Analysis of China's coastal zone management reform based on land-sea integration

Dahai Liu and Wenxiu Xing
First Institute of Oceanography, Qingdao, China

Received 19 March 2019
Accepted 19 April 2019

Abstract

Purpose – After the 19th CPC national congress, Chinese Communist Party and the government put forward higher requirements for the development of coastal zones, and it is urgent to establish an integrated coastal zone management system, so as to better guarantee the construction of maritime powers and regional coordinated development. The purpose of this paper is to aim at re-examining and positioning China's integrated coastal zone management.

Design/methodology/approach – This paper sorts out the current situation of coastal zone resources and environment, summarizes prominent problems and clarifies the path of comprehensive management of coastal zone based on the typicality and comprehensiveness of coastal ecosystem.

Findings – Coastal zone is a typical area of "life community shared among mountains, rivers, forests, fields, lakes and grass." However, there are three prominent problems at present, namely, separation between land and sea, separation among industry sectors and separation among administrative jurisdictions. Coastal zone planning and legislation are important measures to realize the comprehensive management of coastal zone.

Originality/value – This paper puts forward some suggestions on the reform of coastal zone management from the perspective of planning and legislation.

Keywords Legislation, Planning, Coastal zone management, Current situation, Prominent problem

Paper type Viewpoint

China's coastal zone is an arc-shaped ribbon protruding to the southeast, with 18,000 km of mainland coastline and 14,000 km of island coastline, from the mouth of the Yalu River in Liaoning province in the north to the mouth of the Beilun River in Guangxi Zhuang Autonomous Region in the south. At the forefront of reform and opening up in the past 40 years, the coastal zone is not only the "golden coastal zone" where China's population, capital and technology are most concentrated, but also an "ecologically fragile zone" where there is intense land-sea interaction. The coastal zone has become China's economic zone with the highest economic density, the strongest comprehensive strength and the greatest strategic support. In 2017, 11 provinces along China's coastal zone, which occupy about 13.5 percent of the national territory, nurtured 43 percent of China's population and contributed 57 percent of its GDP. In particular, coastal cities which cover an area of only 4.6 percent of China's national land, nurtured 18.4 percent of the country's population and contributed 34 percent of the country's GDP.

However, the coastal zone is strongly influenced by the process of population growth, urbanization and the rapid development of the marine economy (Igumnova *et al.*, 2009). The resources and environment of the coastal zone are undergoing unprecedented abnormal changes, and many common problems hindering sustainable utilization have emerged: continuous reduction of natural coastal wetlands, severe contamination in some coastal

Marine Economics and Management
Vol. 2 No. 1, 2019
pp. 39-49
Emerald Publishing Limited
2516-158X
DOI 10.1108/MAEM-03-2019-0001

waters, frequent environmental disasters in coastal zone (Turner, 2000), unbalanced regional development, convergent industrial structure and extensive utilization of resources (Dauvin, 2008). The coordinated development of coastal zones has become an important focus for society at large.

From the perspective of national strategy, higher requirements are required for the development of coastal areas, which should not only achieve their own high-quality development, but also coordinate with the Yangtze River Economic Zone and the Yellow River Eco-economic Zone so as to form a grand national strategic pattern of "jointly connecting south and north, east and west." The report of the 19th National Congress of the CPC puts forward the ideas of "implementing the strategy of coordinated regional development," "establishing a more effective new mechanism for coordinated regional development," and "pursuing coordinated land and marine development, and stepping up efforts to build China into a strong maritime country." On November 18, 2018, the Central Committee of the CPC and the State Council put forward suggestions on the establishment of a more effective new mechanism for coordinated regional development. On the one hand, planning should be regarded as the guide to promote the comprehensive coordinated development of land and sea in spatial distribution, industrial development, infrastructure construction, resource development and environmental protection. On the other hand, comprehensive plans for coastal zone protection and utilization should be formulated and implemented to strictly control reclamation and promote integrated land and sea ecological protection and rehabilitation in coastal areas.

In light of the above, it is urgent to establish a comprehensive coastal zone management system for the coordinated development of land and sea, so as to better guarantee a maritime power and the coordinated regional development. Based on analysis of the current situation of coastal resources and environment, this paper summarizes the prominent problems in the process of coastal zone management and then discusses the ways of implementation and reform suggestions on coastal zone management for coordinated development of land-sea integration.

1. Current situation of coastal resources and environment

Coastal zone is the material foundation for sustainable economic development and plays an important role in China's economy. China's coastal zones span three climatic regions from north to south, namely warm temperate zone, subtropical zone and tropical zone, and they are abundant in space resources and material resources.

1.1 Abundant space resources in coastal zone

China's coastal zone has important special land resources and provides strategic space to support the country's future social and economic development. Such resources and space mainly include coastal waters, coastline, estuaries, bays, islands, coastal wetlands and other space resources.

In accordance with international law and the relevant provisions of the United Nations Convention on the Law of the Sea, the area of the sea under China's jurisdictions can reach 3m sq. km, of which 380,000 sq. km is the territorial sea with the same legal status as the land territory. The mainland coastline is more than 18,000 km and according to the statistics from 908 Special Surveys on coastal zones in coastal provinces, the proportion of artificial coastlines in the mainland of China has reached 61.55 percent, and some cities do not have natural coastline at all. China's coastline is dotted with more than 1,800 estuaries of various sizes and types, including more than 60 estuaries with rivers over 100 km in length. In addition, it has more than 160 bays covering more than 10 sq. km (State Oceanic Administration, 2012). According to the results of the national census regarding the names of sea waters and islands, there are more than 11,000 islands in China, of which 6,961 islands

have an area of more than 500 sq. km (excluding Hainan Island and the islands belonging to Taiwan, Hong Kong and Macao), accounting for about 0.8 percent of the country's land territory. A large number of offshore islands could pave the way for island development in China. Coastal wetlands are widely distributed in China. According to statistics, in 2015, the total area of offshore and coastal wetlands was about 5.796 million hectares, of which the area of coastal wetlands in Jiangsu and Guangdong was the largest with 1,087.5 thousand hectares and 815 thousand hectares, respectively (State Oceanic Administration, 2016).

1.2 Sharply increasing demand for material resources in the coastal zone

With the rapid development of the national economy and the growing scarcity of land resources, the development of economy and society has a desperate demand for material resources including marine biological resources, water resources, and mineral resources in the coastal zone and the ocean. There are about 20,278 species of marine aquatic life in China, accounting for about 10 percent of the world's total marine species. In terms of development and utilization, China's marine products mainly rely on marine aquaculture and marine fishing. In 2016, the output of national marine products was 349,014m tons, with 196,313m tons of marine aquaculture production and 132,827m tons of marine fishing production, accounting for 56.25 and 38.06 percent, respectively. More than one-fifth of protein food in China is supplied by these marine products (Research group, 2013), and the coastal zone has become strategic base of China's food security. In recent years, the scale and level of seawater resources utilization in China have been continuously expanding. Among the various uses of seawater, industrial cooling water accounts for more than 90 percent of the total amount of utilized seawater in China, followed by seawater desalination. By the end of 2015,121 seawater desalination projects were completed in nine coastal provinces excluding Shanghai and Guangxi (Ministry of Natural Resources, 2016a, b). Oil and gas resources and coastal placer resources are buried in China's coastal zone, which play an important role in promoting economic development. According to the results of The Third National Assessment of Oil and Gas Resources, China's potential petroleum resources are more than 107bn tons, of which 24.6bn tons are offshore oil resources, accounting for 23 percent of China's total petroleum resources. The potential natural gas resources are 54.54 trillion cubic meters, among which the marine natural gas is 16 trillion cubic meters, accounting for 30 percent of the total national resources. Coastal placer mine is one of the most important mines in the coastal zone next only to the submarine oil, which is mainly distributed in Zhejiang, Fujian, Guangdong, Shandong, Hainan and other places, most of which are located near the shore in small and medium size with annual output within several thousand tons to ten thousand tons. However, in recent years the amount of exploitation has been increasing year by year, especially regarding the rapid increase in the amount of sand explored for construction.

1.3 The great pressure on ecological environment in coastal zone

With the tremendous increase in the population of the coastal zone and the accelerating urbanization process, there has been greater pressure on the development of the coastal resource environment. While bringing great economic and social benefits to the coastal zone, the environment and resources of the coastal zone are experiencing unprecedented changes. Many serious problems that hinder sustainable utilization have occurred.

First, the condition of the typical ecosystem is poor. As one of the typical coastal ecosystem, coastal wetlands are located in the transitional zone between terrestrial ecosystem and marine ecosystem. According to the available statistics, since the 1950s, more than 2m hectares of China's coastal wetlands have been lost, which are equivalent to 50 percent of the total coastal wetlands (Zhang *et al.*, 2005). The natural wetlands that experienced greatest reduction include beach, mangrove wetland and delta wetland.

In recent years, although China has redoubled efforts on the restoration and protection of wetlands, most of the wetland ecosystems are still in a sub-optimal state.

Second, pollution remains severe in some waters. Since the introduction of "the 10th Five-year Plan," four types of inshore water with inferior quality have increased from about 32,000 sq. km in 2001 to 35,000 sq. km in 2016 (Ministry of Environmental Protection China, 2017), with a growth rate of 16 percent. Part of the inshore waters are influenced by compound pollution problems like the eutrophication, poisonous and harmful pollutants, which are mainly concentrated in Liaodong Bay, Bohai Gulf and Laizhou Bay, Jiangsu Coast, the Yangtze Estuary, Hangzhou Bay, Pearl River Estuary and other major estuaries.

Third, coastal environmental disasters frequently hit. In 2016, a total of 68 red tides were detected in the whole area, with cumulative areas reaching about 7,484 sq. km (Ministry of Natural Resources, 2017). Compared with the average value of the past five years, the number of red tides detected increased by 18 percent and the cumulative areas increased by 15 percent. Enteromorpha tide has gained momentum, covering a maximum average area of 41,900 sq. km in the past five years and increasing by 33 percent compared with "the 11th Five-year Plan" period. Seawater intrusion and soil salinization are also expanding in some areas. The most serious seawater intrusion areas are mainly distributed in the coastal plain of the Bohai Sea. The seawater intrusion's distance along the coasts of Hebei and Shandong is generally 13~25 km from the shore. The areas with serious soil salinization are mainly distributed in the Bohai coastal plain which belongs to the monitoring areas of Hebei, Tianjin and Shandong, and the salinization spots are generally 10~25 km away from the shore. Storm surges and huge wave disaster losses have increased. From 1980 to 2015, the rate of sea level rise in China's coastal areas was 3 mm/year, higher than the global average (Ministry of Natural Resources, 2016a, b). Accidents such as oil spills and dangerous goods leakages were frequent. In the past four decades, there have been about 3,000 oil spill accidents from ships in China's coastal areas, with an average pollution accident occurring every four or five days (Lan *et al.*, 2014).

Fourth, coastal resources are excessively exploited and utilized. Ways of development and utilization of coastal zone resources in China mainly include the salt pans, cultivation, fishing, ports, oil fields, oil chemicals, electric power, industrial parks, tourism and nature reserves. For a long time, the development and utilization of the coastal zone in our country have generally been following a resource-based model, which is characterized by single-type industry on a small scale. Coastal exploitation and utilization have the prominent issues of exclusivity, lack of comprehensiveness and optimization and the combination of different uses of coastal resources, resulting in low economic efficiency, waste of resources and insufficient use of the comprehensive benefits of coastal resources. In addition, the industrial structure in the coastal zone is unbalanced, characterized by more traditional industries and fewer emerging industries, and more energy-consuming enterprises and fewer low-emission industries. The upstream and downstream industrial chains are insufficiently extended and the industrial homogenization is serious. Some industries with high risks, high emissions and high pollution are located in the vicinity of important marine ecological areas so that the risks on marine environment are increased, and the contradictions between the industrial layout and the bearing capacity of resources and environment of land and sea still exist (Zheng, 2019).

2. Prominent problems in coastal zone management

The prominent problems in coastal zone management can be summarized into three types – separation between land and sea, separation among industry sectors and separation among administrative jurisdictions. They are also the main reasons for the unbalanced development, the depletion of natural resources and the deterioration of ecological environment in coastal zones.

2.1 Separation between land and sea

Coastal zone is the interlaced zone where the land and the sea interact. Due to the complexity of natural elements and ecological processes, the coastal zone has become a unique ecosystem which is different from both the general terrestrial ecosystem and the typical marine ecosystem (Han and Du, 2007). In China, planning and legal system application rules are shown in Table I.

There is no effective and overall coordination mechanism between the legal and planning systems of the land and sea, making it impossible to utilize and protect coastal zones in the best way, especially the intertidal zone where the interaction between the land and the sea is the strongest. Such a lack of institutional design and management system makes the overall development with land and sea as a whole of the coastal zone in a low level. The functional layout of the land and the sea space, the infrastructure construction and the resource allocation are unbalanced and inadequate (He, 2018). The inadequate coordination between the environmental improvement and disaster prevention among the regions, watersheds and sea areas goes against the national strategy to implement coordinated development plans for land and sea.

2.2 Separation among industry sectors

Coastal zone is not only an area with the most intensive production activities and the highest degree of development, but also an area managed and planned by various competent departments. Before institutional reform in 2018, China's coastal zone was under the management of various departments, such as Ministry of Land and Resources, Ministry of Housing and Urban-Rural Construction, Ministry of Environmental Protection, State Forestry Administration, State Oceanic Administration, Ministry of Water Resources and other departments, with each department carrying out their own duties, respectively, to manage land or sea, resulting in competing policies from different departments and the absence of actual effective management. The overlapping of different spatial planning of the coastal areas, the decentralization of the supervision and law enforcement responsibilities and the fact that no department took responsibility for all people-owned natural resources and asset, made it difficult to carry out comprehensive management in coastal zone forward effectively. The marine-related work has been impeded by the problems of land-sea integration, river-sea connection and coastal zone regional coordination for a long time. The problems are especially prominent in the land source pollution prevention and control, marine economic regulation and control and intensive use of sea reclamation.

After the institutional reform, although the spatial planning has been largely handed over to the Ministry of Natural Resources, the lack of comprehensive management laws, regulations and policies will cause conflicts of interest and competition among different departments, leading to accumulated contradictions and problems in practice. This negatively affects the new pattern of all-round coordinated development to promote the space layout of the coastal zone, industrial development, infrastructure construction, resource development and environmental protection (CPC Central Committee and State Council, 2018).

Areas	Applications
Land side of the coastal zone	Land-use planning, urban planning, Land Management Law of the People's Republic of China, etc.
Ocean side of the coastal zone	Planning of marine functional zones, marine functional zoning and the Law of the People's Republic of China on the Use and Management of Sea, etc.

Table I. Comparison of land and Ocean management policies

2.3 Separation among administrative jurisdictions

China has a long coastline, and the coastal zone is composed of administrative jurisdictions at different levels. Over the years, based on the strategic deployment with the eastern region taking the lead in development, several national coastal development strategies have been deployed successively, such as Regional Cooperation Development of Tumen River in Jilin Province, Liaoning Coastal Economic Belt, Tianjin Binhai New area, Blue economic zone in Shandong Peninsula, Jiangsu Coastal Area, Pudong New Area in Shanghai, Zhejiang marine economic development demonstration region, Western Taiwan Straits Economic Zone in Fujian Province and Pearl River Delta Region in Guangdong Province, Beibu Gulf Economic Zone in Guangxi Province, International Tourism Island in Hainan Province and so on. However, with the improvement of marine development capability and the gradual upgrading of marine industry, the competition of marine developments among different provinces has intensified (Li *et al.*, 2011). Meanwhile, the industrial structure has obvious problems of convergence and low quality even with the phenomenon of mutual conflicts and contradictions. Even in the same coastal province, each sub-jurisdiction has difficulty in forming the overall planning of marine development and utilization. The main reason is that there is no adequate and effective overall coordination mechanism across jurisdictions. Moreover, among administrative jurisdictions, there is no adequate and effective overall coordination mechanism in the industrial layout, construction planning and environmental protection. In such a situation, it is difficult to promote complementary and coordinated development of the whole coastal zone and implement the regional coordinated development of national major strategy (Figure 1).

3. Path choice of coastal zone management based on the coordinated development of land and sea

In order to better implement the strategic deployment of the national coordinated development of coastal zones, adhere to the overall planning of land and sea, and accelerate the construction of maritime power, it is essential to fully understand the regional characteristics, ecological features, land and sea attributes and industrial development status of coastal zones in order to coordinate the development of coastal zones with targeted legal systems and planning tools.

3.1 Ecological features of land and sea in coastal zones

Coastal zone is a typical region of "life community shared among mountains, rivers, forests, fields, lakes and grass" (Huang, 2018). The land and sea resources in the coastal zone interrelate with each other, and the ecosystems are interconnected with its functions. There is ecological connection among "mountains, rivers, forests, fields, lakes and grass," and the land and the sea form an interdependent life community:

(1) The ecosystems of land and sea are mutually integrated. The land and the sea form a cyclic ecosphere, in which water, soil, organisms and other ecological elements in the coastal zone are generally connected. There is ecological connection among "mountains, rivers, forests, fields, lakes and grass," and the land and the sea ecosystems are integrated with each other. For example, the input of terrestrial nutrients contributes to the growth of marine biomass, and the moisture from the sea makes the land vegetation flourish. The transport of silt by rivers promotes the development of coastal wetlands. Moreover, fish migrate, spawn and reproduce between rivers and oceans, and birds roost and forage in mountain forests and coastal beaches.

(2) There exists spatial relation between ecological damages to the land and the sea (de Groot *et al.*, 2002). The water, soil, organisms and other ecological elements in the

Figure 1.
Regional strategic distribution map of China's coastal areas

coastal zone interact with each other, and the ecological damages of "mountains, water, forests, fields, lakes and grass" are also related to each other. Therefore, there is a spatial relation between ecological damages to the land and the sea. For example, the pollution of river water may lead to the damage of marine environmental quality and cause an algal bloom disaster. Excessive exploitation of groundwater might cause seawater intrusion and land salinization. And the flow cutoff of rivers and the consequent decrease of silt transported can result in coastal wetland degradation. What's more, coastal wetlands and mangrove destruction cause coastal geological disasters. Dam construction blocks the fish migration channel, and land reclamation destroys foraging and habitat of birds.

Therefore, it is necessary to take an overall perspective to keep balance between the current and long-term, land and sea, demand and supply, development and protection and to coordinate all kinds of utilization demands in coastal zones. And in the meantime, the functional development and elements allocation in adjacent land and sea areas should be fully connected. According to the internal and compatible relations between the natural ecological functions and the spatial influencing scope, the systematic and integrated solutions to see the land and the sea as a whole can be found.

3.2 Path to achieving comprehensive management in coastal zones

The root cause of the three "separations" is the lack of an overall coordination mechanism between departments and regions in coastal zone. Due to the lack of an institutionalized and long-term mechanism, the overall coordination of the coastal zone across natural geographical units, industry sectors and administrative jurisdictions in a "life community shared among mountains, water, forests, fields, lakes and grass" is not only inefficient and costly in administration, but also leads to the overlapping of planning and conflicts between functions (Powell *et al.*, 2009). A comprehensive coastal zone management system should be established from the top down at the national level. This could deal with the three management "separations," achieve coordinated overall planning and the coordinated regional development of land and sea in the coastal zone, control the development and utilization of land and sea scientifically and rationally, and restore the deteriorating ecological environment in the coastal zone. Based on the national development and planning goals and national spatial planning pattern, and directed by the important philosophy of "life community shared among mountains, water, forests, fields and grass," the planning and legislation work in coastal zones can be promoted as the key issue in the overall development of the land and the sea. It is a significant measure to remove the barrier of management, set up the management chain, strengthen the legal basis and promote the coordinated development between land and sea from "isolated development" to "complementary symbiosis":

(1) Coastal zone planning is the key to establishing a comprehensive coastal zone management system. Coastal zone planning is comprehensive and coordinated, targeted at various kinds of problems in coastal zones. It is also a unification of "strategic planning" and "workplanning," and a unification of "spatial planning" and "development planning." The ecological protection, industry development, urban construction and environmental governance factors are included comprehensively in this planning which not only directs the establishment of the overall development and protection framework in coastal zones, but also includes the specific management suggestions. From the perspective of the process of overall management in the coastal zone, the coastal zone planning is the key step to comprehensive management of coastal zone, which includes preliminary investigation, analysis and research at early stage and implementation, supervision and feedback in the later stage (Huang and Huang, 2010). It also formulates the implementation plan and procedure of the overall coastal zone management and is the key step of comprehensive management of the coastal zone.

    According to the coastal zone planning, the key area is within 10 km of the intertidal zone facing toward the land and the sea. Based on the resource and environment carrying capacity and the development situation and potential of the coastal zones, overall considerations should be given to the population distribution, industrial structure and layout so as to coordinate the relationship between the natural resources protection and the social and economic development in the coastal zone in a comprehensive way. A series of scientific and reasonable planning and zoning should be established and the measures of use classification and control should be taken so as to strictly control the access of industries on the negative list to the coastal zone. High-quality development of regional economy should be encouraged to set up the new pattern of land-sea integration in space development and protection in the coastal zone. It can be said that as the key to establishing a comprehensive coastal zone management system, coastal zone planning cannot only provide institutional support for comprehensive management of coastal zones, but also provide a preliminary basis for the legislation of coastal zone management and the formulation of various technical norms and standards for coastal zone management.

(2) Coastal zone legislation is the legal safeguard for the establishment of a comprehensive management system in coastal zones. Developed ocean countries around the world attach great importance to coastal zone management, and they have introduced a series of legal systems successively, such as the US Coastal Zone Management Act, the UK Coastal Protection Act, Japan's Coastal Act, Australia's Coastal Protection and Management Act, and South Korea's Coastal Zone Management Act (Han, 2013). For China, the key content of coastal zone planning and comprehensive management system is the multi-sectoral and multi-field planning and regulatory policies as well as the comprehensive coordination mechanism. Such cross-field, cross-sectoral and cross-regional regulatory policies, and coordination mechanism established from the top down must be safeguarded by normative documents at the legal level. Without the legal "escort," it is difficult for the comprehensive coastal zone management system to give full play to its expected effect. Only in the form of laws can a macro and comprehensive policy system and coordination mechanism be built from the top level, including the establishment and distribution of rights and obligations of overall coordination, the establishment of overall objectives and basic principles of the comprehensive management of coastal zones and the evaluation and review system.

4. Suggestions on promoting the reform of the overall management of land and sea in coastal zones

(1) Preliminary studies should be strengthened and coastal zone planning should be promoted continuously. Coastal zones are key areas and strategic platforms to promote the coordinated development of land and sea, green coordinated development, and high-quality economic development. Coastal zone planning is an important part of improving the land-sea overall spatial planning system, and it is the "main battlefield" to optimize the land space layout of offshore area, expand the space for marine economic development, and realize the "integration of several plans." It is suggested that the preliminary studies of coastal zone planning should be strengthened and that the internal and logical relations among coastal zone planning and market mechanism should be improved. Moreover, land-sea coordination, natural resources, ecological environment, spatial usage control and other aspects should be understood fully. Full consideration should be given to the particularity of marine territorial space and its development and protection. Meanwhile, marine spatial planning and zoning, use classification and regulatory methods should be unified with the land in guiding principles, technical routes and regulatory principles so as to achieve coordination and connection in the comprehensive management of the coastal zone. If this is implemented then a solid foundation will be laid for the unified execution of the responsibilities for all people-owned natural resources and assets, land and sea use regulation and ecological conservation and restoration (Huang, 2018). With the "high quality" as the aim, the "opening" pattern as the foundation, the "large area" as the yardstick to deal with the relation between protection and utilization and guided by the principle of promoting the coordinated development of society, economy and nature, the coastal zone planning should be comprehensively promoted and upgraded to national mid-and long-term development strategy for coastal zones, forming the new pattern of national spatial strategy with the Yangtze River Economic Belt and the Yellow River Ecological Economic Belt.

(2) Comprehensively review the current relevant laws and regulations and promote the introduction of the "Coastal Zone Management Act." Coastal zone management

involves different fields, departments and disciplines of the land and sea economy. It is necessary to formulate special laws for coastal zone management and strengthen the overall coordination of the coastal zone so as to ensure the balance between the sustainable utilization of coastal resources and the level of comprehensive benefits. Therefore, it is recommended that the related legislative activities should be carried out with Xi Jingping's thought on Socialism with Chinese Characteristics for a new era as the guiding ideology. This will go together on the basis of the, unified execution of the responsibilities for all people-owned natural resources and assets, and land and sea use regulation, and ecological conservation and restoration (Huang, 2018). The fulfillment of the responsibility for the natural resources assets in the coastal zone and the spatial planning reform are also an important foundation. On the one hand, adequate preparatory work should be done for Coastal Zone Legislation by investigating the existing laws and other normative documents and sorting out the clauses that are conflicted and overlapped and the blank fields, especially those that can be addressed by institutional reform. On the other hand, by adhering to the principle of having protection and conservation as the top priority, the legislation work of Coastal Zone Management Act can be initiated in a timely way, focusing on the overall coordination mechanism and aiming at the coordination between the land and the sea by different departments and regions.

References

CPC Central Committee And State Council (2018), "Opinions of the CPC central committee and the state council on establishing a more effective new mechanism for coordinated regional development", available at: www.sohu.com/a/279317340_100088635 (accessed November 29, 2018).

Dauvin, J.C. (2008), "The main characteristics, problems, and prospects for Western European coastal seas", *Marine Pollution Bulletin*, Vol. 57 Nos 1-5, pp. 22-40.

de Groot, R.S., Wilson, M.A. and Boumans, R.M.J. (2002), "A typology for the classification, description, and valuation of ecosystem functions, goods, and services", *Ecological Economics*, Vol. 41 No. 3, pp. 393-408.

Han, L.M. and Du, X.Y. (2007), *Ocean Economics Review of China*, Economic Science Press, Beijing.

Han, T.P. (2013), *Legislation Research on China's Coastal Zone Management*, Ocean University of China, Qingdao.

He, L.F. (2018), "Report on the work of developing the Marine economy and accelerating the building of a maritime power", available at: www.sohu.com/a/284503926_99917889 (accessed December 26, 2018).

Huang, K.N. and Huang, S.L. (2010), "An exploratory study of integrated coastal zone management in China", *Journal of Shanghai Ocean University*, Vol. 19 No. 2, pp. 246-251.

Huang, X.J. (2018), "Land ecological economics and territorial space use control: the academic contribution of the work 'land ecological economics' ", *China Land Science*, Vol. 32 No. 2, pp. 1-5.

Igumnova, E.M., Solodova, S.M. and Timchenko, I.E. (2009), "Management of the coastal-sea-zone-ecosystem model", *Physical Oceanography*, Vol. 19 No. 1, pp. 32-44.

Lan, D.D., Sui, W.N., Wang, Z.Z., Liang, B., Xu, Y., Li, M. and Ma, M.H. (2014), "Study on prevention of marine oil spill risk zoning", *Ocean Development and Management*, Vol. 31 No. 12, pp. 12-18.

Li, J.Y., Li, J.X., Ren, J.Y. and Chen, H. (2011), "Liaoning province should strengthen the national pilot area for overall land-sea development", *Decision-Making & Consultancy*, No. 5, pp. 25-30.

Ministry of Environmental Protection China (2017), "Offshore sea environmental quality bulletin", available at: www.cnemc.cn/jcbg/zgjahyhjzlgb/ (accessed May 22, 2018).

Ministry of Natural Resources (2016a), "China sea level bulletin 2015", available at: http://gc.mnr.gov.cn/201806/t20180619_1798296.html (accessed September 17, 2018).

Ministry of Natural Resources (2016b), "National seawater utilization report 2015", available at: http://gc.mnr.gov.cn/201806/t20180614_1794750.html (accessed October 10, 2018).

Ministry of Natural Resources (2017), "China's Marine environment bulletin 2016", available at: http://gc.mnr.gov.cn/201806/t20180619_1797645.html (accessed January 13, 2019).

Powell, R.B., Cuschnir, A. and Peiris, P. (2009), "Overcoming governance and institutional barriers to integrated coastal zone, marine protected area, and tourism management in Sri Lanka", *Coastal Management*, Vol. 37 No. 6, pp. 633-655.

Research group (2013), *Ecosystem Issues and Policy Options Addressing the Sustainable Development of China's Ocean and Coasts*, China environment press, Beijing.

State Oceanic Administration (2012), "National marine functional zoning 2011-2020", available at: https://wenku.baidu.com/view/7a6bde96783e0912a3162a31.html (accessed March 18, 2019).

State Oceanic Administration (2016), *China Ocean Statistics Yearbook 2015*, China Ocean Press, Beijing.

Turner, R.K. (2000), "Integrating natural and socio-economic science in coastal management", *Journal of Marine Systems*, Vol. 25 Nos 3-4, pp. 447-460.

Zhang, X.L., Li, P.Y., Li, P. and Xu, X.Y. (2005), "Present conditions and prospects of study on coastal wetlands in China", *Advances in Marine Science*, Vol. 23 No. 1, pp. 87-95.

Zheng, M.Z. (2019), "Take multiple measures to strengthen the protection of marine resources and environment", available at: www.sohu.com/a/287145701_100122948 (accessed January 8, 2019).

Corresponding author
Wenxiu Xing can be contacted at: xingwenxiu@fio.org.cn