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A comparison of marine spatial planning approaches in China: Marine functional zoning and the marine ecological red line

Wen-Hai Lu [a,b], Jie Liu [b], Xian-Quan Xiang [b], Wei-Ling Song [b], Alistair McIlgorm [c,*]

[a] Ocean University of China, Qingdao, China
[b] National Marine Data and Information Service, Tianjin, China
[c] Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong, Wollongong, NSW, Australia

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ABSTRACT

Marine zoning and planning are cornerstones of China's marine and coastal management, but are facing challenges in maintaining sustainable development with increasing resource use. Marine functional zoning (MFZ) and marine environmental functional zoning (MEFZ) are existing official Chinese regulations possessing legal force. In contrast, the Marine ecological red line (MERL) refers to a type of marine spatial planning aimed at ecological protection which has been promoted following a 2011 decision of the Chinese State Council to strengthen environmental protection. It has been partially implemented within China, but has only gained legal status in late 2014 and implementation in 2015. The paper compares the two kinds of marine spatial planning providing a general overview, an example in the Bohai Sea, and discussing the marine functional zone and marine ecological red line approaches. The legal status, spatial layout, and control of the systems are compared. The comparison shows that the marine ecological red line has the potential to supplement and strengthen the current marine functional zoning system, and that further improvement should come from recent legal developments. Management will require more ecological information to improve the technical aspects of the MERL approach to enable further MFZ and MERL integration.

1. Introduction

Both existing and emerging sea uses such as fisheries and aquaculture, marine transportation and energy, sea salt, coastal tourism, dredging and mining, have dramatically increased through the demand for marine resources. In some areas, the combined demands of these industries have exceeded the available spaces by several times [1,2].

In recent years, an increasing number of countries have initiated marine spatial management processes [3–5]. Although a small number of example of marine protection, such as the Great Barrier Reef in Australia date back to the 1970s, they generally remain very specific in different contexts [6–9]. What is now acknowledged as an inevitable process [10,11] has become essential in dealing with the expansion of marine activities [12–15] in terms of intensity and diversity, and with what appears to be a proportional increase in pressure on marine environments. In this context, Marine spatial planning (MSP) can provide a far more promising approach to implementing ecosystem-based management [16].

Sea areas under China's national jurisdiction, covering approximately 3,000,000 km^2, play an important role in economic development. In 2014, the ocean and coastal economy contributed 9.4% (over 5993 billion RMB) to China's GDP [17]. Chinese governments at different levels have already developed and implemented a variety of zoning and planning schemes.

Before 2014, there were two important types of ocean-related zoning, which were developed by the integrated administrative departments. Firstly, marine functional zoning (MFZ) was created by the State Oceanic Administration (SOA) and secondly, marine environmental functional zoning (MEFZ) was produced by the Ministry of Environmental Protection.

MFZ is the most commonly used marine spatial planning approach, where marine areas are divided into basic marine functional areas of different types in accordance with the requirements for maritime spatial location, natural resources, environmental conditions, exploitation and utilization, as well as taking into account the economic and societal requirements for national or regional sustainable development, thus providing a basis for the development, protection and management of the ocean. In contrast MEFZ divides sea area into different environmental functional zones, in which each zone is a designated sea area carrying out the

* Corresponding author.
E-mail address: amcilgor@uow.edu.au (A. McIlgorm).

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same environmental quality standard, to protect and improve the marine and coastal environment.

However, as the number and intensity of industry uses increase, sector based management is inadequate to address the complex and often competing uses of the marine and coastal areas [18]. Sector based management has led to fragmentation and spatial/temporal mismatches in governance [19], and is considered increasingly less appropriate for use in the pursuit of sustainable development [20]. The pollution and ecological destruction of the Bohai Sea continues apace and has become a focal point for marine environmental improvement in China. This issue has led to policies of marine environmental protection based around the concept of the marine ecological red line (MERL). This baseline of environmental integrity has gradually been proposed, and MSP for the purpose of ecological protection has begun to be widely implemented in the Bohai Sea, which is the first area in China to apply MERL.

There are currently many “red lines” (or other colored lines) being utilized by the various departments of government in China, such as red lines for farmland, water control, forests and wetlands [21].

MERL refers to zones demarcated to maintain the health and safety of the marine ecology, focusing on the protection of important ecologically functional areas, ecologically sensitive areas and ecologically fragile areas, by the implementation of strict controls and legal protection.

MERL came from the field of wildlife conservation research, as well as from research on ecosystem services and ecology. The primary goal of demarcating red line zones is to protect those natural ecosystems which are of importance to humanity’s sustainable development and the sustainable development of China's economy and society. The zones demarcated are important ecologically functional areas, ecologically sensitive areas and ecologically fragile areas.

Since 2004, China's central and local government has formulated a series of plans and decisions, and the awareness of ecological red lines has since been extended from local to central government. The environmental planning usage of ecological red line areas began in the estuary of Zhujiang River of China in 2004. In 2011, the State Council listed the work of delimiting the ecological red line areas as a key priority in the field of environmental protection. In 2013, the planning for national ecological protection requested that ecological red lines should be delimited in important eco-functional areas, land and marine ecologically and environmentally sensitive and fragile areas in China, and that technical specifications for delimiting red lines should be developed. In the same year, the proposal to demarcate the ecological red lines was further specified in the Party Congress of China. Thus, in China’s ecological environment protection, a strategic change was implemented, from pollution control to ecosystem protection, from cure to prevention.

There are two kinds of MSP that have been launched by SOA in China. MFZ, possesses legal force, and the other is the MERL, which has already been implemented in local areas, but has only been part of the national legal apparatus since late 2014. In this paper the two approaches across a range of characteristics. The key issues to be compared are: (1) What are the legal attributes of the two kinds of marine spatial planning? (2) What are the relative spatial layouts under the two kinds of marine spatial planning? (3) What differentiates the environmental management requirements of the two kinds of marine spatial planning?

The paper will examine and compare the two kinds of marine spatial planning in Section 2 and explain the aforementioned key issues in Sections 3, 4, and 5, from the aspects of law, spatial layout and management, and summarize the findings in Section 6.

2. Marine functional zoning and marine ecological red line

2.1. Marine functional zoning

Zoning is gaining support as a solution to spatial problems inherent in managing marine areas [22]. It is an allocation system with centralized decision-making by government, regulations imbued with environmental safeguards to various degrees, and separation of seemingly incompatible uses to different zones [23,24]. MFZ defines the primary function and appropriate management boundaries of each zone, according to its natural characteristics (e.g., natural resources, geographical and ecological features) and social attributes (e.g., socioeconomic development needs) [25]. National MFZ began in China in 1989. However by 1998, China started large scale MFZ and began to establish the current four-level marine functional zoning system, namely: national-level, provincial-level, city-level and county-level.

In March 2012, the State Council approved the release of a new round of the *National Marine Functional Zoning (2011–2020)*. In the approval, the State Council stressed that MFZ is the legal basis on which to reasonably exploit and utilize marine resources, to effectively protect the marine ecological environment and must be strictly implemented. The plan is an integral, fundamental and binding document for China's marine spatial development, control and management. The plan is also an important foundation for the formulation of local MFZ, as well as marine policies, planning at various levels, to carry out management of sea areas, marine environmental protection and other marine management. MFZ has been recognized as a practice of MSP in China [6,25]. It has become the basis for marine development planning, marine resource management, and the establishment of marine nature reserves in China [26,27].

MFZ is based on the *Technical Directives for the Division of Marine Functional Zoning (GB17108-2006)*, establishing the principle, classification system and type classification indexes of the marine functional zoning, as well as the requirements for marine environment protection. MFZ defines the primary function and appropriate management boundaries of each zone, according to its natural characteristics and social attributes [25]. A marine functional zone is the smallest spatial unit of the MFZ scheme [28,29].

There are 8 types of Level I provincial marine functional areas in China, including the agriculture and fishery zone, port and shipping zone, construction zone for industrialization and urbanization, mineral and energy zone, tourism and recreation zone, marine protected area, special functional zone (for research, military use, disposal and dumping), and reserved zone [30]. In addition, to further standardize the compiling work of MFZ at provincial level, the State Oceanic Administration of China released a notification on issuing the *Compiling Technical Requirements for the Division of Provincial Marine Functional Zoning (GHGZ (2010) No. 83)(ref)*. So far, the division of 11 coastal marine functional zones at the provincial and regional level (2011–2020) has been approved, for a total of 329 Level I marine functional areas [30]. Based on natural conditions and economic and societal development needs, the planning determines the overall control requirements for five sea areas, namely, the Bohai Sea, the Yellow Sea, the East China Sea, the South China Sea, and eastern waters of Taiwan; and divide seas under Chinese jurisdiction into 29 key marine areas; and stipulates the main functions and the direction of development and protection for key sea areas. In the plan, there are seven aspects regarded as safeguard measures to consider:

1. To give play to the roles of the integrity, fundamentality and binding effect of the division of zones;
2. To improve the management of the marine areas;
3. To innovate and strengthen the management of sea