



Operating Performance of China's Environmental Governance Industry Under the Impact of COVID-19

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ABSTRACT

With the continuous emergence of environmental problems in recent years, governments of various countries attach great importance to the application of key core technologies such as energy conservation and efficiency, low carbon environmental protection, resource recovery and recycling. The implementation of environmental management concepts is emphasized such as clean production and energy efficiency. As a result, the environmental governance industry has achieved rapid development. However, under the impact of COVID-19, the operation and development of environmental governance industry may be restricted. To explore COVID-19 influence on the operating performance of China's environmental governance industry, Dongzhu Ecological Environment was selected as the research object, and the operation performance of Dongzhu Ecological Environment was analyzed by using the factor analysis method. The results show that the operating performance of Dongzhu Ecological Environment gets up a lot, with the rise of the whole industry due to the epidemic. Additionally, some management implications were put forward that adopted by the environmental governance industry to better promote the coordinated development of economy, society and environment.

INTRODUCTION

At the beginning of 2020, the new epidemic hit the whole world, severely cut off the flow of human, material, and resources, which brought a serious impact on China's economy and enterprises. As the epidemic spreads around the world, epidemic prevention and control work is carried out in an orderly manner, and the economic situation has undergone major changes. The market pattern is divided, and enterprises are faced with serious challenges in resuming work. The epidemic has dealt a blow to China's economy. Many cities in China have already begun blockades. It is difficult for workers to return to work, so they can only find jobs online, and enterprises cannot start to work offline. They have to bear certain rents and wages of employees and face severe challenges. As the epidemic situation in foreign countries is becoming more and more serious, especially the environmental management enterprises have been hit hard, and the impact of the epidemic on countries is sudden and long-term. Affected by the epidemic situation, the risk resonance and risk spillover effects of consumption, investment, production price index, import and export trade, and other macroeconomic fields have been greatly improved, and the risk transmission path has changed significantly.

In the face of the increasing demand for ecological and environmental protection, ecological repair should be

focused on. The case study of Dongzhu Ecological Environment focuses on the ecological wetland field with "water treatment" as the core, and it systematically provides customers with the whole industrial chain solutions of ecological environment construction and restoration engineering from the aspects of planning, design, procurement, construction and maintenance. At the same time, it adheres to the business optimization and upgrading strategy and seeks breakthroughs in other niche areas of ecological restoration. The enterprise actively and deeply distributed water ecological management, mine rehabilitation and forest park projects, trying to gradually achieve the overall coverage of ecological rehabilitation industry and to improve its comprehensive strength and brand effect. In the current epidemic environment, it is of a certain value to ensure that environmental protection enterprises can effectively carry out their business, rapidly improve their business performance, and indeed make great efforts to improve the ecological environment and create a good living environment.

PAST STUDIES

In recent years, with the continuous emergence of environmental problems, environmental governance has increasingly received extensive attention from the government and all sectors of society. With the dual opportunities of

policy support and market demand-driven, the environmental governance industry has achieved rapid development, and scholars have also conducted extensive research on its operating performance. Zhu & Gong (2014) and Wang & Huang (2016) took environmentally friendly listed companies as research objects and found that their operating performance is at a low level through the DEA evaluation model. It's negatively affected by the institutional environment in emerging markets (Alexandre & Renato 2020). Cheng & Yao (2018) evaluated the performance of ecological protection and environmental governance industry and found that the comprehensive performance of this industry shows a decreasing trend year by year, and indicators such as management costs, fixed assets and the number of employees did not reach the corresponding output level. Arrangement and operation rate of environmental protection equipment, number of R&D expenditure, environmental protection technology achievement awards, environmental investment, sewage charge were selected as evaluation indicators (Niu 2018, Ames et al. 2020). Discontinuous environmental events such as rewards and fines were regarded as indicators to reflect the accumulative performance of enterprises, and their environmental initiatives were reflected by the reputation index of enterprises (Baldo 2018). Due to defects and insufficiency of the traditional perspective of enterprise environmental performance evaluation, a new perspective was proposed based on the value chain theory to the internal value chain and external value chain of each link, respectively. Environmental performance evaluation and new evaluation system were built from three dimensions, namely evaluation index, evaluation method and environmental disclosure of value chain of environmental performance (Cardoso et al. 2019). Lv et al. (2018) believed that profitability and growth ability are the keys to improving the operating performance of listed companies in the environmental governance industry. He also proposed that the development of businesses in the form of operational projects can improve the environmental governance benefits and promote the diversification of profit models. Different scholars at home and abroad had put forward different evaluation methods for environmental performance evaluation. According to the summary of existing literature, the commonly used methods in domestic and foreign academic circles included analytic hierarchy process, data envelopment analysis, fuzzy comprehensive evaluation, grey relational degree, artificial neural network method and so on. Among them, the more subjective methods included AHP, and the more objective methods included data envelopment analysis, grey relational degree method (Niu 2007, Zhou & Huang 2018). Environmental performance evaluation of enterprises was

put forward to combine enterprise goal establishment, with the management system and production management, and the key to choose environmental performance indicators and monitoring environmental activities and environmental performance evaluation was using the SPC technology to manage environmental performance, using the system capability index to monitor environmental risk, and analyzing the change of the risk to get the key area of environmental performance evaluation. The risk assessment method was adopted, the quantitative indicators of environmental performance evaluation were established. Different indicators had corresponding environmental risk assessment, which was used to identify the priority of indicators and the environmental factors (Schmidt & Sewerin 2019).

However, the existing studies on the operating performance of listed companies in the environmental governance industry mainly focus on a single dimension and lack systematic and comprehensive analysis. In the context of climate and social and ecological changes, the environmental governance industry faces higher challenges (Boyd 2018). Whether the business performance of this industry is impacted by the influence of COVID-19 and how the response effect is worth further exploring.

MATERIALS AND METHODS

Sample Selection and Data Sources

According to the listed companies published on the websites of Shanghai and Shenzhen stock exchanges in 2020, the study classifies the "environmental governance" listed companies and selects 12 ones as the research samples based on the availability of financial data of listed companies. Based on the data from 2019 to mid of 2020, the financial performance of Dongzhu Ecological Environment is compared. This study mainly relies on the Wind information and the CSMAR database to collect data and standardize the variables to eliminate dimensions.

Modelling

The factor analysis method can be expressed by a mathematical model, with the p variables x_1, x_2, \dots, x_p . The mean value after standardization is 0, and the standard deviation is 1. x_1, x_2, \dots, x_p are expressed in linear form by using $k(k < p)$ factors, namely, f_1, f_2, \dots, f_k .

$$\begin{cases} x_1 = a_{11}f_1 + a_{12}f_2 + \dots + a_{1k}f_k + \varepsilon_1 \\ x_2 = a_{21}f_1 + a_{22}f_2 + \dots + a_{2k}f_k + \varepsilon_2 \\ \dots \\ x_p = a_{p1}f_1 + a_{p2}f_2 + \dots + a_{pk}f_k + \varepsilon_p \end{cases} \quad (1)$$

Equation (1) shows the linear equations of this method. The matrix expression is

$$x = af + e' \tag{2}$$

In the above formula, f is the factor, and the correlation coefficient $f_j(j = 1, 2, \dots, k)$ is 0. a is the factor load matrix and $a_{ij} = 1, 2, \dots, p; j = 1, 2, \dots, k$ is the factor load. e' is a special factor, which is independent of $f_j(j = 1, 2, \dots, k)$.

Index System Selection

Following the relevant provisions of the state-owned capital performance evaluation rules issued by the Ministry of finance, this study constructs a comprehensive evaluation index system of the financial performance of listed companies based on the principle of obtaining data objectively and comprehensively, drawing on the results of domestic and foreign scholars on financial performance evaluation (Table 1). Referring to Gu (2009), Zhang & Shen (2013), Tao et al. (2016) and Hou & Cao (2019), this study analyzes from the following aspects, solvency (liquidity ratio, quick ratio, asset-liability ratio), operational ability (turnover rate of accounts receivable, inventory turnover, the turnover rate of total assets), profitability (return on equity, return on invested capital, operating profit margin), growth ability (growth rate of total assets, the growth rate of

net intangible assets, rate of capital accumulation).

RESULTS ANALYSIS

KMO and Bartlett Spherical Test

In this study, the KMO test and Bartlett spherical test are used to verify the correlation between the selected variables and explore whether they meet the factor analysis conditions. The test results show that the KMO values from 2019 to 2020 are 0.506 and 0.502, respectively, which are both greater than 0.5. The significance probability p-value (sig=0.00) of Bartlett's spherical test from 2019 to 2020 is 0.000, which all meet the test standards and can be factored in.

Factor Analysis

The common factor is extracted, and the eigenvalue and contribution rate of the correlation matrix are obtained by using the rotation method of maximizing variance. The calculation results of the correlation matrix are provided in Table 2. It can be seen from the table that four eigenvalues meet the conditions from 2019 to 2020, and their cumulative variance contribution rate exceeds 75%.

Table 1: Operating performance evaluation index system construction of environmental governance industry.

| Primary index | Secondary index | Calculation formula |
|---------------------|--------------------------------------|---|
| Solvency | Liquidity ratio | Current assets/current liabilities |
| | Quick ratio | Quick assets/current liabilities |
| | Asset liability ratio | Total liabilities/total assets |
| Operational ability | Turnover rate of accounts receivable | Operating income/average balance of accounts receivable |
| | Inventory turnover | Operating cost/average inventory balance |
| | Turnover rate of total assets | Operating income/average balance of assets |
| Profitability | Return on equity | Net profit/average net assets |
| | Return on invested capital | Operating profit/invested capital before interest and after-tax |
| | Operating profit margin | Operating profit/revenue |
| Growth ability | Growth rate of total assets | Total assets growth of the year/total assets at the beginning of the year |
| | Growth rate of net intangible assets | Increase in net intangible assets/net intangible assets at the end of last year |
| | rate of capital accumulation | Ending owner's equity/beginning owner's equity |

Table 2: Eigenvalues and the contribution rate of principal components.

| Year | Ingredients | Extract sum of squares load | | Rotate sum of squares load | |
|-------------|-------------|---|-------|---------------------------------|---|
| | | Cumulative variance contribution rate % | Total | Contribution rate of variance % | Cumulative variance contribution rate % |
| 2019 | 1 | 31.89 | 4.69 | 29.33 | 29.33 |
| | 2 | 51.73 | 3.12 | 19.48 | 48.81 |
| | 3 | 66.29 | 2.40 | 14.98 | 63.78 |
| | 4 | 76.32 | 2.01 | 12.54 | 76.32 |
| Mid of 2020 | 1 | 32.07 | 4.02 | 25.10 | 25.10 |
| | 2 | 50.71 | 2.96 | 18.51 | 43.61 |
| | 3 | 64.76 | 2.31 | 14.42 | 58.03 |
| | 4 | 74.28 | 1.80 | 11.23 | 69.25 |
| | 5 | 81.23 | 1.73 | 10.81 | 80.06 |
| | 6 | 87.70 | 1.22 | 7.64 | 87.70 |

Model calculation: This study adopts the regression analysis method to calculate the scores of principal factors F_1 , F_2 , F_3 and F_4 , which represent profitability, debt repayment, growth

and anti-risk ability. After taking the common factor rotation, the variance contribution rate is taken as the weight, and the weighted sum is sorted.

$$F_{2019} = (F_1 * 29.33\% + F_2 * 19.48\% + F_3 * 14.97\% + F_4 * 12.54\%) / 76.32\% \quad \dots 3$$

$$F_{2020} = (F_1 * 25.1\% + F_2 * 18.51\% + F_3 * 14.42\% + F_4 * 11.23\% + F_5 * 10.8\% + F_6 * 7.63\%) / 87.87\% \quad \dots 4$$

Calculation results: Table 3 shows the comprehensive scores and rankings of the financial performance of listed companies in the environmental governance industry from the beginning of 2019 to June 2020. From the comprehensive score, it can be seen that different strategic choices under the epidemic situation of Dongzhu ecological environment have had a

greater impact on financial performance. In recent years, its financial performance has maintained rapid growth, and it gets better when the epidemic is controlled.

The empirical analysis concludes that despite the impact of the epidemic, the sales level of Dongzhu Ecological Environment has declined, as long as it adopts appropriate

Table 3: Comprehensive score and ranking of the financial performance of listed companies in environmental treatment industry from 2019 to mid of 2020.

| Period | Name | Stock code | F1 | F2 | F3 | F4 | F5 | F6 | Comprehensive score | Ranking |
|-------------|---------------------------------|------------|--------|--------|--------|--------|--------|--------|---------------------|---------|
| 2019 | Wangneng Environment | 002034 | 1.328 | 0.347 | 0.220 | 2.242 | | | 1.010 | 1 |
| | Lvyin Ecology | 002887 | 0.824 | -0.591 | 0.069 | -0.447 | | | 0.106 | 2 |
| | Kerong Environment | 300152 | 0.191 | -0.077 | 0.489 | -0.455 | | | 0.075 | 3 |
| | Sanfeng Environment | 601827 | -0.919 | 0.773 | -0.170 | 1.323 | | | 0.028 | 4 |
| | Tus Environment | 000826 | 0.612 | -0.426 | -0.340 | -0.321 | | | 0.007 | 5 |
| | Weiming Environment | 603568 | 0.037 | -0.396 | 0.573 | -0.332 | | | -0.029 | 6 |
| | Guozhen Environment | 300388 | 0.095 | -0.256 | 0.300 | -0.374 | | | -0.031 | 7 |
| | Poten Environment | 603603 | -0.196 | -0.037 | -0.037 | 0.121 | | | -0.072 | 8 |
| | Dongzhu Ecological Environment | 603359 | 0.278 | -0.935 | 0.078 | 0.188 | | | -0.086 | 9 |
| | Hanlan Environment | 600323 | -0.007 | -0.364 | -0.011 | -0.373 | | | -0.159 | 10 |
| | Misho Ecology | 300495 | -0.228 | -0.001 | 0.142 | -0.624 | | | -0.163 | 11 |
| | Yonker Environmental Protection | 300187 | 0.020 | -0.305 | -0.097 | -0.449 | | | -0.163 | 12 |
| Mid of 2020 | Lvyin Ecology | 002887 | 2.151 | -0.033 | 1.705 | 3.183 | 1.753 | 0.751 | 1.575 | 1 |
| | Sanfeng Environment | 601827 | -0.693 | 0.034 | 4.242 | -0.257 | 0.030 | -0.395 | 0.442 | 2 |
| | Kerong Environment | 300152 | 0.690 | 1.447 | -1.596 | 0.230 | 0.418 | 0.732 | 0.384 | 3 |
| | Dongzhu Ecological Environment | 603359 | 1.044 | -0.388 | 0.667 | 0.597 | -0.140 | -0.586 | 0.334 | 4 |
| | Wangneng Environment | 002034 | 0.231 | 0.598 | -0.592 | 1.514 | -0.239 | 0.001 | 0.259 | 5 |
| | Weiming Environment | 603568 | -0.385 | 1.613 | -1.644 | 0.661 | 1.173 | 0.471 | 0.230 | 6 |
| | Tus Environment | 000826 | 1.738 | -0.044 | 0.276 | -2.903 | -0.440 | 0.547 | 0.155 | 7 |
| | Hanlan Environment | 600323 | 0.647 | -0.596 | 0.696 | -0.291 | 0.154 | -0.045 | 0.151 | 8 |
| | Guozhen Environment | 300388 | -0.445 | 0.715 | -0.303 | 0.965 | 0.383 | -0.082 | 0.137 | 9 |
| | Yonker Environmental Protection | 300187 | -0.381 | -0.165 | 0.477 | -0.771 | -0.321 | 3.751 | 0.123 | 10 |
| | Poten Environment | 603603 | 0.601 | 0.202 | -0.283 | -0.031 | -0.143 | -0.488 | 0.104 | 11 |
| | Misho Ecology | 300495 | -0.195 | 0.407 | -0.146 | 0.874 | -0.131 | -0.095 | 0.093 | 12 |

cost reduction and sales strategies to produce products in response to the needs of the masses under the epidemic situation, the company can still reverse the market situation. After the epidemic, the group will far exceed the same industry group.

According to the factor analysis of listed companies in the environmental governance industry, Dongzhu Ecological Environment's internal resource capacity has met the relevant diversified strategic model. Based on the above comprehensive evaluation of financial performance, it can be concluded that its cost control and precision sales strategy can effectively resist the overall downward risk of the industry. Since the outbreak of the epidemic in 2020, its cost-control strategy has successfully seized rare opportunities for enterprises and achieved the reverse trend of financial performance. Combined with the quantitative and qualitative characteristics, it can be concluded from big data analysis that Dongzhu Ecological Environment's series of measures to rational production, reducing the expenses and production costs, and improving the inventory turnover rate. It is in line with the development requirements of the environmental governance industry.

Management Implications

Full play should be given to its first-mover advantage in the field of ecological wetland restoration, to focus on its main business, and vigorously expands the market. At the same time, enterprises should actively deploy water ecological management, mine restoration and forest park projects to gradually achieve comprehensive coverage of the ecological restoration industry and enhance comprehensive strength and brand effect. Innovative business cooperation models should be actively explored, to seek comprehensive and in-depth cooperation opportunities with local design and construction companies with strong comprehensive strength. Through taking advantage of the partners' local advantages to jointly contract high-quality projects, enterprises' business development capabilities are expected to be further enhanced.

Resource integration of the industrial chain should be actively laid out, to explore opportunities for optimizing and upgrading the industrial chain in the field of ecological and environmental protection. Under the premise of the continuous and steady growth of the main business scope, plans are needed for the supplement of qualifications, to explore the extension of business opportunities in mine management and soil remediation. At the same time, business models should be actively explored in the field of ecological cultural tourism.

Through improving the corporate risk control mechanism, enterprises can actively improve the risk control mechanism and strengthen the construction of risk control departments.

The first of the three tough battles is to "resolutely fight against major risks". The country must guard against risks, and enterprises must also guard against risks. Especially in the landscape engineering industry where enterprises are located, expansion capability of engineering business scale depends to a certain extent on the capital turnover, and financial risks are related to the sustainable development of the engineering construction business. Great importance should be attached to the construction of risk control department. The risk control centre may consist of the management department, final accounts review department, receivable clearing department, and general department. Employees are composed of professionals in law, auditing, fund management, finance, and business. To ensure the high quality of enterprises' contracted projects and to avoid the high risks of the project, steady and healthy growth of enterprises' performance can be escorted.

Internal environmental governance should be optimized, to improve the environmental governance level. On the one hand, enterprises must implement standardized management, act in strict accordance with relevant rules and regulations, integrate environmental governance into the entire internal operating process, and strengthen environmental governance from all aspects of the enterprise. On the other hand, enterprises must formulate an effective environmental supervision system, reward and punishment system to restrict and supervise their daily environmental governance behaviours, and then establish a complete environmental governance system to optimize internal environmental governance. Besides, enterprises must strengthen the learning of environmental governance, carry out corresponding environmental protection education and training, cultivate employees' awareness of environmental protection and responsibility, and realize green and sustainable development.

CONCLUSION

Environmental governance is an important industry in the development of the national economy, which has important practical significance in the effective use of energy, reduction of environmental pollution, prevention of environmental emergencies and other aspects. This study takes Dongzhu ecological environment as the research object and analyzes its operating performance. The main conclusions are as follows: (1) under the impact of the COVID-19 epidemic, Dongzhu ecological environment has good risk response-ability and growth ability and has realized the overall business performance rising against the trend. (2) For listed companies in the environmental governance industry, resource advantages should be made full use to layout integration of industrial chain resources. Then, risk control mechanism should be

explored and the relative system must be established, with optimizing internal environmental governance, to achieve sustainable growth of operating performance.

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