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Marine oil spill contingency planning

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Abstract: According to the practice researching and formulating "The Oil Spill Contingency Plan of South Chinese Sea", this paper analyses and discusses the structure, functions and main contents of marine oil spill contingency planning, programs the organizing and commanding system and emergency response system, and advances the planning and researching method to coordinate comprehensively and to design practically the detailed emergency response steps until to formulate the case operating programs for the plan implementation(PPI) and the PPI to apply high-techniques supporting emergency administrations and response.

Keywords: contingency planning; oil spill; pollution; marine environmental protection; technical supporting systems

Introduction

Since the oil spill incident of "Torrey Canyon" tank happened in 1967 in the sea area near England, which released hundred thousand tones crude oil into the sea and caused serious marine environmental pollution and damage, the international society had pay high attention to the emergency administrating and techniques controlling oil spill pollution and damage. Marine oil spill contingency planning(MOSCP) is a kind of administrative managing method with a certain legal effect, which is used to guide and coordinate people making efficient and orderly emergency preparedness and response actions in order to protect environmental resources and public welfare. After approved by a certain of competent authority, a contingency plan should be obeyed and implemented by related departments and personnel. It was clearly claimed in the "International Convention on Oil Pollution Preparedness, Responde and Cooperation, 1990", drawn up by International Maritime Organization, that each party shall establish a national system for responding promptly and effectively to oil pollution incidents which includes a national contingency plan for preparedness and response. It is also required in the newly revised "Chinese Marine Environmental Protection Law" that the nation draws up the national contingency plan against serious marine pollution incidents according to the requirements of preventing and controlling marine environmental pollution, and that the national maritime responsible department is in charge of drawing up the contingency plan against serious oil spill pollution incidents caused by ships.

Organized by Chinese Maritime Office(CMO), Chinese first national contingency plan has been drawn up, which is composed by a national plan, severe marine area plans and harbor water area plans as well as ship emergency plans. The national and marine area plans, completed basing on overall summarizing the experiences about oil spill emergency preparedness and control(OSEPC) and about contingency planning and on integrating Chinese special conditions, have been approved and released by the Ministry of Communications and the National Department of Environmental Protection, and implemented since April 1, 2000. According to the practice researching and formulating "The oil spill contingency plan of South Chinese Sea", this paper analyses and discusses the structure, functions and main contents of MOSCP, and advances the planning programs to apply high-techniques supporting emergency administrating and response, which making a plan efficient and easy operating.

1 Structure and functions

Oil spill emergency work relates to different aspects such as environment, society, economy, politic, policies, techniques, foreign afairs, judicature, administration an so on. In order to reach a good emergency guiding effect, a plan should reflect such emergency preparedness and response programs that being able to be operated and that to give full plays of the forces from above aspects, whose detailed conditions in a certain of place and period are integrated. Contingency plans satisfied this demand should

have related many aspects and had a large amount of contents. Therefore, it is necessary to regulate the contents comprehensively, according to the following functions, to form such a plan structure that having rational distribution and clear levels and being easy inquired by the users(Fig.1).

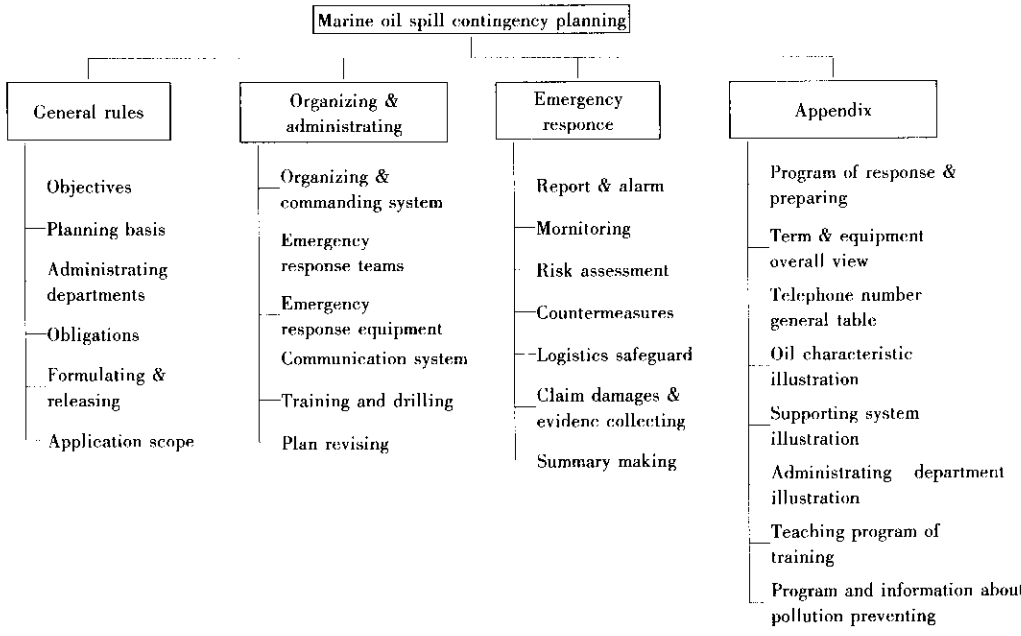

Fig.1 Main structure of a marine oil spill contingency plan

1.1 General rules

The functions include: setting plan's objectives that can represent common interests of different aspects, and defining the contents contained, formulating bases and suitable scopes. What mentioned above establish the foundation researching, formulating and implementing MOSCP. The common interests include: (1) protecting ecological environment and resources, preventing and controlling pollution and damage caused by oil spill incidents, protecting human health and public welfare, enhancing social, economic and transport sustainable developments; (2) fulfilling obligations set in international conventions to which China has acceded; (3) establishing organizing and commanding system and emergency response system against oil spill, and allocating related equipments in order to response rapidly and efficiently to control and cleanup oil spill pollution.

1.2 Organizing and administrating(OA)

The functions include: establishing oil spill emergency organizing and commanding system according to the OA needs and Chinese present conditions(Fig.2); providing responsibilities and roles, which should be played, of different departments and personnel in OSEPC; expounding emergency cooperating patterns and main points between different systems of states or administrations as well as different marine areas; planning constructing and managing programs of OSEPC terms and equipments and that of high- technical supporting systems in different periods; assigning emergency training, drilling and plan revising.

1.3 Oil spill emergency response(OSER)

The main contents of the total OSER processes include: (1) reporting and alarming oil spill incident; (2) monitoring and forecasting oil spill dispersion at sea surface; (3) estimating pollution risk and environmental impact; (4) making OSER decision; (5) acting oil spill pollution control and cleanup; (6) implementing countermeasures protecting sensitive resources; (7) collecting pollution and damage evidences prepared for claiming; (8) evaluating OSER and summarizing incident case. To ensure the above processes implemented efficiently and orderly, it is necessary to apply following researching and planning methods, i.e., programming the marine OSER system(Fig.3); designing the related OSER circuits(Fig.4);

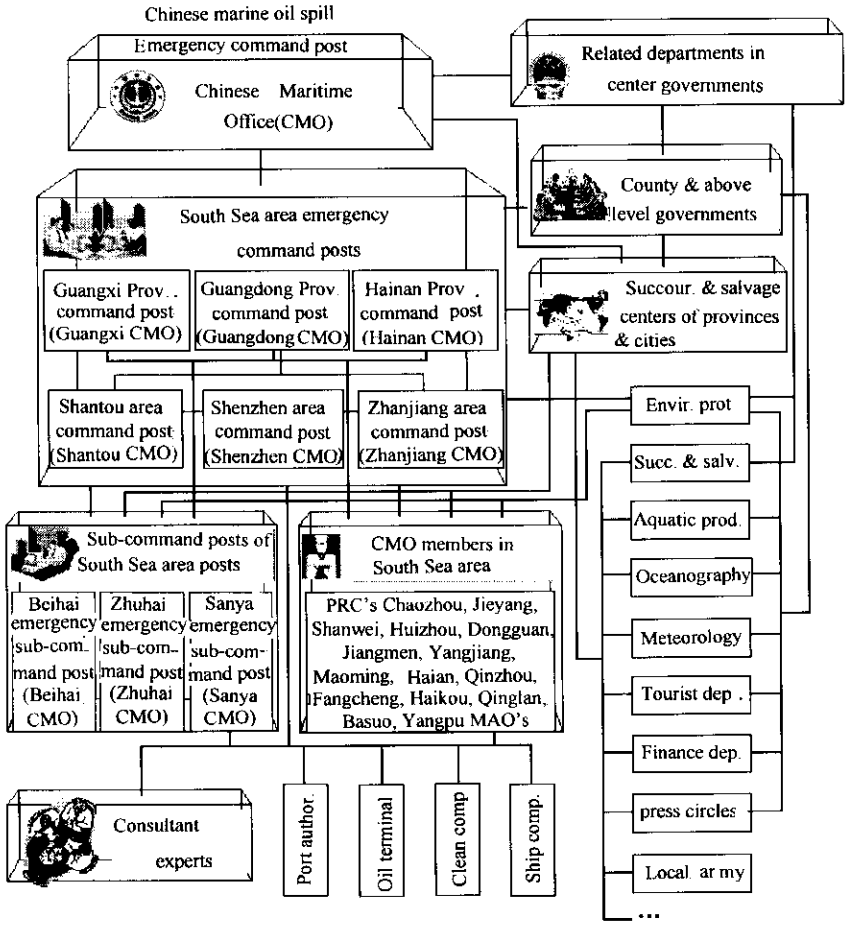

Fig.2 The oil spill emergency organizing and commanding system of the South Chinese Sea

coordinating comprehensively and designing practically the detailed OSER steps until to formulate the ease operating programs for the plan implementation(PPI; Table 1).

Table 1 Main points of PPI about oil spill control and cleanup

Steps	Selecting suitable countermeasures	Clarifying restrict demands for actions	Handling the recovered oil and oily wastes
Main points of PPI	Cleanup principles	Surrounded by booms	Administrating program
	Alternative introductions	Recovered by skimmers	Reusing recovered oil
	Reference table	Spring dispersants	Treating oil wastewater
	Reference chart	On site burning	Direct burying
	Technical guides	Coastline cleanup action	Enhancing bio-deposition
	Necessary accessories	Natural dispersion and recovery	Attentions for storing

1.4 Appendix

The functions include: making necessary supplementary and illustrations for the main plan body for further enhancing practice and easy operating natures of a plan, e.g., emergency report tables, prepared programs for emergency preparedness, response and for pollution and damage preventions, related basic information and data, distributions of technique supporting systems as OSER resources as well as their constructing and perfecting schemes.

2 High-technique(HT) supporting and necessary administrating

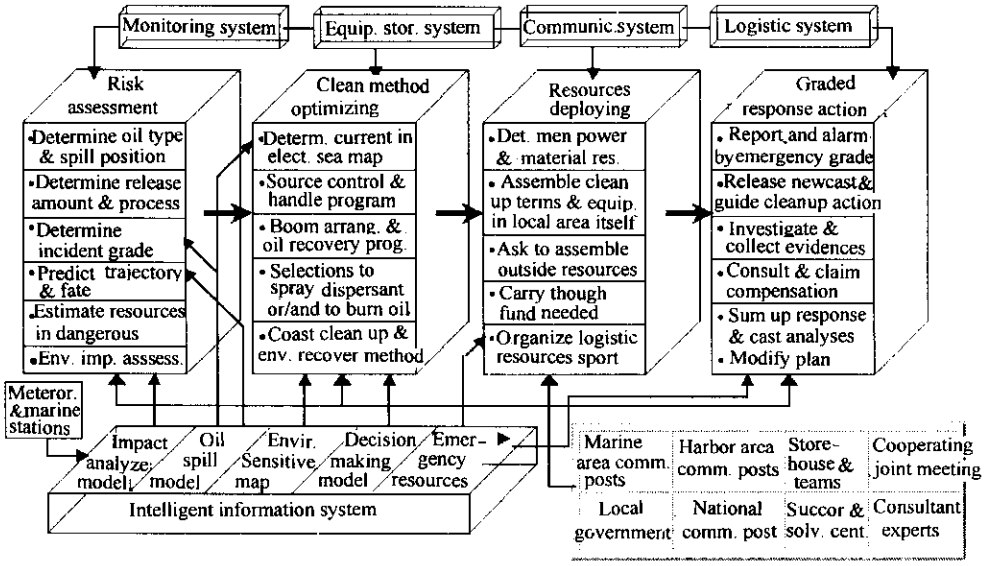

Fig.3 The marine OSER system

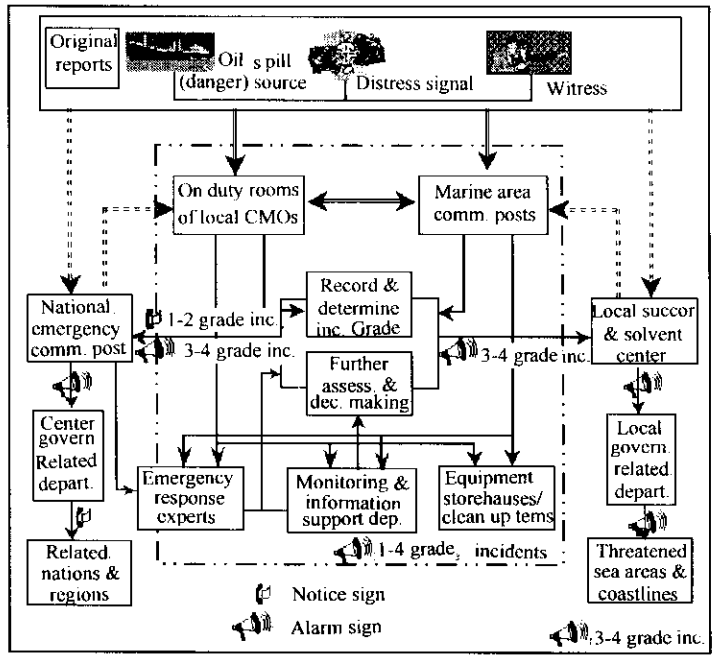

Fig.4 OSER circuit(reporting, alarming and estimating, and so on)

The marine OSEPC is a kind of system engineering with complexity, whose operating efficiency can be raised greatly when applying HT, e.g., information technique, simulating and predicting technique, and so on. It is clear that to reflect the PPI applying HT to support emergency administrating and response in plans can enhance strongly that HT transform into real productive forces, improve significantly the scientific, looking ahead, practice and ease operating natures of the plans, and, therefore, entrust to them a new intention and effect of promoting science and technology serving human resisting environmental disasters. Not only the contents of techniques but also that of related administrating schemes should be included in the PPI, e.g.,(1) planning to setup organization, to allocate and train personnel, to perches

facilities and to budget expenditure; (2) formulating corresponding responsibilities of marine oil spill emergency command posts; (3) advancing related demands for local people's congress and governments completing legislation and administrative rules.

2.1 Communication system(CS)

The CS is composed by the global maritime distress and safety system(GMDSS), special satellite communication network of the Ministry of Communications(transportation satellite and maritime satellite), the public net of post and telecommunication (wire and wireless movable communications) and coast transceivers(Fig.5), which is used to ensure reports, alarms and notices about oil spill incidents and various other information about oil spill emergencies being transported in time, accurately and reliably.

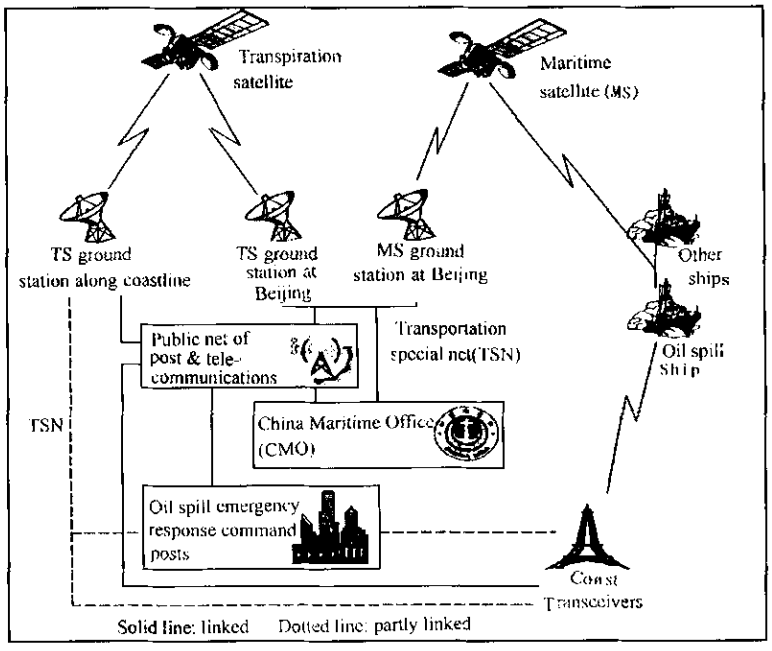

Fig.5 Structure of CS in oil spill emergencies

2.2 Equipment storehouse network system(ESNS)

The ESNS is composed by several equipment storehouses, which depositing ships for recovering floating oil and for other response work, booms, skimmers, oil absorbing materials, dispersant, fixed and floatable oil tanks, oil wastewater treating facilities, etc, distributed in a certain area. The position arrangement and capacities against oil spill of the stores are decided by summarizing following factors: (1) marine ship transportation and the risk of oil spill; (2) types and distributions of environmental sensitive resources; (3) oil spill incident cases in the past; (4) time restrict demands for rapid response of emergency command posts; (5) convenient conditions for facility transportation.

2.3 Monitoring system(MS)

The MS is composed by technical methods such as monitoring of ships, fixed wing planes, helicopters, airships, satellite remote sensing(Yu, 1999), monitoring and alarming of infrared buoy, on site tracing of GPS, and on site sampling, which is used to determine the position, scale, characteristics and dispersion direction of the oil spill in detail, in order to provide the bases for emergency decision making, cleanup acting, and claiming evidences collecting. The planning principles for the near future are: (1) to realize and air monitoring and commanding system, mainly composed by on site tracing of GPS and the remote sensing technique fastening airship(Yu, 1998), to enhance rapid and efficient oil spill pollution monitoring; (2) to dispose at high incident risk positions the monitoring and auto-alarming system

of infrared buoy.

2.4 Intelligent information system(IIS)

The IIS(Qiao, 1997) is composed by the oil spill simulating and predicting model(Qiao, 2001), environmental sensitivity maps, types and distributions of sensitive resources recorded and shown in computers, and the oil spill emergency expert system, whose classified information databases are listed in Table 2, and whose main supporting functions are: (1) to determine the incident emergency grade by means of synthesizing factors of the scale, controlling difficulty, special physical and chemical properties and threaten to the environmental resources of the spill and integrating experiences of managers and experts in related areas; (2) to simulate and show dynamically temporal and spatial distribution of oil spill trajectories and fates; (3) to optimize controlling and cleaning up programs according to the on site environmental conditions, sensitivity maps, and man-power and material resources which can be mobilized; (4) to assess the environmental impact according to a certain of environmental quality standards and the damage of environmental resources applying the ecological system model; (5) to estimate the scope, damage degree and recovery scheme of the damaged resources applying the sensitivity maps; (6) to aid exploring and inquiring of oil spill contingency plans, and to supply simulating platforms for drilling and training.

Table 2 Main information databases of IIS

Classes	Composition and main contents			
Environment & ship transport conditions	Meteor., ocean.& geographical features	Distribution of sensitive & high value areas	Basic phys.& chem. properties of oils and harmfulness	Channel, radio navigation facilities, ship densities
Spill incidents analyzing & simulating	Oil spill incident cases in the past	Oil spill damage assessment model and index	Oil spill identify and oil fingerprints	Oil spill trajectories, fates & impact models
OSER resources	Organizing and commanding departments & CS	Men power resources of OSER teams	Material resource of equipments & peculates	Logistical supporting resources
Preparedness, OSER, claim	Emergency & cleanup action guidelines	Calculation methods of costs and scopes	Damage & pollution cases & report forms	OSER drilling & training

3 Conclusion

Determining objectives representing common interests of different aspects established the foundations to research, plan and implement MOSCP. Structure and function designing can make plans with large amount of contents having clear levels, being operated orderly and being convenient in practical applications. Applying the researching and planning method of systematically and practically designing, and reflecting the PPI applying HT to support emergency administrating and response are helpful to improve scientific, looking ahead, practice and ease operating natures of plans, and entrust to plans a new intention and effect of promoting science and technology serving human resisting environmental disasters.

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