

Article

A Study on Transboundary Marine Governance of Floating Marine Debris—Taking Kinmen–Xiamen Waters between China and Taiwan as an Example

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Abstract: Mainland China's economy has been developing rapidly. Unfortunately, it has led to an increase in municipal and industrial waste, including in Xiamen, in which it has greatly increased. Kinmen is located outside the estuary of the Jiulong River in Fujian, Mainland China, opposite to Xiamen Bay. Whenever there is heavy rainfall, the waste that flows along the Jiulong River is incredible. Kinmen unavoidably has to bear the invasion of floating marine debris due to the effect of ocean currents, tides and monsoons. It does not only pollute the Kinmen sea area, but it also affects the scenery of the beaches in Kinmen. Therefore, this study aimed to explore the data of Kinmen and Xiamen governments regarding the cleaning of floating marine debris, and the differences in distribution areas according to the monsoon, ocean current and tides. In-depth interviews, field investigation, and collection of expert opinions were applied in order to determine the research implication. The results of this study provide information on the marine issues encountered in the governance of the countries surrounding the sea. The study suggests that the transboundary marine governance mechanism should be established in order to effectively solve the problem of floating marine debris in Kinmen–Xiamen Waters. For the welfare of the people, it is expected that the governments of Mainland China and Taiwan will uphold the principle of “pragmatism and reciprocity” by working together to maintain the marine environment in Kinmen–Xiamen waters.

Keywords: floating marine debris; across the Taiwan strait; transboundary marine governance mechanism; Kinmen–Xiamen Waters



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1. Introduction

Most marine debris includes plastic, wood, containers and fishing equipment (such as gear, nets, fishing lines, floats) that floats on the sea or sinks to the seabed for a long time [1]. Marine debris is considered to have a high impact on ecosystems, human health, and the economy, and it is one of the most worrying global environmental issues of today [2]. There has been rapid development in the economy of Mainland China, and the municipal and industrial wastes in Xiamen have greatly increased. Kinmen is located outside the estuary of the Jiulong River in Fujian, Mainland China, and opposite to Xiamen Bay. When there is heavy rainfall, the waste that flows along with Jiulong River is incredible, such that Kinmen unavoidably has to bear the invasion of floating marine debris due to the effect of ocean currents, tides and monsoons. Since 1949, Kinmen and Xiamen have belonged to Taiwan and China. They govern and use “their own half” of the Kinmen–Xiamen Waters based on a tacit understanding, since seawater has no boundary. As the geographic relationship is unchangeable (as shown in Figure 1), issues such as floating marine debris, marine environment and ecological conservation faced by Kinmen should be resolved completely in cooperation with Xiamen.



Figure 1. The area most affected by the monsoon drifts of the Kinmen floating marine debris. Data Scheme 2020. chinese-man-swims-to-taiwanese-island-for-freedom.html. Note: Arrows are drawn by researcher. The arrows indicate the direction of the southwest and northeast monsoons.

From September 2005 to 2013, Kinmen spent over USD 1.8 million on cleaning up floating marine debris. The floating marine debris collected reached 600 tons in 2014 [3] and it has been steadily increasing. This is evident (Table 1) from the statistics of the Kinmen County government. There are still some “restrictions” on cleaning up the floating marine debris in Kinmen–Xiamen waters, because the two governments “do their own affairs”. After statistically analyzing the data from Xiamen, it was found that the Xiamen–Kulansu Waters, Jiulong River Estuary, and the sea in the north of Kulansu accounted for 79% of the floating marine debris in Xiamen Waters [4]. Lin [4] analyzed the correlation between the amount of floating marine debris removed from Kinmen over the years and the floating marine debris in Kinmen and Xiamen, and concluded that monsoons, tides and ocean current are the major causes of the drift of marine debris from Xiamen Waters to the shores of Kinmen. In addition, fishing, shipping and recreational activities are the major sources of floating marine debris [5]. Marine aquaculture is another important source, such as abandoned fishing equipment and polystyrene floats. Besides, styrofoam is a major source of floating marine debris (Table 2) (e.g., [6]).

Table 1. Weight of floating marine debris collected in Kinmen County from 2011 to 2020.

Year	Recyclable (ton)	Non-Recyclable (ton)	Total (ton)
2011	60.91	293.98	354.89
2012	33.63	443.99	477.62
2013	43.78	556.03	599.81
2014	27.64	517.14	544.78
2015	41.81	412.76	454.57
2016	34.08	367.52	401.60
2018	45.512	389.589	435.101
2019	41.208	535.318	576.526
2020	64.966	390.818	455.784
Total	393.536	3907.145	4300.681
Average	43.726	434.127	477.853

Data: Kinmen County government, Taiwan; Note: Official statistical data of 2017 is not available in this study

Table 2. Ranking list of floating marine debris in Kinmen from 2016–2020.

Ranking	Type	Weight (ton)	%
1	Other waste	639.88	55.40%
2	Bamboo and wood	384.86	33.32%
3	Styrofoam	73.47	6.36%
4	Fish nets and equipment	15.1	1.38%
5	PET bottle	13.20	1.14%
6	Glass bottle	11.74	1.01%
7	Tin can	10.95	0.9%
8	Aluminum can	5.25	0.45%
9	Waste paper	0.43	0.04%
	Total	1154.88	100%

Consequently, upon the increasing interconnectedness of today's world, natural resource depletion and waste easily spread across geopolitical boundaries [7]. Moreover, with the recent development of marine ecological civilization worldwide, topics about transboundary marine governance have started catching the attention of the academia and government departments. Since the transboundary waters are jointly governed by Kinmen (Taiwan) and Xiamen (Mainland China), the Kinmen–Xiamen Waters are independently governed by two governments, and cooperation is restricted between the local governments of Kinmen and Xiamen. Therefore, on a management level, the transboundary marine governance mechanism in Kinmen–Xiamen Waters has not been established between the cross-strait governments.

In general, floating marine debris has already caused the pollution of Kinmen Waters, destroying the coastal landscape and even affecting public health. To completely solve this problem, the governments and people on both sides of the strait have to work together. Therefore, it is necessary to further explore issues about controlling floating marine debris by transboundary governance in Kinmen–Xiamen Waters. The remediation of floating marine debris cannot be accomplished separately, especially after establishment of the mini three links between both sides of the strait. According to statistics from the Immigration Agency, people from both sides of the strait who arrived at and departed from Kinmen by “Mini Three Links” reached 1,963,044 persons in the year 2019. It is obvious that people on both sides of the strait are frequenting the Kinmen–Xiamen area. If not for the impact of COVID-19, it is believed that there would have been closer contact between people from both sides. Therefore, the governments of Kinmen and Xiamen could adopt a marine governance mechanism to create a new model of cross-strait urban governance. Thus, the purpose of this study was to explore how the governments of Kinmen and Xiamen can adopt the transboundary marine governance mechanism to control the floating marine debris.

2. Literature Review

2.1. Floating Marine Debris

When technological development is faster and greater than the environment protection awareness of humans, it causes many pollution problems, such as continuous debris discharge into the ocean. When the pollution rate is greater than the sea water purification rate, it causes a series of marine ecological crisis [8]. Marine debris has become a common concern of governments, experts, scholars, and non-governmental organizations and has become a problem that must be resolved immediately [2]. There are different types of marine debris, but plastic products are the major type. Most marine debris comes from

land and ocean sources. Relevant studies have shown that there are 4.8 to 12.7 million tons of marine debris on land floating to the ocean each year. In total, 80% of marine debris comes from land; therefore, the effective control of marine debris must start from land [9].

According to the positions where the debris was found, marine debris has been divided into: (1) sea surface debris, (2) beach debris and (3) seafloor debris [10]. Apart from land, the other major source of marine debris is from objects discharged by ships. The majority of the common floating marine debris includes plastic bags, floating woods, floats and plastic bottles [11]. Beach debris included mainly plastic bags, cigarette butts, plastic tableware, fishing nets and glass bottles [12]. Lee [13] referred to the solid debris in Kinmen Waters as “floating marine debris”. In his study, it was found that the floating marine debris in Xiamen Waters comprises mainly polystyrene foam, fast food boxes, plastic bags, plastic tableware, fishing lines and fishing nets that was the same as in Kinmen. In summary, most of the types of marine debris cleaned up in Kinmen met the major contents of floating marine debris and beach debris mentioned by scholars.

2.2. Correlation between Floating Marine Debris in Kinmen and Xiamen

When land debris flows into the ocean, it floats far away according to the factors of tide, ocean current and monsoons [1]. Based on the study by Lin [4], factors such as the trend of floating marine debris in Kinmen and Xiamen over the years, monsoons, tides, and statistical data from Kinmen and Xiamen governments were analyzed to explore the correlation of floating marine debris between Kinmen and Xiamen, and the possible positions that the debris might be distributed on the coasts of Kinmen. Figure 1 shows that the directions of the wind and the locations of the marine debris are different during summer and winter in Kinmen. According to Lin et al. [14] and Wang [15], monsoons are important factors affecting the washing of debris ashore, and the positions where they are washed ashore. Under the wind field in September, most of the drifts float as reciprocating motion. During neap tide, the range and distance of reciprocating motion would be small. Conversely, the corresponding range and distance would be long for spring tide. After research and testing, the drifts of Kinmen–Xiamen waters float to the southwest, and most of them are washed ashore on the east and north coasts of Kinmen during the northeast monsoon; the drifts float to the northeast during the southeast monsoon regardless of the tide. The drifts of the southwest of Kinmen may come from the Jiulong River Estuary and the Xiamen–Kulangsu waters and would be washed ashore on the southwest coasts of Kinmen [15]. Finally, Lin [4] found that the Xiamen–Kulangsu waters, Jiulong River Estuary, and the sea in the north of Kulangsu accounted for 79% of floating marine debris in Xiamen Waters. According to the correlation analysis of historical data in Kinmen and the floating marine debris in Kinmen–Xiamen Waters, it was found that the northeast and southwest monsoons, and neap tide and spring tide are the major reasons for the difference in the amount of floating marine debris in different coasts of Kinmen.

In addition, the Chinese scholars (e.g., [16]) also found that the Jiulong River is the largest pollution source. During heavy rainfall or spring/neap tide, a large amount of debris flows into the sea [17]. The amount and density of debris in Xiamen Waters is higher in April–November [18] because of the effect of rainfall and typhoons [19,20]. Thus, the aforementioned conditions combined with monsoons, tides and ocean currents have formed the status quo of floating marine debris in Kinmen waters and coastal areas [4].

2.3. Transboundary Marine Governance between Kinmen and Xiamen

The major garbage disposal policy in Taiwan is “garbage reduction and recycling”. This is in line with the perspective of resources sustainability, and advocates green production, green consumption, source reduction, and resources recycling. This promotes an action plan which involves “the full classification of garbage without waste” in Taiwan. Except for the recyclable resources, most of the garbage is disposed in landfills. The landfills in Kinmen are almost full, and the establishment of new landfills may encounter the crisis of public resistance. In addition, the Basel Convention was formulated to ensure that

environmental problems are not exported across boundaries [21], thereby outlawing the transport of Kinmen garbage to Xiamen for disposal [22]. In order to avoid garbage disposal crisis in the future, Kinmen's garbage has been transported to Taiwan for incineration, since December of 2010 [4].

The population of Xiamen municipality is high, but the area is small, and Xiamen government has learned from the experiences of other countries. In 2015, Mainland China and the United States held the first "Ocean Protection of the Ocean" special meeting and reached a consensus on the prevention of marine debris and the establishment of marine protection areas. Both parties also signed the "China-US Marine Debris Prevention-Xiamen-San Francisco 'Partner City' Cooperation Implementation Plan". Implementation of the plan was also intended to enhance the comprehensive management of the nine streams near the Jiulong River Estuary and reduce the discharge of debris into the streams. The plan aimed at improving infrastructure and establishing a marine waste collection and disposal mechanism [23]. Mainland China and the United States are cooperating on marine waste technology, including working mechanisms, monitoring and early warning, management action, public participation, five major plans of cooperation and exchange, and seven action tasks [4]. In the future, the content of the plan could be used as a reference for the cross-strait joint transboundary governance of floating marine debris in Kinmen-Xiamen Waters.

On the whole, marine governance always involves transboundary or even global issues. Both Kinmen and Xiamen are located in Kinmen-Xiamen Waters, and it is necessary for the application of transboundary governance. The approach applied depends on different political, social, economic and ecological drivers. Thus, transboundary governance may face a lot of difficulties [24], such as conflicts caused by the sectionalism of land or marine jurisdiction. This is because, for the jurisdiction of most countries, it is often based on the scope of jurisdiction, and it easily causes confrontation with other governments in the area of sea under their jurisdiction, thereby making coordination more difficult [25]. Moreover, insufficient laws and regulations affect transboundary cooperation; this is due to the fact that the laws and regulations of different countries or governments are not the same. Furthermore, Lo et al. [26] found that an increase in the number of participants would increase the amount of business and negotiation costs, which may result in failure.

In this study, an attempt was made to establish a transboundary governance mechanism to solve the floating marine debris problem of Kinmen-Xiamen Waters. Thus, this study explored relevant issues through literature review, field surveys, in-depth interviews, and expert opinion surveys. Through the literature review, this study explored relevant information about floating marine debris in Kinmen-Xiamen waters, as relevant action to promote the Kinmen-Xiamen transboundary governance mechanism. Observation and survey were conducted in Kinmen-Xiamen Waters during the research period. The observation focused on how floating marine debris was affected by monsoons, ocean currents and tides, and the coastal areas where floating marine debris were distributed. Additionally, to make the collection of literature information more comprehensive and complete, six experts and scholars were invited for opinion surveys, including marine scholars based in Kinmen and Xiamen, and practical experts on remediation of floating marine debris.

In summary, the transboundary marine governance in Kinmen-Xiamen Waters requires the mutual cooperation of the two administrative entities of Kinmen and Xiamen, to jointly acquire and analyze the spatial data of the sea area, in order to develop and propose an appropriate governance mechanism. In addition, the participation of relevant stakeholders is encouraged. This can be achieved through communication and negotiation with them, integrating their opinions, clarifying the ideas and internal relationship of each, in order to establish the marine governance mechanism in Kinmen-Xiamen Waters.

3. Method

3.1. General Situation of Floating Marine Debris in the Study Area

The Kinmen–Xiamen Waters are located at the Jiulong River Estuary in China, and it is formed by Xiamen Harbor, Weitou Bay in Quanzhou, Kinmen Bay and Jiulong River Estuary. The jurisdictions of the sea areas mostly belong to Xiamen and Kinmen [18]. Currently, there is serious environmental pollution in the Kinmen–Xiamen Waters, and the pollution sources are mainly from land. Pollutants from the coasts, harbors and estuaries enter the Kinmen–Xiamen Waters. Due to geographic reasons, there were at least 500 tons of debris floated to Kinmen coasts and beaches [4]. Studies have shown that most of the debris entering Kinmen–Xiamen Waters comes from the rivers [16]. The amount of garbage accounted for 80% of debris in Xiamen waters [20]. The Jiulong River has become the largest pollution source in the Kinmen–Xiamen Waters [19]. Recently, the Xiamen Municipal government has increased its efforts to remediate the pollution of the Jiulong River. For example, in order to control the total discharge of pollutants from Jiulong River to Xiamen Bay, coordination work has been carried out across land and sea boundaries, departments, and administrative boundaries. Although the initial results have been achieved, there is still room for improvement [27]. They started by salvage and cleaning, while exploring a long-term mechanism at the same time. A number of management and assessment methods have also been formulated, such as the “Xiamen Floating Marine Debris Supervision Work Plan” and the “Xiamen Bay Floating Marine Debris Contingency Plan”. There are correlations for the floating marine debris in Kinmen and Xiamen and the transboundary marine governance mechanism is required. If China and Taiwan could refer to the “Xiamen Model”, it could be possible to create the cross-strait marine governance mechanism.

3.2. Methods

Based on the information gathered from literature review, field surveys, and expert opinion surveys, this study has developed an interview outline of “Transboundary Governance of Kinmen–Xiamen Waters for Floating Marine Debris”. This included: whether the current floating marine debris collection and disposal methods are appropriate, and the way to respond accordingly, the methods of solving the long-term pollution of marine debris in Kinmen Waters, inter-shores and beaches, whether it is necessary for transboundary marine governance between Kinmen and Xiamen for floating marine debris, the difficulties and the corresponding solutions for transboundary marine governance between Kinmen and Xiamen, and the transboundary governance mechanism of Kinmen–Xiamen Waters for floating marine debris in Kinmen–Xiamen Waters. The interviewees included a total of five academics, practitioners and environmentalists. The research procedures and methods above were applied to propose research findings from the acquired information, and a transboundary marine governance mechanism was established.

4. Analysis and Discussion

This study has obtained the following results through related research procedures and methods. It found that the largest pollution source in Xiamen Waters is from Jiulong River. In addition, the monsoons and tides are the major factors that determine whether floating marine debris will be washed ashore, and where the corresponding positions will be on the beaches. Besides, relying on Kinmen alone to remediate floating marine debris, it has limited effectiveness. Finally, it was found that the “China–US Marine Debris Prevention—Xiamen–San Francisco ‘Sister City’ Cooperation Implementation Plan” could further be used as reference for cross-strait joint transboundary governance in Kinmen–Xiamen Waters. The analysis and discussion of the results of this study are as follows.

4.1. Analysis of the Current Situation of Floating Marine Debris in Kinmen and Actions Taken by the Governments

In this study, it was found that there was 90% of the floating marine debris in Kinmen that came from Xiamen area. Due to the fact of that Xiamen Bay is located in the west of Kinmen and that its bay mouth is located at the estuary of the Jiulong River. The Jiulong River has been identified as the biggest pollution source [18]. Kinmen has to continue to clean up beach debris for a long time [4]. To effectively remediate the floating marine debris in Kinmen–Xiamen Waters, the marine administrative departments of Kinmen and Xiamen have to cooperate. After years of development, the marine administrative departments of both sides have reached a considerable level and can serve as the foundation of transboundary marine governance [17]. In response to the issue of marine debris, there has been a steady decline in the amount of garbage through the cooperation.

According to the Waste Disposal Act and Basel Convention, the import and export of domestic debris is prohibited. Therefore, Kinmen County government could only transport debris back to Taiwan for incineration. It costs about USD 128 per ton and is a heavy burden for Kinmen County government [14]. At present, the Kinmen County government has negotiated with China to send Styrofoam and recyclable marine debris to Mainland China for processing. Based on current trend, if they could come to an agreement for a common goal, Kinmen and Xiamen could create a new model for both sides of the strait in the field of marine environmental governance [4]. Analysis of this study showed that the average annual amount of floating marine debris in Kinmen County from 2011 to 2020 has reached 477 tons. This shows that the amount of floating marine debris in Kinmen was huge that is a heavy burden for Kinmen County.

In 2013, Kinmen County government introduced the first self-propelled ATV to clean the beach. The cleaning width was 1.3 meters, cleaning speed was 5 km per hour, and the cleaning capacity was 6500 square meters per hour, which is equivalent to 27 people cleaning the beach at the same time [28]. Kinmen County government has arranged garbage collectors to clean up the beaches according to the situation. The floating marine debris in Kinmen County comes mainly from the Jiulong River Basin. The hundreds of tons of debris each year affect marine ecology, coastal landscape, public health, and hinder people from engaging in coastal activities and marine recreation. Since the cross-strait transboundary marine governance of floating marine debris involves cross-strait affairs, the Kinmen County government sent an official letter to invite Straits Exchange Foundation to assist in communicating with Xiamen to reduce the coastal environmental problems [4]. The Xiamen Bay Marine Waste Drift Tracking Forecast System, developed by the Marine Monitoring and Information Services Center (MMS) of Xiamen University, has been tracking the drift of marine debris and predicting its distribution since July 2017. That forecast system could trace the waste drifting to sea and predict the drifting track in the next 24 hours to find out the best interception location. The distribution and amount of waste along the coasts are as shown in Figure 2. Due to the regional relationship of the Kinmen and Xiamen sea area, this forecast system could stimulate the marine waste track of the whole Kinmen and Xiamen sea area and verify the relevance of marine waste in the Kinmen and Xiamen sea area [29].

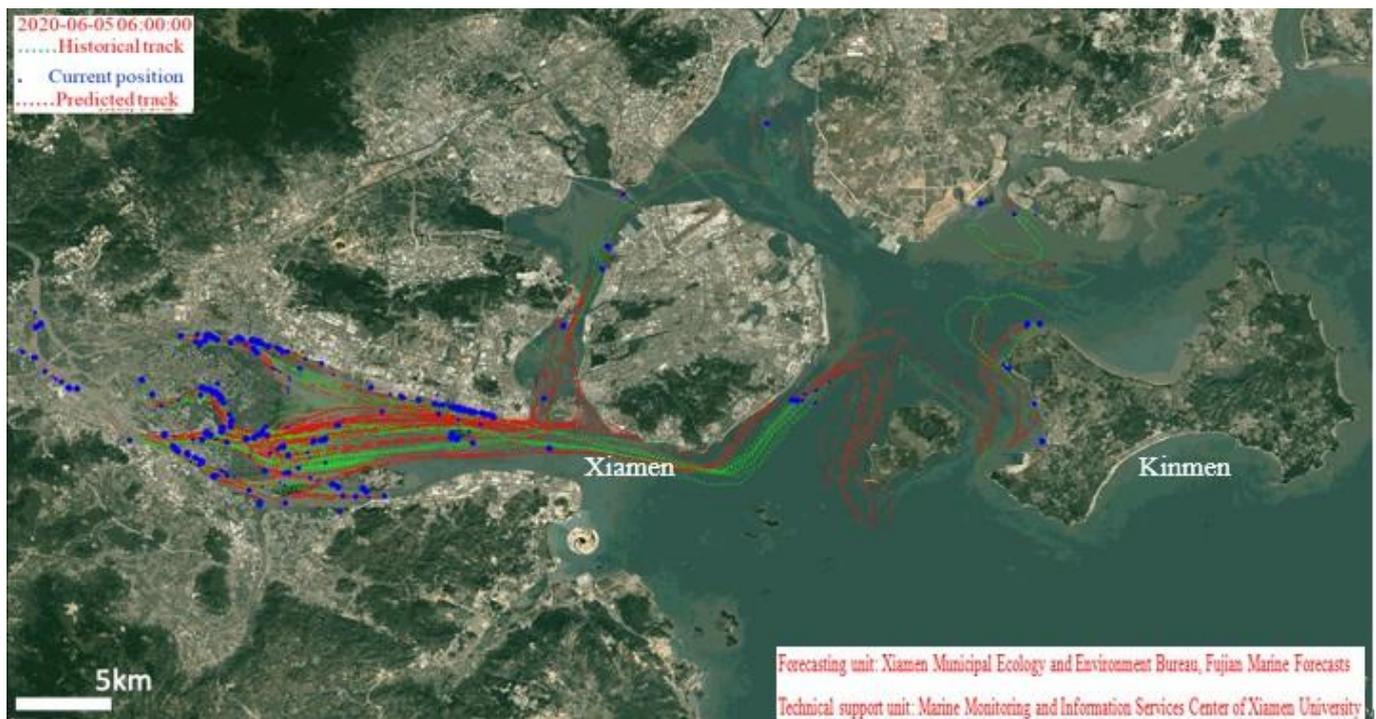


Figure 2. Forecasting map of drifting path of marine debris in Kinmen–Xiamen Waters on 5 June 2020. Data source: Xiamen Bay Marine debris Drift Tracking Forecast System.

The governments on both sides of the Strait have no formal floating marine debris disposal policy in the Kinmen–Xiamen Waters. Kinmen have to handle the debris issue by cooperating with different departments. This delays administrative procedures and timeliness. Therefore, this study must make a loud appeal to the governments of both sides of the Strait to negotiate the transboundary marine governance mechanism as soon as possible.

4.2. Results Analysis of Field Surveys, Expert Opinion Surveys and In-depth Interviews

4.2.1. Field Surveys

This study conducted four field surveys on the coasts of Kinmen in March–April 2021. It mainly focused on the positions where the floating marine debris was washed ashore. The situation of floating marine debris accumulated on the coasts is shown in Figure 3 and is explained as follows: in the northeast coasts of Kinmen, the further to the north, the more debris on the coasts (as shown in Figure 4). In the south of Kinmen, the further to the south, the more debris on the coasts are (as shown in Figure 5). However, the floating marine debris on the northwest coasts would be less (as shown in Figure 6). The survey results showed that during the northeast monsoon, the floating marine debris would be washed ashore roughly in northeastern Kinmen. During the southwest monsoon, the floating marine debris would be washed ashore roughly in southwestern Kinmen. Furthermore, to make the content of various data more appropriate, the review of the analysis results of field survey is taken. Five personnel were arranged for the interview. They were staffs of Kinmen National Park having many years of practical experience on tourism, shipping, fishery and construction. The purpose of the interview was to record the actual experiences and personal opinions of the interviewees in order to acquire appropriate advice [30] (pp. 9–10). The results are consistent with the findings of Lin et al. [4,14].

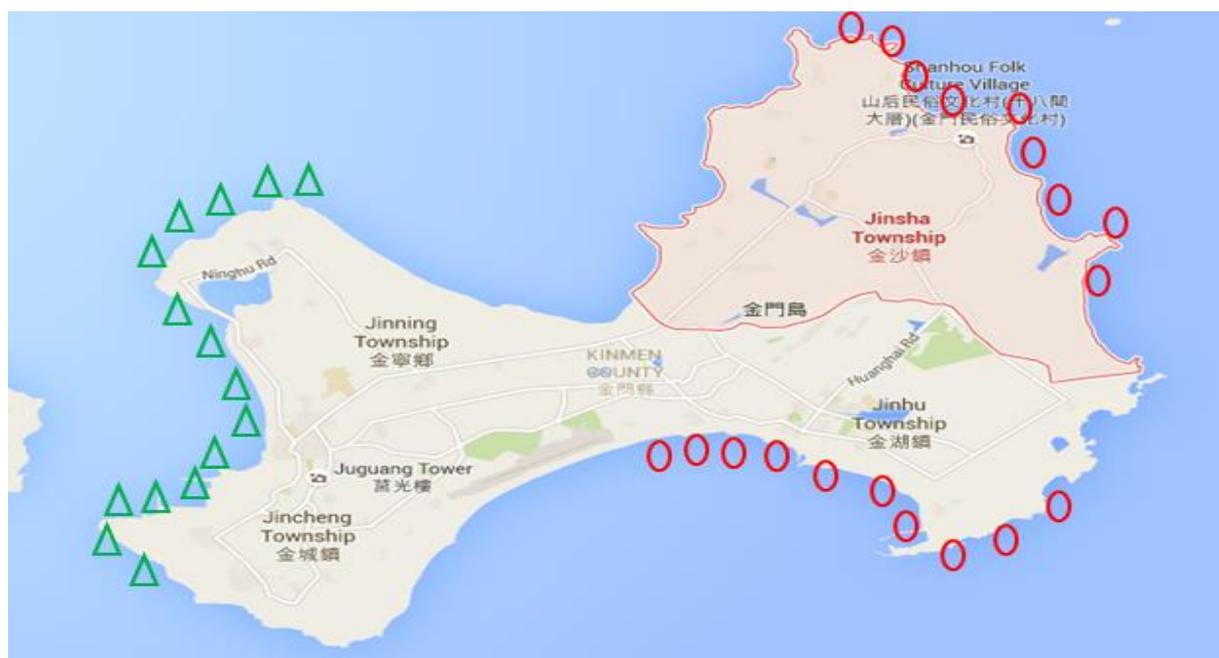


Figure 3. Ellipses mark the locations with more debris and triangles mark the locations with fewer debris. Data source: Ma et al. [30], and Kinmen County government, Available at: <https://kinmen.travel/en/guide/get-around>. Note: The oval marks the locations where the average weight of marine waste was over 10 kg per square meter, and the triangle marks the locations where the average weight was less than 10 kg per square meter.



Figure 4. Floating marine debris on Northeast Coast of Kinmen. Data source: photographed by the research team of floating marine debris in Kinmen and Xiamen waters.



Figure 5. Floating marine debris on Southern Coast of Kinmen. Data source: photographed by the research team of floating marine debris in Kinmen and Xiamen waters.



Figure 6. Floating marine debris on Northwest Coast of Kinmen. Data source: photographed by the research team of floating marine debris in Kinmen and Xiamen waters.

4.2.2. Expert Opinion

In order to understand the cross-strait joint transboundary remediation of floating marine debris. In this study, six experts were interviewed, including one professor in the field of marine affairs from Quemoy University and one from Xiamen University, and two executive staffs in the field of sea areas, tourism or development from Kinmen and Xiamen. The expert's opinion survey covered the marine scholars and practical experts in the Kinmen–Xiamen area. Since they have in-depth research or practical experience on this research topic, their opinions are professionally representative [30].

The following opinions were gathered. First, Kinmen and Xiamen should establish “Kinmen–Xiamen Waters Cross-border Cooperation Management Platform” based on scientific research organizations from both sides. For example, relevant departments of Xiamen University and Quemoy University may act as leaders, and cooperate with other platforms, such as other marine research institutions in Xiamen and Fisheries Research Institute in Kinmen in order to promote scientific research exchange in the future. The communi-

cation and coordination of the management policies should be carried out through the platform. Next, priority should be given to issues of mutual concern. The implementation of transboundary marine governance mechanism would be difficult and complex.

Therefore, both parties should start with existing hot issues in the Waters and gradually promote the research and development of related fields. At present, the floating marine debris in Kinmen–Xiamen Waters should be the issue of concern to both parties. In addition, both sides of the strait should establish a transboundary marine governance mechanism implementation leading group.

To implement the plan, the leading group should unite the scientific research and administrative units of both sides. There is need to include multidisciplinary scientific researchers (such as marine natural sciences, marine management sciences, law, economics and administrative sciences, etc.), government personnel and other stakeholders to the group. Lastly, the two sides of the strait should alternately hold seminars and review the effectiveness of the implementation of previous resolutions, and gradually promote the sustainable development of the mutual benefit of Kinmen–Xiamen Waters. The opinions of scholars, experts and executives on both sides of the strait acquired in the symposium, could be used as an important reference for the governments of Kinmen and Xiamen in establishing a transboundary marine governance mechanism for the Kinmen–Xiamen Waters.

4.2.3. Results Analysis of In-Depth Interviews

In this study, five personnel were interviewed from the operating unit of floating marine debris in Kinmen County, law enforcement unit and environmental protection. They included two mid-level supervisors, two business undertakers, and one environmental protection personnel. The interviewees have worked or engaged in environmental protection for at least 15 to 30 years. First, floating marine debris and general municipal waste have different cleaning and transportation methods based on whether they are combustible or non-combustible. Most combustible debris has been entrusted to incinerators for a long-term in Taiwan, and the transportation and handling cost per ton is about USD130. The non-combustible debris has been entrusted to a local outsourcing company to clean up and relocate to two landfills in Kinmen for burying. An expert and scholar supervision team was also established such that the debris treatment in Kinmen would be handled properly. Kinmen focuses on the development of tourism and in each tourist season, the amount of garbage has increased with tourists. In addition to the 500 tons of floating marine debris, the only solution is to reduce the amount of debris in order to reduce the burden of cleaning up debris for outlying islands. Due to the geographic location, ocean currents and monsoons, among of 500 tons of floating marine debris washed ashore in Kinmen each year, there are about 130 tons of Styrofoam and floats. The situation is most severe when there is southwest monsoon from May to September. The annual handling fee is as high as USD 350,000. In order to improve the situation, Kinmen County government has repeatedly invited relevant agencies, organizations, experts and scholars to discuss and exchange ideas on the problem of floating marine debris disposal. In order to achieve the goal of marine sustainability, it is expected that floating marine debris would be effectively removed and the effectiveness of recycling would improve.

Moreover, the awareness of environmental protection has gradually increased, and people have started focusing on the pollution problem of floating marine debris. Therefore, if both sides of the Strait could cooperate, there will be improved control of the pollution source. With the joint effort of both sides of the Strait towards remediation of floating marine debris and environmental monitoring, the symptoms of the problems could be relieved and the root cause could be solved.

Lastly, the interviewees believed that it was a must to rely on the Taiwan Environmental Protection Administration and the Mainland Affairs Council to continue the negotiation with China, and the issue of floating marine debris was designated as special cross-strait affairs. It was included in the Cross-strait Environmental Protection Cooperation Agreement, in order to solve the problem effectively. Moreover, it was suggested that the central

government should authorize the local governments to negotiate with China to promote the regional transboundary remediation mechanism of floating marine debris. For example, the Kinmen County government has attempted applying the cross-strait consultation mechanism. After negotiation, Xiamen prohibited fishermen from using Styrofoam as buoys while the Kinmen aquaculture industry prohibited the use of Styrofoam, in order to solve the pollution problem caused by Styrofoam use in the aquaculture industry.

4.3. Analysis of Transboundary Marine Governance in Kinmen–Xiamen Waters

4.3.1. Possible Dilemma

According to the investigation report from Taiwan's Control Yuan in 2015, "Environmental Protection Administration has neither addressed the problem of floating marine debris from Mainland China for a long time nor considered the special nature of outlying island affairs or assisted Kinmen or Matsu in solving the problem of floating marine debris from Mainland China". It requested that the Mainland Affairs Council and Environmental Protection Administration should negotiate constantly with Mainland China to classify the floating marine debris as a cross-strait special issue and include it as a sub-topic of the draft cross-strait environmental cooperation agreement. Unfortunately, the scheduled meetings were suspended due to the cross-strait political atmosphere. The above mentioned issues are the dilemmas that may be faced by the transboundary marine governance of Kinmen–Xiamen Waters. However, it should be understood that the only way to solve the issue of floating marine debris in Kinmen–Xiamen Waters is to apply cross-strait joint transboundary governance.

4.3.2. Necessity and Feasibility Analysis of Transboundary Governance of Floating Marine Debris in Kinmen–Xiamen Waters

The cross-strait joint transboundary governance of floating marine debris can be decided by neither Kinmen nor Xiamen. It can only be achieved under the permission of the two political entities. Cross-strait academic circles should play the role of advisers when proposing feasible plans. The feasibility and implementation of the plans depend on the consensus and wisdom of cross-strait leaders but researchers cannot.

Floating marine debris has the following characteristics, which necessitate transboundary governance: (1) Indivisible publicity—the floating marine debris in Kinmen–Xiamen Waters is a public issue. It is necessary for central governments to authorize the Local governments of Kinmen and Xiamen, and to cooperate with relevant organizations and non-governmental organizations. (2) Externality—The consequences of the policy or action taken by the government, may affect people in other places. Therefore, the prevention and control of marine debris can only be supported and implemented by including and reflecting the common interests of stakeholders [31]. (3) Politics—The governance of Kinmen–Xiamen Waters regarding floating marine debris is a transboundary public affair. Therefore, in order to acquire overall interests, it is necessary to consider how collective actions could be arranged through the design of official mechanisms [32]. (4) Comprehensive—The prevention and control of floating marine debris in Kinmen–Xiamen Waters rely on multiple methods and measures, such as administration, law, science and technology. Long-term and constant efforts are required for the use of comprehensive prevention and control measures.

With the jurisdictional restriction of local governments, it is prohibited to exceed the administrative areas. In order to save disposal costs when dealing with environmental issues and enhance organizational functions, the existing administrative border should be crossed by cooperation between different administrative entities to achieve the goal of solving public issues [33]. However, both Kinmen and Xiamen operate at the local government level under different central governments. Therefore, it could only be carried out with the consent of the respective central governments. If there was no transboundary cooperative governance mechanism, the implementation and effectiveness of the policy for governance of floating marine debris would be greatly reduced. The governance of floating

marine debris relies on the transboundary marine governance mechanism, to enhance the effectiveness of the policy in an overall management manner. It was difficult to obtain authorization from the respective central government to discuss the governance mechanism of floating marine debris in Kinmen–Xiamen Waters. However, Mainland China and Taiwan governments have opened the small three links since 2001, such that cross-strait people could make contact with each other through the sea channel. Moreover, based on the Cross-Strait Joint Crime-Fighting Agreement, cross-strait marine law enforcement agencies can also implement coordinated law enforcement in Kinmen–Xiamen Waters, against illegal sand mining and cross-border fishing from the boats of Mainland China.

Since the signing of the Sino-British Joint Declaration in 1984 and the hand over in 1997, transboundary environmental cooperation between Hong Kong and China has addressed environmentalists and researchers. The disposal of construction waste is relatively difficult; therefore, in order to properly dispose this type of waste, Mainland China has signed a waste disposal cooperation agreement and related cooperation affairs with Hong Kong. The Local governments of Mainland China would assist the governments of Hong Kong and Macau to reduce the pressure of waste disposal in those regions. This indicates the commencement of cross-border cooperation between both parties. If the floating marine debris in Kinmen is handled by Xiamen through a relevant channel, it could reduce the burden of local landfills in Kinmen. Since the distance between Kinmen and Xiamen is only 10 kilometers, it would be relatively convenient to transport the debris to Xiamen by sea and cross-strait joint transboundary governance could be possible [13].

The feasibility of this study has been mentioned above and it has been explained that transboundary governance involves the laws and regulations, policies and cooperation of both sides. The cross-strait political atmosphere has always been the main factor affecting whether transboundary governance could break through the existing framework or not. According to the examples mentioned above, cross-strait cooperation would be absolutely feasible, but it depends on the perspectives of the cross-strait leaders. The responsibility of the researcher is to study and analyze issues and to propose feasible plans. It is expected that the national leaders would adopt them in a policy in order to solve the issue of a large amount of floating marine debris in Kinmen.

5. Conclusions and Recommendations

5.1. Research Conclusions

The following conclusions were reached through the literature review, field surveys, expert opinion surveys and in-depth interviews.

(1) The study found that the largest pollution source in Xiamen Waters is the Jiulong River. Over 90% of floating marine debris in Kinmen comes from the Xiamen Area. At present, the amount of floating marine debris in Kinmen is still high. This has polluted the Kinmen Waters, affected the coastal landscape, and even posed hazard to public health.

(2) The monsoons and tides are the major factors which determine whether floating marine debris will be washed ashore, and the corresponding positions on the beaches. The positions where they are washed ashore are usually located on the windward coasts.

(3) Relying on Kinmen alone to remediate floating marine debris has limited effectiveness. The major reason is that the cross-strait coordination mechanism is yet to be institutionalized. In particular, under the tense political atmosphere between the two sides of the strait, many cross-strait coordination and management mechanisms have been suspended. For example, the cross-strait representatives established the “Joint Conference on Remediation of Floating Debris for 6 Cross-strait Cities” in 2015 to negotiate the joint remediation of cross-strait floating marine debris. The members included pilot areas such as Fuzhou, Quanzhou, Xiamen, Zhangzhou, Kinmen, Matsu and Pingtan. If the governments of Kinmen and Xiamen could jointly remediate floating marine debris based on the existing cooperation foundation, it would create a new model for Kinmen and Xiamen in marine governance.

(4) In this study, it was found that in the “China–US Marine Debris Prevention—Xiamen–San Francisco ‘Sister City’ Cooperation Implementation Plan”, both parties proposed plans and action tasks on working mechanisms, monitoring and early warning, management action, public participation, cooperation and exchanges. After five years of continuous efforts, the plan achieved good results. This cooperative governance model could further be used as reference for cross-strait joint transboundary governance in Kinmen–Xiamen Waters.

On the whole, in addition to confirming the existing research findings, this study also proves the importance of the coordinated governance of China and Taiwan in the Kinmen and Xiamen. The surrounding countries or regions can work together to solve the problem of floating marine debris. Based on this, the Kinmen and Xiamen governments should adopt the transboundary marine governance mechanism to control the floating marine debris.

5.2. Recommendations for Future Research

Based on the results of this study, the following recommendations were made:

5.2.1. Comprehensive Recommendations for Remediation of Floating Marine Debris

(1) It is a must to determine the pollution source, in order for marine debris remediation to be successful. This study found that non-recyclable debris accounted for up to 88.5% of floating marine debris in Kinmen. Failure to recycle cleaned-up debris could cause a huge amount of debris accumulation. With the limited manpower for debris collection, controlling the pollution source is definitely the best strategy.

(2) The public awareness of environmental protection and dissemination of regulations should be enhanced, and public participation should be increased. Residents, families, and communities are the main participants in debris classification and recycling. The different approaches of dissemination and environmental education should be increased in order to improve the public environmental awareness and win over extensive public participation and support for government action such that debris could be continuously reduced at the source. In addition, non-profit organizations could function as a platform for public participation. For the issue of floating marine debris, non-profit organizations could appeal to the public, organize social welfare activities, and engage in the remediation of floating marine debris with their professional advantages. Kinmen County should consider establishing an Environmental Protection Fleet and promote the concept of marine users bringing debris back to shore for disposal. For example, Kinmen could follow the example of Penghu to establish an Environmental Protection Fleet and increase the number of trash bins on the shores, in order to increase the willingness to salvage debris for recycling. Consideration should be given to the installation of interception nets at shore-side to reduce the amount of floating marine debris washed ashore.

(3) By facing the threat of marine pollution and limited manpower, the introduction of advanced salvage or debris collection technology could be a good choice [34], such as the Ocean Cleanup Array and marine trash bins [35].

(4) The Internet and multiple channels could be applied to promote coastal section adoption and beach cleaning activities. On important festivals, such as the World Oceans Day, Kinmen County government could organize beach cleaning activities to appeal to the public, communities, volunteers, and public and private organizations to participate in beach cleaning activities and awaken the public awareness of environmental protection.

5.2.2. Recommendations for Transboundary Marine Governance

(1) Kinmen could be utilized as the pilot area for cooperation between cross-strait local governments. At present, exchanges between local cities in Taiwan and Local governments in Mainland China could only be maintained at the level of visits and exchanges. Kinmen could be selected as the pilot area for cross-strait sub-regional cooperation. If the results are good, it could gradually be extended to other counties and cities in Taiwan [14]. In cross-

strait city exchanges and cooperation, the research results showed that Kinmen achieved the best results among the counties and cities in Taiwan. For example, since 2018, Fujian has channeled water to Kinmen, and since 2009, cross-strait law enforcement agencies have implemented coordinated law enforcement on “cross-border fishing” and “illegal mining of sea sand” from the boats of Mainland China in Kinmen–Xiamen Waters.

(2) Since 2010, cross-strait rescue agencies have jointly participated in marine search and rescue exercises in Kinmen–Xiamen Waters and have actually assisted ships and people in distress. In terms of cross-strait cooperation achievements, Kinmen has become a pilot demonstration zone for cross-strait cities cooperation. The level of cooperation has not only surpassed the level of “observation and exchange” but has also entered the level of cross-strait sub-regional cooperation [36]. It should be feasible to apply Kinmen as pilot area for transboundary marine governance by cross-strait local governments. However, the first issue that must be faced by cross-strait transboundary marine governance in Kinmen–Xiamen Waters would be whether both central governments authorized the local governments to handle it.

(3) A cross-strait floating marine debris management cooperation platform should be established and the governance of floating marine debris should not only rely on Kinmen or Xiamen. Before there is an effective way of stopping the drifting of waste to Kinmen, a notification mechanism should first be established to prevent the pollution floating from China. Next, a cooperation mechanism should be established for governance of floating marine debris in Kinmen–Xiamen Waters. Since both sides of the strait have their own existing management systems, as well as laws and regulations, the most urgent task is to speed up the process of institutionalizing the cross-strait joint transboundary governance of floating marine debris for Kinmen and Xiamen. It could make Xiamen to be strictly responsible for controlling the discharge of land-based pollutants, and for jointly negotiating the total amount of sewage allowed to be discharged into the sea. The supervision and monitoring mechanism should be established for the Kinmen–Xiamen Waters, in order to provide long-term control of the ecological and environmental issues in Kinmen–Xiamen Waters.

(4) The governments of Kinmen and Xiamen should jointly establish a marine debris database, and jointly implement the investigation and monitoring of the biological resources and hydrological environment affected by the floating marine debris in Kinmen–Xiamen Waters. However, many specific measures are required to put it into effect, and having a specific plan for the cooperation mechanism could be the first required measure.

(5) The governments of Kinmen and Xiamen should establish and enhance the mechanism of prevention and control of floating marine debris. Specific measures include the formulation and improvement of relevant regulations for the prevention and controlled management of marine debris in Kinmen and Xiamen, formulation of an action plan for governance of garbage. Moreover, it is necessary to establish a leading group and coordination mechanism for cross-strait participation and improving evaluation mechanism for the prevention and control of floating marine debris. Second, a monitoring and early warning plan could be used to enhance the monitoring and early warning capabilities of floating marine debris in Kinmen–Xiamen Waters, especially the dynamic information about floating marine debris in the Jiulong River estuary. The third measure could be the action plan of management. Xiamen government has enhanced the comprehensive governance of streams connected to the sea, and pollution sources in the countryside. In order to eradicate the pollution source of the floating marine debris in Kinmen–Xiamen Waters, specific measures have been applied including launching the remediation of the pollution sources of the Jiulong River. In addition, both Kinmen and Xiamen should improve the infrastructure, as well as establish a collection and disposal mechanism for pollution by floating marine debris. Moreover, it could be necessary to enhance marine ship management and strictly prevent pollutants from entering the sea. The remediation of aquaculture facilities along the coasts of Kinmen and Xiamen should also be improved. At the same time, the remediation and restoration of marine debris should be promoted, and the quality of marine ecological

environment in Kinmen–Xiamen Waters should be improved, including wetlands, rivers and seas, embankments, land reclamation and remediation dredging projects along the coasts of both sides. In addition, there should be implementation of beach restoration projects, as well as beach cleaning and maintenance projects.

(6) The public participation plan—Environmental knowledge should be popularized and public awareness of the environmental protection of cross-strait people should be increased, from the magnitude of social participation in the prevention and control of marine debris. Specific measures also include conducting promotion campaigns for the prevention and control of marine debris in Kinmen and Xiamen. For example, disseminate “Leave No Trace” action to protect the ocean and establish the code of conduct for reducing debris dumped into the sea. In addition, the public should be encouraged to participate in the prevention and control of floating marine debris, and fully utilize the organizational capabilities of the environmental protection groups. In addition, voluntary activities should be held for beach adoption and cleaning.

In short, due to the seriousness of floating marine debris in Kinmen and the necessity for cross-strait joint transboundary marine governance, this study has proposed the recommendations above. For the welfare of the people, it is expected that the governments of Mainland China and Taiwan would uphold the principle of “pragmatism and reciprocity” by working together to maintain the marine environment in Kinmen–Xiamen Waters.

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References

1. Purba, N.P.; Faizal, I.; Cordova, M.R.; Abimanyu, A.; Afandi, N.K.; Indriawan, D.; Khan, A. Marine debris pathway across Indonesian boundary seas. *J. Ecol. Eng.* **2021**, *22*, 82–98. [[CrossRef](#)]
2. Beaumont, N.J.; Aanesen, M.; Austen, M.C.; Börger, T.; Clark, J.R.; Cole, M.; Wyles, K.J. Global ecological, social and economic impacts of marine plastic. *Mar. Pollut. Bull.* **2019**, *142*, 189–195. [[CrossRef](#)]
3. Liu, G.Y.; Ho, R.H.; Chen, N. Taiwan’s outlying islands become China’s garbage dump. *Common Wealth Mag.* **2014**, *551*, 6. (In Chinese)
4. Lin, T.H. Current Status and Disposal Policy of Marine Debris in Kinmen and Xiamen Sea Areas. Master’s Thesis, Institute of Marine Affairs, National Sun Yat-Sen University, Kaohsiung, Taiwan, 2019. (In Chinese).
5. Pasternak, G.; Ribic, C.A.; Spanier, E.; Ariel, A.; Mayzel, B.; Ohayon, S.; Zviely, D. Nearshore survey and cleanup of benthic marine debris using citizen science divers along the Mediterranean coast of Israel. *Ocean Coast. Manag.* **2019**, *175*, 17–32. [[CrossRef](#)]
6. Chen, C.L.; Kuo, P.H.; Lee, T.C.; Liu, C.H. Snow lines on shorelines: Solving Styrofoam buoy marine debris from oyster culture in Taiwan. *Ocean Coast. Manag.* **2018**, *165*, 346–355. [[CrossRef](#)]
7. Islam, M.S.; Hui Pei, Y.; Mangharam, S. Trans-boundary haze pollution in Southeast Asia: Sustainability through plural environmental governance. *Sustainability* **2016**, *8*, 499. [[CrossRef](#)]
8. Seltenrich, N. New link in the food chain? Marine plastic pollution and seafood safety. *Environ. Health Perspect.* **2015**, *123*, 34–41. [[CrossRef](#)]
9. Jambeck, J.R.; Geyer, R.; Wilcox, C.; Siegler, T.R.; Perryman, M.; Andrady, A.; Law, K.L. Plastic waste inputs from land into the ocean. *Science* **2015**, *347*, 768–771. [[CrossRef](#)] [[PubMed](#)]
10. Van Sebille, E.; Aliani, S.; Law, K.L.; Maximenko, N.; Alsina, J.M.; Bagaev, A.; Wichmann, D. The physical oceanography of the transport of floating marine debris. *Environ. Res. Lett.* **2020**, *15*, 023003. [[CrossRef](#)]

11. Chen, H.; Wang, S.; Guo, H.; Lin, H.; Zhang, Y.; Long, Z.; Huang, H. Study of marine debris around a tourist city in East China: Implication for waste management. *Sci. Total Environ.* **2019**, *676*, 278–289. [CrossRef]
12. Ghaffari, S.; Bakhtiari, A.R.; Ghasempouri, S.M.; Nasrolahi, A. The influence of human activity and morphological characteristics of beaches on plastic debris distribution along the Caspian Sea as a closed water body. *Environ. Sci. Pollut. Res.* **2019**, *26*, 25712–25724. [CrossRef]
13. Lee, H. A Study of Waste Disposal Problem and Policy between Kinmen and Xiamen. Master's Thesis, Institute of Mainland China Studies, National Quemoy University, Kinmen, Taiwan, 2010.
14. Lin, T.H.; Kao, R.H.; Chang, S.K. Existing situation of remediation of floating marine debris in Kinmen County and analysis of policy recommendations. In *Proceedings of the 2nd Kinmen-Xiamen Area Collaborative Development and Exchange Symposium*, Xiamen, China, 2017.
15. Wang, Y.H. *Research Report on Ocean Current Survey and Coastal Debris Removal Planning in Kinmen County*; Fisheries Research Institute: Kinmen, Taiwan, 2016. (In Chinese)
16. Lee, W.L. Investigation and countermeasures of floating waste pollution in Xiamen-Jinmen sea area. *Environ. Sanit. Eng.* **2009**, *17*, 46–51. (In Chinese)
17. Chen, C.C.; Fang, Q.; Hsieh, H.S.; Zhuang, S.J.; Chen, J.Y.; Chang, S.S. Feasibility Analysis of Environmental Coordinated Management of Kinmen-Xiamen Waters. *Ocean Dev. Manag.* **2004**, *21*, 24–29.
18. Chen, X.C.; Wang, W.Q. A study on eco-environmental security cooperation on waters between Xiamen and Kinmen. *Ecol. Environ.* **2013**, *275*, 178–181.
19. Lee, W.L. Management and countermeasures of floating waste pollution in Xiamen Sea Area. *Guangzhou Chem. Ind.* **2014**, *20*, 154–156. (In Chinese)
20. Dai, H.; Yang, B.C.; Yan, L.L.; Zhang, Y.; Yuan, C.W. Treatment suggestions on drifting waste in Xiamen sea area. *Ocean Dev. Manag.* **2018**, *11*, 67–71. (In Chinese)
21. Choksi, S. The Basel Convention on the control of transboundary movements of hazardous wastes and their disposal: 1999 Protocol on Liability and Compensation. *Ecol. LQ* **2001**, *28*, 509.
22. Ogunseitan, O.A. The Basel Convention and e-waste: Translation of scientific uncertainty to protective policy. *Lancet Glob. Health* **2013**, *1*, 313–314. [CrossRef]
23. Zhao, F. The 13th Five-Year Plan for Environmental Protection of Xiamen Municipality Has Been Released (with Key Projects). China Daqi Website. 2017. Available online: <http://www.chndaqi.com/news/view?id=253455&page=13> (accessed on 26 March 2021).
24. Chien, S.S.; Hong, D.L. River leaders in China: Party-state hierarchy and transboundary governance. *Political Geogr.* **2018**, *62*, 58–67. [CrossRef]
25. Jay, S.; Alves, F.L.; O'Mahony, C.; Gomez, M.; Rooney, A.; de Vivero, J.L.S.; Almodovar, M.; Goncalves, J.; Gee, K.; Fernandes, M.L.; et al. Transboundary dimensions of marine spatial planning: Fostering inter-jurisdictional relations and governance. *Mar. Policy* **2016**, *65*, 85–96. [CrossRef]
26. Lo, C.C.; Liu, H.; Geng, X. Cross-Boundary Governance Research of Coastal Rivers in Taiwan: Case Study of the Nanshih River Basin. *J. Coast. Res.* **2020**, *109*, 210–215. [CrossRef]
27. Wang, Q.L.; Lee, Y.F. Integrated Land-Marine Management for the Eco-environmental Development in the New Era of Xiamen, China. *Chin. J. Environ. Manag.* **2018**, *10*, 87–91. (In Chinese)
28. Zhuang, H.N. The First Self-Propelled ATV Beach Cleaner in the Country Kinmen Daily News. 2013. Available online: http://web.kinmen.gov.tw/Layout/main_ch/News_NewsContent.aspx? (accessed on 21 December 2020).
29. Jin, Y.H.; Kao, R.H. Analysis on the necessity and feasibility of across boundary governance of floating marine debris in Kinmen and Xiamen sea area. In *Proceedings of the 2021 Marine Affairs and Marine conservation in Kinmen Conservation Academic Seminar*, Kinmen, Taiwan, 2021.
30. Ma, H.Y.; Kao, J.C.; Kao, R.H. How to establish a sustainable sea area governance mechanism? The case of marine waste. *Int. J. Sustain. Dev. World Ecol.* **2021**. [CrossRef]
31. Emerson, K.; Gerlak, A.K. Adaptation in collaborative governance regimes. *Environ. Manag.* **2014**, *54*, 768–781. [CrossRef] [PubMed]
32. Kern, K.; Söderström, S. The ecosystem approach to management in the Baltic Sea Region: Analyzing regional environmental governance from a spatial perspective. *Mar. Policy* **2018**, *98*, 271–277. [CrossRef]
33. Emerson, K.; Nabatchi, T.; O'Leary, R. Environmental Collaboration and conflict resolution. In *Environmental Governance Reconsidered*; MIT Press: Cambridge, MA, USA, 2017; pp. 263–296.
34. Gartry, L. Seabin' Designed by Australian Surfers to Clean Up Marinas, Reduce Ocean Pollution. ABC NEWS. Available online: <http://www.abc.net.au/news/2015-12-20/seabin--designed--by--australian--surfers--to--start--cleaning--up--ocean/7044174> (accessed on 13 December 2020).
35. Seabin Project. Seabin Project: About Us. Seabin Project. Available online: <http://seabinproject.com/about-us/> (accessed on 26 March 2021).
36. Kao, R.H.; Cho, C.C.; Lin, T.H.; Kim, Y.H. A study on the concept of spatial planning in Kinmen and Xiamen sea area from the marine environmental deterioration and maritime safety—The case of trespassed fishing, illegal sea sand mining and floating waste. *Marit. Q.* **2019**, *28*, 79–110. (In Chinese)