YSLME Biodiversity Conservation Plan in PR China，2018-2030

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Contents

1.Background

The Yellow Sea is one of the 66 LMSs with rich marine biological resources and regional fishing ground. It provides significant ecological service and support. The Coastal Water Mass, the Yellow Sea Central Cold Water Mass and the Southern Yellow Sea High salinity Cold Water Mass are 3 basic water mass of Yellow Sea. The activities of these CWM can help to regulate the climate, improve water quality, and enhance primary production. The Yellow Sea Ecoregion is noted for an extremely high biodiversity. There are about 339 species of fishes, 100 species of polychaetes, 171 species of mollusks, 107 species of crustaceans, and 22 species of echinoderms found in this region (UNDP/GEF,2013). The Yellow Sea has rich mineral resources, also is a key lane with several important port city along its seaside.

However, biodiversity in this region have been severely influenced through reclamation, pollution, the spread of invasive species and over-harvesting of marine organisms. The acceleration of urbanization and industrialization threatens the habitat of species, and the pressure on ecosystems increases. The effects of over-utilization and disorderly development of biological resources on biodiversity have intensified. Environmental pollution affects aquatic and riparian biodiversity and

species habitats. The environmental release of invasive alien species and genetically modified organisms increases the pressure on biosafety. The production of biofuels poses a new threat to biodiversity conservation. The impact of climate change on biodiversity is yet to be assessed. Therefore, it is urgent and important to understand the current status of the biodiversity, and to find out the conservation plans to better conserve the YSLME biodiversity.

2. Threats to YSLME Marine Biodiversity

2.1 Overfishing

Under the pressure of over-fishing, the creatures of high trophic level drops distinctly in their trophic level and the economic value of fishing harvests also shows a declining trend. The data from trawl survey can also reflect the changing of fishing harvests from high quality fishes (yellow croakers and hairtails) in 50-60s of 20 century to low quality fishes (sea ells) now.

2.2 Habitat loss due to reclamation

With the development of economy, the land recourses are gradually becoming one barrier for the development of coastal cities. Thus, the cities conduct sea reclamation in different scales, which narrows the space of coastal wetland and leads to the loss of habitat,biodiversity and reducing of eco-service. Meanwhile, the vegetational loss in wetland can make the defending capability of coasts against sea waves decline. Besides, sea reclamation in harbor areas will reduce the tidal capacity and hydrodynamic condition, thus increasing the turbidity of water. This would influence the photosynthesis and growth of the phytoplankton and damage the benthonic environment, and finally, this will make the primary productivity in certain sea regions decline.

2.3 Land-based pollution

According to the data from China Marine Environmental Status Bulletin 2015, the average water quality of Yellow Sea that didn't reach the first level of sea water quality standard in 2015 was 160,260km^2. Due to poor sewage treatment, economic growth and several other factors, the pollution in Yellow Sea area is a severe threat to biodiversity and community structure. These unqualified sea areas are most coastal waters and mainly caused by land-based pollution.

海区	季节	第二类水质海域面积	第三类水质海域面积	第四类水质海域面积	劣于第四类水质海域面积	合计
渤海	冬季	23160	10 300	6 430	7 200	47 090
	春季	12 910	8 540	5 090	4 680	31 220
	夏季	12 010	8 090	4 750	4 060	28 910
	秋季	24 810	5 490	3910	7 330	41 540
黄海	冬季	23 600	7 750	4 730	6 110	42 190
	春季	13 900	8 490	5 940	8 190	36 520
	夏季	15 570	9 490	8 020	4 680	37760
	秋季	19 750	6 450	8 930	8 660	43 790
东海	冬季	19 180	13 290	19 750	50 520	102 740
	春季	21 400	11 430	10 330	33 980	77 140
	夏季	22 050	9 410	9 000	26 670	67 130
	秋季	16 080	14 480	12 880	40 770	84 210
南海	冬季	6 500	8 690	1 380	3 320	19 890
	春季	5 870	6 130	1 850	4 890	18 740
	夏季	4 490	9 910	1 800	4 610	20 810
	秋季	6 330	9 740	3 650	6 470	26 190
全海域	冬季	72440	40030	32 290	67 150	211910
	春季	54080	34590	23 210	51 740	163 620
	夏季	54 120	36900	23 570	40 020	154 610
	秋季	66 970	36 160	29 370	63 230	195 730

Fig.2.1 China Marine Environmental Status Bulletin 2015, Yellow Sea

2.4 Pollution caused by mariculture

The accumulation of excrement and residual feeds of maricultural creatures and the discharge of waste water that hasn't been purified could increase the nitrogen and phosphorus in sea water, thus aggravating the eutrophication and leading to the cultured red tide.

2.5 Marine environmental pollution caused by oil spill

The great need in energy resources increased the number of oil spill accidents year by year. The emergent oil spill could not only damage the ocean and coastal natural eco-environment badly, but also cause great economic loss in local fishery, aquaculture, and tourism. For example, between 2006 and 2008, there were 4 oil spill accident happened in Changdao, Shandong province, which caused huge loss to local people.

2.6 Eutrophication and frequent red tide and green tide

The rapid economic growth, and intensified human activity like: urbanization, fertilizer use led to sever eutrophication. As stated in Yang 2017, the primary production in South Yellow Sea sharply increased after 1980s, which clearly reflected the eutrophication caused by economic

development and land-based pollution discharge.

According to the data from China Marine Environmental Status Bulletin 2015, between 2011-2015, the five-year average area of red tide in Yellow Sea is over 1000 k m^2. Compared with that number in 2004 which was 820 k m^2, the damage of red tide is expanding. The green tide is a new marine ecological hazard that periodically expands and disappears in the Yellow Sea between May and July since 2007. It also brings bad influence and economic damage to coastal areas. These bloom will alter the community structure. According to Guo 2010, the microbial community changed compared with pre-green tide bloom in Qingdao coast, 2008.

2.7 Invasive species

Invasion of alien species is one of the main causes of biodiversity loss. China is one of the countries in the world most severely affected by invasion of alien species. Due to China's vast land area that covers nearly 50 latitudes and 5 climatic zones, as well as diversity of its ecosystems, China is more vulnerable to invasion of alien species, and species from any parts of the world may find suitable habitats in China. In 2003, 2010, 2014 & 2018, China published 4 batches of invasive species with severe

impact to the ecosystem. The species newly included into this list in each batch was 16, 19, 18 and 18 respectively.
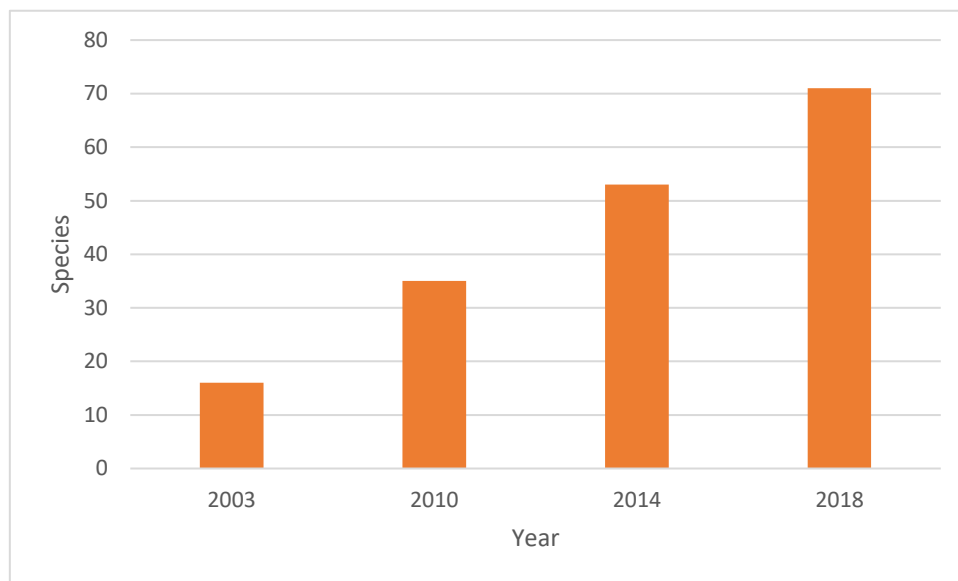

Fig.2.2 the increase in the number of invasive species in China with severe impact to the ecosystem

According to Bai & Ma 2015, the number of marine invasive species in Yellow sea large marine ecosystem was 120, in which, 6 species were microbes, 45 species were animals and 69 species were plants.
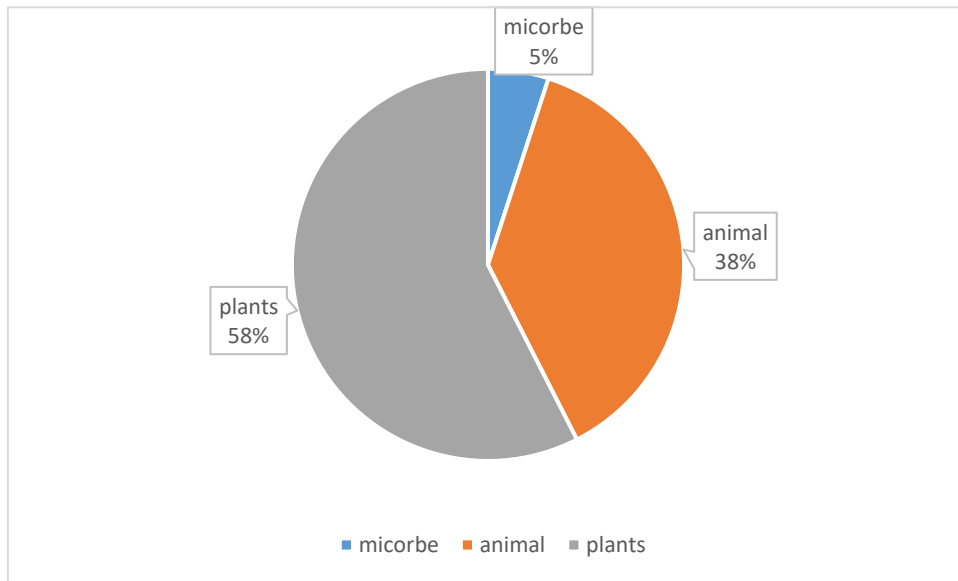
Fig.2.3 The marine invasive species composition in YSLME.

S.alterniflora is listed on the first batch of China invasive species list. It was originally distributed in coast of American Atlantic. It was introduced into China from U.S. in 1979 for its ability in ecological restoration. But, due to its strong adaptability and high reproduction, it spread extensively in the coast of China, especially in Jiangsu coastal wetland, resulting in significant impact on wetland ecosystem health and safety.

Fig.2.4 *Spartina alterniflora* (https://baike.so.com/doc/6533705-

6747443.html)

According to Wang et al., 2018, the area of *S.alterniflora* was only 0.49

km^2 in 1985, then in 2007 it was as high as 123.17 km^2, in 2012, the

expansion was still increasing, with an area of 153.8km^2(Fig. 5.4).

Fig. 2.5 The area of *S. alterniflora* in Yancheng, Jiangsu (Wang et al.,

2018)

2.8 Climate change

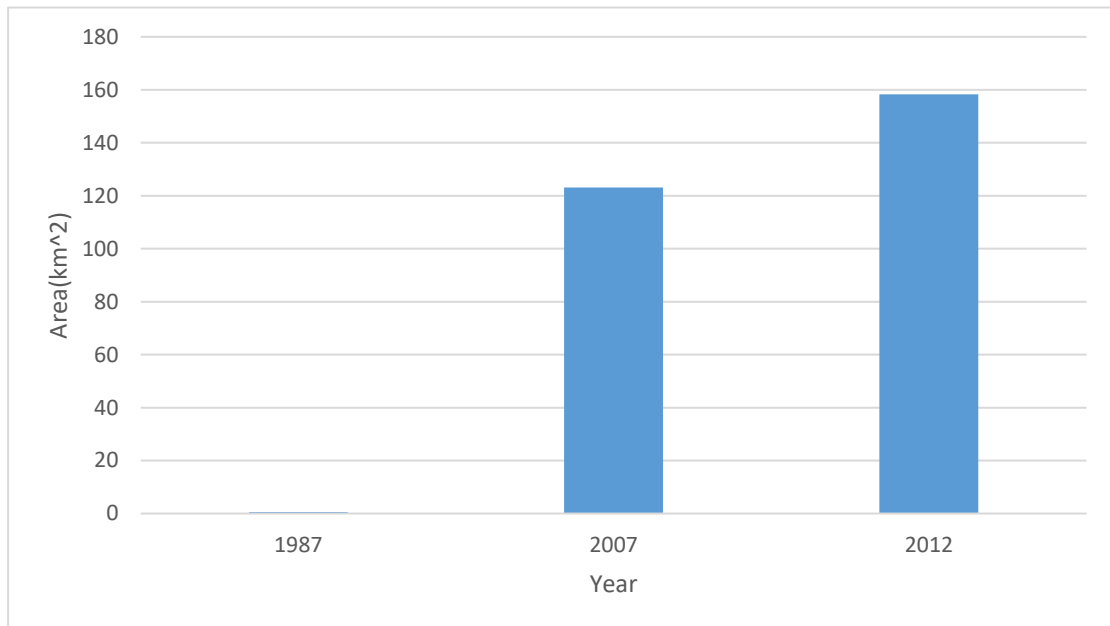The threats of climate change to YS biodiversity is still hard to conclude.

But possibilities could be found in literatures. The warming temperature

may influence the habitats of fishes. In yellow sea, the ascending temperature led to the decline of cold-water fishes species for losing the cold water mass habitat (Liu and Ning, 2011). Melting of sea ice may induce the habitat loss of seals.

Based on a set of seasonally monitored data along transect (at 36°N) maintained by the State Oceanic Administration of China, an ascending trend was found in sea surface temperature in the Yellow Sea.
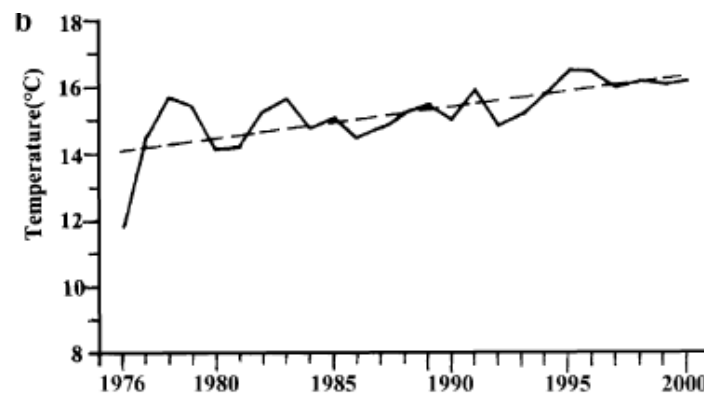

Fig. 2.6 Sea surface temperature changes in the Yellow Sea (36°N transect data, Lin et al, 2005)

2.9 Habitat modification

As stated in UN Millennium Ecosystem Assessment Report，habitat modification caused by port development, urban development, tourism and aquaculture is a big threat to coastal area.

According to a study by Nguyen et al., 2015, in Xinyanggang estuary of

Yancheng Nature Reserve, the reed swamp, farmland, fishpond and tidal flat were formed as four types of disturbed habitats which resulted from different human. The results of this study showed that bird diversity could be influenced by habitats heterogeneity, human disturbance and tidal water level; and different habitats had obvious indicator species respectively; in order to adapt to the changes in habitats，bird community structure appeared a certain gradient change．

Yellow River is the second largest river of China. Due to the intensifying human activity and climate change in the recent years, the water and sediment inflow into the ocean was greatly reduced. Historically, every flood season was in April, when large amount of fresh water and nutrients were brought into the ocean, creating the famous Laizhou Bay fishing ground. The construction of Sanmenxia reservoir stopped this flood. The Sanmenxia project started in April, 1957, the impoundment began in Sep. 1960. After 13 years of exploration until 1973, this project adopted a successful mode and made itself a famous water conservancy project. The side effect of this project was to stop the spring flood of Ningmeng Canyon water completely. The reduction in water inflow could dramatically influence the marine organisms, decrease the primary and secondary production. Due to the increasing sea surface water salinity in Yellow River mouth area, the survival habit of low-saline organism was shrunk, fish egg

abundance and species number decreased, benthic organisms biomass and abundance decreased, primary production also decreased. (Gu et al., 2018)

Large-scale exploitation activities such as reclamation and artificial structure construction have promoted economic and social development, but they also had a significant impact on the marine benthic habitat. The artificial island construction could affect the morphology of sea floor. High resolution bathymetric results near artificial islands showed dredged seafloor which could lead to the destroy of benthic habitat (Li, 2017).

3. Current Progress in YSLME biodiversity conservation

3.1 Law system and regulations regarding biodiversity conservation

The legal system for biodiversity conservation was initially established. The Chinese government has issued a series of laws on biodiversity conservation, including the Wildlife Protection Law, the Forest Law, the Grassland Law, the Animal Husbandry Law, the Seed Law, and the Entry and Exit Animal and Plant Quarantine Law. A series of administrative regulations, including Nature protection Regulation, Wild Plant Protection Regulations, Agricultural Genetically Modified Organisms Safety Management Regulations, Regulations on the Administration of Import and Export of Endangered Wildlife and Wildlife and Resources Management Regulations for Wild Medicinal Materials. Relevant industry authorities and some provincial governments have also formulated corresponding regulations, local regulations and norms.

China has implemented a series of biodiversity conservation plans and

plans. The Chinese government has successively issued the "China Nature Reserve Development Plan (1996-2010)", "National Ecological Environment Construction Plan", "National Ecological Environment Protection Program" and "National Biological Species Resource Protection and Use the Planning Outline (2006-2020). Relevant industry authorities have also issued a series of plans and plans in the fields of nature reserves, wetlands, aquatic organisms, and livestock and poultry genetic resources protection.

3.2 Fishery conservation effects

In China, the Fisheries Law was revised in 2013, more fisheries conservation items have been developed. Ministry of Agriculture and Rural Affairs launched the regular monitoring survey on fisheries in coastal waters and inland waters since 2014, as well as the main spawning ground monitoring. These results will provide the important base for adaptive management. And since 2017, the TAC and Quota management have been introduced in China fishery management, and the closed season extended to 4-4.5 months. The control fishing vessels was conducted in 2003, and reduced 30000 fishing vessels to 2010, and there will reduce 20000 fishing vessels in 2020. The guideline of stock enhancement and marine ranching were issued by Ministry of Agriculture and Rural affairs in recent years, which will guide them to scientific development. Particularly, China-Korea

joint stock enhancement will conduct in 2018, which is a good beginning to the conservation of fishery resources in the Yellow Sea. In the future, China will continue cooperate with the other countries to develop the responsible fisheries.(YSLME Governance group, 2018).

3.3 Marine Eco-civilization construction

China, as the largest developing country, has experienced ecological degradation largely driven by an imbalance between high population and economic growth pressures as well as limited natural resource reserves and environmental capacity. The estimated economic costs of the interrelated problems associated with ecological degradation (e.g., resource depletion, environmental pollution, and ecological degradation) have amounted to over 13% of the national gross domestic product. The widespread ecological degradation has raised serious concerns from both the Chinese government and the general public. As a result, the Chinese government has launched several large-scale ecological rehabilitation and conservation programs since the late 1990s. With the promotion of these programs, China is becoming a greening nation. Here, greening means the process of ecosystem restoration as measured by the increasing greenness of land cover. The extended meaning of greening is the overall improvement of the ecological and environmental qualities of a region.

China's Ecological Civilization Development Process, 1973-2016

Proposed policies and started work on environmental protection

Identified environmental protection as a basic national policy

Incorporated sustainable development strategy into long-term planning for social and economic development

Defined sustainable development as a strategy for national development

Proposed to build a moderately prosperous, well-rounded society and set the objectives of ecological and environmental improvement and sustainable development

Defined the overall design and roadmap for ecological civilization construction in the future

Proposed ecological civilization construction for the first time

Elevated ecological civilization as a political outline and national strategy of governance

Proposed the concept of green development and incorporated ecological civilization as an important part of the Five-Year Plan

1973 ... 2016

74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

1973
First Environmental Protection Working Conference

1983
Second Environmental Protection Working Conference

1994
Released China's Agenda 21—China's White Paper on Population, Resources, the Environment and Development

1997
15th CPC National Congress

2002
16th CPC National Congress

2007
17th CPC National Congress

2015
Opinions on Accelerating the Promotion of Ecological Civilization Construction and Overall Plan for the Reform of Ecological Civilization System

2012
18th CPC National Congress

2016
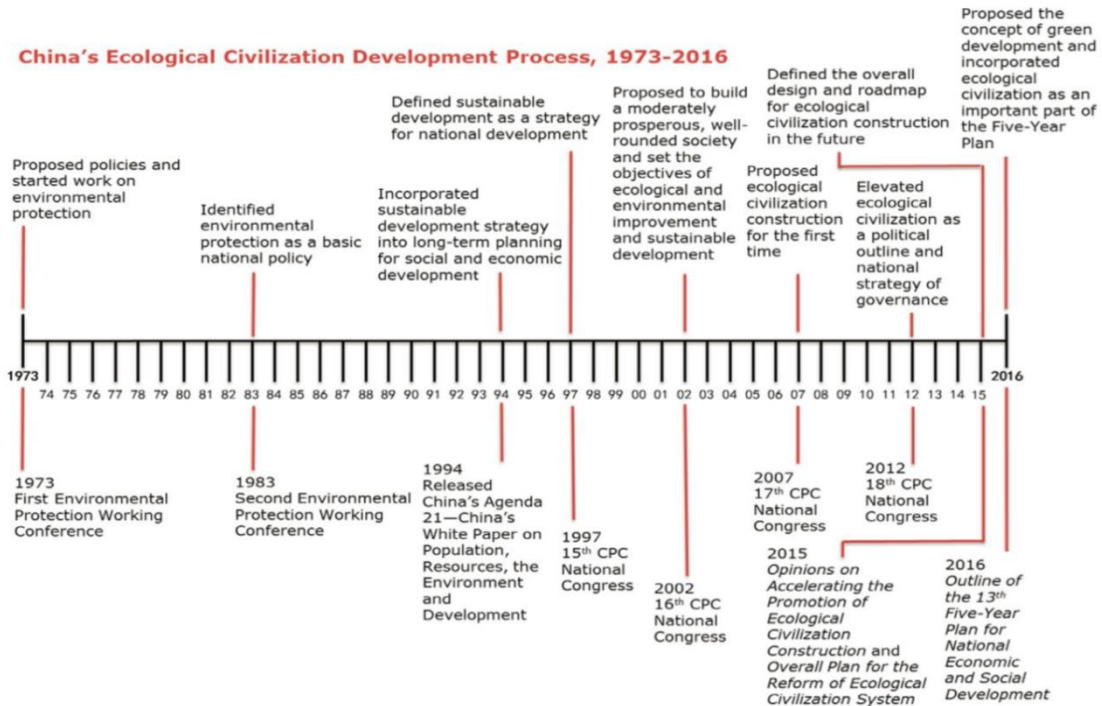*Outline of the 13th Five-Year Plan for National Economic and Social Development*

Fig.3.1 China's ecological civilization development process, 1973-2016

Along with the greening trend, a paradigm of redlining in natural resource and ecosystem management has emerged. Here, redlining is the planning for natural resource use and conservation with certain targeting constraints, such as the lowest level of a natural resource or ecosystem reserve that needs to be preserved. A National Ecological Functional Zonation (NEFZ) program was jointly launched by the Ministry of Environmental Protection and the Chinese Academy of Sciences in 2008 as a stepping stone to accelerate and facilitate innovations for improving environmental conservation and management in China at the central government level. The main objectives of this zonation are (1) to partition ecological function-oriented zones at a national scale based on a

comprehensive analysis of the status and spatial differentiation of ecosystem types, ecological problems, ecological sensitivity and vulnerability, and ecosystem services and (2) to provide guidelines for ecological conservation, ecosystem management, and ecologically friendly socioeconomic development for the different ecological functional zones. Fifty Key Ecologically Functional Zones (KEFZ) were recognized, totaling 2.34 million km ^{2} (covering 24.3% of the Chinese terrestrial surface) after the ecological functional zonation process. These zones play key roles in water provisioning, soil conservation, desertification control, biodiversity conservation, and flood mitigation, all of which need to be considered when determining redlines for ecological and environmental conservation. In the 11th five-year plan, China also put forward Major Function Oriented Zoning (MFOZ) to optimize the spatial pattern of regional development and conservation. The unbalanced regional development, which is mainly represented as a widening regional socioeconomic development gap, uncontrolled urbanization, and disordered spatial development, led to an increase in resource-use pressure, the degradation of ecosystems and environmental quality, unsatisfactory economic operation and urbanization quality, questionable healthiness of regional development, and intensified social conflicts. These problems directly motivated the launch of the MFOZ task. In 2010, the Chinese Central Government formally issued the MFOZ report, which

demarcated the Development Prohibited Zones (DPZ, 12.5% of China's landmass) and Development Restricted Zones (DRZ, 40.2% of China's landmass). The DPZ include national nature reserves, national forest parks, national geo-parks, national tourism resorts, and world cultural and natural relics. Therefore, industrial and urban development is generally prohibited in DPZ to sustain good ecological functioning and environmental quality. With the establishment of new national nature reserves and parks, the DPZ will be enlarged accordingly. The DRZ are composed of 25 regions with high potential for ecological functions, including biodiversity conservation, fresh water provisioning, soil and nutrient conservation, and carbon sequestration. The DRZ host 8.5% of the human population in China, and the functional roles of the DRZ include ecological conservation and demonstrating the harmonization of human–nature relationships; subsequently, large-scale and intensive resource extraction, urbanization, and industrial development are highly restricted in DRZ.

Since late 2012, the government has incorporated Eco-civilization into the "Five-in-One" blueprint of socialism with Chinese characteristics, which outlines a commitment to "innovative, coordinated, green, open and shared development". This blueprint has given great impetus to the implementation of Eco-civilization with environmental quality at its core

aiming at "making the skies bluer, mountains greener, water cleaner, and the ecological environment better".

In 2015, the State Council issued the Suggestions on speeding up the construction of eco-civilization, in which, strict guard on resource and environment red-line, scientifically design the forestry, grassland, wetland and marine red-line were suggested. Then, in 2016, State Oceanic Administration issued the Suggestions on national-wide construction of the marine red-line mechanism. Until now, the eleven coastal provinces/cities have established their marine red-line designation. The marine red-line mechanism has been fully established in China. More than 30% sea area under jurisdiction and 35% coastal line have been included in the red-line paradigm.

In YSLME area, 3 coastal provinces: Shandong, Liaoning, and Jiangsu have also established their red-line paradigm.

➢ **Shandong Province Yellow Sea Marine Ecological Red-line Plan**

In Shandong Province, the YS marine ecological redline designation involves a total sea area of 31011 km^2, total coastal line length of 2414km. In Shandong Province, there are two types of marine ecological redline areas: DPZ and DRZ. In total, there are two types of DPZ, and 9 types of

DRZ. The total area of redline zones were 3134.84 km^2, which is 10.1% of the total Yellow sea area of Shandong. The inventory of natural coastal line length is 1087 km, accounting for 45.03% of the total Shandong Yellow Sea mainland coastal line. In Shandong Province, 151 redline zone were designated in Yellow sea area, in which, 36 were development-prohibited zone, 115 were development-restricted zone. Development-prohibited zone included marine protected area, important estuary system, important coastal wetland, important fishery area were ascribed to development-restricted zone. Each redline zone has its own pollution control and management rule and environmental protection rule. Up to 2020, all the sewage outlet must meet the discharge regulation, no more new industry sewage outlet can be added, total amount of land-based pollutant discharged into sea will be reduced by 10-15%.

The effective date is 2016-2020.

Overall targets:

1) Retention rate of Yellow Sea (YS for short) mainland natural coastal line is no less than 45%, island natural coastal line is no less than 85%

2) Percentage of Marine ecological redline area is no less than 9% of the Yellow Sea area under the jurisdiction of Shandong Province

3) Up to 2020, within the marine ecological red-line area, 100% of the

pollutants directly discharged into sea meet the discharge standard. No new industry outlet is allowed. Most river inflows will be better than class V water standard.

4) Up to 2020, more than 80% of sea water quality inside the marine ecological redline area meet the standard.

Fig.3.2 Shandong YS marine ecological redline area

➢ **Jiangsu Province Yellow Sea Marine Ecological Red-line Plan**

Overall targets

1) Percentage of Marine ecological redline area is no less than 25% of the Yellow Sea area under the jurisdiction of Jiangsu Province,

2) Retention rate of Yellow Sea (YS for short) mainland natural coastal line is no less than 35%,

3) Retention rate of YS island natural coastal line is no less than 25%,

4) Up to 2020, the percentage of good sea water quality (class I and

II) is no less than 41%.

In Jiangsu Province, the YS marine ecological redline designation involves a total sea area of 34766.15 km^2, total coastal line length of 954km. Total redline area is 9676.07 km^2, equals to 27.83% of the sea area of Jiangsu Province. Total mainland redline coastal line is 335.63km, equals to 37.58% of Jiangsu coastal line. Total island coastal line is 49.69, which equals to 35.28% of the Jiangsu island coastal line. In Jiangsu Province, 73 eco-redline zones were designated, including marine protected areas, important estuary ecosystem, important coastal wetland, important coastal recreational zone, important island, and important fishery area et al. The effective date is 2016-2020.
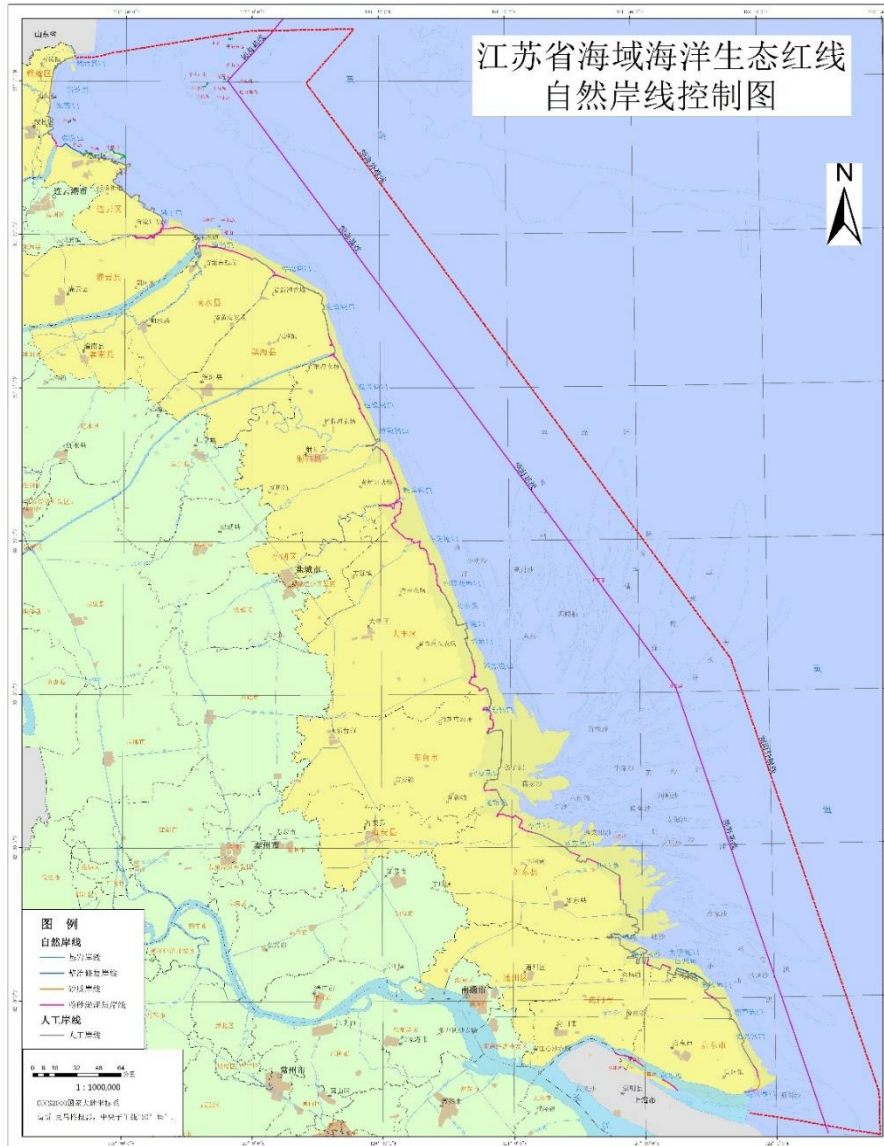
Fig.3.3 Jiangsu YS marine ecological redline area

➢ **Liaoning Province Yellow Sea Marine Ecological Red-line Plan**

Overall targets

1) Percentage of Marine ecological redline area is controlled around 25.4% of the Yellow Sea marine function zone of Jiangsu Province,

2) YS mainland coastal line length is 332 km, retention rate of Yellow Sea mainland natural coastal line is no less than 35%,

3) Island natural coastal line is 456km, retention rate of YS island

natural coastal line is no less than 80%,

4) Up to 2020, the percentage of good sea water quality (class I and II) is around 95% in YS coastal area.

In Liaoning Province, 52 eco-redline zones were designated. The total area is 6796.9 km^2. 16 were DPZ, with an area of 975.9km2. 36 were DRZ, with an area of 5821km^2. The types of redline zones includes: MPA, important estuary system, important coastal wetland, special protected island, historical culture relics, coastal recreational areas, important fishery area, endangered species protected area and sandy rock line sea area. The effective date is 2017-2020.

3.4 Rare species protection

In YSLME area, more MPAs have been designated aiming at protect rare marine species. Before 2006, the total area of this kind of MPA was 1,293,601 ha, until 2017, this number increased to 1,303,929.33 ha, indicating more and more rare species are being protected.
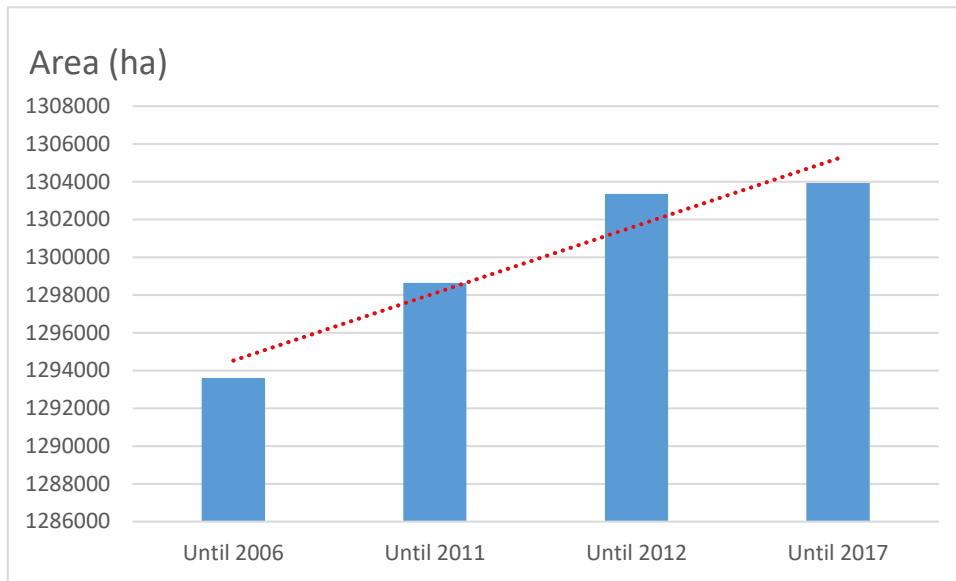
Fig. 3.4 The increase in area of rare marine species protection MPA after 2006

One of the best known functions of wetlands is to provide a habitat for birds. Rudong wetland is critical to the survival of many migratory waterbird species using the East Asian-Australasian Flyway (EAAF), by providing staging and over-wintering habitats for migratory waterbirds. Xiaoyangkou wetland is the most important habitat for waterbirds in China according to o the recent study conducted by Institute of Geographical Sciences and Natural Resource Research of Chinese Academy of Sciences (Xia et al., 2017): the study found that 67 of the 110 priority sites in accordance with the criteria of RAMSAR and Important Bird Areas lie outside protected areas, and some critical habitats for waterbirds are not covered in any type of protected areas especially in Jiangsu. Xiaoyangkou wetland has an Irreplaceability index of 523.05, which is the highest value among wetlands studied. So the

Xiaoyangkou wetland is the most important area of waterbirds conservation in China. Many rare birds can be found in the proposed protected area, such as: Red-crowned crane, White crane, White-headed crane and Grey crane. About 30 species were listed as first and second class national protected animals of China. In Rudong area, the recorded first class national protected animals are: Oriental white stork, Relict gull, White crane and Red-crowned crane. According to the IUCN Red List of Threatened Species 2015, some critically endangered species can be found in this area, such as: Spoon-billed Sandpiper, Baer's Pochard and White crane. Also, some endangered species were recorded in this area: Oriental white stork, Black-faced Spoonbill, Nordmann's Greenshank, Red-crowned crane, Eastern Curlew and Great Knot. Currently, about 370 birds have been recorded in Xiaoyangkou area.

Table 3.1 the national level MPA targeted at rare marine species protection listed in chronological order.

No.	Name	Province	Area (ha)	Protection Target	Time of Approval
1	National Nature Reserve for Rare Birds in Yancheng, Jiangsu	Jiangsu	284179	Rare birds and coastal wetland	1983
2	National Nature Reserve for David's Deer in Dafeng, Jiangsu	Jiangsu	2667	David's deer and wetland ecosystem	1986

3	National Nature Reserve for Coastal Wetland in Yalu River Delta	Liaon ing	1010 00	Coastal wetland and water birds habitat	1987
4	National Nature Reserve for Yellow River Delta in Shandong	Shan dong	1530 00	Rare birds	1990
5	National Nature Reserve for Spotted Seal in Dalian	Liaon ing	6722 75	Spotted Seal	1997
6	National Nature Reserve for Shell Bay and Wetland in Binzhou , Shandong	Shan dong	8048 0	Rare birds	1999
7	National Marine Special Protected Area for Costal Wetland in Wulong River Estuary Laiyang, Shandong	Shan dong	1219	Coastal wetland and rare bird	2011
8	National Marine Park in Liugong Island	Shan dong	3828	Rare birds	2011
9	National Marine Park in Xiaoyangkou, Jiangsu	Jiang su	4700	Rare bird habitat	2012
1 0	National Marine Park in Laishan, Yantai	Shan dong	581. 33	Rare marine organisms germplasm repository	2016

3.5 Habitat conservation

Habitat loss, including degradation and fragmentation, is the most important cause of biodiversity loss globally. Natural habitats in most parts of the world continue to decline in extent and integrity, although there has been significant progress to reduce this trend in some regions and habitats. Reducing the rate of habitat loss, and eventually halting it, is essential to protect biodiversity and to maintain the ecosystem services vital to human wellbeing.

The ever-increasing population and human activity have profoundly

changed our environment, which has experienced biodiversity declines, natural resource depletion, ecological degradation, and environmental pollution. Nature and environmental conservation have been advocated as the main approaches to mitigate these severe problems.
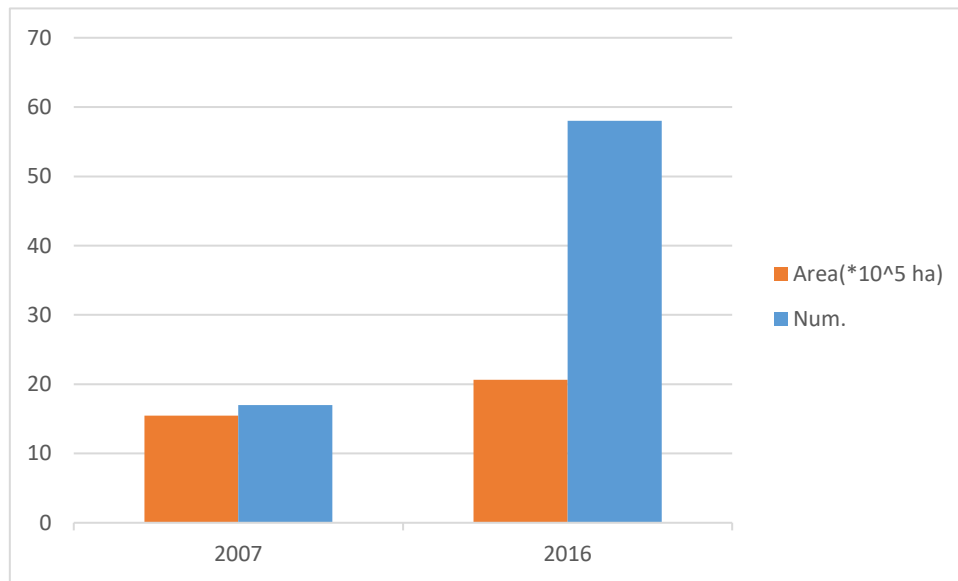
Fig. 4.1 Habitat conservation effects in YSLME region: more national level MPAs after 2007

3.6 Ministry reform

China carried out institutional reforms in the State Council, and the pattern of marine environmental governance changed dramatically. The functions of the former State Oceanic Administration were absorbed into different ministries.

With the finalization of the reform of the State Council's major ministries, the State Oceanic Administration of China has also been "decomposed" into three large blocks, with the main body being merged into the newly formed Ministry of Natural Resources, and the environmental protection functions are incorporated into the Ministry of Ecology and Environment. The Marine Police is incorporated into the Armed Police Force. At this point, China's ocean management will open a new model.

The establishment of the Ministry of Natural Resources, solved the problem of overlapping spatial planning. Since then, the designation of marine protected areas and the setting of marine ecological red lines, as the content of marine spatial planning, will be carried out under this new management pattern. In this way, it can avoid the situation of "enclosure" in which the various departments have been arguing for the protection of their respective protected areas, and it has also avoided many political issues.

MPA

The marine protected areas originally managed by the State Oceanic Administration mostly contain part of the coastal wetlands, and the wetlands are also under the jurisdiction of the former State Forestry Administration. Therefore, there are often two or more "management units" in the same space. This situation will change after that.

After the institutional reform, the newly established National

Administration of Forestry and Grassland of the Ministry of Resources

(developed on the basis of the former State Forestry Administration) will

become the management unit of MPA.

Marine pollution control

For a long time, China's marine pollution control has faced difficulties in

cooperating with "land". The root of the ocean problem is on land and

has become a new slogan calling for a solution to the ocean problem.

The new Ministry of the Environment was formed on the basis of the

former Ministry of Environmental Protection. In addition to all the

functions of the Ministry of Environmental Protection, the department

also included environmental protection functions in six other

departments, including the State Oceanic Administration. Since then, the

management channels for marine and land have been opened, and the

governance of land-based pollution into the sea does not have to be

coordinated across departments.

Take marine plastic waste as an example. Before the connection of land

and sea management, marine plastic waste has been the research and

management object of the Oceanic Administration. However, a large part of the plastics in the ocean comes from the land. The Chinese sea area monitoring found that over 80% of the garbage is plastic. These problems that should have been solved on land will have the opportunity to coordinate with the shore in the future.

3.7 Public awareness raised

Various public activities has been conducted in YSLME area to raise the public awareness on marine biodiversity.

In 2016, the State Forestry Administration (SFA) in conjunction with China Central Television (CCTV) hold an public activity to select the top ten most beautiful wetlands in China. The Jiangsu Yancheng Dafeng wetland was selected as the one of the top ten most beautiful wetland in China.

Fig. 4.2 The David's deers in Jiangsu Yancheng Dafeng wetland

In 2017, on the World Wetland Day, Changzhou, Jiangsu hold the wetland publicity activity with the theme of "reduction on wetland disaster risk". This activity attracted many local citizens, and raised the public awareness of wetland value.

In 2015, Dandong, Liaoning hold the "International Yalvjiang Wetland bird-watch Activity", and the Yellow Sea Wetland Bird Protection Workshsop. This activity's theme was:"Ecological Dandong, home of birds". Many participants, coming from China, New Zealand, Australia, United states and Wetland International Joined this activity.

From June 6th to 12th 2017, in Beijing, State Oceanic Administration organized a "National level MPA photographic exhibition".

Fig.4.3 Raising public awareness of MPA by holding a MPA photo exhibition in Beijing, China.

4. YSLME Biodiversity Conservation Plan

4.1 Basic principle

- **Protection priority**. Priority is given to biodiversity conservation in economic and social development, and active measures are taken to effectively protect important ecosystems, biological species and genetic resources to ensure ecological security.

- **Sustainable use**. It is forbidden to predatoryly develop biological resources, promote the research and development and promotion of sustainable use of biological resources, and use biological resources scientifically, rationally and orderly.

-**Public participation**. Strengthen publicity and education on biodiversity conservation, actively guide the broad participation of social groups and publics, strengthen information disclosure and public opinion supervision, and establish an effective mechanism for the whole society to participate in biodiversity conservation.

- **Land-sea coordination.** Adhere to the idea of "coordinating land and sea, urban and rural integration" and fully mobilize all aspects of cities along Yellow sea. Integrating biodiversity conservation into relevant regulations of governments and departments at several level.

4.2 Objectives and effective time

Objectives:

The biodiversity of Yellow Sea is better conserved.

The effective time of this plan is from: 2018-2030.

4.3 Targets

Short term targets:

By 2025, efforts will be made to achieve basic control over the loss of biodiversity. The background survey and assessment of the yellow sea areas for biodiversity conservation is fully completed and effective monitoring is implemented. The nature reserve system with reasonable layout and complete functions is basically built. The national nature reserve has stable functions and the main protection objects are effectively protected. Biodiversity monitoring, assessment and early warning systems, entry and exit management systems for biological species resources have been improved.

Long-term targets:

By 2030, the number and size of various types of protected areas have reached a reasonable level, and ecosystems, species and genetic diversity have been effectively protected. Form a sound legal system for biodiversity conservation policies and sustainable use of biological

resources, and protect biodiversity as a conscious action of the public.

4.4 Strategic tasks

7 strategic tasks were proposed in this conservation plan. Each strategic tasks has several actions and activities.

1) Improve the policy and legal system for biodiversity conservation and sustainable use

2) Conduct biodiversity surveys, assessments and monitoring

3) Strengthening in situ conservation of biodiversity

4) Strengthening the safety management of invasive alien species

5) Construct a pollution control mechanism by the land and sea coordination

6) Improving the capacity to respond to climate change

7) Establish a public participation mechanism for biodiversity conservation

4.5 Actions

➢ **Improve the policy and legal system for biodiversity conservation and sustainable use**

Action 1. Develop policies to promote biodiversity conservation and

sustainable use

(1) Establish, improve, and promote price, tax, trade, land use, and government procurement policy systems related to biodiversity conservation and sustainable use, and provide prices, credit, and taxation for biodiversity conservation and sustainable use projects.

(2) Improve ecological compensation policies, expand policy coverage, and increase capital investment.

(3) Formulate incentive policies that encourage the recycling of biological resources, and provide policy support for the development of alternatives to biological resources.

Action 2 Improve the legal system for biodiversity conservation and sustainable use

(1) Comprehensively review the contents of biodiversity protection in existing laws and regulations, adjust conflicts and inconsistencies between different laws and regulations, and improve the systemic and coordinated laws and regulations.

(2) Study and formulate laws and regulations on nature reserve management, wetland protection, genetic resource management and biodiversity impact assessment, and study and amend forest laws, wild plant protection regulations and urban greening regulations.

(3) Strengthen legislative work on invasion and biosafety of alien species, study and formulate laws and regulations on biosafety and management of invasive alien species, and study and revise regulations on the safety management of agricultural genetically modified organisms.

(4) Strengthen the construction of local law enforcement systems related to biodiversity laws and regulations.

➢ **Conduct biodiversity surveys, assessments and monitoring**

Action 3 Conduct background survey of biological species resources and ecosystems

(1) Conduct comprehensive survey of biodiversity backgrounds in priority areas for biodiversity conservation.

(2) Conduct key species resource surveys for key areas and key species

types.

(3) Establish a database of species background resources.

(4) Organize YSLME wildlife resources surveys and establish resource files and catalogues.

(5) Construction of a YSLME biodiversity information management system.

Action 4 Conduct biodiversity monitoring and early warning

(1) Establish a monitoring system for ecosystems and species resources, and promote the standardization and standardization of biodiversity monitoring.

(2) Strengthen the development and construction of modern equipment and facilities for monitoring ecosystems and different biological groups.

(3) Build a biodiversity monitoring network system, conduct systematic monitoring, and achieve data sharing.

(4) Develop biodiversity prediction and early warning models, establish

early warning technology systems and emergency response mechanisms to achieve long-term and dynamic monitoring.

Action 5 Conduct a comprehensive biodiversity assessment

(1) Develop ecosystem service function and economic value assessment system for species resources, and carry out pilot demonstrations of economic value assessment of biodiversity in YSLME region.

(2) Evaluate the distribution pattern, change trend, protection status and existing problems of important ecosystems and biological groups, and issue comprehensive assessment reports on a regular basis.

(3) Establish and improve the endangered species assessment mechanism and regularly publish the YSLME Endangered Species List.

➤ **Strengthening in situ conservation of biodiversity**

Action 6 Improve the biodiversity of YSLME wetlands

(1) Carry out general survey of wetland resources, and rescue natural rivers such as river beaches and coastal intertidal zones.

(2) Carry out ecological protection and restoration of degraded wetlands. Increase the intensity of returning farmland to wetlands, returning fisheries to wetland, and mudflat culture ponds within the ecological red line must strictly implement the returning fishing to wetland regulation.

(3) According to the characteristics of different coastal wetlands, the suitable wetland plant species should be planted according to local conditions to enhance the stability of wetland ecosystems.

Action 7 Strengthen the conservation of endemic aquatic germplasm resources in the oceans and estuaries

(1) Strengthen investigation, monitoring and research on marine and estuarine endemic species protection areas.

Comprehensive survey and evaluation of fishery resources in the protected areas to protect the germplasm of endemic aquatic organisms.

Establish a monitoring network for aquatic resources around protected areas.

(2) According to the Law of the People's Republic of China on the

Protection of Wild Animals And the National Aquatic Wildlife Protection Regulations, establish special protection and conservation work programs for The first and second levels of the National protected aquatic animals, like : Chinese sturgeon, finless porpoise, etc.

(3) Strictly control the total number of fishing vessels and horsepower, and gradually reduce the number of fishermen and fishing boats.
Reduce the fishing intensity, strictly enforce the fishing off policy and improve the life guarantee system for fishermen during the fishing-off season; carry out artificial proliferation and release and ocean artificial reefs to alleviate the decline of fishery resources and protect marine life.

(4) Implement the ecological compensation system for marine engineering projects.

(5) Strengthen the protection of habitats and breeding sites of endemic biological resources, and gradually establish key products.

Action 8 strengthen the conservation on YSLME biodiversity priority area

(1) Conduct assessment of the relevance of existing zoning schemes to connectivity of existing MPAs and/or potential MPAs.

(2) Propose new MPA according to gap analysis.

(3)Identifying the BD priority of YS, draw the map of priority areas for designation as conservation areas in YS and identify opportunities for improvements in connectivity with existing and new MPAs.

Action 9 Improvement of YSLME MPA planning and management

(1) Coordinate the implementation of the development plan of MPAs and establish an information management system.

(2)Strengthen the construction of MPAs in the priority areas of biodiversity conservation, optimize the spatial layout, and improve the connectivity and overall protection capacity.

Action10 Promote fish spawning and habitat restoration and reconstruction

(1)Fish spawning and habitat restoration and reconstruction. Identify key

areas for fish spawning grounds and habitat restoration and reconstruction, and prepare fish spawning grounds and habitats for ecological remediation and reconstruction plan to achieve biodiversity restoration in key areas.

(2)Further increase the diversity of artificial reef types, improve the effectiveness of proliferation and release, rebuild fish spawning grounds and habitat environment, and restore biodiversity.

(3)Standardize the management of spawning grounds and habitat areas. In the key areas, any form of development, coastal engineering, and illegal sand mining are prohibited to protect fish spawning grounds and habitats from damage. Establish a dynamic monitoring system for fish spawning grounds and habitats. Standardize fishing equipment during fishing activities.

➢ **Strengthening the safety management of invasive alien species**

Action 11 Strengthen the invasive species control

(1)Strengthen the broadcast and management of alien species hazards. Improve the ecological security awareness of the whole society against biological invasion. Carry out various forms of publicity ways

to improve residents' awareness of alien species and jointly resist invasive alien species.

(2) Investigate data on the species, quantity and distribution of invasive species for ecological damage. Assessment of invasive species such as *Spartina alterniflora,* which has a high degree of damage and rapid spread. Accelerate the research on invasive species control.

(3) Establish risk assessment of alien species. Prevention and assessment are prerequisites for risk management of alien species and should be established.

(4) The integrated management mechanism of invasive alien species builds a comprehensive prevention and control system for the prevention and control of invasive alien species. Take timely early warning and emergency measures, and use effective prevention and control measures to strengthen the prevention and control of invasive alien species.

➢ **Construct a pollution control mechanism by the land and sea coordination**

Action 12 Strengthen the control of ecological red line areas

(1) Strictly implement the redline area management regulation.

DPZ management measure

In nature reserve DPZ, no construction of production facilities was allowed. No organization or individual is allowed to entry without special reason. In marine special protected area, the important protected area prohibits any construction project not related to protected area. In reserve area, human disturbance is strictly controlled, no constructions allowed here. Any production activities that might change the natural ecological condition will be prohibited.

Action 13 Strengthen seawater and estuary pollutant discharge control and supervision

(1) Strengthen the supervision of pollution from land to sea, in accordance with the "watershed – nearshore waters – red line region" hierarchical system to strengthen pollution monitoring and management of rivers entering the sea, comprehensively ban the illegal or unreasonable land-source discharge into the sea.

(2) Strictly control marine pollution discharge and strengthen the

protection of germplasm resources and their neighbors.

It should have pollutants receiving and disposing facilities, anti-pollution emergency facilities and equipment. Receiving and disposing of pollutants such as waste oil, sewage oil, washing water, domestic sewage, garbage and waste gas should have strict supervision and inspection. Illegal discharge is strictly prohibited.

➢ **Improving the capacity to respond to climate change**

Action 14 Develop action plan for YSLME biodiversity conservation to address climate change

(1) Develop an action plan for biodiversity conservation to address climate change. Assess the impact of climate change on important ecosystems, species, genetic resources and related traditional knowledge in YSLME, and propose relevant countermeasures.

(2) Develop monitoring technologies for the impacts of climate change on biodiversity, build monitoring networks, and carry out key monitoring.

(3) Constructing species migration corridors to reduce the negative impacts of climate change on biodiversity; cultivating new varieties

of good animals and plants and enhancing their ability to adapt to climate change.

➢ **Establish a public participation mechanism for biodiversity conservation**

Action 15 Improve public education on biodiversity conservation

(1) Carry out biodiversity conservation education, disseminate ecological culture, ecological health, and ecological environment knowledge. The awareness of promoting the concept of biodiversity protection of the citizens.

(2) Carry out publicity and education on biodiversity conservation for government.

(3) Carry out publicity and education on biodiversity conservation in educational institutions such as schools.

(4) Integrating biodiversity conservation culture knowledge education into kindergartens, primary and secondary schools, and colleges and universities, in order to deepen the students' awareness of biodiversity

conservation.

(5)Carry out publicity and education on multimedia biodiversity conservation. Promote the importance and main measures of biodiversity conservation through public service advertisements.

To improve the level of biodiversity protection and responsibility of citizens; make full use of magazines and newspapers, radio and television, Internet, WeChat public account, etc.

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