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Overcoming the consequence from oil spill incident

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Abstract
Oil spills can originate from a variety of sources such as tankers, oil exploration and storage facilities. Oil spills from tankers are usually caused by cracks, leaks in the hull or collision. Serious oil spills, such as the 2006 Lebanon coast or the 2002 Prestige accident off the Spanish coast, can be a serious threat to marine, aquatic and marine ecosystems. Oil spills often happen to attract the public's attention, but such incidents actually account for only a very small part of the total amount of oil pollution. According to a 2003 National Research Council report (NRC), Oil in the Sea III: Inputs, Fates, and Effects Oil enters the sea due to human activity; In North America this rate is nearly 85%. Most of the oil flowing into the ocean is related to its use on land, especially from the shipping industry - a prime example of a diffuse pollution source.

Keywords: oil spill, oil slick, fast response

1. Introduction
According to the statistics of the International Association of Oil Tankers from 2005 to 2014 for 39 countries, Vietnam is one of the five countries with the highest number of oil spills with the number of 10 incidents or more. Up [1]. According to some statistics of Vietnam, on average, there are about 3 oil spills a year, including traceability and unidentified. And is making efforts in building legal and institutional framework, building resources, strengthening equipment and international cooperation to cope with oil spills. Firstly, in terms of the legal framework, Vietnam has issued a series of legal documents on oil spill response, but there are still many limitations. The first legal document was issued in 2003 and has been replaced by the Prime Minister's Decision No. 02/2013 / QD-TTg dated January 14, 2013, promulgating the Regulation on Oil Spill Response, It has stipulated in detail the authority of agencies in formulating, appraising and approving oil spill response plans at all levels, responsibilities of agencies, units and individuals in responding to incidents. Trying to spill oil. In 2015, the Law on Natural Resources and Environment of the Sea and Islands passed the provisions on coping with oil spills at sea in Chapter VII with 5 articles and provisions on response levels and responsibilities of agencies. Organizations and individuals in the preparation and response to oil spills at sea. Vietnam's Maritime Code 2015 stipulates that when a ship is built and a seaport is built, it must have a plan to cope with oil spills [2]; Decision No. 63/2014 / QD-TTg of the Prime Minister. Amending and supplementing Decision No. 02/2013 / QD-TTg detailing oil tankers of 150RT or more, other ships with a total capacity of 400RT or more must have an umbrella rescue plan. Oil pollution of ships. Environmental protection law in 2014 does not have specific provisions but there are provisions on response to environmental incidents in general; Decree No. 30/2017 / ND-CP of the Government dated March 21, 2017 regulating the organization and activities of response to natural disasters, search and rescue, including oil spills. , The Law on Inland Waterway Transport 2004, amended and supplemented in 2014, stipulates that inland waterway vessels carrying petrol and oil must have a plan to cope with oil spills. Because of many relevant legal documents on oil spill response, there was inconsistency. Regarding the scope of regulation, there is no law that fully regulates oil spill response. The Law on Natural Resources and Environment of the Sea and Islands has scope of regulation on the sea areas, the Law on Inland Water Transport regulates for inland waterway vessels, the Maritime Code regulates for ships and seaports. , Although the Law on Environmental

Protection covers scope both on land and at sea, there are no specific regulations on response to oil spills, so the regulations are in response to oil spills. On land has not been specified in the law. Regarding the subject of adjustment, Decision No. 02/2013 / QD-TTg and Decision No. 63/2014 / TTg only stipulate the responsibility to formulate a plan for response to oil spills for oil tankers of 150RT and above, other ships with a total capacity of 400RT or more must have a Plan for oil pollution rescue, without regulations for tankers of a capacity of less than 150RT and other ships of a smaller capacity. 400RT, while the Law on Inland Water Transport stipulates that inland waterway vessels transporting goods being petrol and oil must have a plan to cope with oil spills and the Vietnam Maritime Code stipulates that new ships must be built. Have a plan to cope with oil spills without specifying capacity limits of vehicles. In addition, although Vietnam has issued a number of legal documents to create a legal framework for oil spill response, most of the documents detailing this content have not yet been issued. Issued as a guide to the process of developing oil spill response plans at all levels (this guidance was issued in the form of guidance documents, not normative documents as a basis for localities). perform); regulations on dispersion use process; process of recovering and improving the environment due to the oil spill; stipulating the process of claiming damages for oil spills; regulations on authority and procedures for making plans for response to oil spill incidents for inland waterway vessels transporting petrol and oil, etc. This has significantly restricted the effective implementation of regulations and As a result, the national oil spill response plan has not been approved yet; most localities are confused in guiding the establishment of local oil spill response plans; overcoming environmental pollution after the oil spill is very limited; over 70% of oil spills in Vietnam's waters have not been compensated. There are many causes of this situation such as collision, accident of water transport means (especially oil tankers), oil rig incident, oil spill incident due to geological changes. Economic activities, especially activities related to the exploitation and use of aquatic resources. Normally, when the ship arrives at the port of loading and unloading of goods to shore, the ship will be cleaned to prepare for the new batch. This work often generates a lot of waste in the form of sludge. Depending on the load and technical state of the vessel, the amount of sludge generated more or less. In particular, a number of Vietnamese river ships due to old equipment, backward risk of causing oil pollution also occurs in larger proportion. River boats also often cause local pollution by rinsing toilets where they dump right there. On 23/6/2010, barge Huynh Nhi 01, registration number BL-0304, load 250 tons suddenly sank across the area under Ton Duc Thang bridge (Bac Lieu 2 bridge) in ward 1, town Bac Lieu, Bac Lieu province when the barge was trying to "pass dry" on the river Bac Lieu - Ca Mau to the loading docks, the obstacles in the riverbed sank. Oil reservoirs on the barges have spilled into the water, polluting the local aquaculture water supply. On 27/4/2010, from the mouth of the river to the sea, to anchor position A12 (in the sea of Sao Mai, Ward 5, Vung Tau City, more than 1 km from the mainland), the ship Bien Dong 50, Changsha Sea Cargo Oil has suddenly sunk in the Vung Tau Sea. In the incident, the Bien Dong 50 carried more than 370 tonnes of DO and more than a dozen empty tanks. Immediately after sinking, the oil has spread out to the sea surface and floating off the surface. After only a few hours, the oil was spread across the sea in long strides. Around the location of the sinking ship with the smell of oil rising. The above are just two of the latest examples of oil spills among the major oil spills in Vietnam.

According to statistics from the HCM City Department of Natural Resources and Environment, an average of one year on the Saigon River occurred more than one oil spill caused by collision or leakage. Especially, along the Saigon River there are many units operating in the oil and gas industry, potential oil spill causing environmental pollution. Meanwhile, the Saigon River along the Dong Nai River system is the source of clean water for the localities of Ho Chi Minh City, Dong Nai and Tay Ninh. Cat Lai Oil Refinery, Cat Lai Petroleum Factory (District 2, HCMC), Petechim - Nha Be Petroleum Enterprise, Petrochemical Products Trading Company Limited and Hiep Phuoc Thermal Power Plant Nha Be) is on the list of potential oil spills. In addition, Ganh Rai Bay (an area bordered by Ho Chi Minh City and Ba Ria - Vung Tau Province) is also on the list, as there are more than 40 gasoline transport barges on the river every day. Moving at high risk. The danger is that these old barges are old lack of equipment to help safe circulation ... Oil Spill Solution? In many countries in the world as well as in Vietnam, measures are often applied to overcome oil spills are: mechanics, chemistry, physics, biology ... In which, mechanical methods Is the number one priority in protecting the coast from the effects of oil. Preventive and recovery devices include a variety of oil floats, oil fences, hand oil pumps, natural and synthetic adsorbents. Mechanical oil separators are used to draw and store oil until it is removed. The advantage of this measure is to prevent, control and quickly collect oil spills in the field. Chemical treatment is used with or without mechanical and oil spill over a long period of time. Agitators and dispersants are used to prevent oil from entering the coast and other biologically sensitive areas. Physical measures are often used to clean the coast. Biological methods are the use of microorganisms that break down oils such as bacteria, yeast, etc. The antiseptic technique is also used to protect birds and animals by isolating them from the area, affected by the oil spill. However, when oil spills occur, mechanical measures are considered as a priority for responding to oil spills in rivers and seaports. Oil spill seriously affects the environment and ecology in any location. Its effects and damage to the environment are difficult to assess. The cost of overcoming oil spills is huge, sometimes up to billions of dollars, depending on severity. According to the assessment, the cost of overcoming oil spills depends on the type of oil spill and, depending on whether the area is offshore or offshore. It is estimated, to handle and fix a barrel of crude oil at $300- $600 in relatively low standard conditions. In other places it can be up to $1200-2400 for a barrel of crude oil at the same conditions.

2. The consequences of oil spills

The most effective and important measure is to prevent the source from arising in the first place. In the United States, the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) collaborate to prevent and treat oil pollution in ocean areas. International cooperative organizations, such

as the United Nations MARPOL 73/78 Agreement (Marine Pollution), which came into effect in 1983, have contributed to reducing the amount of oil pollution originating in the shipping industry. Just one year after the 1989 Exxon Valdez oil spill, the US passed the Oil Pollution Control Act of 1990, requiring the petroleum industry to be more cautious to avoid the oil spill and have a plan to respond. Emergency response to deal with spills. In addition, in 2015, all tankers operating in US waters must be designed with double hulls, so if the outer hull is broken, the inner hull will contain fuel. The international associations and the increasingly stringent legal documents have proven effective, since 1989 the oil spill has become less and less. Another method is to improve tanker positioning devices - especially the emergence of global positioning systems. However, just like the design of a double hull, technology only helps prevent incidents if used properly. The Vietnamese waters are an open ocean linking the Pacific Ocean and the Indian Ocean, which is one of the navigable maritime tracts of which 70% are oil tankers. Although it has not yet been classified as a serious pollutant, it has also been warned that there is a high risk of future pollution, as the industry is booming in coastal areas, plus exploration and mining activities. Oil and gas exploration and exploitation in the region is on the increase, while the area is often a dangerous disaster at sea. According to the Vietnam Institute of Marine Science and Technology - Vietnam Academy of Science and Technology: From 1989 to now, Vietnam's sea area has about 100 oil spills caused by ship accidents. Pour into the sea from a few tens to hundreds of tons of oil. Oil spills usually occur in March and April each year in Central Vietnam; From May to June in the North. Statistics show that, in the period 1992-2008, the oil spill in the sea of Vietnam comes from many different causes. Specifically, oil spills of 7,700 metric tons are usually concentrated mainly due to ship stranding. Oil spills in excess of 700 tons are mainly due to oil transport and ship collisions. Oil spills pollute the marine environment, seriously affecting ecosystems. Especially ecosystems of mangroves, seagrasses, sandy tidal areas, lagoons and coral reefs. Oil pollution reduces the resilience, flexibility and resilience of ecosystems. Oil content in the water is high, oil films reduce the oxygen exchange capacity between air and water, reducing oxygen in water, causing the balance of oxygen in the ecosystem to be upset. In addition, oil spills contain toxins that damage the ecosystem, which can cause ecological degradation. Because oil contains many different components, transforms, destroys the cellular organism structure, sometimes causing the whole population to die. Oil seeped into the sand and coastal mud can affect for a very long time. There have been many cases where organisms die massively due to the effects of an oil spill.

Fig.1: The effect of oil spill, oil slick on the environment and sea lives

It is also alarming that the oil spreading at sea and washed ashore for long periods of time without collection will reduce the number of organisms that cause damage to the fishing and aquaculture industries. Oil contaminates the water environment causing the fish to die massively due to lack of dissolved oxygen. The oil clinging to the soil, rock embankment, island coasts make beauty look, causing bad smell to the revenue of the tourism industry was also severely damaged. Oil spills also affect the operation of fishing ports, ship building and repair facilities. As oil drift breaks down machinery, equipment for resource extraction and shipping. Through surveys at Lach Bang fishing port,

Tinh Gia district, Thanh Hoa province, where frequent anchorage of thousands of fishing vessels from different regions. The environmental pollution of the water here is due to the sludge of the ship "careless" discharge into a large black area. If 10 years ago this estuary was home to a rich ecosystem of mangroves, now almost the entire area of mangroves infected with oil is dying to death, leading to the real Brackish water is almost extinct. This is also a continuous incident of oil pollution causing hundreds of hectares of aquaculture lost, so many households forced to quit. Consequently, the oil spill incident can be considered as one of the types of breakdown that causes the greatest economic loss, in the type of human-induced environmental breakdown. Currently, the location of oil spill and overcome this problem in Vietnam still have many limitations, both legal basis and specialized equipment and technical means to overcome oil spill pollution. Petroleum and petroleum products are liquids with very low solubility in water, especially sea water. Therefore, when the oil enters the water, there will be a phenomenon spreading on the surface of the water. Sea surface spill distribution takes place under the influence of gravity. It is controlled by oil and water surface tension. This process is especially noted for effective oil spill response. In static conditions, one ton of oil can spread over 12km 2 of water, a drop of oil produces a 20m2 oil film with a thickness of 0.001mm, which is capable of contaminating a ton of water. Due to the evaporation and dissolution processes, the density, viscosity increases, the surface tension decreases until the thickness of the oil reaches the minimum, the flowing process terminates. In the absence of disturbance factors, the oil diffuses into a circle, covering a maximum area of: $Smax = R^2max$. In fact, the process of ocean flow is heavily influenced by wave, wind and tidal elements. In parallel to the diffusion process, the oil evaporates depending on the boiling temperature and the partial pressure of hydrogen and carbon in the oil as well as the external conditions: temperature, wave, wind speed and area. The oil between the oil and the air. Hydrogen and carbon have the lower boiling point, the higher the evaporation rate. Under normal conditions, the components of the oil with boiling point lower than 200 ° C will evaporate within 24 hours. Light products such as kerosene, gasolyol can evaporate for hours. Light crude oils evaporate about 40%, while heavy crude or heavy oils are less volatile, and do not even evaporate. The evaporation rate decreases over time, reducing the amount of oil, reducing the possibility of fire and toxicity, while evaporating also increases the viscosity and density of the remaining oil, resulting in speed. Diffusion decreases. This is the process of mixing water and oil. Oil- and oil-laden oil-streaks, which produce particles of different sizes, in which particles are small enough and durable enough to mix relatively reliably into water. This increases the surface area of the oilseed, stimulates the deposit of the oil to the bottom or helps the oil's ability to contact with the oxidizing agent, decomposes the oil, accelerates the decomposition of the oil. This phenomenon usually occurs in places where the waves break and depends on the nature of the oil, the thickness of the oil as well as the sea conditions. Under normal conditions, light-weight, light-weight oil particles can disperse over a period of several days, while large-volume or low-oil emulsions are dispersed.

The solubility of the oil in the water is limited to light components. The rate of dissolving depends on the composition of the oil, its degree of spread, its temperature and its ability to diffuse the oil. FO oils are less soluble in water. The most soluble in water is gasoline and kerosen. However, in any case, the oil content soluble in water always does not exceed 1 ppm (1 mg / liter). The dissolution process also increases the biodegradability of the oil. But this is the factor that increases the oil's toxicity to water, smells, poison the ecosystems of plants and animals in water, especially for animals, oil directly and slowly into the organism leading organisms. This is the process of forming glue particles between oil and water or water and oil. Water-based glue: is a colloidal bead oil, which is water; Are hydrated oil seeds that increase the volume of the oil mass 3-4 times. The particles are quite durable, hard to break too separate water. This type of glue has a very high viscosity, high adhesion, obstruct the collection, difficult to clean the coast. Water-based glue: Water-based glue is an oil that is made of high viscosity oil particles under the long-term effects of waves, especially broken waves. This glue is less durable and easier to extract water. Emulsification depends on the composition of the oil and the turbulent state of the seawater. Wind level 3, 4 after 1-2 hours create a lot of oil emulsion particles. High viscosity oils are easy to create oil emulsion. The most stable emulsion contains 30-80% water. Emulsifying reduces the rate of decomposition and oil weathering. It also increases the amount of pollutant load and increases the work to be done to prevent pollution. Because the density is less than 1, oil and petroleum products often float to the surface without sinking to the bottom. Emulsions after absorbing physical or biological matter can become heavier than water and then sink. There are also some suspended particles, further absorb the scattered particles and sink gradually deposited to the bottom. There is also the process of encapsulation, ie the process of accumulation of many small particles into large array. In general, the hydrocarbons in the oil are quite stable with oxygen. But in reality the oil exists in water or the air is still oxidized to a very small fraction (about 1% of mass). These processes occur due to oxygen, sunlight (ultraviolet rays of the solar spectrum) and are catalysed by a number of elements and the inhibition (slowing) of the sulfur compounds forming hydroperoxides and other products are usually soluble in water. There are many different types of microorganisms that can consume certain segments. Each type of microorganism is only capable of decomposing a particular group of hydrocarbons. However, in the river water there are many strains of bacteria. Therefore, very few types of hydrocarbons can withstand this decomposition. Microorganisms can decompose 0.03-0.5g of oil per day per square meter. When the oil falls into the water, the strain of microorganism is active. The diffusion process occurs well, the process of oil ingestion also occurs strongly. The condition that oil-eating microorganisms can develop is that they must have oxygen. Therefore, it is easy to decompose on the surface of the water, but when sinking to the bottom it is difficult to break down in this way.

Oil spill containment can be carried out using high or simple technical tools such as use of specialized oil separators or using bamboo to make buoys and then quickly collect them all the way from the pump. Sucking until hand picking; it is possible to use straw or porous

materials that are soaked in oil that is dropped into the oil for oil to penetrate, then picked up and picked up in a safe place. In offshore, offshore oil spills, consideration may be given to using oil dispersants to prevent oil from spreading to the shore, as these areas are often sensitive areas, where the living of plants and animals, coastal nature reserves and mangroves should be prioritized for protection. When the oil has spread and washed ashore, all means, from raw materials (such as shovels, buckets, pots ...) to modern ones (urchin, oil pump, Bulldozers, trucks ...) organize the collection of oil scum, oil sludge. Oil spills, oil dregs and other oil-based materials (such as soil, sand, branches, garbage, etc.) need to be gathered in one place, preventing the seepage from seeping into the surrounding environment. Specialized instruction manual. In addition to the above-mentioned emergency measures, advanced countries have used supportive tools to assist in more effective incident recovery such as using satellites to track oil spills in the direction of Wind or tide for timely measures. Using specialized vessels and floats to disperse dispersions or prevent oil spills makes collection easier. In addition to scattered chemicals, another method is to use microorganisms or biological agents to disperse or decay the oil. International law, originally the International Convention on Oil Pollution Readiness, Response and Cooperation (OPRC), is now mentioned in US law, although there are no penalties for damages. To owners who caused the oil spill. Coercion is still a dilemma because foreign oil tankers often fly "convenient flags", and are registered in countries with safety or tax requirements. However, to combat this problem, countries can restrict vessels from being able to provide safety documentation for their ports. A lot of lessons have been learned about how to handle the oil spill since the Exxon Valdez incident. For example, some of the cleaning methods used after the Valdez oil spill accidentally caused additional damage; In particular, hot water pressures with high pressure have destroyed both sediments and nutrients that support ecosystem restoration. To prevent the spillover effects of the incident, we can crank up the oil by using an absorbent barrier or by using a boat to scoop the oil up the surface. Another useful method is local burning, the oil will be burnt right in the water. New biological treatment technologies are constantly being developed by using microorganisms to convert hydrocarbons into less toxic compounds. Scientists are studying new ways to limit the effects of the oil spill; there are even studies using protein from horse sweat to mitigate environmental damage. Since it is not possible to completely eliminate the risk of oil spills during the extraction, processing and transportation of oil, a detailed plan is needed to clean up and limit negative impacts. However, with increasingly stringent rules and regulations, along with the continuous development of scientific research, the number of oil spills and the serious damage have been significantly reduced. In addition, in order to meet the oil spill incident in a professional manner, it is necessary to equip a specialized oil spill response vessel. In recent years, it has been shown that the application of environmental remediation or the liability to pay for damages caused by an oil spill is often based on the cause of the oil spill incident. Specifically, the subject causing the incident is the business. The general solution to the above problem is that the law enforcement agency should force the polluter first to fully implement measures to overcome pollution and restore the environment. In cases where they fail to take such measures, the State management bodies in charge of environmental protection shall determine the damage so that the polluters must pay compensations strictly according to the provisions of law. Trung Thanh - Lam Anh Responsibilities of organizations and individuals for oil spills On 12 May 2005, the Prime Minister signed the Decision No. 103/2005/QD-TTg promulgating the Regulation on Resilience Oil spills, clearly defining the contents of activities and responsibilities of organizations and individuals in coping with and overcoming the consequences of oil spill incidents nationwide. In particular, the establishment owner shall be responsible for developing a plan to respond to the oil spills and submit them to the competent authority for approval. Conduct the oil spill response agreements and contracts with appropriate agencies and units. At the same time, they shall be responsible for the oil spills caused by their establishments; to actively and positively mobilize resources, organize by themselves, command timely and effective response to oil spills. The facility owner is also responsible for compensating for the damage caused by the spill incident as prescribed. Equipment and equipment capable of causing oil spills must be insured for environmental pollution corresponding to the risk of spillage.

The ships under Regulation 26, Annex I of the International Convention for the Prevention of Pollution from Vessels, which Vietnam is a participating member state, must have an oil pollution response plan approved by a competent authority. People's committees of provinces and cities under central authority (referred collectively to as provincial level), National Committee for Search and Rescue, relevant ministries and agencies, regional oil spill incident response centers, economic organizations - Other societies must strictly abide by the provisions of this Regulation. The Vietnamese State encourages and creates favorable conditions for domestic and foreign organizations and individuals to invest in infrastructure and equipment in service of oil spill incident response and environmental protection activities. Schools in Vietnam in accordance with the law, carry out the mobilization of the National Committee for Search and Rescue, the People's Committees of the localities

3. Conclusion

Oil spills are considered as serious environmental pollution incidents because they cause great damage to the environment and the ecosystem if not handled promptly. To protect the environmental environment, it is necessary to quickly address the limitations to ensure the effective prevention, preparation, and response of oil spills, and the need to agree on regulations related to the response. try to avoid oil spill and overlap; to promulgate and promulgate documents and documents as a basis for effective implementation of the oil spill response plan; overcome damage and claim compensation for environmental pollution caused by oil spills; soon formulate and approve a national oil spill response plan. Assign responsibilities clearly to agencies, especially to appoint state management agencies to agree on consultation and strategic planning. Comprehensive strategy and plan in formulating policies, investing resources for oil spill response is one of the priority tasks that our country needs to be completed soon.

Among the components of the environment, the marine environment plays an important role because 71% of the Earth's surface is covered by water and 90% of the atmosphere is ocean. Along with the sea-going development of mankind - the cradle of Earth's life - the sea is also facing serious challenges of pollution. Protecting the marine environment is also an important part of our overall environmental protection strategy.

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