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Strategic Development of Wastewater Treatment Enterprises Based on Ant Colony Algorithm

James Yong Liao*

Philippine Christian University, Philippine

james.liaoyong@pcu.edu.cn

**corresponding author*

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Abstract: With the continuous development of market economy, sewage treatment plants must implement financial strategic mechanism according to their specific needs. This paper studies the Ant Colony Optimization method in the financing strategy of sewage treatment plant, and expounds its application in financial decision-making. With the gradual increase of people's concern and attention to physical health, the requirements for drinking water quality have also increased accordingly. Therefore, the development and transformation of the water treatment industry in the future has a good development prospect. From the perspective of environmental protection, this paper makes a comprehensive analysis of the development status and future development direction of sewage treatment industry. In the daily operation and management of sewage treatment plants, they should strictly control their own profits, and the government should also play an administrative role. It is necessary to combine various social factors to form a perfect operation mechanism of government supervision, so as to achieve the goal of parallel supervision of liabilities and equity assets. By comparing the use of ant colony algorithm and general algorithm for the strategic development of wastewater treatment enterprises, this paper concludes that the efficiency of ant colony algorithm is 13.77% higher than that of general algorithm.

1. Introduction

In the current situation of environmental protection and development, wastewater treatment plants have gradually become an important force for green, economic development, with long-term benefits comparable to the development of wind power.

With the continuous improvement of the level of industrialization, a large number of chemical products have been widely used in production and life. An important result of this problem is that

the water resources on which mankind depends have been seriously affected. Li Yunqin analyzed various indicators of water pollution and accidental emergencies by analyzing the operation methods of water pollution, through on-site water pollution practice and experimental analysis, designed the sewage treatment internet experimental platform, and built the sewage treatment virtual reality experimental system [1]. Obinna IsiukuBeniah analyzed various indicators of organic pollutants, factors affecting soil, water and air quality, and practical application of phytoremediation in water resources [2]. Tang Yankui analyzed the literature on emerging pollutants, introduced the source of pollutants, detection methods, and treatment methods in the environment, and paid special attention to the actual solution strategy [3]. Ahmed Shahid studied people's understanding of water pollution causes, influencing factors and solutions, and suggested that there should be appropriate sewage treatment system, and sewage should be treated before entering rivers and water bodies [4]. Sharma Rohit took different rivers as an example, analyzed the water quality parameters of ten years, and established the water quality index analysis and current pollution model of rivers [5]. Because the harm of sudden water environment is very serious, when the pollution event occurs, the rapid allocation of emergency rescue resources becomes the key to the smooth and timely control work.

Water is the basic living condition of human beings, and water pollution has caused serious harm to human life and physical and mental health. Kanda Wisdom found that the water cycle ecosystem is a more appropriate concept to illustrate the high level of collaboration required by various stakeholders in implementation. From the perspective of ecology, it can provide support for enterprises' innovation and entrepreneurs in the water cycle economy [6]. Velusamy Sasireka discussed the important role of the removal, absorption and combination of heavy metals in the matrix, the impact of various heavy metal ions and their pollutants, the ways to remove these heavy metals, and its application prospects, limitations and related fields [7]. Donner Mechthild understood the driving force and components of its innovation through interviews, on-site visits and secondary data. The treatment of water pollution depends on different levels of behavior, and thorough institutional and technological innovation must be carried out to maximize the use of agricultural water pollution products and by-products [8]. Thakur Vikas combined two comprehensive evaluation methods under fuzzy environment to analyze the correlation between the listed criteria. The survey results can help the health authorities and the pollution prevention and control council to develop a list in order to effectively promote sustainable environmental development [9]. Liu Zheng analyzed the pollution generated by the pharmaceutical industry from the perspective of institutional dynamics. His results showed that in order to improve the success rate of the production of household medical equipment, environmental pollution can be reduced by increasing penalties or reducing subsidies [10]. Water pollution is a key topic of discussion in corporate governance, and how to solve water pollution has become one of the hot topics of the times.

The above studies only studied the ant colony algorithm and the strategic development of wastewater treatment enterprises separately, without combining the two. These studies have some reference, but they are still somewhat insufficient and have some room for improvement. In this paper, in order to study the application of ant colony algorithm in the strategic development of wastewater treatment enterprises, we analyzed the current situation of strategic development of wastewater treatment enterprises and conducted the analysis of experimental data, and also compared the computing efficiency of general algorithm and ant colony algorithm, which is of reference for the future study of algorithms in other fields.

2. Strategic Development of Wastewater Treatment Enterprises

2.1. Current Situation of the Development of Wastewater Treatment Enterprises

Current trends show that the long-term benefits of wastewater treatment plants have the same potential as the development of wind power projects. The creation and proliferation of the concept of manufacturing has led to a fundamental change in the traditional concept of "water treatment", which is seen as equally important as the current higher municipal benefit ratio. Currently, with the gradual stabilization of water supply, water tariff increases and other situations are relatively normal, the overall stability and sustainability of the operation of the relevant water enterprises are less prone to major changes. As a result, in recent years, the large water sector has gradually expanded its business coverage areas. At the same time, there is a certain degree of regionalism in engineering sudden water pollution accidents, which is caused by the mobility of the water environment in the region. When the pollutants flow into the water, they spread in the water at a certain speed and flow downstream with the flow of water, thus posing a great threat to the drinking water and industrial and agricultural water. Pollution of water sources spreads over time, and environmental problems often occur in several different areas, and wanting to move large amounts of resources to different places in the shortest possible time requires simultaneous treatment. If these problems are not dealt with in a timely manner, they can lead to more serious environmental pollution and an increasing consumption of resources.

A dynamic weight-based cycle optimization method has been used by the concerned scholars to improve the operational efficiency of the task scheduling based cloud computing system. This approach considers the resource capacity, task priority, and the duration of the task, thus improving the scheduling efficiency of the task, minimizing the system runtime and waiting time, system throughput, and maximizing the efficiency of the system water utilization [11]. A new path method is given by the related persons for the minimum routing problem in the presence of various fuzzy weights. The cropping method is used to weight the curves containing multiple fuzzy curves in the mitigation of water pollution. Also, the fuzzy weighting of the paths is compared using the spacing function with markers. Finally, three increasingly numerical examples were validated and the obtained results were analyzed in comparison with the traditional method. It was demonstrated that the convergence of the improved method in the solution process is less than the general method [12]. The principle of wastewater treatment is shown in Figure 1.

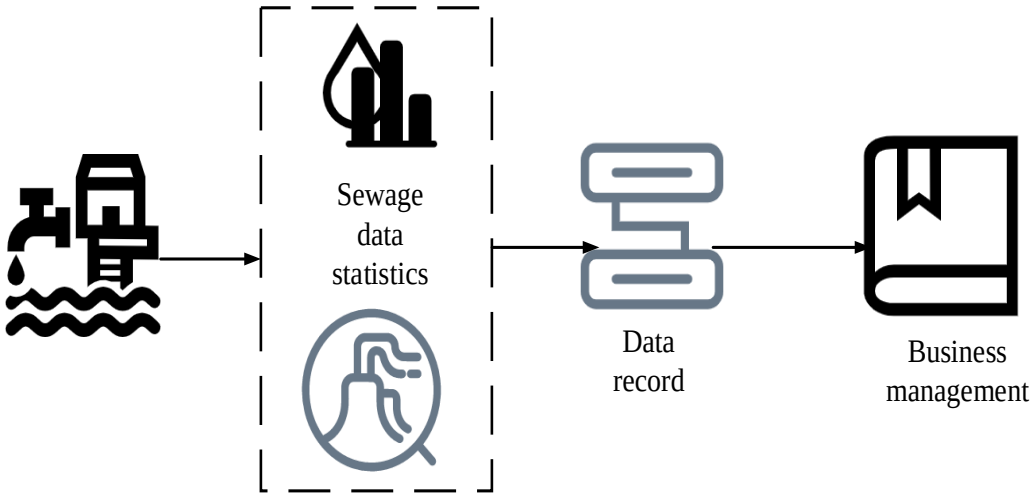


Figure 1. Sewage treatment principle

2.2. Factors Affecting the Development of Wastewater Management Enterprises

In exploring how SMEs in the UAE can use the green innovation approach to address barriers that may increase green products, processes, and management, stakeholders adopted a comprehensive decision process to identify major barriers, sub-barriers, and solutions in the United Arab Emirates. Using a survey approach to SMEs for environmental innovation is the best strategy to address the implementation of environmental innovation in SMEs [13]. The aim of those involved was to explore the role of industry facilitation. The report provides an in-depth analysis of topics and contents from business cases, newspaper articles, press releases, career blogs and scientific articles to improve the business model and corporate purpose. However, it is still hampered, so a comprehensive design must be carried out to create a positive atmosphere of cooperation among the various stakeholders. These findings are useful as a guide in practical applications and scientific research [14].

The stakeholders mainly explored the evaluation of tourist areas and their role in urban metabolism. In addition, this survey uses some of the main performance criteria, such as litter composition, clean coast index, accumulation rate, cumulative index, etc. to measure environmental performance and to evaluate the current basic structure, as well as to evaluate the implementation of a litter treatment program. These results are very useful for any policy maker, authorities and tourism agencies with the aim of developing or adapting sustainable waste development strategies related to UN goals, European environmental agreements and new circular economy strategies [15]. The relevant experts approach the economic, social and environmental dimensions to promote economic development through tourism. The social responsibility of hotel companies, the benefits and innovations brought by good practices are presented, and how to achieve long-term objectives are illustrated. An exploratory approach was used to describe the results of the experiment and the information shown [16]. The factors affecting the development of wastewater management enterprises are shown in Figure 2.

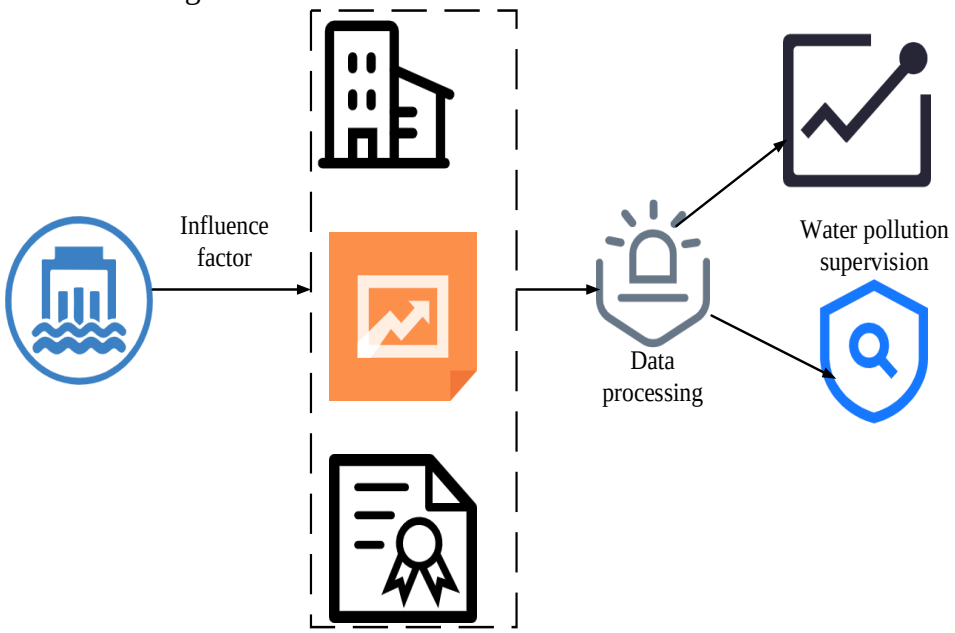


Figure 2. Factors influencing the development of wastewater treatment enterprises

2.3. Strategic Development Prospects of Wastewater Treatment Enterprises

The company develops a sound business plan, organically combines the development system

with the standard development plan, improves the overall effectiveness of supervision, integrates the corresponding analysis process with the results, and ensures that the relevant models are implemented. Among other things, it fully recognizes the control functions of motivation, evaluation, and management of the enterprise, and in a sense ensures the diversification of business operations and operational efficiency.

When implementing financing strategies, it should take the initiative to build a perfect financial analysis system, consider reducing financing costs and widening financing channels as the core, effectively improve the company's operation management and engineering control, and maintain the company's overall efficiency, while monitoring it according to financial guidelines to improve its management effectiveness. It is also necessary to make a comprehensive analysis of the financing cost as a whole to make it reach the best state of financial efficiency.

In conclusion, when formulating the company's financial strategy, it is necessary to unify the business processes of the enterprise, ensure the operation of the enterprise's regulatory mechanism and form a perfect regulatory structure, and also make full use of the company's incentive and management advantages to provide assurance for the progress of the company's financing strategy and overall development strategy, and realize the overall progress of the company's financial management level. The strategic development prospect of the wastewater management enterprise is shown in Figure 3.

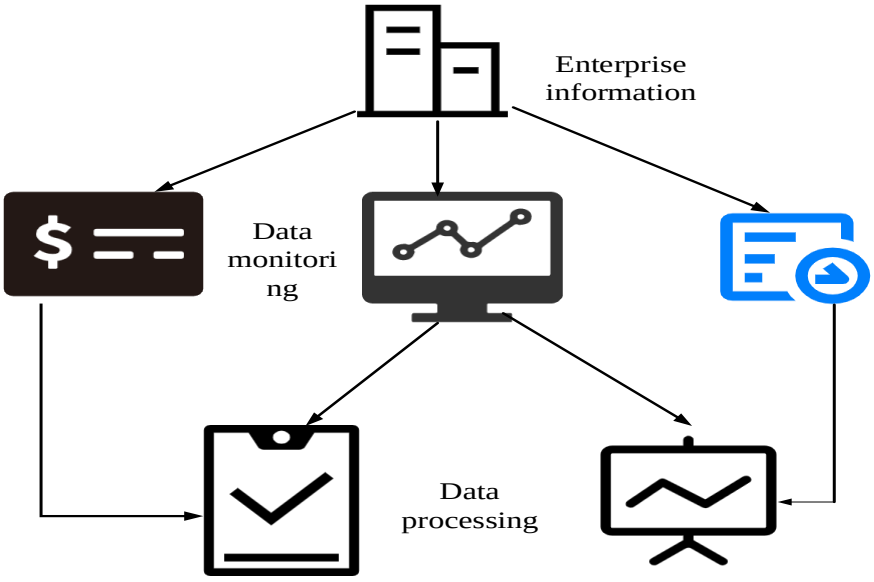


Figure 3. Strategic development prospects of sewage treatment enterprises

3. Ant Colony Algorithm

The ant colony algorithm is a probabilistic method of searching for the optimal route. It is inspired by the fact that ants find a shortest route when foraging for food. The good performance of the ant algorithm is proved by simulation analysis. By comparing with the traditional genetic algorithm, the effectiveness and practicality of the algorithm in simulating the evolutionary process are verified. River samples are selected in the same river channel and the visibility function is set as follows.

$$N_{ij} = \frac{1}{M_{ij}} \tag{1}$$

Where N_{ij} is the visibility function and M_{ij} is the cost of the i-th ant on the j-th segment of the river.

Then determine the selection weight of the next river step:

$$A_{ij} = \frac{\tau_{ij}(t) w_{ij}(t)}{\sum \tau_{ij}(t)} \tag{2}$$

Where i is the number of ants; j is the number of river segments; A is the set of ants walking through; τ_{ij} is the pheromone value, and $w_{ij}(t)$ is the weight value.

Since the pheromone keeps iterating with the cycle of the ant colony, the information value keeps changing.

$$\tau_{ij}(t+n) = \tau_{ij}(t) + \Delta\tau_{ij}(t, t+n) \tag{3}$$

Where $\Delta\tau_{ij}(t, t+n)$ denotes the pheromone difference between segment t+n and segment t of the river.

4. Comparison Experiment before and after Sewage Treatment

4.1. Experimental Method

By selecting water pollution samples from five urban rivers, we applied the ant colony algorithm to analyze the indicators of the water pollution control system in each of these five cities and compared the recorded data results.

4.2. Data Analysis

4.2.1. Affiliation Analysis

Five enterprise data samples were selected, and these five samples were analyzed to compare their affiliation degrees. In order to further determine the weight status of different indicators and the validity of the impact on the development strategy of wastewater treatment enterprises, this paper ranked the importance of specific indicators, industrial strength indicators ranking number affiliation is shown in Table 1.

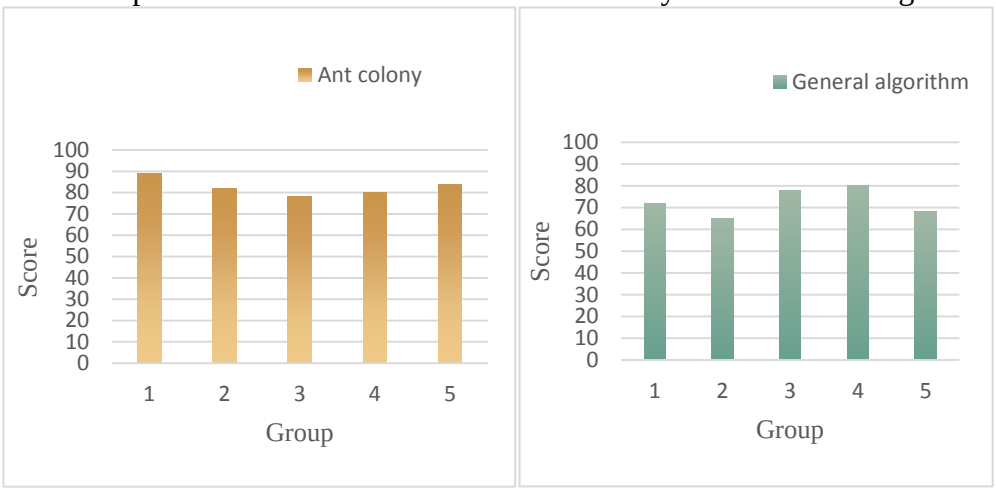
Table 1. Ranking number of industrial strength indicators

Membership	Index				
	C_1	C_2	C_3	C_4	C_5
B_1	0.158	0.323	0.234	0.134	0.178
B_2	0.324	0.342	0.214	0.213	0.243
B_3	0.345	0.357	0.389	0.423	0.465
B_4	0.435	0.476	0.489	0.456	0.473
B_5	0.542	0.432	0.567	0.545	0.564

By analyzing the data in Table 1, under the primary indicator specification, five companies are in the range of 0.134 to 0.323, where $C_2 > C_3 > C_5 > C_1 > C_4$. Under the specification of secondary indicators, 5 enterprises are in the range of 0.213~0.342, of which $C_2 > C_1 > C_5 > C_3 > C_4$. Under the tertiary indicator specification, five companies were in the range of 0.345 to 0.465, where $C_5 > C_4 > C_3 > C_2 > C_1$. In addition, by comparing the fluctuation space of indicator weights, different indicators have different upper limits of weights. Among them, the fourth indicator has the least fluctuation and the fifth indicator has the highest affiliation, and the results indicate that the fifth indicator has the highest importance.

4.2.2. Water Pollution Control Effect Evaluation Analysis

The analysis compares the use of ant colony algorithm and general algorithm for strategic development analysis of wastewater treatment enterprises, the higher the score, the better the treatment effect. Water pollution treatment effect evaluation analysis is shown in Figure 4.



(a)Ant colony *(b)General algorithm*

Figure 4. Evaluation and analysis of water pollution control effect

From Figure 4, we can see that Figure a is the score of ant colony algorithm, in which the average score is 82.6; the highest value is 89; the lowest value is 78; the fluctuation is small, and the effect is good. Figure b shows the score of the general algorithm. It can be seen that the score of the ant colony algorithm is higher than that of the general algorithm. The average score of the general algorithm is 72.6, and the score is basically distributed in the range of 65~80, with a large fluctuation and poor effect. The ant colony algorithm is 13.77% more efficient than the general algorithm.

5. Conclusion

With the development of economy and society, the material conditions of the people have been continuously improved, and the surrounding ecological environment has also changed. At present, the situation of water environment is not good. In this environment, the treatment of water environment has become a common concern. At present, the basic research of water environment treatment is to take the way of "pollution control at the source" to completely eradicate the recent water pollution and carry out comprehensive water purification. Among these problems, wastewater

treatment is a very critical link. It can be seen from the process of establishing and operating the wastewater treatment system that this is a basic operation mode invested by the state and jointly operated by the company. In this case, the core competence of the construction and operation enterprises of the municipal solid waste treatment plant has become its main competitive advantage. Through the analysis of enterprise capital, market competition and product competition, this paper obtains the competitive advantages of urban sewage treatment plants. The ant colony algorithm proposed in this paper is of great significance to the future research on the development strategy of water pollution enterprises by analyzing the membership of enterprises and the operation efficiency of the ant colony algorithm.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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