

Analysis of Global Marine Environmental Pollution and Prevention and Control of Marine Pollution

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Abstract

The ocean, the origin of life, the total area of about 360 million square kilometers, accounting for 71% of the Earth's surface area. Ocean Freight has become the world's most important import and export trade mode of transport. Our daily life is also closely linked with the ocean, the ocean food, marine-related products. It can be said that the ocean has become the most important part of people's life around the world. However, the current situation of marine environment is not optimistic, marine pollution has become a very important topic in today's society. The oil spill incident; the oil Leakage incident; or the chemical incident. All of these marine pollution incidents have caused significant and difficult recovery of the marine environment. So, how do we prevent and control the occurrence of these marine pollutions? How to restore and manage contaminated waters? This article we will focus on several major marine pollution incidents in the history of the world to discuss and analyze the pollution of the world's oceans, how to prevent and control marine pollution, and how to treat the polluted oceans.

Key words: marine, marine pollution, marine pollution prevention, oil spill, maritime transport

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Chapter1. Introduction

The ocean is the biggest area and the most important part on Earth; it has the huge amount of water storage, which has long been the most stable ecosystem on Earth. The oceans accept the various substances flowing into the ocean from the land, but the ocean itself does not undergo significant changes. However, in recent decades, with the development of the world industry, the pollution of the ocean is becoming more and more serious, so that the local marine environment has undergone great changes, and continues to expand the trend.



Figure 1:Penguins covered in oil ^[1]

The ocean as an important component of human development is now facing a huge challenge, the pollution sources from land, ship, marine accidents are affecting the marine environment little by little. In the face of increasing marine pollution, we can not continue to sit still, the protection of the marine environment should now be regarded as one of the most important topics of human development. Everyone should act to contribute to the protection of the marine environment.

1.1: Background and significance of the topic

As a student who studies maritime knowledge, I have more exposure to the ocean, in the usual learning, I understand that today's marine environmental problems are not optimistic, when I was a child, I lived in Dalian, China (A important port city of China), but just less than 20 years, the ocean in Dalian has changed a lot, the ocean was blue and transparent, there was a variety of marine life on the beach, but now they are no longer exist, due to the reclamation Land, oil spills and other issues so that now the ocean has become beyond recognition in Dalian, the ocean has become dirty, the marine life no longer exist on the beach, and also there are some floating garbages on the sea, these problems made me deeply feel that people should to start action to protect the marine environment, at least I will try my best for the marine environment protection.

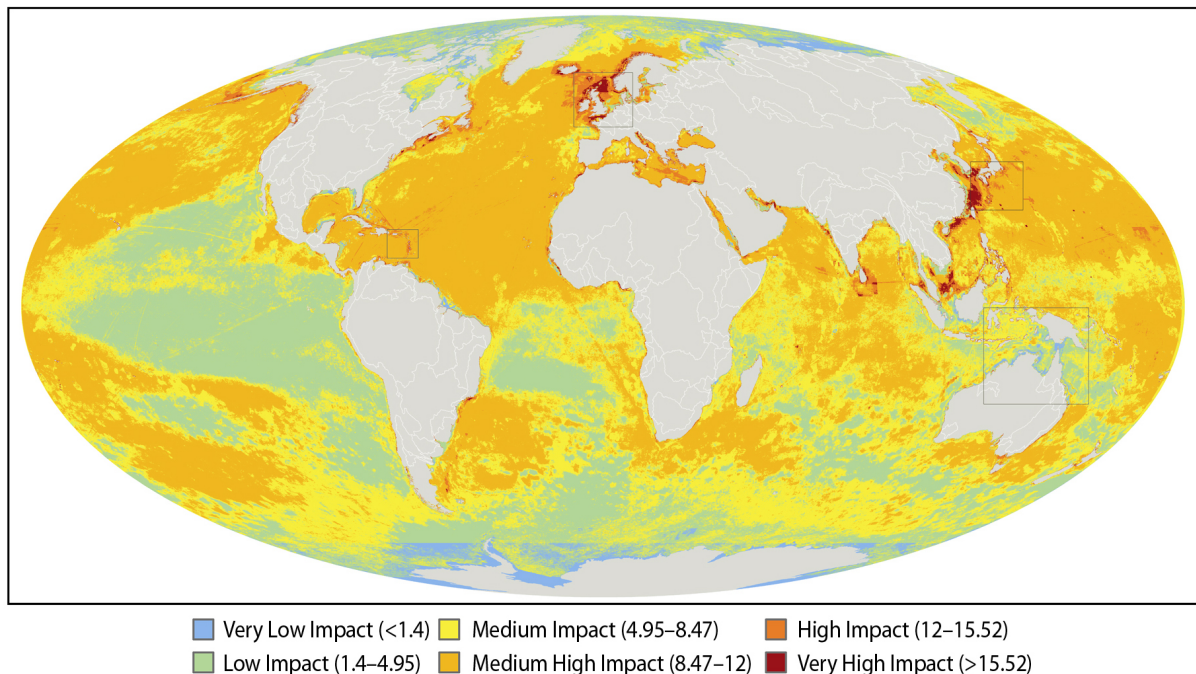


Figure 2: MARINE POLLUTION DISTRIBUTION (source: "A Global Map of Human Impacts to Marine Ecosystems 2008" 2008,02,15)

Marine pollution occurs mainly in the gulf near the mainland. Due to intensive population and industry, a large number of waste water and solid waste dumped into the sea water, coupled with the twists and turns of the coast caused by poor water exchange, making the temperature, pH, salt content, transparency, biological species and quantity of traits change, The ecological balance of the sea constitutes a hazard. Marine pollution is characterized by oil pollution, red tide, accumulation of toxic substances, plastic pollution and nuclear pollution, etc; the most polluted waters are the Baltic Sea, the Mediterranean, Tokyo Bay, New York Bay, the Gulf of Mexico and so on. As far as the country is concerned, coastal pollution is serious in Japan, the United States, Western European countries and the former Soviet Union countries. Pollution in Bohai Bay, the Yellow Sea, the East China Sea and the South China Sea is also very serious in China. In the Bohai Sea, which is the most polluted, the fishing grounds have been relocated, the fish have died, the red tide has spread. Some of the aquatic wasteland has been abandoned. Resources are being lost. ^[1]

In the course of human production and life, the large amount of pollutant nuclei produced in the sea enters the ocean through various channels. The damage to the marine biological resources, marine development and marine environmental quality will endanger the mankind.

Therefore, the marine environmental protection is imminent, in this paper I will analyze some world's major marine environmental pollution accidents and put forward specific programs for the protection of the marine environment.

1.2: The State of the Global Marine Environment

July 14, 2016, the UNESCO's Intergovernmental Oceanographic Commission on the status of the global large-scale marine ecosystem research report released by the growing climate change and human activities lead to global large-scale marine ecosystem conditions worrying. Of the 66 large marine ecosystems in the world, over 50 percent of the fishery resources are overfished, and 64 large marine ecosystems are affected by sea water warming. In addition, more than 50% of the world's coral reefs are threatened, by 2030 this proportion will reach 90%.

Large Marine Ecosystems (LMEs) are relatively large areas of ocean space of approximately 200,000 km² or greater, adjacent to the continents in coastal waters where primary productivity is generally higher than in open ocean areas. At present, there are 66 large marine ecosystems in the world, each of which has an area of more than 200,000 square kilometers. In these areas, generally have a high marine productivity, but it is also very vulnerable to human activities.

The report that pointed out that from 1957 to 2012, the temperature of 64 large marine ecosystems is rising. And three of them, the sea water temperature rise the fastest (maximum temperature rise

of 1.6 °C) Respectively, the East China Sea, Scotia sea, the United States northeast continental shelf waters.

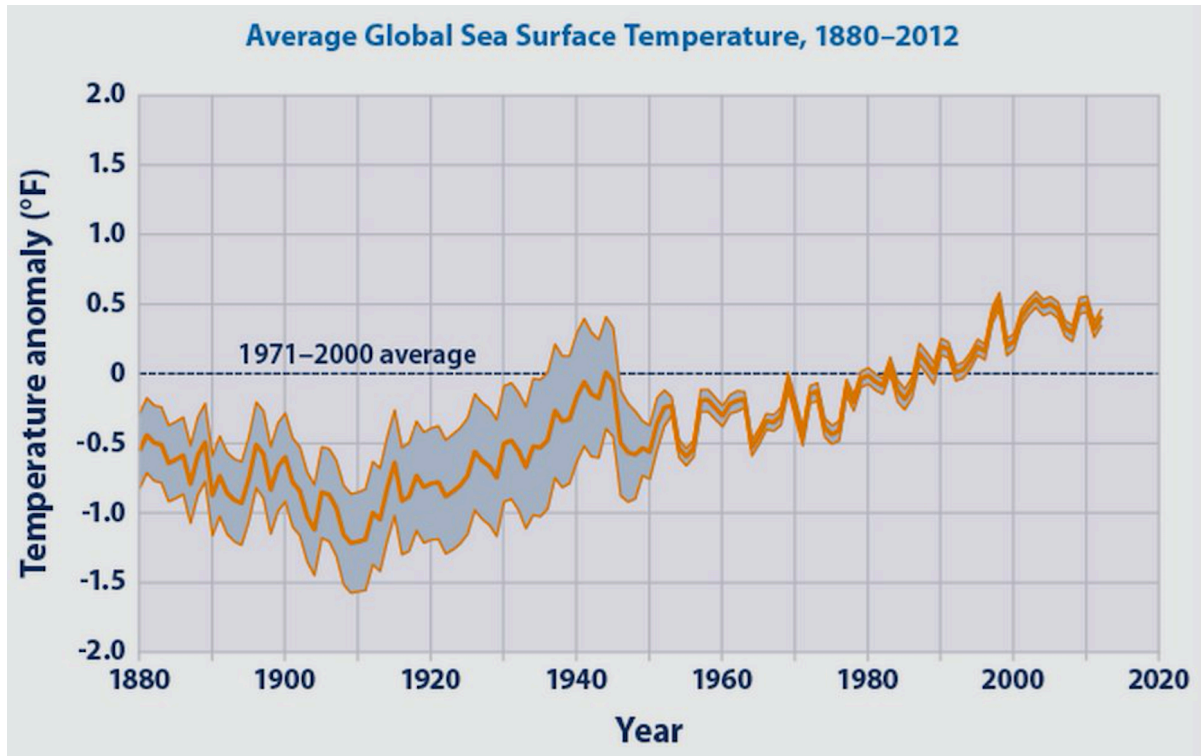


Figure 3: AVERAGE GLOBAL SEA SURFACE TEMPERATURE FROM 1880-2012 (SOURCE: NOAA (National Oceanic and Atmospheric Administration). 2016. Extended reconstructed sea surface temperature (ERSST.v4). National Centers for Environmental Information. 2016,03)

In addition to seawater temperature, the report also evaluated the productivity, fishing, pollution and environmental protection, marine health and socio-economic development, and integrated management of large marine ecosystems. Overall, the global large-scale marine ecosystems generally get low scores.

In the case of plastic pollution, there is a high risk of contamination in the East and South-East Asian seas, the Mediterranean and the Black Sea. Spanish media ^[2] said the Greenpeace reported on August 25, every second there will have more than 200 kilograms of plastic is dumped into the ocean, and every year there will have more than 8 million tons of plastic to stay in the ocean. The report notes that there are about 5 to 50 trillion tons of plastic debris in the oceans. Although the exact numbers are uncertain, but it is certain that this number is very high, and this number doesn't include plastic debris deposited on the sea floor and on the beach. Although some waste can be degraded within 6 months, but some may remain in the ocean for hundreds of years.

In addition, the organization's experts estimate that by 2020 the rate of plastic waste production will reach 9 times in 1980, the annual output will reach 50 million tons. Experts warned that half of the increase would occur in the last 10 years. It is for sure that all the plastic waste is from human activities; in recent years these plastics have accumulated in the Pacific, the Atlantic and the Indian Ocean into five huge garbage islands. 80% of the litter in the ocean comes from the ground, 15% of them are floating on the sea surface, 15% of the waste is below the seawater moving with the sea, and 70% deposited in the sea, so people just can see a little bit of these rubbish. Experts point out that Spain ranks fifth in the list of countries with the highest consumption of plastics. Every day up to 50 million plastic containers are put into the market for beverage cups. But just have less than 20 million of these beverage cups are recycled properly, and the rest are burned into rubbish, or thrown directly into the environment. Plastic wastes are degraded more slowly in the marine environment than on land, and may have additional effects. Because these plastic containers will release toxic substances, does not belong to the normal marine nutrients circulation.^[3]

In seawater eutrophication, 21% of large marine ecosystems will be at risk of eutrophication by 2050, mainly in East and South America and Africa. As far as human activities are concerned, large marine ecosystems are generally adjacent to densely populated areas, especially in large waters adjacent to developing countries, and are most severely affected by human activities. Among them, ocean acidification, seawater temperature rise, commercial transport and submarine trawling operations, are the most serious factors affecting marine ecosystems.

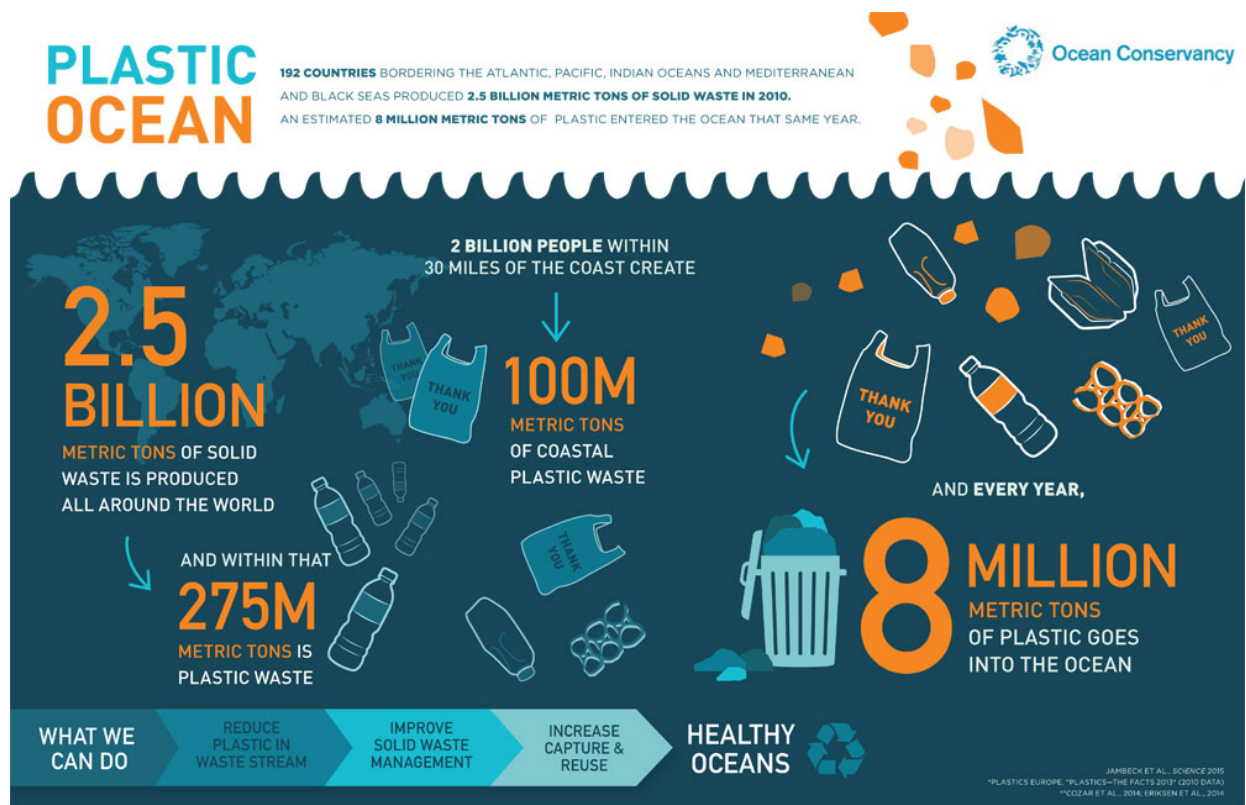


Figure 4: "PLASTIC OCEAN" (source:"Trash Pollution" oceanconservancy.org)

In marine health indicators, the largest marine ecosystem near the equator has the lowest score, suggesting that marine environmental protection in the tropics should be strengthened. In addition, the highest score of large marine ecosystems are in Australia and the North Atlantic Ocean near the Arctic Circle.

In the same period, the most threatened tropical areas are the threatened index, which includes environmental risk, resource dependency and coping capacity.

Overall, the global marine environment is facing enormous challenges, such as marine ecosystem damage caused by overfishing, the rise of seawater temperature, the pollution of waste such as plastics, and eutrophication of seawater. Are reminding people that it is time to act to protect the marine environment.

1.3: The State of China Marine Environment

With the rapid development of urbanization and the increase of population, the marine pollution in China is becoming more and more serious. The domestic sewage, industrial waste water, oil product leakage, offshore oil exploitation and mariculture additives around the sea basin have caused serious pollution to China's coastal waters. The extinction of fish stocks, the frequent occurrence of natural disasters and so on, we have to consider how to effectively control marine pollution. ^[4]

In 2008, the monitoring area of coastal waters in China totaled 281,012 square kilometers, of which Class I and Class II were 212270 square kilometers, Class III was 31077 square kilometers, Class IV and Class IV were 37665 square kilometers. According to incomplete statistics, the Chinese coast since 1980, happened a total of 300 red tides. This has had a significant impact on the marine ecosystem.



Figure 5: MARINE LIFE AFFECTED BY RED TIDE

In the Bohai Sea, the Yellow Sea, the East China Sea and the South China Sea, the seawater pollution in the Bohai Sea and East China Sea is more serious than Yellow Sea and South China Sea. The polluted area of the Bohai Sea is about 24,000 square kilometers, accounting for 1/3 of the total area of the Bohai Sea. The area of the Yellow Sea which is not up to the standard of clean water is mostly clean and light pollution, The pollution degree is relatively low; the main pollution area of the East China Sea is relatively concentrated and the pollution is heavy, mainly concentrated in the Yangtze River Estuary and Hangzhou Bay; The overall pollution of the South China Sea is relatively low. Most of the areas that do not meet the clean water standards are cleaner and slightly polluted. The areas with moderate pollution and serious pollution are mainly in the coastal waters of the Pearl River Estuary, Shantou and Zhanjiang Port.

In 2004, the coastal waters were still seriously polluted, and the serious pollution areas were mainly distributed in the local waters such as Yalu River Estuary, Liaodong Bay, Bohai Bay, Yangtze River Estuary, Hangzhou Bay and Pearl River Estuary. Table 1 shows the sea areas that did not meet the clean standards in each sea area.

	Clean	Light Polluted	Moderate Polluted	Serious Polluted
Bohai Sea	15900	5410	3030	2310
Yellow Sea	15600	12900	11310	8080
East China Sea	21550	13620	12110	20680
North China Sea	12580	8570	4360	990

Table 1: Seawater Pollutin Degree, 2004 (km2)^[5]

The area did not meet the clean water quality standard is about 169,000 square kilometers, compared with 2003 increased by 27,000 square kilometers. In general, the pollution of China's sea areas has not been alleviated, especially the moderate pollution increased by 15,900 square kilometers, an increase of 106.6%; serious pollution of sea area increased 7380 square kilometers, an increase of 29.9%, pollution increased significantly.

	Clean	Light Polluted	Moderate Polluted	Serious Polluted
2001	99440	25710	15650	32590
2002	111020	19870	17780	25720
2003	80480	22010	14910	24680
2004	65630	40500	30810	32060

Table 2:China Marine pollution area from 2001-2004 (km2)^[5]

According to a recent survey, the Bohai Sea in China almost as fast as the "Dead Sea". As well as the 2010 Dalian Xingang "7 ,16" oil pollution incident, 2011 Penglai "3,19" oil spill accident, 2011 Fukushima nuclear accident in Japan, so that the marine environment has been hit, and these pollution effects are still existing.^[6]

Chapter 2: Analysis of Main Causes of Marine Pollution

Seawater turbidity caused by marine pollution will seriously affect the photosynthesis of marine plants (phytoplankton and algae), thus affecting the productivity of the sea, the fish are also harmful. Heavy metals and toxic organic compounds and other toxic substances accumulate in the sea, and through the enrichment of marine life, marine animals and other animals to feed poisoning. Oil goes into the sea, so that a large number of dissolved oxygen is absorbed by oil; the oil film covering the water, made the separation between seawater and air, this can also cause the sea water hypoxia. Seawater hypoxia can cause marine life death. Oil will make economic fish, shellfish and other seafood produce has oil smell, adult fish, shellfish in the long-term living in the polluted seawater in the accumulation of certain harmful substances, when we eat them, it will harm the human health. Because of organic matter and nitrogen and phosphorus pollution, some algae plankton in sea water can multiply quickly and rapidly. Different algae have different colors, which cause red, pink and green colors, which are called red tide. The red tide caused by sea water hypoxia will make a large number of fish, shellfish and other marine animals due to lack of oxygen and suffocation.

Oceans as an important part of human life, its changes will directly or indirectly affect human life. Marine pollution will have a great impact on human life. So what are the causes of marine pollution? In this chapter I will talk about the main causes of marine pollution.

2.1: Marine pollution caused by ships

Because of its low cost and the advantage of large cargo volume, ship transportation has become the most important transportation mode. With the great development of industrial technology and rapid population growth, the volume of sea freight has increased significantly year by year, and the tonnage and size of ships have been increasing. But with the emergence of marine pollution

problems are becoming more serious. Ship in the course of the operation, it is inevitable to introduce some pollutants into the ocean, causing marine pollution.

2.11: Oil pollution caused by ship transport

The oil pollution caused by ship transport mainly includes two categories ^[7]: the first is the pollution caused by normal navigation, eg: cabin bilge water, oil tanker ballast water, washing water and so on. The second category is due to shipping accidents, eg: oil spill. Among all types of marine pollution, oil pollution should be said that the most serious. Because oil is difficult to volatile, making the oil on the sea to form a terrible oil film, resulting in a series of serious consequences.

2.12: Harmful substances caused by Marine pollution

In recent years, with the transport of dangerous chemicals increased ship, harmful substances caused by pollution is also growing. In general, this type of pollution includes:^[8] (1) pollution caused by the transport of liquid toxic substances in bulk, including ballast water and tank washing water, cargo pump bilge water, and the other is due to the accident caused by a large number of toxic and hazardous substances spillover , And loading and unloading operations in the drop, leakage and so on. (2) packaging harmful substances caused by the pollution. In case of transport of hazardous substances in containers on board ships, packaging damage, leakage, spillage and spillage on open decks and bilges will result in maritime contamination when water is removed from the ship's surface to remove these spilled toxicants. In addition to these toxic substances mixed garbage, separators or other materials are also sources of pollution, of course, when the emergency abandonment of the goods will also cause serious marine pollution.

From the figure below we can see that between 2000 and 2009, only in the Malaysia Coastal Areas and the Malacca Strait some shipping accidents occurred. It can be seen from the ship accident caused by dangerous goods and oil leakage caused by marine pollution is very serious.

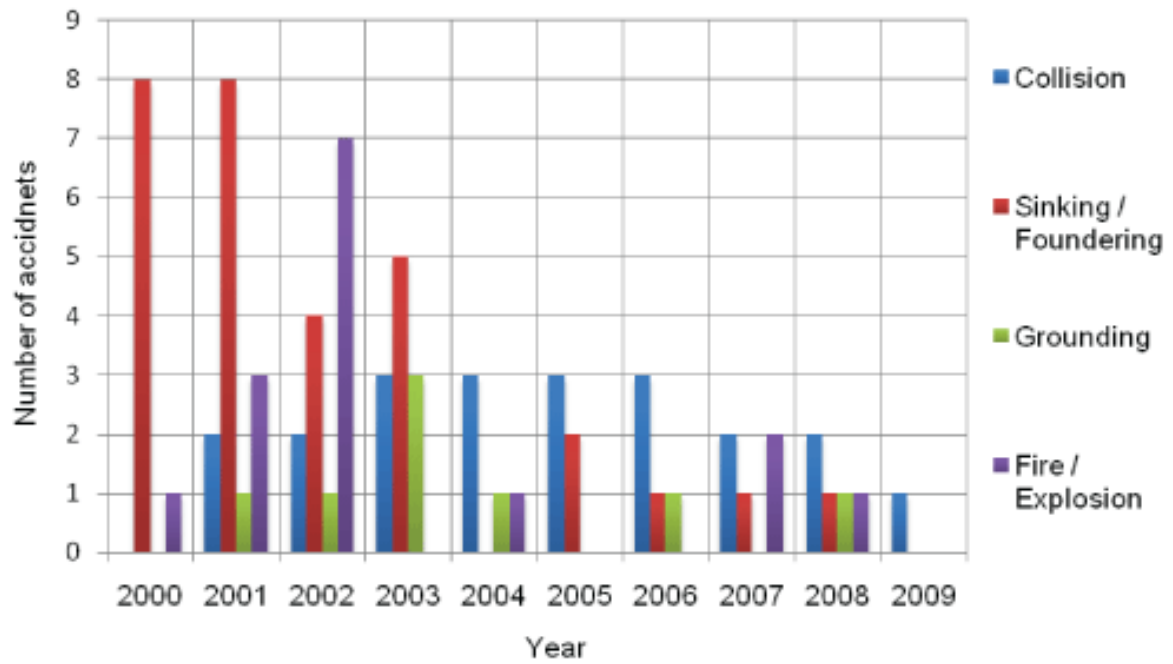


Figure 6: TOTAL OF ACCIDENT OF SHIPS AND BOATS AT MALAYSIA COASTAL AREAS FROM YEARS 2000-2009.

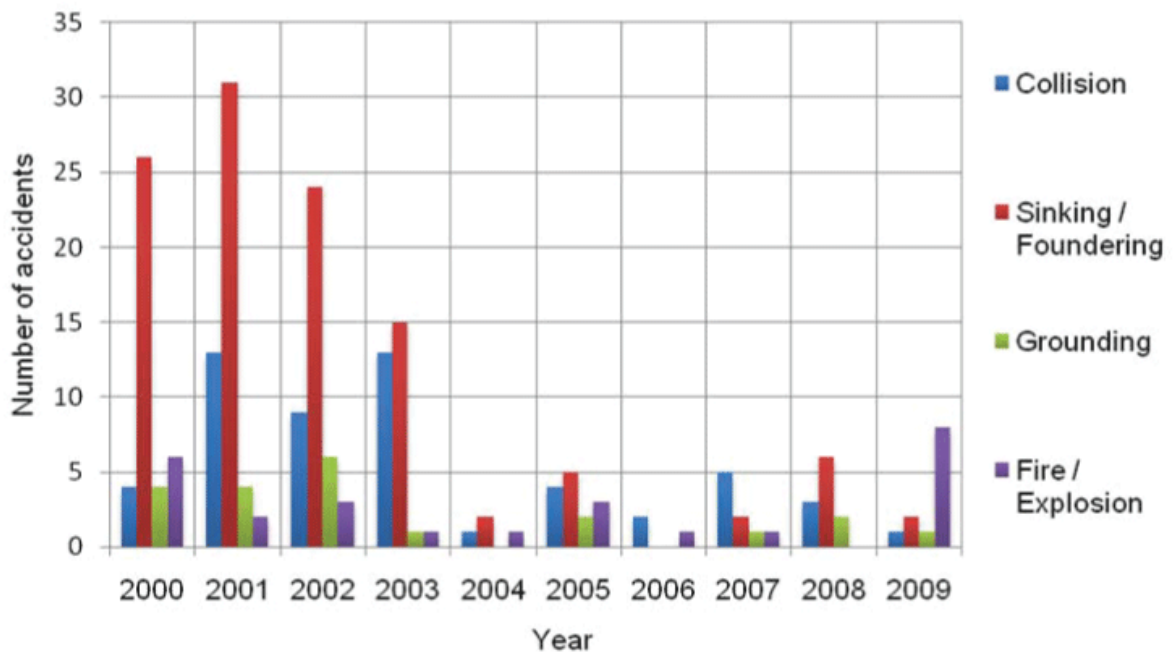


Figure 7: TOTAL OF ACCIDENT OF SHIPS AND BOATS MALACCA STRAITS FROM YEARS 2000-2009 (source: Malaysian Marine Department [Z] 2010.03.24)

2.13: Pollution from domestic sewage and garbage

Ship sewage usually is the excreta from daily , such as toilet discharge, medical room discharge, the activities of the premises of the discharge material. Ship waste is mainly solid waste, such as a variety of daily necessities, food and work supplies. As the sewage water containing bacteria, viruses and various eutrophication substances, resulting in emissions of seawater after the pollution, such as the eutrophication of sea water and lead to depletion of dissolved oxygen, organics corrosive stench, making the seawater serious pollution. Marine waste can also cause environmental pollution due to the presence of substances that are toxic or difficult to degrade, such as plastics.

2.14: Pollution of air by ships

Ship air pollution caused mainly in the following three aspects: (1) fuel combustion. Exhausted carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x) and other causes of air pollution. (2) The use of refrigerants, fire extinguishing agents, detergents, foaming agents (insulation materials), such as the production of chlorofluorocarbons (CFCs), halocarbons (Halon), the ozone layer of the atmosphere produced serious harm . (3) liquid hydrocarbons in the hydrocarbon gas or harmful gases, the proliferation of air pollution caused by the atmosphere.

The above four points we can see the ship pollution caused by the following characteristics:

1. Diversity of pollutants in ships. The substances discharged by the ship are oil, toxic and hazardous substances, ship waste, on board living wastewater. One of the main is the oil substances.
2. The pollution of ships is fluid and non - border. The mobility of seawater, the mobility of the ship determines the pollutants from the ship into the ocean can not be limited to or fixed at a point and stationary. A pollution may spread to many countries, to the pollution caused by a lot of inconvenience.
3. Ship pollution is highly hazardous and has a wide range. The pollution of the marine environment is damaged and the habitat environment of the marine organisms is destroyed, which seriously affects the adjustment function of the ocean itself. It will bring serious harm to the marine ecological environment, marine biological resources and marine fishery production, thus affecting the global ecological balance, A serious threat to human living environment.

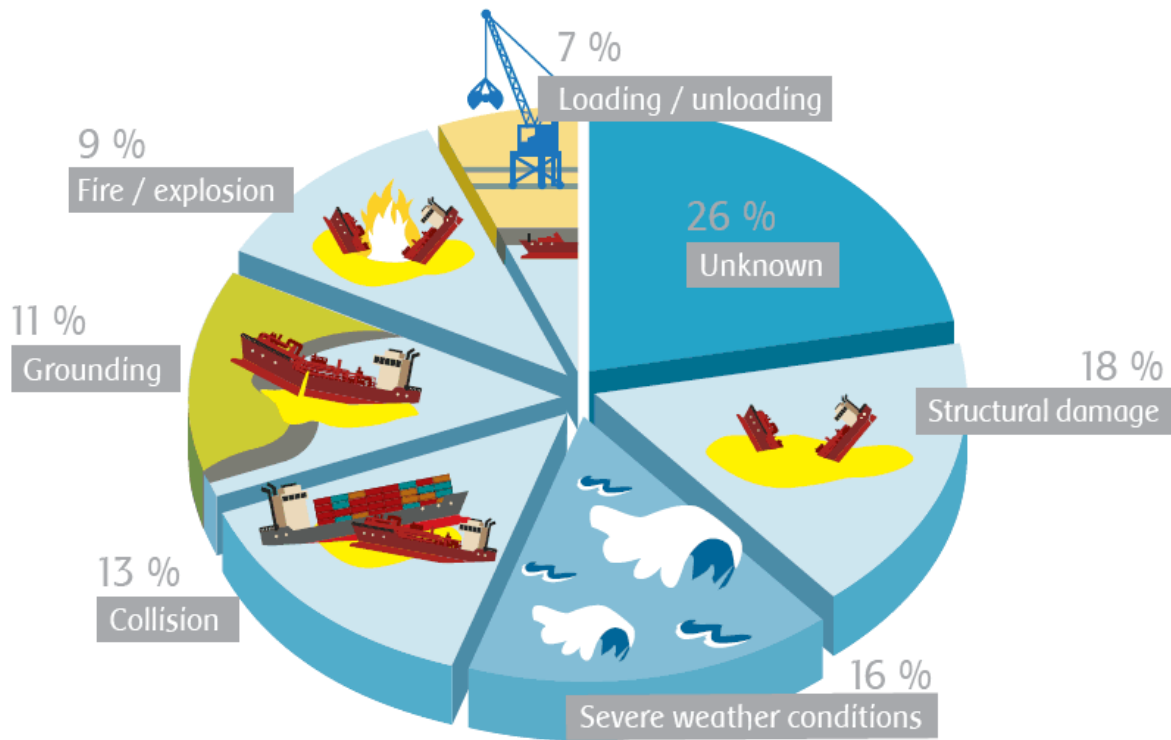


Figure 8: CAUSES OF SHIP-SOURCE ACCIDENTS INVOLVING HNS WORLDWIDE (BETWEEN 1917 AND 2010) (SOURCE: chemical-pollution.com)

2.2: Marine pollution caused by oil

Oil as the basis of industry, it can't be replaced for industry, the oil bring us a lot of convenience in production and life, but also brought the significant pollution to the environment, especially the marine environment, and now, oil Pollution has become one of the most important causes of marine pollution.

2.2.1: Status of Offshore Oil Pollution

Oil pollution is associated with the discovery and use of oil. At present, oil energy accounts for about 33% of the world's total energy.^[9] The widespread use of petroleum and its products has had a serious impact on the environment. According to statistics, the total annual amount of oil poured into the ocean is between 200 to 1000 million tons every year. With the development of the

petroleum industry, the marine area contaminated by petroleum is expanding and the pollution degree is also increasing. The oil pollution in China is also very serious, every year, there will have about 10 million tons oil discharged into the ocean in China, ^[10] this caused the fisheries losses about hundreds million dollars each year. According to the National Marine Environmental Monitoring Network monitoring, China's offshore oil content of more than one or two types of sea water quality standards of the sea area has reached 56,000 square kilometers. With the rapid development of the oil industry, many environmental problems have been brought, such as oil spills, leakage, settlement and discharge, which are caused by accident, abnormal operation and overhaul in crude oil extraction, transportation and processing. Oil pollution has become a major pollution of the marine environment, the marine and coastal ecological environment caused serious harm.

Marine oil pollution comes mainly from oil spill, offshore oil production, marine transport, atmospheric transport, urban pollution and water discharge. Of which natural sources account for about 92%, and human activities account for about 8%. ^[11] and the most serious environmental impact of human activities caused by sudden oil spills. According to United Nations statistics, the annual oil well blowout accidents and oil tanker accidents caused oil spill as high as 2.2×10^7 t. A large number of oil spill into the marine environment instantly, through the proliferation, drift and other effects on the marine ecological environment and society caused serious damage. Offshore oil pollution by oil input type, can be divided into sudden input and chronic long-term input. Sudden input includes oil tanker accidents and offshore oil spills and blowout accidents, while the chronic long-term input is the port and ship operations oily wastewater discharge, natural seabed leakage, oily sediments erosion after exudation, industrial waste water discharge, ^[12]. The main causes of pollution are as follows: the frequent sea oil shipping increases the probability of oil spill at sea; the port loading and unloading oil operation is frequent, there is a hidden danger of spill oil; large-scale oil tanker has increased the occurrence of major oil spill accidents The possibility of oil spill treatment to improve the difficulty of offshore oil exploration and development of oil spills and wastewater discharge.

2.22: Hazards of Offshore Oil Pollution

1. Ecological hazards

(1) The impact of sea air exchange: Oil film covering the sea, blocking O₂, CO₂ and other gas exchange. Caused the destruction of the ocean dissolved gas cycle balance.

(2) The impact of photosynthesis: Oil hinder the sun into the ocean, so that the water temperature drops, undermine the ocean O₂, CO₂ balance, which also destroyed the objective conditions of photosynthesis. At the same time, dispersed and emulsified oil invades marine plants, destroying chlorophyll, blocking normal division of cells, blocking plant respiratory tract, and then destroying the main body of photosynthesis.

(3) The consumption of dissolved oxygen in seawater: a large number of the degradation of oil consumption of oxygen in the water, but the main way the sea water reoxygenation dissolved oxygen film was obstructed, made a direct result of sea water hypoxia.

(4) poisoning: The polycyclic aromatic hydrocarbons contained in petroleum are highly toxic to organisms, and the toxicity is significantly related to the number of aromatic rings and the degree of alkylation. First of all, the absolute toxicity of macromolecular compounds is very high, and in water, low molecular class due to the strong water-soluble and subsequent great bioavailability, also showed severe toxic effects. Hydrocarbons can be further exacerbated by bioaccumulation and transport of food chains. Evidence suggests that hydrocarbons have mutagenic and carcinogenic effects, while the ecological risk of chronic oil pollution is more difficult to assess.

(5) Destruction of coastal wetlands: Oil development and other human activities led to the loss of serious coastal wetlands in China. According to preliminary estimates ^[13], China's total loss of coastal wetland area of about 2.19 million hectares, accounting for 50% of the total coastal wetland area.

2. Social harm

(1) The harm of oil pollution to fisheries: Oil pollution as a result of inhibition of photosynthesis, reduce the dissolved oxygen content, destruction of biological physiological function, marine fisheries resources are gradually declining.

(2) The occurrence of red tide stimulated by oil pollution: The occurrence probability of red tide increased in the oil-polluted sea area. Although the mechanism of red tide is still inconclusive, the role of petroleum hydrocarbon should be considered.

(3) The impact of oil pollution on industrial and agricultural production: Oil in the oceans is easy to attach to fishing nets, increase the difficulty of cleaning, reduce the efficiency of network equipment, increase fishing costs, resulting in huge economic losses. On the beach drying plant, sewage is undoubtedly difficult to use, for desalination plants and other needs to seawater as raw material for the enterprise. Polluted seawater is bound to substantially increase production costs.

(4) The impact of oil pollution on tourism: Offshore oil can be easily attached to the beach and so tarnish attractive beachfront entertainment, the image of the coastal city.

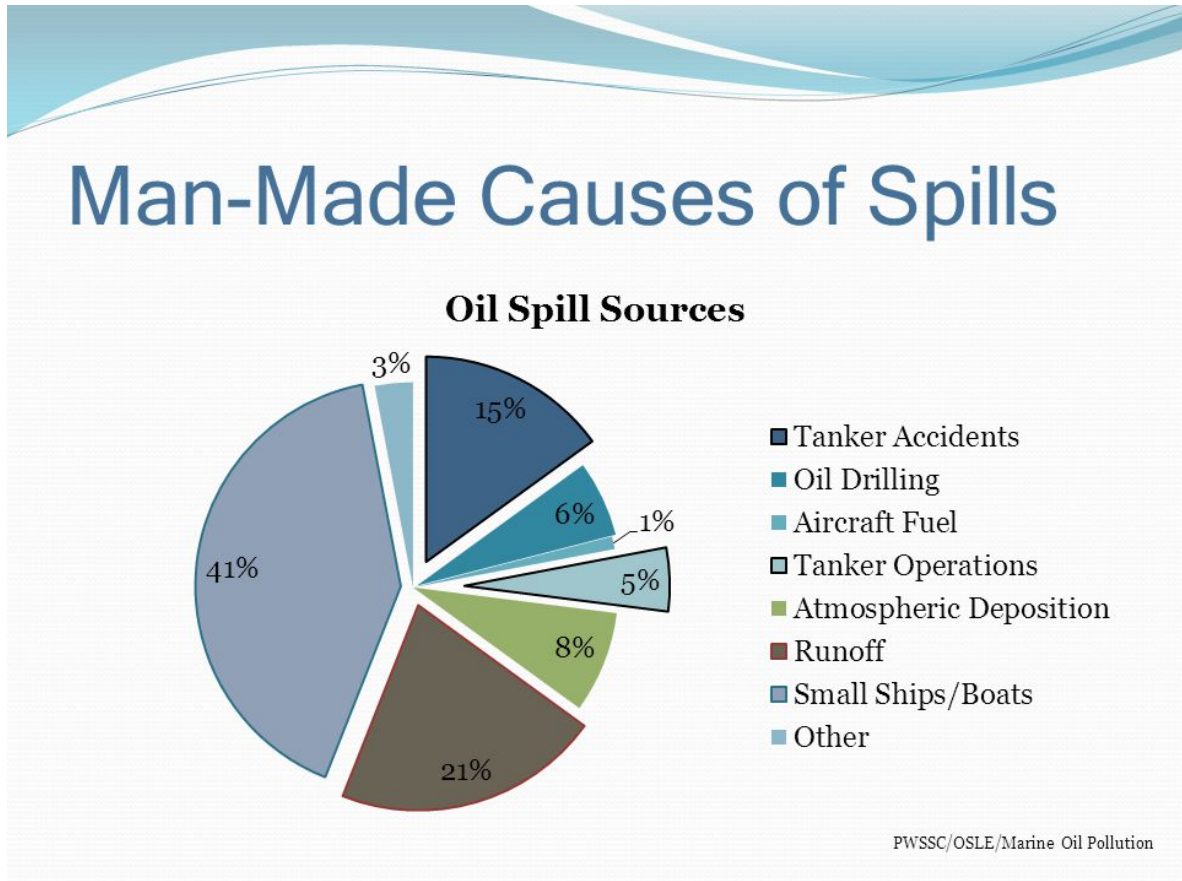


Figure 9:MAN MADE CAUSE OF SPILLS (source:PWSC/OSLE/Marine Oil Pollution)

2.23 Impacts of Offshore Oil Pollution

1. Impact on human health

Marine oil pollution on human health have a direct or indirect impact on the health hazards of anesthesia and suffocation, chemical pneumonia, dermatitis and so on. Such as gasoline for the narcotic poisoning, acute poisoning can cause central nervous system and respiratory system damage; inhaled a large number of diesel oil droplets in the short term can lead to chemical pneumonia. Such as underground oil tank and oil pipeline corrosion leakage of soil and groundwater pollution, not only cause soil salinization, poisoning, leading to soil destruction and destruction, and its toxic substances through crops, especially groundwater into the food chain system, the ultimate direct harm to human . Especially oil into the ocean, but also through the food chain in the final enrichment in the human body, resulting in serious harm to human health. Gasoline, diesel, kerosene in the toxic and harmful substances on the human nervous system, urinary system, respiratory

system, circulatory system, blood system and other hazards. Foreign studies have found that children living near gas stations or auto repair shops have a fourfold higher risk of developing acute leukemia than those who have children who are at risk of developing acute leukemias. These children are at risk of developing acute leukemias. The risk of acute non-lymphocytic leukemia is seven times higher than that of children living in the same area but not near the gas station. This shows that oil on human health will have a great harm.

2. Effects on aquatic organisms

Oil pollutants into the marine environment will have a huge impact on the growth and reproduction of aquatic organisms and the ecosystem as a whole. Toxic compounds in pollutants can change the cell activity, algae and other plankton acute poisoning death. When the oil concentration in the sea is $10^{-4} \sim 10^{-3}$ mg / L, it can affect the early development of fish eggs and fish. The oil coating will lead to a large number of bird deaths, such as Exxon's Valdez shipwreck accident in four months, causing up to 30,000 birds killed. Heavy components of oil sank to the bottom of the sea and cause damage to benthic organisms. Oil will penetrate into higher plants such as *Spartina anglica* and mangrove plants, alter the physiological functions such as cell permeability, and serious oil pollution may even lead to the death of these tidal zones and salt marsh plants. The chemical toxicity of petroleum to marine organisms depends on the type and composition of the oil. Usually, the toxicity of refined oil is higher than that of crude oil. The toxicity of low molecular weight hydrocarbon is higher than that of high molecular weight hydrocarbon. In various hydrocarbons, the toxicity is descending in order of aromatics, alkenes, cyclic hydrocarbons and chain hydrocarbons. The damage of petroleum hydrocarbons to marine organisms is mainly to destroy the normal structure and permeability of cell membranes and interfere with the enzyme system of organisms, thus affecting the normal physiological and biochemical processes of organisms. Such as oil pollution can reduce phytoplankton photosynthesis intensity, hinder cell division, reproduction, so that many animals, embryos and larvae developmental abnormalities, growth retardation; oil can also make some animal diseases such as fish gill necrosis, skin erosion, suffering from stomach As well as carcinogenic.
[14]

3. Impact on fisheries.

Oil pollution can inhibit photosynthesis, reduce the oxygen content in seawater, destruction of the normal physiological function of organisms, so that the gradual decline of fisheries resources. In the contaminated waters, the poor quality of water to make a large number of objects of death. Survived also because of containing oil pollutants and smell, resulting in inedible. Fish and shellfish in the oil content of 0.01mg / L of living in the sea water for 24h can be with oil, if the concentration increased to 0.1mg / L, 2 ~ 3h can make it with a smell. Oil will be attached to the fish gills, the fish suffocation. The formation of oil film can hinder the re-oxygenation of water, the impact of marine plankton growth, damage to marine ecological balance.

4. Impact on the environment

The formation of oil in the sea oil film can hinder the exchange of gas between the atmosphere and sea water, affecting the sea surface of the electromagnetic radiation absorption, transmission and

reflection. Long-term oil film covering the polar ice will enhance the endothermic capacity of the ice and accelerate the melting of the ice, potentially affecting global sea-level changes and long-term climate change. The oil in the sea surface and seawater can dissolve the lipophilic components in the pollutants such as halogenated hydrocarbons and reduce the rate of interfacial migration and transformation. Oil pollution will damage the coastal scenic area and beach. Affected by ocean currents and waves, the oil in the oceans easily accumulates on the shore, polluting the beach and destroying the tourism resources. 2002 Panamanian oil tanker "prestige" broken oil spills, making the original charming scenario of the Galician coast of Spain became a black oil of hell, to the local tourism industry a heavy blow.

2.3 The "Prestige" oil tanker sinking incident

2.31 Event Review

November 19, 2002, another oil tanker sank. Behind the sinking of oil tankers is the widespread destruction of marine life such as fish and shrimp shellfish, and hundreds of thousands of wild seabirds are starved to death and freeze to death in a number of survivability. Each year, a variety of harmful substances are infiltrated into the marine food chain. Will thus threaten mankind itself ...

"Prestige" is a Greek company's oil tanker with Bahamas' flag, carrying 77,000 tons of fuel oil, The trip was from Latvia to Gibraltar. November 13 evening, the ship sailed to 9km away from the Galicia region of Spain encountered the gale, and suffered a hole in the side. There was a 35 meters' long gap appeared on the hull. a large number of fuel leakage started. The Spanish government immediately dispatched rescue ships and helicopters to rescue 27 crew members on the tanker to safety zone, and sent 4 tugs to towed "prestige" to the international waters. On 19th, the wind was blown to the Portuguese direction, and from the Portuguese waters about 93 km the ship were broken into two parts, sinking into the 3600 meters deep seabed. The accident on the local ecological environment caused great disaster, some tributaries on the coast, swamps and grassland vegetation pollution is serious. Because the fuel is a large, viscous mixture, it is more toxic and harder to clean than crude oil. Due to the strong winds at sea, the coastline that leaks oil stains is about 400 kilometers long, making it one of the most serious ecological disasters in the history of the world. On the coast of 500 km north of Spain, 179 beaches were heavily polluted and more than 10,000 seabirds died. Coastal more than 4,000 fishermen due to pollution of fishing resources can not go fishing, the economic loss of 300 million euros. The Spanish authorities estimate that the entire oil clean-up may would take six months, costing \$ 42.05 million. World Wildlife Fund, the local ecological environment at least 10 years is expected to return to normal. In addition, the livelihood of some 4,000 Spanish fishermen and nearly 30,000 industry practitioners has also been greatly

affected. The local government has issued a fishing ban, and prohibit the fishing range with the spread of the fuel and continue to expand. Which for the vast majority of fishermen is undoubtedly a fatal blow. ^[15]



Figure 10: THE LASTS DAYS OF THE "PRESTIGE" (source: bilingualhistory.blogspot.com.es)

The prestige oil tanker spends about 125 tons of oil per day, and the oil spill may last for 5 to 39 months, the Spanish scientific committee, which said the monitors of the tanker's oil spill, said on Dec. 10. The Spanish Scientific Committee concluded this based on data from submarines being surveyed at the site. In the sea near the site of the wreck also formed an area of 1,000 square kilometers of fuel pollution zone. To January 4, 2003, "prestige" oil tanker on the leak of fuel has drifted to the French coast, the local ecological environment poses a serious threat. And until January 11, the Spanish government's first deputy prime minister said that the Spanish government will take positive measures to seal the fastest speed is still oil spill "prestige" oil tanker on all the oil spill cracks.

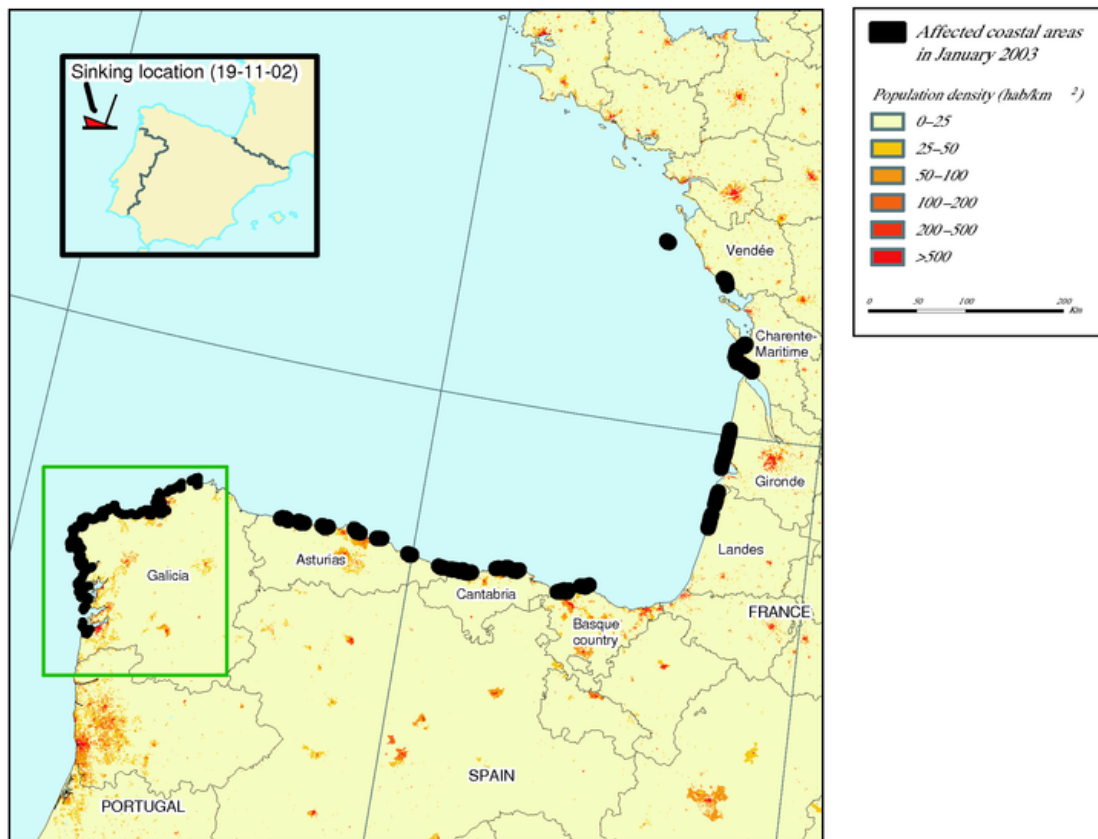


Figure 11: AFFECTED AREAS (SOURCE: eea.europa.eu)

According to the report of the International Maritime Organization, "prestige" was the fourth shipwreck (made in Japan) within 10 years. The 20th century 70 years, the docks of Japan built a large number of inferior quality ships. At present, there are more than 1,000 single-hull oil tankers in the world, and more than 300 ships were built with inferior steel at that time in Japan, of which three were in 1992, 1993 and 1999 caused serious oil spills. In view of the single-hull tanker accident rate than the double-hull tanker 5 times higher, the United States has long banned the import of single-hull oil tankers, France also began to force the Japanese-made single-hull tanker retired. But the international oil traders to reap huge profits, not only continue to use such vessels to transport oil, but also to prevent countries to force the old ship scrapped. "Prestige" has been 26 years of age, as early as 1999 should be suspended. When it was last inspected, it was also found to have a gap in the hull that required urgent repairs. But in June this year the ship in the Strait of Gibraltar and Greece to stay, local officials were not re-examination would approve the release.

Such an old-fashioned dangerous ship, actually swaggering in the sea cruising to the crash so far. Environmentalists pointed out that around the world sailing nearly 1,000 similar single-hull old tanker, also has become a threat to the global marine ecology of the "mobile time bomb." Despite the urgency of the matter, the parties involved in the oil spill have focused on how to shirk responsibility. First, Spain and Portugal, the two governments in the clean-up of the division of responsibilities on the oil. To protect their tourism and fisheries are not affected, the two governments have denied that the incident belongs to the territorial waters of their own territory, and ordered the rescue team to drag the tanker into their own port, the last "prestige" was dragged from the incident to 240 km Away on the high seas. The experts pointed out that if stranded in protected waters, the ship could have been "more easily controlled." Then Spain and the United Kingdom who is responsible for the outbreak of diplomatic disputes. The West government said the tanker has the practice of docking in the British Strait of Gibraltar, but the British side has never carried out the necessary checks. And because the tanker did not meet the EU's safety standards, European countries, the port should not even allow it to stop. The British government immediately denied that the ship was docked in Gibraltar, the British ambassador to Spain said the accusations are "unfounded."

This incident has also aroused grave concern from the rest of the EU. In this regard, the European Commission Vice-President for Energy and Transport called on member states to take immediate and urgent steps to eliminate single-hull tankers from the EU. The European Commission plans to announce a list of ships with bad shipping conditions from January 2003 onwards, forbidding them from entering EU ports. From 2004 onwards, the use of life beyond the provisions of the dangerous vessels to strengthen the port annual inspection efforts, and plans to completely ban by 2015 all 30,000 deadweight tons single-hulled tankers in the EU waters infested.

2.32 Accident processing

After the accident, the International Foundation for the Prevention of Cruelty to Animals quickly set up emergency relief teams, with the local wildlife protection organizations in the shore to establish seabird relief center. A large number of rescue workers and volunteers to those in the sea oil struggling puffins, seagulls and other seabird salvage center sent to the careful care and feeding, and finally put them back to nature. This time, Spain and France, in accordance with the spirit of the United Nations Law of the Sea, decided on 27 November 2002 to restrict strictly any vessel carrying dangerous cargoes liable to cause marine pollution, such as petroleum crude oil, fuel oil, Strictly limiting the age of 15 years of single-hull vessels through the territorial waters of the two countries. At the end of November 2002, the EU 15 ministers of transport meeting agreed that in 2006 after the ban on Member States transport companies operating with single-hull tankers, and are not allowed to commission single-hull oil tankers; And on board personnel severely punished.



Figure 12: VOLUNTEERS CLEANING THE CONTAMINATED BEACH (SOURCE: xclusivetalk.blogspot.com.es)

2.33 Impacts

The oil spill happened after "prestige" sinking in the Galician coast and further in a more extensive area. This area is rich in a variety of birds and sponges, extremely rich in fishery resources, coral clumps, beautiful scenery, is the seabirds and other marine life important place to stay and migrate. There are numerous tourists every year.

The fuel oil is a kind of fuel which used to ship or power plant, it is black, more viscous, pungent smell, it's more difficult to cleaning up, it has long decomposition cycle , Particularly harmful to the ecosystem. By November 25, Spain's 500-kilometer coast was contaminated by black waves, 135 beaches covered with oil. Some of the beach oil more than half a meter, caused amount of sea fish, shellfish died .Seabirds who stick to oil, can not fly, either trapped to death, either because of hunger and death. "A vessel like this is not supposed to be so close to the coast because it's an important habitat for many organisms," said Dr. Simon Cripps of the World Wildlife Fund. "We see that there are 17 or 18 The different species of birds thus die. "



Figure 13: A BIRD COVERED BY OIL (SOURCE: ansamed.info)

The spill caused hundreds of miles of Spanish coastline to be contaminated, tens of thousands of seabirds, countless fish deaths, more than 4,000 fishermen in a very long time can not make a living. Treatment of contaminated beaches costs as much as \$ 42.05 million, and the entire governance process takes at least six months..^[16] Moreover, to eliminate the ecological problems caused by oil spills, but also patiently waiting for twenty or thirty years. According to the report of the Economic Committee of Porter Weitra show that if you want to clean up the oil leaked prestige, the EU countries need to invest large sums of money, is expected to total 12 billion US dollars is huge.

The accident also to the local economy, tourism, fisheries and so has a significant impact. The contaminated area includes a large number of fishing areas, the leakage caused by a large number of shellfish, fish and other marine life after the accident, the Spanish government ordered the blockade of 128 kilometers of sea, causing local fishermen can not go fishing, which means Most of the fishermen are fully engaged.

The local because of its beautiful scenario attracts a large number of tourists each year to travel, the pollution of the local tourism industry caused a serious blow, 90 beach pollution, resulting in a decline in the number of tourists, hotel occupancy rate. These have given the local economy a serious impact.

2.4 Gulf of Mexico oil spill

2.4.1 Event Review

May 5, 2010, the US Gulf of Mexico oil spill caused the international community's attention, many countries to the United States transported equipment and personnel to help the United States as soon as possible to deal with pollution problems. Although Iran and the United States in the nuclear energy project on the existence of serious conflict, but also to provide the United States to play the technology of killing wells. July 15, 2010, BP announced that the new oil control device has been successfully cover the underwater oil spill point, "no further oil into the Gulf of Mexico."

Local time April 20, 2010 about 10 o'clock in the evening, Louisiana, a coastal oil drilling platform exploded, drilling platform sinking in about two days, the oil wells under the sea damaged began to leak. The National Oceanic and Atmospheric Administration estimates that about 5,000 barrels of oil are leaking at the bottom of a sinking offshore drilling platform in the Gulf of Mexico, five times the previous estimate. Oil wells continue to leak the same day, the engineers also found a leak point. In order to avoid floating oil drift to the US coast, the US disaster relief departments to take measures to burn, burn thousands of liters of crude oil.



Figure 14: The affected zone (Source: BBC Case study: Gulf of Mexico oil spill and BP)

April 28, 2010, British Petroleum engineers found the third oil spill point. According to the chart provided by the Coast Guard and relief departments, the oil slick covers an area of about 160 km and a maximum width of about 72 km. US Gulf of Mexico oil spill accident June 23, 2010 deteriorated again: originally used to control the oil spill point of the underwater device was removed due to failure to repair, billowing crude oil has been suppressed for several weeks after the spewing out, Continue to contaminate the vast waters of the Gulf of Mexico. July 15, 2010, monitoring the Gulf of Mexico oil spill from the bottom of the camera video capture screenshots show that the oil spill into the new oil control device and then no signs of oil leakage. In the Gulf of Mexico oil spill occurred nearly 3 months later, BP announced on the 15th, the new oil control device has successfully covered underwater oil spill point, "no further oil into the Gulf of Mexico."



Figure 15: The oil is on fire (source: policy.oceanleadership.org)

2.42: Cause of the event

A "BUBBLE": Beyer is a member of the US National Academy of Engineering responsible for the safety of oil pipelines, in the 1990s as the British oil company risk assessment consultant. According to these records, Beyer restored the process before and after the explosion. The workers set up and tested a cement seal at the bottom of the well, then lowered the internal pressure of the drill pipe and attempted to set up a cement seal. At this time, set the sealing caused by the chemical reaction to produce heat, resulting in a methane bubble generation, leading to this seal was destroyed. Methane is normally in a crystalline state on the seafloor. Deep-sea drilling platform operations often

encounter methane crystals. The methane bubble rises from the high pressure at the bottom of the drill pipe to the low pressure, breaking several safety barriers. "A small bubble becomes a pretty big bubble," Beyer says. "The expanding bubble is like a cannon, jetting into your face."

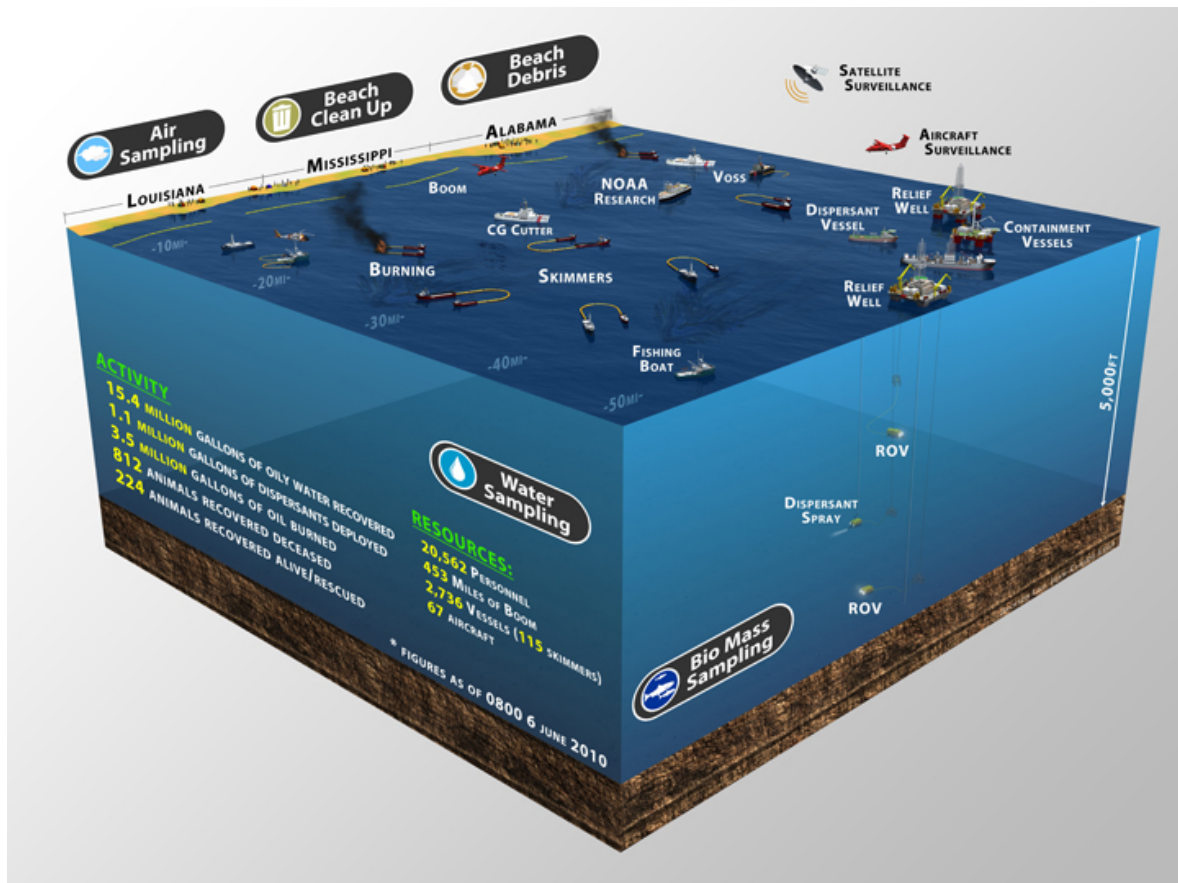


Figure 16:3D DEPICTION OF RESPONSE AT OCEAN SURFACE RELATIVE TO SOURCE OF LEAK (SOURCE: BP Deepwater Horizon oil spill in Gulf of Mexico)

"Gas cloud" hood: April 20 incident, the drilling platform workers observed drill pipe suddenly jet, Then the gas and crude oil come up. Gas flocked to a room with flammable materials, where the first explosion occurred. Followed by a series of explosions, lit up the crude oil. Inquiry records show that when a rise of "gas cloud", covering the "deep horizon." Large-scale engine drilling rig then exploded. The engine exploded, igniting the drill floor, with fire everywhere. About 36 hours after the explosion, the Deepwater Horizon sank into the Gulf of Mexico.

Valve failure: a "blowout valve" big as a double-decker bus, weighing 290 tons. As the last barrier to prevent oil spill, "anti-spray valve" installed in the wellhead, close the oil pipe in the event of oil spills. But "Deepwater Horizon" and "anti-spray valve" does not normally start. "Deep Horizon" equipped with an automatic backup system. The system should be activated when the worker fails to activate

the "blowout preventer", but it did not work at the time. After the incident, BP attempted to use underwater robots to start "anti-spray valve", failed to work. ^[17]

2.43:Impacts

Economy: As of June 1, 2010, the oil spilled into the Gulf of Mexico ranged from 17 million gallons to 27 million gallons of oil that could fill 25 to 40 Olympic-size pools. Even more frightening is that leakage continues, the daily oil spill in 12000 barrels to 19000 barrels, far more than the previous assessment of 5000 barrels. Under the influence of the oil spill, President Obama had to announce a moratorium of six months on 33 deep-water drilling projects, and to suspend oil drilling projects along the coast of Alaska. British oil companies in the public criticism of the first to bear the brunt. Media reports pointed out that BP since the beginning of hire "Deep Horizon" has been invested in huge funds, start-up costs as high as 100 million US dollars. BP said it had spent \$ 930 million in response to the oil spill, including measures to control oil spills and payouts. ^[18]

Environment: Louisiana governor said on May 26, 2010, more than 160 kilometers of the coast of the state by the leakage of crude oil pollution, pollution than the Mississippi and Alabama coastline of the total length. The Gulf Coast ecological environment is experiencing "disaster", the relevant experts pointed out that the pollution may cause 1,000 miles of coast along the Gulf of Mexico wetlands and beaches destroyed, fisheries damage, fragile species extinction. "This time is particularly sensitive, because many animals are preparing to lay eggs in the Gulf of Mexico, large bluefin tuna are multiplying, their eggs and young fish floating in the sea; seabirds are nesting, while the spawning turtle The beaches are devastated and the effects are deadly. "Larry Crod, a marine biologist at Duke University, says a major oil spill would destroy the entire ecosystem and the economic activity that is built on it. University of South Florida oceanographer Weisiboge is more worried that the oil will be involved in the Gulf of Mexico sets of flow. Because once into the set of flow, oil spread to the Florida Strait just a week or so; another week, Miami Beach will see the oil. Crude oil entering the taint will pollute Turtle National Park, causing local coral reefs to die, followed by dolphins, sharks, waders and crocodiles in the Everglades National Park.



Figure 17: OIL ON OCEAN SURFACE (source:nydailynews.com)

Politics: As the leakage of oil wells have not been blocked, the Obama administration is facing increasing external pressure, its ability to be questioned. Fifty-one percent of Americans are dissatisfied with Obama's approach to dealing with the spill, with 60 percent saying the government is incapable of averting similar incidents in the future, according to the latest data from the CNN poll. US Coast Guard commander Admiral Allen said that the United States has not considered an alternative solution to oil spills, BP should continue to work to prevent the leakage of crude oil. Bush's ruling period in response to Katrina hurricane disaster and criticized, and now the Republican Party to seize Obama's "pigtail", launched its fierce criticism. "In the 35-day period, President Barack Obama has not been able to use the government's resources to deal with the situation," said Rep. Darrela Isa, a Republican from California, after the oil spill in the Gulf of Mexico. "Republicans also sneered through the media," In the course of the disaster, we see the president still have time to play golf, political donations and large state banquet. " President Barack Obama responded: "The oil spill in the Gulf of Mexico was anxious." On the day I got the oil blast, I told my team that we had to spare all our resources to deal with it effectively.

Oil spill accident. Obama also said that the government has sent 1,000 federal workers to the disaster relief, the government is taking all means to control the spread of the disaster, but Obama's conduct of the government also conducted a review.

British Petroleum Company announced on the 18th, has been completed from the bottom of the cement plugging the work of the Gulf of Mexico oil spill, cement has been solidified. If further testing shows that no new oil spill points, you can officially declare the leak well is completely blocked. ^[19]

British Petroleum Company said in a press release the same day, engineering staff from the 17th to the oil spill into the cement, about 18 o'clock that night to complete the perfusion. At present, the cement injected into the well has solidified, and the engineers will carry out the final "pressure and gravity" test. If the test results show that no new oil spill point appears, the oil spill will be officially declared "dead". BP in early August by injecting cement from the top, blocking the Gulf of Mexico oil spill. After that, the company has been preparing for its "bottom block" project, that is, through a large amount of mud and mud into the accident wells to the bottom of the accident, the implementation of permanent sealing leakage wells.

2.5: Marine Pollution caused by Heavy Metals

Heavy metals will cause some pollution to the sea, including mercury, copper, zinc, cobalt, chromium and other heavy metals, arsenic, sulfur, phosphorus and other non-metallic human activities into the ocean of mercury, up to 10,000 tons, The world's annual production of about 9,000 tons of mercury records, this is because coal, oil and so on in the combustion process, which will contain trace mercury released into the atmosphere, and ultimately into the ocean, it is estimated that the global in this regard The mercury pollution in the oceans is about 4 thousand tons per year. Cadmium annual production of about 15,000 tons, according to the survey of marine pollution of cadmium is much greater than mercury. ^[20]

2.5.1: Pollution Status of Marine Heavy Metals in China

China is a large marine country with a coastline of 18,400 km and rich resources. In recent years, with the rapid economic development, there has been a series of coastal pollution and other serious marine environmental problems. Since the 1980s, the problem of marine pollution in China has become increasingly serious. In the 1990s, the pollution of coastal waters in China was very serious. The area of coastal water quality worse than the standard of seawater was increased from 100,000 square kilometers in 1992 to 1999. Year of 202,000 square kilometers. By 2012, some coastal waters

pollution is still serious, did not meet a class of sea water quality standards of the sea area of 170,000 square kilometers, higher than the 2007 to 2011, 150,000 square kilometers of the average level. Seawater quality is inferior to the four categories of coastal waters area of about 68,000 square kilometers, an increase of 24,000 square kilometers. Near the coast of about 19,000 square kilometers of the sea was severe eutrophication. ^[21]

In 2011, the total amount of heavy metals discharged into the sea from the Yangtze River, Pearl River, Yellow River and Minjiang River was about 44,300 tons and the total arsenic was 3,500 tons. Among them, the Yangtze River and the Pearl River estuary in 2012 the two heavy metals into the sea of nearly 40,000 tons of arsenic, 3241 tons, accounting for China's total discharge of 90% of the sea and 92.6%. The Yangtze River and the Pearl River estuary discharge high, on the one hand because the two estuary itself large runoff; the other hand, because the Yangtze River Delta and the Pearl River Delta is China's coastal two most dynamic economic zones, The modern industrial enterprises in these two regions have discharged a large amount of industrial wastewater and urban sewage.

Although the relevant departments have also strengthened the protection work; However, the overall situation of China's coastal waters pollution is still grim. Contaminated waters are relatively concentrated in the coastal areas of the Gulf Coast and the major rivers, such as Liaodong Bay, Bohai Bay, Laizhou Bay, the Yangtze River Estuary, Hangzhou Bay, Pearl River Estuary and some large and medium-sized cities near the coastal areas with rapid economic development and high population densities. Local waters. The main pollutants in seawater are inorganic nitrogen, active phosphate, petroleum and heavy metals.

Not only China, in recent years, more and more pollutants such as nutrients, heavy metals, oils and persistent organic pollutants into the coastal waters of the world's coastal countries, the global marine pollution is increasing. Faced with such a large environmental pressure, the world for the marine environmental pollution problems a lot of scientific research and take measures to deal with.

2.52: Causes of Marine heavy metal pollution

Whether you like it or not, heavy metal elements are everywhere. Heavy metals are a natural part of the earth, and they are indispensable for life, while others are useless. In industrial production, almost all of the heavy metals are of great use, which is the main source of heavy metal pollution in the environment. ^[22]

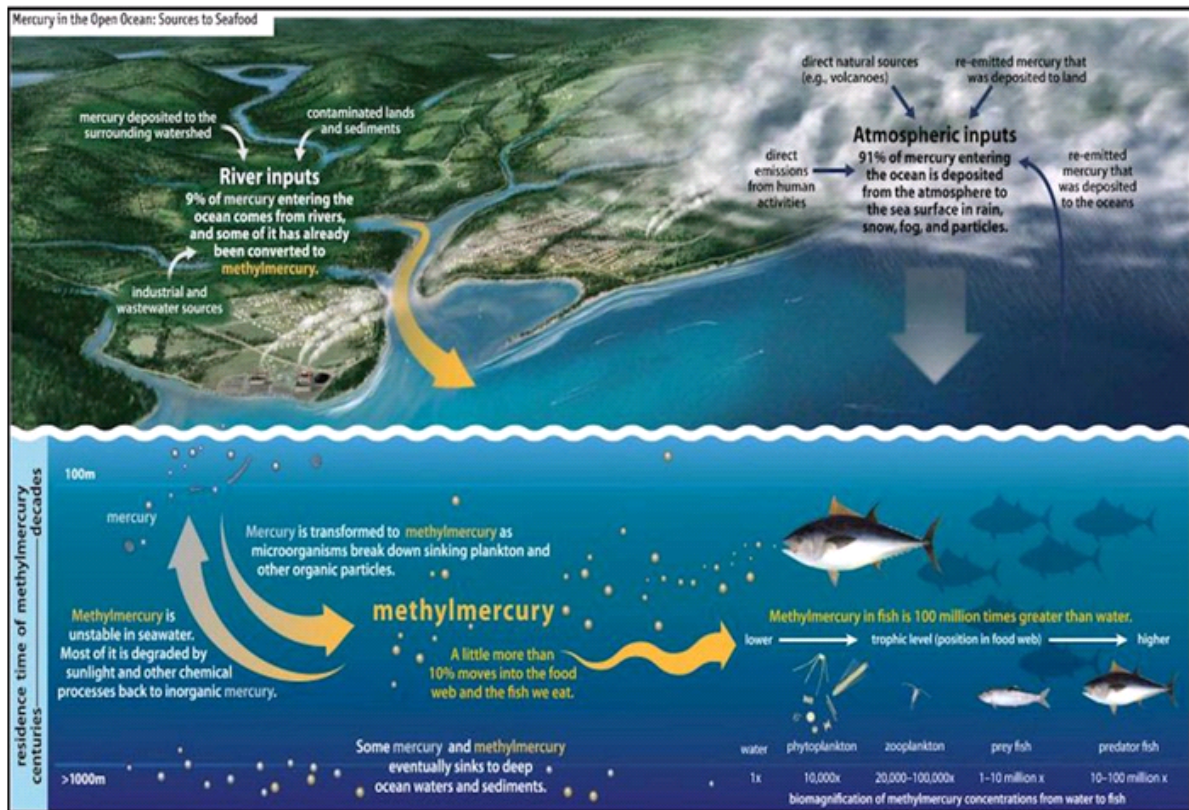


Figure 18: HOW MERCURY IS LEACHED INTO OUR OCEANS (SOURCE: marinecitizenship.com)

Unlike biodegradable organic pollutants, heavy metals circulate in nature. Rock weathering, dusty, volcanic eruptions, rivers to sea - heavy metals through these processes from the land into the ocean. Heavy metals will not stay in the surface water, they adsorbed on the particles, followed by sinking into the sediment. The layers of sediment cover, after a long time, and eventually become a rock, heavy metal will be detained again. However, human activity disturbs the endless cycle of nature.

Ore mining, metal smelting, the production, use and disposal of metal products, all of which are releasing heavy metals into the environment. This greatly increased the flow of heavy metals in the environment, and in water, soil, air and other media concentrations. Although in the face of natural forces such as tsunamis, earthquakes and typhoons, humans are extremely small; but human beings' ability to emit heavy metals can already be compared with nature, or even far more than nature. To make matters worse, heavy metal pollutants are not evenly dispersed in the sea, but concentrated in the coastal waters - this is where human settlements, the production of fisheries. After the industrial revolution, marine ecosystems felt the enormous pressure caused by human pollution.

Human emissions of heavy metals, and some through the atmospheric transport into the ocean. For example, coal burning produces fine particles floating in the air, they can carry heavy metals and travel long distances, and ultimately subsidence into the sea or even ocean. However, the heavy metals in the coastal waters mainly come from the transportation of rivers and the direct discharge

of domestic sewage and industrial waste water into the sea. For a particular sea area, a factory, a sewage outfall, are likely to be the main source of heavy metals. The mercury pollution incident in Minamata Bay in the 1950s is one such example.

Japan's Minamata City, a "Suzuki" plastic factory with mercury as a catalyst for the production of acetaldehyde, the reaction generated by-product methyl mercury. Methylmercury is discharged into the waters of Minamata Bay with waste water, and then is absorbed and enriched by fish and shellfish. The contaminated seafood on muddy unaware of the local people's table, resulting in at least 2265 people were poisoned, of which 1784 people were killed. The ecological disaster that has shocked the world has made people realize that dumping heavy metals into the sea will not only damage ecosystems, but also harm humans through the food chain.

2.53: Impacts of marine heavy metal pollution on human beings

Heavy metal pollution and other organic compounds pollution are different. Many organic compounds can be through the physical nature of the physical, chemical or biological purification, so that the harmful reduction or removal. Heavy metals are enriched and difficult to degrade in the environment. Heavy metals released from wastewater, even in very small concentrations, can accumulate in algae and sediment, are adsorbed on the surface of fish and shellfish, and accumulate in the organism through the food chain, causing genetic mutagenesis of marine organisms, leading to biological growth Slow, abnormal development, reduce the survival rate of embryos, larvae and adults, and even lead to the extinction of sensitive species, leading to ecological degradation.

Heavy metal pollution is a direct and indirect threat to the ecosystem. Heavy metal through the food chain enrichment and amplification, and ultimately in the human body a large number of accumulation, destruction of the body's normal physiological metabolic activity, damage to human health.

Mercury is eaten by aquatic organisms in the body into methylmercury, the substance through the fish and shrimp into the human body and animals, it will destroy brain blood vessels, causing a series of central nervous system symptoms such as hand, foot, lips numbness and red Pain, language disorders, hearing failure and other symptoms of cerebral arteriosclerosis patients; methylmercury can also lead to abortion, fetal malformations and congenital dementia children, great toxicity.

Organisms of lead intake with a variety of enzymes combine to interfere with various aspects of the physiological activities of the organism, and systemic organ damage. The most important is the nervous system, kidney, hematopoietic system and blood vessels and so on. Lead poisoning manifested as anemia, abdominal pain, high blood pressure. Low-dose exposure to lead can adversely affect the function of the human body's red blood cells, kidneys, immune system, bone marrow, and central nervous system, and all of these effects may not be clinically apparent before they occur. Lead poisoning will affect the infant standing, walking and talking age, may also cause

children to distraction, memory loss, decreased comprehension and learning difficulties. Pregnant women inadvertently lead poisoning during pregnancy, can cause miscarriage, stillbirth or birth defects of the baby. Lead penetration to the brain, can directly inhibit the growth hormone secretion, causing children short stature, precocious puberty, obesity and so on.

Cadmium is widely distributed in nature, its harm to human health is mainly due to industrial and agricultural production caused by environmental pollution. Cadmium is absorbed by the body, the body will selectively accumulate in the liver, kidney caused by disease, resulting in anemia and metabolic disorders. Cadmium in the environment can not be biodegradable, and its biological half-life in the human body up to 10 to 30 years, known as the most easily stored in the body of toxic substances. The main symptoms of the poisoning atherosclerosis, renal atrophy or chronic glomerulonephritis. In addition, the excessive intake of cadmium, cadmium into the bone can replace some of the calcium, causing bone softening and deformation, severe cases caused by natural fractures and death. Japan had a "bone pain" the anatomy of the deceased, found that the body as much as 122 fractures. Length reduction of 30 cm, cadmium cadmium content than the control 150 times higher. In addition, cadmium also mutagenic, carcinogenic and teratogenic effects and cause high blood pressure, emphysema. Chromium is a dangerous carcinogenic, teratogenic, mutagenic "three to" heavy metal material; because of its strong oxidizing, on the skin, mucous membranes have severe corrosive. In addition, the chromium into the animal will be methemoglobin oxidation into methemoglobin, leading to its normal carrying oxygen; excessive chromium will also nucleic acid and nuclear protein precipitation degeneration, loss of activity.

Arsenic and its compounds are widely found in the environment. The main toxic arsenic compounds, arsenic trioxide that arsenic is highly toxic. Arsenic toxicity in the human body is mainly associated with the enzyme in the cell, so that many enzymes inactivation, resulting in metabolic disorders. Skin hyperpigmentation and hyperkeratosis of the skin, the occurrence of cracking of the ulcer is another feature of arsenic poisoning. Acute arsenic poisoning is not timely if the rescue caused death.

Copper is an essential trace elements in the body, the content of iron in the human body and zinc. Excessive copper on the organisms have significant toxic effects, can lead to copper poisoning. Recent studies suggest that liver cancer mortality and environmental copper content was positively correlated. In addition, copper metabolic disorders can produce brain and brain stem lesions.

In addition, the beneficial or detrimental effects of heavy metals in the water are not only dependent on the species, physical and chemical properties of the metals, but also on the concentration of metals and the valence and morphology of their presence. Even if the beneficial concentration of heavy metal elements exceeds a certain value, there will be severe toxicity, animal and plant poisoning or even death. Metal organic compounds (such as organic mercury, organic lead, organic arsenic, organic tin, etc.) than the corresponding metal inorganic compounds toxicity is much stronger, soluble metal than granular metal toxicity.

2.54: Is heavy metal pollution in the sea more and more serious?

Nowadays, more and more reports on heavy metal pollution in the oceans have been reported. Does this mean that the pollution of heavy metals in the oceans is becoming more and more serious? Compared with three or four decades ago, the heavy metal pollution is undoubtedly serious; However, in recent years, pollution is still increasing?

China's economy is steadily increasing, the use of heavy metals and a corresponding increase in emissions, heavy metal pollution, of course, will become increasingly serious. However, this reasoning is not necessarily true. Pollutant emissions do not always increase with economic growth. Technological progress and scientific management can cut off the link between economic development and pollution discharge. According to the survey^[23] in 1992 to 2007, China's GDP per unit of water caused by the gradual increase of heavy metal emissions. From 2007 to 2012, heavy metal emissions with the growth of GDP has not increased. National Bureau of Statistics data also show that from 2003 to 2011, the national emissions of industrial waste water lead, mercury, cadmium, hexavalent chromium, arsenic showed a decrease in the total trend.

The heavy metal pollution of the sea comes from the industrial waste water, the direct discharge of domestic sewage into the sea, and more indirect transportation from the river. In recent years, the direct discharge of heavy metals has been effectively controlled, the downward trend in emissions, while the amount of heavy metals transported by rivers is still not reduced.

According to the issued by the Ministry of Environmental Protection in recent years^[24], all kinds of heavy metals discharged into the sea with the discharge of industrial wastewater and integrated sewage are generally decreasing. In 2007, mercury, hexavalent chromium, lead, cadmium emissions are maintained at about 1 ton or less. In addition to industrial wastewater, the contribution of domestic wastewater directly into the sea can not be neglected. However, until 2011, only 19 kg of mercury, 113 kg of hexavalent chromium, 1276 kg of lead, cadmium 46 kilogram. The discharge of domestic sewage is the most serious, and it is equal to the sum of industrial waste water and integrated sewage.

The amount of heavy metals that enter the ocean indirectly through the river is much greater - hundreds or even thousands of times - than the above direct sea discharges. Moreover, in recent years to monitor the lead, copper emissions are still rising trend.

In addition to analyzing the monitoring data over the years, there are some "tricky" methods to understand the trend of marine heavy metal pollution. As mentioned earlier, the heavy metals in the water will sink into the sediment with the particles. The bottom of each layer of the same record as the pages of water pollution at the time of the situation. If drilling a mud column, the analysis of the heavy metal content of each layer, it can clearly understand the history of heavy metal pollution, and even can be traced back hundreds of years ago. Some researchers collected samples of columnar

sediment samples from several sampling points in the Pearl River estuary in 2000 for analysis. The results showed that although the specific data of each sampling point were different, the overall trend was similar: nearly 100 years, especially the last 20-30 years, the concentration of lead and zinc in sediments increased obviously; copper and nickel had no such rise Trends have been fluctuating in a narrow range.

Another approach is the use of coral growth characteristics: the accumulation of coral layer of calcium accumulated to form the skeleton, like the tree's rings leave the same traces of the years. The heavy metal content in the coral skeleton was positively correlated with the concentration of heavy metals in the water. Some researchers have analyzed coral samples from the Daya Bay area of Guangdong, which have been preserved for about 30 years: the relative concentration of zinc in the coral skeleton has risen steadily, accelerating in the last 10 to 20 years, increasing by 3 to 5 Times.

At present, China's annual number of heavy metals into the sea is still a lot of heavy metal pollution in the marine situation is still grim. If the timely and scientific management to reduce pollution from the source to control the spread of pollution, to the marine ecological environment to self-repair time, the situation can still be recovered. China's marine heavy metal pollution in the spatial distribution is very uneven, even in the overall deterioration of the background, there are still many areas of the sea is clean. According to the National Bureau of Statistics, in 2010, affected by varying degrees of pollution in coastal waters area of 10.07 million square kilometers, of which serious pollution accounted for 47,800 square kilometers, there are still 42,400 square kilometers of clean coastal waters. To maintain the marine environment, we can do more.

2.6 Japanese Minamata disease events

2.61 Event Review

Japan Kumamoto County Minamata Bay teem with seafood. Minamata is a small town in the eastern part of Minamata Bay, with over 40,000 inhabitants. The surrounding villages are home to more than 10,000 farmers and fishermen. The abundance of fisheries makes the town particularly prosperous.

In 1925, the Japanese nitrogen fertilizer plant here, and later opened a synthetic acetic acid plant. After 1949, the company began to produce vinyl chloride, the annual production continues to increase, more than 6,000 tons in 1956. At the same time, the plant discharges untreated waste water into Minamata Bay.^[25]

In 1956, a strange disease was discovered near Minamata Bay. This disease first appeared in the cat body, sick cat gait instability, convulsions, paralysis, or even jump into the sea to die, known as the "suicide cat." Shortly afterward, the person was also found to have this condition. Patients due to central nervous system and peripheral nerve damage, symptoms as above. At that time, the disease

was called "strange disease" because of unknown etiology. This "strange disease" is the future sensation of the world "Minamata disease", is the first to appear as a result of industrial waste water pollution caused by pollution.

"Minamata disease," the culprit was the world's cutting-edge technology in the chemical industry of nitrogen (N) production enterprises. Nitrogen for the soap, chemical seasonings and other daily necessities as well as acetic acid (CH_3COOH), sulfuric acid (H_2SO_4) and other industrial products manufacturing. Japan's nitrogen industry was founded in 1906, followed by the extensive use of chemical fertilizers leaving the rapid development of fertilizer manufacturing, and even some people say that "the history of nitrogen is the history of the Japanese chemical industry," Japan's economic growth is " Led by the completion of the chemical industry under the support of ". However, the "pioneer industry" wanton development, gave the local residents and their living environment has brought endless disaster.

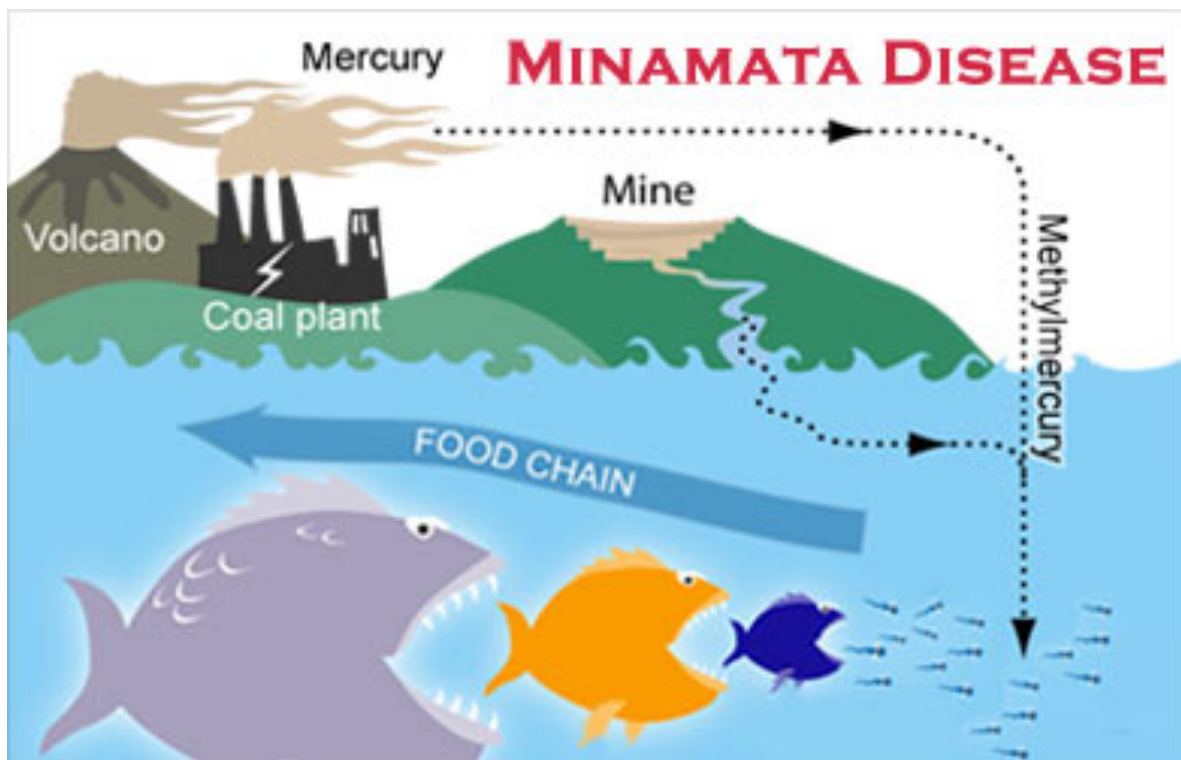


Figure 19:CAUSES OF MINAMATA DISEASE (source: medindia.net)

Vinyl chloride and vinyl acetate in the manufacturing process to use mercury of the catalyst, which makes the discharge of waste water contains large amounts of mercury. Mercury is converted to methylmercury when it is consumed by aquatic organisms in water. This poisonous substance, which is half the size of a dug-spoon, can cause death in humans, and the continued production of nitrogen

at that time has caused the methylmercury content of Minamata Bay to reach levels sufficient to poison the Japanese national population twice . Minamata Bay has been heavily polluted by perennial industrial wastewater discharge, and the fish and shrimp in Minamata Bay are polluted. These contaminated fish and shrimp through the food chain has entered the animal and human body. MeHg through the fish into the body, is gastrointestinal absorption, against the brain and other parts of the body. Methylmercury into the brain can cause brain atrophy, damage to nerve cells, damage to master the body balance of the cerebellum and the perception system. According to statistics, hundreds of thousands of people eat Minamata Bay in the methylmercury-contaminated fish and shrimp.



Figure 20: A SEVERE CASE OF MINAMATA DISEASE (SOURCE: Shimbun Asahi and William Underwood“ Minamata Disease at Fifty” 2013,01,12)

Many years ago, there have been reports about the biotransformation of fish, birds and cats in Minamata Town. Even the cats are extinct. "Minamata disease" endangering the health of the local people and family well-being, so many people physically and mentally destroyed, the economy suffered a heavy blow, or even broken family. Even more sadly, due to methylmercury contamination, fish and shrimp in Minamata Bay can no longer be eaten and consumed. The lives of local fishermen have become deprived of dependency, and many families have become impoverished.

2.62 Event resolution

Cause of disease

Mercury, is commonly used in the temperature table shows how many degrees of silver-white metal, it is a highly toxic heavy metals, with strong volatility. Mercury toxicity to organisms depends not only on its concentration, but also on the chemical form of mercury and the characteristics of the organism itself. Mercury is believed to penetrate through the surface of the marine organism (skin and gills) or contain mercury-containing food into the body.

Way of entry

Mercury enters the ocean mainly through industrial wastewater, the loss of mercury-containing pesticides, and the deposition of mercury-containing waste gases. In addition, mercury-containing slag and pulp is also one of its sources. Why should Minamata Bay contain mercury-containing seafood? This is also the case from a factory in Minamata. Minamata town has a synthetic acetic acid plant, in the production of mercuric chloride and mercury sulfate two chemical substances as a catalyst. Catalyst in the production process only play a role in promoting the chemical reaction, and finally all discharged into the wastewater near the Minamata Bay, and most of the sediment in the bottom of the mud. The catalysts chosen for the plant, mercuric chloride and mercury sulphate, are toxic but not very toxic. However, they can become toxic to methylmercury in the sea mud by a bacterium called Methylcobalamin. Methylmercury can be released at a rate of 1% per year, resulting in secondary pollution to the upper seawater. The fish and shellfish that live here for a long time are most susceptible to methylmercury contamination. The amount of mercury in seafood in Minamata Bay is measured Has been more than 50 times the edible, residents of long-term consumption of such mercury-containing seafood, naturally become the victims of methylmercury. Once the methylmercury into the body will quickly dissolve in human fat, and most gathered in the human brain, adhesion in the nerve cells, so that the reduction of ribonucleic acid cells, causing cell division death.

Fatal dose

Scientific test confirmed that the safety of human blood mercury concentration of 1 microgram / 10 ml, when reaching 5-10 micrograms / 10 ml, there will be obvious symptoms of poisoning. Calculated, if a person eating 200 grams per day of mercury 0.5 mg / kg of fish, the body's intake of mercury just in this safe range. However, the amount of mercury in seafood measured in Minamata Bay is as high as several tens of milligrams per kilogram, and the daily consumption of other foods, which may also contain a certain amount of mercury, It is much more than the safety limit of the standard.

Minamata disease is a direct result of mercury pollution of the marine environment pollution, has so far been found in many places similar to the pollution poisoning, but also found that other heavy metals such as cadmium, cobalt, copper, zinc, chromium, and non-metallic arsenic, they Of the many chemical properties are similar with mercury, which can not but cause people's vigilance, and another "bone pain" occurs, after long-term follow-up investigation and study, eventually confirmed that this is a heavy metal cadmium pollution caused.

Hereditary

Minamata disease is also highly inherited, pregnant women to eat methylmercury-contaminated seafood, may cause the baby suffering from congenital Minamata disease, even some healthy people (may be minor damage, no obvious disease) offspring is also difficult Escape the bad luck. Many children with congenital Minamata disease, there are sports and language barriers, the disease resembles polio, indicating that to eliminate the impact of Minamata disease is not easy. As a result, environmental scientists believe that the heavy metal pollution in the environment is a "time bomb", when the external conditions to adapt, it may lead to premature explosion. For example, under anoxic conditions, some anaerobic organisms may methylate the inorganic metal. In particular, the uncontrolled release of large quantities of pollutants in the last 20 years has saturated the adsorption capacity of some harbors and near-shore sediments and may detonate the "time bomb" of chemical pollution at any time.

From this chapter we can see that there are many reasons for the impact of the marine environment, for example, due to human activities on the marine pollution, such as ship sailing, factory wastewater. Due to oil pollution caused by the sea, such as oil spills on the sea caused serious pollution. There are heavy metals on the marine pollution, such as the factory has not been processed directly to the sewage discharged into the ocean caused by excessive marine heavy metals caused by marine pollution. The pollution of the oceans has a direct or indirect impact on human beings. Due to oil spills caused by ecological disasters, due to heavy metal pollution caused by various diseases. Therefore, we should be aware of the importance of the marine environment to us, the protection of the marine environment should be the responsibility and obligation of each of us.

Chapter 3: Marine Pollution Control Measures

3.1 Change the energy structure

from China's existing energy structure inspired, I think the energy structure of the impact on the environment can not be ignored. According to the survey, in the range of 2000 meters from the surface below the surface of the crust, the forecast of the total coal resources of 5,059.2 billion tons. In terms of reserves, by the end of 2013, China's proved reserves of coal were 114.5 billion tons (62.2 billion tons for anthracite and bituminous coal, 52.3 billion tons for sub-bituminous coal and lignite), accounting for 12.8% of the world's proved reserves of coal.

China has now become the world's largest coal-producing countries, the world's coal bear nearly half of the output. Coal as China's most important energy resources, reserves, wide distribution, coal quality is better and more complete varieties. In China, coal plays a dominant role in energy supply, with a share of 67.5%. China's coal output in 2013 was 3.68 billion tons (1.84 billion tons of oil equivalent), an increase of 1.2%, accounting for 47.4% of world coal production. ^[26]

Year	Total energy production (million tone)	Percentage of total energy production (%)			
		Coal	Oil	Gas	New Energy
2001	135048	73	16.3	2.8	7.9
2002	143875	73.5	15.8	2.9	7.8
2003	150656	76.2	14.1	2.7	7
2004	171906	77.1	12.8	2.8	7.3
2005	196648	77.6	12	3	7.4
2006	216219	77.8	11.3	3.4	7.5
2007	247279	77.7	10.8	3.7	7.8
2008	260552	76.8	10.5	4.1	8.6
2009	274619	77.3	9.9	4.1	8.7
2010	296916	76.6	9.8	4.2	9.4
2011	317987	77.8	9.1	4.3	8.8
2012	333300	76.6	8.9	4.4	10.1
2013	340000	75.6	8.9	4.6	10.9

Table 3:China's total energy production and composition (source: Steel Information of HeBei province 2013)

China is not only the world's largest coal producer, but also the largest consumer of coal. Coal consumption in 2013 was 1.95 billion tons, an increase of 4.0%, accounting for 50.3% of world coal consumption.

Year	Total energy consumption (million tone)	Percentage of total energy production (%)			
		Coal	Oil	Gas	New Energy
2001	150406	68.3	21.8	2.4	7.5
2002	159431	68	22.3	2.4	7.3
2003	183792	69.8	21.2	2.5	6.5
2004	213456	69.5	21.3	2.5	6.7
2005	235997	70.8	19.8	2.6	6.8
2006	258676	71.1	19.3	2.9	6.7
2007	280508	71.1	18.8	3.3	6.8
2008	291448	70.3	18.3	3.7	7.7
2009	306647	70.4	17.9	3.9	7.8
2010	324939	68	19	4.4	8.6
2011	348002	68.4	18.6	5	8
2012	361732	66.6	18.8	5.2	9.4
2013	375116	67.5	17.8	5.1	9.6

Table 4:China's total energy consumption and composition(source: Steel Information of HeBei province 2013)

In recent years, China's coal production and consumption in the primary energy production and consumption in the proportion remained at 66%, while the output is occupied 3/4 of the high share. From the trend of coal consumption proportion, in recent years, coal consumption in the total energy consumption in the proportion of declining trend, mainly due to environmental policies in recent years, as well as the continuous development of clean energy development. ^[27]

With the increasingly stringent environmental standards, the continuous development and utilization of new energy, although coal production and consumption in the proportion of energy consumption has declined, but its energy production and consumption in China's dominant position in the structure for a long time Within a fundamental change can not occur.

Impact of Coal Production and Consumption on Environment

The impact of China's coal on the environment mainly in the mining, transportation and utilization, of which the use of coal pollution on the environment. The impact of coal mining on the environment mainly for the land resources, water resources destruction and pollution of the atmospheric environment. In the coal mining process, underground large area of empty, forming a large number of mined-out area, likely to cause ground subsidence. At the same time, coal mining and washing of water resources also caused damage and pollution.

In addition, in the course of coal mining, coal mine gas and natural release of gas will produce pollution. According to statistics, China's coal mine methane emissions of up to 70-90 billion cubic meters per year, accounting for about 1/3 of the global total, is very serious environmental pollution. In the washing process, the screen out of the gangue spontaneous combustion emissions of a large number of sulfur dioxide, carbon monoxide and other toxic gases. China's coal gangue emissions accounted for about 15-20% of raw coal production.

The unbalanced distribution of coal resources in China determines the transport pattern of coal transportation between north and south and coal transportation from west to east. The environmental pollution caused by coal storage, loading and transportation is mainly coal dust. Data show that in recent years, China's coal storage and coal transport process in the dust produced by about 20 million tons per year, there is a greater impact on the environment.

Compared with coal production and transportation, coal utilization has a greater impact on the environment. China's coal consumption in the form of direct combustion, about half of the coal used for coal-fired power generation, coal direct combustion for the environmental pollution caused by soot-type more serious. Data show that in 2013 the national emissions of sulfur dioxide emissions 20.439 million tons. Among them, industrial sulfur dioxide emissions of 18.352 million tons, accounting for 89.8%. National emissions of smoke (dust) dust emissions 12.781 million tons. Among them, industrial smoke (powder) dust emissions of 10.946 million tons, accounting for 85.6%.

The coal pollution caused by these direct pollution of the oceans, it can be seen, change the energy structure can directly improve the marine environment pollution.

3.2 Measures for the Control of Marine Pollution by Ships

1. To strengthen China's legislation on ship pollution prevention and control, establish and improve the marine environmental law system in China, adhere to the legislation of ship pollution prevention and control and the uniformity of the environmental legal system, especially marine environmental legal system, and correctly handle ship pollution prevention and control Legislation and related marine environmental law and the relationship between the characteristics and adhere to the comprehensive and systematic review of existing ship pollution control legislation on the basis of the necessary amendments and additions, the key legislation and general legislation combined to improve the marine pollution prevention legislation at the same time Formulate national laws and regulations on prevention and control of pollution from inland waters. While strengthening the domestic legislation on ship pollution prevention, we should study and learn from the advanced experience and effective management methods of foreign ship pollution prevention legislation, adopt the system and measures of pollution prevention and protection of marine environment prevailing in various countries, and make the best according to actual needs. Possible participation in the relevant conventions, should make every effort with international standards, the international

conventions of the specific, domestic. International treaties are an important manifestation of modern international law. In international relations, the state has an international obligation under international treaties. It has the duty to make its domestic law consistent with its international obligations. Therefore, the marine environmental protection law is made according to the relevant international conventions. Amendments are absolutely necessary. The 21st century is the era of great development of marine industry, which requires us to be from a strategic perspective, attention to the ocean, treat the sea. The implementation of the revised law not only improves China's legislation on marine environmental protection, but also plays an important role in strengthening marine environmental management, further protecting and improving the marine environment, protecting ecological balance and promoting sustainable economic and social development of our country.

On the world level, on the basis of the above, countries should develop a complete system of marine environmental law, for those of the marine environment pollution caused by the ship should be punished.

2. To further improve the marine environmental protection awareness, to minimize or avoid human factors caused by pollution. For the operational pollution of ships, strengthen the publicity and education, so that the majority of the crew fully aware of the dangers of pollution in the waters, to help them understand the prevention of pollution, the protection of the marine environment of great significance and enhance anti-pollution awareness. Increase penalties, illegal operations or bring the pollution of the re-incorruptible vessels, punish them to take measures to strengthen the supervision and inspection of water pollution, efforts to minimize sea pollution. Strictly abide by the laws and regulations on the prevention of pollution from ships, and improve management standards, improve the allocation of anti-fouling equipment for ships, so that ships have a strong ability to deal with waste in accordance with the requirements of the relevant international conventions. All types of ships should be equipped with oil and water separation equipment, port construction of oil-containing sewage treatment facilities and emergency equipment. At the same time, it is necessary to increase public awareness and public awareness of environmental protection and stimulate public participation in marine environmental protection. Is the most effective prerequisite for the complete eradication of marine pollution.

3.3 Oil pollution control measures

As a kind of environmental pollution, offshore oil pollution has aroused close attention all over the world, and prevention and control of offshore oil pollution is urgent. Governance of marine oil pollution should start from the humanities, to find solutions.

1. Raise environmental awareness and protect the ocean. Ocean gave birth to the rich life of the earth, for the development of life on Earth to provide a vast space. But with the development of society, people actually the ocean as a natural dumping sites, resulting in a large number of waste water, waste gas, waste discharge into the sea. Ocean self-purification capacity is limited, if the human pollution of the ocean exceeds the threshold of self-purification capacity of the sea, marine pollution will certainly have a devastating impact on the entire planet. China has about 320,000 kilometers of coastline, 388,000 square kilometers of territorial waters and nearly 3 million square kilometers of jurisdiction of the sea, which is an important resource for sustainable development in China. However, according to a comprehensive survey of coastal and tidal resources in China: the total amount of pollutants entering China's coastal waters is 6.5 million tons / year, of which oil is 180,000 tons / year, China's oil pollution shows an increasingly serious trend . Therefore, it is necessary to improve people's environmental quality and change people's traditional idea of using the ocean as a natural garbage dump driven by oil interests. It is fully aware that damage to the marine environment is not only endangering a sea area, but also affecting the whole world. behavior.

2. To strengthen legislative oversight, increase law enforcement efforts. In accordance with the UN Convention on the Law of the Sea and other international laws and regulations, all countries should accelerate the formulation and implementation of special laws on offshore oil pollution in accordance with their national conditions, ratify the International Convention on Oil Pollution Preparedness, Response and Cooperation as soon as possible, Pollution control, strengthen the management of oil tankers and crew training; the international community to cause sea and high seas oil pollution units, organizations, countries should be dealt with severely, at the same time, should strengthen international cooperation and common governance of offshore oil pollution .

3. To prevent and control pollution of coastal waters of industrial pollutants in the environment. First, by adjusting the industrial structure and product mix, change the mode of economic growth, the development of circular economy. The second is to strengthen the management of key industrial pollution sources, the implementation of the whole process of cleaner production. Third, in accordance with the "who is polluted, who bear the" principle, professional treatment and in situ treatment, prohibit industrial pollution sources of toxic and hazardous substances emissions. Fourth, the implementation of environmental impact assessment and the "three simultaneous" system. Fifth, the implementation of total pollutant discharge control and sewage permit system.

4. To prevent, mitigate and control pollution of coastal cities along the coastal waters of the environment. Including the adjustment of irrational town planning, strengthening urban greening and coastal forest construction, protection of coastal wetlands, speed up the coastal urban sewage collection pipe network and the construction of sewage treatment facilities, increase urban sewage collection and treatment capacity, improve urban sewage treatment facilities Denitrification and dephosphorization.

5. To prevent, mitigate and control the pollution of marine pollutants in the marine environment. Start the ship oil pollutant "zero emissions" plan, the implementation of the ship sewage system seal system. The establishment of large-scale port wastewater, waste oil, waste recycling and treatment

systems, transportation and fishing vessels to achieve the discharge of pollutants focused on recycling, shore treatment, discharge standards.

6. To prevent and reduce the occurrence of sudden pollution accidents. The development of marine oil spills and toxic chemicals spill contingency plans, the development of port environmental pollution accident contingency plans, the establishment of emergency response system.

7. Prevention and control of offshore oil platform oil pollution generated by oil and garbage on the marine environment pollution. So that the environmental quality of oil and gas fields and the surrounding areas meet the environmental quality control requirements of such functional areas, not adverse effects on other marine functional areas adjacent to the development process, no major oil spill occurred. The oil spill response plan should be formulated for the offshore oil exploration and development.

3.4 heavy metal pollution control measures

First of all, heavy metal pollution is difficult to control, which is inseparable from its characteristics, but also it is more and more attention of the reasons, so in the control and control of heavy metal pollution must be fully taken into account its characteristics. As the heavy metal pollutants are persistent pollutants, can not be completely removed from the environment, can only change the location or the existence of the form, so the heavy metal pollution in the "anti" and to control as an adjunctive measure.

1. Source Governance

Around the heavy metal pollution enterprises, especially the backward technology, serious environmental pollution enterprises serious environmental safety problems investigation and found a solution to a warning one, and resolutely eliminate the hidden dangers of pollution in the bud.

Scientifically adjust the environmental safety protection distance of heavy metal enterprises and prohibit the construction of new related projects in areas with important ecological functions and areas where environmental quality can not be stabilized due to heavy metal pollution. Organize the development of heavy metal industry in key areas, environmental impact assessment of key industries, improve the system of laws and regulations as the prerequisite for the acceptance of the environmental impact assessment documents of the relevant construction projects in the heavy metal industry. In the future, those who did not complete the elimination of backward production capacity in areas where significant pollution caused by mass incidents in the region, suspended its new focus on the prevention and control of pollutant discharge construction project approval.

Environmental protection departments at all levels should effectively strengthen the heavy metal pollution incident information submitted in the event of a problem, it is necessary to report and properly handle and assist the local government to do a good job of information disclosure, mass appease and publicity and education, and earnestly safeguard the environmental rights and interests of the masses, Maintain social harmony and stability.

Environmental protection departments should be on a regular basis these enterprises around the soil water and other sample testing to ensure that the surrounding heavy metal emissions standards, do not pollute the environment. Strengthen the treatment mechanism of enterprise waste, so that recycling, to prevent environmental pollution, while improving the health conditions of labor to ensure the health of workers.

2. Cleaner production

The new and expanded large-scale smelting projects should strictly control the total amount of heavy metal emissions. The transformation of industrial water circulation system, improve the industrial water cycle rate. Reasonable deployment of enterprise production water, to promote the cascade use of water technology. Improve the level of industrial wastewater treatment technology, the wastewater back to the production system for processing. Strengthen the research on key technologies related to clean production and popularize and apply the existing advanced technologies, accelerate the technological progress of the industry and improve the quality and efficiency of the development of the industry.

Optimize the layout of enterprises, located in large and medium cities, towns and other densely populated areas on the wind direction and from the nearest sensitive point distance of less than 1km of heavy non-ferrous metal smelting enterprises should be through the relocation, stop production, etc. exit. At the same time to strengthen the green plant around to ensure that the vegetation coverage, in order to reduce pollution particles. Such as oleander, acacia, camphor, tree, crape myrtle and other plants, can effectively absorb HF, Cl₂, SO₂ and other harmful gases, and reduce dust concentration around the plant.

3. Improved technology

Improve industry technology, technology and equipment, automation and mechanization, reduce the amount of heavy metal pollutants. Strengthen the industry heavy metal pollution control core technology research, increase business "three wastes" treatment. Strengthen the comprehensive utilization of resources, and promote industrial upgrading.

Heavy metal pyrometallurgy should pay attention to the flue gas purification treatment, hydrometallurgy should pay attention to wastewater discharge standards, such as the use of microbial wet copper smelting, the premise is to do well seepage leakage well to ensure that the leaching solution is not leaking. Raw materials through the car for transport, transport vehicles must be closed vehicles or top cover, to prevent dust or spilled. After being transported to the raw material area, it is directly discharged into the raw material workshop. The raw material workshop

should be closed structure. In order to prevent the secondary dust generation, the raw material workshop should be regularly sprinkled and humidified. For factory vehicles must be thoroughly cleaned before leaving the factory to avoid the pollution caused by vehicles carrying the surrounding environment, rinse wastewater should be collected to the sewage treatment plant to the rear of the plant.

Adjust the industrial structure, accelerate the elimination of backward production equipment rely on scientific and technological progress, and actively promote energy-saving emission reduction technology development. Improve the degree of enterprise intensive, the use of advanced technology and large-scale equipment, improve energy efficiency. Vigorously research and development of cleaner production technologies and equipment, focusing on technology integration and innovation, strengthen the study of circular economy technology.

Frequent outbreaks of heavy metal pollution incident to bring us bursts of pain at the same time as we wake up wake up the alarm of environmental protection, the incentive behind the more worthy of our exploration and reflection. Environment is the necessary condition for our survival, if we do not treat the environment, then the environment will be different ways to retaliate against mankind, we only take the economic and environmental harmonious development path, can truly benefit the people.

Chapter 4: Suggestion and Prospect

The marine environment has a huge impact on human life. The global warming caused by marine pollution and rising sea level also pose a great threat to mankind. Marine oil pollution caused by the destruction of the biological chain, environmental degradation and other issues are also very serious. Heavy metal pollution to the sea is a direct result of human life, heavy metals through the natural cycle into the ocean in the biological chain, and ultimately into the human body, the human health caused a huge impact.

Protection of the marine environment is the responsibility and obligation of each of us, and the marine environment is now faced with a huge test, not optimistic. However, in recent years, with the enhancement of people's environmental awareness, the marine environmental protection has been more and more attention. More and more new environmentally friendly energy be used, environmental monitoring efforts to enhance the discharge of industrial wastewater discharge standards, we can see the hopeful of marine environmental protection.

With the progress of mankind, I believe that marine environmental problems will eventually be resolved.

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