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IMPLEMENTING THE STRATEGIC ACTION PROGRAMME FOR THE YELLOW SEA LARGE MARINE ECOSYSTEM:  
RESTORING ECOSYSTEM GOODS AND SERVICES AND CONSOLIDATION OF A LONG-TERM REGIONAL  
ENVIRONMENTAL GOVERNANCE FRAMEWORK  
(UNDP/GEF YSLME Phase II Project)

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# **YSLME Biodiversity Conservation Plan**

## **2018-2030**

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# 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.

Based on the drafts of Biodiversity Conservation Plan of Korea<sup>1</sup> and China<sup>2</sup>, this compilation was aimed to have a whole picture of the threats for marine biodiversity, as well as to integrate the conservation activities for the YSLME area.

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<sup>1</sup> FRAMEWORK PLAN FOR THE YSLME BIODIVERSITY CONSERVATION IN RO KOREA (2018-2030) prepared by Dr. Won-Tae Shin;

<sup>2</sup> YSLME Biodiversity Conservation Plan in PR China (2018-2030) prepared by Dr. Zhaohui Zhang;

## **2.Threats to YSLME Marine Biodiversity**

### **2.1 Overfishing**

Overfishing is a major threat to marine biodiversity in coastal fishery. 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 in China from high quality fishes (yellow croakers and hairtails) in 50-60s of 20th 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 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.

In 2018, the State Council of China issued the notice on strengthen the protection of coastal wetland, and strictly control the reclamation. According this notice, any new application of reclamation, except national strategic project, will be all banned.

More critical habitats have been protected in China. More MPAs have been designated after 2007 in YSLME region, including Bohai Sea. Before 2007, there 17 national level MPAs, the total area was  $15.45 \times 10^5$  ha. Until the end of 2016, the number increased to 58, and the total area was  $20.66 \times 10^5$  ha.

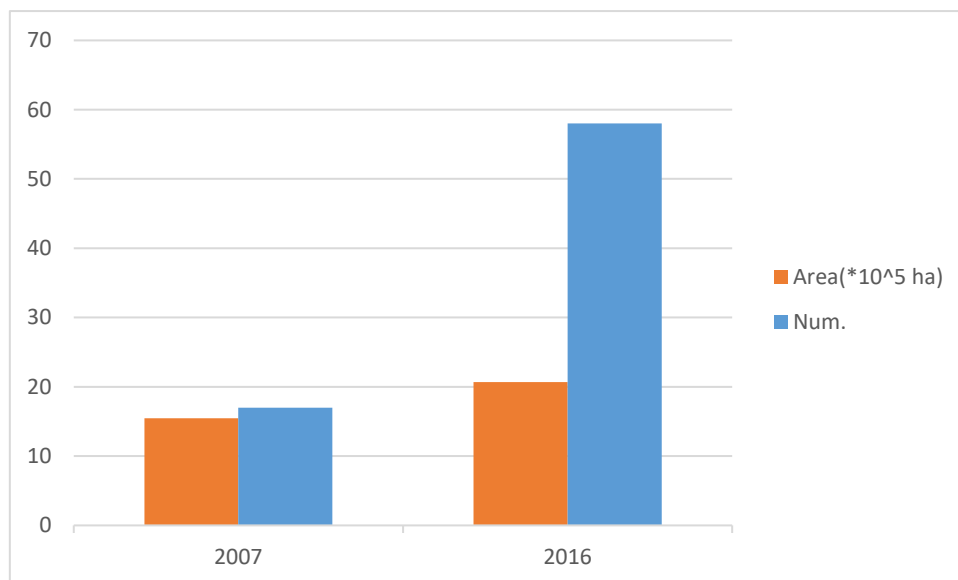


Fig. 2.1 Habitat conservation effects in YSLME region: more national level MPAs after 2007

In Korean, both Sihwa and Saemangeum Lakes were created through reclaiming huge areas of tidal flats. The West Coast of RO Korea is considered as one of the richest tidal flat areas in the world. The tidal flats sustain huge population of migratory bird species of international importance. Many of the migratory bird species are endangered or critically endangered. Some of them are about to extinct such as Spoon-billed Sandpiper and Black-faced spoonbill. It was reported that about 22% of the tidal flats were lost during the past three decades. Although the government adopted a policy to ban reclamation, the pressure and desire to reclaim coastal wetlands still exist.

The RO Korean government designated 29 Marine Protected Areas until 2017. There are three types of MPAs in RO Korea depending on the purpose of the designation, namely: Coastal Wetland Protected Areas, Marine Ecosystem Protected Areas and Marine Species Protected Areas. Since the first MPA was designated in 2001, the number of MPAs is steadily increasing.



Fig.2.2 Location of MPAs in RO Korea

### 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<sup>2</sup>. 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.2.3 China Marine Environmental Status Bulletin 2015, Yellow Sea water quality

## 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 km<sup>2</sup>. Compared with that number in 2004 which was 820 k m<sup>2</sup>, 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.

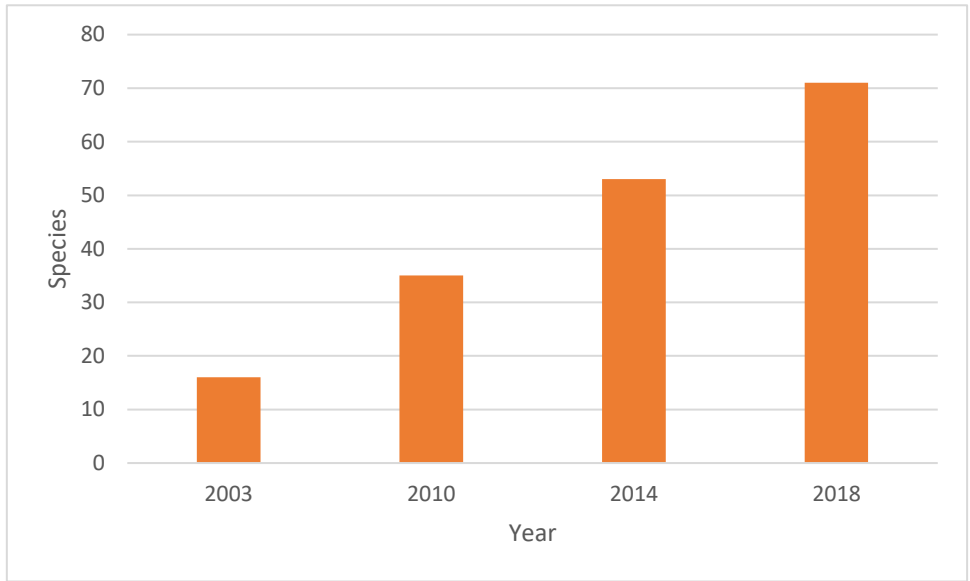


Fig.2.4 The increase in the number of invasive species in China with severe impact to the ecosystem

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.

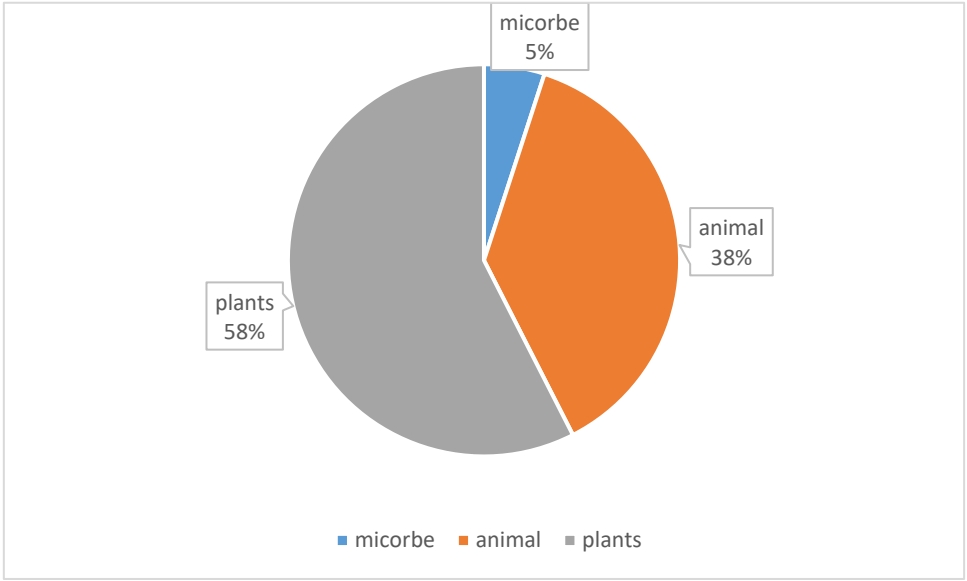


Fig.2.5 The marine invasive species composition in YSLME.

*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.2.6 *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<sup>2</sup> in 1985, then in 2007 it was as high as 123.17 km<sup>2</sup>, in 2012, the expansion was still increasing, with an area of 153.8km<sup>2</sup>.

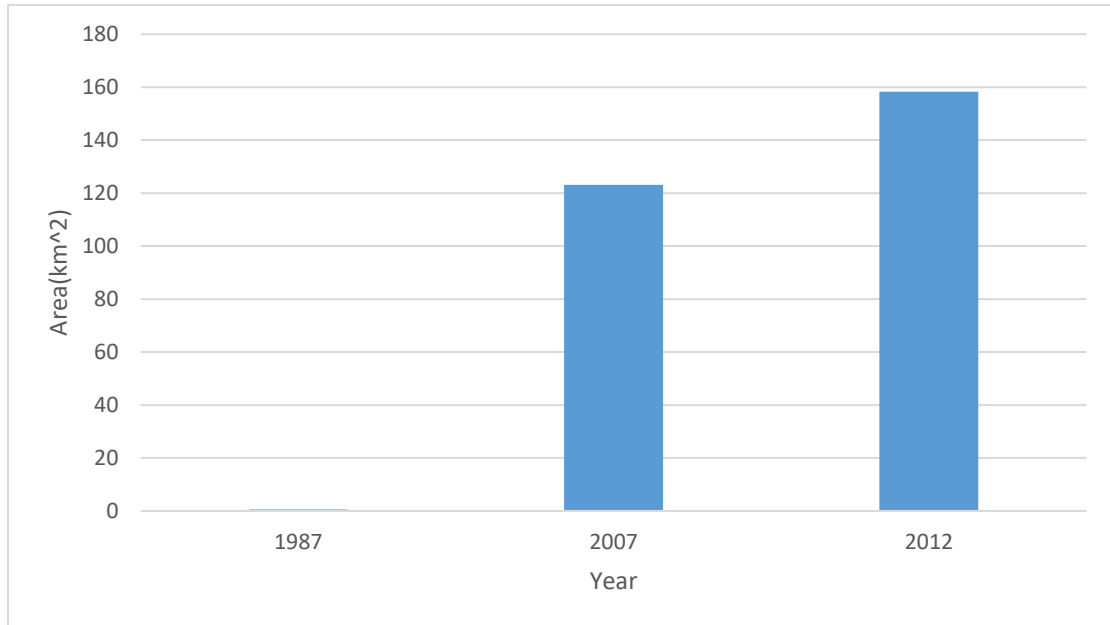


Fig. 2.7 The area of *S. alterniflora* in Yancheng, Jiangsu (Wang et al., 2018)

In Korea, designation and registration of protected species and invasive alien species is on the rise. Since 2009, more than 31 species were registered as protected and 4 species as invasive alien species.

## 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.

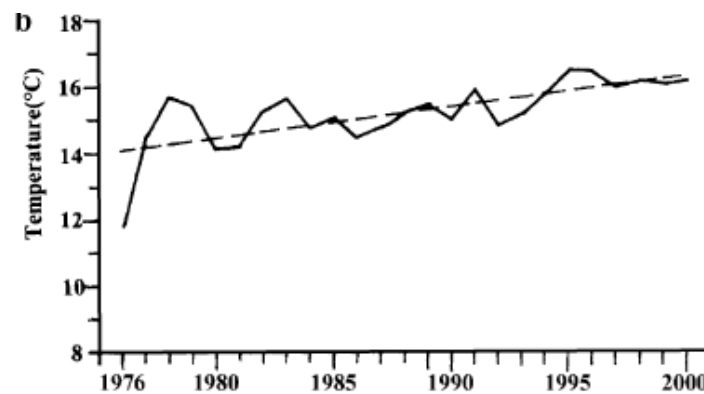


Fig. 2.8 Sea surface temperature changes in the Yellow Sea (36°N transect data, Lin et al, 2005)

## 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. Legal and Institutional arrangement**

#### **3.1 Legal and institutional arrangement in China**

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. 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.

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).

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.

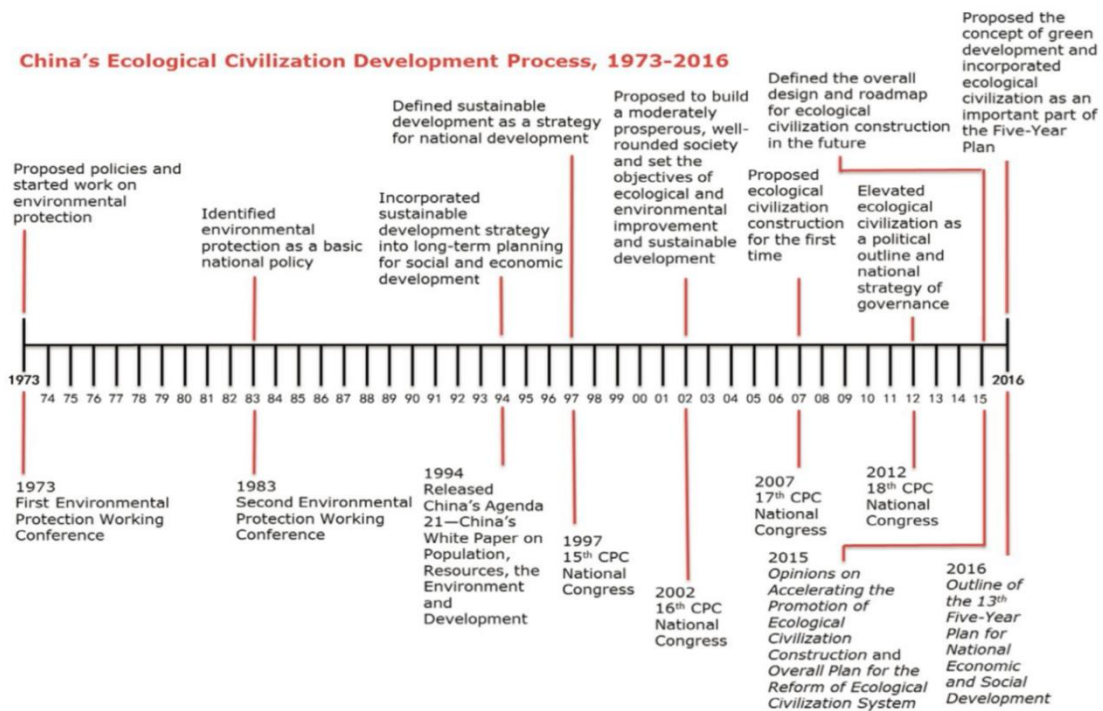


Fig.3.1 China's ecological civilization development process, 1973-2016

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<sup>2</sup> (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<sup>2</sup>, 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<sup>2</sup>, 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<sup>2</sup>, total coastal line length of 954km.

Total redline area is 9676.07 km<sup>2</sup>, 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.

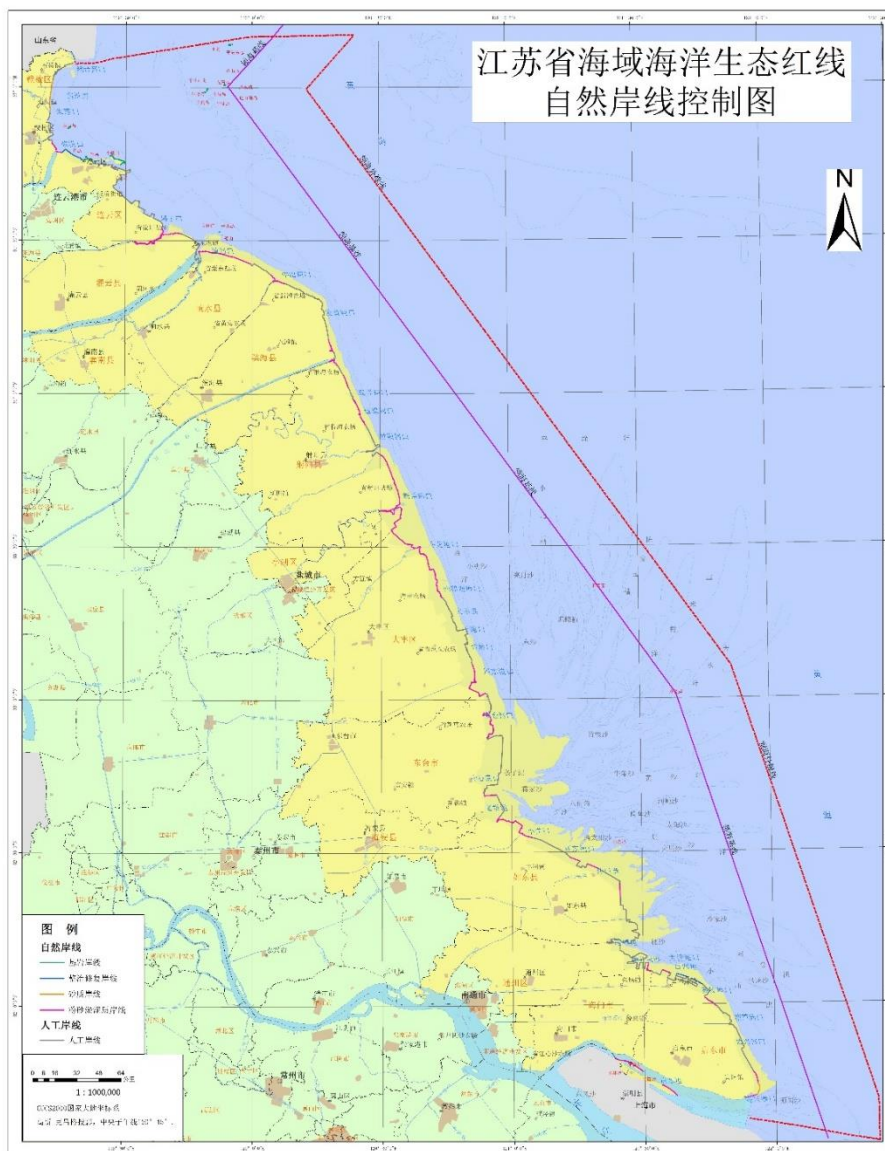


Fig.3.3 Jiangsu YS marine ecological redline area

➤ **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<sup>2</sup>. 16 were DPZ, with an area of 975.9km<sup>2</sup>. 36 were DRZ, with an area of 5821km<sup>2</sup>. 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.

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.

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.

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.

### 3.2 Legal and institutional arrangement in RO Korea

The law governing the entire ecosystem of RO Korea is the 'Conservation and the Use of Biodiversity Act', which directly aimed at protecting biodiversity. The Act was enacted on the 1st of February in 2012 and took effect on 2nd of February in 2013. Although the government subsequently enacted several regulations indirectly relating to biodiversity conservation in the past, this act was a meaningful turning point for Korea in that a national level approach is being proactively made, promoting the systematic biodiversity protection. The Korea government is also seeking to raise the public awareness on this crucial topic. Furthermore, the Korean government is making efforts in implementing a wider range of acts related to ecosystem conservation and management:

Natural Environment Conservation Act (enforced on Sep. 1, 1992)

Wildlife Conservation and Management Act (enforced on Feb. 10, 2005)

Conservation and Management of Marine Ecosystems Act (enforced on Apr. 5, 2007)

Wetland Conservation Act (enforced on Aug. 9, 1999)

Nature Parks Act (enforced on Jun. 1, 1980)

Cultural Properties Protection Act (enforced on Jan. 10, 1962)

Development and Management of Forest Resources Act (enforced on Aug. 5, 2006)

Baekdudaegan Protection Act (enforced on Jan. 1, 2005)

Act on the Transboundary Movements of LMOs, etc (enforced on Jan. 1, 2008)

Conservation and the Use of Biodiversity Act (enforced on Feb. 2, 2013)

Through the '2nd Master Plan for Wildlife Conservation (2011-2015), the government has carried out ecosystem monitoring, protection of wildlife including endangered species, and management of harmful wildlife and invasive alien species.

In the past, wildlife, agriculture, forest, marine and bio-information were separately handled by different ministries; therefore Korea's legal system related to biodiversity lacked a systematic management. A

comprehensive response on national level was required to adapt to the



globally changing demands including Nagoya Protocol adopted at COP 10. From this perspective, the Korean government enacted 'the Act on Conservation and Use of Biodiversity' in February, 2012. The Act has three main purposes: i) contribute to the enhancement of biodiversity by creating a national management system, ii) promote the sustainable use of biological resources, and iii) cooperate with the international mechanisms including the Convention and Nagoya Protocol. The Act implements the following: i) setting up NBSAP every five years, ii) building a system for sharing information with National Biodiversity Center with a view to an integrated management of information on biodiversity, iii) preparing National Index of Species, iv) promoting cooperation with North Korea for conservation of biodiversity and endemic species in the Korean Peninsula, v) fair and equitable sharing of benefits from the use of biological resources, and vi) prerequisite test of alien species for any hazards to the local ecosystem.

Regarding marine ecosystem conservation, the significant milestone has been set up in 2006 when the Conservation and Management of Marine Ecosystem Act has been enacted. The law stipulates specifically the conservation of marine habitats, marine animals, marine protected areas etc. In accordance with the law, the government of Korea developed 'Master Plan for Marine Ecosystem Conservation and Management

(2006-2017)'. Under the master plan, its sub plan was also designed called 'Conservation countermeasures for marine life subject to protection'. Through the plans, marine organism habitat protection, marine ecosystem restoration and system management are being carried out. The 2nd Master Plan for Marine Ecosystem Conservation and Management is being crafted by the government in 2018.

The founding laws that govern the marine ecosystem and biodiversity are:

Conservation and Management of Marine Ecosystems Act

Wetland Conservation Act

Marine Environment Management Act

### **Ministry of Oceans and Fisheries (MOF)**

RO Korea adopted the integrated management of marine and ocean in 1996. As the result, an integrated government agency was formed in the name of the Ministry of Maritime Affairs and Fisheries. As the name suggests, the Ministry is focused on the industrial side of the ocean sector such as marine transportation, port development and fisheries. However, the Ministry has more and more focused on the ocean governance and marine environment in accordance with the global trend of sustainable marine management. In 2007, the Ministry has been

reorganized by integrating Land and Ocean sectors into one Ministry. The resultant Ministry is called Ministry of Land, Transport and Maritime Affairs. The intention is to harmonize land and ocean in an integrated way but the implementation was not so effective. Therefore, the government recreated the integrated ocean ministry in 2013 in the name of the Ministry of Oceans and Fisheries.

Ministry of Oceans and Fisheries is taking a significant role in managing sustainable use and conservation of marine resources and environment as a de facto island country of RO Korea. The ministry has grown in number and territorial coverage in recent years. It has several associated and affiliated agencies which support the operation and management of sustainable coastal and ocean of RO Korea.

### **Marine Environment Management Corporation (KOEM)**

Korea Marine Environment Management Corporation (KOEM) is an operational and working arm of MOF in terms of marine environment management. KOEM was established in 2007 when the Marine Environment Management Act was fully re-enacted. KOEM has major projects on marine environment management including Marine Species Protection, Survey of Marine Species and Habitats, MPA management, Marine Water Quality Monitoring, Oil Spill response and preparedness

and others.

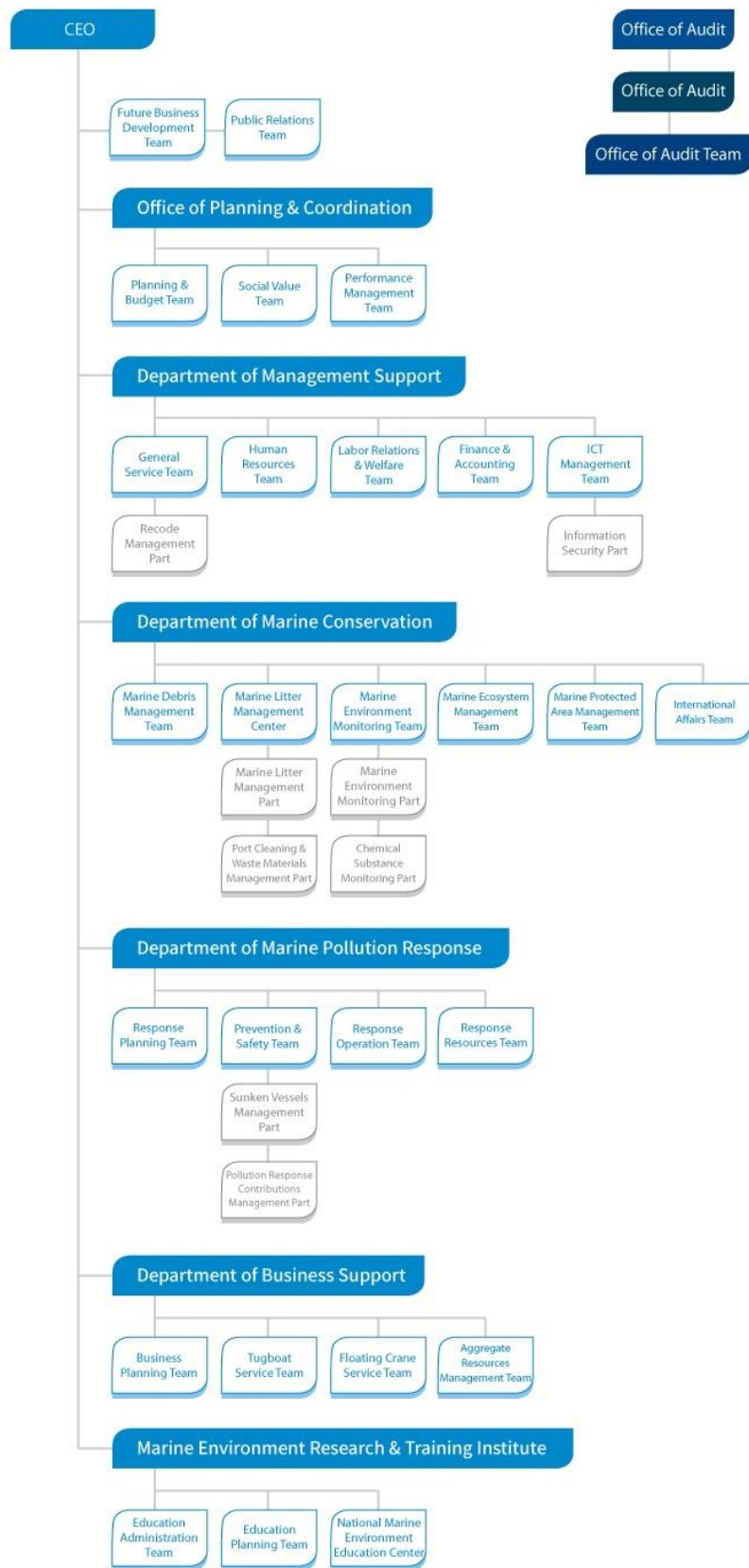


Fig.3.4 Organization chart of KOEM

## **Marine Biodiversity Institute of Korea (MABIK)**

MABIK was established relatively recently in the effort of saving the Janghang tidal flat. The residents of Seocheon-Janghang requested their proposal to reclaim the tidal flat so that the land can be developed into an industrial complex which will be economically beneficial to them. The proposal was considered within the ministry and then President late Mr. Roh Mu-Hyun visited the site. The arbitrary recommendation came from the government that the area will be developed as a science complex for attracting tourists and visitors and providing monetary compensation to residents in return of saving the tidal flat. As the results of the negotiation, the MABIK was established in 2015. The Institute is considered as a symbol of Tidal Flat conservation.

## **The 1st Marine Biodiversity Conservation and Management Plan**

The 1st Marine Biodiversity Conservation and Management Plan was established in 2008 in accordance with the Chapter 2. Formulation of Plans and Investigations of Marine Ecosystems of the Conservation and Management of Marine Ecosystems Act. The 10 year plan encompassed 5 broad targets, namely:

Target 1. Systematic Management of Marine Habitats

Target 2. Enhancing Conservation and Management of Marine Biodiversity

Target 3. Enhancing Public Awareness on and Sustainable Use of Marine Ecosystem

Target 4. Establishing Effective Management System for Marine Ecosystem

Target 5. Establishing Marine Ecosystem Survey System and Enhancing Knowledge Management

The evaluation of the 1st Plan has been conducted in 2018. The evaluation revealed that the Plan invested approximately more than US\$10M during 2009 to 2017. The spending was more than what was planned (about 105% than planned investment). Target 2 and 3 were over spending and Target 1, 4 and 5 was under spending.

## 4.YSLME Biodiversity Conservation Plan

### 4.1 Basic principle

China:

- **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 predatory 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.

RO Korea:

- 1) Marine ecosystems shall be conserved or managed as the assets of all nationals, serving the public interests, and marine ecosystems shall be used on a sustainable basis;
- 2) There should be harmony and balance between the use of the sea and the conservation or management of marine ecosystems;
- 3) Endangered marine organisms or ecologically important marine organisms shall be protected, and the diversity of marine organisms shall be conserved;
- 4) Nationals shall take part in the conservation or management of marine ecosystems, and shall be provided more opportunities to use marine ecosystems in a sound manner;
- 5) The burden of conserving or managing marine ecosystems shall be shared in an equitable manner, and benefits generated from marine



ecosystems shall be preferentially enjoyed by local residents and interested persons;

6) No ecological balance shall be destroyed nor shall the value thereof be undermined, when marine environments are used or developed, and endeavors shall be made to restore or recover marine ecosystems and marine landscape, when they are destroyed, damaged or injured;

7) International cooperation shall be promoted for the sustainable use of marine ecosystems.

## 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 Strategic tasks

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

- 1) Strengthen the marine habitat protection
- 2) Improving the governance of marine environment management
- 3) Enhancing the Benefits of Marine Ecosystem Services
- 4) Improve the safety management of invasive alien species
- 5) Enhance the capacity to respond to climate change
- 6) Promote the public participation

#### 4.4 Actions and activities

##### ➤ **Strengthen the marine habitat protection**

##### **Action 1 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 2 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 3 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.

#### **Action 4 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.

## **Action 5 Restoring degraded or damaged marine ecosystems**

(1) Strengthening marine ecosystem restoration project implementation system

(2) Establishing marine ecosystem restoration education and knowledge management system

(3) Establishing marine ecosystem restoration monitoring system

➤ **Improving the governance of marine environment management**

## **Action 6 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 7 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 8 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.

### **Action 9 Strengthen seawater and estuary pollutant discharge control and supervision**

- (1) Strengthen the supervision of pollution from land to sea
- (2) Strictly control marine pollution discharge and strengthen the protection of important habitats.  
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.

➤ **Enhancing the Benefits of Marine Ecosystem Services**

**Action 10 Providing services of ecosystem-based marine spatial planning**

(1) Strengthening scientific base of marine spatial planning. Establishing evaluation system for the marine ecosystem services. Conducting evaluation of marine ecosystem services and management.

(2) Strengthening the capacity for marine spatial. Developing guideline for application of marine ecosystem services. Enhancing collaboration between local governments. Conducting education and public outreach for marine ecosystem service.

**Action 11 Promoting marine eco-tourism.**

(1) Fortifying the capacity of marine eco-tourism development. Establishing the system for promoting marine eco-tourism. Establishing marine eco-tourism database.



➤ **Improve the safety management of invasive alien species**

**Action 12 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.

➤ **Enhance the capacity to respond to climate change**

**Action 13 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.

## **Action 14 Protecting marine animals in response to climate change**

(1) Reducing climate change impacts using marine species and ecosystem.

Enhancing greenhouse gas sequestration capacity of marine species and ecosystem. Establishing evaluation system for climate change risk to marine ecosystem.

(2) Enhancing adaptive capacity of marine ecosystem. Establishing evaluation system for climate change risk to marine ecosystem.

Strengthening awareness and publicity of vulnerable marine species.

### **➤ Promote the public participation**

## **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) 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.

(4) 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, etc.

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