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# The legal system for environmental protection during exploration and exploitation of marine mineral resources in China

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ABSTRACT

Great achievements have been achieved in exploring mineral resources in China since recent decades, which have significantly contributed to the climate change on the other hand. Environmental laws perhaps at par values to govern and administer the ecological environment protection in the exploration of natural resource such as marine mineral resources. China has developed various laws and policies to administer its extensive economic growth coupled with the utilisation of marine mineral resources. This study adopts both qualitative and quantitative means for data collection and content analysis of current legal developments in this regards. Therefore, the study aims to discuss practices and contributions China has made concerning the exploitation of marine mineral resources and the protection of the marine environment. The focus then turns to the adaptation of Chinese laws regarding the exploitation of marine mineral resources in its continental shelf and the Area. To this end, some lessons can be learned from other State practices such as Germany and the Czech Republic. The paper concludes by suggesting that China should actively participate in the mineral resources development and ecological environmental protection works to improve laws governing the ecological environment protection obligations on Chinese and foreign enterprises, in order to provide a legal basis for the ecological environment protection of China's maritime areas.

## 1. Introduction

Pursuant to the 1982 United Nations Convention on the Law of the Sea (UNCLOS),[1] the coastal State exercises, over the continental shelf, sovereign rights for the purposes of exploring it and exploiting its natural resources, however, other States may participate in the exploration and exploitation, through cooperation with the coastal State. This article aims to discuss practices and contributions China has made concerning the exploitation of marine mineral resources and its efforts concerning the protection of the marine environment. Special attention has been paid to the relevant Chinese laws concerning the ecological environment protection in the mineral resource exploitation in the Area.[2] In this regard, some lessons can be learned from other State practices such as Germany and Czech Republic. The balance between Chinese laws, regulations and rules for protection of the marine ecological environment as well as the exploration of marine mineral resources is also discussed (Chang, 2019). The paper concludes by suggesting that, China should actively participate in the mineral resources development and ecological environmental protection works. There is also a need for China to improve its laws governing the ecological environment protection obligations of Chinese and foreign enterprises, in order to provide a legal basis for the ecological environment protection of China's maritime areas.

## 2. Practices and contributions made by China concerning the exploitation of marine mineral resources and the protection of the marine environment

### 2.1. China's practices in the exploitation of mineral resources on the continental shelf

China exercises its jurisdiction over the Bohai Sea, the Yellow Sea,

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[1] *United Nations Convention on the Law of the Sea*, opened for signature 10 December 1982, 1833 *U.N.T.S.* 397 (entered into force 16 November 1994).

[2] Article 1 of UNCLOS: "Area means the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction."

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the East China Sea and the South China Sea, which totals more than 3 million square kilometres and which contains abundant marine mineral resources (Q. Li, 2012). According to estimates, China has 25 billion tons of oil reserves and natural 8000 billion cubic meters of gas reserves, on its continental shelf (Yu, 2015). Oilfields such as Penglai 19-3, Qinhuangdao 32-6 and Suizhong 36-1, are currently operating in the Bohai Sea (CNOOC, 2003; 2004a, 2017a). In 2016, the China National Offshore Oil Corporation completed an evaluation of oilfields such as Kenli 16-1, Penglai 20-2/2–3 and Caofeidian 12-6/6-2, in the Bohai Sea (CNOOC, 2018a). The East China Sea is rich in offshore sea sand resources, as well as in oil and gas resources, including oil and gas fields such as Chunxiao, Canxue, Duanqiao and Tianwaitian (CNOOC, 2004b, 2005, 2008). As for the South China Sea, it is not only rich in oil and natural gas resources but also in seashore sand resources, including such as rutile, diamonds (Li, 2012). Additionally, there are also abundant gas hydrates, manganese nodules, iron nodules and sulfide resources, in the depths of the South China Sea (Q. Li, 2012). Many oil companies have determined the exploitation of oil and gas resources in the South China Sea, as a future development priority (CNOOC, 2018b). The exploitation of deep oil and gas resources is being conducted by the China National Offshore Oil Corporation, with various oil and gas fields being in operation such as Liwan 3-1, Liuhua 34-2, Panyu 34-1/35-1/35-2, etc (CNOOC, 2017b).

In addition to the exploitation of oil and gas resources, China has a large land space which is rich in various natural resources. It has more or less proven reserves of all types of minerals discovered so far across the globe. Of these, the proven reserves of titanium, tantalum, rare earth, antimony, tungsten and tin ranked top around the world; those of lithium, beryllium, niobium, molybdenum and vanadium are in 2$^{nd}$ place; that of zinc in 4$^{th}$ place; and those of silver, gold, lead, and iron ranked in the 5$^{th}$ place. Metallic minerals are widespread and are comparatively concentrated in different regions. For example, iron deposits are primarily found in three areas: Shanxi, Hebei, and Anshan-Benxi (Liaoning) Provinces. Bauxite deposits are mostly found in Guangxi Zhuang Autonomous Region as well as Guizhou, Henan and Shanxi Provinces. Whereas, tungsten deposits are mainly found in Guangdong, Hunan and Jiangxi Provinces and tin deposits in the provinces of Hunan, Guangdong and Yunnan and the Guangxi Autonomous Region (Guo, 2013).

China is also among one of the world's few countries, which has a comparatively complete spectrum of non-metallic mineral resources (Lipinski, 1992). Of these, the proven deposits of rock gypsum, salt (halite), bentonite, alunite, wollastonite, barite, asbestos, talc, fluorite, graphite and magnesite are regarded as the largest across the globe, while the deposits of perlite, zeolite, tripolite, mirabilite, pyrite, kaolin and phosphorus occupy important positions. In addition, there are deposits of limestone and marl for their production. It is also noteworthy that some of the natural stone-materials in China, i.e., granite and marble, are of high quality and China is rich enough with its reserves, as shown in Table 1.

It could be concluded from the abovementioned introduction that, China has abundant mineral resources and demonstrates ample practices and experience concerning the exploitation of these mineral resources including oil and gas on the continental shelf. Besides, Fig. 1 (below) represents an overview of the topographic world map showing the continental shelf of China's oceans in the context of the continental shelves and backwaters of the western Pacific, which will also help to have a clearer picture of Chinese distinct waters before further digging into the matter. The pink dotted line approaches the Great Gradient Line (GGL), which is characterised by differences in heat flux, thickness of crust, gravity, altitude and seismic velocity of the mantle between the highlands to the west and the hilly plains to the east, interpreted as expressing a strong variation of the lithospheric thickness of 150 km thickness among the plateaus up to a thickness of 80 km under Eastern China, whose thinning mechanisms and simultaneous magmatism were interpreted as genetically linked to Paleo-Satanic subduction in the Mesozoic and later, leading to the verifiable Prediction of the exotic nature of the continental shelf of the seas of eastern and southern China-led (Niu et al., 2015). Also note that the islands of Hainan and Taiwan are located on the continental shelf of exotic origin.

**Table 1**
Major mineral resource-production in China.

| Item | Mineral Resources in China | |
|---|---|---|
| | Million Tons of Contents | Per Capita (in Kgs) |
| Bauxite | 150 | 128.2 |
| Copper | 3.00 | 2.56 |
| Iron ore | 3500 | 2992 |
| Lead | 6.00 | 5.13 |
| Manganese | 13.6 | 11.62 |
| Molybdenum | 0.55 | 0.47 |
| Nickel | 0.73 | 0.62 |
| Tin | 1.50 | 1.28 |
| Titanium | 30.0 | 25.64 |
| Tungsten | 1.05 | 0.90 |
| Vanadium | 0.61 | 0.52 |
| Zinc | 5.00 | 4.27 |

Source: World Resource Institute (1992, pp. 322–3); (AZO Mining, 2012).

### 2.2. Chinese practices in the exploitation of marine mineral resources in the area

China's practices in the exploitation of mineral resources in the Area began in the last century. In the 1970s, China began its activities, exploring polymetallic nodules in the sea areas outside its State jurisdiction (SOA, 2007). In accordance with the, 'Request for Strengthening the Investigation of Ocean Manganese Nodule Resources', jointly approved by the State Council, State Oceanic Administration and the Ministry of Geology and Mineral Resources, the State may deploy vessels to explore the polymetallic nodules and it has ascertained that there are more than 300,000 square kilometres of rich ore in the area (SOA, 2007). The aforementioned exploration activities have laid a solid foundation for China to apply these measures for further exploration of the Area.

In the process of formulating UNCLOS, the United Nations established a Preparatory Committee, in order to protect some States and entities, in conducting investment ventures in seabed mining (Odunton, 2012). During the Preparatory Committee's existence, a total of seven pioneer investors registered, including the, 'China Ocean Mineral Resources Research and Development Association (COMRA)' (Odunton, 2012). After its registration with the pioneer investor programme in March 1991, COMRA signed an exploration contract with the International Seabed Authority.[3] Between May 22, 2001 and May 21, 2016, COMRA carried out exploration activities for polymetallic nodules in the Clarion-Clipperton Zone and the contract was extended from 22 May 2017, to 21 May 2021 (ISA, 2018a). In addition, COMRA has enjoyed rights of exploration for polymetallic sulphides in the Southwest Indian Ocean, from November 18, 2011, to November 17, 2026 (ISA, 2018a), and for cobalt-rich ferromanganese nodules in the Western Pacific Ocean, from April 29, 2014, to April 18, 2029 (ISA, 2018a). COMRA's exploration activities cover all three resources currently permitted by mineral resource exploration in the Area, becoming the only contractor enjoying rights of exploration for three types of mineral resources simultaneously (ISA, 2018b). Apart from COMRA, the China Minmetals Corporation signed a polymetallic nodule exploration contract with the International Seabed Authority, on May 12, 2017, which authorises the China Minmetals Corporation to explore for polymetallic nodule in the Clarion-Clipperton Zone, until May 11, 2032 (ISA, 2018b).

In China, three Provinces are regarded as resource-rich Chinese

[3] ISBA/7/C/4 (22 June 2001).

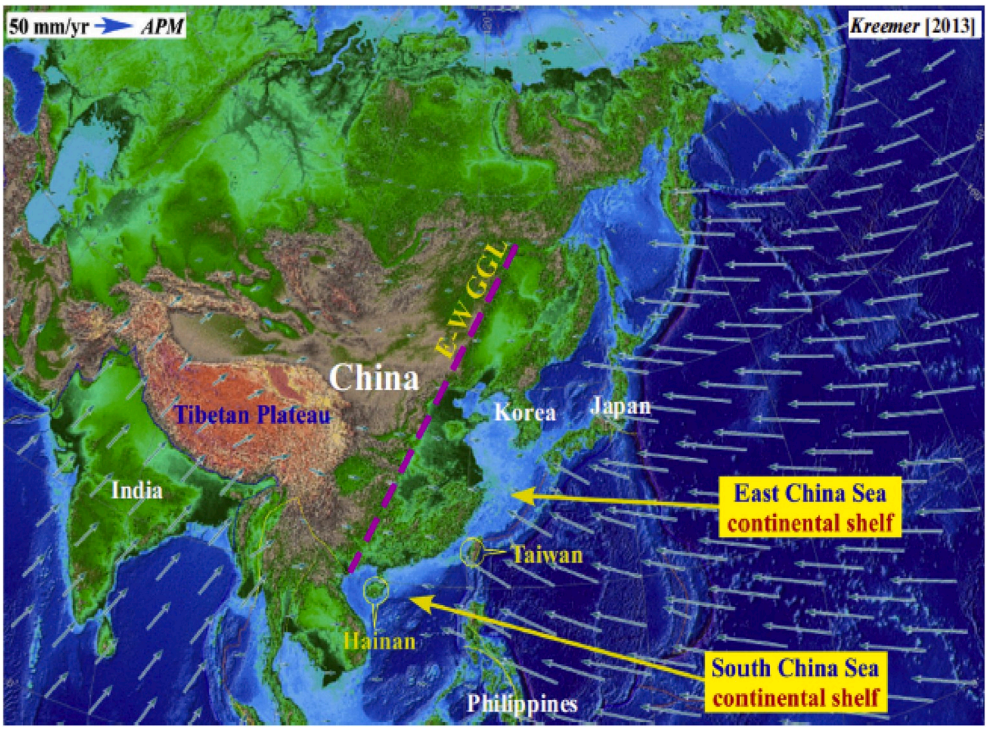


**Fig. 1.** An overview of the Chinese continental ShelvesSource Science b
ulletin (Niu et al., 2015).

Provinces which are Inner Mongolia (9%), Shanxi (20%) and Sichuan (20%), which hold nearly half of the country's minerals. However, the other 12 (resource-oriented) Provinces (Tibet, Zhejiang, Jiangsu, Fujian, Tianjin, Beijing, Hubei, Guangxi, Shanghai, Jilin, Guangdong and Hainan) do not account for more than 5% (independently) in total mineral reserves (see Fig. 2).

In aspect of exploration activities for mineral resources in the Area, is that China has simultaneously guaranteed multiple contractors, whose exploration activities cover all three types of mineral resources in the Area, which is currently unique. Table 2 presents an overview of the mineral resources found in different Provinces of China whereas, Table 3 further explains about the newly discovered and production of these mineral resources.

In 2017, there were approximately 44.3 thousand hectares of production in new mining areas in China, including restoration of around 28.2 thousand hectares of production, equating almost 63.7% of the total new production. Also, 6268 mines have been restored, mostly in the areas of Qinghai, Jiangsu, Shanxi, Xinjiang, Shandong, Inner Mongolia, Ningxia, Anhui and Shaanxi. In 2017, phosphate rock production was 120 million tonnes, an increase of 0.6% as compared to last year. In addition, cement production fell by 0.2%–2.32 billion (Zhiping and Xianda, 2018).

The Chinese production of crude steel, gold, and ten non-ferrous metals was ranked 1st across the globe in 2017. Among them, iron ore production was 7.1% higher than in the previous year at 1.23 billion tonnes. Crude steel production increased by 5.7%–830 million tonnes. The production of ten types of non-ferrous metals amounted to 53.778 million tons, an increase of 3.0%. Among these, refined copper production reached 8.889 million tonnes, an increase of 7.7%; and electrolytic aluminium's production was 32.273 million tons, which is an increase of 1.6%, whereas gold production decreased by 6.0%–426.1 tonnes (Zhiping and Xianda, 2018).

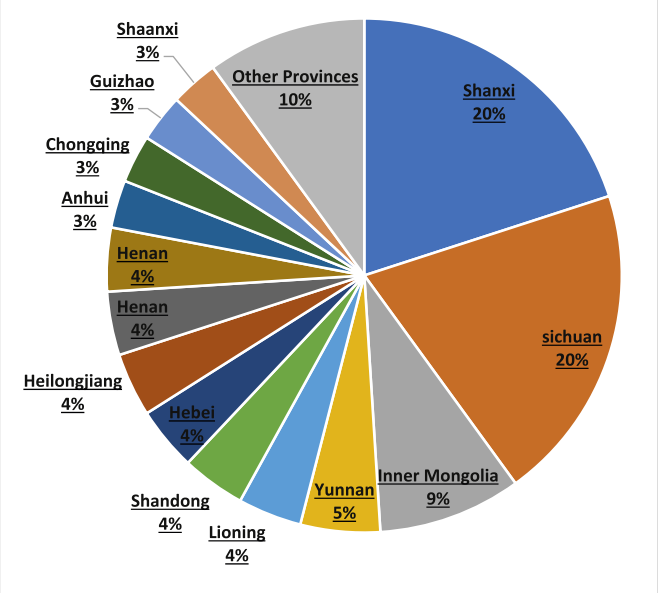


**Fig. 2.** Area-wise Distribution of Salient Mineral Resources in ChinaSource Sun (1987, pp. 4–8) and Guo (2013, pp. 52).

### *2.3. China's contributions to ecological environment protection in the exploitation of marine mineral resources*

In terms of marine ecological environment protection, it is exceptionally important to determine the environmental baseline, to mitigate any impact on the marine ecological environment caused by marine mineral resource exploitation and this also helps to measure the influence of mining activities on the environment and provide necessary scientific basis for laws and regulations regarding environmental

**Table 2**
The major resource-rich provinces in China.

| Mineral Resources | Resource-rich Regions or Provinces |
|---|---|
| Antimony | Yunnan, Guizhou, Guangxi, Hunan |
| Bauxite | Guizhou, Guangxi, Shandong, Henan, Shanxi |
| Bismuth (Bi): | Inner Mongolia, Yunnan, Hunan, Jiangxi, Guangdong |
| Chromium (Cr): | Gansu, Inner Mongolia, Tibet |
| Coal: | Ningxia, Guizhou, Shaanxi, Inner Mongolia, Shanxi |
| Cobalt. (Co): | Shanxi, Hebei, Shandong, Yunnan, Gansu |
| Copper (Cu): | Anhui, Gansu, Yunnan, Tibet, Jiangxi |
| Gold (Au): | Hubei, Jilin, Heilongjiang, Jiangxi, Shandong |
| Iron (Fe) ore: | Anhui, Shanxi, Hebei, Sichuan, Liaoning |
| Kaolin (Ka): | Liaoning, Guangdong, Fujian, Jiangsu, Hunan |
| Lead (Pb): | Jiangxi, Inner Mongolia, Hunan, Guangdong, Yunnan |
| Manganese (Mn): | Sichuan, Liaoning, Guizhou, Hunan, Guangxi |
| Mercury | Yunnan, Sichuan, Hunan, Shaanxi, Guizhou |
| Molybdenum (Mo): | Jiangxi, Shandong, Shaanxi, Jilin, Henan |
| Natural gas: | Tianjin, Hebei, Xinjiang, Henan, Liaoning, Sichuan |
| Nickel (Ni): | Hubei, Sichuan, Jilin, Yunnan, Gansu |
| Petroleum: | Xinjiang, Hebei, Liaoning, Shandong, Heilongjiang |
| Platinum (Pt): | Sichuan, Yunnan, Gansu |
| Silver | Hunan, Yunnan, Jiangxi, Guangxi, Guangdong |
| Silica stone (SiO2): | Sichuan, Gansu, Liaoning, Beijing, Qinghai |
| Tantalum (Ta): | Sichuan, Hunan, Guangdong, Inner Mongolia, Jiangxi |
| Tin (Sn): | Jiangxi, Guangdong, Hunan, Yunnan, Guangxi |
| Titanium (Ti): | Shanxi, Shaanxi, Hebei, Sichuan |
| Tungsten (WO3): | Guangxi, Fujian, Henan, Jiangxi, Hunan |
| Vanadium (V): | Anhui, Hubei, Gansu, Hunan, Sichuan |
| Zinc (Zn): | Gansu, Hunan, Guangdong, Inner Mongolia, Yunnan |

Source: Understanding the Chinese Economies, 2013.

**Table 3**
Newly-discovered resources and production of major minerals.

| Minerals | Unit | Available Resources/ Production |
|---|---|---|
| Coal | Million tons | 81,556 |
| Oil | Million tons | 877 |
| Natural gas | Billion cubic meters | 555.38 |
| Coalbed methane | Million cubic meters | 10,480 |
| Shale gas | Billion cubic meters | 376.76 |
| Iron ore | Million tons of ores | 1451 |
| Manganese ore | Million tons of ores | 282 |
| Copper | Million tons of metal | 4.18 |
| Lead | Million tons of metal | 6.12 |
| Zinc | Million tons of metal | 10.87 |
| Bauxite | Million tons of ores | 292 |
| Nickel | Thousand tons of nickel | 38.8 |
| Tungsten | Thousand tons of $WO_3$ | 160.1 |
| Tin | Thousand tons of metal | 86.0 |
| Molybdenum | Thousand tons of metal | 1070.0 |
| Antimony | Thousand tons of metal | 140.4 |
| Gold | Tons of metal | 1104.35 |
| Silver | Thousand tons of metal | 51.6 |
| Pyrite | Million tons of ores | 105.95 |
| Phosphate rock | Million tons of ores | 992 |
| Potash | Million tons of KCl | 10.75 |
| Crystalline graphite | Million tons of minerals | 61.48 |
| Fluorite | Thousand tons of minerals | 14,391.7 |

Source: Ministry of Natural Resources, PRC, 2018.

protection (Tu, 2006). China is at the forefront of the research and practice concerning the environmental baseline. In 1996, the China Ocean Mineral Resources Research and Development Association proposed the Natural Variability of Baseline Study (NaVaBa) programme, which is also one of the international programmes cooperating with the International Seabed Authority (People's Daily Online, 2011). The designing and implementation concept of this programme is that, although the environmental baseline is called a 'line', it is not a fixed line but a moving range (Tu, 2006). Through observation and data collection, analysis and comparisons of the same sea areas at different times and different sea areas at the same time, the programme aims at understanding the environmental baseline conditions and their natural changes in these areas (Ocean 360, 2010). Change is an inherent feature of the ecosystem and the programme could help in distinguishing variations caused by exploitation activities from natural variations, due to the changeable character of the marine ecosystem itself. It also helps to clarify the range of fluctuations in the environmental baseline, in its natural status (Tu, 2006). The observation time of the programme is the summer and autumn of every year or every other year, with the location of COMRA's exploration zone for polymetallic nodules in the Pacific Ocean (Tu, 2006). The NaVaBa programme covers investigations of marine life, chemistry, physics, as well as plume flow, geological baselines, procedures for studying environmental baseline investigating techniques and current approaches and results of any environmental impact experiments of deep-sea mining (Ocean 360, 2010). The NaVaBa programme has been in operation since COMRA opened it in 1996, currently the implementation plan of the programme has been extended to 2020. Furthermore, the programme will study the environmental baseline through 'multi-areas, multi-circles, multi-space and time' with 'multi-disciplines' and 'multi-methodologies and high technologies' (Wu and Zhou, 2006).

The NaVaBa programme is a significant contribution that China is making to the marine ecological environment protection in the Area. This method applies to the sea areas both beyond and within the limits of State jurisdiction and to mineral exploitation activities on both the deep seabed and the continental shelf. In the Arctic Ocean, especially in the Area of the Arctic Ocean, States and international organisations can currently take full advantage of the underdeveloped or untapped conditions, to conduct a comprehensive survey and study of the environmental baseline and its natural variations and prepare for the marine ecological environment protection requirements in future exploration.

The Chinese government regards the protection of ecological environmental as a focal point of its overall environmental protection strategies. In addition to the above-mentioned environmental issues, China's top six environmental concerns may include water pollution, air pollution, biodiversity, desertification, cancer villages, and population growth (Lallanilla, 2013). To address these issues, the Chinese government also seriously considering the other options, for example, the construction of forest ecological projects. China has launched ten forest ecology projects since 1978, with a planned reforestation area comprising 120 million hectares, primarily targeting the protection and enhancement of the natural ecosystem and the sustainable use of natural resources (State Council PRC, 2019). Besides, amendment of the Environmental Protection Law (2015) and the Environmental Protection Tax Law (enforced since 1st January 2018) are the comprehensive legal development concerning the contemporary environmental issues in China (Khan and Chang, 2018).

## 3. Remarks on the relevant Chinese laws concerning the environment protection during marine mineral resources development in the area

Two pieces of laws are particularly relevant to the mineral resource exploitation in the Area. Firstly, the Law of the People's Republic of China (hereinafter PRC) on the Exploration and Development of Resources in Deep Seabed Areas (hereinafter 'Deep Seabed Law'), as adopted at the 19th Session of the Standing Committee of the Twelfth National People's Congress of the PRC on February 26, 2016[4] and came into force on May 1, 2016 (Standing Committee of PRC, 2016). Secondly, the Mineral Resources Law of the PRC was adopted at the 15th Meeting of the Standing Committee of the Sixth National People's

[4] Order No. 42 of the President of the People's Republic of China on February 26, 2016.

Congress on March 19, 1986.[5] It was amended for the first time in accordance with the Decision of the Standing Committee of the National People's Congress at the 21st Meeting of the Standing Committee of the Eighth National People's Congress on August 29, 1996; amended for the second time according to the Decision on Amending Some Laws adopted at the tenth session of the 11th Standing Committee of the National People's Congress on August 27, 2009 (Standing Committee of NPC, 2009).

### 3.1. Law of the PRC on the Exploration and Development of Resources in the deep seabed area

In China, the exploitation of mineral resources got initial legal cover in April 2013. The Environment and Resources Committee (ERC) of State Council proposed a legal framework to regulate the various activities in this regard, to the Standing Committee of National People's Congress (hereinafter NPC) (Zhang and Zheng, 2016). China is a signatory to UNCLOS and sponsors developments of mineral resources in the region. Therefore, the Deep Seabed Law is of huge significance in fulfilment of its obligations in this domain.

The Deep Seabed Law consists of 7 Chapters and 29 Articles which determine, "protecting the marine environment, promoting the sustainable utilisation of resources in deep seabed areas, and protecting the common interests of mankind."[6] The third chapter specifically deals with the 'protection of the marine environment.' In order to explore or develop the mineral resources in deep seabed area, the applicant is required to file an application first to the Oceanic Administration of the State Council, and then to the International Seabed Authority. Besides, it is prerequisite to submit a comprehensive pertinent plan which must include and address the tentative impact on the marine environment, emergency response strategy in case of potential loss to the marine environment, and also the materials to be used in this process.[7] A contractor is bound to maintain and ensure the protection of the marine environment,[8] which may include preserving and protecting fragile or rare ecological systems and a variety of marine organisms.[9] To conduct exploration and development activities in the region, contractors have an obligation to use modern technologies and to take all the necessary measures to control, reduce and prevent pollution and any of the factors that may cause damage to the marine environment.[10] The Deep Seabed Law necessitates to carry out an environmental impact assessment (EIA), determine the baseline of the environment, and to record, monitor as well as report the activities concerning exploration and development in the area.[11] The Oceanic Administration of the State Council has a sole mandate to inspect the contractors' vessels, equipment, logbooks, facilities, data and records.[12] When an accident triggering grave loss to the marine environment occurs or likely to happen, the contractors shall instantly issue an alarm, execute the emergency response strategy, take all pertinent measures to refrain marine environment from expected damages by the incident, and also report it to the Oceanic Administration of the State Council within due course of time.[13] On undermining the quality of the marine environment and other violations of any provision of the law, the contractors will have to face the relevant penalties as prescribed in the law.[14]

### 3.2. The Mineral Resources Law of the People's Republic of China

The Mineral Resources Law (MRL) of the PRC deals with the exploration as well as the exploitation of the country's mineral resources in the Sea area under its jurisdiction.[15] However, this law does not impose any additional condition about protection of the marine environment while conducting the activities concerning exploration and exploitation of the mineral resources. Only Article 21 and Article 32 of this law deal with environmental protection. Article 32 provides that operators must avoid damaging the marine environment by all means and various provisions for protecting the environment should be observed while conducting such activities. Also, at the end of the mining enterprise, the environmental protection related materials should be presented for its approval.[16] Besides, this law does not contain any provision for the protection of biodiversity and the ecosystem.

The rules for the implementation of MRL of the PRC provide that the miner or prospector shall bear the cost of environmental protection and take all necessary measures after these activities have been completed, to keep the environment protected.[17]

### 3.3. Comments on the existing laws

The promulgation of the Deep Seabed Law comes up with various advantages to the country such as to standardise the operations of domestic contractors, filling a vacuumed space in China's legal system in the area, and also to endorse its obligations in sponsoring the coastal States (Zhang and Zheng, 2016). Some features of the Deep Seabed Law are pertinent to mention here. Firstly, it holds the contractors to be responsible for protecting the rare and fragile species as well as the marine biodiversity (COMRA, 2016). Secondly, the law does not cover only the activities concerning exploration and exploitation of mineral resources but also the development activities in the area which demonstrates it to be a more comprehensive law (COMRA, 2016).

However, some issues remained unattended in the Deep Seabed Law. Firstly, its provisions are general in nature that may create barriers in its implementations, which merits pertinent management measures to be followed to ensure its smooth implementation (Zhang and Zheng, 2016). At present, the State Oceanic Administration has articulated necessary measures for the administration of licensing concerning exploration and exploitation of mineral resources in the area, which will further help in the better implementation of this law (COMRA, 2017). The management measures for examining and evaluating the marine environment together with the implementation of this law should continue to be promulgated in the future.

Secondly, the motivational measures should also be added to the Deep Seabed Law. Currently, only Article 28 of this law provides the incentive measures that reasonably reveal that the various laws and regulations of China will be applied to the tax-related issues in the area, which makes these provisions vaguer in nature (Zhang and Zheng, 2016). The law should encourage the contractors by providing comprehensive provisions regarding incentive measures, and more

[5] Order No. 36 of the President of the People's Republic of China on March 19, 1986.

[6] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Article 1.

[7] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Article 7(4).

[8] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Article 9.

[9] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Article 14.

[10] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Article 12.

[11] Law of the People's Republic of China on the Exploration and Development of Resources in the Deep Seabed Area, Articles 13, 20.

[12] Law of the People's Republic of China on Exploration and Development of Resources in the Deep Seabed Area, Article 21.

[13] Law of the People's Republic of China on Exploration and Development of Resources in the Deep Seabed Area, Article 11.

[14] Law of the People's Republic of China on Exploration and Development of Resources in the Deep Seabed Area, Article 26.

[15] The Mineral Resources Law of the People's Republic of China, Article 2.

[16] The Mineral Resources Law of the People's Republic of China, Article 21.

[17] Rules for the Implementation of the Mineral Resources Law of the People's Republic of China, Articles 20, 34.

importantly the provisions concerning the environmental protection of marine resources. There is an acute need to develop pertinent management measures and implement policies such as subsidies by the government, tax relief, credit support and procurement, etc. to encourage the contractors to abide by the concerned laws and regulations.

Thirdly, the law does not specifically cover the contractors' obligations concerning environmental protection after the completion of the exploration as well as exploitation activities and designate remedial measures, however, it only contains provisions to address prior and ongoing operations of such activities (Zhang and Zheng, 2016). The features mentioned above of the law should be addressed to make it more effective.

As for the Mineral Resources Law of the PRC, it would be much better if the materials concerning environmental protection could be submitted for approval before the mining activities actually conducted. It would also be helpful if the implementing Rules could address the ecosystem-based approach as well as biodiversity issues in connection with the mining activities.

### 3.4. Inspiration for China from other states' legislation concerning the area

At present, a total of 30 States and regions have enacted laws on the development of mineral resources in the Area (ISA, 2018a). In its advisory opinion concerning Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area, the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea mentioned that, the domestic legislation of Germany and the Czech Republic can provide some references for the legislation of all States, for the purpose of fulfilling their obligation to ensure the legality of their activities in the Area.[18] Therefore, the domestic laws of the two States will be discussed and analysed below.

#### 3.4.1. Germany

Germany has two items of legislation in force concerning the mineral resource development activities in the Area, the 1980 Act on the Interim Regulation of Deep Seabed Mining and the 1995 Seabed Mining Act, respectively.

(1) 1980 Act on the Interim Regulation of Deep Seabed Mining

This Law preliminarily provides for the exploration and exploitation of deep seabed mineral resources prior to the entry into force of UNCLOS and its legislative objectives include the protection of the marine environment.[19] Specifically, when authorising applicants to exploit seabed mineral resources, such development activities shall not adversely affect the marine environment.[20] The applicant must submit a work plan when applying, which should include a description of the project, in particular the measures to be taken to protect the marine environment.[21]

(2) 1995 Seabed Mining Act

The legislative objectives of this Act also include the protection of the marine environment.[22] To conduct activities in the Area, applicants must obtain the approval of the Office of National Mining, Energy and Geology, which, when reviewing such applications, must seek advice from the Federal Maritime and Hydrographical Agency on transport and environmental protection, in drafting the work plan opinions and consider these opinions in their decisions.[23] In the area of environmental protection, the Federal Maritime and Hydrographical Agency should submit its opinion, having been agreed by the Federal Ministry of Environment.[24] Prospectors and contractors in the Area must comply with UNCLOS, the 1994 Implementing Agreement, rules developed by the International Seabed Authority, contracts, this Law and administrative decisions having been issued by the Office of National Mining, Energy and Geology and are obligated to protect the environment in the Area.[25]

Prospectors and contractors must assign a certain number of responsible persons to lead and oversee prospecting and activities in the Area. Responsible persons must have reliability, appropriate expertise and physical fitness to fulfil their responsibilities then, finish their tasks and exercise their powers to ensure that prospecting and activities are orderly and safely conducted in the Area.[26] Prospectors and contractors must assign responsibility and power to responsible persons, in a clear and definite manner and ensure orderly cooperation among them. Prospectors and contractors shall also report responsible persons' names, positions, qualifications, position changes and resignation, in a timely manner to the Office of National Mining, Energy and Geology,[27] which has the power to supervise prospectors and contractors' activities in the Area.[28]

#### 3.4.2. Czech Republic

Act No.158 of May 18, 2000, on the Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, regulates prospecting, exploring and developing activities of natural and legal persons, as well as the administrative activities of the State of the Czech Republic.[29] In particular, this Act refers to the principle and rules of international law that seabed mineral resources in the Area should be considered as the common heritage of mankind.[30]

According to this Act, prospecting and related activities in the Area are governed by and come under the responsibility of the appropriate persons granted expert certificates by the Ministry of Industry and Trade.[31] Such persons must satisfy a range of conditions, in particular, they must be familiar with this Act, UNCLOS, the 1994 Agreement for Implementation and the rules lay down by the International Seabed Authority.[32]

The prospecting activities and other activities in the Area must be conducted in accordance with UNCLOS, the 1994 Implementing

[18] Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area, Advisory Opinion, 1 February 2011, ITLOS Reports 2011, page 73, para.237.
[19] Act on Interim Regulation of Deep Seabed Mining (English translation) (1981) 20 International Legal Materials 393, Section 1(2).
[20] Act on Interim Regulation of Deep Seabed Mining, Section 5(1).
[21] Act on Interim Regulation of Deep Seabed Mining, Section 8.
[22] Seabed Mining Act (6 June 1995), Section 1(1).
[23] Seabed Mining Act, Section 4(4).
[24] Seabed Mining Act, Section 4(4).
[25] Seabed Mining Act, Section 5.
[26] Seabed Mining Act, Section 6(1).
[27] Seabed Mining Act, Section 6(1).
[28] Seabed Mining Act, Section 8.
[29] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 1(1).
[30] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 1(2).
[31] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 3.
[32] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 6(1) (c).

Agreement, the rules established by the International Seabed Authority and contracts with the International Seabed Authority and be subject to the International Seabed Authority's inspection.[33] In addition, prospectors and contractors must purchase damage insurance.[34] If prospectors and contractors cause damage to the marine environment of the Area, they must redress the consequences of such devastation,[35] including damage to such as marine living resources, human health, fisheries and other marine activities, seawater quality.[36] Activities not regulated under this Act are governed by the international conventions signed by the Czech Republic or by the principles and rules of general international law.[37] This Act also stipulates the withdrawal and expiration of guarantees granted.[38]

#### 3.4.3. Inspiration to China from German and Czech practices

As revealed in the above discussion, the provisions of the domestic laws of Germany and the Czech Republic for the protection of the marine environment from the activities in the Area, are not as detailed as China's Deep Seabed Law, however, there are two aspects which are noteworthy. Firstly, both States provide for the management and accountability of prospecting and other activities in the Area by persons, in line with certain standards. The German law stipulates that the tasks and powers of responsible persons must be clearly and unequivocally assigned. Such provisions specify obligations on individuals, thus, contributing to the implementation of tasks and attachment of liability. Secondly, the Czech law provides for the withdrawal and expiration of a guarantee, by a sponsoring State. If, for example, a contractor has caused damage to the marine environment, the Ministry of Industry and Trade should withdraw its guarantee to the contractor, which encourages the contractor to fulfil its obligation to protect the marine environment. The above two aspects are, currently, missing and should be introduced in Chinese legislation.

Keeping in view the characteristics of the relevant laws in Germany and the Czech Republic, Chinese laws for the protection of the marine ecological environment should adhere pertinent provisions to address the contemporary issues. Presently, there are various advantages and loopholes in the domestic legislation for the ecological environmental protection. The thoughts, comments, and comparison drawn in this section demonstrate several inspirations to amend and improve the pertinent domestic legislation in China. Also, an in-depth analysis of the Chinese laws, regulations and rules for the protection of the marine ecological environment is presented in the subsequent section, which will further assist the stakeholders to understand the issues and address it by providing ample directions for the possible improvements in the relevant domestic legislation.

[33] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Sections 8(2) (g), 8(2) (h), 10(1) (f), 10(1) (g).

[34] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Sections 8(3), 10(2) (f).

[35] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 11(c).

[36] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 2(e).

[37] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 20.

[38] Act No.158 of May 18, 2000 on Prospecting, Exploration for and Exploitation of Mineral Resources from the Seabed beyond Limits of National Jurisdiction, Section 17.

## 4. Analysis of Chinese laws, regulations and rules for protection of the marine ecological environment

Legal practice from other States regarding the ecological environment protection, in the development of mineral resources, offers valued guidance to Chinese legislation, which can be divided into the following two aspects. First of all, while participating in the activities of mineral resources development, Chinese enterprises must comply with the regulations of the relevant coastal State as well as the pertinent international environmental laws. An obligation to protect the environment by Chinese enterprises must be achieved inclined with the Chinese domestic laws during the activities concerning foreign investment and cooperation in the construction projects. Secondly, marine mineral resources are found in abundance in the Chinese continental shelf that fascinates local as well as foreign enterprises for competitively investing in its development. Therefore, it demands the process of mineral exploitation to be covered by Chinese domestic legislation concerning the protection of the marine environment.

### 4.1. Advantages of Chinese domestic legislation

Firstly, China's domestic laws are comprehensive in the aspects of number and the scope of coverage. China's domestic laws include not only the Marine Environmental Protection Law of the PRC that regulates overall marine environmental protection but also specific administrative regulations and rules relating to inhibiting pollution from ships, marine engineering activities, offshore oil projects and dumping polluting materials. China's marine resources utilisation legislation also includes regulations on marine ecological environment protection. In addition, China also adopts marine zoning, EIA and the establishment of marine nature reserves, to protect the marine environment.

Secondly, judging from the purpose of legislation and guiding ideology, much domestic environmental legislation in China refers to the maintenance of ecological balance and ensuring the sustainable and coordinated development of the economy, society and the environment. For example, the legislative purpose of the Marine Environmental Protection Law of the PRC includes, 'protecting and improving the marine environment, protecting marine resources, preventing and controlling pollution damage, maintaining ecological balance, ensuring human health, and promoting sustainable economic and social development'. The legislative purpose of the Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering also includes addresses the threat of marine environmental pollution caused by marine engineering, maintenance of the marine ecological balance and the protection of marine resources. The legislative purpose of the Regulations of the PRC on the Dumping of Wastes at Sea is to prevent dumping from causing damage to the marine environment, maintaining ecological balance and protecting marine resources. The purpose of the legislation of the Law of the PRC on Environmental Impact Assessment is to prevent any planned project from causing damage to the environment, ensure sustainable development, and 'promote the coordinated development of the economy, society, and the environment'. In addition, although the Law of the PRC on the Administration of Sea Areas does not mention the ecological environment in its legislative purpose, it includes the requirements of, 'protecting and improving the ecological environment, ensuring the sustained utilisation of sea areas and promoting the development of the maritime economy', in the formulation of the marine functional zoning. The statements of legislative purpose in this legislation reflect the concept that Chinese domestic legislation has begun to pay heed to the ecology.

Thirdly, there are already some laws and regulations that reflect the principles and requirements of the ecosystem approach (Zhu, 2017). For example, the Marine Environmental Protection Law of the PRC stipulates that, the marine administrative department must seek the opinions of other departments before approving an environmental impact report

submitted by the constructors of marine engineering projects.[39] The Measures for the Implementation of the Regulation of the PRC on the Administration of Environmental Protection for Offshore Oil Exploration and Exploitation stipulates that, it is necessary to measure the potential impact of activities on the natural environment, fisheries and other resources, in any environmental impact assessment.[40] The Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering stipulates that, no blasting or other activities that may potentially have adverse effects on fishery resources, shall be conducted during the spawning period of major economic fish and shrimp species.[41] This shows requirements influenced by an ecosystem approach indicating that, managers should take into account the linkages between ecosystems and the impact of activities under consideration, on other ecosystems and other marine resources. Most of the legislation applicable to the development of marine mineral resources sets monitoring obligations and the Measures for the Administration of Environmental Impact Assessment of Construction Projects (for Trial Implementation) specifically stipulates that, the actual environmental impact of construction projects and effectiveness of measures to prevent and control pollution and protect the ecological environment, must be re-evaluated and improved, after an activity has been in operation for a period of time.[42] This reflects recognition of the dynamics and uncertainties of ecosystems and the need for adaptive management. In addition, the Measures for the Administration of Environmental Impact Assessment of Construction Projects (for Trial Implementation) stipulates that, post-environmental impact assessments can be conducted for individual projects or for multiple projects, that have a cumulative impact within the same administrative region,[43] which reflects the consideration of the cumulative impact required by an ecosystem approach. The ecosystem approach also requires that, management should be decentralised to the lowest appropriate level, to increase managerial responsibility and maximise the use of local knowledge. At present, most of the laws and regulations applicable to marine environmental protection in the course of development of marine mineral resources in China adopt a hierarchical management approach and assign power to local governments, such as the Marine Environmental Protection Law of the PRC and the Administrative Measures of Marine Nature Reserves, etc.[44] This is also a reflection of the principles of ecosystem approach. Article 5 of the Regulations of the PRC on Nature Reserves, which stipulates that, economic protection and social development should be taken into consideration when establishing nature reserves. Article 14 of the above Regulations stipulates that, 'proper consideration shall be given to the integrity and suitability of the protected objects and to the needs of local economic construction, and production activities and the daily life of local residents while determining the ranges and boundaries of nature reserve', which also reflects the ecosystem approach. In addition, the division of sea areas and the establishment of marine nature reserves are concrete methods for applying the ecosystem approach in managing human activities and protecting the marine ecological environment.

[39] Marine Environment Protection Law of the People's Republic of China, Article 47.

[40] Regulations of the People's Republic of China Concerning Environmental Protection in Offshore Oil Exploration and Exploitation, Article 5.

[41] Administrative Regulation on the Prevention and Treatment of the Pollution and Damage to the Marine Environment by Marine Engineering, Article 28.

[42] Measures for the Administration of Environmental Impact Assessment of Construction Projects (for Trial Implementation), Articles 2, 8.

[43] Measures for the Administration of Environmental Impact Assessment of Construction Projects (for Trial Implementation), Article 9.

[44] Administrative Measures of Marine Nature Reserves, Article 4.

### 4.2. Insufficiency of Chinese domestic legislation—existing gaps

Although there is much domestic legislation, covering a wide range, the regulations are relatively simple and many are impractical (Guan, 2011). Problems also exist in the aspects of vertical and horizontal division of power. Taking the Marine Environmental Protection Law of the PRC as an example, Article 5 of this Law stipulates that, the administrative department in charge of environment protection under the State Council, the State Oceanic Administration, is empowered to conduct marine environment supervision and control under the coastal local people's governments at or above the county level, all having the power to monitor and manage the marine environment. Article 7 of the Law of the PRC on the Administration of Sea Areas stipulates that, the State Oceanic Administration is responsible for the supervision and administration of the use of sea areas throughout China but the marine administrative authorities of coastal governments at or above the county level, also have the authority to supervise and manage the utilisation of sea areas adjacent to the administrative area. This shows that in China, the dual management system of central and local governments is implemented. This type of system is understandable because the management of activities affecting the marine ecosystem should be decentralised to the lowest level of management, however, the current widespread problem is the lack of effective coordination mechanisms between central and local governments and between locals and local governments. The issue of the effectiveness of the policy and the possibility that local governments may condone some activities that destroy the marine ecological environment in their jurisdictions, for the sake of local economic development (Gao, 2016).

Although China has achieved a milestone to improve its environmental conditions, however, due to the lack of coordination between national and local government, the World Bank referred China as "institutional orphan" concerning environmental health since the environmental authority is divided among the various central and local agencies as well as local governments, which rarely work altogether at substantial level (Chaeles and Lu, 2008). For example, according to a study by Chaeles and Lu (2008), some risky projects continued to work in China for a period of time even after the implementation of Environmental Impact Assessment (EIA) Laws (Chaeles and Lu, 2008). In China, Ministry of Ecology and Environment has the authority to look after the large-scale projects, but the rights concerning industrial planning fall in the bucket of local governments, who takes such decision while prioritising their economic growth. There are problems of imbalance of environmental rights and obligations, unreasonable pertinent system design, unclear responsibility, and lack of operability exist in the legal content among the central and local governments (Mu et al., 2014). Thus, leads towards the inadequate coordination between the central and local government and between local governments.

Besides, the marine environmental issues need rapid actions, i.e., the management of oil spills. However, lack of operability and coordination among different pertinent laws and authorities may defer the quick response. For instance, the law on the protection of the marine environment in China, requires only that the responsible party is needed to inform and report on the oil spill. However, no operational provisions have been made as to which sectors or departments should be informed of the incidents. While the environmental emergency plan provides that the departments responsible for environmental protection are responsible for driving and coordinating the main environmental emergencies, the main responsibility for responding to oil spills lies with the maritime safety authority and the administration of the oceans of the State (Zhao, 2018). Furthermore, some regional and local coastal governments may not have prepared emergency plans for oil spills, which make it difficult for governments and local departments to coordinate according to the law.

In addition to the issue of power distribution and collaboration between the central and local governments, there are also deficiencies in the management of a specific marine ecological environment pollution

source. Taking a ship, as an example, according to the Marine Environmental Protection Law of the PRC, three departments have the right of supervision, management and enforcement over different ships, namely, the Maritime Administrative Department, the Fishery Administrative Department, and the Military Environmental Protection Department.[45] Such a legislative model leads to the separation of powers in the management of ships as a source of pollution and mutual disassociation of involvement can often emerge, since the three departments have equal law enforcement status and a parallel scope of duties (Gao, 2016). Despite the fact that, management effective functioning requires cooperation and coordination, the current legislation in this area is a not satisfactory.

In addition, shortcomings in cross-sectoral cooperation are noteworthy. Article 9 of the Marine Environmental Protection Law of the PRC stipulates cross-departmental and cross-regional cooperation. The lack of a permanent cooperation mechanism and systematic cooperation and coordination provisions is not, however, conducive to cooperation and effective joint emergency responses. Cooperation in trans-regional marine environmental protection relies on consultation or coordination between the coastal areas or the people's governments at higher levels. Major trans-department marine environment protection work should be coordinated by the administrative department in charge of environmental protection, under the State Council. Problems that fail to be settled through coordination, should be submitted to the State Council for adjudication.[46] Although Article 8 of the Marine Environmental Protection Law of the PRC stipulates that, the governments of provinces, autonomous regions and municipalities directly under the Central Government and relevant departments throughout the crucial sea areas can establish regional cooperation organisations to unify the planning and implementation of the protection of the marine ecological environment, this is, currently, not an obligation to force the establishment of a regional cooperation organisation.

Legislation concerning the prevention and control of marine eco-environmental pollution focuses on limiting pollution sources, to those which adversely affect the marine environment. Although regulations on the impact of these sources on marine ecosystems and the impact on biodiversity are included, the current strictness is far from sufficient (Guan, 2011). In terms of legislation on the utilisation of marine resources, the Mineral Resources Law of the PRC contains few environmental protection provisions and does not provide for the protection of ecosystems and biodiversity. Although there are provisions in the Fisheries Law of the PRC and the Wildlife Protection Law of the PRC concerning the protection of biological resources from the exploitation of marine mineral resources, these provisions are relatively modest. Attention to marine ecosystems and biodiversity is insufficient in terms of the prevention and control of marine eco-environmental pollution legislation and marine resource utilisation legislation. This has led to separation of the prevention of marine pollution, the utilisation of marine resources, the protection of marine ecology and marine biodiversity.

### *4.3. Development direction of domestic ecological environmental protection legislation in the exploitation of mineral resources on China's continental shelf*

Although some domestic legislation has already incorporated the concept of protecting the ecosystem, maintaining the ecological balance and achieving sustainable development in the purpose of legislation, there are still some laws that do not so provide. Specifically, this refers to; the Mineral Resources Law of the PRC, Law of the PRC on the Administration of Sea Areas, the Fisheries Law of the PRC, the Administrative Regulations of the PRC on Prevention and Treatment of the Pollution and Damage to the Marine Environment by Ship and the Measures for the Implementation of the Regulation of the PRC on the Administration of Environmental Protection for Offshore Oil Exploration and Exploitation, all of which require more emphasis on the concept of protecting the ecological system, in their legislative objectives.

Although some provisions in current Chinese legislation already reflect the principles of the ecosystem approach, these regulations are not systematic and the principles of the ecosystem approach have not yet become the guiding principle of Chinese legislation. The solution to this problem would be to formulate a national marine basic law, guided by the principles of the ecosystem approach and to make overall arrangements for various aspects such as the prevention and control of marine pollution, utilisation of marine natural resources and protection of the marine ecological environment (Gao, 2016). Later, the marine ecological environment protection legislation, concerning the exploitation of mineral resources on the continental shelf, should be revised in accordance with the basic law, to seek comprehensive and systematic regulation of marine ecological and environmental protection issues, in the development of continental shelf mineral resources.

In this process, special attention should be paid to cooperation and coordination between the central and local governments, locals and local governments and the relevant departments. In terms of cooperation between locals and local governments, provinces, autonomous regions and municipalities that govern maritime areas, it may be required to establish permanent coordination agencies for marine cooperation, in order to respond to marine pollution and promote biodiversity conservation across jurisdictions.

In addition, various mechanisms should be applied to adjust and regulate human activities affecting the marine ecological environment, such as the introduction of market mechanisms, social mechanisms, etc (Bo and Feng, 2009; Cai, 2007). Even although relevant provisions have been provided for in Chinese domestic legislation, they are relatively modest in scope and lack practicality (Bo and Feng, 2009). With regard to market mechanisms, Article 9 of the Law of the PRC on the Administration of Sea Areas stipulates that, the government rewards individuals and units that actively protect the sea area and use the sea area reasonably. This law does not, however, stipulate the criteria for rewards. To give another example, Article 5 of the Mineral Resources Law of the PRC stipulates the system of reduction and exemption of exploration and mining fees, resource tax and resource compensation fees. Such mechanisms could also be applied to encourage the practice of protecting the marine ecological environment. The government must provide appropriate incentive policies and subsidy policies in this regard, such as providing tax deductions and preferential loans to miners who adopt advanced technologies and methods for marine eco-environmental protection; rewards should be given to miners adopting stricter eco-environmental protection measures, than those required by law (Li, 2007). In terms of social mechanisms, the government should publish relevant information and encourage participation in the decision-making process by all scientific institutions, social organisations and stakeholders (Cai, 2007). Although the Ministry of Environmental Protection has promulgated the Measures for Public Participation in Environmental Protection, the degree of public participation can be further improved.

## 5. Conclusions and recommendations

China has abundant practice in the development of mineral resources in the Area and on the continental shelf. There is international recognition of its contribution to the protection of the ecological and environmental protection in marine mineral resources exploitation. China has domestic legislation in force concerning the exploitation of mineral resources in the Area. These laws could have application to any activities that China may undertake in the deep ocean floor. These laws, however,

[45] Marine Environment Protection Law of the People's Republic of China, Article 5.

[46] Marine Environment Protection Law of the People's Republic of China, Article 9.

have many shortcomings that need to be addressed. If China is to fully participate in the development of marine mineral resources, it must not only comply with relevant international law but must improve its own domestic laws, so as to provide comprehensive encouragement for the protection of the marine ecological environment. There is a need for China to improve laws governing the ecological environment protection obligations on Chinese and foreign enterprises, in order to provide a legal basis for the ecological environment protection of China's maritime areas. The present study recommends some policy measures which can be adopted to fill the gaps and improve the current situation in the Area. Firstly, China should bring institutional reform and environmental health governance mechanisms which can smoothly address the relevant contemporary issues. To this end, lessons can be learnt from the state practices, as mentioned in the above sections, i.e., Germany and the Czech Republic for the development of pertinent laws and policies. Secondly, improving the coordination concerning relative laws and regulations between the central, regional and local governments could be beneficial. Thirdly, the problems of imbalance of environmental rights and obligations, unreasonable pertinent system design, unclear responsibility, and lack of operability in the legal content among the central and local governments should be addressed efficiently with improve coordination and managerial reforms. Fourthly, China should consider designing multi-body participating mechanisms to take all the stakeholders on board in addressing the legal ecological environmental issues in the Area.

## Declaration of competing interest

This is a short statement to confirm that there is no conflict of interest for this piece of work. All authors agree with the terms and the name order that places in the paper.

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