Proposed Revisions by Chinese NWGs to the TDA Update Report

November 18, 2019

This document was consolidated by the Secretariat based on the review meeting conducted by the NWG members of PR China held in Dandong on November 10, 2019 organized by the Secretariat. It contains the proposed revisions to the TDA update report submitted by the International Consultant.

Proposed revisions:

1) Page 2: Executive summary: the 4th paragraph can be further strengthened by adding highlights of the report, and summary of the key issues and good practices for replication and dissemination.
2) Suggest to add the following paragraph to page 2 of the summary report:

   "The IMTA demonstration, training course and promotion in Sanggou Bay was very successful. The Rongcheng government invest 120 million Yuan to promote standard IMTA in Rongcheng and the corresponding policy was published according to the demonstration results from NWG-M. There were 10000ha^2 standard IMTA area promoted by the local government in 2018-2019. The carrying capacity assessment, ecological aquaculture, land-based IMTA and so on, which is the core content in the IMTA training module published by YSLME-II, were listed in the national policy file "Accelerating the Green Development of Aquaculture Industry" released by 10 ministries including Ministry of Agriculture and Rural Affairs. "

3) Page 9 please replace Figure 1 as the project boundary line should go to Lvshun instead of Dalian.
4) Page 10. "[Define this] " on the 4th line of paragraph 1:

   "***Kuroshio is a warm current that flows northeastwardly off the coast of Japan into the northern Pacific ocean".***

5) and on the same page, info on yellow sea inputs of nutrients:

   "According to 2018 Yellow River Sediment Bulletin, the sediment load of Lijing Station in 2018 was 297 million tonnes, which was much lower than the average value from 1952 to 2015 (674 million tonnes). "

6) Page 13: please revise the third paragraph;
7) the last sentence is related with status in RO Korea and can be combined with the first paragraph of page 14;
8) Table 5 as referred to at the end of the last line of paragraph 3 is not clear. After checking the KNAP review report, Table 5 cannot be found.
9) Page 14: suggest to delete the last paragraph as it is inappropriate to stay here.
10) Page 15: line 4 of 2nd paragraph: "sea user fee" is not the correct expression. The correct expression is "***sea area utilization fee***"
11) Page 16: Table 4 Action 3.3 should be deleted according to the previous conference discussions. And the following sentences to the second last paragraph:

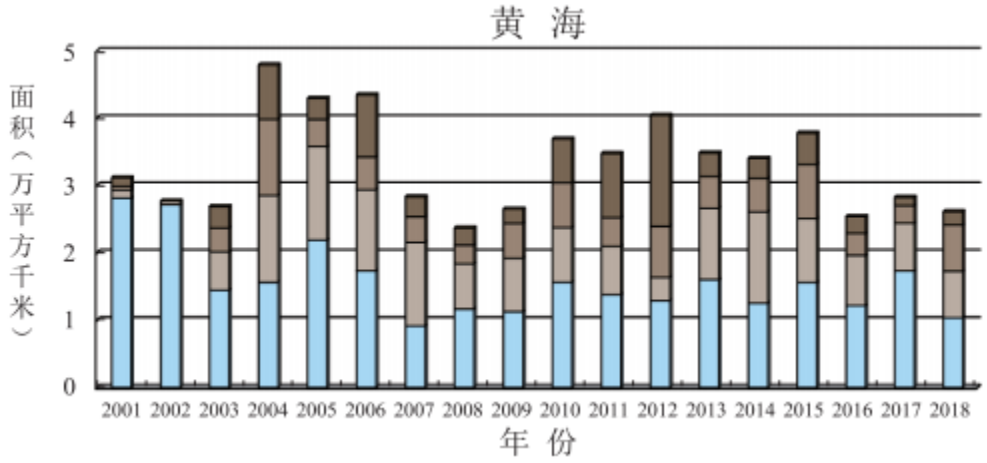
    "The demonstration of land based IMTA showed significantly improvement in water quality. The N, P and organic particles were reduced by an IMTA pond out of the indoor fish aquaculture area. The government is organizing the experts to release the official industry standard for aquaculture wastewater. The land based IMTA gives the farms very good solution to comply the coming standard. The demonstration of land based IMTA is forward-looking. "

12) Page 18: there is a discrepancy between the second line which says "100%" and third last line which says "91.7%"; the 6th line has a reference of "reduced by 1.5 km^2". Please double check. Original and updated texts are illustrated below for ease of comparison:

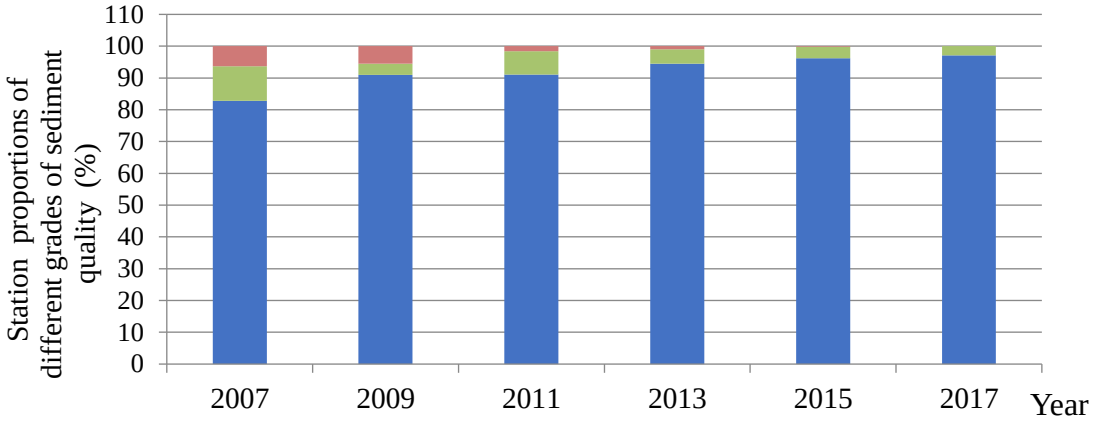
~~Original:~~ ***~~China publishes the China marine environment status bulletin every year. In this bulletin, the sediment quality monitoring was also carried out. The monitoring indicators include heavy metals, PCB, sulphide and organic carbon and petroleum. According to 2017 China marine environment status bulletin, 100% of the Yellow Sea sediment monitoring sites reached the "good" status. As for seawater, the areas polluted in the YS has been fluctuated between 2001 and 2016. In 2016, the average areas of seawater that had not reached the 1st grade of seawater quality standard was about 34,000 km^2, reduced by 1.5 km^2, the highest polluted sea area dropped by 37%. It is also noticeable of that the main pollutants of the seawater in the YS were inorganic nitrogen, active phosphate and oil (Figure 8). For marine sediment, however, about 91.7% of marine sediment sites in the YS coastal regional had met comprehensive quality grade 1 (good quality) as shown Figure 9 showing the marine sediment quality distribution. The marine sediment quality of the YS was good and annual variations were not significant.~~***

Updated text: China publishes the China marine environment status bulletin every year. As for seawater, the areas polluted in the YS has been fluctuated between 2001 and 2016. In 2016, the average areas of seawater that had not reached the 1st grade of seawater quality standard was about 34,000 km^2, the highest polluted sea area dropped by 37%. It is also noticeable of that the main pollutants of the seawater in the YS were inorganic nitrogen, active phosphate and oil (Figure 8). In this bulletin, the sediment quality monitoring was also carried out. The monitoring indicators include heavy metals, PCB, sulphide and organic carbon and petroleum. For marine sediment, in 2007, about 91.7% of marine sediment sites met comprehensive quality grade I (good quality), in 2017, the ratio increased to 100%. Figure 9 showed the marine sediment quality distribution trend in last 10 years. The marine sediment quality of the YS was good and annual variations were not significant.

13) Page 19: the Figure 8. Seawater quality in the YS as a function of time (from ***C-NSAP, p 24***) is updated as below:



14) Figure 9. Annual variation of integrated quality of sediments of the YS (2006-2015) (from C-NSAP, p 25) is updated as below:



15) Page 21: there are repeated use of "under this system" in the first three lines of paragraph 1; suggest to combine the second paragraph with second last paragraph of page 20
16) Page 22: suggest to delete "China Ocean Day" in the 3rd line of the paragraph 3; suggest to combine the second and third last paragraphs, with the second last paragraph in the front.
17) Page 27: from "In Mya to July" on, please combine with the preceding paragraph from the second line of the last paragraph. Suggest to add green tide.
18) Page 28: to replace "West Sea" with "YSLME" to maintain consistency in use of term across the publication.
19) Page 29: "red times" is used in the paragraph. Does it mean "red tide"?
20) Page 33: please add more details as follows to the last paragraph of 2.3:

"Marine hazards

Marine disasters in the coastal region of the Yellow Sea are mainly caused by storm surge (including near-shore waves), ocean waves, sea ice, green tide and red tide as well as coastal erosion. Saltwater intrusion, soil salinization and sea level rise related to climate change can also induce varying degrees of disasters. Climate change can also induce negative impacts on coastal and marine systems in the Yellow Sea. For example, salt marshes and seagrass beds may decline unless they can move inland, while coastal marshes will be vulnerable to saltwater intrusion with rising sea levels. Overall, in the influence of climate change, marine hazards seriously threaten the lives and property safety of residents in the coastal areas of the Yellow Sea and also obstruct the development of an ecological civilization of this region, becoming one of the restrictions to the economic and social development of the coastal region.

To address climate change, China has established the marine disaster prevention and mitigation operational system for the entire coastal region of the Yellow Sea, including the operational observing and monitoring network, the warning and monitoring system for marine ecosystems, marine environmental warning and forecasting integration as well as marine hazard mitigation and hazard risk prevention. Moreover, China is now exploring applications and practices in marine disaster emergency management, ocean-related spatial planning "multi-regulation", integrated marine management, and community disaster reduction, to mitigate and adapt to climate change. However, the function of coastal ecosystems on mitigating marine hazards is still insufficiently considered in the present work for marine disaster prevention and mitigation. Climate change impacts on coastal ecosystems in the Yellow Sea are still poorly understood, particularly for the damage to ecosystems caused by tropical and extratropical cyclones and storm surges.

Previous studies have suggested that coastal ecosystems, such as coastal wetlands, salt marshes and sandy coasts, can potentially play an important role in coastal defence, disaster risk reduction and carbon fixation, to mitigate and adapt to climate change. Therefore, it is recommended to implement coastal ecosystem protection and restoration projects, aiming at preserving and restoring coastal habitats for building natural infrastructure to increase resilience and biodiversity of the coastal habitats to reduce marine disasters. For some coastal areas in the Yellow Sea, hybrid living shorelines with traditional, hard infrastructure and nature-based defenses are also recommended to implement to reduce ecological and economic losses by mitigating storm, erosion and rising sea level risk associated with climate change. "

21) Page 34 second line of last paragraph: please add "ecological" in front of "redline policy". In the same paragraph, the 6th line says :"as of 2017…….". apparently the figure 23(b) is incomplete as it does not have data on year 2017.
22) Page 35 please use YSLME to replace "Yellow Sea Large Marine Ecosystem" in the second line.
23) Page 37: suggest to consolidate the paragraphs on Korea with the paragraph on the following page. Check the grammar of the second line of the first paragraph "before 2007……"; To standardize the expression of ha and km2 (i.e. the fourth line 2.1 million ha);

"China has steadily increased the number of MPAs. More critical habitats have been protected in YSLME region. More MPAs have been designated after 2007 in YSLME region, including Bohai Sea. Before 2007, there were 17 national level MPAs, with a total area of 15,000 km^2. By the end of 2018, the number increased to 58, and the total area was 21,000 km^2. "

24) review and validate the expression of the last paragraph on Korea (as of 2017……)

"As of 2017, Korea designated 28 MPAs along the entire Republic of Korea peninsula (Figure 27, Figure 41, K-NSAP, p 131), with a total area 586 km^2. These consisted of protected areas for wetlands (236 km^2), marine ecosystems (259 km^2), and marine organisms (91 km^2)."

25) Delete figure 26 and its related explanation.
26) Page 38: suggest to delete Figure 26.
27) Page 41: The purposes of Section 4.1 in the second line of the first paragraph are unclear. What is the source of information of "about 50 million" in the last sentence of the second paragraph?
28) Page 41: 3.1.1 is updated as follows:

"3.1.1 China

Three provinces form China's coastline on the Yellow Sea: Liaoning in the north, followed southward by Shandong and Jiangsu. They occupy an area of 410,000 km^2, accounting for 4.2% of the total land area of China. In 2016, the total population of this region was about 218 million, accounting for 15.8% of the total population of China. This population density is much higher than average for China. The major coastal cities of the Yellow Sea are Dandong, Dalian, Yantai, Weihai, Qingdao, Rizhao, Lianyungang, Yancheng, and Nantong. About 50 million people living in the coastal cities and counties of the Yellow Sea.

The coastal regions of the Yellow Sea in China have developed quickly in recent decades. In 2016, the Gross Domestic Product (GDP) of the three coastal provinces was 16.5 trillion yuan, which was 22% of the GDP of the whole country. Nationwide, Jiansu has the second largest economy in China, followed by Shandong with the third largest economy, and Liaoning with the 14th largest economy.

In 2016, the marine GDP of the coastal regions of the Yellow Sea was 2.38 trillion yuan , which was 3.2% of the GDP of the whole country and 33.8% of the marine GDP of the whole country. The major marine industries are marine fisheries, coastal tourism, the marine salt industry, the marine chemical industry, marine biological pharmaceutical industries, marine shipbuilding, the marine power industry, marine engineering projects, marine transportation, and comprehensive utilization of seawater.

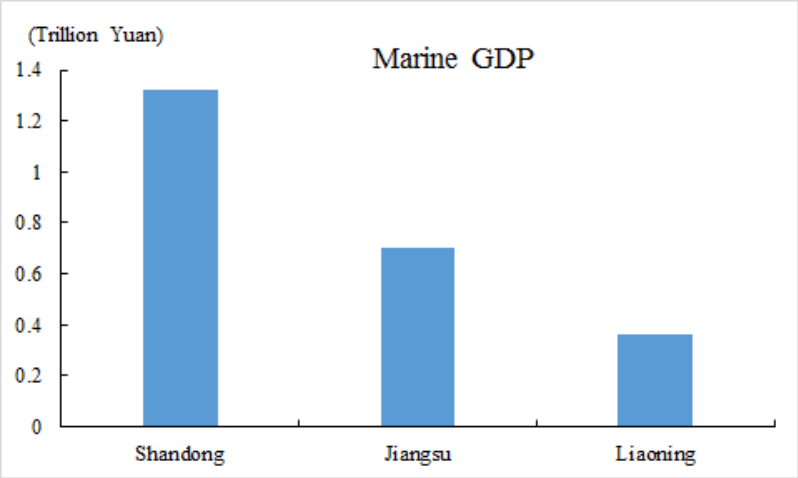


Fig.-- the marine GDP of the coastal regions of the Yellow Sea

The coastal regions of the Yellow Sea are well developed in industry and agriculture, of which their products play an important role in China. The transportation infrastructure is well developed with ample and well-maintained highways, airports, and harbors. The more than one hundred harbors are vital economic resources for China, of which Dalian Harbor is the most important in northeast China. Qingdao Harbor is the second largest harbour in terms of freight and ranks third in container transportation in China and 15th worldwide."

29) Please improve Section 3.1.2, and delete "overview and the first bullet point.
30) Page 42: the following paragraphs are added:

"3 YELLOW SEA LIVELIHOODS AND SOCIOECONOMIC IMPACTS

3.3 Mariculture

Positive effects on livelihoods and socioeconomic impacts

Compared with monoculture area, the density of kelp in IMTA demonstration area decreased by 33.43%, the average wet weight of kelp increased by 47.74%. The yield rate increased by 14.8%, the labor cost decreased by 10%, and the economic benefit increased by 57.85%. The monomeric oysters were increased from the average weight of 6.25g to 124.73g. The comprehensive benefit of the IMTA demonstration area was increased by 131.1%. The promotion of IMTA in Rongcheng was initiated by the government, which covers more than 10 thousand ha^2. And there is no long line aquaculture along the coastline within 1km on the sea. The density was highly reduced, the carrying capacity results of the project played essential effects. Both of the income and environment was improved.

Compared to the common indoor aquaculture, the outdoor pond in the land-based IMTA system is an extra part. The outdoor pond is only cultured sea cucumber and scallop. The investment and income are the extra fee compared to the indoor aquaculture. The sea cucumber is

harvested when the body weight is about 150g. The sea cucumber production is 2,250kg. The bay scallop is harvested when the shell length is about 7.0-8.0cm. The bay scallop production is 700kg. According to the price of the product and the cost in 2019, the profit of the outdoor pond (1 ha^2) is 190,300 Yuan. The P and N were reduced 30%-80% compared to the indoor aquaculture area, which was much more than the project target 5%.

According to the demonstration result, the IMTA, compare to traditional mono- or poly-culture, promotes economic and environmental sustainability by converting byproducts and uneaten feed from fed organisms into harvestable crops, thereby reducing eutrophication, and increasing economic diversification. Properly managed multi-trophic aquaculture accelerates growth without detrimental side-effects. This increases the site's ability to assimilate the cultivated organisms, thereby reducing negative environmental impacts. IMTA enables farmers to diversify their output by replacing purchased inputs with byproducts from lower trophic levels, often without new sites. Initial economic research suggests that IMTA can increase profits and can reduce financial risks due to weather, disease and market fluctuations. The positive effects are far more beyond negative impacts.

Negative impacts on livelihoods and socioeconomic impacts

Although IMTA is an efficient way of applying aquaculture which reduce the culture waste, it still human activities which impose additional biomass to the natural environment. IMTA inherit the same negative effects with regular aquaculture but has greatly minimize the impact. Some of the negative effects mainly includes natural effects such as unsustainable demand for wild seed or juveniles for fattening (e.g. shrimp and shellfish); affect the biodiversity of local environment et al. As the government advocate green development of aquaculture, the impact on the livelihoods and socio-economy of ecological aquaculture in YS will be more positive. There is very little negative impact on the livelihoods and socio-economy. "

3.4 Other Impacts

- Impacts to marine industries
- Changes in regulations on ballast water.
- Land-side impacts
- Upgrading infrastructure to reduce point sources of nutrients
- Changing practices for fertilizer application in agricultural lands
- Socioeconomic impacts of regulatory changes related to reclamation and commercial development in coastal areas.
- ***Management of Ballast water***

  Ballast water may lead to the invasion and large-scale propagation of marine organisms in different places, damage the ecological balance of the local sea areas, and harm the fishery resources. The transfer of harmful aquatic organisms and pathogens carried by ships' ballast water is listed as one of the four threats to the ocean by the global environment facility. In Feb. 2004, "the International Convention for the control and management of ship ballast water and sediment" was adopted at the diplomatic conference held in London. On Jan. 22, 2019, the convention entered into force in China. MSA of China had done lots of works to prepare and implementation of Ballast water convention, such as introduction of ballast water sampling and analysis standards, improvement of ability of treatment and acceptance of ballast water in ports, etc.

- ***Reduce point sources of nutrients***

  Local government has done a lot of work to reduce point sources of nutrients, for example, Jiangsu Province has formulated a work plan for the prevention and control of water pollution. The emphasis was placed on the regulation of heavy pollution enterprises and the promotion of cleaner production. In 2016, all chemical parks installed automatic on-line monitoring devices for wastewater. By the end of 2019, the sewage treatment rates of cities and counties will reach 95% and 85% respectively. In 2020, the new sewage treatment capacity of the province will reach more than 2.5 million cubic meters per day.

- ***Fertilizer usage in agriculture lands***

  Coastal provinces should adopt different fertilization strategies according to specific conditions to correctly handle the relationship between food security and environmental protection.

  (1) Provide guidance of chemical fertilizer deep placement by machinery, in order to limit the non-point source pollution caused by fertilizer over-use.

  (2) Adjust the structure of fertilizer use. Standards for fertilization limits for each region should be established rationally, to reduce haphazard use of chemical fertilizers, and optimize the ratio of N:P:K. Take activities to improve fertilization technology, to increase the application of organic fertilizer and biological fertilizer, and ensure sustainable development of agriculture.

  (3) Implement the organic fertilizer substitution demonstration project, to promote the organic fertilizer to replace the chemical fertilizer technology, and to promote actions of using organic fertilizer to replace of the traditional fertilizers. Gradually establish a high-quality and high-price guidance mechanism for agricultural products, and encourage the use of commercial organic fertilizer.

31) Page 42: newly added information on marine economy

    In the past decade, reclamation and development activities along the Yellow Sea had provided space for the socio-economic development of the coastal zone. Driven by economic growth, the employment opportunities and per capita income of the people in the coastal zone have increased, but at the same time, it has also caused some environmental problems. The loss of coastal wetlands, especially some important habitats, has greatly affected the large marine ecosystem of the Yellow Sea and some migratory species. It is gratifying that the Chinese government began a total ban on new reclamation projects in July 2018, while investing a large amount of funds for coastal wetland restoration and blue bay construction.

32) Page 43: please complete section 4.1; it is unclear the meaning of "status" in the table.
33) Page 44: please pay attention to the translation of the titles of legal documents in the first paragraph, for example the title of the "Marine Environment Protection Law" is provided in the collection of laws and regulations published by the Legal Office of the State Council of the PR China. In this case, English titles of laws should follow the translation provided in this collection of laws.
34) Page 45: Should information on DPR Korea be added? Based on the last ad hoc ICC the mechanism will not involve DPR Korea within the project.
35) Page 46: Primary Problems referred to Table 15 in the YSLME of Mariculture: Carrying capacity assessment for aquaculture has not been promoted; and IMTA promotion still need be strengthened.

36) Page 47: 5.1.2 second paragraph: delete.
37) Page 47: 5.1.2 third paragraph: Delete first sentence. Add the following text:

"*The IMTA demonstration, training course and promotion in Sanggou Bay was very successful. The Rongcheng government invest 120 million Yuan to promote standard IMTA in Rongcheng and the corresponding policy was released according to the demonstration results from NWG-M. The carrying capacity assessment, ecological aquaculture, land-based IMTA and so on, which is the core content in the IMTA training module published by YSLME-II, were listed in the national policy file "Accelerating the Green Development of Aquaculture Industry" released by 10 ministries including Ministry of Agriculture and Rural Affairs. "*

38) Page 47: 5.1.3 Increasing impact of extreme climate and heatwave to the mariculture, the following text is added:

"Climate Change impacts oceans, coastal and inland waters. It is believed that coastal systems and lower-lying areas will face increasing risks of flooding, seawater intrusion, coastal erosion and saltwater intrusion. Coastal systems face the most serious risks. For example, predictions of elevated carbon dioxide concentrations in seawater and the resulting acidification problems will have a physiological impact on the growth and reproduction of bivalves, which may affect the quality of the shell. However, climate warming will also increase the rate of attachment and growth of shellfish and expand the latitude of aquaculture, so climate change may also bring benefits. "

39) Page 48: 5.1.4 delete "and "Lack of comprehensive and coherent framework for coastal and marine resource development."
40) Page 48: In Section 5.1.5, add the following:

"Mariculture SAP targets

Target 1: establishment of aquaculture carrying capacity management for important species and typical aquaculture areas.

Target 2: aquaculture waste water comply with the industrial standard.

Target 3: standardized aquaculture and mechanization aquaculture promotion improves 30%-50% production efficiency.

41) Page 49: please update section 5.2.3 and 5.2.4:

~~***【original】5.2.3 Emerging Problems***~~

~~***Emerging problems related to pollution include:***~~

- ~~***Greater recognition that increased HAB blooms can enrich the YSLME in organic nitrogen.***~~
- ~~***Greater recognition of the extent and possible ecosystem damages at all trophic levels caused by micro-plastics in the environment.***~~
- ~~***Acidification: data are available in YSFRI on the effects on bivalves, and data from NMEMC.***~~
- ~~***PM2.5 and PM10 are suggested by ROK but are considered as factors contributing to silicate.***~~
- ~~***Threat of marine plastics greater than originally understood.***~~
- ~~***Contaminants of emerging concern (e.g., pharmaceuticals) associated with poorly treated or untreated wastewater.***~~

【updated】***5.2.3 Emerging Problems***

Emerging problems related to pollution in Yellow Sea I: Microplastics

As an emerging pollutant, microplastics in the marine environment are of increasing concern. A large amount of plastic waste enters the ocean through various ways. One of the studies shows that in 2010, 4.8-12.7 million tons of plastic waste was discharged from 192 coastal countries in the world. Plastic debris occurs at the sea surface, on coastlines, in Arctic sea ice, and on the sea floor. As plastics are difficult to degrade, they can accumulate in the ocean. It is predicted that by 2050, there will be more plastic than fish by weight in the oceans. Marine plastic is a serious threat to marine environment, especially microplastics less than 5 mm. It is called "PM2.5" in the ocean. Microplastics are ingested by marine organisms such as zooplankton, shellfish, and fish, which adversely affect the growth, development, and reproduction of the above-mentioned organisms.

Since 2016, Marine microplastic Pilot Monitoring Programme in China was carried out by State Oceanic Administration of China. The microplastics was monitored in 17 stations in the yellow sea. Comparison of the monitoring data with those of other published reports shows that the microplastic density in the Yellow Sea was in the lower-middle level. However, due to the limitation of monitoring capability, microplastic monitoring stations cannot cover the whole yellow sea area. In addition, there is still a lack of systematic research on the origin, flux into the sea, transmission path and ecological impact of marine microplastics in the yellow sea region.

Emerging problems in Yellow Sea II: Seasonal acidification

As a sink of atmospheric CO2, oceans absorb about 25% of anthropogenic atmospheric CO_2 emissions annually, progressively lowering levels of seawater pH and aragonite saturation state (Ω_{arag}), a process referred to as ocean acidification. It affects the growth, reproduction, metabolism and survival of marine organisms, which affecting the balance of marine ecosystems and the service functions to humans. However, ocean acidification in coastal regions is more complex as these areas are impacted by multiple natural and anthropogenic processes other than CO_2 uptake.

The Yellow Sea, a semi-enclosed shallow sea of the northwest Pacific, form a major marine zone in China with increasing sensitivity to ocean acidification. The seriously acidified seawaters with Ω_{arag} of less than 1.5 occupied one third of surveyed Yellow sea in summer and autumn, while subsurface water Ω_{arag} was generally lower than 1.0 in the central area in autumn. It also revealed that sea surface water with Ω_{arag} values above 2.0 will disappear for the whole Yellow sea by the year 2100. Notably, bottom water Ω_{arag} will drop to 0.8–1.9 and most subsurface water will develop substantial aragonite under saturation in the central areas.Thus, the Yellow Sea might represent a system highly vulnerable to the potential negative effects of ocean acidification in Chinese seas, where should be considered as a priority region for further research on ocean acidification and its synergistic effects on marine mammals and ecosystem structures.

Emerging problems related to pollution in Yellow Sea III: Atmospheric deposition

Atmospheric deposition input is generally equivalent to or even greater than the riverine input of some pollutants in the coastal waters (GESAMP, 1989; Duce et al., 1991), especially in the open sea, atmospheric deposition is the most important entry route for pollutants from human activities in the open sea area far from the land. The substances transported to the sea are mineral dust, plant residues, heavy metals, nitrogen compounds from combustion and fertilization, pesticides, and a range of industrial and synthetic organic compounds.

42) 5.2.4 “home heating emissions” changed to “electric power plant”
43) 5.2.5 Preliminary Recommendations to Guide SAP, add the following:

“In order to improve the prevention and control of marine plastics in the yellow sea region, it is suggested to carry out the following research in SAP:

1. ***Strengthen marine microplastics monitoring to provide scientific data support for pollution prevention and control; put forward effective strategy and management measures for marine microplastics***
2. ***Conduct in-depth research on the source, sea flux, transmission path and ecological impact of marine microplastics in the yellow sea region.***
3. ***Control the input of “raw” plastic debris from land-based source, such as decreasing or eliminated the usage of disposal plastic products, encourage the recycle usage industries of plastic, prevent the plastic debris move to sea through river and estuary.***

In 2008, China government revised the law on “prevention and control of atmospheric pollution in China” . The main modifications include:

1. ***strengthen the responsibility of local governments and strengthen assessment and supervision;***
2. ***promote the transformation of the mode of economic development, optimize the industrial structure, adjust the energy structure, and improve the quality standards of products containing volatile organic compounds such as coal, tar, biomass fuels and coatings;***
3. ***strengthen the comprehensive prevention and control of atmospheric pollution such as coal combustion, industry, motor vehicles and vessels, dust-raising and agriculture.***
4. ***regional coordinated control of particulate matter, sulfur dioxide, nitrogen oxides, volatile organic compounds, ammonia and other atmospheric pollutants and greenhouse gases.***
5. ***strengthen the punishment of atmospheric environmental violations, raise the upper limit of fines, and refine the provisions of daily punishment.”***

44) Page 50. Please improve Section 5.3.3. Kyoto Protocol is referred in the last line of this page. Please update and KP is now replaced by other protocols now. Please improve Section 5.2.3.
45) Page 51: please verify cordgrass, invasive species and emerging issues.
46) Page 51: In Section 5.4.1 delete the following:

~~***“The introduction of non-native planktonic species through uncontrolled releases of ballast water has threatened YSLME ecosystems with imbalances in ecosystem structure.”***~~

Add the following:

“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. “

47) In Section 5.4.2, add the following:

“Activities to prevent or control the spread of invasive alien species have been targeted to developing better technologies such as physical, chemical or biological technologies to control spread of invasive species.”

48) In Section 5.4.3 please add:

Construction of MPA network: Identification and construction of MPA network is an effective way to protect biodiversity and address climate change. A better planned MPA network could bring more benefits to ecosystem than the total of every single member of this network. Currently, the MPA network construction is far from being completed. To better construct a MPA network, we need to learn and develop scientific tool for MPA planning, conduct gap analysis, monitor migratory route of target species and so on.

49) Page 52: In the third line of the second paragraph, please revise the last sentence as "***Shorebirds' main foraging areas are….".***

50) Page 52: please verify statements in Section 5.4.5.