

Statistics And Analysis Of Maritime Accident In Chinese Navigable Waters

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Abstract

For the purpose of evaluating the maritime safety situation in Chinese navigable waters, statistics and analysis work on maritime accidents occurred in Chinese navigable waters in last ten years has been done in this paper. It presents that number of maritime accidents steadily decreased while direct economic loss and number of life loss seems fluctuating during the period 1993-2002. In accordance with the analysis results, except the human factors, which have been involved in most of major maritime accidents, some other factors such as management of shipping companies, ship conditions, conditions of navigable waters, marine traffic volume and maritime traffic safety assuring and supporting system were also play an important role in all those maritime accidents. Based on the results of analysis, some recommendations on measures and policies against the maritime accidents are presented.

1. Introduction

China is one of the main maritime countries in the world. Chinese waterborne transportation plays a very important part in the development of domestic economy and international trade, but maritime accidents, which occurs frequently and causes losses of property and life and damages environment, impedes the development of waterborne transportation. Thereby, Chinese government and maritime society has paid more attention to maritime safety and taken every necessary measure to avoid occurrence of maritime accidents and to decrease the number of accidents.

The key steps in accidents avoidance is to identify the factors and causes that leads to the occurrence of maritime accidents. Statistics and analysis of maritime accidents can be helpful to find the rules of occurrence of accidents, causes and contributory factors of accidents, as well as learn lessons from accidents, so as to take correct and necessary measures to improve maritime safety situation. In this paper, statistics and analysis work on maritime accident occurred in Chinese navigable waters in last ten years are introduced, for the convenience of analysis work, the status of waterborne transportation in China has also been introduced.

2. Status of waterborne transportation in China

Chinese domestic economics and international trade develop very fast in last ten years with annual increase rate 10% and 15%. In this progress, waterborne transportation plays a very important part. As shown in table 1 and fig.1, although the increase rate of cargo carried by sea is lower than that of GDP and international trade during the period, the trend of this increase is continuous and steady.

Corresponding to the rapid development of domestic economics and international trade, the capacity of Chinese waterborne transportation also made a great progress during the same

period from 1993-2002, as shown in table 2 and fig.2.

Table 1 the relationship between Chinese domestic economics and waterborne transportation

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Population (Billion)	11.85	11.19	12.11	12.24	12.36	12.48	12.59	12.95	12.76	12.85
GDP (1000× Billion RBM Yuan)	3.14	4.38	5.83	6.78	7.48	7.96	8.19	8.94	9.59	10.24
International trade (100×Billion USD Dollars)	1.96	2.37	2.81	2.90	3.25	3.24	3.61	4.74	5.10	6.21
Waterborne transportation (Billion Ton)	0.98	1.07	1.13	1.27	1.13	1.1	1.15	1.23	1.33	1.41

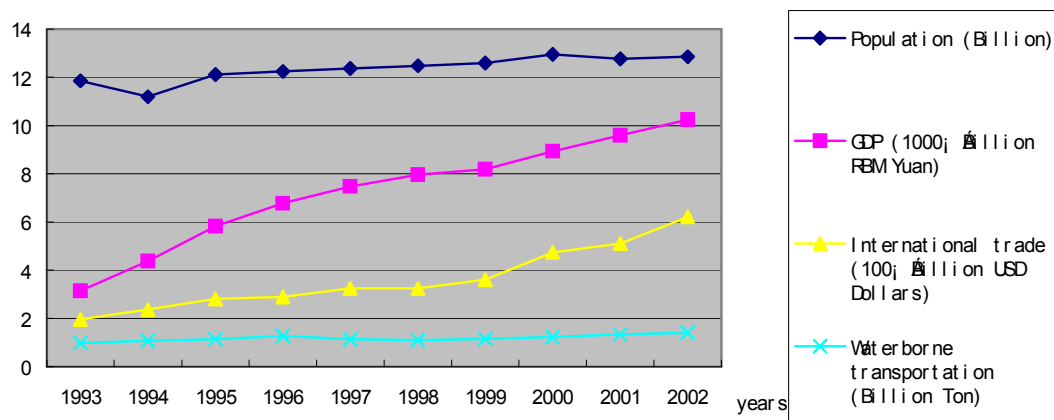


Fig. 1 the development of Chinese economics and waterborne transportation

Table 2 Capacity of Chinese waterborne transportation

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Number of ships (10,000)	38.29	36.17	36.50	33.09	27.19	26.36	24.20	22.98	21.08	20.30
Fleet in dwt (mt)	44.00	48.55	50.43	49.12	48.00	47.94	47.89	51.00	54.50	57.06
Cargo throughput (100mt)	15.7	16.9	18.0	18.4	18.4	18.1	19.6	22.1	24.0	28.0

Source: Statistical communiqué on the national economic and social development (1993-2002), National Bureau of Statistics of China.

From table 2 and Fig. 2, it can be seen that the size of fleet in dwt and the cargo throughput of ports was increasing steadily while the number of ships was decreasing year by year, that means the size of ships was getting larger continuously.

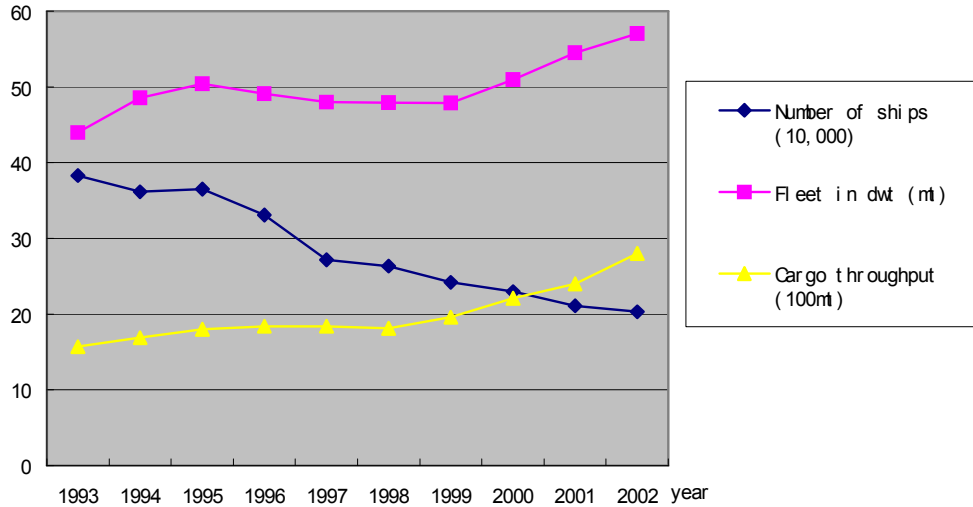


Fig. 2 Capacity of Chinese Waterborne transportation

3. Statistics of maritime accidents in China

With the fast development of waterborne transportation in China, the situation of maritime safety is drawing more and more attentions from the maritime community of China since the situation of maritime safety has a deeper influence on the development of the domestic economics. For evaluating the maritime situation in China, number of accident, number of foundering, number of dead and missing and direct economic loss are taken as indicators of safety status by maritime safety authority of China, which is also called four indices of maritime accidents.

In Table 3, the annual figures of four indices of maritime accidents during the period 1993 to 2002 are presented. For convenience of analysis, the table 3 has been transferred into Fig.3-6.

Table 3 Statistics of maritime accidents during the period 1993 to 2002

Year	Number of accidents		Number of foundering	Deaths and missing	Direct economic losses (million RMB Yuan)
	Total	Serious			
1993	2002	444	364	527	115.89
1994	1781	803	332	543	206.68
1995	1486	718	277	731	206.90
1996	1232	608	257	665	316.92
1997	981	532	267	582	295.80
1998	984	563	295	606	221.15
1999	832	529	253	769	251.00
2000	633	481	234	576	135.96
2001	645	445	290	490	164.72
2002	735		384	463	161.35

In accordance with Fig3, Fig4, Fig5 and Fig.6, it can be told that in the past ten years, the

number of accidents fell steadily from about 200 in 1993 to around 700 in 2002, while the number of foundering, the life lost and missed at sea, the direct economics loss seems fluctuating during the period in question.

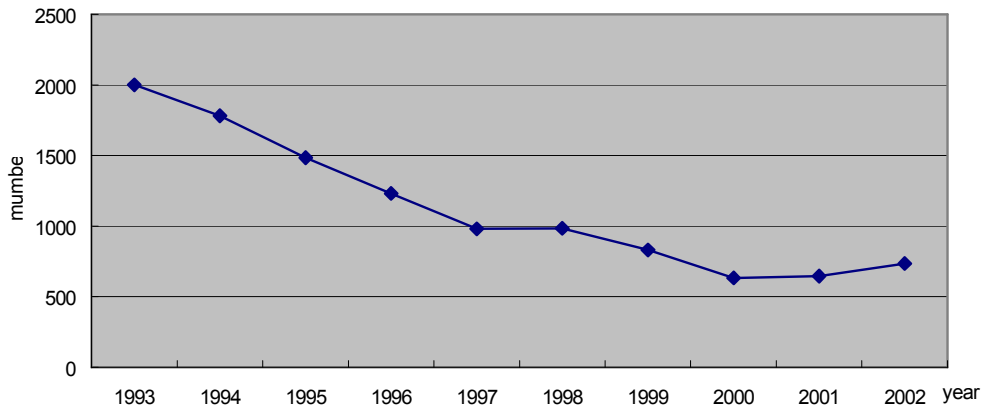


Fig 3 Number of maritime accidents

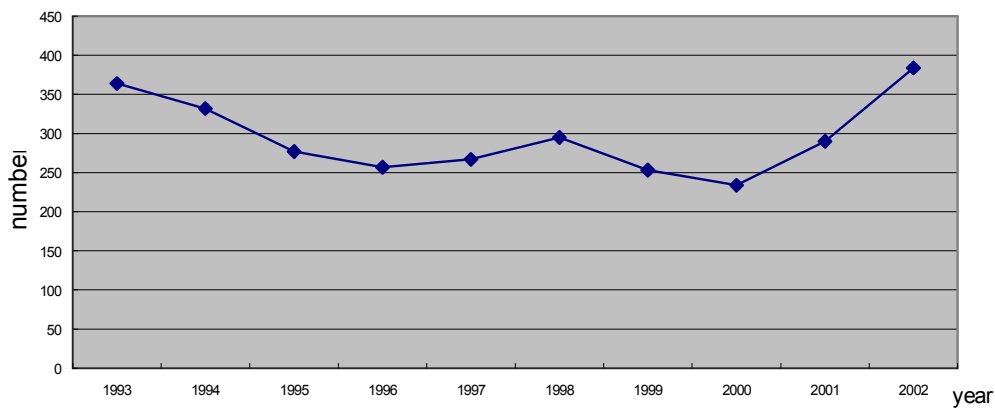


Fig. 4 Number of foundering

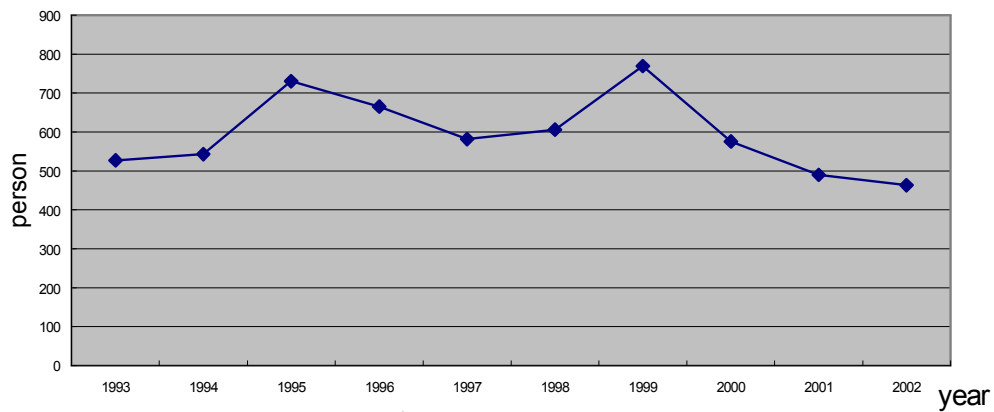


Fig.5 Deaths and missing

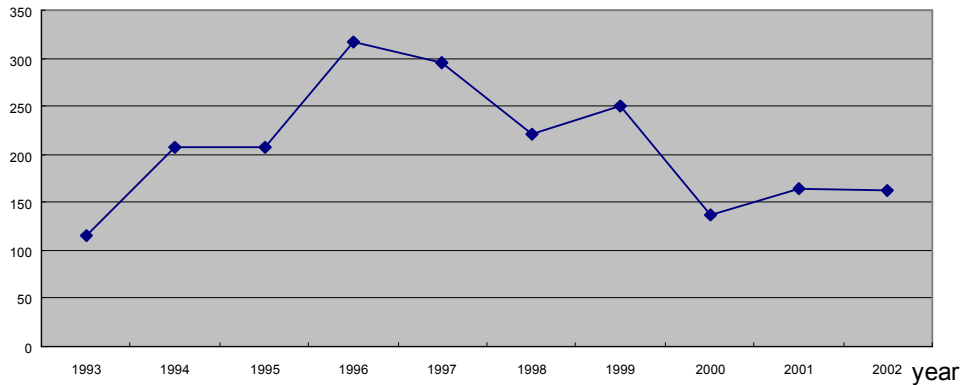


Fig. 6 Direct economic losses (million RMB Yuan)

Among all these maritime accidents, it is necessary to mention that small ships owned by the individuals who live in small towns and villages are involved in maritime accidents with a very high ratio. For example, in 2000, the four index of maritime accidents of small ships are 297, 145, 345, and 38.7 respectively, that share 44.1%, 59.8%, 59.6% and 28.5% of total in the country (as shown in table 4).

Table 4 Maritime accidents occurred on small ships in 2000

	Number of accidents	Number of foundering	Deaths and missing	Direct economic losses (million RMB Yuan)
Total	633	234	576	135.96
Small ship	297	145	345	38.7
Ratio (%)	44.1	59.8	59.6	28.5

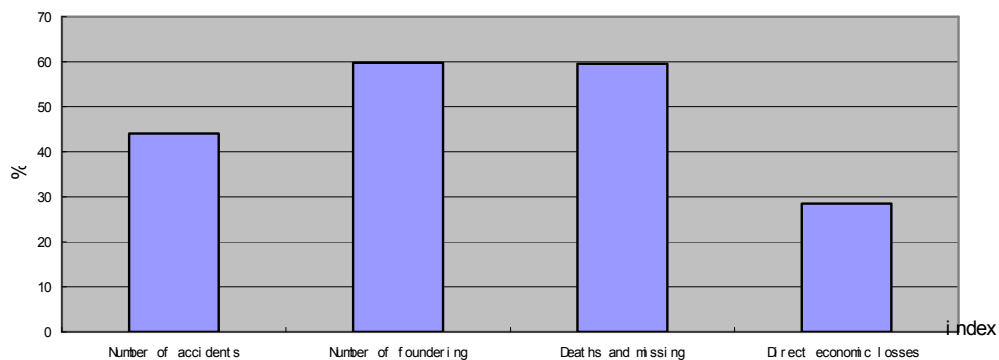


Fig. 7 Ratio of small ships involved in accidents presented in index

4. Analysis of Maritime accidents in China

Investigation of accidents indicates that the causes of maritime accident can be derived into following areas:

4.1 Human factors

Fig.8 shows that more than 90% accidents involve human factors. In this analysis human factors is not only related to seafarers, but also related to these personals in shipping company,

ship classification society and maritime safety administrations. “Da Shun”, a ferry sailing between Dalian and Yantai, sunk in heavy weather in 1999, caused 282 lives lost, is a very serious maritime disaster happened in China waters in last 10years. Investigation indicate, Captain’s improper operation is the main cause of the accident, but ship company gave the pressures on the ship for leaving out the harbors, local maritime safety administrations did not carry out formal inspection before Da Shun leaving out of harbor are other main reasons which caused the accident (CMSA 2001).

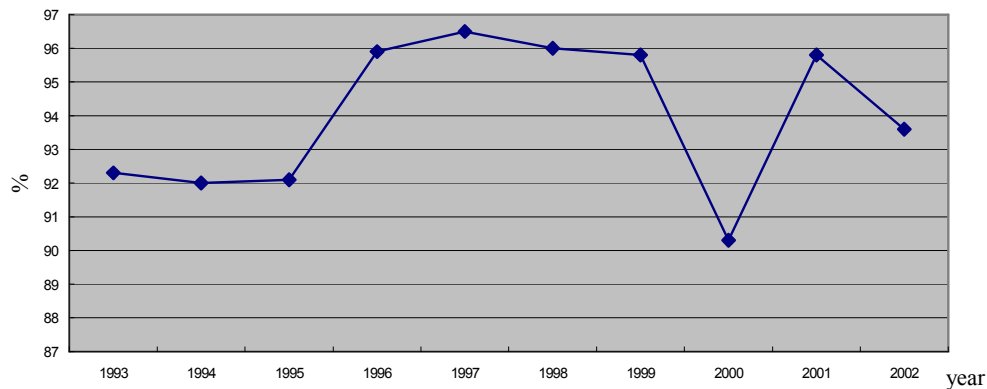


Fig.8 The ratio of human error involved accidents

4.2 ship conditions

China is a developing country, the ship owned by Chinese shipping companies and individuals have relative low technical conditions, such as the size is small, the age is high, a lot of second-hand vessel and wooden ship are still used in coast and inland waters. Table 5 gives the comparisons results between Chinese fleet with the world fleets.

Table 5 Comparison between Chinese fleet and world fleet

	Liquid carrier		Bulk carrier		General Cargo		Container	
	China	World	China	World	China	World	China	World
Structure of fleet (%)	14.9	42.3	53.4	34.2	19.1	12.7	9.2	8.4
Deadweight tonnage (, 000)	20.6	46.4	39.3	49.2	8.4	7.5	20.0	26.1
Average age (years)	18.3	15.7	15.9	14.7	21.6	18.1	10.8	10.1

Source: compiled from statistics in ISL 2000(ships of 1000gt and over)

4.3 Navigational water circumstances

With the development waterborne transportation and other productive activities at sea, the navigable water circumstances seems to be worsen and harder to marine traffic. The waters seems to be more narrow and risk of accidents increased for the density of marine traffic is increased and the also the size of ships. Statistics prove that more maritime accidents occurred

in port and harbor area than that in open sea, as show in Fig.9.

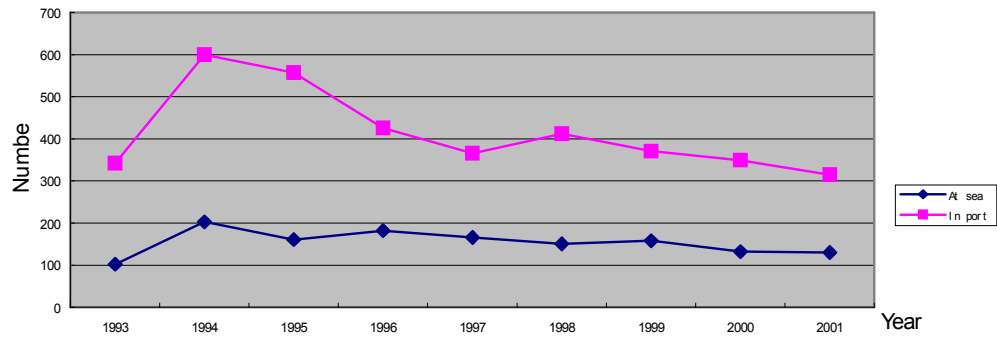


Fig. 9 The Comparison between the accidents occurred in port area and sea

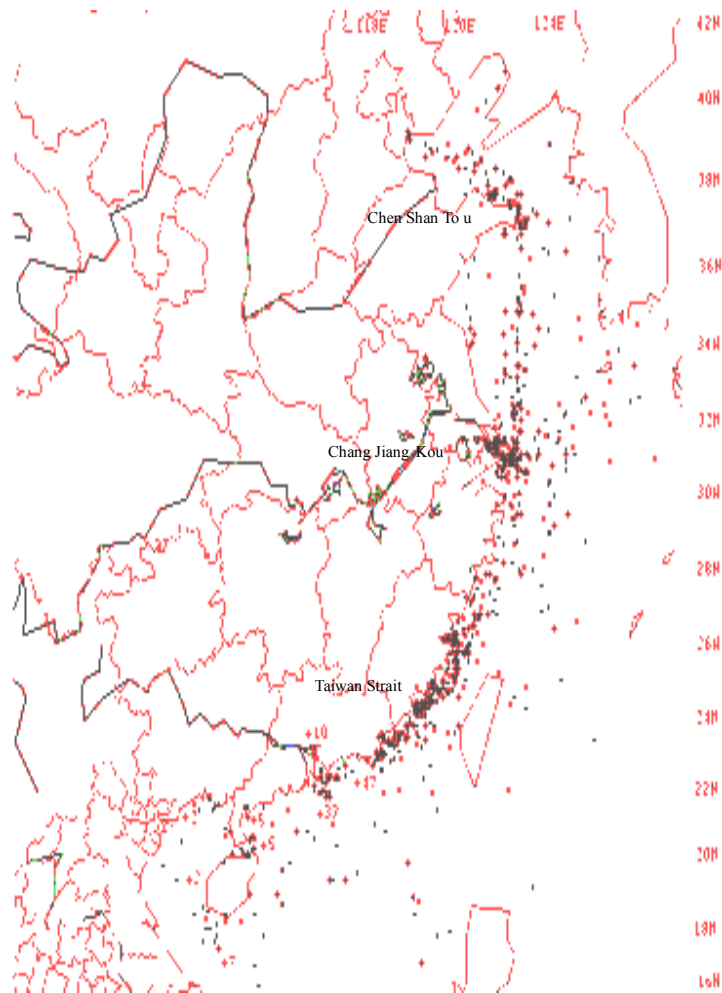


Fig.10 the distribution of maritime accidents in Chinese waters

The most dangerous waters that maritime accidents frequently occurred in Chinese navigable waters is shown as Table 6 and Fig10 (Zhu 2003). It shows that except port and harbor waters,

straits and estuaries are also the areas where maritime accidents frequently happened.

Table6 Accident frequently happened area in Chinese waters

Coastal waters	Lao Tie Shan Strait, Chen Shan Tou Channel, the estuary of Zhu Jiang river, Taiwan Strait waters, Qiong Zhou strait and the estuary of Yangzi river
Inland waters	Yangzi river and its branch, Xi Jiang river, Jing-Hang canal, Hei Long Jiang river

4.4 Maritime Traffic assurance and support system

For the purpose of maritime safety and marine environment protection, a mechanism called maritime traffic safety assurance and support system has been primarily established and strengthened in China since her liberation. As a whole, the system includes the subsystems as maritime safety laws and regulations, maritime safety superintendence, aids to navigation, ship survey, maritime communications, search and rescue, and emergency reactions. The system has already play an active part in the preventing the happening of maritime accident and reducing the impacts of maritime accidents since its beginning. But, Frankly to say, there must be a close relationship between the high occurring rate of maritime accident and the system's incompleteness. An important research project was carried out and completed by the author of this paper. In this project the present maritime traffic safety assurance and support system was evaluated (Wu, at al 2004). The evaluating results are as shown in table 7.

Based on Table 7, it can be told that the adaptability of Chinese maritime safety assuring system to the requirements of the development of Chinese economics and transportation is still low. The general adaptability of the system is as low as 0.652. Compared with the other indices, the arriving time in emergency case or responding action is two slow. It means that the hardware for emergency reaction in China is lack behind the requirements of the waterborne transportation. Immediate improving action on Chinese maritime safety assuring and support system is strongly needed.

Table 7. The adaptability of maritime safety assuring system to waterborne transportation in China

General index	Adaptability	Index	Adaptability	Sub-index	Adaptability
Waterborne transportation assurance	0.652	Safety situation	0.645	Number of fatal maritime accidents per 10,000 ships	0.547
				Dead per 100 millions km (person)	0.690
				Direct economic per million ton-km in RBM Yuan	0.871
				Spilled oil per million ton transported oil (ton)	0.500
		Capacity of assurance	0.665	Arriving time in emergency □min.□	0.429
				Ratio of successful life saving□%□	0.704
				Ratio of successful ship saving□%□	0.822

5. Conclusions

Based on our research, the following conclusions could be get:

- As the rapid development of Chinese domestic economics, the requirements on waterborne transportation are also enhanced. There is a trend that the traffic in Chinese waters will continuously increased.
- The safety situation in Chinese navigable waters is still not optimistic. Although the number of maritime accidents reduced drastically during the period of last 10 years, the loss of life and direct economic still keep at a high level.
- The causes of maritime accidents are multi dimensions. The major factors that lead to the accidents in Chinese waters are human errors, traffic environment and ship conditions. The incompleteness of the waterborne transportation safety ensuring and supporting system has also somewhat negative influences on maritime safety situation.
- For the purpose of Chinese waterborne transportation, it is necessary for Chinese government to pay more attention the completeness of Chinese waterborne transportation safety ensuring and supporting system.

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