

威海市海洋垃圾防治措施研究方案

Research Scheme of Developing Regulatory Measures for
Marine Litter Management in Weihai City of PR China

山东省海洋资源与环境研究院
Shandong Marine Resources and Environment Research
Institute

二〇一八年五月

May 2018

I. Project Introduction

Marine litter, including plastics and micro-plastics, is considered “a global concern affecting all the oceans of the world”. More than 800 marine species have been found to interact with marine litter to date, with ingestion and entanglement the two main types of interaction. Based on the transboundary diagnostic analysis of the Yellow Sea, one of the major environmental problems is the marine litter in the Yellow Sea.

Marine litter commonly stems from shoreline and recreational activities, commercial shipping and fishing, and dumping at sea. The majority of marine litter (approximately 80 percent) entering the seas and oceans is considered to originate from land-based sources. Marine litter is as much a transboundary global problem as well as a local issue with a multitude of sources. Litter pollution in the marine and coastal environment is a challenging restoration and governance issue. Similar to many environmental problems, marine litter pollution is transboundary and therefore the governance solutions are complex.

Therefore, this project seeks to develop regulatory measures for marine litter monitoring, disposal, handling, reuse, and recycle in pilot site to enable investment on recycling economies. It is expected that this project will contribute to knowledge building in YSLME.

II. Research Objectives

The study aims to provide regulatory measures for marine litter monitoring, disposal, handling, reuse and recycle in pilot province or city of Yellow Sea. The project will support a series of activities leading to enhanced marine litter management capacity, and development and application of regional guidelines on the control of marine litter.

III. Research Content

1. Review of historical monitoring data of marine litter (including micro-plastics) in Weihai City;
2. Assessment of the types, distribution, quantity and composition, sources and identification of stakeholders of marine litter (including micro-plastics), and identify the “hotspot” areas, which are the sea areas of Xiaoshi Dao and Weihai Bay in Weihai City. Assessment of existing status of marine litter and regulatory and policy framework in the management of marine litter (micro-plastics) in Weihai City;
3. Review of current policies and regulations as well as best available technologies for reducing litter and assess cost efficiencies of their application in other cities in applicable;
4. Identification of policy, regulatory framework, financial and technological gaps based on historical and second-hand monitoring data assessment;
5. Drafting proposals of policy or financial incentives for consideration by Weihai City to incentivize investment by private sector in prevention, control, recycling, re-use of litter (including micro-plastics) originated from identified sources.

IV. Research Methodologies

The sea areas of Xiaoshi Dao and Weihai Bay in Weihai City are selected as the pilot sites.

1. The historical investigation data of marine litter (including micro-plastics) in the sea areas of Xiaoshi Dao and Weihai Bay will be reviewed and analyzed, and the data are supplied by Shandong Marine Resource and Environment Research Institute and Weihai Marine and Fisheries Administration.

Meanwhile, the current investigation about marine litter will be monitored at the sea areas of Xiaoshi Dao and Weihai Bay in Weihai City by the method of belt transect and trawl survey for the floating litter, and the visual and gravimetric method for garbage on the beach, which completed by Shandong Marine Resource and Environment Research Institute, in August to September, 2018.

2. The current policies, regulations and technologies will be reviewed and sorted. In order to better grasp the situation, four times of investigations and studies need to be conducted in Weihai City, Qingdao City, Fujian City, and Hainan City to learn their relevant experiences and ideas. At the meantime, the changes of marine litter between the pre- and post-implementation of relevant policies and regulations, and the change trend during the implementation process will be analyzed. Hence, the relevant policy, regulatory framework, financial and technological gaps will be identified. The basic principles include integration of sea and land, integration of prevention and treatment, innovation and guide, open and cooperation, and green development.

This task will be completed by Energy and Environmental Development Research Center, Shandong Marine Resource and Environment Research Institute and Weihai Marine and Fisheries Administration. The report of gaps in regulatory and policy measures in the management of marine litter and micro-plastics will be drafted by Energy and Environmental Development Research Center.

3. For the governance of marine litter, the first task is to strengthen source management, clean-up, and disposal capacity of marine litter. The second is to set up a long-term mechanism for marine litter control by promoting optimization of the coastal industrialization structure, perfecting the monitoring system of marine litter, strengthening patrol, carrying out renovation and modification of the environment, and expanding public participation for marine litter control. The third is to carry out cooperation for marine litter control by establishing the mechanisms of common connection, advance in cooperation, and gain-sharing. And at the same time, supporting measures will be implemented by strengthening organization leadership, system construction, scientific support, and financial support.

In all, the proposals of policy or financial incentives for consideration by Weihai City to incentivize investment by private sector in prevention, control, recycling, and reuse of marine litter will be drafted. Meanwhile, the obtained results will be piloted in other cities if applicable.

The proposals will be drafted by the four participating organizations, which are

Shandong Marine Resource and Environment Research Institute, Energy and Environmental Development Research Center, National Marine Environmental Monitoring Center and Weihai Marine and Fisheries Administration, and unified by Shandong Marine Resource and Environment Research Institute.

V. Data and Information Collection

The research data comes from the marine litter monitoring data from the past few years and the survey data in 2018.

The historical investigation data of marine litter (including micro-plastics) in the sea areas of Xiaoshi Dao and Weihai Bay will be reviewed and analyzed, and the data are supplied by Shandong Marine Resource and Environment Research Institute and Weihai Marine and Fisheries Administration.

Meanwhile, the current investigation about marine litter will be monitored at the sea areas of Xiaoshi Dao and Weihai Bay in Weihai City by the method of belt transect and trawl survey for the floating litter, and the visual and gravimetric method for garbage on the beach, which completed by Shandong Marine Resource and Environment Research Institute, in August to September, 2018.

VI. Team Structure

The team consists of eight members. The team leader is Yuanqing Ma, who is in charge of the overall arrangement and progress of the project. Liping You and Juan Zhang will be responsible for reviewing and analyzing the historical investigation data of marine litter in the sea areas of Xiaoshi Dao and Weihai Bay, as well as assessing the types, distribution, quantity and composition, sources and identification of stakeholders of marine litter. Maowei Ju will be responsible for identifying best available technologies for reducing litter and assess cost efficiencies of their application in other cities. Xin Liu will be responsible for viewing and sorting the current policies and regulations, as well as identifying the related policy, regulatory framework, financial and technological gaps. Peng Liu and Wei Sun will be responsible for the current investigation and analysis of marine litter. Huawei Qin will be responsible for the overall proposals drafting of relevant policy or financial incentives, and all the other members of the team will participate in this task.

No	Name	Gender	Date of Birth	Degree	Title	Expertise	Organization	Years of Professional Experience	Email
1	Yuanqing Ma	Male	04/27/1979	Master's Degree	Senior Engineer	Marine Chemistry	Shandong Marine Resource and Environment Research Institute	16	erma0402@163.com
2	Huawei Qin	Male	04/30/1980	Bachelor's Degree	Senior Engineer	Applied Chemistry	Shandong Marine Resource and Environment Research Institute	14	15965178556@126.com
3	Liping You	Female	11/28/1985	PhD	Research Assistant	Environmental Science	Shandong Marine Resource and Environment Research Institute	4	youliping521@163.com
4	Peng Liu	Male	02/29/1976	Bachelor's Degree	Senior Engineer	Marketing Management	Weihai Marine and Fisheries Administration	11	Whlp312660@163.com
5	Juan Zhang	Female	07/14/1988	Master's Degree	Research Assistant	Environmental Science	Shandong Marine Resource and Environment Research Institute	5	zhangjuan714@163.com
6	Xin Liu	Male	11/26/1970	PhD	Senior Engineer	Environmental Economics	Energy and Environmental Development Research Center	24	liuxin@eed.com.cn
7	Maowei Ju	Male	07/28/1981	PhD	Engineer	Environmental Engineering	National Marine Environmental Monitoring Center	6	mwju@nmemc.org.cn
8	Wei Sun	Male	07/24/1983	Master's Degree	Research Assistant	Ecology	Shandong Marine Resource and Environment Research Institute	10	Chinaradio789@163.com

VII. Work Plan

Lot 1

The activities and deliverables that shall be undertaken by the end of twenty weeks upon signing of the contract are as follows:

1. Review historical monitoring data of marine litter (including micro-plastics) in Weihai City;
2. Assess the types, distribution, quantity and composition, sources and identification of stakeholders of marine litter (including micro-plastics), and identify the “hotspot” areas.

Lot 2

The activities and deliverables that are expected to be undertaken between four and forty-four weeks upon signing of the contract are as follows:

1. Review current policies and regulations as well as best available technologies for reducing litter and assess cost efficiencies of their application in other cities if applicable;
2. Identify policy, regulatory framework, financial and technological gaps based on historical and second-hand monitoring data assessment;
3. Draft proposals of policy or financial incentives for consideration by Weihai City to incentivize investment by private sector in prevention, control, recycling, and reuse of litter (including micro-plastics) originated from identified sources.

VIII. Output

1. Assessment of existing status of marine litter and regulatory and policy framework in the management of marine litter (micro-plastics) in Weihai City;
2. Proposal of policy or financial incentives to incentivize investment by private sector in prevention, control, recycling, reuse of litter.

IX. Results Submitting

No.	Reporting	Compiling Organization	Submission deadline
1	Inception report detailing the process and methodologies, data and information collection, team structure and work plan	Shandong Marine Resource and Environment Research Institute	May 11, 2018
2	Analysis of the status and trends of marine litter in Weihai City	Shandong Marine Resource and Environment Research Institute	June 20, 2018
3	Gaps in regulatory and policy measures in the management of	Energy and Environmental Development Research	November 1, 2018

	marine litter and micro-plastics	Center	
4	Proposals for regulatory and financial policies to encourage the investment by private sector in monitoring, reduce, recycling and reuse of marine litter and micro-plastics	Shandong Marine Resource and Environment Research Institute, Energy and Environmental Development Research Center, National Marine Environmental Monitoring Center and Weihai Marine and Fisheries Administration, and unified by Shandong Marine Resource and Environment Research Institute	April 30, 2019

UNDP/GEF-YSLME

**Research Progress Report on Developing Regulatory
Measures for Marine Litter Management
in Weihai City of PR China**

Shandong Marine Resources and Environment Research Institute

July 2018

Contents

Introduction	1
1. Survey and Analysis Methods	2
1.1 Survey Methods	2
1.2 Data Analysis Methods	3
2. The Status of Marine Litter in Weihai City	4
2.1 Litter on the Beach	4
2.1.1 Litter on the Beach in Weihai City	4
2.1.2 Litter on the Xiaoshi Dao beach in Weihai city	4
2.2 Floating Litter on the Sea	7
2.2.1 Distribution of the Litter	7
2.2.2 Classification and Sources of the Litter	7
2.3 Submarine Litter	8
2.4 Conclusion	8
3. Survey Results of Marine Aquaculture and Marine Fishing	8
3.1 Survey Results in Rongcheng City	8
3.1.1 Marine Aquaculture	8
3.1.2 Marine Fishing	9
3.1.3 Litter Disposal	9
3.2 Survey Results in Rushan City	10
3.2.1 Marine Aquaculture	10
3.2.2 Marine Fishing	10
3.2.3 Litter Disposal	10
4. Next Work Plan of the Project	11

Introduction

Marine litter is a persistent, man-made/processed solid waste in the marine and coastal environment. It mainly includes litter on the beach, floating litter and submarine litter. With the continuous deepening of human development and utilization of the marine coast, the amount of the marine litters increases rapidly. It is reported that the increase rate of the beach litter reached 140% between 1994 and 2013 in Britain. The damage caused by marine litter to marine ecosystem and biological resources is increasingly serious. And the litter has been one of the major pollution phenomena in the coastal environment. Data shows that there are about 8 million wastes per day, and up to 6.4 million tons of wastes per year entering the sea. It is estimated that the stock of plastic garbage has reached 36 times of the plankton biomass in the Pacific. Plastic marine litter can not only directly lead to the injury or death of marine organisms, but also the micro plastic particles produced after aging and fragmentation will enter the food chain and cause hidden dangers to human health.

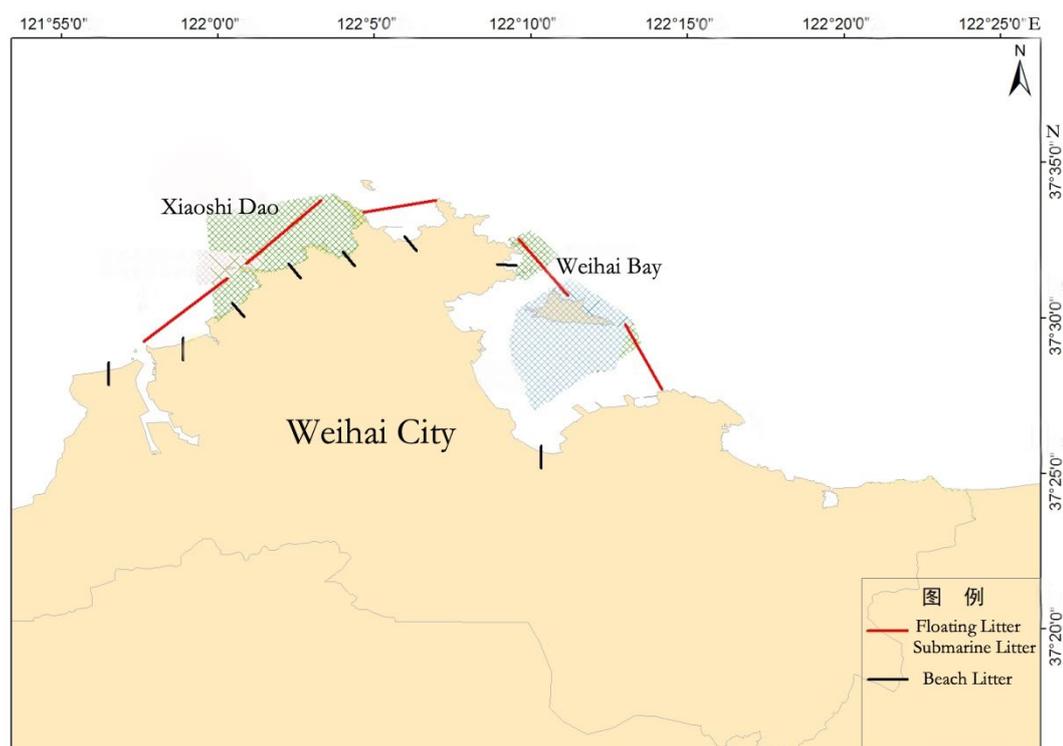


Fig.1 Monitoring areas and sampling sections of marine litter in Weihai city

Since 2007, the status of marine litter has been listed in “Marine Environment Status Bulletin in China” as one of the contents. In the same year, the marine litter monitoring in coastal cities has been carried out in Shandong Province. In the present project, Xiaoshi Dao and Weihai Bay in Weihai city are selected as the research area, and 17 sea and land monitoring sections are set up to

monitor the type and density of marine litter. The historical data in the project comes from marine litter monitoring data of Xiaoshi Dao in Weihai from 2009 to 2017 and the special monitoring data of marine litter from “Marine Litter Prevention and Management in Weihai City between China and the United State- ‘Sister Cities’ ”. And meantime, to get more information about the status of wastes generation and recovery/disposal of marine aquaculture and marine fishing in Shandong province, we have selected Rongcheng City and Rushan City as the representative areas to investigate the specific conditions of marine aquaculture and marine fishing.

1. Survey and Analysis Methods

1.1 Survey Methods

(1) The methods of section layout, classification and specification statistics are referred to “Technical Regulations for Marine Litter Monitoring and Evaluation (Trial)” (Haihuan Zi [2015] No. 31). The width of the monitoring section is 5 m, and the length is from the edge of water surface or beach perpendicularly to the average high tide line or the vegetation cover area. The collected samples were simply cleaned, measured, classified, counted, and weighed. The marine litter were divided into small blocks (size <2.5 cm), medium blocks (size ≥ 2.5 cm and ≤ 10 cm), large blocks (size > 10 cm and ≤ 1 m) and larger blocks (size >1 m).

Tab.1 Contents and methods of marine litter monitoring

Monitoring contents	Survey Methods	Survey Contents
Litter on the Beach	Visual and Gravimetric Method	
The Floating Litter	Large and Larger Blocks Small and Medium Blocks	The Type and Density of Litter Debris
	Belt Transect Method Trawl	
Submarine Litter	Trawl	

(2) The statistical classification method of the Northwest Pacific Ocean and Coastal Regional Environmental Protection Organization (NOWPAP) was used to analyze the sources of the litter on the beach (Tab.2). The sources are analyzed according to five categories, including human coast activities, shipping/fishing activities, smoking supplies, medical/hygiene products, and other wastes.

Tab.2 Classify category of the beach litter sources

Number	Sources	Types
S1	Human Coast Activities	Plastic Bottles, Fast Food Boxes, Beverage Cans, Newspapers, Plastic Bags, etc.
S2	Shipping/Fishing Activities	Abandoned Fishing Nets, and Debris, Fishing Lines, Floats, etc.
S3	Smoking Supplies	Cigarettes, Cigarette Cases, Lighters, etc.
S4	Medical/Hygiene Products	Syringes, Waste Bottles, Sanitary Napkins, Diapers, etc.
S5	Other Wastes	Tyres, Fluorescent Tubes, Screens, Wires, Light Bulbs, Glass, etc.

1.2 Data Analysis Methods

The density of some kind of litter i on the beach is calculated as follows:

$$D_i = \frac{n_i}{Lw}$$

In the Formula:

D_i —The density of the litter on the beach (ind.·km⁻² or kg·km⁻²);

w —The width of survey section (km);

L —The length of survey section (km);

n_i —The sum of the number or quantity of some beach litter on the survey section (ind. or kg)。

There are many types of litter on the beach with regional differences. It is of positive significance for the targeted prevention to determine the main components of litter in a certain area. Referring to the concept of the share rate of pollutants by Zhao Wei, et al., the share rate of some litter i on the beach is calculated as follows:

$$K_i = \frac{n_i}{n} \times 100\%$$

In the Formula:

K_i —The share rate of some litter i on the beach;

n —The sum of the number or quantity of some beach litter on the survey section (ind. or kg)。

In order of magnitude, the cumulative percentage greater than 80% is the main component of the beach litter.

2. The Status of Marine Litter in Weihai City

2.1 Litter on the Beach

2.1.1 Litter on the Beach in Weihai City

(1) Distribution of the Litter

The monitoring results showed that beaches under sanitary management, such as International Bathing Beach and Gold Beach Bathing Beach, were relatively clean with a small density; the natural beaches with frequent artificial activities, such as the north sea of Chu village and the west coast of Xiaoshi Dao, had a high density of litter; The demolition and relocation on some Boyu beaches was in progress, and the litter distribution density was not stable, so the monitoring results were not recorded.

(2) Classification of the Litter

The litter on the beach in Weihai city was dominated by living waste, including plastics, wood products, glass, paper, polystyrene foam, metal, and other types. The main stocks were medium and small, and the average density was $1989 \text{ kg}\cdot\text{km}^{-2}$. Plastic wastes was the main litter in amount, accounting for 49%, followed by polyethylene foam and wood products, accounting for 22% and 12%, respectively.

(3) Sources of the Litter

The sources of litter were as follows. The first was left by tourists sightseeing and sea-catching, such as cigarette butts, beverage bottles, food packaging bags, etc. The second was the land-based light waste blown into the sea, such as light and thin polyethylene foam, etc. The third was the fishing boat remnants by seawater conveyor, such as Fishing nets, ropes, etc.

2.1.2 Litter on the Xiaoshi Dao beach in Weihai city

(1) Component Analysis

The total amount of the collected litter on Xiaoshi Dao beach was 220 in Weihai city. The amount and mass of the samples are shown in Tab.3. The proportion in the order of high to low were plastics, other types, wood products, polystyrene foam, paper, metal, glass, fabric (cloth), and rubber. Plastic was also the highest in mass.

Results showed that the highest quantity of beach litter in Xiaoshi Dao was plastics (37.73%). The results is consistent with Zhao, et ac., who reported that the main types of beach litter in China was plastics (37.37%), and the percent of plastics in beach litter was about 50% to 80% in the coast of New South Wales, Australia and Balearic Islands, Spain. And moreover, the joint survey of Japan's coastal countries revealed that plastics accounted for about 55% to 93.4%.

Tab.3 Composition and quantity of litter on Xiaoshi Dao beach

Types	Number/Ind.	Number Proportion/ %
Glass	11	5
Rubber	2	0.91
Plastics	83	37.73
Wood Products	33	15
Paper	14	6.36
Metal	12	5.45
Other Artifacts and Unidentifiable Materials	42	19.09
Styrofoam	18	8.18
Fabric (cloth)	5	2.27

(2) Density Distribution

The average amount of beach litter in Xiaoshi Dao was 27,063 ind. \cdot km⁻² (Tab.3), which was respectively lower than those in Shandong Province (75,958 ind. \cdot km⁻²), East China Coast (31,001 ind. \cdot km⁻²) and China's marine litter monitoring area (54,371 ind. \cdot km⁻²). According to the mass statistics, the average mass of litter on Xiaoshi Dao beach was 3428.33 kg \cdot km⁻², which was respectively higher than those in Shandong Province (1186.47 kg \cdot km⁻²), East China Coast (1633 kg \cdot km⁻²) and China's marine litter monitoring area (1589 kg \cdot km⁻²). The litter on Xiaoshi Dao beach had lower amount and higher mass, which revealed that the litter was dominated by light litter with medium and large blocks (93.18% and 2.73%, respectively) and large masses. The statistical results of the inter-annual variation coefficient of density (Tab.4) revealed that the distribution varies of beach litter were great and was affected by the distribution of beaches, functional types, human disturbances and exotic.

Tab.4 The density of beach litter in Xiaoshidao, Weihai City in China, 2009-2017

Area	2009	2010	2011	2012	2013	2014	2015	2016	2017	Means	STD	Variation Coefficient
Xiaoshi Dao in Weihai /ind. \cdot km ⁻²	28571	4000	3000	12000	19000	37000	33000	50000	57000	27063	19240	71.09%
Xiaoshi Dao in Weihai /kg \cdot km ⁻²	6057.14	2672	1420	1654.5	2573	11370.5	1989	512.8	2606	3428.33	3348.89	97.68%

Area	2009	2010	2011	2012	2013	2014	2015	2016	2017	Means	STD	Variation Coefficient
Monitoring Area in Shandong /ind.·km ⁻²	67898	62574	61841	111762	101611	78984	70395	90900	37658	75958	20282	26.70%
Monitoring Area in Shandong /kg·km ⁻²	1530.92	895.05	593.18	1158.00	1584.14	2310.13	635.29	576.98	1394.52	1186.47	519.20	43.76%
Monitoring Area in China/ind·km ⁻²	12000	30000	62686	72581	70252	50142	69203	70348	52123	54371	19834	36.48 %
Monitoring Area in China/kg·km ⁻²	688	770	1114	2494	1622	3119	1105	1971	1420	1589	726.49	45.72 %

Tab.5 Distribution and source analysis of litter in the monitoring area on Xiaoshi Dao beach

Monitoring Area	Type of the Functional Area in Adjacent Waters	Beach Sediment Type	Amount/ind.·km ⁻²	Mass/kg·km ⁻²	The Main Source
Xiaoshi Dao	The Sea Area Near to the Harbor	Fine Powder Sand	27063	3428.33	S1、S2、S5

(3) Characteristics of the Inter-annual Change

The inter-annual variations of litter on Xiaoshi Dao beach during the period from 2009 to 2017 are shown in Fig.2 and Tab.4. Similar changes were recorded in the inventory of beach litter in the marine litter monitoring area of China and the seven coastal beach cities in Shandong Province in the same period. Quantitatively, the amount of litter on Xiaoshi Dao beach in Weihai decreased from 2009 to 2010, and increased from 2011 to 2017, with the exception of 2015. The overall situation showed a continuous upward trend. Qualitatively, the mass of litter continuously decreased from 2009 to 2011, and increased year after year from 2012 to 2014, and then returned to the average annual levels.

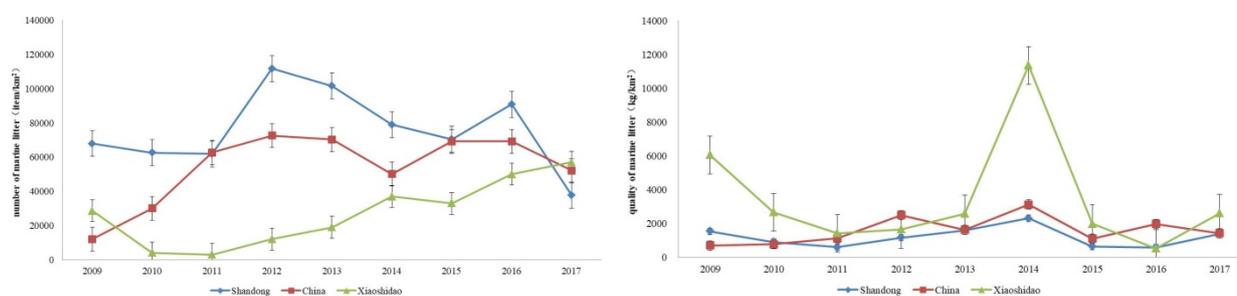


Fig.2 Annual change characteristics of beach litter

(4) Sources Analysis

The analyzed results about the litter sources were shown in Fig.3. The results showed that human coastal activities were the main litter source, accounting for 52.47%. The second source was other wastes and shipping/fishing activities, accounting for 25.11% and 16.59%, respectively. The source of smoking articles and medical/hygiene supplies was relatively low, accounting for 3.59% and 2.24%, respectively. The main sources of litter on Xiaoshi Dao beach were human coastal activities, other wastes, and shipping/fishing activities.

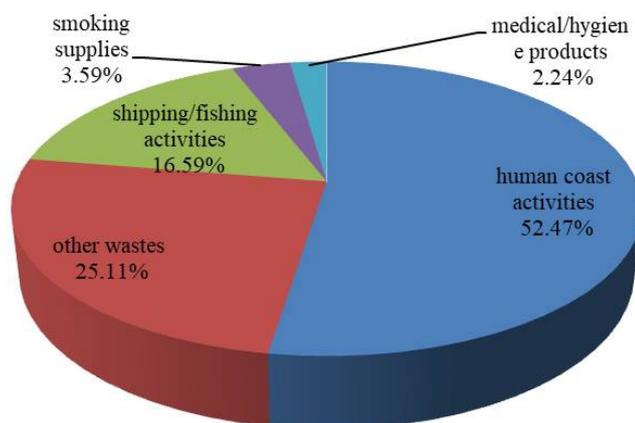


Fig.3 Sources of litter on Xiaoshi Dao beach

2.2 Floating Litter on the Sea

2.2.1 Distribution of the Litter

The density of floating litter was not uniform and affected by the time and sea area.

Human activities in winter and spring were not strong, and the source of marine litter is relatively small. At the same time, due to seasonal northerly winds, some floating litter landed on the beach and become beach litter. The amount of floating litter was small, and some monitoring sections (from Chubei village to Jingzi Tou area) were not even monitored.

In summer and autumn, the amount of sea vessels, near-shore, human tourism and bathing beaches increased. Thus, the amount of floating litter increased significantly, which mainly distributed in tourist and recreation areas, agricultural and fishery areas, port shipping areas, and adjacent sea areas. Among them, the distribution of floating litter in the agricultural and fishery areas was significantly higher than other sea areas.

2.2.2 Classification and Sources of the Litter

The floating litters in Weihai City were mainly plastic paste, polystyrene foam chips, plastic bags and plastic bottles. The average amount was 3 ind.·km⁻² for large block, 102 ind.·km⁻² for the medium and litter block. And the average density was 2.06 kg·km⁻². Plastics posted the highest

amount, accounting for 52%, followed by polystyrene foam, accounting for 34%. 61% of the floating litter source was from sea activities and 39% from land.

2.3 Submarine Litter

Results showed that the density of submarine litter in Weihai City is relatively low, and the main source was the deserted operational tools of fishery production.

From the Beihai in Chucun village to Jinzitou sea-area, three sections seabed trawls were carried out. 9 plastic nets, 6 plastic nets, and 1 scallop cage were detected on the west side of Xiaoshi Dao. The total weight was 4.05 kg, and the average density was $7.5 \text{ kg}\cdot\text{km}^{-2}$. 4 plastic webs, 1 glass bottle, 1 plastic water bag were collected, and the total weight was 389 g, and the average density was $0.7 \text{ kg}\cdot\text{km}^{-2}$. No litter was detected in the International Bathing area.

Three sections of submarine litter trawls were carried out in the Haixitou sea area. 2 aquaculture floats were monitored in the northern waters of the Acacia, with a total weight of 3.2 kg. 2 floating floats were detected in the eastern part of the Yinshan Bay, with a total weight of 3.5 kg. The submarine litter was not detected in the northern sea area of Shijia River.

2.4 Conclusion

(1) The main sources were human coast activities, other wastes, and shipping/fishing activities.

(2) Marine litter was detected in tourist and recreation areas, agricultural and fishery areas, port shipping areas and adjacent sea areas. Among them, marine litter in tourist and recreation areas was mostly household garbage such as plastic bags and plastic bottles. Litter in agricultural and fishery areas was mostly production waste, such as plastic and polystyrene foam. The density was higher in agricultural and fishery areas than that in tourist and recreation areas and port shipping areas.

(3) Among the marine litter components, the amount and mass of plastic waste accounted for the highest proportion.

3. Survey Results of Marine Aquaculture and Marine Fishing

3.1 Survey Results in Rongcheng City

3.1.1 Marine Aquaculture

The specific species of Rongcheng marine aquaculture mainly include shrimp (*Penaeus vannamei*, *Fenneropenaeus chinensis*, and *penaeus japonicus*), crab (*Portunus trituberculatus*), shellfish (oyster, abalone, arcoida, etc.), algae (*Saccharina japonica*, *Undaria pinnatifida*, and *gracilaria*), and other species (sea cucumber, sea urchin, etc.). The total aquaculture area is approximately 34,423 hectares, and the total production is approximately 753,763 tons/year. And

the main breeding methods include pond culture, raft culture, sowing culture, mudflat aquaculture, etc.

The main breeds in Rongcheng are algae and shellfish, which could generate no additional litter.

3.1.2 Marine Fishing

(1) Offshore Fishing

There are 6,800 offshore fishing vessels with a net tonnage of 497,700 tons and a total power of 563,800 kilowatts. The main fuel is diesel. The working time is 6 months/year and 20 days/month for the fishing vessels, and 8 months/year and 25 days/month for the farming vessels. The litter is mainly living waste with an annual production of about 2,000 tons. The treatment methods include garbage bins, garbage bags, salvage, etc.

(2) Ocean Fishing

There are 300 ocean fishing vessels with a total tonnage of 180,243 tons and a total power of 316,330 kilowatts. The main fuel is diesel, with a total annual fuel consumption of 300,079 tons. The work is through the whole year. And the main methods of the work include tuna fishing, squid fishing, purse seine, trawling, and transportation. The litter is mainly living waste, and the ships are equipped with corresponding garbage bins.

(3) The Production Cuts of Fishing Vessels

Since 2017, a total of 161 fishing vessels have been completed in the production cuts with a total power of 13,562 kw.

3.1.3 Litter Disposal

A work plan for waste control in light of actual conditions has been formulated in Rongcheng City. And the relevant laws and regulations include “Environmental Protection law of the People's Republic of China”, “Marine Environmental Protection law of the People's Republic of China”, “Fisheries law of the People's Republic of China”, “Regulations for the investigation and handling of pollution incidents in fishery waters”, “Environmental protection administrative penalties”, “Provisions on Fisheries Port and Navigation Supervision of the People's Republic of China”, etc.

The scope of governance includes solid waste, floating litter on the sea and oil sewage in the port area of the city. The governance measures mainly include (1) Increase the environmental protection propaganda of fishing port terminals; (2) Establish an integrated management process for the disposal of source management; (3) Joint enforcement to vigorously promote the implementation of governance objectives. And the main implementation mechanisms include (1) Establish an operational mechanism for the management of the main body of the fishing port; (2) Strengthen the source governance mechanism for fishing vessels and aquaculture production areas; (3) Implement the territorial management mechanism; (4) Improve the input guarantee mechanism;

(5) Strengthen organizational leadership Mechanism; (6) Establish an assessment and evaluation mechanism.

3.2 Survey Results in Rushan City

3.2.1 Marine Aquaculture

The main marine aquaculture species in Rushan City is oyster. The breeding scale is 80 000 mu and the aquaculture capacity is 300 000 tons/year. The main breeding method is raft culture. The marine litter could be neglected, as there is basically no feeding.

3.2.2 Marine Fishing

(1) Offshore Fishing

There are 1,446 offshore fishing vessels (including 714 fishing vessels and 732 auxiliary fishing vessels) with a total power of 36,291 kW. The main fuel is diesel, with a total annual fuel consumption of approximately 17,978 tons. The working time of the fishing vessels is as follows: 15 days/month except the off-season fishing for purse seine fishing, 5 months/year and 28 days/month for the trawling and gill-netting. The working time of the auxiliary fishing vessels is as follows: year-around and 28 days/month for the farming vessels, 5 months/year and 28 days/month for the fishery transport vessels, and 8 months/year and 18 days/month for the law-enforcement vessels.

There are no hazardous wastes from the fishing vessels in Rushan City. And the solid wastes mainly come from the living wastes during the production and life of fishing vessels and the production equipment for discarded nets. The annual living wastes and waste net production equipment are about 2,660 tons.

(2) Ocean Fishing

There are 11 ocean fishing vessels, 7 of which are for ocean-going operations with a total power of 6,400 kw. The main fuel is diesel, with a total fuel consumption of about 3,300 tons/year. The working method is longline fishing. The busy season is from October to December every year, and the leisure season is from March to July. The type of garbage is mainly living wastes and has not been counted.

(3) The Production Cuts of Fishing Vessels

Since July 2017, a total of 52 fishing vessels have been completed in the production cuts with a total power of 1,615 kW in two batches.

3.2.3 Litter Disposal

We will focus on the publicity and training to continuously enhance the awareness of marine environmental protection at all levels. The persons in charge of the fishing vessels and the responsible persons at the first, second and third levels will be indoctrinated of the marine environmental protection. And meanwhile, the training on marine environmental protection and

the recycling of marine living wastes, waste equipment and production equipment will be increased during the annual crew certificate training.

4. Next Work Plan of the Project

(1) 2018/08~2018/09, the site survey of marine litter in Xiaoshi Dao and Weihai Bay in Weihai will be carried out. The types, distribution, quantity and composition of litter will be assessed. And the sources and stakeholders of marine litter will be identified.

(2) 2018/10~2018/11, the current policies and regulations as well as best available technologies for reducing litter will be reviewed. And the cost efficiencies of their application in other cities if applicable will be assessed. The policy, regulatory framework, financial and technological gaps based on historical and second-hand monitoring data assessment will be identified.

(3) 2018/12~2019/04, the research foundation of policy or financial incentives for prevention, control, recycling, and reuse of litter originated from identified sources will be drafted.

UNDP/GEF-YSLME

**Research Progress Report on Developing Regulatory
Measures for Marine Litter Management
in Weihai City of PR China**

**—Present Situation and Countermeasures of Marine Litter
Treatment in Weihai**

Shandong Marine Resources and Environment Research Institute

November 2018

Contents

Introduction.....	1
1. Current situation of marine litter control in Weihai city	1
1.1 Organization and Leadership	1
1.2 Management System	1
1.3 The Specific Work of Marine Litter Management	2
1.3.1 Strengthening of fishery production litter management.....	2
1.3.2 Strengthening of marine litter cleaning and beach management protection	3
1.3.3 Implement of the remediation and restoration projects.....	4
1.3.4 Realization of urban and rural sanitation integration and litter classification pilot..	4
1.4 The Specific Work of Marine Litter Monitoring and Inspection.....	5
1.4.1 Marine litter monitoring.....	5
1.4.2 Marine litter inspection	5
1.5 Public Opinion Work on Marine Litter Prevention and Control	7
1.5.1 A series of thematic publicity activities of "Sea Frontier Ecological Tour"	7
1.5.2 Volunteer activities to "Prevent and Control Litter Pollution and Protect Marine Home"	7
1.5.3 Publicity activities of "Wave the Sea, Go Deep Blue"	7
1.5.4 Marine environmental protection into campus activities	8
2. Opportunities and Challenges of Weihai Marine Litter Prevention and Control	8
2.1 Marine Litter Prevention and Control Faces Important Opportunities	8
2.1.1 Weihai city becomes the first national demonstration area of marine ecological civilization.....	8
2.1.2 Weihai and New York establish "Sister-Cities" partnership in marine litter control	9
2.1.3 Weihai city has laid a good foundation for marine litter disposal	9
2.2 Marine Litter Prevention and Control Faces Serious Challenges	9
2.2.1 Shoreline litter management failed to achieve full shoreline coverage.....	9
2.2.2 Litter pollution in coastal waters is difficult to eradicate	9
2.2.3 The status of seabed litter is unclear	10

3. Prospects for Marine Litter Prevention and Control in Weihai	10
3.1 Strengthen the Implementation of Marine Litter Prevention and Control.....	10
3.2 Strengthen Investment in Science and Technology and expand International Cooperation	11
3.3 Improve Marine Litter Monitoring and Evaluation System	12
3.4 Increase the Publicity of Marine Litter prevention and control	12

Introduction

Marine litter is one of the most widespread and most troubled marine environmental pollution problems all around the world. The amount of marine litter in the Pacific alone has reached more than 3 million square kilometers, even exceeding the land area of India. Researches on rivers, bays, islands and offshore waters around the world reveal that marine litter has become one of the common water pollutants. The main sources of the beach litter are from human coastal activities, recreational activities, shipping and fishing and other maritime activities. Statistics show that the amount of marine litter from human activities is staggering. About 6.4 million tons of litter enters the ocean every year, and about 8 million of litter enters the ocean every day. And of which, about 70% settle to the bottom of the sea, 15% float on the surface, and 5% rest on the beach. Monitoring results show that plastic and polystyrene products account for 90% of marine floating litter. Thus, effective measures are needed to mitigate the sea load and to deal with the enormous challenges to the environment on which humans and other living things depend. Weihai City is the research pilot city selected by this project. And marine ecological civilization is an important part of Weihai ecological civilization construction, which plays an important strategic role in promoting the coordinated development of economy, society and environmental protection. For a long time, Weihai Municipal Government has attached great importance to marine environmental protection and marine litter prevention and control. In 2007, it took the lead in implementing the "weihai Marine environmental protection plan", which has established and improved the environmental protection district planning system. And meanwhile, a series of key projects for marine ecological protection have been implemented, resulting in the significant improvement of the marine environmental quality and the remarkable results about marine litter and plastic pollution management.

1. Current situation of marine litter control in Weihai city

1.1 Organization and Leadership

Marine litter prevention and control is set as a normalization work in Weihai City. A leading group for marine litter prevention and control in Weihai city has been set up with members from 31 management departments, including urban construction, environmental protection, agriculture and oceanology, which is responsible for coordinating and handling the daily affairs of marine litter prevention, and coordinating the prevention and reduction of litter into the sea. At the same time, an expert working group composed of 10 experts from the fields of ocean and fishery, water conservancy, urban construction, environment and universities has also been established as the technical support institution of the leading group, which will provide decision-making consultation and related suggestions for in-depth promotion of marine litter prevention cooperation.

1.2 Management System

The “Implementation Plan of the "Partner City" for Marine Litter Prevention and Control between Weihai City, China and the United States” organized by Weihai City has clearly defined the main objectives, key tasks and safeguard measures of marine litter prevention and cooperation, and provided institutional guarantee for the comprehensive prevention and control. The specific work is carried out as follows.

The marine and fisheries departments are responsible for marine litter monitoring, surface and seabed litter cleaning, fishery production waste management, marine environmental remediation, law enforcement inspections, and marine litter prevention cooperation. The propaganda and cultural departments are responsible for marine litter management publicity and education. The water conservancy department is responsible for the comprehensive regulation of rivers entering the sea. The agriculture, forestry and animal husbandry departments are responsible for the construction of coastal windbreaks, plastic film recycling, agricultural clean production, and harmless treatment of aquaculture waste. The environmental protection department is responsible for the construction of sewage treatment stations

and high-temperature steam treatment facilities. The housing and construction department is responsible for household garbage control and construction waste disposal and other work. Other relevant departments perform their respective duties in accordance with the requirements of the "Plan".

The "Regulations on the Protection of Urban Features" has been officially issued and implemented, while the "Regulations on the Protection of Coastal Zones in Weihai City" has been reviewed by the Municipal Law Office. And in the two "regulations", the coastal litter management and urban landscape protection have been regard as an important part of promoting marine litter management. And furthermore, the two "Regulations" can provide rules for marine litter management to follow, and promote the coordinated development of urban coastal zone construction, ecological protection, and social culture.

1.3 The Specific Work of Marine Litter Management

1.3.1 Strengthening of fishery production litter management

(1) Fishing ports

The regulation projects of fishing ports have been carried out in many sea areas of Weihai City, which effectively improved the coastal water quality and maintained the marine ecological balance. And in the meanwhile, the "Regulations on Environmental Sanitation Management of Fishing Ports in Weihai Aquaculture Farms" has been formulated and promulgated to support the special action for comprehensive rectification of the fishery environment. According to the "Regulations", the dirty, chaotic and poor conditions in fishing ports, aquaculture and nursery farms has been thoroughly cleaned up and rectified. The farming materials and facilities are classified and sorted. The generated litter is concentrated and stored in a sealed manner, so as to avoid the adverse effects of shoreline litter on marine ecology.

(2) Off-shore Aquaculture

The regulation of prohibiting the newly-enclosed aquaculture was clearly stipulated in "Weihai Marine Functional Zoning" (2013-2020). And "Mudflat Aquaculture Plan in Weihai City" has been prepared, in which, the scale of off-shore

aquaculture will be compressed, aquaculture enterprises are encouraged to expand to the open sea and develop the ecological breeding of famous and excellent products. Thus, the transformation and upgrading of aquaculture enterprises would be further realized. And furthermore, the offshore platforms and aquaculture vessels are supported to be developed, the land farming docks are reasonably planned, the operation time of aquaculture production in the land are gradually reduced. Thereby, a harmonious integration of aquaculture production, environmental protection, coastal tourism and urban construction are expected to be achieved.

(3) Agricultural Non-point Source Pollution

A demonstration project of plastic film recycling and comprehensive utilization of agricultural clean production was carried out in Weihai city to enhance the recycling and comprehensive utilization capacity of plastic film. During the project, 30,000 hectares of waste plastic film was recycled, 7,000 hectares of plastic film for easy recycling were promoted to be used, 4 waste plastic film recycling points and 2 processing points were set up, and 1,200 tons of waste plastic film processing capacity was newly increased. And in the meanwhile, the disposable orchard reflective film will be gradually replaced through increasing the efforts of the research and development, production and promotion of reusable new reflective cloth.

1.3.2 Strengthening of marine litter cleaning and beach management protection

In accordance with the principle of territorial management, Weihai City requires coastal parks, bathing beaches, scenic spots, port (docks) management departments and coastal production enterprises to be responsible for the cleanup of shore beach litter within the scope of "Be Responsible for General Sanitation in Front of the Door", and the town (street) where the other beaches are located to be responsible for cleaning up the litter. And the first responsibility system for sea surface litter disposal should be implemented, which consists of the sea area owner, the harbor pool manager, the coastal park and the scenic area management departments, and the district/city government (the management committee) in the sea area where the garbage is located. The first person system should be responsible for timely salvaging, cleaning and transshipment of sea surface litter and carrying out special clean-up operations on seasonal and large-scale sea surface litter such as

enteromorpha.

"Management Measures for the Protection of Beaches in Weihai City" has been formulated in Weihai city, in which, the principle of beach classification protection is established, the procedures for the development and utilization of beaches and the specific requirements for beach cleaning are specified, and the legal responsibility for setting up land-source sewage outlets, litter dumping, litter burning and illegally sea sand mining on the beach are all clarified.

1.3.3 Implement of the remediation and restoration projects

Weihai City has long promoted the remediation and restoration of sea area, island, and coastal zone. Accumulatively, 48 projects about the remediation and restoration of sea area, island, and coastal zone has been undertaken, nearly 3 billion yuan was invested, 75 km of damaged shoreline, 600,000 m² of beach, more than 10,000 mu of wetland have been repaired, 89,000 m² of vegetation has been restored, 275,800 m³ of silt has been removed, 594,500 m³ of litter has been cleaned, 25 dangerous rock masses have been rehabilitated, 20,000 m³ of algae reefs have been placed, and 80,000 algae has been transplanted. The retention rate of the natural shoreline in Weihai city reaches 65.1%, of which the sandy shoreline is 255 km, accounting for one quarter of the whole coastline in Weihai city and one-third of the sandy shoreline in Shandong Province.

In 2006 and 2007, a total of 117 comprehensive river improvement projects were carried out in weihai, an investment of 140 million yuan were invested to governance the river of 132 kilometers long. The 3 directions of the river remediation work are as follows. (1) The improvement of river flood control capacity. The work includes dredging, litter removal, widening river courses, deepening riverbeds, and repairing slopes. (2) Pollution control at source. The work includes planting trees, reforestation, rain and sewage diversion, and interception. (3) The enhancement of river appreciation. The work includes construction of ecological revetment, planting of aquatic plants, design of art pieces, construction of hydrophilic platforms, construction of near-wet wetlands, etc.

1.3.4 Realization of urban and rural sanitation integration and litter classification pilot

At present, the coverage rate of township litter transfer stations and the domestic garbage input rate in Weihai city are both up to 100%. In Shandong Province, the first centralized garbage disposal system for “housekeeping, village collection, town transportation, and municipal treatment” was established, and the harmless treatment rate of domestic garbage reached 100% in Weihai city. In 2006 and 2007, a pilot program for garbage sorting has been launched in Huancui district, involving 8 residential communities, 29 primary and secondary schools, and 20 government agencies, enterprises and institutions. The current classification principle of domestic garbage includes four categories, which are the principle of combining source diversion and classification, the principle of “large-scale coarse separation, dry-wet separation”, the principle of classified delivery, classified collection, and classified disposal, the principle of matching the classification method with the garbage terminal treatment facilities.

1.4 The Specific Work of Marine Litter Monitoring and Inspection

1.4.1 Marine litter monitoring

(1) Marine litter monitoring and evaluation in Weihai

A comprehensive monitoring and evaluation of marine litter in urban areas has been carried out in Weihai city. The monitoring covers beaches, sea surface, seabed and rivers. Thus, the distribution of marine litter in urban coastal areas has been basically mastered. 17 sea and land monitoring sections are set up to monitor the type and density of marine litter, and four rivers, such as Zhangcun River and Bijiatuan River, are selected to carry out the blocking facilities layout and monitoring of the litter into the sea from the living and production areas.

(2) Land-based sources of marine pollution survey

In order to promote the investigation of the land source waste into the sea, a relevant survey was carried out in Weihai city, to find out the location, mode, quantity and temporal distribution of the land source sewage outlets and rivers entering the sea along the coast of the city, and to screen the key pollution sources and major pollutants.

1.4.2 Marine litter inspection

(1) System design

the systems of responsible for marine surveillance, regular inspections, and follow-up supervision have been strictly implemented in a series of regulations, such as "Views on Strengthening Coastal Zone Management and Protection", "Measures for Coastal Zone Law Enforcement Inspection in Weihai City", "Rules for Coastal Zone Law Enforcement Inspection in Weihai City", which were first issued in Weihai city.

(2) Supervision and law enforcement

Weihai City has carried out special enforcement actions such as "Haidun", "Bihai" and "escort blue zone" to implement the marine law enforcement inspection system and conduct law enforcement inspections and comprehensive rectification of the coastal environment within its jurisdiction. In 2017, 21 urban comprehensive remediation actions were carried out along the coastal areas, 10,840 square meters of illegal buildings were demolished, 1045 square meters of garbage were cleared, and 6,000 square meters of flats were set.

The "Detailed Rules for the Implementation of the Responsibility System for the Coastal Supervision of Weihai City" was formulated and promulgated. In the "Rules", the person in charge of the marine law enforcement supervision and the supervisory information officer are selected to monitor the coastline in a timely manner, so as to grasp the sea area use situation and marine environment dynamics in the city. Thus, the marine environmental protection violations can be promptly investigated and dealt with, and the municipal marine litter prevention and control work to the depth of development is further promoted.

(3) Management of commercial vessels litter

In Weihai city, the vessels pollutant discharge standards are strictly enforced, the vessels litter management plans are implemented, and the handling of illegal ships is increased. In the meanwhile, the renovation non-standard vessels and old vessels environmental protection facilities and publicity and education of ship operators are being carried out. And furthermore, the key commercial ports and the professional and technical environmental clean-up companies are supervised and urged to sign

agreements to ensure that vessels litter and port waste can be recycled in a timely, centralized and classified manner.

1.5 Public Opinion Work on Marine Litter Prevention and Control

Weihai City has continuously strengthened the public opinion work of marine awareness and environmental protection to promote public awareness of sea use in accordance with the law, and promote the extensive development of marine litter prevention and control work. At the same time, the achievements of Weihai City in the prevention and control of marine litter are being systematically publicized through the marine litter prevention and control film.

1.5.1 A series of thematic publicity activities of "Sea Frontier Ecological Tour"

In 2016, the "Sea Frontier Ecological Tour" of the State Oceanic Administration was launched in Weihai City. The advanced achievements, experience and typical examples of marine environmental protection and marine litter prevention in Weihai were concentratedly displayed and promoted by the central media, which further enhanced the public's awareness of marine environmental protection and won high recognition from the society.

1.5.2 Volunteer activities to "Prevent and Control Litter Pollution and Protect Marine Home"

In 2017, a number of units in Weihai City held the "Weihai China-US Marine Litter Prevention and Control" youth volunteer service at the Golden Beach Bathing Beach. A "Marine Ecology Environmental Protection Volunteer Service Team" was formally organized and established by five colleges and four social welfare organizations, which enhanced the social participation in marine litter prevention and control.

1.5.3 Publicity activities of "Wave the Sea, Go Deep Blue"

In 2017, the themed public welfare activities of "World Ocean Day and National Ocean Propaganda Day" were held in Liugong Island of Weihai with live interviews, reports and live webcasts. The activity team consists of more than 600 staff members and volunteers, and more than 5,000 promotional materials are distributed. Among them, more than 100 volunteers took the sea surveillance and law enforcement vessels

and the Liugongdao tourist ship into the Weihai Bay to carry out sea surface litter disposal work, and more than 500 people visited the laboratory of the marine scientific research unit and the marine surveillance law enforcement ship.

1.5.4 Marine environmental protection into campus activities

Weihai City launched a series of activities such as "Environmental Themed Handwritten Newspaper Competition" and "Strive for Environmental Protection Little Guardian" in the city's primary and secondary schools. It called on primary and secondary school students to actively participate in volunteer activities, consciously implement the concept of green life and scientifically deal with garbage, actively pay attention to marine ecology and protect the marine environment, so as to together guard the blue, beautiful and healthy marine of Weihai.

2. Opportunities and Challenges of Weihai Marine Litter Prevention and Control

2.1 Marine Litter Prevention and Control Faces Important Opportunities

2.1.1 Weihai city becomes the first national demonstration area of marine ecological civilization

In 2013, Weihai was selected as the first batch of national marine ecological civilization demonstration zone construction list, which is an affirmation of its long-term effectiveness in marine ecological environment protection. At the same time, it is expected to further promote marine ecological environment protection through the establishment of long-term mechanism in the future. The construction of the National Marine Ecological Civilization Demonstration Zone provides the target requirements and operational guidelines for the promotion of marine litter control in Weihai City, as well as necessary policy and financial support, so that Weihai City has a good marine litter prevention environment. The marine ecological environment has been optimized and developed with marine litter prevention and treatment as the starting point, and the construction of marine ecological civilization will make new achievements.

2.1.2 Weihai and New York establish "Sister-Cities" partnership in marine litter control

In March 2016, the State Oceanic Administration issued the "sister city" work plan for marine litter control between China and the the United States. According to this, Weihai City started its cooperation with the "sister city" of marine litter control in New York City, USA. Thus, the opportunity to promote marine litter prevention and control and to strengthen the protection of the regional marine ecological environment through international cooperation has been obtained, which will improve the capability of marine litter prevention and control in Weihai City. Promoting the construction of marine ecological civilization demonstration area and promoting the status of city will have an important impact.

2.1.3 Weihai city has laid a good foundation for marine litter disposal

The Weihai Municipal Government has carried out fruitful work aimed at litter pollution in coastal waters. It has issued the "implementation Plan for Marine Litter Prevention and Control," and the government has invested in and attracted a large amount of social capital. It has laid a good foundation for the disposal of marine litter in Weihai City.

2.2 Marine Litter Prevention and Control Faces Serious Challenges

2.2.1 Shoreline litter management failed to achieve full shoreline coverage

The ecological environment is beautiful with a clean city appearance and effectiveness waste prevention in Weihai region. However, in some industries and living activities intensive coastal areas and remote coastal areas, there are still different levels of litter pollution phenomenon, marine litter prevention and control cannot achieve the whole shore cover. For example, the beach of Xiaoshi Dao with less human activities around it, piles up a large amount of domestic waste all year round because of its failure to clean it up in time. Its sources include tourists traveling to the sea and leaving behind, and light landmass litter is blown into the sea by the wind, as well as the marine transport of fishing boat droppings.

2.2.2 Litter pollution in coastal waters is difficult to eradicate

Due to the influence of coastal tourism, fishery and shipping industry, littoral

litter in Weihai coastal area is in the condition of pollution while controlling for a long time. Coastal marine litter mainly comes from shipping and fishing, coastal recreational activities, as well as random disposal of beach refuse and river refuse. Under the influence of industrial activities and the lack of environmental awareness among people, these litters are difficult to eradicate completely and are extremely harmful. They not only affect marine and coastal natural landscapes, but also have negative effects on marine ecosystems and marine economy. The safety of navigation may also be threatened in serious cases.

2.2.3 The status of seabed litter is unclear

The beach and sea surface litter in most sea areas of Weihai City can be cleared in time because of the naked eye. However, the source, migration route and distribution problems in the near-shore submarine area are still unknown and lack of corresponding investigation and research.

3. Prospects for Marine Litter Prevention and Control in Weihai

Marine litter prevention and control is a long-term project, which needs to strengthen capacity building from social environmental protection actions, system and law enforcement construction, industrial development, environmental remediation, capital investment, scientific and technological innovation, international cooperation and other aspects. A long-term mechanism for the prevention should be promoted to be established, and of and the source prevention and control of marine litter should be strengthened to greatly reduce litter into the sea.

3.1 Strengthen the Implementation of Marine Litter Prevention and Control

(1) The “Implementation Plan of the "Partner City" for Marine Litter Prevention and Control between Weihai City, China and the United States” will continue to be implemented, and all the work will be put in place.

(2) Revise and improve the existing technical procedures for marine litter monitoring, carry out in-depth investigation of marine litter pollution in coastal provinces and municipalities, establish key monitoring areas for marine litter, and

develop a long-term monitoring system for marine litter.

(3) Further strengthen the treatment of industrial and construction waste, agricultural non-point source pollution, fishery production waste, commercial vessels and ports, domestic garbage, further reduce the amount of litter into the sea from the source, and increase the harmless disposal and resource utilization of waste.

(4) Based on the actual situation of Weihai, four main tasks for implementing the Weihai Estuary Plan are studied and proposed, which are as follows. To investigate and assess the estuary ecological environment, including estuarine health assessment, degradation cause diagnosis and future development trend prediction. To implement the total pollutant control in the estuary area. To construct the estuarine ecological environment protection and restoration project according to local conditions. And to conduct the ecological environment monitoring network in the estuary area.

3.2 Strengthen Investment in Science and Technology and expand International Cooperation

(1) We should increase investment, develop professional and technical equipment for marine litter collection and disposal, carry out screening technology for marine litter recovery, select some typical beaches, establish demonstration points for the recycling of marine litter, analyze the feasibility of recycling resources for marine litter, and analyze their economic inputs, benefits and environmental benefits and ecological benefits. And at the same time, we will introduce the advanced technologies for marine litter prevention and control from foreign countries, and carry out exchanges and cooperation in technology and management systems.

(2) In terms of international cooperation, we should improve the contact mechanism for marine litter prevention and control, and strengthen mutual communication and mutual benefit sharing. Regular exchanges of visits and exchanges at a frequency of one to two times a year are needed to study the advanced concepts and mature experiences of marine litter control in foreign countries, during which, the achievements are expected to be reported regularly. And furthermore, the communication and cooperation mechanisms for bilateral academic exchanges and between private environmental protection enterprises are expected to be established to

broaden cooperation areas.

3.3 Improve Marine Litter Monitoring and Evaluation System

(1) Monitoring stations will be set up in key bays to investigate and monitor the beach, sea surface and seabed litter. The tracking monitoring of marine engineering and the impacts of marine environment and sea resources in surrounding sea areas will be strengthened to prevent marine ecological risks.

(2) The marine litter monitoring system will be gradually improved, and the basic investigations and assessments will continue to be organized. The technical standards for monitoring are expected to be studied and formulated to gradually realize real-time monitoring, analysis and evaluation of sea surface and beach litter.

(3) The information disclosure mechanism for marine environmental monitoring should be improved and standardized to release marine environmental monitoring information in a timely manner, and increase the information disclosure.

3.4 Increase the Publicity of Marine Litter prevention and control

(1) The publicity and education for residents and tourists can be strengthened through the media channels such as radio and television, newspapers, websites, WeChat, Weibo, etc. The relevant work includes increasing notices, strengthening management, and formulating holidays beach environmental health emergency plans, and other ways. For all these, a good atmosphere for the public to participate in the marine litter prevention and control is expected to be gradually formed.

(2) The concept of marine litter classification management should be promoted, and a marine litter classification manual should be prepared. And the litter classification concept of the public is expected to be enhanced by preaching the harm of different types of litter to the marine environment.

(3) The construction of volunteer teams should be strengthened to ensure the normal operation of volunteers. All social forces should be mobilized to participate in marine environmental protection, so as to to form a good social atmosphere where everyone loves and protects the ocean.

UNDP/GEF-YSLME

**Research Progress Report on Developing Regulatory
Measures for Marine Litter Management
in Weihai City of PR China**

——Weihai Marine Litter Management Incentive Policies and Suggestions

Shandong Marine Resources and Environment Research Institute

April 2019

Contents

Introduction	1
1. The necessity of public participation in marine litter management	1
1.1 Reinforcement of the management of marine litter sources	1
1.2 Improvement of the scientific and effective in the administrative management.....	1
1.3 Effective promotion of marine litter management systems and behaviors.....	1
1.3.1 Regulate inshore farming practices.....	2
1.3.2 Strengthen the management of fishery production litter	2
1.3.3 Strengthen marine litter cleanup.....	2
1.3.4 Implement remediation and restoration projects	2
1.3.5 Strengthen beach management and protection.....	3
2. Problems in public participation in marine litter management	3
2.1 Public participation is less efficient.....	3
2.1.1 Participation awareness.....	3
2.1.2 Participation level.....	3
2.1.3 Management process engagement.....	4
2.2 The protection legal systems of public participation is insufficient.....	4
2.3 The cooperation between government departments and enterprises is insufficient.....	4
3. Public participation incentive policy proposals for marine litter management	5
3.1 Improve incentives about laws and regulations for public participation in marine litter management.....	5
3.1.1 Improve the legal mechanism for public participation in marine litter management.....	5
3.1.2 Improve the administrative mechanism for public participation in marine litter management	6
3.1.3 Improve the long-term mechanism for enterprises to participate in marine litter management	6
3.2 Improve incentives about the social mechanism for public participation in marine litter management.....	7
3.2.1 Improve marine environmental protection literacy of the public.....	7

3.2.2 Expand the channels for public participation in marine litter management.....	7
3.2.3 Establish a collaborative governance mechanism between government departments and enterprises	7
3.3 Improve the financial incentives for public participation in marine litter management	8
3.3.1 Special fund incentive.....	8
3.3.2 Support incentive.....	8
3.3.3 Waste monetization.....	9
3.4 Improve public opinion propaganda incentives for public participation in marine litter management.....	9
3.4.1 Give play to the role of public opinion propaganda in marine litter management.....	9
3.4.2 Establish a big data platform for the disclosure of marine litter monitoring information	9
3.4.3 Establish a dedicated media channel for corporate culture.....	10

Introduction

Weihai city is prosperous due to the sea, and the sea is the advantage of the city. With the continuous deepening of the development and utilization of the sea, the quantity of marine litter is increasing rapidly, and the management of marine litter faces severe challenges. Results of marine litter monitoring in Weihai Xiaoshi Dao from 2009 to 2017 showed that the average quantity of marine litter on the beach of Xiaoshi Dao was 27 063 ind.·km⁻², and the average mass was 3428.33 kg·km⁻². For 2017, the average quantity of marine litter on the beach was 57 000 ind.·km⁻², and the average mass was 2606.8 kg·km⁻². The highest quantity of beach litter in Xiaoshi Dao was plastics, and human coastal activities were the main litter source. In response to such a large threat to marine environment, Weihai City has done a lot of work in the prevention and control of marine litter. In 2016, it became a “partner city” with New York City for marine litter prevention and control. However, these jobs were basically led by the government, and public participation was less. The public is both a direct victim of marine litter pollution and a direct beneficiary of marine litter management. And meanwhile, it is also a participant in marine litter management. The “public” is generally regarded as an individualized citizen, which is defined in a narrow scale by ignoring the grouped public, such as the public institutions, enterprises and other social organizations. However, the grouped public is also one of the main forces in marine environmental protection. The relative researches showed that marine environmental governance is an important social undertaking. The marine litter management process can be defined as source classification - intermediate collection and transportation - end processing. And during the process, the realization of reduction, harmlessness and resource could not just depend on the strength of government departments. Therefore, the public participation governance model is necessary.

1. The necessity of public participation in marine litter management

In the process of ecological environment management, "Principles of public participation" is one of the basic principles of the Environmental Law. The public includes a variety of groups, including social groups, social organizations, units or individuals. The government-leading and public-participating model of marine litter management, with the public interest as the value guidance, can maximize the efficiency of resource allocation.

1.1 Reinforcement of the management of marine litter sources

Survey results indicated that the main marine litter sources in Weihai city were human coastal activities, other wastes, and shipping/fishing activities. Marine litter was detected in tourist and recreation areas, agricultural and fishery areas, port shipping areas and adjacent sea areas. The main proportion included plastics, other types, wood products, polystyrene foam, paper, metal, glass, fabric (cloth), rubber, etc. Thus, mobilizing public participation such as tourists, fishermen, farmers and related enterprises will play a key role in strengthening marine litter management.

1.2 Improvement of the scientific and effective in the administrative management

For a long time, Weihai Municipal Government has attached great importance to marine environmental protection and marine litter prevention and control. The specific practices are as follows. (1) In 2007, it took the lead in implementing the Weihai Marine Environmental Protection Plan. (2) The Weihai City Marine Pollution Prevention Leading Group was established to coordinate the promotion of prevention and reduction of waste into the sea. (3) An expert working group composed of 10 experts from the fields of marine and fishery, water conservancy, urban construction, environment, universities and other fields was established to provide decision-making consultation and related suggestions for in-depth promotion of marine litter prevention cooperation. (4) The "Regulations on the Protection of Coastal Zones in Weihai City" was drafted to set the coastal litter treatment and urban landscape conservation as the important part of promoting marine litter management. For these work, information collection, expert consultation, research and demonstration activities all require adequate information and intellectual support. And detailed and timely first-hand information often comes from the public directly related to the marine environment. Thus, it is undoubtedly scientific and effective to bring together public opinions and suggestions to clarify the public's real needs for the marine environment.

1.3 Effective promotion of marine litter management systems and behaviors

In recent years, Weihai has carried out a series of work to strengthen the management of marine litter. The effective promotion of these tasks requires the government departments to join the relevant people and coastal production enterprises to participate and govern together. Thus, the environmental, economic and social problems could be taken into account, and the overall benefits of environmental, economic and social benefits would be maximized.

1.3.1 Regulate inshore farming practices

The regulation of prohibiting the newly-enclosed aquaculture was clearly stipulated in "Weihai Marine Functional Zoning" (2013-2020). And "Mudflat Aquaculture Plan in Weihai City" has been prepared, in which, the scale of near-shore aquaculture will be compressed, aquaculture enterprises are encouraged to expand to the open sea, and the operation time of aquaculture production in the land will be gradually reduced.

1.3.2 Strengthen the management of fishery production litter

Weihai City has deepened the special action for comprehensive rectification of the fishery environment, and formulated and promulgated the "Environmental sanitation management regulations on the Fishing Ports of Weihai Aquaculture Farm". 20 million yuan of provincial funds has been received to carry out regulation projects in multiple sea areas, improve the quality of coastal water quality, and avoid the adverse effects of the litter on coastal marine ecology.

1.3.3 Strengthen marine litter cleanup

In accordance with the principle of territorial management, Weihai City requires coastal parks, bathing beaches, scenic spots, port (docks) management departments and coastal production enterprises to be responsible for the cleanup of shore beach litter within the scope of "Be Responsible for General Sanitation in Front of the Door", implements the first responsibility system for sea surface litter disposal, and carries out special clean-up operations on seasonal and large-scale sea surface litter such as enteromorpha.

1.3.4 Implement remediation and restoration projects

Weihai City has long promoted the remediation and restoration of sea area, island, and coastal zone. Accumulatively, 48 projects about the remediation and restoration of sea area, island, and coastal zone has been undertaken, nearly 3 billion yuan was invested, 75 km of damaged shoreline, 600,000 m² of beach, more than 10,000 mu of wetland have been repaired, 89,000 m² of vegetation has been restored, 275,800 m³ of silt has been removed, 594,500 m³ of litter has been cleaned, 25 dangerous rock masses have been rehabilitated, 20,000 m³ of algae reefs have been placed, and 80,000 algae has been transplanted. The retention rate of the natural shoreline in Weihai city reaches 65.1%, of which the sandy shoreline is 255 km, accounting for one quarter of the whole coastline in Weihai city and one-third of the sandy shoreline in Shandong Province.

1.3.5 Strengthen beach management and protection

"Management Measures for the Protection of Beaches in Weihai City" has been formulated in Weihai city, in which, the principle of beach classification protection is established, and the legal responsibility for setting up land-source sewage outlets, litter dumping, litter burning and illegally sea sand mining on the beach are all clarified.

In addition, works of urban and rural sanitation integration, litter classification pilot, river comprehensive improvement project, hazardous waste disposal, and agricultural non-point source pollution control, have also been promoted in Weihai city. And all these works have achieved good marine litter control effects.

2. Problems in public participation in marine litter management

2.1 Public participation is less efficient

In the process of marine litter management, the public participation efficiency is mainly reflected in the strength of public participation awareness, the level of public participation and the engagement in management process.

2.1.1 Participation awareness

The problem of marine litter pollution has already attracted enough attention from the public. Most of the public is aware of the importance of marine environmental protection. The enthusiasm of public participation in environmental management is on the rise, yet has not formed a stable behavioral reflection. And the direction of public concern is mostly limited to areas of interest. Studies have shown that in China, environmental management is still considered to be the responsibility of the government and the related experts, the awareness of public independent participation is still weak and relatively passive. Thus, it is difficult to achieve effective governance effects.

2.1.2 Participation level

The basis and prerequisite for participating in marine litter management is the related knowledge and skills. At present, the overall level of public knowledge and skills on marine litter management is still low. And most public protection behaviors for the marine environment are more slogans and less practical, which caused the inequality between the awareness and action of the public. According to the results of the 2010 China Public Environmental Index Survey, nearly 90% of the public believed that environmental protection took precedence over economic development. However, the investigation of public specific behavior patterns showed that the practice rate of the public participation in environmental protection social activities was low, which led to the stay level of consciousness in in marine litter management.

2.1.3 Management process engagement

At present, the form of public participation in marine litter management in China is relatively simple, mainly focusing on publicity and education, volunteer activities, reports of marine litter pollution, etc. Most of these forms are at the end of the marine litter management. So far, the relevant laws and regulations on marine litter control basically aim at the already existing of marine litter or caused pollution, that is, end processing participation. Thus, it would lead to the passive public participation and the positive inhibition.

2.2 The protection legal systems of public participation is insufficient

In theoretical research, scholars pay more attention to the study of social, administrative, legal, and management mechanisms under government regulation, and insufficient attention to the research on the involvement of individuals, enterprises, and social organizations in marine litter management. And meanwhile, in response to the pollution prevention and control of marine litter, China has successively promulgated and formulated laws, such as "Solid Waste Pollution Prevention and Control Act", "People's Republic of China Marine Dumping Management Regulations", "Regulations on the Prevention and Control of Marine Environmental Pollutants Damage to Marine Environment", etc., and the corresponding supporting methods and policies. All the documents make requirements for public participation in marine environmental protection, but are lack of the definition of the scope of public participation, the guidelines for participation, and the corresponding safeguard measures.

2.3 The cooperation between government departments and enterprises is insufficient

In the process of source classification- intermediate collection and transportation - end processing of marine litter management, enterprises play a unique advantage in terms of capital technology investment and operational efficiency improvement. However, in general, the cooperation between government departments and marine-related enterprises mainly concentrated in end processing, and maintained active and passive relationships in terms of source classification and intermediate collection and transportation. In the process of marine litter management and law enforcement, government departments have not fully integrated relevant enterprises. And the resulting inconsistencies are as follows. The flow of information between the government and enterprises is not smooth, the joint power of litter management is difficult to enhance, and the introduction of public resources into the marine litter co-management structure is difficult. All these will in turn affect the synergy between government and enterprises in environmental protection and litter management.

3. Public participation incentive policy proposals for marine litter management

So far, the marine litter prevention and control work in Weihai City has achieved substantial positive results, and successfully promoted the coordinated development of coastal zone construction, ecological protection and social culture. In view of the importance and necessity of public participation in marine litter management, and according to the actual situation of marine environmental management in Weihai City, the public participation could be incited in the following aspects to maximize the efficiency of resource allocation and promote the positive and comprehensive management of marine litter.

3.1 Improve incentives about laws and regulations for public participation in marine litter management

3.1.1 Improve the legal mechanism for public participation in marine litter management

A sound legal and regulatory mechanism is an important guarantee for the public to participate in the management of marine litter. In Weihai City, the level can be deepened and the channel can be broadened for public participation on the basis of the issued regulations and methods, such as "Views on Strengthening Coastal Zone Management and Protection", "Measures for Coastal Zone Law Enforcement Inspection in Weihai City", "Rules for Coastal Zone Law Enforcement Inspection in Weihai City", "Implementation Plan of the "Partner City" for Marine Litter Prevention and Control between Weihai City, China and the United States", "Measures for Construction Waste Management in Weihai City", etc.

(1) It is necessary to formulate public/market incentive policies that include means of defining the legal status of public environmental rights, improving the marine litter information disclosure system by government departments, and improving the environmental public interest litigation systems. The amount of marine litter can be reduced and the resources can be recovered and utilized through the means and methods of adjusting economic interest mechanism. For example, we can supervise the marine litter sources (individuals and related enterprises) to better carry out the classification and resource recycling by means of litter metering charge, deposit return system, product liability extension and raw material taxation learned from foreign countries.

(2) Improve the information disclosure system for marine environment protection. The subject, content, timeliness, etc. of information disclosure will be standardized. And the environmental information that the government and related companies need to publish also will be clarified, which includes the major government projects and decisions on marine environmental management, marine ecological environment quality and marine litter monitoring data, illegal enterprises and individuals engaged in marine ecological environment protection, the pollution situation and the environmental consequences of the sea-related enterprises production, etc. In this

way, the information symmetry of the effective public participation in marine litter management can be achieved.

(3) Improve the marine environmental public interest litigation system. According to the provisions of the new Environmental Protection Law about the environmental public interest litigation system, we should make the public, government departments and other environmental protection organizations as the main body of public interest litigation clearly, and establish a financial support system.

3.1.2 Improve the administrative mechanism for public participation in marine litter management

(1) At present, "top-down" environmental governance system in China is changing, and the "bottom-up" green reform is spreading. In view of this, the transformation of marine litter control system should be carried out based on the existing marine litter control plan of Weihai City. The marine environmental stakeholders such as markets, companies, individuals and other related organizations should be organized to participate in marine litter management with government organizations. And at the same time, an equal dialogue between the executive branch and the public will be achieved. Finally, the way of marine environmental management is gradually diversified and a new pattern of diversified marine environmental management will be formed.

(2) Improve the hearing system for marine environmental management. This requires the corresponding hearing of the marine environment administrative decision-making to be held, the composition of the hearing representative to be defined, and a direct communication channel between the government department and the public to be established. At the same time, a legal protection platform is expected to be established for the public to express their own appeals and safeguard their own rights and interests by means of questionnaire survey, forum, and expert consultation about marine litter management.

3.1.3 Improve the long-term mechanism for enterprises to participate in marine litter management

(1) Strengthen collaboration between government departments and marine-related enterprises. The government departments should make clear the responsibilities of relevant product manufacturers in the process of inspection, supervision and enforcement, incorporate enterprises in various industries into the process of marine environmental protection and litter management, improve the terminal harmless treatment industry for marine litter, and assist in the matching development of production enterprises and terminal recycling industry, and enhance collaboration between more enterprises and government departments in marine environmental protection and litter management.

(2) Improve the dialogue and consultation mechanism, information flow mechanism and incentive compensation mechanism between government departments and enterprises, and strengthen the synergy for marine litter management between government departments and enterprises to maximize the efficiency of public resource allocation.

3.2 Improve incentives about the social mechanism for public participation in marine litter management

3.2.1 Improve marine environmental protection literacy of the public

The marine environmental protection awareness of public can be Cultivated and enhanced by the education in the marine environment. For different public groups, education can be divided into basic education, higher education and professional technical guidance education. Student groups in the public can be educated at the basic level and a higher level, so as to enhance their awareness of ecological crisis and marine environmental protection, and create preconditions for the formation of public ecological literacy. For enterprises and institutions and other social organizations in the public, it is necessary to organize and level the corresponding professional and technical courses to improve their practical ability of marine environmental protection and litter management.

3.2.2 Expand the channels for public participation in marine litter management

By improving the mechanism construction of public participation in marine litter management, government departments can provide multiple ways for the public to participate in marine litter management at multiple levels and in an all-round way. For example, through convening major project symposiums, census suggestions for marine pollution sources, marine garbage transfer and recycling volunteers, etc., and publicly exchange various social, scientific and financial issues that need to be faced with marine waste management, and raise public awareness. Participate in the enthusiasm and effectiveness of waste management. The government departments can face up to and communicate with the public about various social, scientific and financial problems that marine litter management needs to face through convening symposiums on major projects, suggestions collection for marine pollution sources census, conscription meetings of volunteers for marine litter transfer and recycling, etc. Thus, the positivity and effectiveness of public participation in litter management are expected to be improved. In addition, a special advisory expert group for marine litter management decisions is suggested to be set up, resident experts to be employed, and a channel for public suggestions to be opened, so as to realize the transformation of public participation in marine litter management from "formal participation" to "substantial and scientific participation".

3.2.3 Establish a collaborative governance mechanism between government departments and

enterprises

A collaborative governance mechanism between government departments and enterprises is expected to be established to incorporate enterprises from various industries into the body of marine litter management. The government departments should organize related experts from enterprises to jointly prepare the "Marine Litter Management Industry Cooperation Plan". The files will define the collaborative way between government and enterprises, and their respective areas of responsibility and economic interests during the process of source classification, prevention and control - intermediate collection and transportation - terminal treatment of marine litter. At the same time, the government management departments, production enterprises and recycling industries will be equipped with marine litter management links to form an effective industrial chain system.

3.3 Improve the financial incentives for public participation in marine litter management

3.3.1 Special fund incentive

Weihai City will be supported by the special funds from government in terms of marine litter prevention and control, such as provincial funds for fishery production waste management, sea island coastal zone rehabilitation project fund, river comprehensive improvement project fund, etc. This financial support is a means used by government agencies to regulate social distribution and production. It is suggested to formulate positive incentive and negative penalty schemes for government funds, and classify government funds to support different marine litter treatment processes, respectively, such as marine litter source classification funds, transfer funds, disposal funds, recovery funds, etc. And furthermore, different subsidies for marine litter reduction and treatment can be offered according to the relevant provisions of the "Renewable Energy Law". For example, waste incineration power generation enterprises can be subsidized at a price of 0.25 yuan per kilowatt.

3.3.2 Support incentive

So far, Weihai has been continuously promoting the construction of waste disposal capacity, and has realized the harmless disposal of medical waste in the city. It is suggested to fully support the development of marine litter recycling industry. It can refer to the "Resource Recovery Industry Plan" issued by Taipei city to formulate the "Resource Recovery Industry Regulations" in line with the actual situation of weihai city, carry out the regulation and qualification examination of recycling enterprises in weihai city, support the development of the industry with the management mode of special fund dedicated ledger through financing incentives, tax reductions, financial subsidies, etc., and provide guidance and business support to the enterprise through the

"Marine Litter Management Decision Advisory Group".

3.3.3 Waste monetization

Researches on the value of marine waste are expected to be carried out in Weihai City, following the model of "plastic bank" in Canada. An equivalence table between various marine litter and daily payments for electricity, water, telephone, gas, insurance, etc. should also be created. A special "marine waste bank" department is expected to be opened up to sell marine litter as raw materials to the corresponding manufacturing industry, with a view to the successful trial operation of "monetize marine waste".

3.4 Improve public opinion propaganda incentives for public participation in marine litter management

3.4.1 Give play to the role of public opinion propaganda in marine litter management

Public opinion is an important force to promote marine environmental governance. Weihai city has achieved certain results in publicity work on strengthening public marine awareness and environmental protection, and systematically publicized the achievements in marine litter prevention and control. It is suggested that the government environmental protection department establish a long-term cooperative relationship with the mass media industry. (1) To expand the influence of marine environmental law enforcement and the effect of social publicity through advanced modern network and media means. Different publicity methods, such as instruction manuals, public service advertisements, promotional videos, documentaries, short videos, etc., are set up for different levels of the public. (2) Build public opinion media into a special channel for equal communication and dialogue among stakeholders in Marine environmental governance. Strengthen the credit construction of government departments through public opinion publicity, and reach a consensus on the environmental interests of the public. (3) For the behaviors of destroying the marine ecological environment and hindering the work of marine litter management, the related organizations and individuals will give public exposure and criticism to warn the public to exercise self-discipline by using the supervision function of public opinion of modern media.

3.4.2 Establish a big data platform for the disclosure of marine litter monitoring information

Since 2007, the status of marine litter has been listed in "Marine Environment Status Bulletin in China" as one of the contents. Thus, the data of marine litter monitoring in Weihai City have been able to support the construction of "Weihai Marine Litter Monitoring Information Big Data Platform". The platform will integrate marine litter management achievements, public participation, and the contribution rate of different levels of the public to the management achievements in Weihai city, and add an information disclosure section to facilitate citizens to inquire, supervise and use environmental information.

3.4.3 Establish a dedicated media channel for corporate culture

Government departments related to marine environmental governance may use material incentives and spiritual rewards to encourage relevant production enterprises and recycling enterprises to participate in marine litter management, and gradually infiltrate the awareness of marine environmental protection into the daily operation of enterprises. And in the meanwhile, government departments should encourage enterprises to incorporate marine environmental protection concepts into the product design process, and build up a special media channel for corporate culture promotion including newspapers, magazines, radio and television, websites, WeChat, Weibo, etc. in combination with enterprises and the mass media industry. The channel should meet the following functions. (1) The function of matching the contribution rate of enterprises' participation in marine litter management and the efforts of corporate culture publicity. (2) Relevant enterprises can collect design drafts of corporate culture publicity through the channels, and expand the breadth and depth of their own corporate culture publicity. (3) Enterprises promote their green products and advocate the public for a green lifestyle in the sales and publicity process. (4) Enterprises can find the upstream or downstream industries suitable for each other, and spontaneously form an industrial chain system supporting the marine litter treatment.