

Enhancing the Preparedness and Response to Oil Spills in Bohai Sea: Dongying Experience

Shenghao Liu*

Marine Ecology Research Center, The First Institute of Oceanography, State Oceanic Administration
Qingdao 266061, Shandong, People's Republic of China

Key Message

- Environmental and socioeconomic risks from oil spills can be effectively mitigated with the combination of a national policy framework, effective institutional arrangements, contingency planning from national to enterprise level, and strengthening of oil spill detection and monitoring capacity.

are some of the major environmental risks that could significantly damage large areas of wetlands, nature reserves, mariculture activities, and tourism. While oil spill preparedness and response are the primary responsibility of the national and provincial governments, the local government of Dongying City plays an active role in complementing national and provincial efforts in oil spill risk reduction. The city actively develops local oil spill preparedness and response plans; develops cooperation programs and partnerships with industries; strengthens local management and coordination capacity, especially in oil spill response and claims for compensation; and effectively utilizes scientific information and technology and expert advice for decisionmaking and response actions. Close cooperation and coordination with concerned agencies, the support of the public, and efficient law enforcement are required. Thus, oil spill preparedness and response are included as essential and regular activities within the natural and human-made disaster component of the ICM program of Dongying City.

Abstract

The economic prosperity of Dongying City largely depends on the development of the oil and gas industry which generates substantial financial revenues for the city's economic growth and social development. Located at the estuary of Yellow River which discharges into Bohai Sea, Dongying City is vulnerable to the impacts of human activities in Yellow River Delta and Bohai Sea area, including oil and gas exploration and exploitation, mariculture, and shipping and port operation activities. Oil spills from ships and oil drilling and extraction activities



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* Email: shliu@fio.org.cn

Background

The Bohai Sea, a shallow, semi-enclosed sea in the People's Republic of China, has a total area of 77,000 km² and 2,300 km of coastline. Average water depth is 18 m with the deepest point of 85 m at Bohai Strait (Liu, et al., 2014; Tong, et al., 2014). It is connected with the adjacent Yellow Sea through the narrow Bohai Strait. The Bohai Sea is bordered by three provinces (Liaoning, Shandong, Hebei) and one municipality (Tianjin City), covering the Laizhou Bay in the south, Liaodong Bay in the north, and Bohai Bay in the west. Due to the shallow depth and narrow connection with the outer ocean, water exchange is relatively slow and with limited flushing or “self-cleaning” capacity (Dang, et al., 2013).

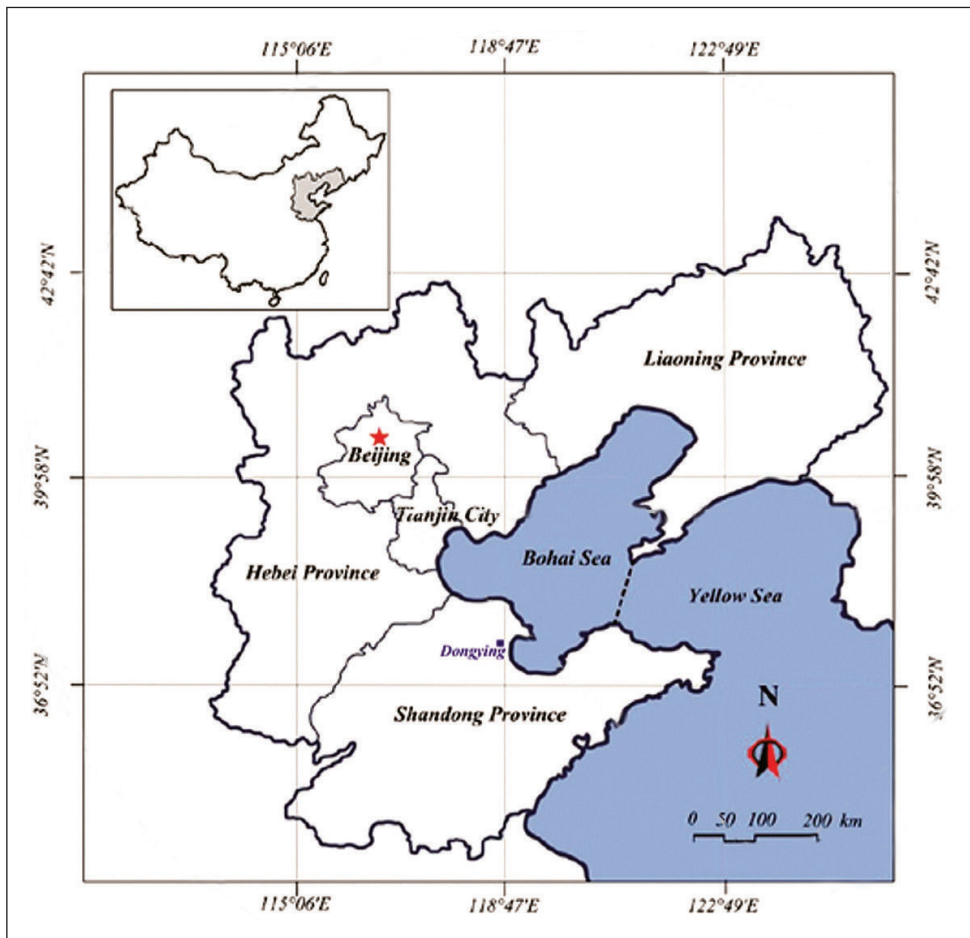
In the last few decades, the Bohai Sea region experienced rapid and significant economic and

social development. By 2010, approximately 20% of the country's population lived in the region. Although the region constitutes only 6.8% of the total area of the country, it produces 25% of the country's GDP (Liu, et al., 2013).

Dongying City is located in the estuary of Yellow River, adjacent to Bohai Sea (Figure 1). Its 413-km coastline is used substantially, through heavy marine resource exploitation, mariculture, and shipping and port activities, connecting the Bohai economic zone and the Yellow River economic zone. The sea areas and beaches in the city are used for wetland conservation, sea-farming, salt-making, tourism, port development, shipping, gas and oil extraction, and other industrial developments.

The offshore oil and gas extraction and processing industry is the largest contributor to the marine

Figure 1. The location of Bohai Sea and Dongying City (Tong, et al., 2014).



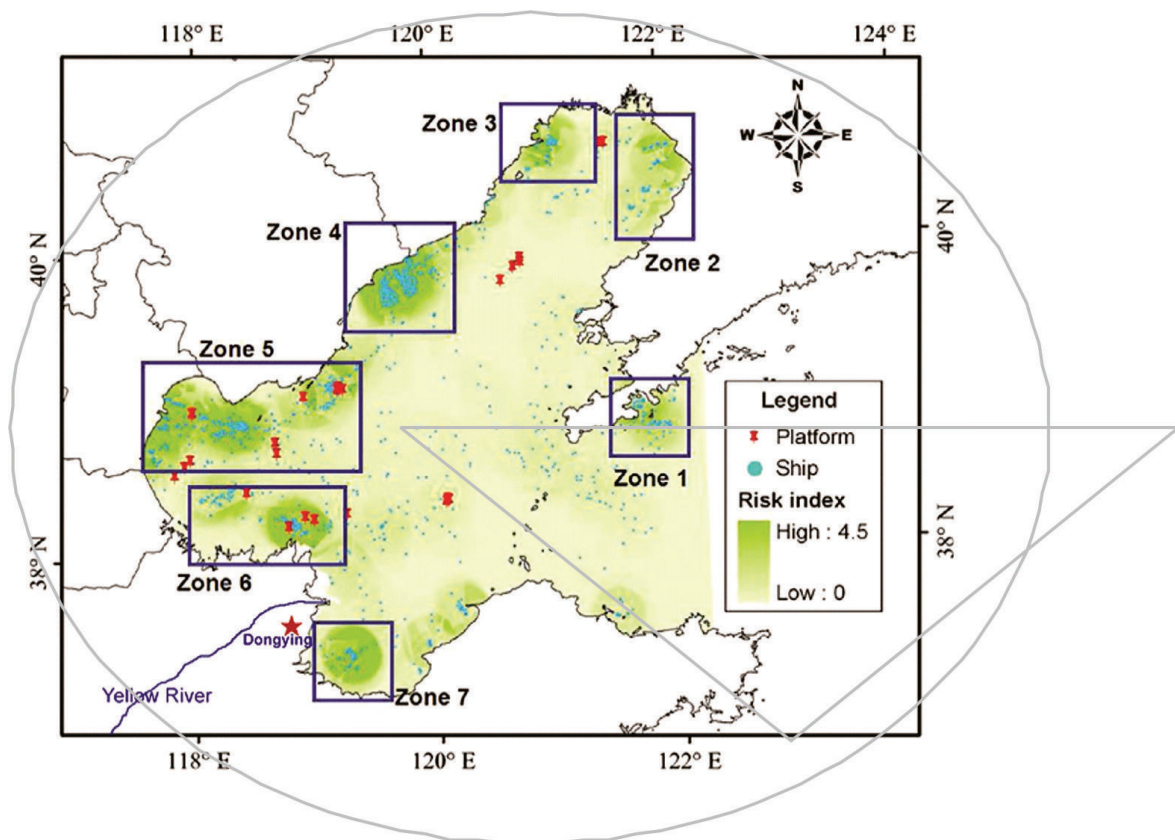
economy in Dongying City. In 2008, extraction activities generated RMB 10 billion (US\$ 1.57 billion), accounting for 47% of marine industrial outputs. In particular, Shengli Oilfield, the second largest oilfield in PR China, contains 48.3 billion tons of petroleum geological reserves (80% can be found in Dongying territory) and 230 billion m³ of natural gas geological reserves (Liu, et al., 2013).

Oil spills are an inherent risk associated with offshore petroleum activities. At present, Bohai Sea has 285 platforms, 3,181 operating wells, and 1,600 km of submarine pipelines. Their operation poses high risk of oil spills. Satellite images identified locations of potential spills related to both ship transportation and oil drilling activities in Bohai Sea, with seven high risk zones identified (Figure 2). In recent years, three major oil spill accidents occurred in Dongying

Sea area (the “Le’an No. 16”: 975 tons; the Shengli oilfield in No. 106 area: 150 tons; and the submarine pipelines of Shengli oilfield penetrated by pilferers: 16,523 tons). These oil spill accidents caused direct economic losses amounting to as much as RMB 400 million (approximately US\$ 63 million) (Liu and Zhu, 2014).

This case study presents the efforts and experience of the Dongying City government to reduce the risks of oil spills by strengthening its legislative and institutional arrangements; developing oil spill emergency response plans and compensation schemes; improving communications; securing support from experts and the effective use of information technology; and strengthening local capacity and partnerships with industries. Such risk reduction measures were also integrated into

Figure 2. Risk evaluation of potential oil spill in the Bohai Sea based on satellite images together with recorded accident data and literature information. Oil drilling platforms are marked in red, while light blue indicate ships. Oil spill risk index is shown in green. Seven high-risk zones (Zones 1-7 were offshore of Dalian, Yingkou, Huludao, Qinhuangdao, Tianjin, Huanghua, and Dongying) were identified and marked in blue (Liu et al., 2015).



the city's ICM program to take advantage of its overall planning and management framework and the coordinating mechanism and consultative platforms. PR China has adopted the ICM concept since the early 1990s to promote sustainable coastal development (Lau, 2005; Chua, 2008; Wu, et al., 2012).

Approach and Methodology

The ICM program in Dongying City, which started in 2005, enabled the local government to develop a comprehensive and integrated natural and human-made disaster response and management program so that it could consolidate available resources across government agencies to address common threats regardless of institutional mandates.

The Dongying City government actively cooperated with national and provincial efforts in reducing the risk of oil spills by developing city level oil spill preparedness and response action plans. The steps involved were:

- 1. Build upon the legal and institutional framework for oil spill preparedness and response at the national level.** PR China ratified the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) in November 2009 and issued a series of laws and regulations concerning the prevention and management of marine pollution from ships. The country's ratification of the OPRC served as a driving force and framework that enabled PR China to improve its national system for emergency responses to oil spills from shipping as well as from oil and gas exploration and production activities.

Specifically, the State Council of the People's Republic of China issued a notice in 2013 identifying the State Oceanic Administration (SOA) as the responsible organization for the prevention of pollution damage from marine oil and gas exploration. The SOA was responsible for monitoring and managing marine environments, organizing marine environment surveys, and conducting scientific research. It was also responsible for the prevention and control of pollution from offshore construction projects and marine dumping. All offshore operators were required to develop oil spill contingency plans for their operations which are to be approved by SOA.

Dongying City worked closely with SOA through its provincial and local agencies to ensure local preparedness in the event of oil spills. The city government incorporated risk reduction from oil spills as part of the natural and human-made disasters management component of its ICM program to effectively utilize local resources from related government agencies, including those from the Ministry of Environment and Ministry of Agriculture and Fisheries in addressing oil spill concerns (Dongying City Government, 2013).

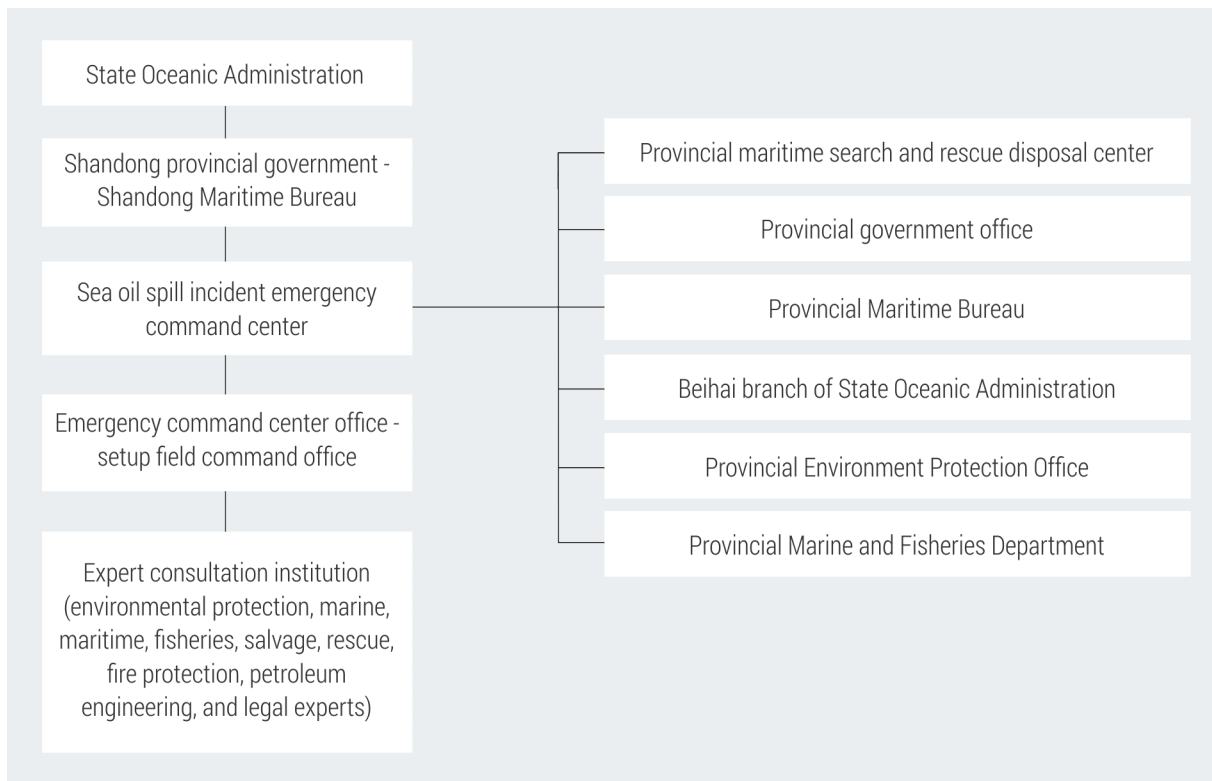
- 2. Complement the provincial efforts in the implementation of an oil spill emergency response plan.** In Shandong province, an emergency response plan for oil spills from oil and gas exploration was developed to ensure that the relevant agencies and personnel were able to execute a unified and coordinated response during oil spill incidents. The plan included oil spill emergency classification, organizational structure and responsibilities, procedures for prevention and activation of early warning strategies for emergency response, early warning support systems, news releases, subsequent disposal works, etc.

The Oil Spill Incident Emergency Command Center, headed by the provincial government, was responsible for the unified coordination of the emergency response operation during oil spill incidents (Figure 3). The director of the Maritime Search and Rescue Center held a concurrent post as director of the Emergency Command Center, while the deputy directors of the provincial government office, the Shandong Maritime Bureau, the Beihai Branch of SOA, the Provincial Environmental Protection Office, and the heads of the Marine and Fisheries Department held posts as deputy directors. Personnel—from all levels of emergency command, and port and stations of loading and unloading—were trained in emergency operations and issued the corresponding certificates.

The role of the city government was to be familiar with the provincial emergency response plan and, more importantly, to cooperate with relevant provincial authorities when oil spills occur within its administrative boundaries.

3. **Develop an oil spill emergency response plan at the city level.** Although major oil spill emergency response was usually managed by the provincial government, the Dongying City government prepared and released its marine oil spill emergency response plan and established the City Oil Spill Incident Emergency Command Center (COSIECC) (Box 1) for emergency response in cooperation with the Maritime Search and Rescue Center.

Figure 3. The Shandong Province oil spill response organization and command system.



Box 1. Responsibility of the Dongying City Oil Spill Incident Emergency Command Center.

The center was led by the provincial oil spill emergency command center and the city government. The center organized, coordinated, conducted, and commanded the emergency response to oil spill incidents at sea within its jurisdiction.

Specifically, the center was tasked with:

- Formulating the relevant rules and regulations relating to emergency response and preparing, revising, and managing the Dongying marine oil spill emergency response plan;
- Organizing the work conference of city sea oil spill emergency response and supervising and inspecting the implementation of relevant decisions;
- During oil spill incidents, organizing the implementation of the marine oil spill emergency response plan;
- In the event of a large oil spill incident, reporting the developing condition to the provincial government and activating the emergency response;
- When the oil spill spread to the jurisdiction of the neighboring city, issuing timely notifications to the concerned city offices and coordinating related matters; and
- Guiding the implementation of the oil spill emergency response plan of related departments and enterprises.

In the event of large oil spills, COSIECC would, based on the nature of the oil spill (pollution sources), inform the relevant professional departments, which would then establish a field command office in conjunction with the county and district governments and the Municipal Development Zone Management Committee. The office was provided with following responsibilities:

- a. Execute the order of COSIECC and determine and implement the detailed oil spill response plan;

- b. Collect relevant information on the oil spill incident and provide timely progress reports, including results of the emergency response to COSIECC;
- c. Organize teams to contain oil spills at the source; control the diffusion and expansion of spilled oil to other areas; remove and dispose the pollutant; and keep record of specific actions;
- d. Based on the field conditions, evaluate the efficiency of the oil spill disposal action and propose the next action scheme to COSIECC; and
- e. Ensure adequate communication for oil spill emergency response action and provide security and logistical support for field operation personnel.

4. Establish an expert consultative group.

To provide more professional support for maritime rescue and pollution disposal, an expert consultative group was established in June 2014, consisting of 19 representatives from various organizations in related fields of oil spill emergency response. The experts participated in marine pollution emergency response operations; researched on important issues relating to emergency response activities; and provided advice and recommendations for emergency command decisions and for dealing with the aftermath of accident.

5. Develop a compensation mechanism and impact assessment methodologies for valuation of impact of oil spills.

In June 2011, the Penglai 19-3 oilfield incident polluted an area of about 6,200 km² (nearly nine times the size of Singapore), including 870 km² severely polluted. The US energy giant Conoco Phillips China and its partner, the China National Offshore Oil Corp, agreed to pay RMB 1.68 billion (US\$ 267 million) for cleanup, environmental restoration, and protection

efforts. The experience from Penglai 19-3 oil spill incident provided a basis for the development of marine ecological impact assessment guidelines to assess damage from oil spills to the marine environment. The guidelines included penalty and compensation classified into three categories, namely: (1) administrative penalty; (2) compensation for marine ecology; and (3) compensation for fishery losses (Liu and Zhu, 2014).

6. Strengthen local oil spill monitoring capacity to promote prompt and fast response.

Oil spills have the potential for serious damage to the marine environment. Fast and accurate detection of oil spills are significant for disaster prevention and mitigation. In 2014, the Dongying City Ocean and Fishery Bureau (DOFB) developed a new marine integrated information system which focused on information processing and warning with upgraded video surveillance system composed of radar, AIS, GIS, buoys, and other relevant techniques (Zhang, et al., 2015). DOFB was also equipped with a multipurpose microwave radar automatic oil spill detection system. Radar monitoring stations were constructed in the estuary of Guangli River, the fishing harbor of Xiaodao River, the central fishing harbor of Hekou District, and the fishing harbor of Diaokou District. The radar detection system automatically obtained the location of the oil spill, range (contour and area), and positioning and carried out continuous tracking, which significantly improved the capability and response efforts.

7. Maintain good communication across all levels.

Communication programs, targeted at potential key stakeholder groups, such as aquaculture farmers, tourism sector, among others, were essential in order to

maintain effective working relationships and awareness in case of emergencies. Whenever a project involved sea areas, the Dongying City government convened a consultative meeting with stakeholders, and across levels of governments. For example, the National and Local Government People's Congress and the Chinese Political Consultative Conference, together with the Standing Committee, Dongying City, and Shengli Oilfield, formulated important policies and major projects for the oil cooperation program. Dongying City also set up a site office system and easy access system to coordinate and solve problems encountered in major project construction in Shengli Oilfield (Zhang, 2014).

8. Establish partnership arrangements with industries.

These arrangements in implementing communication and capacity development programs were important to reduce the negative impacts of oil spills, specifically economic loss to aquaculture. Recently, the Dongying City government and Shengli Oilfield established a coordination office to optimize the industrial use of petroleum and improve the ecological quality of the environment; thus, achieving a functional urban development.

Results

Leveraged support for environmental improvements

Dongying City mobilized resources from the petroleum industry to enhance its capacity in environmental management of petroleum exploration and production activities. The Shengli Oilfield spent about RMB 8 billion (US\$ 1.25 billion) to set up nearly 50 sewage treatment plants and 7 marine environment monitoring

stations in the river estuary and petroleum platform. Dongying City established a marine emergency center and a professional emergency rescue team equipped with an emergency vessel, special fire boats, booms, skimmers, and other facilities. Dongying City also improved the capacities of the marine oil spill emergency response center, the marine pollution early warning and emergency processing system, and the marine pollution monitoring center. The oil spill emergency response center was capable of effectively responding to a 3,000-ton oil spill. Dongying City constructed a maritime management information system and was able to establish a communication network from national to city levels.

Collaborative planning and cross-sector linkages

Contingency planning for oil spills from national to local levels (including company level) associated with offshore petroleum activities was supported by the existing national policy framework of PR China. Specifically, all offshore oil operators were required to develop oil spill contingency plans for their operations, including building capacity for oil spill response. For instance, the China National Offshore Oil Corporation (CNOOC) established the emergency planning information system to support its decisionmaking and response during oil spill incidents. Three levels of emergency response planning system were established: (1) crisis management plan at the head office; (2) contingency plans and special emergency plans at the branch office; and (3) emergency response plans at factories and work sites. Each level of the emergency response plan included a corresponding command center.

Industry responding to risks

An effective information management system is the key to an effective response. The CNOOC, together with the local government, established a high technology emergency information management system including personnel management system, 3D emergency information display platform, production facilities emergency database, oil spill simulation tracking system, and disaster weather early warning system, among others.

The CNOOC also invested RMB 500 million (US\$ 78 million) to establish an emergency response team—the CNOOC Oil Spill Environmental Service Corporation. All emergency personnel underwent international professional training and obtained internationally recognized qualification certificates.

Lessons Learned

A national policy framework on oil spill management facilitates the establishment of a system for oil spill preparedness and response at the city level. However, it is worthwhile for governments to consider the following:

- Additional measures such as better news releases, accurate damage assessment methods, and better claims and compensation channels to promote programs necessary for public involvement;
- Preparedness and emergency response planning to oil spills is most effective when established and connected at various levels: provincial, local, and industries;

- Provision of adequate resources for industrial and environmental safety training, training and emergency preparedness, availability of safety equipment, knowledge on evacuation procedures, and availability and effectiveness of rescue teams can have a positive influence on the overall impact of oil spill incidents when they occur; and
- New technologies for rapid and precise reconnaissance and sampling to support a timely and robust response effort, and to facilitate better integration of operational and scientific monitoring and data application in planning and implementation of preparedness and response efforts as well as compensation for damage.

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