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Research of the Socio-economic Development in Dalian Chengshantou Nature Reserve

Hong MA^{1*}, Qiang SUN¹, Yang ZHAO², Changqiang MIAO²

1. College of Environment and Chemical Engineering, Dalian University, Dalian 116622, China; 2. Dalian Chengshantou Coastal Landform National Nature Reserve Administration, Dalian 116600, China

Abstract For the purpose of accommodating the relationship between the protection of nature reserve and the development of local society and economy, this paper, taking Dalian Chengshantou Nature Reserve as a study area and PRA as a main research method, investigated and analyzed the status of social and economical development and the existing problems in the study area. The result shows that; the contradictory between the protection of nature reserve and the local development of social and economical activities are still prominent, and the principle of "integration of protection and reasonable development" proposed by the general plan of nature reserve has not reached the expected result. Therefore, further efforts should be made firstly to accommodating relationship between the protection of nature reserve and the local development activities, secondly to accelerating the development of eco-tourism and the relevant service industries in accordance with the local practical situations, and finally to promoting the sustainable development of both the protection of nature reserve and the local society and economy.

Key words Nature reserve, PRA method, Socio-economic status, Coordinated and sustainable development

Dalian Chengshantou Coastal Landform National Nature Reserve was established by the former Dalian Jinzhou District People's Government in 1989, and went through the expert demonstration in Dalian City and Liaoning Province in 1996 and 1998, to be upgraded to municipal and provincial nature reserve. In June 2001, the State Council officially approved Dalian Chengshantou Coastal Landform Nature Reserve as the national nature reserve, and in 2008, it was included into the "Chinese People and Biosphere Protection Zone" network by China National Committee for Man and the Biosphere which corresponds to International Network of Biosphere Reserves of the UNESCO.

In 2006, the Reserve Administration developed "Overall Plan of Dalian Chengshantou Coastal Landform National Nature Reserve in Liaoning Province"^[1], and it was implemented in the same year. For nearly seven years, the work on the reserve has been carried out steadily; at the same time, the socio-economic situation of the nearby villages and communities is also undergoing great changes. Various functional areas of the reserve overlap the production and living areas of local residents, so various problems inevitably exist between the protection and management of the reserve, and local socio-economic development.

In order to accurately understand and assess the actual effects of implementation of the overall plan of the reserve, the survey and research work, based on the socio-economic development status of the reserve and the principles and objectives developed by the overall plan of the reserve, aims to study the problems existing between the protection and management work of the reserve and local

socio-economic development since the implementation of the overall plan of the reserve, as well as the deep-seated reasons, to better coordinate the relationship between the protection and management of the reserve and local socio-economic development, and promote the sustainable resource conservation of the reserve, social harmony and sustainable development of the local economy. Meanwhile, it also provides a theoretical foundation and basis for policy adjustment and the formulation of the next strategic planning for sustainable development of the reserve.

1 Overview of the reserve and research methods

1.1 Overview of the reserve Dalian Chengshantou Coastal Landform National Nature Reserve (39°10'47" – 39°10'55"N, 122°04'41" – 122°12'06") features a hilly slope, located in the southeast coast of Dalijia Street of Jinzhou New District in Dalian City, and the south of Mopanshan Mountain. Its east and southeast are on the verge of the Yellow Sea, with coastline of 15 km. The reserve is 5 km away from the seat of government of Dalijia Street, 20 km away from the Jinzhou District in Dalian City, and 70 km away from the city center of Dalian. The reserve is from Caotuozi of Zhengming Temple in the west, east to Chengshantou of Chengzi Village (including Yuanyangshi – Dantuozi), north to the ridge of Biandanshan Mountain and Mopanshan Mountain, and south to the sea waters extending 500 m. The terrestrial protected area is 600 hm², including eight natural villages (Laohugoutun, Shangxuezijiao, Xiaxuezijiao, Laoyuwopeng, Zhujiatun, Shihuiyao, Gongjiatun, Houjiatun). The marine protected area is about 750 hm², and the reserve is divided into three functional areas (core zone, buffer zone and test zone) in accordance with the characteristics of resource distribution and conservation objectives.

1.2 Research methods The survey and research content of social development in the reserve includes demographic change and

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* Corresponding author. E-mail: hongma@163.com

distribution, population age structure, employment status and income level, culture and education, health care, social security for villagers, and rural community development.

The survey and research content of economic development includes transportation construction conditions, land types and land production, farming, forestry, animal husbandry and fishery production, industrial production, ecotourism, and sustainable economic development trend.

Data are from *Statistical Yearbook* published from 2007 to 2012, census statistics, and Annual Statistical Report of the National Economy. The socio-economic development data are mainly obtained by PRA (Participatory Rural Appraisal)^[3-4].

During the period of survey and research, 200 questionnaires and nearly 30 kinds of related survey tables were distributed, with response rate of nearly 99%, which could truly, comprehensively and objectively reflect the positive and negative effects of the establishment of the reserve on the socio-economic development of the region and its surrounding villages, communities.

2 The social development of the reserve

2.1 Demographic change In addition to the 4 administrative villages under the jurisdiction of Chengzi Village, the reserve also involves 5 administrative villages, covering 8 natural villages. As can be seen from Table 1, from 2007 to 2012, the permanent population in the reserve decreased from 2 513 to 2 217, a decrease of 296 in total; the temporary household population increased from 1 636 to 1 720, an increase of 84 in total; the total population decreased from 4 149 to 3 937. Over 7 years, the total population in the reserve decreased by 212 in total. In 2012, the number of permanent residence households in the experimental zone of the reserve was 457, with population of 1 166; the number of permanent residence households in the buffer zone was 153, with population of 390; the number of permanent residence households in the core zone was 31, with population of 79.

2.2 Population age structure The permanent population in the reserve is 2 217. There are 218 people aged 0 – 14 years, accounting for 9.8% of total population; there are 1 563 people aged 15 – 59 years, accounting for 70.5% of total population; there are 436 people aged 60 years or more, accounting for 19.7% of total population. According to the current age structure, the population in the reserve will be difficult to continue, and the working-

age population will continue to be short. In addition, the aging population is over the warning line, and the population aging has become the trend. The old-age security and social health security issues will be more prominent. The main body of labor in the reserve is in the 15 – 59 age group. In this age range, the number of labor force with permanent residence was 1 303 in 2012, accounting for 83.4%; the number of labor force with temporary census register was 1 040, accounting for 88.2%. The ratio of two numbers is 1.25:1. Although the population with permanent residence can provide effective labor, but due to the outflow of young people and premature aging of the population, the labor reserve supplement is lost. Therefore, no matter what it is today or the future, the labor forces provided by the population with temporary census register will always be the main force for socio-economic development in the reserve.

2.3 The income level and employment status in the reserve

2.3.1 The income level. The total collective income in the reserve was increased year by year in the period 2007 – 2012, from 99.926 million yuan in 2007 to 162.225 million yuan in 2012 (Table 2), with the average annual growth rate of 10.4%. At the same time, the per capita net income of villagers also increased, from 8 376.1 yuan in 2007 to 13 560.4 yuan in 2012, with an average annual growth rate of 10.3%. The villagers' bank deposits in the reserve also increased while their income increased. The villagers' per capita amount of bank deposits increased from 24 306 yuan in 2007 to 39 406 yuan in 2012, with an average annual increase of 2 516.7 yuan, increase rate of 10.4%. From the above analysis, it shows that since the establishment of Dalian Chengshantou Coastal Landform National Nature Reserve, the socio-economic development in the reserve has encountered a slump. Within the reserve, the collective income is increased year by year, the villagers' personal income and bank deposits are increased year by year, and the quality of life of villagers is also increased year by year.

Table 1 The changes in the number of permanent residents

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|----------------------|-------|-------|-------|-------|-------|-------|
| Permanent population | 2 513 | 2 477 | 2 388 | 2 334 | 2 256 | 2 217 |
| Temporary population | 1 636 | 1 653 | 1 663 | 1 683 | 1 700 | 1 720 |
| Total population | 4 149 | 4 130 | 4 051 | 4 017 | 3 956 | 3 937 |

Table 2 The total collective income, per capita net income and per capita deposits

| Years | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------------------------------------|---------|----------|----------|----------|----------|----------|
| Total income//10 ⁴ yuan | 9 992.6 | 11 054.1 | 12 147.2 | 13 412.9 | 14 760.6 | 16 222.5 |
| Net income per capita//yuan | 8 376.1 | 9 309.9 | 10 246.2 | 11 298.1 | 12 390.2 | 13 560.4 |
| Bank savings per capita//yuan | 24 306 | 27 156 | 29 870 | 32 848 | 36 054 | 39 406 |

2.3.2 Employment status. The temporary labor forces make up for the lack of labor with permanent census register in the reserve. Within the reserve, the labor forces with permanent census register and temporary census register together constitute the main body of employment. The villagers in the reserve have little land and there

are no villagers keeping subsistence merely by agricultural production. Their main incomes come from the primary industry and tertiary industry, and the actual survey results show that there are 2 343 labor forces in the reserve, and 102 tertiary industry dealers which can absorb 246 labor forces. The business categories in-

clude restaurants, shops, hardware accessories, processing, repairing, and entertainment. The primary and secondary industries cover 12 types of industry, such as seafood aquaculture, seafood breeding industry, shipbuilding, seafood processing industry and machinery processing industry, and there are 83 enterprises absorbing 2 097 labor forces. Basically, there is no idle labor in the reserve, and the overall employment is in good condition.

2.4 Culture and education in the reserve

2.4.1 Education level of population. In the 2 217 population with permanent census register in the reserve, the illiterate people account for 1.2% ; the people with primary school education account for 18.8% ; the people with junior high school education account for 48.0% ; the people with senior high school education account for 31.5 % ; the people with junior college education account for 0.5 % . The common feature is that the population with junior and senior high school education accounts for the vast majority, followed by the population with primary school education; the illiterate person is rarely seen, only part of the aging population. The population with junior college degree or above is almost close to zero. The reason for this case is that the young generation after 80s and 90s transfers to big cities, and these people universally have higher education. This imbalance in education is consistent with the results of the aforesaid demographic changes and aging.

2.4.2 Rural education resources. The educational resources in the reserve is configured and managed by Dalijia Street. Now Dalijia Street has one high school, three primary schools and four kindergartens. In 2012, the primary schools in Dalijia Street have a total of 1 180 school-age children, including 705 students with permanent census register and 475 students with temporary census register, all receiving the national compulsory education. Since 2006, Dalijia Street has integrated primary education resources for many times, and the main reason is the declining number of students. As can be seen from Table 3, the student population with permanent census register was decreased year by year during the period 2007 – 2012, and the student population with temporary census register was increased year by year. The increasing student population with temporary census register only slowed this trend, and overall there was a decreasing trend of students. This trend of change is consistent with the trend of the aforesaid population age structure, and the phenomenon of school-age pupils difficult to continue the primary education is also mainly caused by the transfer of young people from rural areas to urban areas.

2.5 Health resources The health resources are also configured and managed by Dalijia Street. Currently Dalijia Street has 1 health center, 28 – 30 health care workers, and 20 – 25 hospital beds. Chengzi Village and Zhengmingsi Village each have 1 health clinic, 2 – 3 health care workers and 3 – 5 beds. There is health room in the village, equipped with the rural doctors with some medical knowledge, who can carry out medical care for the people suffering common diseases. The role of village doctors in the rural grass-roots health care is irreplaceable, but there are some com-

mon problems. On the one hand, the rural health workers' income can not be guaranteed; on the other hand, the health infrastructure is backward, the rural hospital equipments are obsolete, and the existing health care staff are of low quality, lacking adequate training, making it difficult to meet the growing medical needs. The new rural cooperative medical care system was promoted in 2003. The implementation of the system can basically ensure that there is no need to go out of the villages for the treatment of minor illnesses, and go out of the streets for the treatment of general illness; if people suffer the serious illness, they can get a certain amount of reimbursement. However, from the implementation situation, the local villagers are not very satisfied with the new rural cooperative medical care system, due to low security level, too long period for reimbursement, and too complicated reimbursement procedures.

Table 3 The changes in the number of rural primary school students in Dalijia Street

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------------------------------|-------|-------|-------|-------|-------|-------|
| Pupils of permanent residence | 798 | 787 | 759 | 742 | 717 | 705 |
| Pupils of temporary residence | 452 | 457 | 460 | 465 | 470 | 475 |
| Total | 1 250 | 1 244 | 1 219 | 1 207 | 1 187 | 1 180 |

2.6 Social security for the villagers At present, apart from the new rural cooperative medical care system, the social security system in the reserve includes the rural system of five guarantees, the rural minimum living security classification system and new rural endowment insurance system. In the surveyed 30 poor families, three are three households enjoying the five guarantees (childless and infirm old persons who are guaranteed food, clothing, medical care, housing and burial expenses), accounting for 10% of the total surveyed families. In 2012, the minimum living security payment for the concentrated households enjoying the five guarantees in the villages under the administration of Dalian City was 3 960 yuan/year; the minimum living allowance for the scattered households enjoying the five guarantees was 2 820 yuan/year. In the reserve, there are 19 poor people with permanent census register enjoying the guarantee security, and the average security standard is 3 220 yuan/year. Overall, the security level is very low and the security coverage is too small. Taking the reserve for example, the total coverage of villagers enjoying the five guarantees and subsistence allowances was less than 0.9% in 2012. The pilot work of "new agricultural insurance" system was promoted from 2009, and it is projected that the population of the right age will be fully covered in 2020. The "new agricultural insurance" is another major preferential agricultural policy after some policies, such as abolishment of the agricultural tax, direct agricultural subsidies and the new rural cooperative medical care system. On the basis of no taxes paid for farming, no payment for schooling and not too much payment for medical treatment, this policy provides the security for the farmers when they are old. It is a critical step of China's pension system towards the goal of "universal sense of security". As the "new agricultural insurance" has

the above advantages, it is deeply favored by the villagers. Currently, the farmers in the reserve and the surrounding villages have all volunteered to participate in the new rural social pension insurance.

3 The economic situation in the reserve

3.1 Transportation Liaoning coastal roads run through the reserve, so the transportation is convenient from the outside. But the transportation between the villages in the reserve is not convenient. The village-level roads lead everywhere, but the roads are narrow, with poor road conditions, and if there is rain or snow, the road safety is difficult to ensure. There is no public transport running normally in the reserve, and the links between villages thank to private vehicles. The traffic situation will inevitably affect the development of tourism in the reserve. If wanting to develop tourism, it is imperative to improve the village roads, and open the public transport operating daily.

3.2 Land type and land productivity

3.2.1 Land type and arable land area. The land types in the reserve can be divided into two main types; one is woodland, and the other is arable land. Arable land mainly includes field, orchard and vegetable garden. In 2012, the arable land area was 75.42 hm², and the woodland area was 468.69 hm². Compared with 2006, the arable land area was decreased from 86.75 hm² to 75.42 hm² in 2012, a decrease of 11.33 hm² in total, an average annual decrease of 1.89 hm². If we consider the upcoming transfer of the land, the arable land will be reduced to 57.62 hm² at the end of 2013, a decrease of 29.13 hm² in 7 years. Then, the average annual reduction of arable land will reach 4.16 hm². The main reason for the reduction of arable land is the change of land use type, and the land transfer is mainly used for building factory and other development projects. It also highlights a fact that the arable land area in the reserve is decreasing year by year.

3.2.2 Land productivity. The main crops planted in the reserve are maize and millet; the main crops planted in the vegetable garden are cabbage, spinach, cucumber, radishes, tomatoes, beans, potatoes, etc.; the main crops planted in the orchard are strawberries, peaches, blueberries, pears, apples, etc. The purpose of planting crops in the woodland is for soil and water conservation, afforestation and landscaping, not dominated by economic interests. The main planting tree species are pine, cypress and other evergreen trees. There are also a small amount of acacia trees, poplars, mulberries and other deciduous trees and some dwarf shrubs. In the reserve, the order in terms of productivity per unit of land is as follows: vegetable garden crops > orchard fruits > field crops; the order in terms of annual productivity of land is as follows: orchard fruits > vegetable garden crops > field crops. In 2012, the gains obtained by the reserve through land productivity were 556 200 yuan, accounting for only 0.34% of total revenue in the same year. Therefore, in addition to the vegetable garden around the houses, the transfer of land has not have much impact on the villagers' actual income and life. In turn, they will get

greater benefits due to the transfer of part of land (such as social security, etc.). This is exactly why the local villagers are willing to transfer their land. It also reflects that it is difficult for the villagers in the reserve to maintain livelihoods solely relying on a small amount of cultivated land.

3.3 Farming, forestry, animal husbandry and fishery production Table 4 is the input and output of farming, forestry, animal husbandry and fishery production in the reserve from 2007 to 2012. During this period, the forestry input was little and thus the output was also little; there was a positive correlation between input and output in farming and aquaculture, and the average input-output ratio was 0.627 and 0.271 5, respectively; the input-output ratio of aquaculture was low, and the profit was 2.31 times that of farming, indicating that aquaculture always showed good momentum of development; there were fluctuations in the input and output of animal husbandry, and the input-output ratio was 0.399 in 2010 and 0.371 in 2012, indicating that there were great natural risks and market risks in animal husbandry; from 2007 to 2011, the input was positively correlated with the output in the marine fishing industry, and the output increased with the increase in the input, but the input-output ratio during this period increased year by year, from 0.145 in 2007 to 0.328 in 2011, and then in 2012, the input and output of fishing industry declined sharply (The input was only 6.1 million yuan, a decrease of 83.5% over the previous year; the output was only 18.776 million yuan, a decrease of 83.4% over the previous year. Therefore, the overheating aquaculture input and the sharp cooling down of fishing industry can explain two problems: (i) Overfishing and pollution of the sea in China cause the severe depletion of marine resources, and the marine fishing costs and operational risks mount significantly, but the yield is decreased; (ii) The original fishermen engaged in fishing industry switch to aquaculture, which further exacerbates the shallow water pollution.

3.4 Industrial production From the perspective of large-scale farming, the industrial enterprises referred to here are all non-farm enterprises, which are the secondary industry often said by people. Due to the special geographical location of the reserve, the industrial enterprises are not developed, and most of them are on the small and medium scale. From 2007 to 2012, there were a total of 6 industrial enterprises (3 shipyards; 1 mechanical processing factory; 1 shellfish processing plant; 1 rope plant. In addition to mechanical processing plants and shellfish processing plant not in the reserve, the remaining companies are located within the reserve. In 2012, the secondary industry in the reserve achieved the revenue of 18.754 7 million yuan. According to incomplete statistics, although there are few non-farm enterprises in the reserve and the nearby Chengzi Village, we can not ignore their pollution to the coastal waters, especially for the ship repair and shipbuilding. The direct effects of ship repair and shipbuilding on the marine environment are that the oily wastewater is discharged directly into the sea, causing serious pollution to the marine environment, especially in shallow waters, so we should pay close attention to this.

Table 4 The input and output of farming, forestry, animal husbandry and fishery production in the reserve from 2007 to 2012

| Year | Farming//10 ⁴ yuan | | Forestr//10 ⁴ yuan | | Animal husbandry //10 ⁴ yuan | | Aquaculture //10 ⁴ yuan | | Marine fishing industry//10 ⁴ yuan | |
|------|-------------------------------|--------|-------------------------------|--------|--|--------|---------------------------------------|----------|--|----------|
| | Input | Output | Input | Output | Input | Output | Input | Output | Input | Output |
| 2007 | 79.6 | 127.3 | 5.0 | – | 40.9 | 123.8 | 1 054.0 | 7 251.4 | 1 232.4 | 8478.8 |
| 2008 | 95.7 | 153.0 | 4.0 | – | 46.2 | 133.3 | 1 423.0 | 8 003.0 | 1 664.0 | 9 358.4 |
| 2009 | 67.8 | 108.2 | – | – | 48.1 | 144.1 | 2 039.2 | 9 268.7 | 2 198.0 | 9 990.5 |
| 2010 | 78.7 | 125.6 | – | – | 50.0 | 125.3 | 3 031.1 | 10 578.5 | 3 077.4 | 10 740.1 |
| 2011 | 90.0 | 143.4 | – | – | 51.5 | 146.4 | 4 023.0 | 12 273.9 | 3 696.0 | 11 276.3 |
| 2012 | 94.3 | 150.8 | – | 8.3 | 52.5 | 141.6 | 7 844.0 | 24 144.6 | 610.0 | 1 877.6 |
| Mean | 84.4 | 134.7 | 1.5 | 1.38 | 48.2 | 135.8 | 3 235.7 | 11 920.0 | 2 079.6 | 8 620.3 |

4 Conclusions

From 2007 to 2012, the number of people with permanent census register in the reserve was decreased year by year, and the number of people with temporary census register in the reserve was increased year by year. The temporary labor forces make up for the lack of labor with permanent census register in the reserve. The population with permanent census register tends to be severely aging, and the social medicare and social security obviously lag behind, which is the fundamental reason for their willingness to use land for social security. There is no idle labor in the reserve, and the primary industry is the main force for absorbing labor force. The collective income, the collective accumulation, the villagers' income and the villagers' savings are mainly from the primary industry. Due to the economic driving force of the primary industry, the collective income and personal income show a growth trend. The majority of young people after the 1980s and 1990s in the population with permanent census register, transfer to the big city through learning and employment, leading to the low level of education of population with the permanent census register in the reserve, which is in stark contrast to the level of education of urban population. In the reserve, the school-age population tends to decline obviously year by year, resulting in constant re-integration of rural primary and secondary education resources. In the reserve, there is serious imbalance in demand and supply of social medical resources, and the phenomenon of rural poverty caused by diseases sometimes occurs. These poor farmers are not satisfied with the new rural cooperative medical care system. However, they generally endorse the "new agricultural insurance" policy. Through visits and questionnaire surveys, it shows that there is low degree of recognition among the local villagers on the definition of the reserve boundary and the protection management methods. The root of the problem is the blurred responsibility of property rights in the reserve. Overall, the positive effect of social development in the reserve is greater than the negative effect of social development in the reserve, indicating that the overall trend is good. The village roads in the reserve need to be improved, and the tourist traffic is also expected to be developed. There is a lot of woodland in the reserve, but the arable land is scarce, and the integrated productivity of arable land is only at a medium level. In the reserve, the primary industry is competitive industry, and the development momentum is very strong, followed by the secondary industry. Due to the effect of population, the tertiary industry is not developed well, however, this industry structure matches the economic geog-

raphy of this region.

In the secondary industry, the ship repair and shipbuilding have caused heavy pollution to the sea, so the industry's presence is not conducive to the sustainable conservation of the reserve. In the development of farming, forestry, animal husbandry and fishery, the input-output ratio of aquaculture is the lowest, with the best benefits; meanwhile, it is also the industry with the maximum contribution rate in the primary industry. In recent years, there has been a sharp decline in the fishing industry benefits; animal husbandry is consistent with the domestic industry status, showing a cooling trend; the development of farming is good; the forestry input is not enough. The per capita GDP and per capita income in the reserve are both higher than in the neighboring regions, owing to its unique economic and geographical position and large scale agricultural production. There are significant differences in the economic driving force between the reserve and neighboring regions; its driving force of economy comes from its unique industrial structure, that is, the primary industry is the main economic driver. The age structure of the population in the reserve needs to be improved, and human capital also needs to be updated, otherwise it will affect sustainable economic development in the reserve. Currently, the eco-tourism projects have not yet been started in the reserve. But there is a huge potential for eco-tourism development. According to the agricultural location theory in the economics, the reserve is very suitable for the development of large agricultural economy and large tourist economy. In order to lay a good social foundation for the eco-tourism development in the reserve, it is necessary to comprehensively carry out eco-tourism education, and establish a new concept of eco-tourism. It is also necessary to introduce capital, open up and achieve internationalization of eco-tourism as quickly as possible, so as to improve the competitiveness of eco-tourism in the reserve.

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