2.3.3 *Comprehensive Evaluation.* There are many methods for comprehensive evaluation. This paper chooses the linear weighted summation method with the following formula:

$$P = \sum_{j=1}^n C_j * W_j \quad (5)$$

### 3. Result analysis

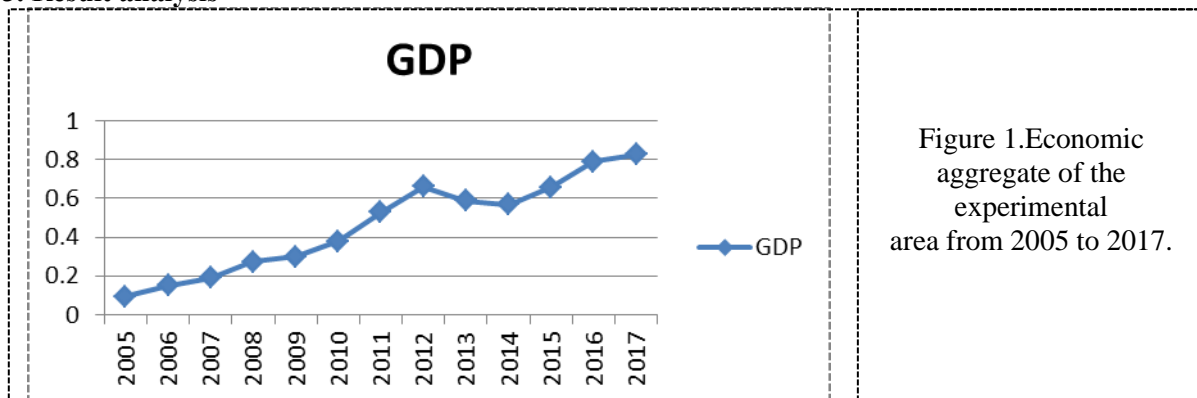


Figure 1. Economic aggregate of the experimental area from 2005 to 2017.

#### 3.1 Economic evaluation

As shown, the GDP of the Qaidam Circular Economy Experimental Zone in 2005-2017 is in a process of tortuous rise. From 2005 to 2011, the economic growth rate of the pilot zone rose to the first peak, a total increase of 447%, which is in line with the pilot zone 2014. The annual economic scale of the test zone dropped from 0.58 to 0.56, a decrease of 3%. This is because the enterprises in the test zone severely rectified that they did not meet the requirements of the circular economy and ordered them to make changes. The test zone has been increasing significantly from 2014 to 2017, reaching the second peak of 0.83 in 2017. This is in line with the 2010 State Council's approval of the "Qaidam Circular Economy Experimental Zone Master Plan" and the development of the test zone from 2010 since the beginning of the year, the pilot zone has taken "industrialization" and "greening" as the development priorities, and prioritized economic development and environmental protection. Based on this, the local strategy of the construction country has been upgraded to a national strategy, which has strengthened the economic development of the pilot zone. In 2012, the total economic volume of the pilot zone began to increase, and it began to rise steadily in 2014, achieving the goal of coordinated development of industrialization and greening.

### 3.2 Pollution Evaluation

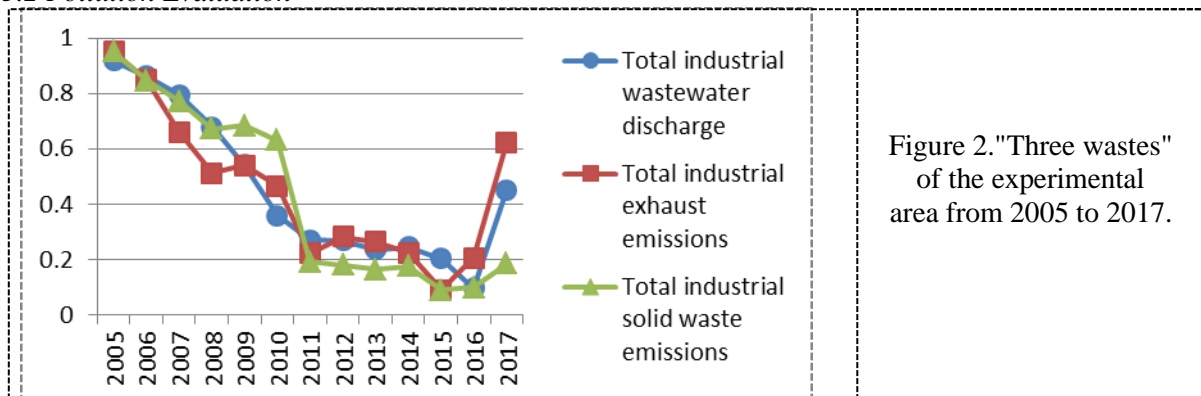


Figure 2. "Three wastes" of the experimental area from 2005 to 2017.

The degree of pollution discharge in the test zone has been in a declining stage since 2005, which is related to the increase in the scale and number of industrialized enterprises in the test zone. From 2005 to 2010, the total discharge of the "three wastes" in the test zone decreased. Compared with 2005, the total wastes water discharge decreased by 60%, and the total waste gas discharge decreased by 51%, and the total solid waste discharge decreased by 34%. From 2011 to 2017, the pollution emission map of the test zone showed a trend of first decrease and then increase. The total amount of industrial waste gas discharge, total waste water discharge, and solid waste were higher than in 2011. This phenomenon can be reflected as environmental protection in the test zone. With the increase in intensity, the "three wastes" emissions are strict, but the number of polluting enterprises has increased and the pollution has increased.

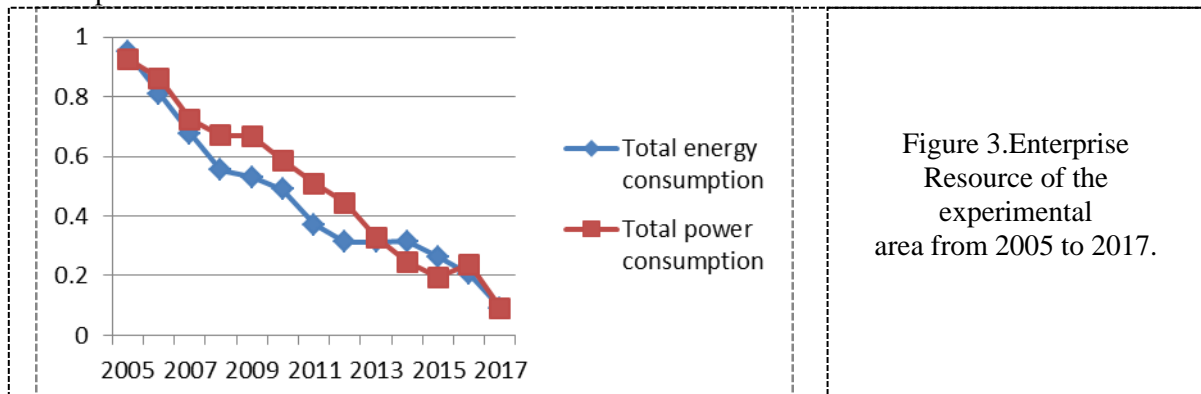


Figure 3. Enterprise Resource of the experimental area from 2005 to 2017.

### 3.3 Enterprise Resources Evaluation

From Figure 3, it can be seen that the total energy consumption and total power consumption of the companies in the test zone have been decreasing. This is because, although the number of industrial companies in the test zone has increased, corporate management has become more stringent and resource utilization has been higher. From 2005 to 2017, the total energy consumption decreased by 91%, and the total power consumption decreased by 90%.

### 3.4 Social Resources Rating

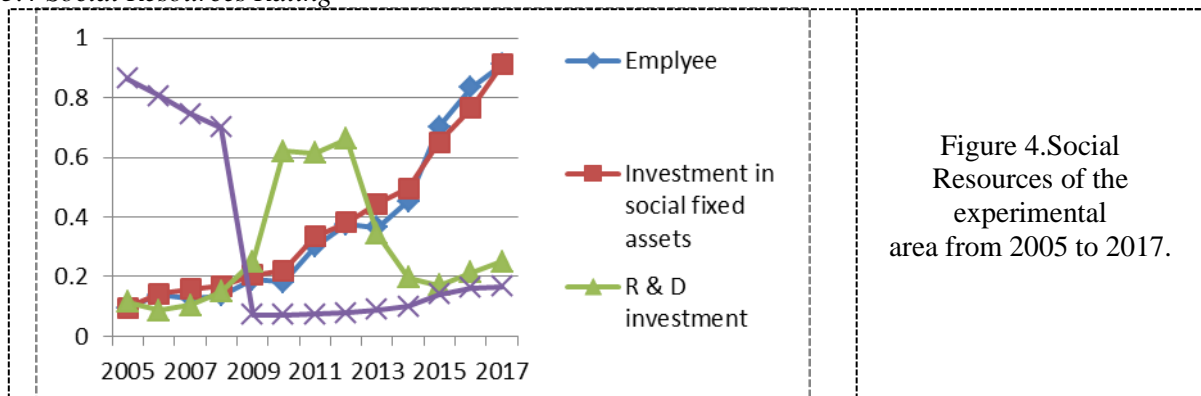


Figure 4. Social Resources of the experimental area from 2005 to 2017.

It can be seen from Figure 4 that the number of employees and the investment in social fixed assets show an upward trend. The evaluation of transportation land first decreases and then slowly rises, while R & D investment first increases and then decreases. This is because in 2010, after the development of the pilot zone was upgraded to a national strategy, national investment increased. Most of the projects were 3 years in the period, and other projects were less than 1 year and 5 years. Therefore, in 2015, R & D investment returned to the beginning of the state. The gap in the evaluation of transportation land is so large because in 2005-2008, all transportation land was counted in three years. In 2009, it was adjusted to start counting enterprise transportation land. The data volume is different. The other two data indicators, the number of employees and the investment in social fixed assets, are based on the development of the experimental zone.

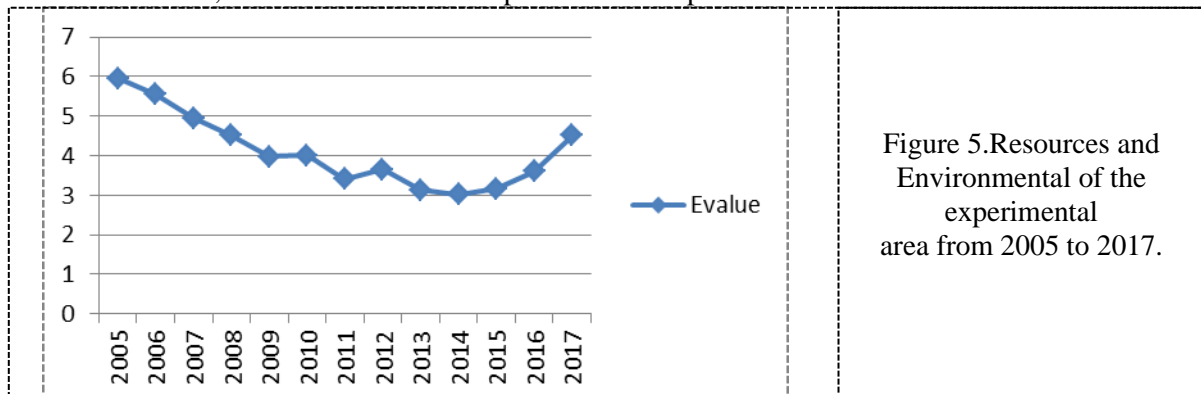


Figure 5. Resources and Environmental of the experimental area from 2005 to 2017.

### 3.5 Resources and Environmental Assessment

In summary, from 2005 to 2017, the evaluation of the resources and environment in the test zone showed a slow decline and growth. From 2005 to 2014, the evaluation of the resources and environment in the test zone continued to decline. Based on the above four figures, it can be seen that the main reason for Decline. The 2015-2017 test zone has a high assessment of resources and environment, increased economic aggregates, low resource consumption, and a high degree of environmental protection. At the same time, as the total economic volume of the test zone continues to increase, the environmental pollution index is not only rising but is getting lower and lower, and the degree of environmental protection is also improving. It can be clearly seen that the environmental management level of the test zone is getting higher and higher.

## 4. Conclusion

Nowadays, the economic development of the experimental zone is rapid while protecting the environment, and it has realized the coordinated development of industrialization and greening, and the prospects are good. For the sustainable development of the Qaidam Circular Economy Experimental Zone, it is important to balance the relationship between economic development and the



ecological environment. As the main body of development, the test zone must shoulder this responsibility and realize the coordinated development of industrialization and greening. The Management Committee of the Pilot Zone has undertaken important responsibilities in it, and it can be seen that major changes in the Pilot Zone are inseparable from the leadership of the Management Committee. Under the leadership of the Management Committee of the Pilot Zone, the Pilot Zone increases resource utilization, develops various industries on the basis of protecting the environment, enhances the development of the Pilot Zone, meets the needs of residents, protects the ecological environment, and finally realizes the harmonious coexistence of man and nature.

### Acknowledgments

First of all, thank you my mentor for guiding us and providing the “Circular Economy Institute” for us to study; secondly this research was financially supported by the National Science Foundation. The project name is “Study on the coordinated development of industrialization and greening in Qaidam circular economy experimental zone”, the project number is 18BJY012.

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