

# *Evaluation of Environmental Protection Effect of Nature Reserves under Information Technology*

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**Abstract:** At present, the environmental problems around the world are becoming increasingly serious, which has become an important constraint on the economic and social development of many countries in the world. The establishment of nature reserves is the most direct and effective response to the ecosystem. However, under the joint action of human activities, climate change and other factors, the protection effect of some protected areas has also been questioned. With the continuous development of science and technology, information technology has gradually penetrated into all fields of society, and information technology has developed into a new topic. Of course, this technology has also played a great role in environmental protection with the support of the government. With the rapid development of information technology, more and more related technologies have been applied to environmental protection. This paper discussed in detail the development and application of information technology in environmental protection. The scientific and accurate evaluation of the protection effect of the nature reserve was of great practical significance for the formulation and optimization of its protection strategy. The experimental results of this paper showed that there were 30 respondents who believed that information technology was very effective for the environmental protection of nature reserves, accounting for 60%.

## **1. Introduction**

The nature reserve is the world's most valuable natural heritage, the most beautiful natural landscape and the richest natural resources, and is the world's largest terrestrial ecosystem and. The establishment of nature reserves is of great significance to the protection of China's natural resources and ecological environment, the maintenance of national ecological security, the

realization of harmonious coexistence between human and nature, and the promotion of the sustainable development of China's economy and society. In the process of China's economic transformation, in order to pursue the coordination of "development" and "protection", natural reserves have naturally become the main way to realize the sustainable development of regional economy and society. However, with the development of human beings, the natural environment has been seriously damaged, and a large number of wild animals are on the verge of extinction. Countries around the world are calling for the protection of nature. At present, the establishment of national parks or nature reserves around the world has become the main way for various countries to protect natural ecosystems and rare wild animals and plants, and is also an important indicator to measure the degree of natural protection and development of a country or region.

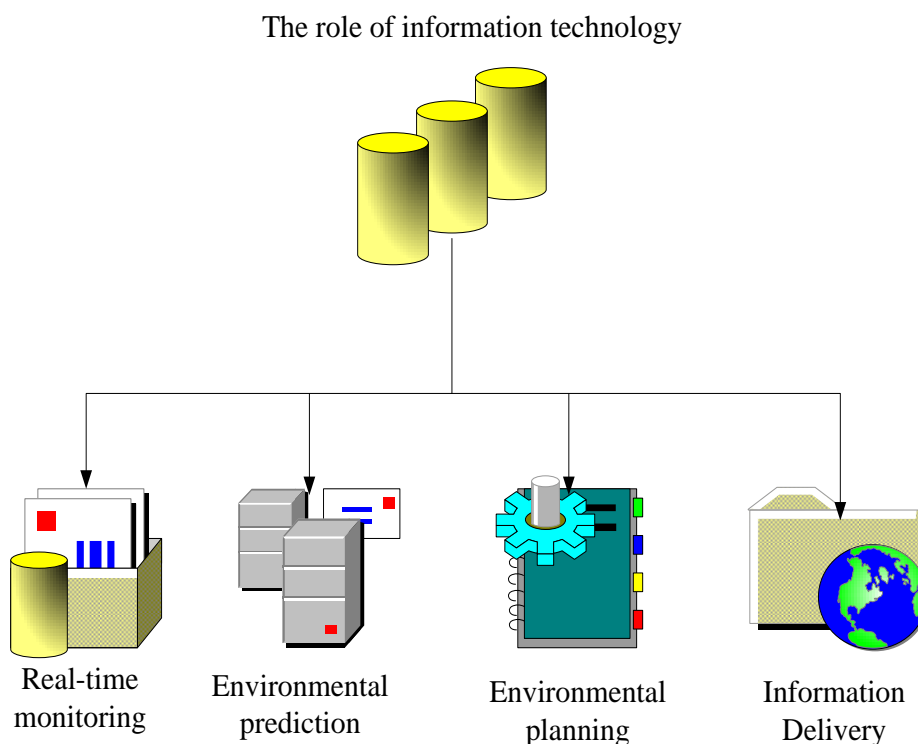
Although the number of protected areas managed by China for sustainable use has increased rapidly in recent years, it is suggested that they should not replace or weaken the nature reserves with biodiversity protection as their main function. Zhang Yuling's research aimed to assess the relationship between community development and environmental protection by using environmental behavior variables based on the social exchange theory. The residents' experience data was collected in the Nanling Mountain National Nature Reserve in southern China. Under the tourism participation strategy, the residents' perception level was lower than other strategies [1]. Ma Zhijun believed that nature reserves were the cornerstone of biodiversity conservation. As one of the largest diversified countries in the world, the rapid expansion of China's nature reserves played a key role in mitigating biodiversity loss. Although the number of nature reserves continues to increase, the total area of China's nature reserves decreased [2]. Gritsan Yuriy I. conducted geomorphological and sedimentological surveys of exposed and submerged dune systems, which was the basis for successful implementation of coastal planning and development management and protection strategies. Due to the lack of buildings, the regional and local authorities did not consider the study area in the coastal protection plan, so the area was currently facing serious coastal erosion [3]. Kujirakwinja D. found that the biological investigation started in the 1950s provided clear evidence, which showed that the nature reserve was a great innovation of modern human beings to protect the ecological environment and natural resources, facing the challenge of destruction [4]. The above scholars believed that the nature reserve was a symbol of human progress and civilization. Therefore, it was necessary to make overall consideration, and make reasonable planning, so as to take effective countermeasures and measures to strengthen the construction and management of natural reserves.

At present, the increasingly serious environmental problems in nature reserves have a great impact on people's lives. At the same time, people are also deeply aware that "protecting the environment, and everyone has responsibility" is not an empty slogan, but requires people to take action and put it into practice [5-6]. Forests, wild animals and plants and other important life forms are an indispensable part of the ecosystem and also a valuable asset of mankind. The national nature reserve is not only to protect natural resources and ecological environment, but also to effectively realize its value to China's economic development and scientific research, so as to embark on the path of sustainable development [7-8]. Therefore, the establishment of natural reserves is a once-in-a-lifetime opportunity for the country and governments at all levels. People should do their best to accelerate the formulation of relevant measures, so as to make the management of China's natural reserves more scientific and efficient.

## 2. Environmental Protection of Nature Reserves under Information Technology

With the development of social economy, people also pay more attention to environmental protection. The development of human society has caused great damage to the ecosystem, which

has been greatly affected. With the wide application of computers and networks, including information technology related to environmental protection in nature reserves, has had a huge impact on the development of human society. Environmental protection work should rely on emerging scientific and technological means, and use modern management methods to improve the efficiency and quality of environmental protection work [9-10]. The development and application of environmental protection information system and information management have been carried out for many years in China. Each department of environmental protection has basically equipped its corresponding staff with an environmental protection information management system. In the environmental protection information system, the collection, input, transmission, analysis, storage, expression and application of data are inseparable from the support of information technology [11-12]. The construction of a complete environmental protection information system can strengthen the sharing of environmental protection information and improve the use efficiency of resources. The role of information technology in environmental protection is shown in Figure 1:



*Figure 1. The role of information technology in environmental protection*

As shown in Figure 1, the role of information technology in environmental protection includes real-time monitoring, environmental prediction, environmental planning and information release. The information center not only has a wide range of satellite communication networks, advanced hardware facilities and software systems, but also has professionally trained information management personnel. The information center has made outstanding contributions to people’s in-depth understanding and mastering of the extent, root causes and hazards of environmental pollution and environmental damage, the acquisition, analysis, storage and transfer of relevant information, and the planned implementation of environmental protection, prevention, ecological restoration, pollution control and other aspects.

## 2.1. Combined Application of Information Technology

The technology composed of global positioning system, remote sensing technology and geographic information system is indispensable in information technology and environmental protection [13-14]. Among them, the familiar remote sensing technology is mainly used in the data dynamic monitoring department and the natural resources survey department, such as the weather forecast, water pollution sources, vegetation data monitoring, etc. in people's daily life. It can quickly display human interests, and also help the relevant departments to make timely response to avoid unnecessary losses. The combined application of information technology is shown in Figure 2:

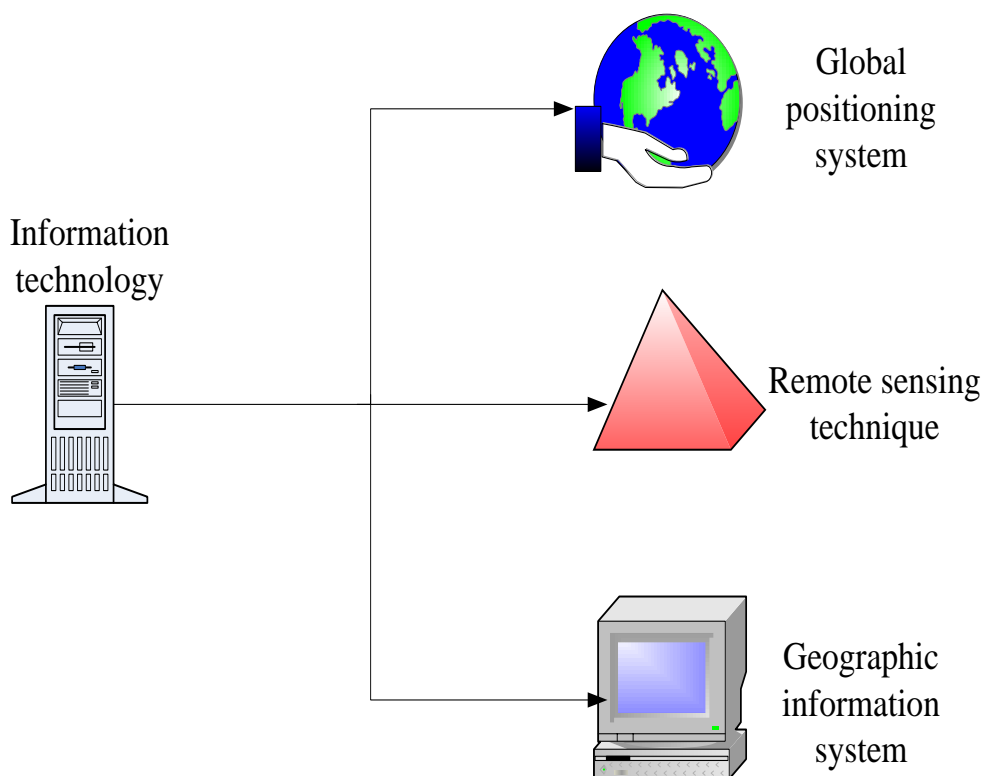


Figure 2. Combined application of information technology

As shown in Figure 2, geographic information system and global positioning system in information technology play a very important role in monitoring, early warning, land development, survey and other aspects of natural disasters [15]. The most important is to use remote sensing technology to detect the size of particles in the air and the distribution of pollutants, and to collect data on water pollution and ecological environment pollution. The global positioning system can be used to carry out detailed positioning of the data, and then achieve accurate collection of these data. Geographic information system is used to analyze these data, and finally realize real-time monitoring of these data, so as to provide some support in environmental protection for the correct evaluation of natural reserves.

## 2.2. Environmental Protection Effect Evaluation

Under the strong environmental pressure, people began to think about how to protect and use the natural reserve resources on which human beings depend, so as to maintain its ecological functions and security. The establishment and establishment of nature reserves is to protect the resources of nature reserves. Due to the joint efforts of the country and society, the scale of nature reserves has

expanded rapidly in the world. However, the protection effect of nature reserves is obviously poor, and there are still many nature reserves that have not achieved their minimum protection objectives.

This paper studied the conversion relationship between different landscape types, and the calculation formula of landscape protection effectiveness index is as follows:

$$B_i = \sum_{i=1}^m aC_{1i}C_{2i} \quad (1)$$

Among them,  $B_i$  is the effectiveness index of landscape protection, and the transformation range index of one landscape type to another in the same functional area is expressed by the following formula:

$$C_2 = \frac{S_{i \leftarrow j}}{S_{ii}} \times 100\% \quad (2)$$

$C_2$  is the index of transformation degree of landscape type;  $S_{i \leftarrow j}$  refers to the area of landscape type i transformed from landscape type j in the previous period;  $S_{ii}$  represents the area of class I landscape type in this period.

The area change of the main protected objects in the nature reserve during the evaluation period is mainly evaluated to analyze the stability and change trend of the main protected objects:

$$C_3 = \frac{S_{t+i} - S_t}{S_t} \times \frac{1}{i} \times 100\% \quad (3)$$

$C_3$  is the quality and effectiveness index of the protected objects, and  $S_{t+i}$  is the area of the protected objects in the year of the end of the study.

The landscape structure of species habitat is the basis for species to survive, and its stability directly affects the succession of species. Landscape fragmentation refers to the fact that the original intact habitat is divided into several fragmented pieces under the influence of human activities, climate change and other factors. If the habitat is fragmented to a large extent, it may cause the overall number of one habitat to decline, and may also cause the decline of all habitats.

Wetland and forest landscape fragmentation indicators are information extracted from remote sensing data:

$$F = (NP - 1) / NC \quad (4)$$

F is the fragmentation of the geographical landscape, and NP is the total number of patches in the nature reserve. The landscape fragmentation of the protected objects during the study period is mainly evaluated:

$$C_4 = \frac{F_{t+i} - F_t}{F_t} \times \frac{1}{i} \times 100\% \quad (5)$$

$C_4$  represents the change rate index of landscape fragmentation,  $F_{t+i}$  and  $F_t$  represent the landscape fragmentation at the end and beginning of the study period, respectively.

The diversity and representativeness of species and the diversity of rare and endangered species reflect the diversity of species, so it is necessary to evaluate the protection effect of nature reserves.

### 3. Current Situation of Environmental Protection in Nature Reserves

#### 3.1. Lack of Capital Investment

In order to protect the ecological environment and promote the development of social economy, many countries have established nature reserves, which should be protected and reasonably used and studied. This requires not only increased investment in the infrastructure of nature reserves, but also increased investment in scientific research and publicity. In this paper, the staff of 50 nature reserves were investigated, as shown in Figure 3:

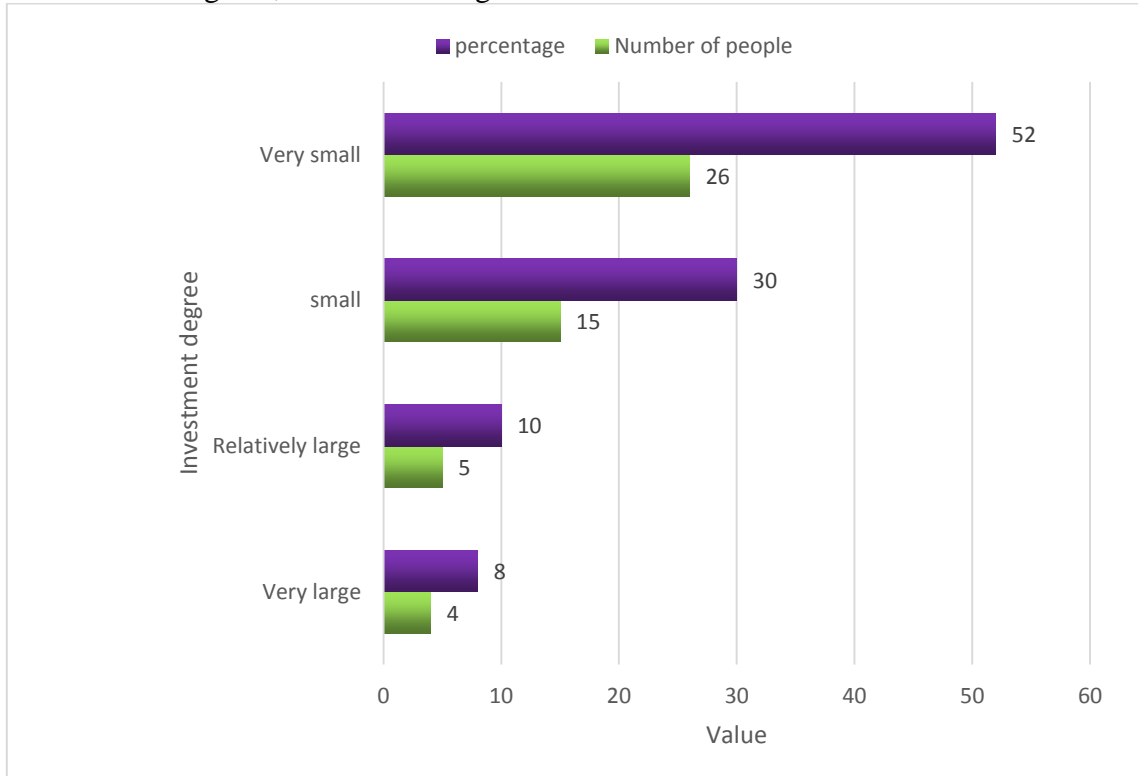


Figure 3. Investment degree

As shown in Figure 3, four respondents believed that the government’s investment in natural reserves was very large, accounting for 8%. Five respondents believed that the government’s investment in nature reserves was relatively large, accounting for 10%. Fifteen respondents believed that the government’s investment in nature reserves was small, accounting for 30%. 26 respondents believed that the government’s investment in natural reserves was very small, accounting for 52%.

At present, China’s nature reserves have a great shortage of funds. Due to the lack of financial support, the environmental protection effect of nature reserves is not ideal, and there is also a lack of corresponding scientific, monitoring facilities and data management system.

#### 3.2. Insufficient Human Resources

The technical means of conservation and management in nature reserves are still in a relatively rough state. Its function cannot be fully played. Due to its remote geographical location and low level of economic support, the human resources for environmental protection in China’s nature reserves are scarce. The adequacy of human resources was shown in Figure 4:

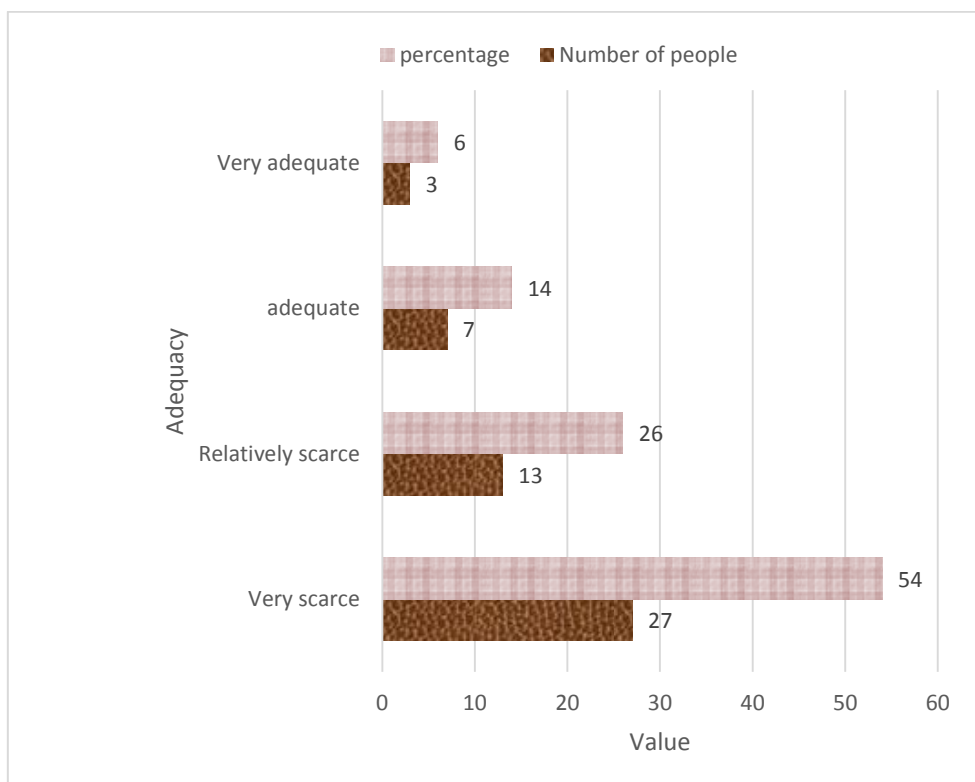


Figure 4. Adequacy of human resources

As shown in Figure 4, three respondents believed that the environmental protection talents in the nature reserve were very sufficient, accounting for 6%. Seven respondents believed that there were sufficient environmental protection talents in the nature reserve, accounting for 14%. There were 13 respondents who believed that the environmental protection talents in the nature reserve were relatively scarce, accounting for 26%. There were 27 respondents who believed that the environmental protection talents in the nature reserve were very scarce, accounting for 54%.

Due to the lack of sufficient human resources, the environmental management, construction, development and publicity of many nature reserves cannot be effectively and smoothly carried out, thus limiting the environmental protection of national nature reserves. In the process of building a well-off society in an all-round way in China, people’s living standards have also been raised from the initial level of material needs to the level of spirit and culture, so tourism has become an inevitable choice for many people to obtain happiness and happiness in life. In recent years, the number of tourists has continued to increase, which is both an opportunity and a challenge for the nature reserve. However, due to the lack of management funds and personnel, this has caused great pressure on the nature reserve.

### 3.3. Lack of Civic Awareness

It is very necessary to establish and improve the talent team of environmental protection in nature reserves. The advent of the new era has put forward new requirements for the personal quality of environmental protection workers, which should be both compatible with the development of the times and integrated with the development of the times. At present, many veteran cadres engaged in environmental protection work still use the old methods in environmental protection work without any innovation, thus affecting the quality of environmental protection in China. When selecting environmental protection staff, it is necessary to select talents with high

political literacy, strong professional ability, and relatively trendy and broad vision. The necessary degree of environmental protection for the nature reserve was shown in Figure 5:

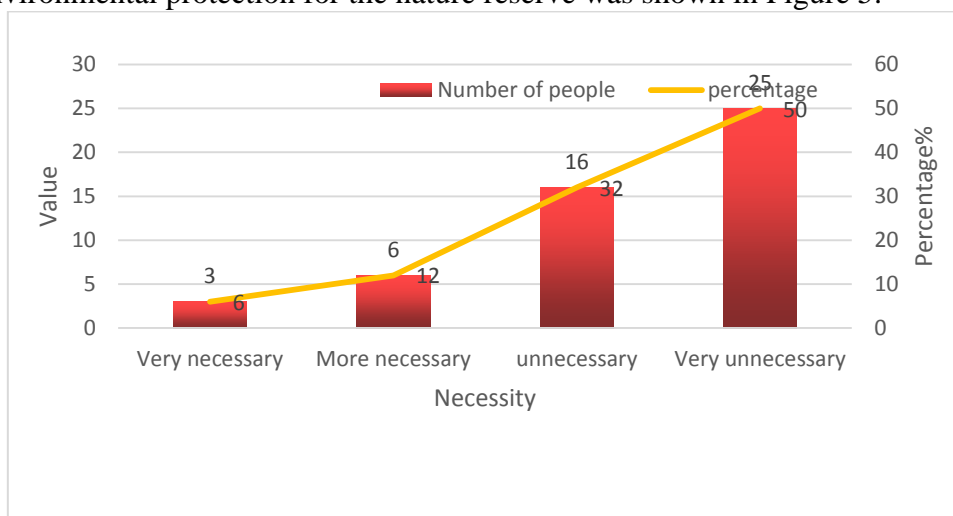


Figure 5. Necessity of environmental protection for natural reserves

As shown in Figure 5, three respondents believed that it was very necessary to protect the environment of the nature reserve, accounting for 6%. Six respondents believed that it was more necessary to protect the environment of the nature reserve, accounting for 12%. Sixteen respondents believed that it was unnecessary to protect the environment in the nature reserve, accounting for 32%. There were 25 respondents who thought it was very unnecessary to protect the environment of the nature reserve, accounting for 50%.

The environmental protection team should be actively optimized. The quality of staff should be improved, and the organic integration with the government and enterprises should be realized. At the same time, people should learn from relevant technologies to make better use of them in environmental protection.

### 3.4. Effectiveness

With the deepening of the construction of China’s environmental informatization standard system, an automatic monitoring system of pollution sources has been built, which means that this technology can identify major pollutants and provide information basis for environmental supervision and risk prevention. In particular, it can monitor water quality and air pollution in rivers and lakes, and effectively improve the intensity and accuracy of information collection, so as to provide a reliable source of information for environmental protection. At the same time, China has launched a satellite system for environmental protection, which can monitor the ecological environment in an all-round way, and has achieved good results in collecting environmental information using remote sensing technology. The effectiveness of information technology on environmental protection was shown in Table 1:

Table 1. Effectiveness of information technology for environmental protection

Effectiveness	Number of people	Percentage
Very effective	30	60%
More effective	18	36%
Generally effective	2	4%
No effect	0	0%



As shown in Table 1, 30 respondents believed that information technology was very effective for environmental protection in nature reserves, accounting for 60%. 18 respondents believed that information technology was more effective, accounting for 36%. Two respondents believed that information technology was generally effective, accounting for 4%. No respondents believed that information technology was invalid.

With the continuous improvement of information technology, some new changes have taken place in the country's management of the environment. To this end, the state has formulated a series of systems that would play a guiding role in the development of environmental protection projects and the implementation of environmental protection projects. At the same time, the state has also improved the government website in environmental protection, and has carried out extensive exchanges with the public and environmental protection personnel, which has built a complete network system that can find and solve problems in time.

#### 4. Conclusion

The progress of information technology has enabled people to have a clearer understanding of everything around them. Information technology has not only played a vital role in national engineering projects, which enables the projects to be completed efficiently and quickly, but also provided powerful data analysis and monitoring and early warning for the environmental protection of natural reserves. In the future development of science and technology, there would be more information technology to provide more direct assistance and supervision for environmental protection. In recent years, more research has been carried out on the ecological environment monitoring and protection effect evaluation of nature reserves. However, in the current situation, the ecological monitoring and protection effect evaluation of China's nature reserves are still in the initial stage, and the evaluation system is not perfect. Most of the protected areas have not conducted a region-wide biodiversity survey. Some national nature reserves have only carried out a small amount of scientific research, and lack of long-term and continuous monitoring data on the ecosystem and biodiversity of nature reserves, so it is difficult to provide support for the comprehensive evaluation of nature reserves.

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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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