

Ecological governance of Hainan coastline from the perspective of one health: a case study of the sustainable development of people's livelihood after the coastline of Qionghai city was repopulated

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Abstract. Purposes It aims to discuss how to effectively carry out the ecological governance of the coastline of Qionghai City, Hainan Province under the concept of One Health [1] to promote the sustainable development of residents' income and provide practical cases and theoretical references for the ecological governance of the Hainan Coastline. **Methods** Use field research and random interview methods to obtain relevant data and conduct quantitative analysis. **Results and shortcomings** Residents' income has stable growth, water pollution control effects are outstanding, and the governance of air pollution is obvious. However, there are still problems such as serious degradation of coral reef ecosystems and lack of effective funding for ecological compensation, mainly due to the threat of insufficient capital investment and human activities. **Conclusions** It is recommended to improve the sustainable development capacity of the township governments, build a reasonable ecological compensation mechanism, accelerate the transformation of the township governments to the ecological government, increase the implementation of green GDP, form a virtuous circle of compared to achieve ecological environmental protection and economic development. Department decision -making provides a scientific basis.

1 Introduction

Developing the economy is vital to people's livelihood, as is protecting the environment. In the continuous in-depth discussion of the sustainable development of people's livelihood after the retreat of Qionghai's coastline, it was found that only by exploring the advanced

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route of ecological priority and green development, and establishing and improving the long-term mechanism of ecological environmental protection, can we improve the high level of ecological governance and protection, and calculate the two accounts of "ecology" and "people's livelihood". In order to effectively promote the healthy and high-quality economic development under the concept of "One Health", so as to benefit the people in the true sense.

2 One health

The concept and practice of "One Health"[2] involves many aspects, including human beings, animals, food, environment, etc. It is the common health of the whole ecology of human beings, animals, plants, etc. It is the fair health covering all individuals, groups and species, the all-round health that "integrates health into all policies", and the communication and collaboration between multi-disciplines and cross-departments. "One Health" is committed to promoting the harmonious coexistence of people, animals and the ecological environment.

In today's increasingly severe environmental and ecological problems, antibiotic resistance is increasingly serious, food and drug safety incidents occur frequently, the concept of "One Health" and the concept of "Lucid waters and lush mountains are invaluable assets" are important theoretical support for the pace of progress in the new era, both of which reflect the construction of ecological civilization is the meaning of today's social development. Taking the concept of "One Health" as a theoretical premise to look at the construction of ecological civilization will find a new connotation: implementing the new development concept, comprehensively practicing the construction of ecological civilization, promoting green development, and safeguarding the "lucid waters and lush mountains".

3 The results of the work of returning colonies to the beach in the field of people's livelihood.

3.1 The income of residents has grown steadily

According to the Statistical Communiqué of Qionghai City of China on the 2021 National Economic and Social Development [3], the regional GDP of Qionghai City in 2021 was 33.79 billion yuan, an increase of 9.6% according to comparable prices, and the economic aggregate reached a new leap. Since the replantation and beach restoration work under the perspective of "One Health" was carried out in 2020, compared with the total output value index from 2017 to 2021, the total output value index from 2020 to 2021 showed a peak rising period, rising from 3% to 9.6%, which was a larger increase than the previous four years. Among them, the fishery output value was 1.95 billion yuan, an increase of 15.4 percent over the previous year.

In 2021, the per capita disposable income of urban and rural residents in the city is 29,241 yuan, an increase of 9.3% over the previous year. The per capita disposable income of permanent urban residents was 39,538 yuan, an increase of 7.7 percent over the previous year; The per capita disposable income of permanent rural residents was 20,068 yuan, up 12.1 percent over the previous year. As shown in Figure 1, from 2017 to 2021, the per capita disposable income of the city's residents increased year by year, but the average growth rate was relatively slow. From 2017 to 2020, the growth index of per capita disposable income showed a downward trend, but it began to turn around in 2020, when the "retreat from the beach and return to the colony", and the per capita disposable income index rose sharply. From 5.7% to 9.3%, it can be seen that this work has a relatively significant impact on the stable growth of residents' income.

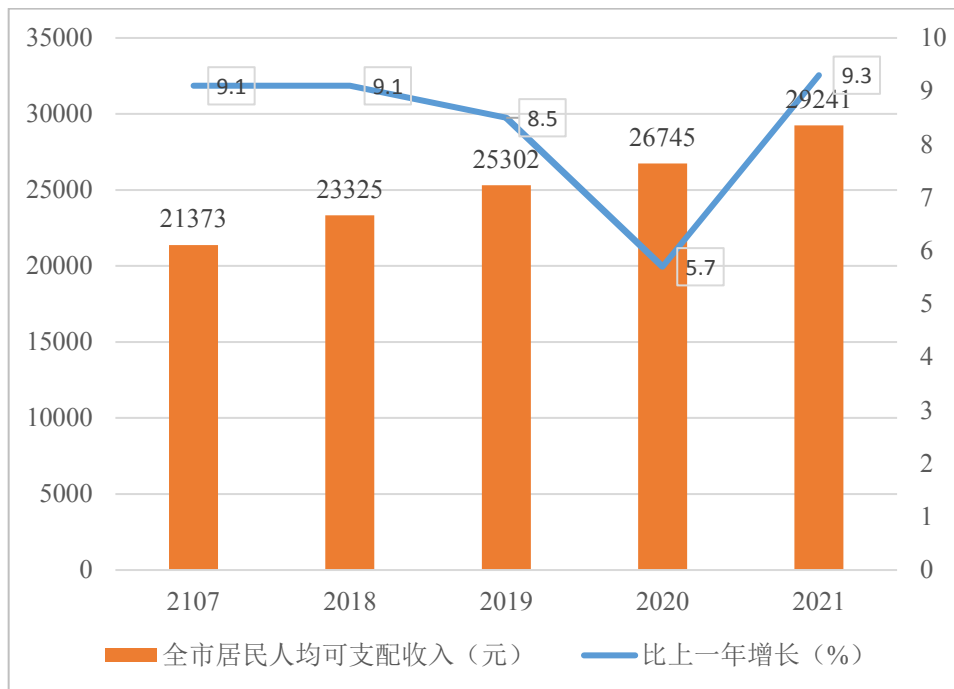


Fig. 1. Per capita disposable income and its growth rate of Qionghai residents from 2017 to 2021.

3.2 The effect of water pollution control is outstanding

First, the aquacultural tail water treatment effect is obvious. As of December 2021, there are 990 aquaculture households in Changpo Town of Qionghai City within 300 meters of the coast, involving 2,132 acres of aquaculture area, and 447 tailwater treatment three-level pools have been built together, and the construction rate of tailwater treatment facilities has reached 100%, realizing the "zero direct discharge" of aquaculture tailwater within 300 meters of the Changpo coast. After the construction of tailwater treatment ponds and other systems, the city's water quality indicators such as pH, chemical oxygen demand, total phosphorus, and total nitrogen have been significantly improved (Table 1), and the discharged tailwater conforms to the "Freshwater Aquaculture Wastewater discharge Standard" (SC/T9101-2007).

Second, the quality of drinking water continues to improve. Since Qingtui offshore aquaculture pond, a total of 12 towns in Qionghai City have been monitored for drinking water sanitation in 2021, accounting for 100% of the towns in the city (Table 2). The monitoring results of drinking water in Qionghai City in 2021 were significantly higher than the overall qualified rate of water samples in 2021, which was 43.8%. Among them, Boao Town, Tanmen Town and Changpo Town, which have the largest aquaculture area, have a higher qualified rate of drinking water samples, all of which are more than 90%. The water sample qualification rate of Dalu Town, Huishan Town, Longjiang Town, Shibi Town and Yangjiang town was low, which was mainly caused by total coliform group and heat-resistant coliform group, but not due to water pollution caused by offshore aquaculture.

Third, the implementation of domestic sewage is effective. As of December 2021, Qionghai has completed the task of treating rural domestic sewage in 9 administrative villages, and has also achieved full coverage of sewage treatment facilities in 12 established towns, and urban domestic sewage has achieved unified treatment, management and discharge goals.

Table 1. Treatment of aquaculture tail water in Qionghai City in 2021.

Group	water temperature (°C)	pH	Chemical oxygen demand (mg / L)	Total phosphorus (mg / L)	Total nitrogen (mg / L)
Before governance	16.0	9.57	27	1.02	6.2
Standard discharge value of freshwater aquaculture wastewater (SC / T9101-2007)	—	6.0~9	≤25	≤1.0	≤5.0
After governance	12.8	7.73	14	0.42	2.98

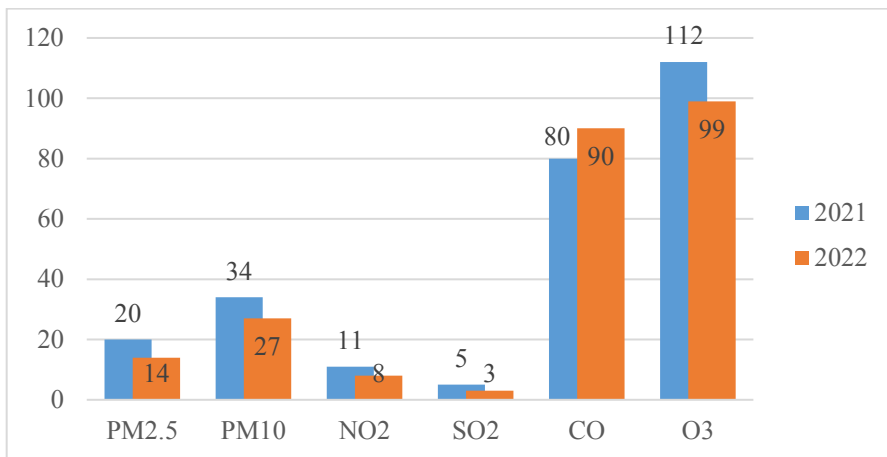
Table 2. Monitoring results of drinking water in each township of Qionghai City in 2021.

Town	Total		
	Water samples (parts)	Qualified (parts)	Qualified rate (%)
Boao Town	12	11	91.7
Ao Da Lu Town	12	6	50.0
Huishan Town	8	4	50.0
Jiaji Town	26	26	100.0
Longjiang Town	10	3	30.0
Shibi Town	14	7	50.0
Tayang Town	12	12	100.0
Tanmen Town	8	8	100.0
Wanquan Town	12	12	100.0
Yangjiang Town	12	6	50.0
Changpo Town	8	8	100.0
Zhongyuan Town	10	7	70.0
Total	144	110	76.4

3.3 The role of air pollution control is obvious

Starting from 2020, Qionghai City will clean up the offshore aquaculture pond, control the aquaculture tail water, clean up the river, and clean up the offshore aquaculture waste to reduce the degree of pollution to air quality.

According to the "Qionghai Environmental Air Quality Annual Report (2022) first quarter", from January to March 2022, Qionghai air quality effective monitoring days 90 days, excellent days 82 days, good days 8 days, good air quality rate (AQI≤100 ratio of 100%, the same as the same period last year. It can be clearly seen from the data that except for the 95th percentile of carbon monoxide (CO) (Figure 2, Table 3), the concentration of other pollutants has decreased to a certain extent compared with the same period last year. Among them, sulfur dioxide (SO₂) has decreased to the highest degree, which is 40%, and the concentration of fine particulate matter (PM_{2.5}) has decreased by 30%. Inhalable particulate matter (PM₁₀) decreased by 21%, nitrogen dioxide (NO₂) decreased by 27%, and ozone (O₃) decreased by 12% in the 90th percentile [4], indicating that the reforestation work had a significant impact on the improvement of air quality.



Note: The actual concentration of CO is multiplied by 10 in $\mu\text{g} / \text{m}^3$.

Fig. 2. Year-on-year situation of major pollutants in the first quarter of 2022.

Table 3. Statistical table of pollutant concentration in the first quarter of 2022 (unit : $\mu\text{g} / \text{m}^3$).

Year	PM _{2.5}	PM ₁₀	NO ₂	SO ₂	CO 95th percentile	O ₃ 90th percentile
2021	20	34	11	5	0.8	112
2022	14	27	8	3	0.9	90
Change	↓30%	↓21%	↓27%	↓40%	↑13%	↓12%

4 Analysis of the problems and causes caused by the return of colonies to the beach in the field of people's livelihood

4.1 Problems arising from the return of colonies to the beach in the field of people's livelihood

4.1.1 Ecological compensation lacks effective financial guarantees

In recent years, Hainan Province has had a single source and channel of funds for ecological compensation, mainly from government finance and relevant administrative departments. In addition to the single source of funds in terms of ecological compensation, Qionghai City has no special project for ecological compensation funds, which not only compensates ecological construction projects, but also compensates residents in ecological reserves. In 2020, the provincial finance allocated a total of 33,426,000 yuan per mu for returning ponds to forest at high levels, and 21,000 yuan/mu for returning ponds to forests at low levels, with a total allocation of 42,577,500 yuan. In Qionghai City, the high-level pond retreat pond was only 25,000 yuan/mu, and the low-level pond was returned to forest, with a total of 10 million yuan allocated for special funds, which is lower than the provincial ecological compensation standard, and the relevant departments reflect a large funding gap. In addition, because the management of funds is not perfect, it is impossible to effectively control and use these funds to maintain and develop large-scale ecological region construction, but scattered use in various places, resulting in a large consumption of funds. On the whole, governments at all levels in Qionghai and their relevant departments generally reflect the contradiction between

limited available financial resources and the large demand for ecological and environmental protection input.

4.1.2 Coral reef ecosystems are severely degraded

At present, the coral ecological environment in Qionghai City is very serious, the environment is deteriorated, the ecological restoration capacity is insufficient, the fishery production is tight, and it is damaged by the long-spined starfish, resulting in the restoration of coral reefs has become very slow. Due to the limitations of technology, an effective way to quickly and efficiently restore degraded coral reefs has not yet been found, and artificial restoration cannot be carried out in some areas, and in some areas, there will even be repeated phenomena of "degradation-restoration-degradation" of some coral reefs. After coral bleaching, although the city's fish catch and average catch have increased, fish species diversity has declined, especially the number of carnivorous fish with higher economic value has decreased and is difficult to catch, while the number of cheap herbivorous fish has increased. Studies have shown that the decline in fish diversity not only has a certain impact on the economic interests of fishermen, but also destroys the entire food chain and damages the ecosystem, thus creating a vicious circle.

4.2 Cause analysis

4.2.1 Insufficient capital investment

The compensation mechanism should be based on the principles of "easy to easily, then less difficult, first, then more, then the core areas, then the surrounding areas, the ancestral livelihood project, and then the construction project". Environmental protection and economic development are highly closely related, and the two complement each other and interdependence. In the process of developing the regional economy, it will inevitably pay a certain environmental cost, so a reasonable environmental protection mechanism must be established, which is also an important factor in the national and provincial governments attach importance to ecological compensation. According to the actual situation of Hainan Province and Qionghai City, areas with good ecological environmental conditions are usually in the low -economic development stage, but the ecological environment of high economic levels is frequently damaged. Excessive use of natural resources will greatly destroy the ecological environment, and all of this will be attributed to lack of reasonable ecological compensation mechanisms.

4.2.2 Threat of human activities

One is illegal theft. Because the coral appearance is exquisite, it can be made into crafts and decorations for viewing or selling, which has certain economic value. Therefore, driven by the interests of money, the criminals will be madly pirated by corals, causing a large number of corals to be damaged. The second is pollution of waste water. At present, there are many high -level pond shrimps and fish ponds in the coastal towns and villages do not establish a good sewage treatment facility, resulting in high -concentration nutrients directly flowing to the sea. The third is excessive fisheries. Due to the surge in population, people's demand for fisheries has risen sharply, and super -loading fishery production has severely damaged the healthy growth of coral ecosystems, and reduced the diversity of coral reef fish functions. At present, the damage to the coral ecosystem in Qionghai area is mainly due to the destructive fishing of human beings. The phenomenon of fried fish and poisonous fish in the coral reef

area is more frequent. Use explosive fishing is a huge fishing method to destroy coral reefs. The reef coral and coral reef fish also caused fatal damage to other creatures, which caused the quality of the entire coral reef ecosystem to deteriorate, and the coral reef ecosystem lost balance.

5 Countermeasure thinking on sustainable development of people's livelihood under decolonization

5.1 Improve the sustainable development ability of township government

At present, the main direction of the sustainable development of China's township government is to protect the ecological environment and reduce the degree of pollution. In the process of economic development, the destruction of the ecological environment is inevitable and unavoidable. At present, only by vigorously developing the circular economy and taking the road of green sustainable development can we promote the development of people's livelihood and enhance people's happiness. First, resolutely win the blue sky defense war. We will continue to carry out air pollution prevention and control work, implement air pollution prevention and control responsibilities, focus on straw burning and urban dust pollution, carry out remediation and implementation item by item, and continuously improve the ambient air quality of the city. The second is to promote the 'six water co-governance' [5]. Continue to carry out comprehensive water control in the whole region, establish a full-chain management system of "sewage outlet-sewage pipeline-pollution source," strengthen industrial sewage treatment, strengthen domestic sewage prevention and control, increase the treatment of poultry and aquaculture pollution, coordinate the water environment, protect water and control poor water.

5.2 Build a reasonable ecological compensation mechanism

The ecological compensation [6] mechanism is an effective way to realize the ecological environment protection of natural resources. However, the traditional and single ecological compensation mechanism has many unreasonable problems, which can not cope with the current ecological compensation work. A diversified and market-oriented ecological compensation mechanism should be established. First, clarify the legal status of ecological compensation, further improve relevant laws and regulations, establish and improve relevant supporting policies, form an authoritative and unified ecological compensation mechanism, and ensure the integrity of the system. The second is to explore multiple channels of capital compensation, which can introduce sources of funds other than the government through market transaction operations, social donations, market special funds, etc., break the uniqueness, improve capital efficiency, and increase financial support. The third is to clarify the main body of market compensation in ecological areas and draw the boundaries of rights and responsibilities; clear compensation object, efficient use of funds; clarify the scope of compensation and formulate reasonable and diversified compensation standards. The fourth is to improve the legal supervision system, build a joint ecological supervision system of the government, society and the masses, implement evaluation-based ecological supervision and management, ensure that the market mechanism gives full play to its effectiveness, and ensure that the ecological compensation mechanism is in place.

5.3 Accelerate the transformation of township government to an ecological government

The traditional township government can only alleviate the complex and contradictory relationship between the government, society and citizens, while the ecological government can not only solve the complex relationship between the government and the people, but also solve the problems between the society and the natural environment. Therefore, the construction of ecological organization structure of ecological township government should be improved. First of all, we must build a coordinated and unified ecological environment governance system to achieve coordinated management of the ecological environment. Secondly, it is necessary to clarify the responsibilities between local governments and departments, so as to prevent functional ' confusion ' and effectively accountable for responsibilities. Finally, it is necessary to strengthen the dynamic governance mechanism under the ecological environment, increase the intervention and feedback between the government, environmental protection departments and relevant administrative departments and enterprises, communities and non-governmental organizations, and enhance the response of the ecological government. At the same time, it is also necessary to strengthen the ecological service functions of the township government and incorporate ecological governance into the core functions of the government. This is the most effective way to solve the problems of township ecological civilization construction and people 's livelihood.

5.4 Strengthen the implementation of green GDP

Green GDP [7] refers to the gross domestic product obtained after deducting fixed capital consumption and environmental costs from GDP, that is, deducting the cost of economic losses caused by environmental pollution, natural resource degradation, and low education level. Green GDP is of great significance to achieve efficient protection of the ecological environment. It has a high guiding role in taking the road of "Lucid waters and lush mountains are invaluable assets. " It is crucial to the improvement of people's living standards. Therefore, it is urgent to increase the implementation of green GDP. From the individual level, we should vigorously cultivate the concept of ecological civilization of citizens, establish the awareness of green development, lead the green ecological culture, and incorporate green GDP into the assessment indicators of residents ' health literacy, strengthen mutual supervision among citizens, and further improve the people 's awareness of green environmental protection. From the social level, accelerate the upgrading and transformation of industrial industries, focus on the development of green industries, accelerate green technology innovation, achieve green and low-carbon manufacturing, and reduce environmental pollution caused by various industries. From the government level, implement the green development strategy, introduce relevant policies, improve the green economic development system, establish and improve the ecological environment protection mechanism, clarify the legal status of green GDP, and realize the sustainable development of environment and economy.

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