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Perception Analysis of the Transformation from a Fishery-Led to Industry-Led Island with its Human Settlement Changes: A Case Study of Liuheng Island, Zhoushan City, China

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Abstract: Based on the theories of industrial structure and settlement environment, this paper conducts a quantitative and qualitative study to investigate how the evolution in the industrial structure of the island affects the settlement environment with relevant statistical data, local chronicles, and questionnaire survey data. The study found that the industrial structure of Liuheng Island has transformed from a fishery-led to industry-led island, which has led to the rapid increase of urbanization on Liuheng Island, and the public service facilities have been increasingly densely distributed urban-type communities with high modernization levels, such as Longshan Community, Xuanzhuotou Community, and Taimen Community. The local residents of Liuheng Island are also satisfied with the public service facilities in terms of facility availability, transportation convenience, environmental comfort, and environmental health. For a period, the island residents were particularly concerned about the regional differences in environmental health, and the main reasons were the industrial structure upgrade towards industrialization, which would cause certain industrial waste emissions, and the pressure of commuting within the island, which would affect residents' sense of security. This indicates that the evolution of industrial structure will directly affect the speed and quality of urban and rural settlement hardware construction and also, to a certain extent, the subjective perceptions of residents around the dense industrial areas on the state of the settlement, especially in terms of environmental health and community living safety.

Keywords: settlement environment; island town; industrial structure; Zhoushan City; public service facilities

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1. Introduction

Island cities are types of urban settlements that have drawn academic interest due to their distinct socioeconomic development challenges and distinctive ecological environment occurrences [1]. The human settlements in island cities exhibit a variety of states, traits, and challenges under various developing conditions [2]. The concept of human settlements was first proposed by Doxiadis, who emphasized that five basic elements (i.e., nature, human, society, architecture and city, transportation, and communication network) should be systematically studied [3,4], and the United Nations' Vancouver Declaration promoted it to an independent discipline and discussed how to understand and solve a series of human settlement problems, such as urban traffic jams, housing shortages, environmental

pollution, and ecological destruction, which are caused by the rapid development of urbanization around the world [5], which also established a special human settlements body and proposed the improvement of "human settlements". The construction of sustainable, safe, efficient, healthy, and ecological human settlements has become a global consensus [6].

Islands have a single economic structure, limited resources, and little environmental capacity, making them sensitive zones of land–sea interaction and fragile ecological environments [7]. Due to the impact of globalization, an increasing number of people and industries are moving to cities, which consume 70% of the world's energy. It can be seen that global cities are under severe ecological pressure and are important contributors to global climate deterioration. As a special regional unit, island cities have their own unique development mode and path, and the interaction between the development and evolution of economies, resources, and the environment has always been one of the important issues concerned by geography [8–10]. Islands have been critical strategic sites for China's development since the 21st century. Their sustainable development is of great practical significance for realizing the strategy of becoming a maritime power, coordinating land and sea space development, optimizing marine territorial space, and promoting high-quality marine economic development [11,12]. At present, China's eastern coastal areas have become the most densely populated, the most concentrated, have the largest industrial scale, the greatest pressure of urban development in the region, natural ecological damage, municipal infrastructure overpressure, declining living conditions, increasing social contradictions, and other prominent problems [13,14]. Global warming [15,16], rising sea levels [17,18], and frequent natural disasters in coastal areas have exerted great influence on the sustainable development of mankind. The existence of the above-mentioned issues severely limits the sustainable development of island cities and threatens their strategic position in marine development. Furthermore, compared with mainland coastal cities, island cities are characterized by poor resources and a single structure, demonstrating the strong sensitivity and vulnerability of the human settlement environment system [19]. Some natural or man-made anthropogenic may lead to system collapse and serious urban development problems [20].

Relevant studies show that the industrial development types of sea islands in China are diversified and prominent; there is a transition type of structural evolution, and the rate of industrial structure evolution is increasingly [21]. Other island cities, aside from Changhai County, where fishery is the dominant industry, are transforming and upgrading to secondary and tertiary industries [22]. The transition type of industrial structure evolution is mainly manifested in right-handed and left-handed modes [23], in which secondary and tertiary industries alternately grow into regional leaders. Among them, Dinghai County and Dongtou County have a good economic foundation, and their industrial structures have basically realized the advanced level of post-industrialization. The four counties of Changdao, Changhai, Pingtan [24], and Shengsi [25] carry out large-scale aquaculture of fisheries by virtue of their excellent marine resources [26]. The fishery is the leading industry, and the tertiary industry for serving fishery production is emerging gradually. Although the service industry develops faster than the industrial sector, it cannot yet overtake the fisheries industry as the region's leading industry. The industrial structure presents the characteristics of evolution from "primary, secondary, and tertiary industries" to "primary, tertiary, and secondary industries". Daishan, Putuo, Chongming, Nanao, Dongshan, and Yuhuan, relying on their excellent harbor resources and marine resources, vigorously develop shipbuilding, harbor chemical industries, intensive processing of aquatic products, and other industries. Although the industrial economy has become the backbone of the urban economy, its proportion remains modest when compared to tertiary industries. The industrial structure presents the characteristics of leap-forward evolution from "primary, secondary, and tertiary industries" to "tertiary, secondary, and primary industries" and then to "secondary, tertiary, and primary industries". In the early stages of the development of the marine economy, fishery was the leading industry in island cities. With the continuous expansion of fishery production scale, the seafood trade service industry for serving

fishery production began to develop, and relying on unique marine tourism resources, the primary producer service industry was developed to accumulate funds for high-efficiency industrial production.

This typical evolution law of island industrial structure results in unique landscape phenomena and island urban human settlement development difficulties. The existence of the transition evolution law indicates that the regional industrial structure is unstable, which seriously affects the contribution rate of regional economic aggregates to local financial revenue. Secondly, fishery is still the leading industry in certain island cities. Based on marine living resources, it has a significant impact on the marine ecological environment. Furthermore, the seafood service industry serving fishery production and the primary producer service industry relying on the development of marine tourism resources have low added value and weak employment capacity, which cannot greatly improve the income and consumption levels of island residents. In addition, fishery is a polluting industry. Processing waste from marine products, the foul smell of marine products, and the excrement of aquaculture objects have a significant impact on the quality of the human settlement environment on islands. Finally, traditional industries with a low proportion on the island, such as ship repair, port chemical industry, and aquatic product processing, have low added value, weak employment absorption capacity, serious environmental pollution, and a large consumption of freshwater resources. In addition to degrading the integrity of the natural environment, they place significant strain on infrastructure, such as transportation on the island cities, and have a serious impact on residents' quality of life [27].

Urban human settlements can effectively reflect the social and economic development and material and cultural living standards of a country and region [28]. A suitable living environment is the common aspiration of city residents and the inherent requirement of sustainable development [29]. The characteristics and research objects of geography point towards a promising future in human settlement research [30]. For China, a nation with a sizable population and limited resources, enhancing the living conditions in island cities and promoting the transformation and upgrading of the industrial structure on islands have important national rights and interests and national defense and security strategic significance for the development and protection of marine resources. Zhoushan, Zhejiang Province, China, is the east gate city of China's opening to the outside world, located at the mouth of the Yangtze River. It is an important base for the construction of a good deep-water port, the development of offshore oil and gas, fishery, and marine tourism, and has significant political, economic, and ecological values. It is critical for the promotion of Zhoushan's entire value to strengthen the research of Zhoushan Island and promote understanding of its features and development rules.

2. Data and Methodology

2.1. Study Area

Liuheng Island, Zhoushan City, covers a land area of 139 km^2, which is the third largest island of the Zhoushan Islands (Figure 1). The area under its jurisdiction consists of five residential islands, Liuheng, Fodu, Xuanshan, Duimianshan, and Liangtan, with 30 uninhabited islands and 80 reefs. Currently, it has jurisdiction over 27 rural fishery communities and 5 urban communities. The registered population is approximately 63,000, with a permanent population of approximately 100,000. From 1953 to 2019, the proportion of the output value of the secondary industry on Liuheng Island increased from 0.95% to 48.99%, demonstrating the successful parallel development of the industrial structure from the fishery industry to the ship repair industry, the marine transportation industry, the tourism industry, and the foreign trading industry. At the same time, Liuheng Island has evolved from a pure rural agricultural land to a modern urbanized community and a landscape of farming and fishing communities. The infrastructure covers all the daily life needs of local residents as well as the production needs of various enterprises, and the living environment has changed dramatically.

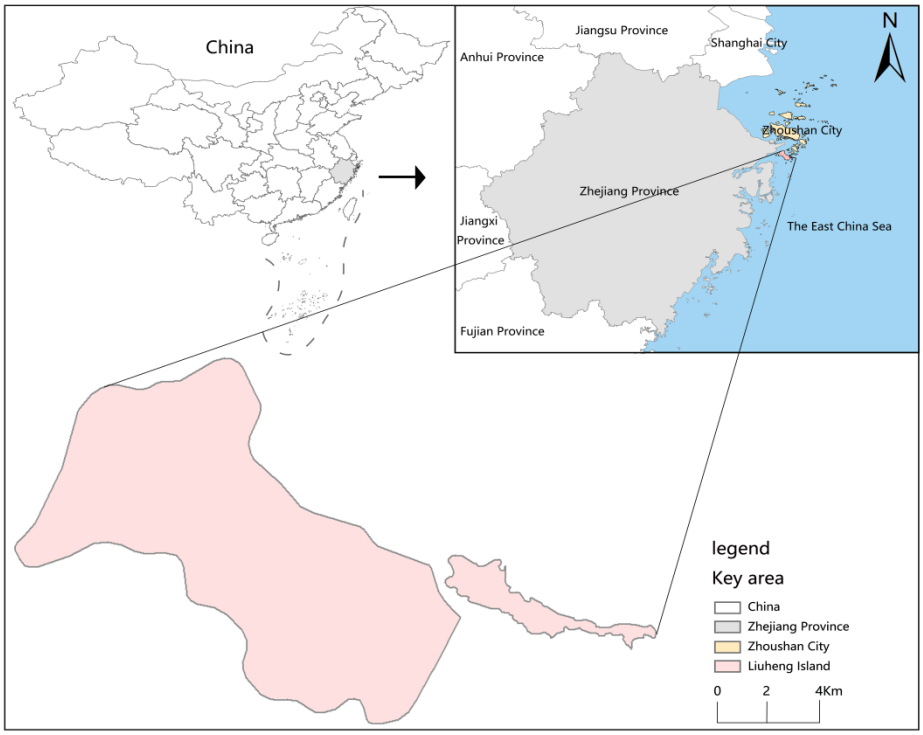

Figure 1. Scope of the study area.

2.2. Data Sources

The data types mainly include economic, land use, enterprise attributes, and policy planning. Among them, economic and industrial data are mainly obtained from the data sources of Zhoushan City and Putuo District's annual statistical yearbooks; land use data are mainly obtained from the interpretation of remote sensing images; enterprise attribute data are mainly obtained from enterprise information and spatial coordinate data provided by major network system platforms; and planning policy data are mainly obtained from various urban planning projects.

Enterprise data is mainly obtained from open network platforms such as Qichacha and Qixinbao by searching keywords such as "Liuheng" to obtain the whole enterprise information records, including the enterprise name, location, establishment time, business status, business scope, etc. A total of 13,114 enterprise information records were collected (June 2019). The information regarding public service facilities was obtained from the website of Zhejiang government services (http://zsptlh.zjzwfw.gov.cn (accessed on 15 March 2023)). The coordinate picker in the Baidu Map API development platform (http://api.map.baidu.com/lbsapi/getpoint/index.html (accessed on 9 April 2023)) was used, the coordinate system was the WGS-84 coordinate system encrypted twice by GCJ-02 and BD-09, and the name or address of each enterprise and public service facility was used for coordinate search and to obtain the corresponding XY coordinate value.

In order to evaluate the subjective perceptions of settlement on the island, questionnaire interviews are needed to obtain the subjective perceptions of local residents and foreign visitors. Therefore, questionnaires were designed for both groups of people. To ensure the validity of the questionnaire survey, the administrative division and population of the study case were sorted out to determine the sample size of the questionnaire. The study case was selected for Liuheng Island, Zhoushan City, China. Liuheng Town has 32 communities with a population of 66,126 and 19,459 households. With households as the sample subjects, the sample size of each community was calculated according to the formula of simple random sampling, as shown in Table 1, and the number of questionnaires distributed was 500, of which 475 were effectively collected.

Table 1. The number of samples in each community.

Community Name	Sample Size	Community	Sample Size	Community Name	Sample Size
Jiaotou	16	Shuangtang	12	Gaofeng	3
Shizhutou	6	Qinglian	6	Taimen Center	12
Longshan Center	15	Qingshan	7	Tianao Center	11
Damaikeng	2	Gunlongao	3	Xuanshan	9
Shanxi	4	Cengxia	4	Fodu Center	8
Songshan	4	Pinjiao Center	9	Dongjing Community	5
Jizhi	3	Meizhi	3	Zhanglangshan Community	3
Wuxing	4	Duzhuang Center	5	Zonglvwan Community	2
Herun	3	Xiaohu	5	Taimen Community	4
Xiaoguoju	3	Cangdong Center	8	Xinmin Community	3
Shuangyugang	5	Jiaotan Center	6	Total	195

2.3. Methodology

2.3.1. Spatial Analysis

Spatial analysis is a data analysis strategy that uses geographic location as the foundation. It is an efficient, accurate, and scientific method of data analysis that is critical for exploring the connections and patterns between geographical phenomena. It is a technique that combines location information with other types of information (e.g., socioeconomic, demographic, building, etc.) for in-depth analysis. This analysis method is based on GIS systems that provide powerful geographic information data integration and analysis capabilities to effectively analyze multiple types of geographic data and find connections and trend patterns among them.

In recent years, Liuheng Island has transitioned from a rural to an urbanized area, resulting in a significant increase in the level of public service facilities (Figure 2). With the accelerated urbanization and economic development, the infrastructure construction on Liuheng Island has improved, including roads and transportation, which have been vigorously developed. Simultaneously, public service facilities such as medical and health care, science, education and culture, entertainment, and leisure have also been built, and the quality of services and management has gradually improved, providing residents with more convenient and high-quality services. As a result, based on the application advantage of ArcGIS 10.8.1, a spatial analysis software in urban geography, the relevant POI data of Liuheng Island were processed and visualized to measure the geographical spatial phenomena of the region, and the agglomeration and distribution characteristics of urban public service facilities on Liuheng Island were analyzed and discussed by using the analysis tools.

2.3.2. Questionnaire Method

Small-scale human settlement research is mostly based on satisfaction, often using methods such as principal component and hierarchical analysis and questionnaire surveys or national census data to explore the subjective or subjective quality of the settlement [31]. In social science research, the questionnaire survey approach is commonly used. The questionnaire-based survey method may efficiently collect a huge amount of qualitative and quantitative data while also revealing participants' attitudes and perceptions about a topic, phenomena, product, or service.

A questionnaire was used to obtain the subjective perceptions of local residents and foreign visitors to Liuheng Island, and questionnaires were designed for both groups of people. The questionnaire is divided into three parts: the first part is the focus of the survey, which mainly involves the respondents' evaluation of the factors affecting the satisfaction of the living environment in their residence and the surrounding area, including the satisfaction of safety, the satisfaction of living facilities, the satisfaction of

daily transportation, the satisfaction of the natural and human environment, and the satisfaction of environmental health; the second part of the survey is about respondents' satisfaction with housing and income; the third part is about respondents' personal and family situations. The questionnaire distributed to foreign tourists consisted of fifteen questions in three parts: part 1 was a survey of the basic information of the respondents; part 2 was a survey of the respondents' satisfaction with the environment of the case place as a tourist destination, including the surrounding natural environment, the convenience of supporting facilities, environmental health, public security, internal and external traffic accessibility, and service experience; and part 3 was the respondents' personal information.

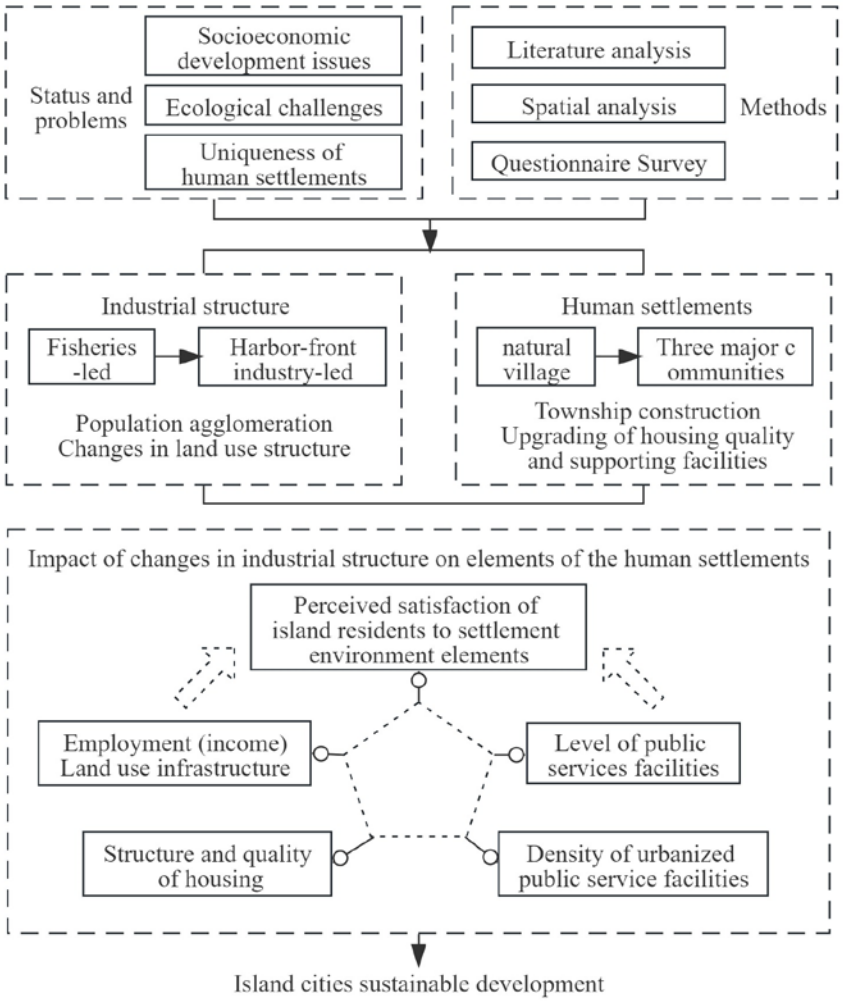

Figure 2. Framework for this study.

3. Empirical Results

3.1. Evolution of Industrial Structure on Liuheng Island

3.1.1. Evolution in the Major Industrial Sectors

(1) The maritime freight industry emerged during the Song and Yuan dynasties at the beginning of the establishment of individual operations of wooden sailing ship transport. In the 1960s and 1970s, some villages emerged with transport vessels, transport households formed transport consortium groups, and mixed passenger and freight operations emerged. The number of sea transport vessels increased dramatically after the development of an individual and joint-family transport industry in the countryside in 1978. By 2013, there were nine shipping companies, one hundred twenty-four cargo ships, and forty-two individual private ships on Liuheng Island. In total, 81.127 million tons of goods were handled by the port in 2019.

(2) Liuheng passenger transport industry was founded in 1992; Liuheng bus station and Liuheng passenger transport center were built in 2009; and Liuheng bus passenger transport Co. was founded in 2012. In 2019, the company received 3.04 million visitors, with a total tourism revenue of 1.74 billion yuan.

(3) The construction and real estate industries on Liuheng Island were organized by a few individual craftsmen cooperatives (groups) in the early 1950s and then gradually developed into construction enterprises. In 2000, a real estate development company from Ningbo settled on Liuheng Island, marking the end of the era of local construction companies building public housing on the Island, with a total area of 703,000 square meters of real estate development in the whole territory by 2013. Liuheng Town has three urban areas, namely Credit Head, Taimen, and Longshan, with a built-up area of 8 km^2, a resident population of 80,000 in the built-up area, and an urbanization rate of 75%.

(4) Evolution in the plantation sector on Liuheng Island. Liuheng Island began land reform in October 1950, and the agricultural mutual aid group was established in 1951. In 1953, there were four agricultural cooperatives with land and agricultural tools, and by September 1954, there were ninety-seven of them. From 1978 to 1992, the proportion of income from farming in total rural income dropped from 59.28% to 9.28%, while that from animal husbandry increased from 1.21% to 3.16%. In the 1950s, dry land increased, paddy land decreased, and the total land decreased due to afforestation, farmland water conservancy construction, and infrastructure; in the 1960s, farmland water conservancy construction continued, part of it was returned to forest, and the arable land continued to decrease; in the 1970s, paddy land was relatively stable, and capital construction was based on dry land as the main construction. For example, cotton production was expanded in 1959, and rape, vegetable, fruit, and melon planting were increased in the 1980s; from 1979 to 1980, the cultivation was stopped and returned to forest, the use of arable land was changed, fruit and shrimp ponds were operated, and the construction of market towns and houses for farmers increased; in 1992, the area sown with cash crops accounted for 31.3% of the total area sown with crops.

(5) Evolution in the development of marine aquaculture and the fishery industry on Liuheng Island. The marine fishery and aquaculture industries are more developed to the south of Zhoushan fishery grounds. In the early Qing Dynasty, small fishery gears were operated exclusively or in partnership, and during the Guangxu period, some fishermen became shareholders and bosses; the main form from the late Qing Dynasty to the Republic of China was the "Chang yuan" employment system. The former fishery cooperatives were changed into fishery production brigades, with the main production and operation labor arrangements, revenue distribution, and financial accounts managed by the commune. After gradual reform of the fishery area in 1978 to implement the joint production contract responsibility system, in 1984, the political and social division, the restoration of the township people's government, the fisheries brigade to the fisheries village, and the production organization for the fisheries cooperative were completed. After 1985, the mass fishery company was established, and the stock cooperative economy was initially implemented in the 1990s. Before 1978, the main focus was on offshore fisheries. The main types of fisheries were the open net industry, shrimp trawling, and small and large fishery operations. The marine fishery industry on Liuheng Island is primarily shrimp trawling, drift gillnets, single trawls, seines, and open nets; it has a total of 318 small and large fishery boats, most of which have less than 60 horsepower; as a result of Zhejiang Province's implementation of "one hit, three rectification", the offshore fishery industry has turned to commercial companies. By 2014, Liuheng had more than 12,000 acres of pond culture, mainly pike crab farming, and the implementation of three-dimensional farming, such as the culture of South American white shrimp and bamboo shrimp, while also raising razor clams, scallops, arks, sand clams, etc., to improve the efficiency of farming. By 2019, the six cross towns of Fodu village pond farmers would engage in pike crab, Chinese shrimp, bamboo shrimp, razor clams, scallops, and other three-dimensional mixed culture modes

to obtain better economic benefits, giving the village of several farmers of bamboo shrimp an annual income of 70 to 100,000 yuan.

(6) Evolution in the development of major industries on Liuheng Island. Before the liberation of Liuheng Island, there were no modern industries and handicraft industries were developed. At the beginning of liberation, the handicraft industry was socialistically transformed, and small-scale industries were organized in the 1950s. After 1978, island-based industries, mainly fish processing, were developed. In 1977, there were two light industry enterprises mainly engaged in ship repair, agricultural and sideline products processing machinery manufacturing and maintenance, fishery and agricultural production equipment, and daily necessities production. After 1978, the transformation of town and village enterprises outward, ships, machinery, aquatic and agricultural processing, and knitted garments were the mainstay. Since 2000, the industry of Liuheng Town has mainly focused on shipbuilding, thermal power generation, and aquatic products, with COSCO Shipbuilding, Xinya Company, Dongpeng Shipyard, and Zhejiang Energy Liuheng Power Plant as the representatives of the regulated industrial enterprises.

3.1.2. Characteristics of the Changing Industrial Sectors on Liuheng Island

Throughout the development status of the main industrial sectors on Liuheng Island since the founding of the country, we can see that the industrial structure of Liuheng Town has undergone significant changes.

(1) Marine fisheries and polder farming have been the mainstays of the six cross-fisheries. With the reduction of fishery resources and space and the willingness of fishermen to change production, fisheries have transformed into offshore commercial fisheries, and part of the fishery village is mudflat, three-dimensional farming-based. The fishery output value as a proportion of GDP has been reduced year by year, continuing the overall trend of shrinkage.

(2) The sown area of crops and crop types on Liuheng Island have been significantly adjusted. The proportion of grain crops planted in the town has decreased, and the planting of cash crops has been significantly influenced by market demand and started to transform into a suburban agricultural development mode. The focus has been on building an ecological agricultural production base in the southwest of Shuangtang, with vegetables, citrus, tea, and flowers as the advantageous planting industries.

(3) The secondary industrial structure of Liuheng Town tends to be dominated by ship repair and construction, coal, and electricity, and the industrial park is initially complete. A total of 906 enterprises will have settled on Liuheng Island by the end of 2019, including COSCO, CNPC, CEC, Guodian Group, Wuhan Iron and Steel Group, and Jihua Group. The company has 906 settled enterprises, including COSCO Group, CNPC, CEC, Guodian Group, WISCO Group, Jihua Group, CSIC, Zhenneng Group, HeRun Group, Zhongao Group, Xinya Company, Longshan Shipyard, Dongpeng Ship, etc. The industrial park has been improved, and the marine biology park, the island industrialization park, the ship repair industry industrial park, etc., have been built. The spatial distribution of industries has formed functional blocks such as the port logistics industry in the northeast, the ship repair industry in Longshan in the north, the leisure tourism industry on Taimen Island in the southeast, the petrochemical industry in Xiaoguojiu Port in the southwest, and the container logistics industry on Fodu Island.

(4) The tertiary industry of Liuheng Town is mainly port logistics and marine tourism, including Liuheng Island's preliminary formation to the Portuguese marine trade culture as the theme of the ancient port of Shuangyu cultural and leisure tourism area, Jiaotou–Longshan cultural and industrial tourism area, the island world marine leisure resort, the hanging mountain island ecological leisure tourism area, the seaside farming and beach as resource characteristics of Tian'ao–Cangdong–Duzhuang coastal rural leisure tourism area, and high-tech agricultural characteristics of the double pond agricultural tourism area.

3.1.3. Communities and Administrative Villages of Liuheng Township Industrial Sector

According to the main data bulletin of the first, second, third, and fourth economic census of Putuozhi and Liuheng Town in Zhoushan City, combined with the field visits and surveys of the authors, the communities or administrative villages on the Liuheng Island area were classified from the industrial level according to the standard of "2017 National Economic Industry Classification (GB/T4754-2017)" [32], forming residential communities, fishery villages, plantation villages, plantation and fishery villages, industrial and agricultural village, industrial village, market trade town, etc. (Table 2).

Table 2. Characteristics of the economic structure of the village on Liuheng Island.

Community Name	Industry Development	Industrial Sector	Type	Economic Functions
Cangdong Zhongxin community	Fisheries (mariculture); Resident service, repair, and other service industries	The primary fishery industry is the main industry, supplemented by the tertiary service industry.	1 + 3	Fishery community
Cenxia community	Fisheries (fishery professional and auxiliary activities); Mining industry (salt mining); Manufacturing industry (aquatic product processing)	Primary fishery and secondary mining are the main industries, supplemented by secondary manufacturing.	1 + 2	Industry and agriculture community
Damaikeng community	Manufacturing industry (manufacturing of ships and related devices); Manufacturing industry (metal surface treatment and heat treatment-electroplating)	Secondary manufacturing industry	2	Industry community
Dongjing community	Resident service, repair, and other service industries; Wholesale and retail trade; Leasing and business services	Tertiary service industry	3	Market community
Duzhuang Zhongxin community	Manufacturing industry (non-metallic mineral manufacturing industry-brick factory); Water conservancy, environment, and public facilities management industry(Ecological protection and environmental management–oil pollution treatment); Agriculture (grain cultivation, fruit cultivation); Fisheries (mariculture, marine fisheries)	The secondary manufacturing industry and tertiary service industry are the main industries, supplemented by primary agriculture and fishery.	2 + 3	Industry and agriculture community
Gaofeng community	Agriculture (grain cultivation, fruit cultivation); Fisheries (mariculture); Manufacturing industry (wood, stone, metal processing)	Agriculture and fishery are the main products, and manufacturing industry is the second.	1 + 2	Industry and agriculture community
Gunlong'ao community	Agriculture (grain cultivation, citrus cultivation); Fisheries (mariculture)	Agriculture and fishery	1	Planting and fishery community
Herun community	Agriculture (grain planting, vegetable planting, citrus planting, bayberry planting); Fisheries (mariculture)	Agriculture and fishery	1	Planting and fishery community

Table 2. *Cont.*

Community Name	Industry Development	Industrial Sector	Type	Economic Functions
Jizhi community	Agriculture (grain planting, fruit and vegetable planting); Fisheries (marine fisheries, mariculture)	Agriculture and fishery	1	Planting and fishery community
Jiaotou community	Wholesale and retail trade; Leasing and business services; Resident service, repair, and other service industries; Manufacturing industry (manufacturing of ships and related devices)	The tertiary service industry is dominant, supplemented by the secondary manufacturing industry.	3 + 2	Market community
Longshan Zhongxin community	Manufacturing industry (manufacturing of ships and related devices); Manufacturing industry (metal manufacturing, aquatic product processing); Wholesale and retail trade; Resident service, repair, and other service industries	The secondary manufacturing industry is dominant, supplemented by the tertiary service industry.	2 + 3	Industry community
Meizhi community	Agriculture (grain cultivation, vegetable cultivation, citrus cultivation); Manufacturing industry (wood, stone, metal processing)	Agriculture is the main industry, supplemented by manufacturing industry.	1 + 2	Industry and agriculture community
Pingjiao Zhongxin community	Agriculture (grain cultivation, vegetable cultivation); Manufacturing industry (wood, stone, metal processing); Primary processing of agricultural and sideline products	Agriculture is the main industry, supplemented by manufacturing industry.	1 + 2	Industry and agriculture community
Qinglian community	Agriculture (grain cultivation, vegetable cultivation, citrus cultivation)	Primary agriculture	1	Planting community
Qingshan community	Agriculture (grain cultivation, vegetable cultivation, citrus cultivation); Fisheries (mariculture); Forestry (tree breeding and seedling raising); Manufacturing industry (metal manufacturing)	Agriculture, forestry, and fishery are the main products, and manufacturing is the second.	1 + 2	Industry and agriculture community
Shanxi community	Agriculture (vegetable cultivation, citrus cultivation); Fisheries (mariculture)	Primary agriculture	1	Planting community
Shizhutou community	Manufacturing industry (metal manufacturing); Resident service, repair, and other service industries	The secondary manufacturing industry and the tertiary service industry are relatively balanced.	2 + 3	Industry community
Shuangtang community	Manufacturing industry (metal manufacturing); Wholesale and retail trade; Agriculture (vegetable cultivation)	The secondary manufacturing industry and tertiary service industry are dominant, supplemented by primary agriculture.	2 + 3 + 1	Industry and market community
Shuangyugang community	Manufacturing industry (manufacturing of ships and related devices); Manufacturing industry (metal manufacturing); Fisheries (mariculture)	The secondary manufacturing industry is dominant, supplemented by the primary fishery industry.	2 + 1	Industry community

Table 2. *Cont.*

Community Name	Industry Development	Industrial Sector	Type	Economic Functions
Songshan community	Fisheries (mariculture); Forestry (tree breeding and seedling raising)	Agriculture, fisheries, and forestry	1	Agriculture community
Taimen community	Resident service, repair, and other service industries; Fisheries (mariculture)	The tertiary service industry is dominant, supplemented by primary fishery.	3 + 1	Market community
Tian'ao community	Agriculture (grain cultivation, vegetable cultivation); Manufacturing industry (manual processing); Accommodation and catering services	Primary agriculture, secondary manufacturing, and tertiary service industries are relatively balanced.	1 + 2 + 3	Planting and tourism village
Wuxing community	Fisheries (mariculture); Agriculture (tea planting)	Agriculture and fishery	1	Planting and fishery village
Xiaoguoju community	Fisheries (mariculture); Resident service, repair, and other service industries	The primary fishery industry is the main industry, supplemented by the tertiary service industry.	1 + 3	Fishery community
Xiaohu community	Fisheries (mariculture, marine fisheries); Transportation, warehousing, and postal services	Pay equal attention to agriculture and fisheries.	1	Fishery community
Xinmin community	Fisheries (seawater fisheries); Resident service, repair, and other service industries	Primary fishery and tertiary service industries are balanced.	1 + 3	Fishery community
Cockroach mountain community	Residential community, with a small number of residential services, repairs, and other services.	A small amount of tertiary service industry	3	Residential community
Zonglvwan community	Wholesale and retail trade; Resident service, repair, and other service industries	Tertiary service industry	3	Residential community

3.2. Settlement Environment Changes on Liuheng Island

3.2.1. Urbanization, Community, and Characteristics of Major Facilities of Liuheng Island

Liuheng Island features three urban areas, namely Jiaotou, Taimen, and Longshan, with a total built-up area of 7.4 km^2, a resident population of 80,000, and a 72% urbanization rate. There is one high school, two junior high schools, eight elementary schools and kindergartens, forty-three medical institutions of various levels, and four public passenger stations. There are one hundred nineteen grass-roots cultural and sports service centers, summer vacation spots, and communication and postal service stations, thirteen emergency disaster shelters, nine welfare and relief institutions, and four meteorological and environmental protection institutions. The traffic network of "one ring, two companies, and four columns" on Liuheng Island has basically taken shape, with 54 km^2 of primary and secondary highways, and passenger ferries with Ningbo and Zhoushan Island, with an annual water transport flow of about 1.8 million passengers. Liuheng Island has 2 × *1 million kilowatts of ultra-supercritical thermal power generating units at the Zhejiang Energy Liuheng Power Plant and 220 KV power transmission projects on Zhoushan Island and Ningbo City, and the desalination project can supply 30,000 tons of fresh water per day.

From 1992 to 2018, Liuheng Island has been greatly promoted in the construction of the town. The public service facilities, roads, town and village appearance, and community living environment have been significantly improved, and the town function has been increasingly perfected. Around 2003, the town area was built in Xuantuo and Taimen, and Longshan Town, with the rise of the shipbuilding industry, gathered a large number

of foreign workers and investment operators to form a town area for the ship repair industry and service industry. The built-up area of Liuheng Island has built the government affairs center square as the core, newly created three city core lakes, such as Chuxin Lake, Shuangyu Lake, and Fodu Lake, and created 10 pocket parks such as Maritime Park, Port and Maritime Park, Shuangyu Park, and Children's Park. In addition, the exploration of Liuheng Island's blue bay restoration project strings Tian'ao, Cangdong, small lake, Taimen, opposite mountain, hanging mountain, and scape belt, promoting "a village a scenery"and A-class scenic village full coverage.

3.2.2. Characteristics of the Residential Environment of Liuheng Island

The living environment mainly refers to the quality of household housing and its supporting facilities. This section focuses on the housing situation of households on Liuheng Island and the public facilities and services in administrative villages and communities. According to the relevant policy documents of Putuo District, Zhoushan City, Liuheng Island started to implement the "Ten Million Project" in 2003, which focused on the improvement of the dirty and disorderly living environment in fishery and rural areas; since 2006, the construction of new fishery and rural areas focused on promoting community or administrative village housing, road hardening, and water supply; in 2011, the center town, center village, and rural housing renovation were carried out. In 2011, we carried out the work of center town, center village, and rural housing renovation and completed the renovation of 92 communities and villages by 2013, with a total investment of 69.128 million to build 90 village roads.

The housing throughout Liuheng Island is mostly mud and wood stone or brick and wood structured bungalows in the 1950-1960s, brick and wood structured buildings in the 1970s, 2–3 story brick and mix structured buildings in 1980s, new two-story buildings in fishery and rural areas after 1992, and villa-type fishery and rural housing after 2005. In general, the housing structure of the fishery villages or communities developed by commercial real estate companies in the whole area of Liuheng Island is mainly two-story or multi-story buildings, and the building facades tend to use new decorative materials, such as mosaic and tile, and adopt air-conditioning and cooling facilities. The toilets are mainly flush toilets. After 2010, the construction of fishery villages' housing was synchronized with that of the towns and developed into a multi-story modern household structure. According to the Uniform Standards for Civil Building Design (GB 50352-2019) [33] and the building classification and grading standards, combined with the author's field research on the structure, style, and appearance of houses in each administrative village on Liuheng Island, the family houses in each administrative village and community on Liuheng Island are divided into: low-rise brick and concrete houses, low-rise reinforced concrete frame houses, multi-story houses, and multi-story steel houses (Table 3). In general, the 39 administrative villages and communities on Liuheng Island are dominated by low-rise brick and concrete houses, which account for 62% of all the communities and administrative villages.

Table 3. Proportion of residential types on Liuheng Island.

Liuheng Residential Classification	Administrative Village or Community	Quantity
Low-rise brick–concrete structure	Cangdong Community Village, Cenxia Community Village, Damaikeng Community Village, Dongjing Community Village, Duzhuang Community Village, Gaofeng Community Village, Gunlong 'ao Community Village, Herun Community Village, Jizhi Community Village, Jiaotou Community Village, Longshan Community Village, Meizhi Community Village, Pingjiao Community Village, Qinglian Community Village, Qingshan Community Village, Shanxi Community, Shuangtang Community Village, Shuangyugang Community Village, Songshan Community Village, Taimen Community Village, Tianao Community Village, Wuxing Community Village, Xiaoguoju Community Village, Xiaohu Community Village	24

Table 3. *Cont.*

Liuheng Residential Classification	Administrative Village or Community	Quantity
Low-rise reinforced concrete frame structure	Shizhutou Community Village, Songshan Community Village, Taimen Community Village, Wuxing Community Village, Roach Mountain Community Village, Palm Bay Community Village	6
Multi-story brick–concrete structure	Dongjing Community Village, Longshan Center Community Village, Shuangtang Community Village, Taimen Community Village, Xinmin Community Village	5
Multi-story reinforced concrete frame structure	Dongjing Community Village, Jiaotou Community Village, Longshan Central Community Village, Shuangtang Community Village	4

3.2.3. Scale and Location Characteristics of the Settlement on Liuheng Island

According to the classification scheme of village population in "Topics in the Geography of Settlements" by Song Jinping et al. [34]: less than 100 people are small villages, 100–1000 people are medium villages, and more than 1000 people are large villages, as well as the classification methods of settlement patterns such as cluster and belt. The administrative villages and communities of Liuheng Island are classified according to the natural geographic background characteristics of the island, as shown in Tables 4 and 5. The size distribution of administrative villages and communities on Liuheng Island is mainly large villages with more than 1000 inhabitants, which is in line with the characteristics of the urbanization process of the island; at the same time, given the frequent occurrence of typhoons and the characteristics of the natural geographic environment of the island, the administrative villages and communities are mostly located in the low mountain plains and developed in clusters.

Table 4. Types and distribution of residential scales on Liuheng Island.

Administrative Village and Community Scale	Name of Administrative Villages and Communities	Quantity
Medium (100–1000 people)	Cenxia Community Village, Gunlongao Community Village, Herun Community Village, Meizhi Community Village, Cockroach Mountain Community Neighborhood Community, Palm Bay Community Neighborhood Community	6
Large (more than 1000 people)	Cangdong Central Community Village, Damaikeng Community Village, Dongjing Community Village, Duzhuang Central Community Village, Gaofeng Community Village, Jizhi Community Village, Jiaotou Community Village, Longshan Central Community Village, Pingjiao Central Community Village, Qinglian Community Village, Qingshan Community Village, Shanxi Community Village, Shizhutou Community Village, Shuangtang Community Village, Shuangyugang Community Village, Songshan Community Village, Taimen Community	22

Table 5. Clustering form and location distribution of the Liuheng Island residential area.

Settlement Form	Name of Administrative Villages and Communities	Quantity
Coastal belt	Damaikeng Community Village, Duzhuang Central Community Village, Xiaohu Community Village	3

Table 5. *Cont.*

Settlement Form	Name of Administrative Villages and Communities	Quantity
Intermountain plain	Cangdong Central Community Village, Cenxia Community Village, Gaofeng Community Village, Tian 'ao Community Village, Gunlong 'ao Community Village, Herun Community Village, Jizhi Community Village, Longshan Central Community Village, Pingjiao Central Community Village, Meizhi Community Village, Qinglian Community Village, Qingshan Community Village, Shanxi Community Village, Shizhutou Community Village, Shuangyugang Community Village, Songshan Community Village, Taimen Community Village, Wuxing Community Village, Xiaoguoju Community Village, Xinmin Community Village, Cockroach Mountain Community Neighborhood Community, Palm Bay Community Neighborhood Community	22
Plain	Dongjing Community Village, Shuangtang Community Village, Jiaotou Community Village	3

3.3. Impacts of Industrial Structure Evolution to Liuheng Island

3.3.1. Impact on the Income and Employment of Local Residents

For any household, household economic income is the primary factor affecting the quality of life and determining the household's residential location and living environment. Generally speaking, the higher the level of local economic development, the lower the unemployment rate, the higher the labor demand, and the higher the income of local residents, all other things being equal. Zhang Wenzhong et al. (2016) [35], in "Theory and Practice of Harmonious and Livable City Construction", pointed out that "disposable income can be used as a multidimensional economic indicator to explain the subjective evaluation of quality of life". That is, in areas with high levels of disposable income, the satisfaction of residents with the conditions of social and public service facilities in the area is correspondingly higher. This is because the level of household economic income at the microlevel largely determines the ability of households to access various public services.

Data from the first, second, third, and fourth economic censuses in Putuo District, Zhoushan City, show that there is a significant positive promotion effect between the number of legal person units of local industries, the amount of gross local product, and the average income of resident households in the process of upgrading the industrial structure on Liuheng Island since 2010, i.e., the amount of gross local product and the average income of resident households increase significantly when the number of legal person units of industries tends to increase the proportion of secondary and tertiary industries. However, the share of the increase in the number of local residents employed may not be significantly higher in the secondary and tertiary industries.

3.3.2. Impact of the Change in Industrial Structure of Liuheng Island on the Level of Public Service Facilities

The degree of economic development of cities and towns at the macro level determines the level of supply of local public service facilities, which is another important influence of economic development on the construction of hardware for human living environments. Zhang Wenzhong et al. (2016) [35] simulated the correlation analysis between GDP per capita and the level of public services and infrastructure such as medical care, education, transportation, water supply networks, etc. Based on the data of the China Urban Statistical Yearbook and the China Urban Construction Statistical Yearbook, as shown in Table 6, they show that GDP per capita has a significant positive correlation with all the above categories of settlement environment hardware indicators with correlation coefficients in the range of 0.21–0.4.

Table 6. Correlation analysis of China's urban per capita GDP and urban residential environment hardware facilities indicators.

Public Service Facilities Index	Per Capita GDP
Number of beds in medical facilities with 10,000 people	0.3800 *
Teacher–student ratio	0.2728 *
Number of standard buses with 10,000 people	0.3671 *
Harmless treatment rate of domestic garbage	0.3357 *
Number of Internet broadand access users	0.3004 *
Density of water supply pipeline in built-up area	0.2255 *

Source: Calculated according to China Urban Statistical Yearbook 2013 and China Urban Construction Statistical Yearbook 2013. * indicates significant correlation at the level of 0.05.

For Liuheng Island, the correlations between GDP and major local public service facilities (number of primary and secondary schools, road mileage, and built-up area) from 2000 to 2018 are shown in Table 7. The correlations for the number of primary and secondary schools did not increase significantly, and the correlations for road mileage and built-up area were both significantly correlated at the 0.05 level with correlation coefficients of 0.2113 and 0.1892. This indicates that the accelerated urbanization of Liuheng Island induced by the change in industrial structure has promoted the rapid construction of hardware facilities for human living environments.

Table 7. Satisfaction score of island residents' living environment elements during the process of industrial structure evolution on Liuheng Island.

Index	Content	Proportion	Index	Content	Proportion
Security	Very satisfied	25.9%	Housing mode	House building	64.1%
	Satisfied	51.0%		Purchase	27.9%
	Common	21.1%		Rent	6.0%
	Dissatisfied	1.2%		Stay at somebody else's place	0.8%
	Very dissatisfied	0.8%		Allocation	1.2%
Completeness of facilities	Very satisfied	17.1%	Year of house	1970–1980	6.4%
	Satisfied	51.8%		1980–1990	13.5%
	Common	28.3%		1990–2000	15.5%
	Dissatisfied	2.8%		2000–2010	33.9%
	Very dissatisfied	0.0%		2010–2020	30.7%
Convenience of transportation	Very satisfied	20.3%	Reasons for living mode	Cheap house price or rent	8.0%
	Satisfied	53.0%		Convenient transportation	39.0%
	Common	25.5%		Complete and convenient shopping.facilities	28.3%
	Dissatisfied	0.8%		Convenient medical treatment	16.3%
	Very dissatisfied	0.4%		Convenient school	20.7%
Environmental comfort	Very satisfied	22.7%		Convenient for personal or family work	26.3%
	Satisfied	54.2%		Good residential environment (landscape, facilities, management, atmosphere, public security)	20.3%
	Common	21.5%		Unit distribution	11.2%
	Dissatisfied	1.2%		Close to friends and family	2.4%
	Very dissatisfied	0.4%		Ancestral homeZuzhai	22.3%

Table 7. *Cont.*

Index	Content	Proportion	Index	Content	Proportion
Environmental health	Very satisfied	25.9%	Housing satisfaction	Others (collective demolition and resettlement)	11.6%
	Satisfied	40.2%		Very satisfied	13.1%
	Common	28.3%		Satisfied	57.4%
	Dissatisfied	5.2%		Common	25.5%
	Very dissatisfied	0.4%		Dissatisfied	3.6%
Overall scoring	40–55 points	1.6%	Income satisfaction	Very dissatisfied	0.4%
	55–70 points	12.7%		Very satisfied	6.0%
	70–85 points	42.6%		Satisfied	25.9%
	85–100 points	43.0%		Common	51.4%
Important factors	Security	79.7%		Dissatisfied	14.7%
	Completeness of living facilities	81.7%		Very dissatisfied	2.0%
	Traffic convenience	85.7%		Very satisfied	5.6%
	Comfort of natural and human environment	80.1%		Satisfied	43.0%
	Environmental health	82.5%	Overall satisfaction with life	Common	49.0%
Sources of housing	Self-built house	72.9%		Dissatisfied	2.0%
	Commercial residential building	54.6%		Very dissatisfied	0.4%
	Demolition and resettlement house	47.8%			
	Low rent house	24.3%			
	Allocated house	20.3%			

3.3.3. Impact of the Change in Industrial Structure of Liuheng Island on the Density of Urbanized Public Service Facilities

As shown in Figure 3, the urbanized public service facilities of Liuheng Island are densely distributed in the three highly urbanized areas—the communities of Credit Head, Taimen, and Longshan. (1) The Longshan community was established in July 2005, with the national-level deep-water port of Shuangyu Port to the west and the Fodu waterway to the north. The land area of the community is 14.37 km^2, with arable land of 3215 acres and more than 300 industrial and commercial enterprises. There are more than 23,000 foreign workers and hundreds of foreign crew members. Fisheries, the electroplating industry, the ship-repairing industry, and the marine passenger and freight industries are among the best communities for industrial development on Liuheng Island. Therefore, the level of industrialization and the gathering of foreign populations in this area accelerate the intensification and high level of development of public service facilities. (2) Credit Head Community is the seat of Liuheng Town government, established in July 2005, with an area of 9.8 km^2, a resident population of more than 100,000 people, and a foreign population of about 4000. There are 1500 mu of arable land, nearly 300 private enterprises and cottage industries, and large and medium-sized enterprises, including Dongpeng shipyard, Liuheng coal transit base of Zhejiang Energy Group, Fengyuan asphalt processing project, Zhong'ao Energy P Phase I project, the five-star Jinle Hotel, Baofeng Hotel, and the five-star Jinle Hotel, Baofeng Tangfan Ship Matching Industrial Park, Wengjiazui City Pedestrian Street, Golden Mongkok Hotel, and more than 10 medium- and high-grade entertainment venues. The density of all kinds of urbanized public service facilities in this area ranks first on Liuheng Island, which is a typical political and economic trigger-type dense area of human living environment hardware facilities. (3) Taimen Community was established in July 2005, east of Taimen Port, a national-level fishery port with a land area of 17.83 km^2; the

industry is based on fishery and agriculture, and industry, tourism, and service industries are developed in a coordinated manner. In the past 10 years, industrial enterprises above the scale, cottage industry households, aquatic enterprises, transportation enterprises, and commercial enterprises have substantially increased, and the urbanized public service facilities in this area are also becoming increasingly dense, induced by the needs of industrial structure upgrading.

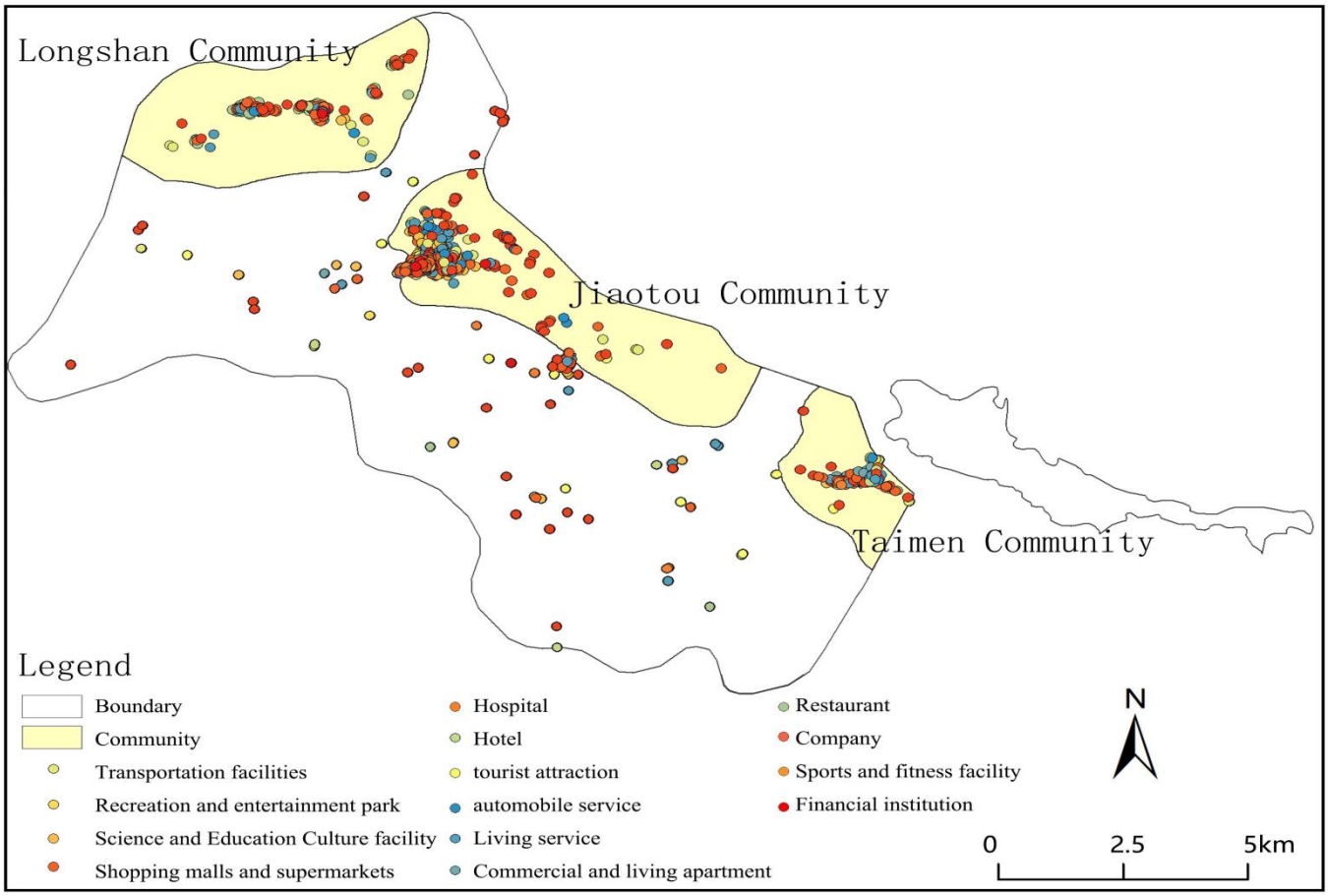

Figure 3. Liuheng Island urbanized public service facilities POI dense area.

3.3.4. Impact on the Structure and Quality of Housing for Island Residents

As shown in Figure 3, the multi-story reinforced concrete structure of family houses in each administrative village and community on Liuheng Island is mainly distributed in Dongjing Community Village, Jiaotou Community Village, Longshan Center Community Village, and Shuangtang Community Village, which are precisely the typical areas of the advanced industrial structure of Liuheng Island, with industry and tourism, commerce, and service industry as the main communities, such as Xuanzuo Head Urban Area as the production service center of the southern island of Zhoushan and the Liuheng Island comprehensive industrial development. The main industrial base is the port industry, and the shipbuilding industry and coal and electricity integration are developing rapidly. The community of Longshan Central Village is the supporting area for the living and public service facilities of Longshan Industrial Zone. It should be noted that the advanced industrial structure has a high driving effect on the house price of Liuheng Island, and urban problems such as high house prices and rising costs of living will increase the cost of living for local residents on the island, especially the middle- and low-income people, who are the most affected.

3.3.5. Perceived Satisfaction of Island Residents to Settlement Environment Elements

As shown in Table 7, the perceived characteristics of satisfaction with the elements of the living environment of island residents in the process of industrial structure evolution on Liuheng Island are as follows: local residents' ratings of community housing and its security against natural disasters, completeness of public service facilities, and environmental comfort are just over 50%, and satisfaction with environmental health and housing is below 50%. It can be seen that local residents are less satisfied with the environmental impact and housing purchase or housing quality in the process of industrialization as the industrial structure tends to industrialize.

4. Discussion and Conclusions

4.1. Discussion

4.1.1. Advantages

This paper studies Liuheng Island of Zhoushan City from the perspective of the influence of industrial structure evolution on human settlement environment, breaking the practice of taking the mainland area as the research area of human settlement environment. It is of great practical significance to improve the island human settlement environment through research by clarifying the characteristics and problems of the evolution stages of the key elements of the island human settlement environment at different times and spaces, as well as using economic externalities and other theories to analyze the path of industrial structure evolution affecting the key elements of the island human settlement environment.

4.1.2. Implications and Limitations

In past traditional settlement studies, most scholars have focused on land-based, county-centered settlement studies, ignoring the uniqueness that comes from the island as a special symbolic unit. In studying the settlement of sea islands, this paper focuses on the uniqueness presented in the town-centered urbanization process. Compared to cities on land, cities on islands are significantly different due to the heterogeneity of their natural and social environments. The inherent attributes of islands, such as topography, climate, and resources, determine the urban spatial structure and scale of island cities, and the urbanization process must follow the characteristics of these inherent attributes.

The study of the specific forms and problems of the impact of the changes of the industrial structure in the island area on the human settlements can provide a reference for the decision-making of the sustainable development of the island towns, guide the industrial layout of the island to avoid natural disasters as effectively as possible, reduce the economic losses caused by natural disasters, prosper the population and employment in the island area, and avoid the loss of geopolitical significance of the island area. At the same time, it can enrich and develop the theory of human settlements in the process of industrial structure change of island.

Due to the investigation cycle, the research failed to obtain continuous multi-year industrial development data and corresponding objective and subjective state values of human settlement environment elements on Liuheng Island so as to conduct comprehensive quantitative research. In the future, long-term and systematic investigation, analysis, and quantitative simulation are needed to better interpret the influence mechanism of island industrial structure change on human settlement environment elements. The obtained questionnaire data are only a simple statistical description, which can be further explored through the application of the structural equation model in the future in order to deeply explore the spatial relationship between the evolution of industrial structure and local human settlements from multiple levels and perspectives. The research mainly selects more specific elements in the human settlement environment to describe the human settlement environment in the island area. In the future, more scales and characteristic indicators of the human settlement environment in the island area should be selected to form a human settlement environment evaluation system with island characteristics.

4.2. Conclusions

In summary, the industrial structure of Liuheng Island has transformed from fishery-led to industry-led, and accordingly, the urbanization level of Liuheng Island has rapidly increased, and urbanized public service facilities are increasingly and intensively laid out in urbanized communities, such as Longshan Community, Jiaotou Community, and Taimen Community; accordingly, the satisfaction level of public service facilities perceived by local residents of the island is also focused on the completeness of public service facilities, convenience of transportation, environmental comfort, and environmental health. This is mainly due to the fact that the industrial structure tends to upgrade in the direction of industry, which will cause certain industrial waste emissions and the pressure of commuting within the island, affecting the residents' sense of security. This indicates that evolution in industrial structure will directly affect the speed and quality of hardware construction in urban and village settlements and also, to a certain extent, affect the subjective satisfaction evaluation of the settlement of residents around the dense industrial area, especially in terms of environmental health and community living security.

With the transformation of industrial structures, island cities are facing the challenge of livelihood issues. Many residents usually rely on farming and fishing for their livelihoods, but as the economy develops, these traditional industries are gradually declining, and people's livelihood problems are becoming increasingly serious. Although some manufacturing enterprises exist on the island, most of them are state-owned, such as shipyards. However, local residents are often limited by their level of knowledge to work in these state-owned enterprises, leading to a more vulnerable livelihood for residents. As a result, residents of island cities have gradually begun to transition to industries such as port terminals and services. At the same time, in the process of urbanization, the natural villages that were scattered throughout the area are becoming fewer and fewer, replaced by an expanding number of concentrated commercialized settlements. The impact of this trend is not only reflected in the evolution of urban scale but also involves the intensification of land use, the emergence of new production and lifestyles, and changes in transportation. It is worth noting that there are also unique urbanization problems and challenges in the urbanization of island cities compared to non-island cities due to factors such as small space and complex topography.

In the urbanization process of island cities, with population growth and economic development, the scale of cities has been expanding, and urban functions have been gradually diversified. However, in this process, island cities tend to concentrate on marinas, while traditional industries such as farming and fishing gradually decline. In contrast, modern industries such as services and warehousing have developed rapidly. Terminal shorelines are often the main exchange centers for ships and goods in a country or region and thus play an important role in supporting local economic growth and trade activities. However, although the terminal shoreline itself does not generate any economic activity, this shoreline activity is dependent on the stability of the shipping market. The shipping market is a fragile market that is affected by a variety of factors, such as international trade, policies and regulations, natural disasters, and changes in market supply and demand. If there is an unstable change in the shipping market, such as an economic recession, global disasters, political conflicts, etc., it will have a huge impact on this economic activity. In contrast, traditional marine economic activities such as fishery are more stable and less affected by some external factors. For example, in natural disasters such as hurricanes or typhoons, fishermen can dismantle their nets or suspend fishery to avoid safety problems at sea. In addition, fisheries can also regulate the use of resources through intra-industry cooperation to ensure their sustainability and longevity.

Therefore, island cities need to be more cautious in developing their economic–industrial structure during the urbanization process, especially taking care to avoid over-reliance on the dock industry. On the one hand, the vulnerability of the shipping market and how to mitigate the impact of shoreline economic activities need to be carefully considered, while on the other hand, new economic growth points need to be actively explored

and developed. These economic growth points can include new industries such as tourism, creative industries, and technology industries, which can bring more employment opportunities and economic benefits while diversifying the economic industrial structure. Only in this way can we ensure the sustainable development of the island city economy.

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