

# SUSTAINABLE DEVELOPMENT OF MARINE ECONOMY IN CHINA

ZHANG Yao-guang<sup>1</sup>, DONG Li-jing<sup>2</sup>, YANG Jun<sup>3</sup>, WANG Sheng-yun<sup>3</sup>, SONG Xin-ru<sup>3</sup>

*(1. Research Center for the Sustainable Development of Marine Economy, Liaoning Normal University, Dalian 116029, P. R. China; 2. Department of Sociology, Shenyang Normal University, Shenyang 110034, P. R. China; 3. College of City and Environment, Liaoning Normal University, Dalian 116029, P. R. China)*

**ABSTRACT:** China is a large marine country. Developing marine economy is an effective way to solve a series of problems with which man is faced, such as the want of natural resources, space limitation, the environmental deterioration, etc. This article analyzes the rich resources of marine biology, harbor, offshore oil and natural gas and coastal tourism resources in China and describes the developing features and regional differences of marine economy. To realize the sustainable development of marine economy in China, what we need to do are as follows: 1) to list exploiting ocean into national development strategy; 2) to realize integrated economy of sea and land; 3) to develop ocean by science and technology; 4) to perfect legal institution of marine environment; 5) to establish new idea of sea defending.

**KEY WORDS:** marine resources; marine economy; marine industrial structure; sustainable development

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## 1 RICH MARINE RESOURCES IN CHINA

China, located in the east continent of Asia, is a large marine country. It possesses 18 000km of land coastline, more than 6500 islands whose areas are more than 500m<sup>2</sup>, over 14 000km of island coastline, and its natural conditions are very superior. Through rough estimate, the sea area under the jurisdiction of China is nearly  $3 \times 10^6$ km<sup>2</sup>, occupying one third of the area of land territory in China. The vast "blue territory" and its rich marine life, petroleum, natural gas, solid mineral, regenerated energy and coastal tourism resources are favorable to the exploitation and utilization of marine resources in China. Among rich marine resources, the species of marine organisms are various, which amount to 20 278 species, including 3023 species of recorded fish. The area of shallow sea and tidal-flat are about  $13.33 \times 10^6$ ha in China. The area of shallow sea whose water depth ranges from 0 to 15m is  $124 \times 10^3$ km<sup>2</sup>. The quantity of marine petroleum resources is about  $24 \times 10^9$ t, and the quantity of natural gas is about  $140 \times 10^6$ m<sup>3</sup>. Besides, there is also hydrate of natural gas, and beach placer is  $3.1 \times 10^9$ t. Marine energy in theory is  $630 \times 10^6$ kW. There are more than 160 gulfs, 400km of

waterfront of deep water, and more than 60 deep-water harbors in China, all of which are favorable for building the ports to develop marine transportation. Coastal zone have more than 1500 landscape resources of tourism and recreation, which adapts to developing marine tourism, furthermore, there are  $75 \times 10^3$ km<sup>2</sup> of multi-metal gravel mineral zone in international bottom of the sea (The State Council of P. R. China, 2004).

## 2 FEATURES OF MARINE ECONOMY DEVELOPMENT IN CHINA

### 2.1 Rapid Increase in Gross Output Value of Marine Economy

It has a long history for China to exploit the sea and ocean. Several thousand years ago, some marine industries had developed. Through exploiting the rich marine resources in the vast sea region of China at present, people gain more and more food, water and energy resources, which makes marine economy become the new increasing point of national economy. Entering the 1990s, marine economy of China began to have new development. According to the statistics, gross output value of marine economy in China was only  $6.4 \times 10^9$

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Biography: ZHANG Yao-guang (1934–), male, a native of Shanghai, professor, specialized in marine economy geography. E-mail: zhangyaoguang@163.com

yuan (RMB) in 1979, but raised to  $24.5 \times 10^9$  yuan in 1989, increasing 4 times during the 10 years, moreover, the output value of marine economy raised from  $22.66 \times 10^9$  yuan in 1986 to  $905.229 \times 10^9$  yuan in 2002, increasing 40 times during the 16 years (Fig. 1). The proportion of the output value of marine economy in GDP changed from 0.7% in 1979 to 1.7% in 1989, increasing one percentage point. Especially, the proportion of the added value of marine economy in GDP increased from 1.93% in 1995 to 3.85% in 2002 (Table 1).

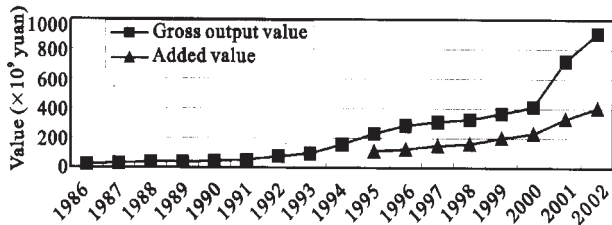


Fig. 1 Development of gross output value and added value of marine economy in China

## 2.2 Yearly Increase in Output of Marine Industries

Concerning the rich marine resources in China, the policy of comprehensive exploitation and utilization is adopted in order to promote the coordinate development of marine industries, which makes the product output of the main marine industries enhance year after year (Table 2).

The production of main marine industries in China lays forefront in the world. Chinese marine transportation ranks the 8th in the world; China has become the 'A' grade of a member of the UN Security Council of sea transportation of world; China has been the 3rd largest country of shipbuilding for seven years in the world; the gross aquatic product in China have been the first in the world for many continual years; the production of offshore crude oil in China has exceeded  $24 \times 10^6$ t, initiating new stage of exploiting and carrying back the crude oil from abroad. The production of sea salt in China always ranked the first place of the world.

Table 1 China's GDP and marine economic product

	GDP ( $\times 10^{12}$ yuan)	Gross output value of major marine industries ( $\times 10^9$ yuan)	Proportion of gross marine output value in GDP (%)	Added value of marine economy ( $\times 10^9$ yuan)	Proportion of added value of marine economy in GDP (%)
1986	1.02022	22.660	2.22	-	-
1990	1.85984	44.400	2.39	-	-
1995	5.74949	264.390	4.28	110.733	1.93
1996	6.68505	285.522	4.27	126.630	1.89
1997	7.31427	310.443	4.24	147.680	2.02
1998	7.93957	326.992	4.12	160.292	2.02
1999	8.19109	365.130	4.46	202.220	2.47
2000	8.94036	413.350	4.62	229.704	2.57
2001	9.59333	723.380	7.54	329.728	3.43
2002	10.47906	905.029	8.63	404.153	3.85

Sources: National Marine Data and Information Service, 1986, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002; National Bureau of Statistics of China, 1986, 1990, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002

Table 2 China's main marine product output

		1980	1990	1995	2000	2001	2002
Offshore crude oil	( $\times 10^3$ t)	398	1455.4	9275.4	20803.6	21429.5	24055.5
Mariculture production	( $\times 10^3$ t)	444	1624	4123	10612.9	11315.3	12128.4
Marine catches	( $\times 10^6$ t)	2.813	5.509	10.268	14.7745	14.4061	14.3349
Total seawater aquatic products	( $\times 10^6$ t)	4.500	7.125	14.391	25.3874	25.7215	26.4634
Output of sea salt	( $\times 10^6$ t)	13.561	11.486	16.925	23.644	22.050	25.983
Cargo handled at seaports	( $\times 10^6$ t)	217.000	483.000	801.660	1256.030	1426.340	1666.280
Seaborne freight traffic	( $\times 10^6$ t)	114.830	227.080	401.100	536.530	604.700	662.880
Oceangoing freight traffic	( $\times 10^6$ t)	42.920	94.080	152.620	229.490	275.730	298.960
Shipbuilding	( $\times 10^6$ t)	-	-	1.750	2.2451	3.4973	32.3097
International tourists to major coastal cities	( $\times 10^6$ )	-	6.2057	9.548	17.1757	18.8014	21.3569

Sources: National Marine Data and Information Service, 1980, 1990, 1995, 2000, 2001, 2002; National Bureau of Statistics of China, 1980, 1990, 1995, 2000, 2001, 2002

Note: All data do not include the data of Taiwan, Hong Kong and Macao

China's marine economy has made great progress, yet it still falls behind those developed countries about 10 years or so, no matter on developmental scale and level

(YANG *et al.*, 2000). The gross value of marine economy in 1995 in China was  $US\$30 \times 10^9$ , which ranks the fourth in the world. The average increase of speed of

world marine economy was 9%, China is 25.6% in the same year, which was far beyond the speed in the world. At that time, the absolute value of marine economy of China (US\$30×10<sup>9</sup>), however, was much less than those of America (US\$186×10<sup>9</sup>), Japan (US\$140×10<sup>9</sup>) and England (US\$76×10<sup>9</sup>) (SU and JIANG, 1999). The value of output of marine economy in China in 2001 accounted for 7.0% in the world, but that in America was evaluated about 16.7%, and that in Japan was about 14.0%.

### 3 FEATURES OF MARINE ECONOMY STRUCTURE IN CHINA

#### 3.1 New Progress in Structure of Marine Industries

With further exploiting of marine resources, marine industries have developed greatly. In the statistics of marine economy beginning from 2001, the number of marine industries has increased from 7 to 13, so the structure of marine industries changed greatly (Table 3).

Table 3 Structure of marine industries in China (2002)

Marine industry	Value of output (×10 <sup>6</sup> yuan)	Proportion(%)	Marine industry	Value of output (×10 <sup>6</sup> yuan)	Proportion(%)
Gross value	905029	100.0	8. Marine electric power and sea water utilization	50754	5.61
Marine primary industry	254103	28.08	9. Marine engineering architecture	1060	1.17
1. Aquatic product industry	254103	28.08	Marine tertiary industry	489342	54.08
Marine secondary industry	161584	17.84	10. Marine transportation	134200	14.83
2. Sea salt industry	9004	0.99	11. Coastal tourism <sup>①</sup>	287486	31.77
3. Shipbuilding	39591	4.37	12. Marine information service	0	0.00
4. Offshore oil and natural gas	36053	3.98	13. Other marine industries	67656	7.48
5. Beach placer	464	0.05			
6. Marine chemical	10375	1.15			
7. Marine biological pharmaceutical industry	4743	0.52			

Source: National Marine Data and Information Service, 1993

Note: ① include 203.6×10<sup>9</sup> yuan of earnings from domestic tourism

#### 3.2 Change of Structure of Marine Industries

According to the division criterion of national economic three industries, we divide marine industry into three parts on the basis of the Chinese present marine industries, i.e. marine primary industry is aquatic products industry; marine secondary industry includes sea salt industry, the exploitation of offshore oil and natural gas, shipbuilding industry, the beach placer; marine tertiary industry involves in marine transportation and coastal tourism (Fig. 2).

We can find some characters of China's marine industries from Fig. 2. The proportion of marine primary industry has the decreasing trend. In marine secondary industry, with the augment of area in exploiting of offshore oil and natural gas, development of shipbuilding industry and increasing of marine biological pharmaceutical industry, marine chemical, marine electrical power, sea water utilization etc., its output value and proportion increase. With the construction of harbor, the development of marine transportation and marine

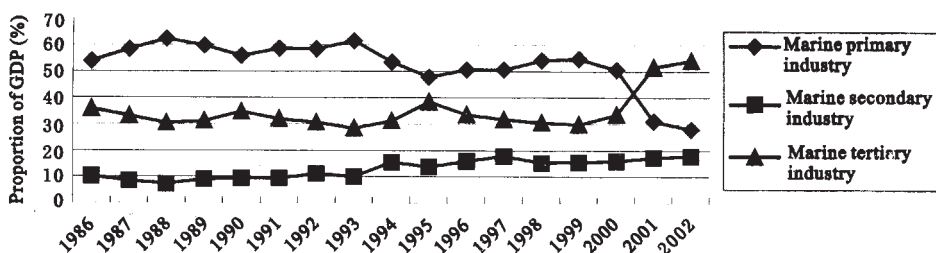


Fig. 2 Structure of marine industries in China

information industry, the proportion of the tertiary marine industry that accounts for more than 50% of gross output value of marine industry at present, especially

coastal tourism is in the increasing trend, which is more than 1/3 of national marine economic output value, and coastal tourism becomes main industry.

### 3.3 Regional Difference of Marine Economy

#### 3.3.1 Marine economic output value

Because of the difference of social economic conditions and sea areas, there are disparities in the level of technology and the degree of marine synthetically management etc. in different provinces. So the gross output values of marine economy are different, especially Guangdong, Shandong, Shanghai, Zhejiang etc. dominated the main position. Between the highest and the lowest values, the difference reached 20.5 times in 1995 and 15.5 times in 2002 (Table 4). The index of centralization was 0.4969 in 1995, but 0.4633 in 2002 (the index of centralization ranges from 0 to 1, if it tends to 1, it shows the centralizing distribution; if it tends to 0, it shows the even distribution). The distance between them is 0.0336. It shows that the difference of provinces is decreasing.

#### 3.3.2 Centralization of marine industrial products

There is huge disparity among coastal provinces in the output value of marine economy, but each province has its own marine products, which occupies the dominant position. We can see that 11 provinces are listed in the top 3 outputs of main marine products from Table 5.

According to the distribution of marine industries in coastal provinces in China, we drawn Lorenz curve (Fig. 3) and computed the index of centralization. The index of centralization of each marine industry is as follows: gross output values of marine economy is 0.496; marine fisheries is 0.5696; marine transportation is 0.6656; marine tourism is 0.7632; the industry of sea salt is 0.6464; shipbuilding industry is 0.6964; offshore oil and natural gas is 0.8964. From the index of centralization and Fig. 3, we can see the disparity of the distribution of marine industries. For those industries whose

Table 4 Gross output values of marine economy in coastal provinces in China

Year	Item	Tianjin	Hebei	Liaoning	Shanghai	Jiangsu	Zhejiang	Fujian	Shandong	Guangdong	Guangxi	Hainan
2002	Output value ( $\times 10^6$ yuan)	4.161	1.273	4.593	7.220	2.215	14.827	10.371	9.946	16.957	1.505	1.094
	Proportion of output value (%)	5.9	1.8	6.5	10.3	3.2	15.4	14.8	14.2	24.2	2.1	1.6
1995	Output value ( $\times 10^6$ yuan)	1.223	0.404	1.785	3.646	0.975	2.677	2.182	4.769	6.163	0.459	0.301
	Proportion of output value (%)	4.6	1.6	7.3	14.9	4.0	10.9	8.9	19.5	25.2	1.9	1.2

Sources: National Marine Data and Information Service, 1996, 2003

Table 5 Output of main marine products in China (2001)

Marine product	Province <sup>①</sup>	Proportion of all outputs (%)
Mariculture production	Shandong (27.0) Fujian (24.1) Guangdong (15.8)	66.9
Marine fisheries	Shandong (22.8) Fujian (18.9) Zhejiang (15.9)	57.6
Marine catches	Zhejiang (23.2) Shandong (19.5) Fujian (14.7)	57.4
Marine oil exploiting	Guangdong (57.1) Tianjin (29.0) Shandong (10.0)	96.1
Offshore oil and natural gas exploiting	Guangdong (73.2) Tianjin (13.7) Shanghai (7.8)	94.7
Beach placer	Guangdong (85.1) Hainan (9.8) Guangxi (2.4)	97.3
Sea salt	Shandong (39.5) Hebei (21.2) Liaoning (13.0)	73.7
Shipbuilding	Shanghai (50.6) Liaoning (22.0) Jiangsu (8.2)	80.8
Marine transportation	Shanghai (31.4) Guangdong (20.2) Zhejiang (11.9)	63.5
Cargo handled at sea ports	Shanghai (16.1) Zhejiang (15.0) Shandong (14.3)	45.4
Tourism receipts	Guangdong (48.5) Shanghai (21.1) Fujian (10.3)	79.9
International tourists	Guangdong (63.5) Shanghai (10.9) Fujian (7.7)	82.1

Source: National Marine Data and Information Service, 2002

Note: ① The figures in the brackets are the proportion of output of each province in nation (%)

marine resources are limited in minority regions, for example, exploiting offshore oil and natural gas and beach placer, their Lorenz curves are near to the outside line. For those industries with relatively widespread resources distributed in every province on different degrees, for example, the index of centralization of marine fishery is below 0.60, their Lorenz curves are near to the diagonal (the line of even distribution). For those industries with relatively widespread resources distribution, but going on the trend of centralization, between 0.6

and 0.8, their Lorenz curves are between the first two, such as sea salt industry, shipbuilding, marine transportation.

## 4 SUGGESTIONS AND COUNTERMEASURES

As to the exploitation of ocean, it is expected to reach the harmonious development of ecosystem, economic benefit and social equity, and to get the harmony of system development between human and sea (region) so as

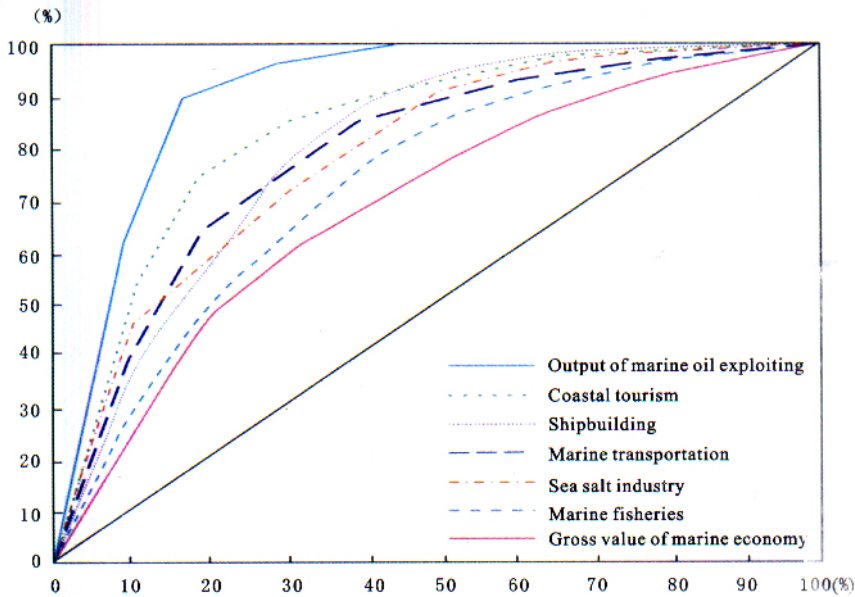


Fig. 3 Lorenz curves of main marine industries in China

to make marine resources be sustainably utilized, marine economy increase continuously, and the economy of sea and land develop together (State Oceanic Administration, P. R. China, 1996).

#### 4.1 To List Exploiting Ocean into National Development Strategy

China has adopted certain measures in the sustainable development of marine economy, and put forward that "to exploit marine resources, to distribute reasonably marine industries, to develop marine economy, to protect the environment of maritime space" as Chinese strategy in *The Ninth Five-year Plan of National Economy and Social Development and A Long-range Objective in 2010*. China carries out presently that exploiting ocean is a strategic mission to push the progress of Chinese economy and society. We must strengthen the evaluation and plan of ocean investigation, promote overall the use and manage of marine region, enhance the protection of marine environment, and advance marine exploiting and economic progress (HU, 2004). *The Planning Outline of Marine Economic Progress in China* issued in 2003 is an important symbol that China makes developing marine economy be listed in national developing strategy.

#### 4.2 To Realize Integrated Economy of Sea and Land

With fish resources catching excessively and the treaties signed between China and Japan, China and Korea, China and Vietnam, coming into force, the proportion of marine primary industry has dropped. It will attach

importance to utilizing marine space and non-biological resources to develop marine secondary and tertiary industry so as to build the international shipping center in Shanghai and to utilize fine conditions of large and small Yangshan islands of Shengsi islands to build the deep-water port, then to connect them by the 32-km-bridge, which not only develops the economy of sea islands, but also has important significance to the development of economy of the Changjiang River delta. At the same time, it will make the economic grow of marine secondary and tertiary industries more quickly than the progress of aquatic products industry. In future, it is expected to center on increasing the faculty of marine economic development, and go with the main line of optimizing marine industrial structure and the distribution of marine economic region. Those will help to make ocean become the component of economic region in China as one economic belt, mainly including coastal economic belt and islands economic belt, and to promote the common development of sea and in land economy (ZHANG, 1996). The economy of hinterland of inland can be driven by the marine economy, and even the exploiting the western China and promoting the old industrial base in the Northeast China to advance the progress of the gross national economy with the beneficial conditions.

#### 4.3 To Develop Ocean by Science and Technology

With the development of marine high and new technology and the understanding of the knowledge of exploiting marine resources, it is estimated that in the initial

stage of 21st century, the direct utilization of seawater, marine chemical industry, marine biological pharmaceutical industry will be on a certain scale; following them, the extensive utilization of deep-sea mining, marine energy (wave energy, salinity energy, thermoenergy, tidal range energy and energy of tidal current etc.), the industry of comprehensive utilization of seawater as future marine industries, will take on the tendency of production increase, and new structural system of marine industries in China will gradually form. After all knowledge economy is the new economy that mainly relies on high science and technology, which can make marine economy be a sustainable economy (GUAN, 1999). According to the prediction of Pierre's model, the progress of marine economy in China experienced four stages: 1) the period of pregnancy before 1998; 2) the period of grow during 1999–2015; 3) the prosperous period during 2016–2033; 4) the period of mature after 2034. The first 30 years of the 21st century will be the best period of construction of marine economy and progress of marine undertaking. So it is the next step to enhance the rate of contribution of science and technology applied in marine economy and to promote sustainable development of marine economy.

#### 4.4 To Perfect Legal Institution of Marine Environment

China just only starts with marine exploitation, but marine pollution is also very serious. In order to make China become a big, strong country of marine economy, we must practically and effectively do a good job to protect marine environment. And the emphasis is laid on strengthening the control of polluted sources and perfecting the system of monitoring and evaluating of marine ecological environment, strengthening the study, monitoring and forecast of red tide, setting up the zone of monitoring red tide. The non-government organization should be encouraged to carry out the actions to protect marine ecological environment. The international cooperation of protection of marine environment will be strengthened.

#### 4.5 To Establish New Idea of Sea Defending

With marine position increasingly enhancing, the ocean will be competitive target, so, when exploiting and utilizing the ocean, China must enhance the ability of protecting her marine power in the aspects of politics,

diplomacy, military affairs etc., safeguard peaceful exploitation and utilization of Chinese marine resources and national right. Thus, it is urgency to have strong modern power of navy as guarantee. At present, *The Law of Exclusive Economic Zone and Continental Shelf* and its relative regulations supply the law foundation for managing marine region in China, meanwhile, we must seriously implement "lying aside dispute, commonly exploiting" policies (DENG, 1993), strengthen the further friendly relation with the countries of periphery and do well the work of dividing boundaries of sea area with neighboring countries (ZHANG *et al.*, 2000), in order to ensure the exploiting of marine resources and the development of marine economy in China.

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