10-31-2021

Challenges and potential for Egyptian oil spill contingency plan: a comparative study for improving oil spill preparedness : case study Gulf of Suez and North Sea

Ahmed Raafat Reiad Nasreldin

WORLD MARITIME UNIVERSITY
Malmö, Sweden

Challenges and potential for Egyptian oil spill contingency plan a comparative study for improving Oil Spill Preparedness: case study Gulf of Suez and North Sea

By

AHMED NASRELDIN
EGYPT

A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
in
MARITIME AFFAIRS

(OCEAN SUSTAINABILITY, GOVERNANCE AND MANAGEMENT)

2021

Declaration

I certify that all the material in this dissertation that is not my own work has beenidentified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

Signature: .....

Date:....21/09/2021..... . ..

Supervised by: Professor Ronan Long

Supervisor's affiliation: Director, WMU-Sasakawa Global Ocean Institute

Nippon Foundation Professorial Chair

Ocean Governance & Law of the Sea

WORLD MARITIME UNIVERSITY

Acknowledgements

"In the name of Allah, the Merciful, Praise be to Allah", the Lord of the Worlds. I thank Allah for his grace, which allowed me to study for my master degree in the World Maritime University (WMU) after God has enabled me to complete this thesis. My sincere thanks and great gratitude to everyone who extended a helping hand and provided me with advice, guidance, and direction during this study and research to complete this work.

Then I would like to thank my supervisor, Professor Ronan Long, for his guidance and advice during this research. Also, my sincere appreciation to professor, Tafsir Johansson, for his guidance and advice throughout that research; his words have always encouraged me to move forward. He has provided research materials, books, and in-depth knowledge on the issue that motivated me to continue my journey.

Furthermore, I would like to thank the faculty, administrative staff and library at WMU for their outstanding efforts and cooperation over the academic year.

I greatly appreciate my mother's constant efforts, prayers for me, and continuous encouragement and support throughout my life. Moreover, I would like to extend a special thanks to my great wife and children for their tolerance, love and continuous support, as they are the ones who lightning the way for me to move continuously forward.

Last but not least, I would like to extend my thanks and gratitude to everyone who helped me with honest guidance and fair opinion until this research was completed and came out that way.

Abstract

Title of Dissertation: **Challenges and potential for Egyptian oil spill Contingency plan a comparative study for improving Oil Spill Preparedness: case study Gulf of Suez and North Sea**

Degree: **Master of Science**

The marine environment is considered as one of the richest areas abundant with natural resources. It provides invaluable resources in addition to shipping activities, which is the backbone of global trade and economics. Therefore, protecting the marine environment and achieving sustainable development is no longer a choice, but rather an international obligation broadly owing to the fact that marine pollution does not know borders and could easily effect influence the countries of a specific vulnerable region.

Attention is drawn to the Gulf of Suez marine environment that is exposed to many pressures due to various activities and many pollutants. Persistent in nature from anthropogenic activities, oil pollution is considered as the most critical marine environment issue because of its harmful impacts on marine ecosystems. Therefore, protecting the marine environment from the deleterious effects of oil pollution still remains as significant challenge that countries are faced with.

The international community has consolidatet efforts to curb marine pollution. Most countries have realised the importance of protecting the marine environment through international conventions and regulations and their inclusion in national legislation. Regional agreements and action programs have been drawn up to facilitate marine protection aligned with international criteria.

The research undertaken for this study is timely, and shows the importance of the role played by IMO in reducing oil pollution by providing a synoptic overview of conventions and agreements that apply to marine pollution from ships, liability and compensation.

The study further analyses the main theme of the research, i.e., marine oil pollution in the Gulf of Suez. The author reviews the administrative and organisational structure of Egypt's various national bodies and institutions related to the (please spell out full form of NOSCP before first usage) NOSCP. It defines a set of legislative and local measures to combat marine oil pollution in the Gulf of Suez and the North Sea Regions, additionally the bodies and their responsibilities related to curbing marine pollution.

As a part of the research, comparative analysis between the Gulf of Suez and the North Sea regions is conducted to extract differences in approach and to understand the level of preparedness and response. Both regions, according to the author, have similarities in many activities, circumstances and causes of oil pollution. However, The Gulf of Suez region seems to lag behind the North Sea in terms of effective cooperation and regional partnerships as countries have varying levels of obligation to achieve pre-determined agreements. In addition to the similarity of the objectives regional agreements for the two regions mentioned above.

Finally, this research deploys a SWOT analysis to evaluate the strengths, weaknesses, threats and opportunities concerning oil spill preparedness and response in the Gulf of Suez. Subsequently, recommendations are presented and findings are synthesized to identify best ways forward.

Keywords: Marine oil pollution, oil pollution prevention, Gulf of Suez, Environmental management, Oil spill response plan, Monitoring and surveillance.

Table of Contents

List of Figures

List of Abbreviations

CC-PROV	Regional Coordination Committee
CLC	Convention International Convention for Civil Liability for Oil Pollution Damage, 1969
CP-OPS	command centre operations
CTG MPPR	Consultative Technical Group for Marine Pollution Preparedness and Response
CTGMPPR	Consultative Technical Group Marine Pollution Preparedness and Response
EEAA	Egypt Environmental Affairs Agency
EMSA	European Maritime Safety Agency
FUND	International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage
GEIP	General Emergency and Intervention Plan North Sea
IMO	International Maritime Organization
IPIECA	International Petroleum Industry Environmental Conservation Association
ITCP	Integrated Technical Cooperation Program
ITOPF	International Tanker Owners Pollution Federation
LOSC	law of the sea convention
MARPOL73/78	International Convention for the Prevention of Pollution from Ships
NOPCP	National Oil Pollution Contingency Plan
NOSCP	National oil spill contingency plan
OPRC	International Convention on Oil Pollution Preparedness, Response and Co- operation

PERSGA	Regional Agreement to Preserve the Environment Of the Red Sea and the Gulf of Aden
SOLAS	International Convention for the Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
SUMED	Egypt's Arab Petroleum Pipelines Company
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
VLCC	very large crude carrier

Chapter One

1. Introduction

Maritime transport is a universal industry, and it can proceed forward if the requirements are ratified and applied following international conventions as a basis. More than 80 percent of the universal trade is carried by ships between all countries because of the low economic cost for transporting goods worldwide (IMO, 2020; UNCTAD, 2020).

Due to the COVID 19 pandemic, the global oil demand has declined as a result of travel restrictions and has had an impact on the global economy; therefore, the oil companies have excess crude oil leading to the usage of the large oil tankers as floating storage (UNCTAD, 2020).

In 2019, we notice that international maritime trade grew by about 0.5 percent, reaching a total of 11.08 billion tons. This rate is the lowest growth rate since the global financial crisis of 2008-2009 (UNCTAD, 2020).

Oil spills are casual incidents causing deterioration to the marine environment to the detriment of marine animals and their habitats. Additionally, it has severe impacts on local activities, such as tourism and recreational activities. Therefore, asserted that oil spill incidents require effective management and governance skills, especially coordination among departments and agencies (Assilzadeh & Gao, 2010).

The oil spill has been labelled as one of the essential sources of ocean pollution. The region affected by oil pollution shows changes in its ecosystem, indicating that oil spills can suffocate life underwater (Li et al., 2017).

Marine pollution is affecting the whole world because oil pollution has no borders. The exploration and expansion in marine areas through increased human activities can increase the risks of pollution. Prevention is necessary. But prevention itself

comprises a lot of complex layers, and such, marine oil pollution prevention is one of the biggest challenges in the early twentieth century (Jernelöv, 2010).

Egypt has two seas: the Mediterranean Sea located on the north coast, and the second is Red Sea --- south of the capital city Cairo 120 km. The red sea in the southern part is connected to the Indian Ocean via the strait of Bab-al Man dab and is connected in the northern part to the Mediterranean sea through the Suez canal (Tesfamichael & Pauly, 2016).

Oil exploration and ship operations represent a significant threat to the marine environment. Egypt has been fortunate enough to avoid large oil tanker disasters. However, other countries in the region have experienced large oil spills. In Italy, for instance, the incident that took place in April 1991 has resulted in 144,000 tons of oil spilt into the sea (Kostianoy & Carpenter, 2018).

Also, the analysis and study in the Mediterranean Sea show that the main reason for oil pollution from ships is from operational and generic activities. In fact, in the Mediterranean, analysis from satellite description indicates that the risk is ongoing and remains at about one to ten tonnes per day caused by ship routine operations on the sea (Kostianoy & Carpenter, 2018). On top of that, gas exploration is still ongoing, with exploration and exploitation activities taking place in the eastern Mediterranean. Experts report that the volume of oil pollution in that part remains between 1600 to 1000000 tonnes per year (Kostianoy & Carpenter, 2018).

In 2004, the VLCC AL- SAMIDOON incident with a canal dredger occurred in the Suez Canal, and approximately 9,000 tons of Kuwaiti crude oil spilled. Initially, the response was handled by the Suez Canal Authority. All efforts were made to collect oil using dispersants, booms and skimmers. However, the oil spots migrated to the north appearing in the Mediterranean as shiny balls and tar (REMIP, 2008; ITOPF, 2018).

In 2004, the oil tanker Good Hope incident occurred during the loading operation at Sidi Kerir oil terminal, which has caused an oil spill of about 1000 tons of Arabian Light crude (ITOPF, 2018).

The Egyptian Environmental Affairs Agency and environmental scientists stated the Red Sea had witnessed several cases of oil pollution on the beaches from Ismailia to Hurghada, which has seriously affected the marine environment and coral reefs. In 2017, Egyptian authorities reported the frequent appearance of oil spills on the coasts of Hurghada and Ras Ghareb since February 2016 (Kostianaia et al., 2020).

The Environmental Law No. 4 of 1994 is the national legislation in Egypt regulating shipping and oil exploration and includes provisions regarding reducing oil spills and pollutants from ships (Leach, 2014).

We observe in 1986 that the National Oil Spill Response Plan (NOSCP) was prepared by the petroleum sector. The NOSCP was updated in 1998 and over the past years, there have been assessments to identify the gaps in the oil spills response plan (Bashat, 2005). In November 2016, the Ministry of Environment implemented the evaluation of the national emergency plan to combat marine oil pollution and how to coordinate between the concerned authorities on different levels in relation to response techniques used, lists of equipment in the oil pollution combat centres, follow-up forms as well as training, and the method of communication between and among international organisations specialised in the field of pollution control, which can be used in the event in addition to national response mechanisms (Ministry of Environment,2016).

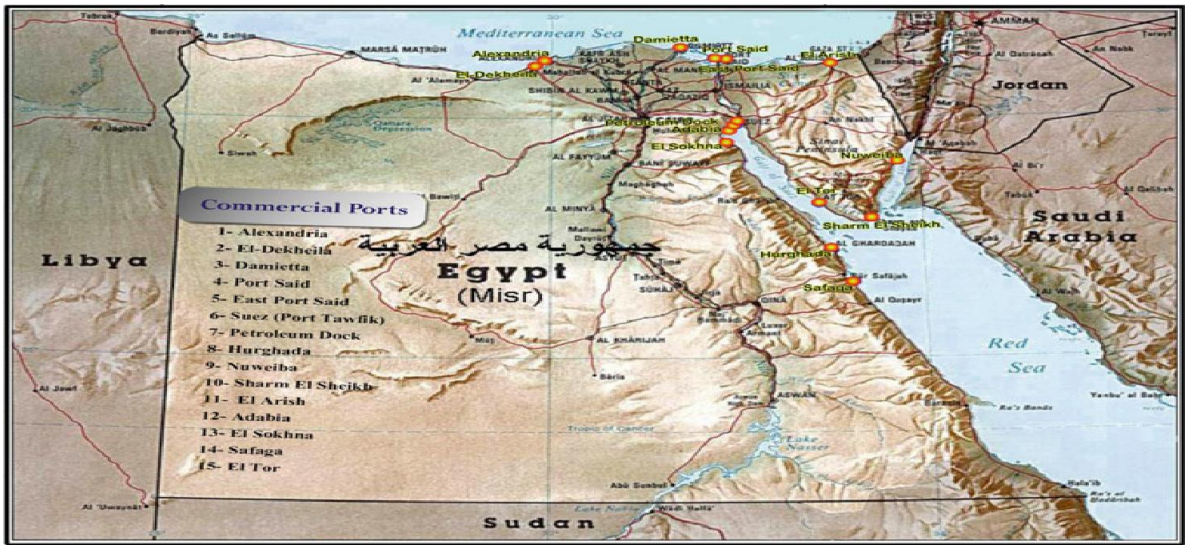
2. Problem Statement

The proportion of trade volume passing through the Suez Canal comprises 15% of global trade, with 10% of the global seaborne oil passing through the Suez Canal. The total number of ships passing through the Suez Canal reached 17,550, where container ships represented the highest percentage, reaching 31.7% and oil tankers and bulk carriers with a percentage of 25.85 %. However, there is a slight increase in ship movement due to the new channel (Suez Canal Authority, 2019).

The Red Sea has many important ports, such as Egypt's Arab Petroleum Pipelines Company (SUMED) terminal for large crude oil carriers. Additionally, oil field

exploration activities commenced in the twentieth century today. In the Gulf of Suez, there are more than 80 oil fields in the red sea (Kostianaia et al., 2020).

Figure 1: Egypt's commercial ports as showing in the figure



Source Maritime Transport Sector, 2019

The huge and rapid development of maritime transport and the limited abilities in the mechanisms for responding to oil pollution ended in a gap in the national emergency preparedness plan for responding to potential oil spills in this area ((Leach, 2014).

The risk of an oil spill in Egypt is ever-present, particularly in the Gulf of Suez region, where chances are very high due to the utilisation of the Suez Canal for global trade, and it is connecting to oil sources with global markets. In addition, the exploration of oil and gas increases the risks of oil spill incidents. Therefore, a holistic state oil spill response plan for Egypt is in order and one that will also enable continuous assessment and development in that area in compliance with international regulations and conventions.

3-Aims and Objectives

3.1. Aims

This study and research seek to tackle the applicability of oil spills contingency plans and conventions to prevent marine pollution. This research aims to evaluate and rectify the gap in the current regime to enhance the capacity to prepare and respond to large oil spill accidents.

3.2. OBJECTIVE

- To illustrate the sources of oil spills in the marine environment;
- To explain oil spill risks and potential environmental impact due to oil spills in the marine environment;
- To perform analysis and description of the international conventions and protocols to protect the marine environment from oil spills
- Evaluating the Egypt national contingency plan for the oil spill and its compatibility with international conventions and protocol;
- Identifying the gaps in the system in terms of contingency plan and readiness for oil spills comparative with the North sea; and
- The recommendations and outcomes for protecting the Gulf of Suez marine environment from oil pollution.

4. Research question

I-What are the main sources of oil spills?

II -What are the international and national regulations for preventing maritime oil pollution?

III - what are the roles and duties in the oil spill response contingency plan in the Egyptian maritime environment?

IV - what are the challenges and potential for implementation of the oil spill response contingency plan in the Gulf of Suez?

V - What are the effective means to be implemented for readiness and monitoring oil pollution in the Gulf of Suez maritime environment?

5. Research Methodology

The research method includes the framework determined by the researcher in the forms and methods of data collection and the process of analysing and interpreting data, and the use of appropriate techniques and practices (Creswell & Creswell,

2018). The research design for this study will use qualitative analysis relying on a case study approach to perform data analysis. The Qualitative analysis will use to understand the drivers, causes and conventions related to marine pollution.

Primary data is collected using an electronic questionnaire was submitted to the Egyptian Environmental Affairs Agency. Secondary data sources involve carrying out a literature review of International Maritime Organization (IMO) publications, academic journals, International Tanker Owners Pollution Federation Limited (ITOPF) publications, oil spill preparedness national reports and case study-analysis relevant materials.

However, a research design is a plan and structure the researcher determines the layout of the chosen research, whether qualitative, quantitative, or mixed methods. They are also called research strategies (Creswell & Creswell, 2018)

The qualitative method is used in this research as it leads to an understanding of the causes, motivation and implications of the principles and conventions related to marine pollution. At the outset, reviews of the major sources of marine oil pollution are examined utilising the principles and conventions surrounding marine pollution. Finally, a case study The North Sea approach is used to perform a comparative examination of noteworthy oil spill response and contingency plans.

6. Data analysis.

This research used the comparative study between the Gulf of Suez and the North Sea regions in preparedness and response for oil spill contingency plan to identify the gaps in the Gulf of Suez oil spill response and preparedness.

7. Key assumptions and potential limitations

The researcher, during this study, will illustrate the efficiency and capacity of the Egyptian oil spill contingency plan to combat oil pollution incidents. In addition, the researcher considers the roles and responsibilities of all government agencies,

international agencies, oil companies, and shipping companies. In doing so, the researcher:

- Will follow a professional approach acknowledging affiliations and avoiding misrepresentation of data collected;
- Will utilise accessible, relevant data and environmental reports regarding both Egyptian ports and oil terminals;
- Will observe the response of the Egyptian Port authority for inquiry regarding the environmental impact assessment report and port performance; and
- Will examine the management barriers that may limit the use of new technology to protect the marine environment from oil spills.

8. Scope of the study

The dissertation contains seven chapters to examine Gulf of Suez oil spill contingency plan preparedness, and they are as follows:

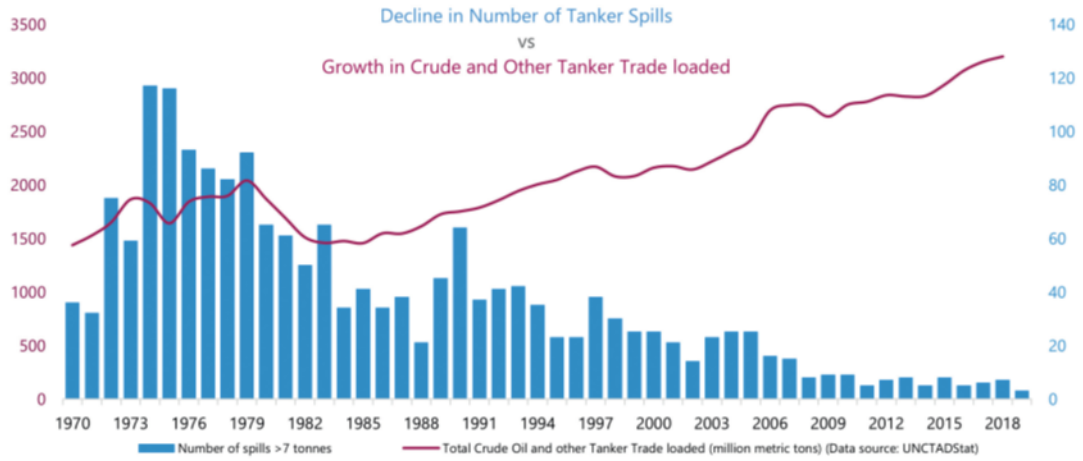
- Chapter one will embrace the introduction and the background of oil pollution, especially in the context of the Gulf of Suez area. The problem statement of the preparedness for Egypt oil spill contingency plan also outlines the aims and objectives, Research question, Research methodology, key assumptions and potential limitations.
- Chapter two will contain a literature review that illustrates the effects of oil spills on the marine environment and the Challenges of Oil Pollution on the Egyptian Red Sea coast.
- Chapter three will define the international regime containing regulations for oil pollution prevention, regulatory framework on oil spill contingency planning and examines oil spill contingency plan for Gulf of Suez and the North Sea regions.
- Chapter four will examine the national regime, regulatory framework and oil pollution preparedness and response in Gulf of Suez and The North Sea related to the national oil spill contingency plan.
- Chapter five will comprise a comparative analysis.
- Chapter six will illustrate the summary of findings and Recommendation for the Egyptian challenges on oil spill preparedness.
- Chapter seven Conclusions.

CHAPTER Two: Literature Review

2.1 Introduction

Since 1970, we perceive that seaborne oil trade has grown significantly and the impact of the Covid-19 in the oil market remains undetermined. Despite the increase in oil trade to date; the decline in oil spills is deemed to plummet (ITOPF, 2020).

Figure 2: Decreasing of oil tanker spills vs increase in crude and tanker trade from 1970-2019



Source (ITOPF, 2020)

Notwithstanding, as a result of the further developments including the reconstruction of the Suez Canal in 2015 --- ship traffic has increased. According to various studies, experts note that the source of the pollution in the Gulf of Suez mainly emanates from vessels due to oil exploration in that area (Kostianaia et al., 2020).

Markedly, the marine environment of the Ain Sukhna area has deteriorated significantly due to continuous oil pollution, as in the vicinity of the SUMED terminal, pipeline and SBM area for VLCC lightering to pass the Suez canal (REMIP, 2008).

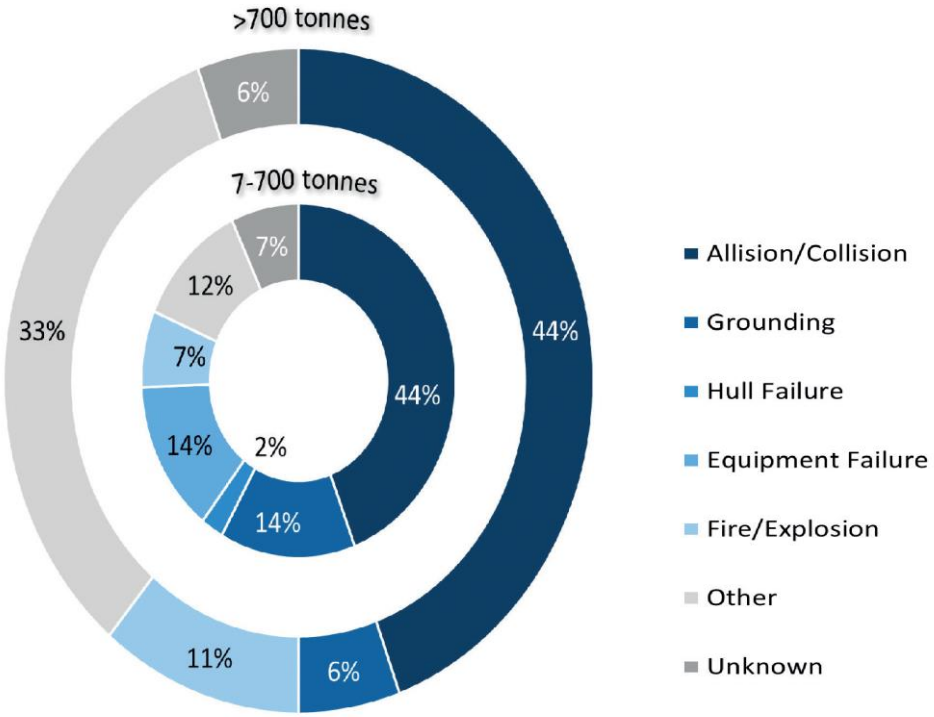
After a comprehensive study on pollution sources affecting the marine environment conducted by the United Nations expert group working with marine environmental

protection, it is clear that there is a need to adopt significant means for improving and controlling oil spills accidents by reducing risk and developing effective oil spill response plans (Moller, 2003).

According to the International Petroleum Industry Environmental Conservation Association IPIECA annual review report in March 2020, oil spills remain one of the most important challenges for oil companies and maritime shipping, even though the numbers of oil spills have declined. There is still a growing need to perform oil spill risk assessments coupled with a readiness to respond to oil pollution incidents quickly and reliably marked by strong skills and resources to effectively perform (IPIECA, 2020).

When observing post-incident analysis of various causes and circumstances resulting in tankers oil spill, we observe that they occur due to a variety of reasons such as collisions and grounding (ITOPF, 2020).

Figure 3: Causes of spills, 2010-2020



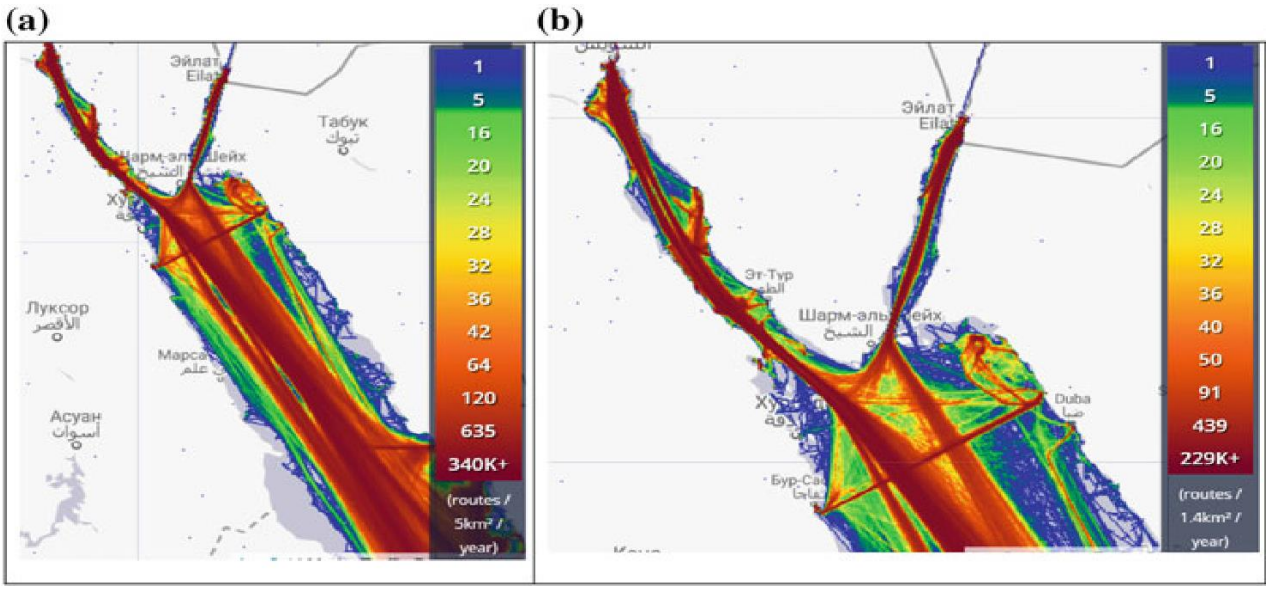
Source (ITOPF, 2020

2.2 Challenges of Oil Pollution in the Egyptian coast Red Sea

2.2.1 - Marine Environment Threat and Tourism Growth

The Red Sea is very rich in biodiversity, coral reef and cultural heritage; therefore, they can create a befitting touristic environment. Coral reefs and environmental activities such as diving, rowing and snorkelling are considered the main attractions for tourists, whereby tourism in Egypt in the last several decades is considered a significant source of national income (Gouda, 2015).

The red sea is characterised as a sensitive marine environment and fragile in nature with narrow and semi-enclosed waters. Those features increase the risks of oil spills and will have destructive ramifications on Egyptian coasts leading to the deterioration of the marine environment and touristic areas (Kostianaia et al., 2020). The figure 4 shows the density of marine traffic north of the Red Sea for all ships.



Source Marine Traffic (2019)

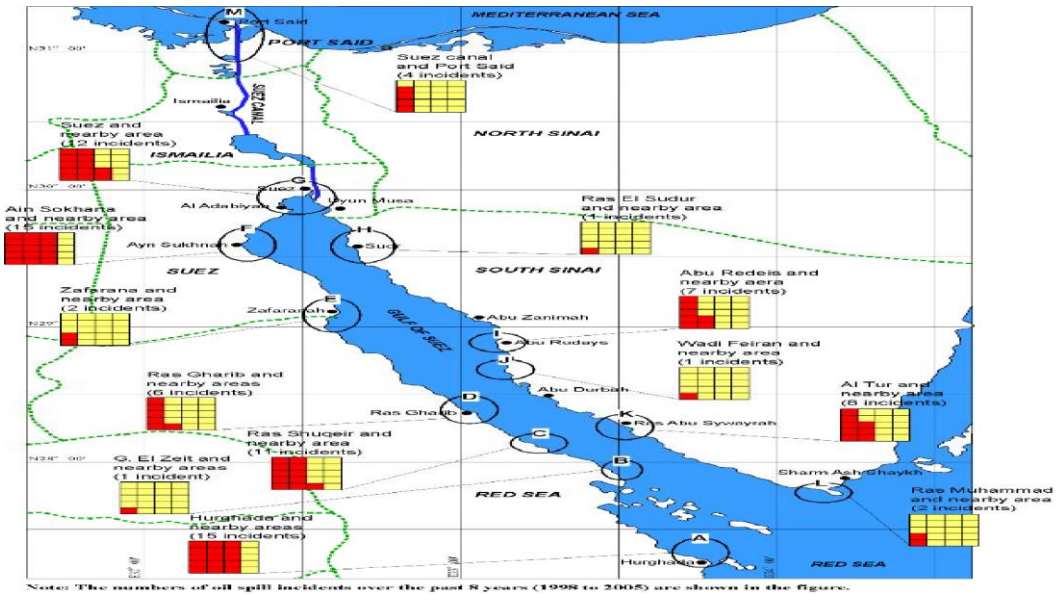
The red sea shipping routes are along the Egyptian coast. Heavy traffic proportion with offshore drilling operations exposes the coast and associated marine environment to significant threats. The Egyptian Environmental Affairs Agency and environmentalists state that marine oil pollution is increasing from Ismailia to Hurghada (Kostianaia et al., 2020).

2.2.2 Oil Pollution incidents

The Gulf of Suez produces about 36 million tonnes of oil and gas annually. The Gulf of Suez has more than180 oil fields and submerged pipelines for transferring crude oil along with the coast (NOSCP, 2009).

The oil pollution and its impacts on the Red Sea marine environment have gained a lot of awareness in recent years. The development of terminals and the opening of the new Suez Canal increase the possibility of oil pollution risks (Kostianaia et al., 2020).

Figure 5 showing Locations of Oil Spill Incidents



Source (REMIP, 2008)

According to Egypt Independent (2017), frequent oil spills have been observed on the coast of Ras Ghareb and Hurghada in the Red Sea region, which has had a major impact on marine ecosystems, for example, the decline of coral reef cover.

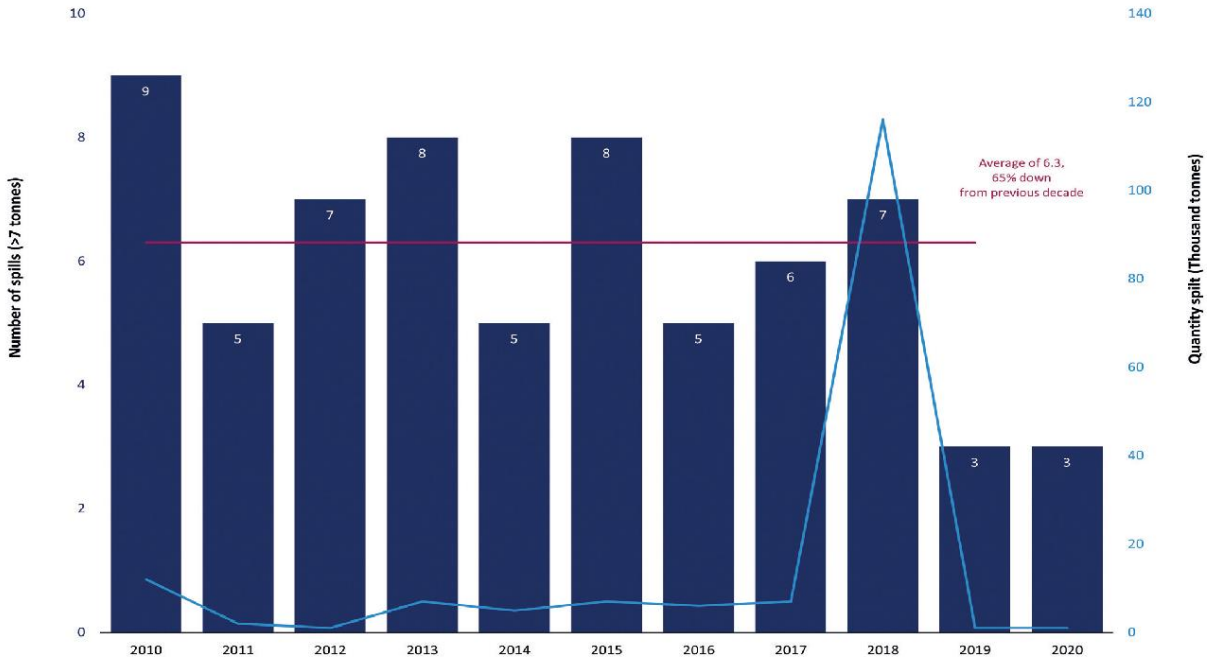
On 16 June 2010, oil pollution was discovered about 160 km along the coast, which has several tourist-resorts in the Jabal al-Zayt area and there was no clear reason

for the source of this massive pollution. The Egyptian Ministry of Petroleum noted that the pollution originated from one of the oil tankers passing through the Gulf of Suez region but there were also some statements that pollution originated from one of the oil rigs (Julian2010; Leach 2014).

In 2020, the average of medium oil spills (7-700 tons) was three as recorded in Europe, Africa and Asia and it remains the lowest since 1970. In 2020, the total volume of oil spilled into the marine environment from tankers was about 1,000 tons (ITOPF, 2020).

Over the past five decades, the number of large oil spills is said to be greater than 700 tons, and has decreased significantly. Between 2010 and 2019, there were 1.8 spills per year on average. However, the forecast for the next ten years remains uncertain (ITOPF, 2020).

Figure 6: Quantities and number of spills (>7 tonnes) from 2010-2020



Source (ITOPF, 2020)

2.2.3 Sources of marine oil pollution from shipping activities

The study illustrates that marine environments can be polluted by oil from various sources such as transport and fixed installations (Carpenter, 2019). The following are noteworthy sources of oil pollution from shipping activities: Oil spills from ships occur for many reasons and conditions. However, their analyses provide valuable insights into risk management (ITOPF, 2020). Oil spill caused by ships they are:

I-Oil tanker accidents are one of the significant causes of major oil spills as well as, loading and unloading operations for oil tankers (Carpenter, 2019; Chen et al., 2019)

II-During bunkering operation of vessels (ITOPF, 2020)

III-Tank cleaning operation for oil tanker (Kostianaia et al., 2020)

Iv-Intentional disposal of oily water into the sea without compliance with the rules (Carpenter, 2019)

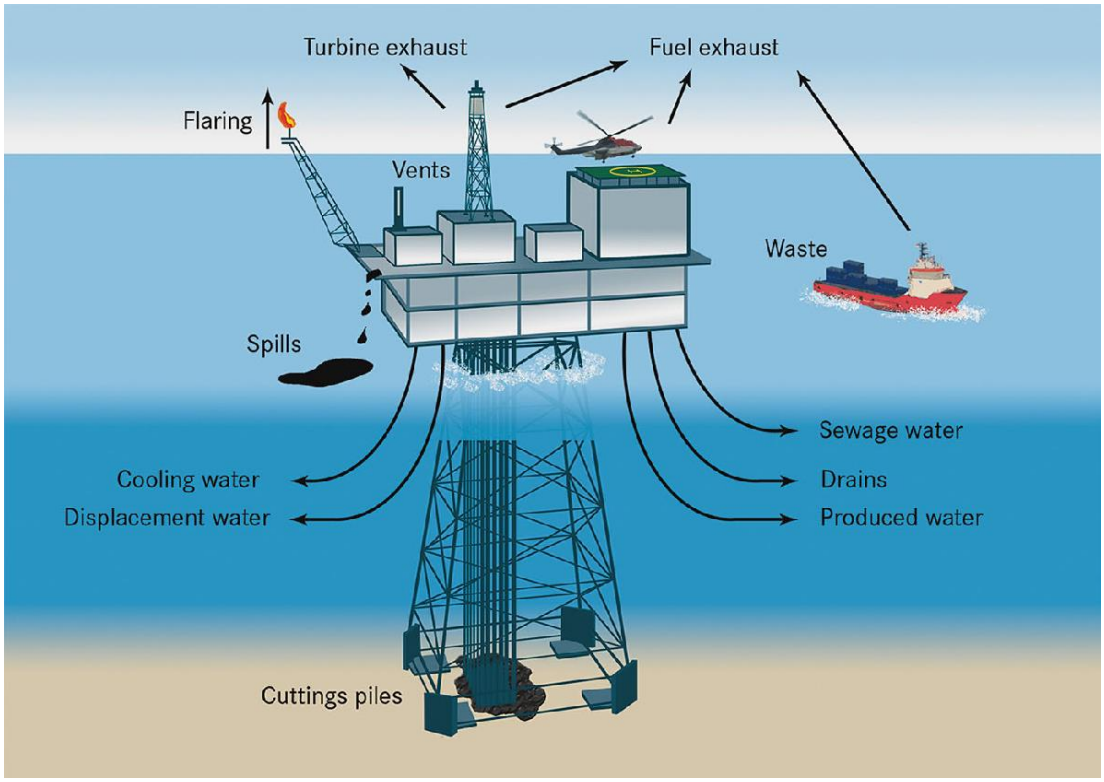
International Maritime Organization (IMO), maritime authorities, classification societies and agencies should cooperate to better understand the reasons behind the oil spill. Data gathered by concerned authorities should be used by the shipping industry for an effective perspective to reduce oil spills from tankers (Chen et al., 2019).

2.2.4 Sources of oil pollution from oil exploration

The Gulf of Suez has a basin area of about 19000 km2. The area is rich in oil and it contains more than 80 oil fields. Moreover, there are many oil terminals and shore facilities on the red sea coast, therefore, their operations have an impact on the marine environment (Kostianaia et al., 2020).

Oil and gas exploration and exploitation holds the highest risk of oil pollution that could result from blowouts, ruptured pipelines, illegal disposal for oily water and accidents (Chen et al., 2019).

Figure 7 showing Substances released during routine offshore oil and gas production



Source OSPAR Commission 2010

Observing the quantity of oil entered into the marine environment from 1970 to 2020, it is seen that approximately 5.86 million tonnes of oil spill was the result of tanker incidents. Nevertheless, the volume of oil spilled over the past decades has reduced. Finally, in 2020, the total oil volume spilled from tankers to the marine environment is about 1000 tons (ITOPF, 2020).

2.3- The significance of Suez Canal for Shipping

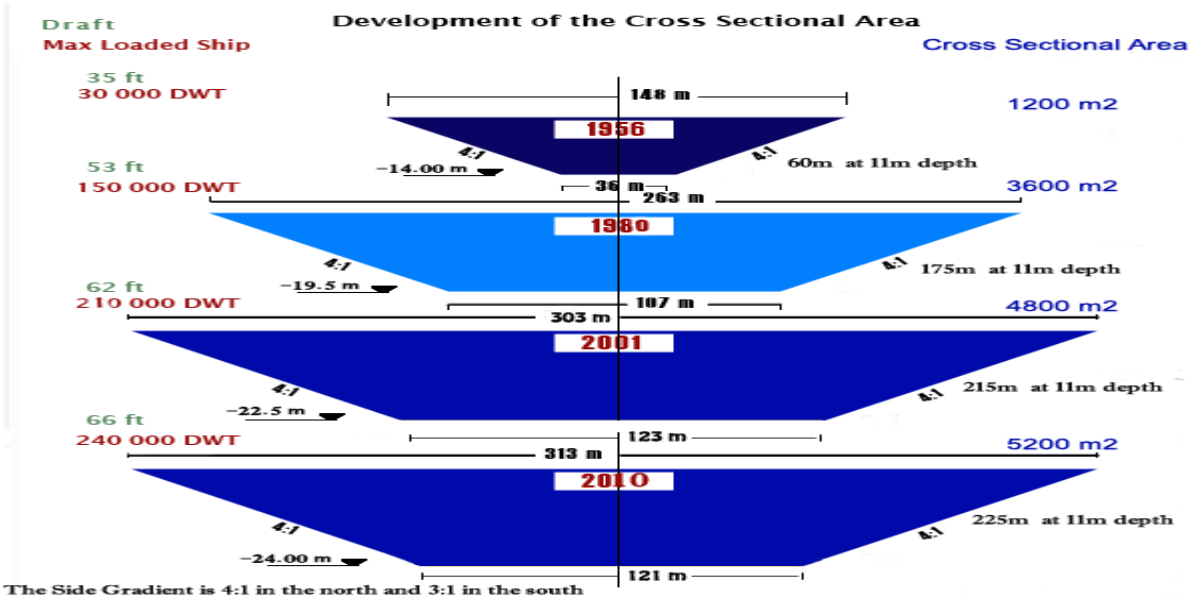
The Suez Canal is an artificial waterway connecting the Mediterranean and the Red Seas which has a length of 193 km. On 17 November 1869, the canal was opened for operations. The Suez Canal is considered one of the significant and heavily passage through which vessels transit (Suez Canal Authority, 2017).

On March 23, 2021, the huge container ship MV Ever Given ran aground in the Suez Canal blocking one of the most important arteries of maritime trade and

stopping more than 300 ships trying to cross. This incident revealed the importance of the Suez Canal to the global supply chain (Schiffling, et al., 2021).

Since the Suez Canal was opened for navigation, it has passed through many stages of developments to keep pace with the development in the maritime transport industry including increase in ships' size. At the beginning, the depth of the Suez Canal was 8 meters and allowed the passage of a 5000 DWT, but with new and emerging developments, it was necessary to develop and increase the capacity of the Suez Canal in line with the shipping market. In the year 2015, the depth of the canal reached 24 meters and allowed the passage of 240,000 DWT (Suez Canal Authority, 2019).

Diagram 8 showing development of the Suez Canal cross Sectional Area:



Source (Suez Canal Authority, 2019)

In 2015, a new canal of 35 km long was drilled, which allowed passage in both directions in this area, as the goal of the project was to reduce the transit time for the canal and increase the number of ships expected to transit as a result of growing the global trade (Suez Canal Authority 2017).

2.4- Oil spills Impact on the Marine Environment

We observe that oil spilled in the marine environment is subject to many physical and chemical changes some of which leads to the need for mitigation strategies for immediate removal. Oil pollution depends on many factors such as the amount spilled, weather conditions, and the primary physical and chemical properties of oil (ITOPF, 2014).

Oil pollution is recognised as a severe environmental issue; therefore, we notice that major accidents receive great attention due to its overarching impact and the manner in which it affects beaches and wildlife including birds and marine mammals. These effects can be short or long-term on the marine environment according to the amount of pollution. Also, Pollution occurs when small volumes of oil are spilled for long periods, such as natural leaks, which leads to exposure of living organisms to oil and its chemical components (Board et al., 2003).

In general, oil pollution impacts the marine environment in the following manner;

I- Smothering, that can impact the capacity of the marine ecosystem (ITOPF, 2014).
II- Oil pollution is harmful to the marine environment. It can be resulting in the toxicity (ITOPF, 2014).
III- Change habitats such as lose organisms (ITOPF, 2014).

It is clear that oil pollution of the marine environment has harmful effects on birds and marine mammals, as well as fish and shellfish, the oil effects can render fish and shellfish risks to eat (NOAA, 2021).

Seabirds are vulnerable to oil spills whereby oil sticks to the feathers of birds. Also, oil pollution destroys the insulating ability of the fur for mammals and ultimately, these mammals and birds are exposed to harsh and cold conditions leading to fatality due to the low temperature of the body. Moreover, oiled feathers hinder birds' ability to fly with a view to avoiding predators (NOAA, 2021; ITOPF, 2014).
Also, oil pollution impacts dolphins and whales. There is a chance they might inhale the oil, which destroys the lungs and reproduction, as well as sea turtles that find themselves trapped in the oil, particularly Juveniles, in addition, we note that many

birds and animals can be poisoned as a result of ingesting the oil when cleaning themselves (NOAA, 2021).

Oil spill represents a major threat to sea turtles as it can infect their mucus membrane, especially, during the nesting season when the beaches are polluted with oil and thus lose nests (ITOPF, 2014).

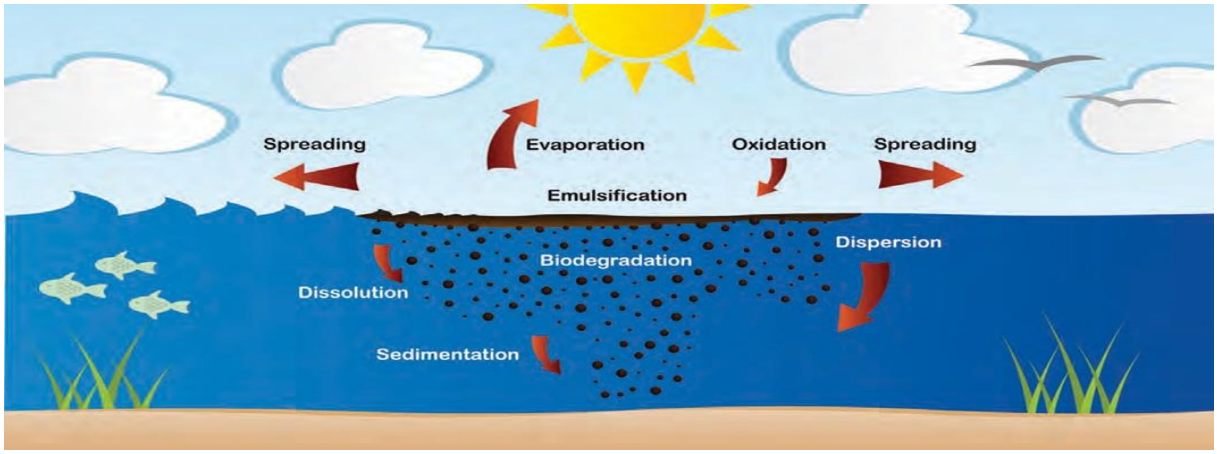
The Red Sea is very rich with coral reefs and holds great importance for ecosystems such as protecting the open beaches and shelter habitat for fishes. However, coral reefs are very sensitive to oil spills, particularly when using dispersants for cleaning which can cause choking for coral reefs (ITOPF, 2014).

2.5 Weathering processes Performing on the marine oil spill

According to IMO's 2010 Manual on oil pollution, the main factors affecting the weathering process include,

I- Physical characteristics especially, specific gravity, API, viscosity, pour point and boiling point;
II- Chemical components of the oil;
III- Weather and sea conditions and
IV-sea water Properties and concentration such as water density, current, temperature, available bacteria, nutrients and dissolved oxygen and sediments The Marine oil spills will be under the natural weathering processes, although the time factor plays a significant role in each process.

Figure 9 showing Weathering processes acting on oil at sea.



Source, (ITOPF, 2014)

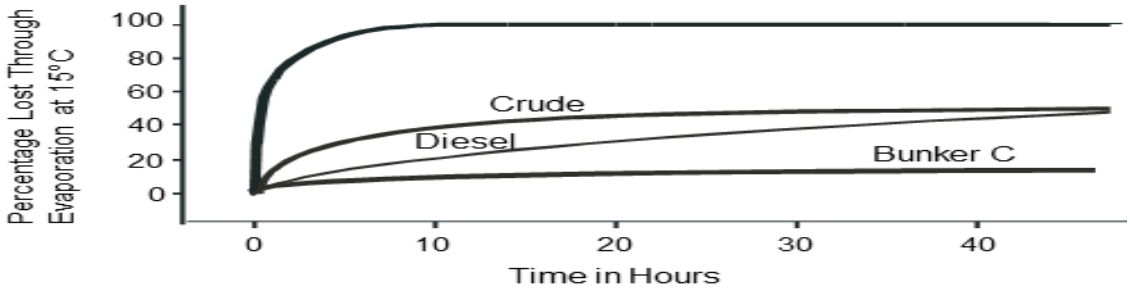
2.5.1- Spreading

The spreading-rate of oil spilled at sea depends on the volume of the oil and the degree of viscosity. It is seen that the low-viscosity of oil spreads faster than oils with high viscosity. In addition, the oil spreading-rate is affected by several factors such as waves, tidal currents, currents, wind speed and direction. The increasing power of combined factors result in an increased rate of oil spread (ITOPF, 2014)

2.5.2- Evaporation

The evaporation process is considered one of the most important processes in oil spills. The crude oil consists of hundreds of compounds that vary according to the source of oil where the volatile components will evaporate into the air. Light crude oil evaporates about 75% of its volume; medium crude oil evaporates about 40%, and heavy crude oil will only evaporates about 10% of its volume (ITOPF, 2014; Board et al., 2003). In addition, the evaporation process will increase the viscosity and density for residual oil, which will be affecting on oil spill cleaning process (ITOPF, 2014).

Figure 10 showing Evaporation rates of different types of oil at 15c



Source (Board et al., 2003)

2.5.3- Dispersion

The important factors affecting the dispersion rate are the properties of the oil and the state of the sea. It is also noticed that the rate of dispersion increases as the viscosity of oil decreases. The waves can break the oil slick into several droplets, while the bigger spots seek to combine to spread in a thin layer on the surface (ITOPF, 2014).

2.5.4- Emulsification

Emulsification is the process of blending oil with water and forming an emulsion with different properties and specifications. This process can increase the volume of pollutants depending on several factors (ITOPF, 2014).

The percentage of water in the stable emulsion reaches about 60% to 85%, and thus, it increases the volume from 3 to 5 times the original volume. In addition, it increases the density, which reaches about 1.03mg. This increase in viscosity changes the petroleum product into a heavy and semi-solid substance, and therefore a significant change is observed in the character of oil spilled into the sea (ITOPF, 2014; Board et al., 2003).

2.5.5- Dissolution

The solubility process depends on several factors and the most important of which are the properties of oil and the temperature of the seawater. We see that light

compounds especially aromatic hydrocarbons such as benzene and toluene dissolve slightly, while the heavy components of the crude oil are insoluble in the sea-water (ITOPF, 2014).

2.6. Conclusion

From the above information, it is clear from the background of the oil spills incidents and intense traffic of the ships in the Suez Gulf area suffices to conclude that risks from oil spill remains high in the Suez Gulf area.

Also, we perceive that main shipping routes extending along the Egyptian coast and the importance of the Suez Canal in the Red Sea for global trade can lead to an increasing the rate of oil pollution incidents. In addition, the Red Sea has many important ports, oil terminals, and pipelines for transporting oil such as the SUMED oil terminal for transporting oil from the Red Sea to the Mediterranean Sea. All of these factors increase the risks of an oil spill incident. Accordingly, based on those factors and the risk pertaining to oil spills, therefore, it is important to review and update the national oil spill contingency plan.

Chapter Three: International Regimes for Oil Pollution prevention from Ships

3.0. Introduction

The International Maritime Organization (IMO), as one of the specialised agencies of the United Nations, provides regulatory mechanisms for intergovernmental cooperation to prevent and control pollution of the marine environment from ships. Since its inception in 1958, the International Maritime Organization (IMO) has sought to adopt many international legal instruments to prevent and combat marine oil pollution. Marine pollution control is technically complicated, which has led to the development of international conventions (Carpenter & Kostianoy, 2018).

It is clear that international laws relating to combating oil pollution stem either from the 1982 United Nations Convention on the Law of the Sea (UNCLOS) or from regulations and standards adopted by the International Maritime Organization (IMO).

Moreover, the importance of the continuous development of rules and regulations to prevent oil spill incidents from oil tankers or oil installations is visible to reduce these incidents. However, there are still many countries that need to improve and implement their national regulations and legislations (Chen et al., 2019).

This chapter will critically analyse available literature with respect to the international regime for preventing oil spills and contingency planning. This chapter is an effort to review the legal instruments of the International Maritime Organization related to oil pollution. In addition, the chapter will illustrate one of the most important tools, i.e., the MARPOL Convention Annexe II and its importance in reducing marine oil pollution from the source of ships.

Finally, this chapter will review the liability and compensation agreements issued by the International Maritime Organization and the evolution and current Challenges of pollution liability and compensation.

3.1 International Instruments

3.1.1. A Brief historical development for protecting the marine environment regulations

In 1967, the oil spill incident of the ship Torrey Canyon occurred, which led to a spill of more than 119,000 tons of crude oil, as oil slicks formed 35 miles along the English Channel and the coast of the United Kingdom. Moreover, all of these harmful effects captured the world's attention and demonstrated the failure of the international community to prevent them comprehensively (Mohd Rusli, Mohd Hazmi Bin, 2012).

As a result of the motor tanker Torrey Canyon disaster, the international community realised the importance of protecting the marine environment. The Stockholm ‘’Conference on the Human Environment 1972 (Stockholm Conference)’’ was one of the first global efforts to protect the marine environment. The Stockholm Conference highlighted the responsibilities of the states for the protection of the marine environment in addition to the recommendations of the Conference for negotiating other tools for protecting the marine environment, such as the International Convention for the Prevention of Pollution from Ships 1978 (Mohd Rusli, Mohd Hazmi Bin, 2012).

3.1.2. UNCLOS 1982

The United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982 and entered into force in 1994. The Convention provided a framework for the further development of the law of the sea (UNCLOS, 1982).

The dissertation's purpose will focus on particular provisions related to preventing, reducing and combating marine environment pollution from the activities of various ships. The UNCLOS deals with the framework for the protection and conservation of the marine environment. The Provisions relating to the protection and preservation of the marine environment are customary laws and are binding to all countries (Doelle, 2006).

UNCLOS Convention Part XII Articles 192 and 194 have a general obligation to each state according to their abilities, to protect the marine environment and preserve it from intentional pollution from ships. With an emphasis on balance with the state's right to exploit the natural resources of its marine environment while taking appropriate measures to prevent and control pollution. Article 194 is a central provision that provides a guide for states about protecting the fragile marine ecosystem and mitigates climate change (Johansson & Donner, 2014).

According to chapter V, Article 211(LOSC), states shall adopt regulations for preventing, reducing, and controlling pollution by ships in the marine environment. Furthermore, illustrates the State's jurisdictions on the principle of marine pollution and ship examinations, namely, flag State, port State and the coastal State jurisdictions. Moreover, the Convention imposed on states an obligation to monitor and evaluate the marine environment.

The Coastal States have a right to take appropriate measures when a vessel in transit breaches applicable pollution rules or threatens to cause damage. In the exclusive economic zone, the enforcement mechanisms of the coastal State are relating to the violation of regulations. However, from the perspective of the UNCLOS Convention, there are no apparent differences between the potential for damage that justifies the coastal State taking inspection and the pollution that justifies proceedings. In the absence of such an infraction, the coastal State may request the necessary information to determine the occurrence of the violation (Johansson & Donner, 2014).

However, one of the reasons for the weak implementation of international marine conventions is that many ships are registered under the flags of convenience. that Some shipowners prefer because of the ease of the procedures and obligations required by that flag state (Johnson, 2004; Hakapää, 2005).

The UNCLOS has addressed some of the significant gaps in marine environmental law, as pollution is no more under the freedom of the seas, and the states are

obligated to prevent marine pollution. In addition, it achieves a balance of power between the flag states and the coastal states (Karim, 2016). On the other hand, coastal states have a right to protect their marine environment even though UNCLOS gives them restrictive and enforcement jurisdiction (Johnson, 2004; Hakapää, 2005).

Finally, UNCLOS changes from the perspective of focusing on the responsibility of the State for environmental damage to international cooperation to protect the marine environment (Karim, 2016).

3.1.3. International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention Convention)

In 1969, the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties was ratified by states and entered into force in 1975. The scope of the agreement is limited to oil pollution on the high seas. Under this convention, the state parties may take necessary preventive measures on the high seas to prevent or mitigate serious risk to their coasts from threats of oil pollution (IMO, 1969).

In 1969, the Brussels Conference recognised the need to extend the Convention to include substances other than oil. Therefore, the London Conference on Marine Pollution adopted the 1973 Protocol, which led to expanding the Intervention Convention1969. The 1973 Protocol entered into force in 1983 and was amended in 2002 to update the list of articles associated with it (IMO, 1969).

Regardless of the principle of "freedom on the high seas," the Intervention Convention caused international debate due to the departure from the traditional principle (Carpenter & Kostianoy, 2019). The convention gives the states the right to take precautionary measures against foreign ships on the high seas in an oil pollution threat (Karim, 2016).

However, we observe that the Intervention Convention establishes a framework for the cooperation of coastal states in oil spills and have contributed to addressing immediate response issues that arise from "grave and imminent danger".

3.1.4. International Convention for the Prevention of Pollution from Ships (MARPOL73/78)

The MARPOL Convention was adopted in November 1973. A consequence of several tanker accidents in 1977 lead to the ratification of the 1978 MARPOL Protocol, which entered into force in 1983. The MARPOL Convention has subsequently been updated and revised over the years (IMO, 1973).

We perceive MARPOL Convention as the main international mechanism that covers the prevention of pollution of the marine environment as a result of the ships operation or accidental causes (IMO, 1973).

For the purpose of that research, emphasis was on annexe one deals with the control of pollution from oil. MARPOL73/78 Annex I include procedures and regulations to be followed to prevent marine oil pollution. Annexe I, which is a technical annexe, contains many conditions and obligations that must be applied to ships, such as oily water discharge criteria (Karim, 2016; Mohd Rusli, Mohd Hazmi Bin, 2012; Mona et al., 2019).

Moreover, MARPOL73/78 Convention Annex I considered the red sea as a Special Area. That required higher regulations and obligations for better protection of the marine environment.

Over the past decades, we realize the importance of the MARPOL Convention in limiting and reducing marine oil pollution through many instruments and procedures applied to ships as follows:

I. Segregated ballast tanks and their importance for the ship stability in the ballast voyage without the need to load seawater into the cargo tanks (Hassler, 2016);

II. Crude oil washing system (COW) improves the quantity of discharging oil and reduces sludge in cargo tanks (Hassler, 2016);
III. Shipboard Oil Pollution Emergency Plan (SOPEP) shall be on board every ship and approved by the Administration (Carpenter & Kostianoy, 2018); and
IV. In 2003, amendment to the MARPOL annexe one required the single-hull tankers to be a phase-out. This requirement is one of the essential tools for reducing accidental oil spills in the event of a collision or grounding (Hassler, 2016).

Ultimately, the Egypt Environmental Affairs Agency (EEAA) report 2016 that stressed on the need to review the extent of commitment to the implementation of the MARPOL Convention regarding pollution from the various activities, indicated that it needs to prepare guidelines for the handling of the waste received from ships and the waste resulting from the port (EEAA, 2016).

3.1.5. International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC)

In 1990, the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) was adopted for preparedness, response and cooperation in cases of oil pollution. Under this Convention, countries are committed to taking the necessary measures locally or with other countries to deal with oil pollution incidents (IMO, 1990).

State parties under the (OPRC) convention are required to develop and implement a National Oil Pollution Contingency Plan (NOPCP). In addition, they must ensure that their ships and naval units operating within the jurisdiction of the States Parties carry an oil pollution emergency plan on board (IMO, 1990). Also, state parties to this convention must ensure that the seaports and handling facilities within their jurisdiction are equipped with the following conditions:

- The emergency plan and the facilities necessary to implement the plan in cases of oil pollution and the need for it when necessary (IMO, 1990);
- Ships must immediately report to the coastal authorities in case of oil pollution incidents (IMO, 1990); and

- In the event of an emergency related to oil pollution, the States Parties to this Convention are obligated to help each other (IMO, 1990).

Furthermore, the range of the OPRC Convention was expanded to include harmful substances other than oil in 2000 (IMO, 1990). The national emergency plan to combat oil pollution provides a legal basis for implementing the Responsibilities of Egypt towards the Agreement on Preparedness, Response and Cooperation for Accident Oil pollution.

3.2. Liability and Compensation

Many international conventions aim to establish a legal framework for damage caused by marine pollution. Where the UNCLOS Article 235 requires states to provide adequate compensation for damages resulting from marine pollution. Moreover, it calls countries to implement and develop international laws on marine pollution damage.

3.2.1. International Convention on Civil Liability for Oil Pollution Damage (CLC)

The Civil Liability Convention was adopted on 29 November 1969 and entered into force on 19 June 1975. It provides the strict liability of shipowners for oil pollution damage related to the cap of ship tonnage. Also, the Convention binding the ship owners to provide compulsory insurance to compensate for the damage. Only within the territory of the member states and their territorial waters (IMO, 1969). The purpose of adopting the Civil Liability Convention was to ensure adequate compensation for persons suffering from oil pollution caused by oil tankers accidents (IMO, 1969).

It was necessary to make additional amendments to the regime through Protocol 92. CLC 92 introduced several significant changes that were lacking in CLC 69. It was expanding the scope to the exclusive economic zone and applying this convention to unladen tankers.

Moreover, under Protocol 92, more strict provisions relating to the pollution resulting from the personal act or negligence of the shipowner with knowledge of the possibility of damage, the shipowner could not limit liability (IMO, 1969).

The 2000 amendments were adopted and entered into force in 2003. The amendments raised the limits of compensation compared to Protocol 92.

3.2.2. International Convention on Civil Liability for Bunker Oil Pollution Damage (The Bunker Convention)

The International Convention on Civil Liability for Bunker Oil Pollution Damage was adopted on 23 March 2001 and entered into force on 21 November 2008. The Convention provides a tool that covers pollution damages only that occur in the territorial sea and the exclusive economic zones of the Parties (IMO, 2001).
The adoption of the Convention on Civil Liability for Bunker Oil Pollution Damage aimed to ensure adequate prompt and effective compensation for persons suffering damages caused by oil spills when transported as fuel on ships. Similar to the Civil Liability for Oil Pollution Damage Convention,1969, the Bunker Convention requires the ship-owner to maintain mandatory insurance cover (IMO, 2001).

3.2.3. International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND)

The International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND) was adopted on 18 December 1971 and entered into force on 6 October 1978. Replaced In 1992, by the adoption of the protocol 1992, and entered into force on 30 May 1996 (IMO, 1992).

The purpose of the FUND convention is to compensate for pollution damage and assist shipowners in dealing with the additional financial pressure imposed on them by the 1969 Civil Liability Convention (IMO, 1992).

Under this convention, the Fund is obliged to pay compensation to countries and persons who suffer from pollution damage in case that no compensation obtain from

the owner of the ship that caused the pollution or if the compensation was not sufficient to cover the occurring damage (IMO, 1992).

3.2.4. Evolution and current Challenges of International Regime regarding ship-source pollution liability and compensation

Lessons learned from past incidents resulted in developing a comprehensive system of liability in pollution cases and strengthened over time to keep in line with the continuous development of shipping trends, which included all legal instruments deal with oil spills from tankers. Such as the 1992 International Convention on Civil Liability for Oil Pollution Damage (1992 CLC) and other conventions until the adoption of 2001(Bunker Convention) governing oil pollution damage occurring of spills from the ship's bunker. This convention closes a significant gap in a comprehensive international system of liability and compensation for ship source pollution (ITOPF, 2017).

Despite the efficiency of the international liability and compensation regime, we still face challenges in consistently applying and understanding of the conventions, which leads to different liability and compensation regimes in the case of transboundary pollution (ITOPF, 2017).

3.3. International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention was adopted on 7 July 1978 and entered into force on 28 April 1984. The STCW Convention of 1978 was the first Convention setting the standards required for seafarers training and certification at the international level. The Convention set the minimum requirements for training, certification and watchkeeping of seafarers that countries must meet or exceed (IMO, 1978).

On 25 June 2010, the Manila amendments to the STCW Convention required updating competence for seafarers working on all tankers. These amendments have

contributed to raising the efficiency and skills of seafarers on oil tankers additionally, new requirements for marine environmental awareness and encourage teamwork.

3.4. International Convention for the Safety of Life at Sea (SOLAS), 1974

The International Convention for the Safety of Life at Sea (SOLAS) was adopted on 1 November 1974 and entered into force on 25 May 1980. The SOLAS Convention is considered one of the most important agreements of the International Maritime Organization related to the safety of ships. The first version was adopted in 1914 in response to the *Titanic* disaster. Also, it was updated over the years until the 1974 version (IMO, 1974).

The primary purpose of the SOLAS Convention is to set the minimum standards for ship construction and equipment. The flag state must ensure that ships flying his flag are complying with international standards. Monitoring provisions allow the port state inspection to ensure the foreign vessels comply with the requirements of the Convention (IMO, 1974).

The SOLAS convention contains articles defining general obligations, followed by an appendix divided into 14 chapters (IMO, 1974). We realise that the second chapter of the SOLAS agreement is one of the most important chapters covering the construction of oil tankers.

In 2010, "Goal-Based Standards" were adopted, requiring designing and building oil tankers and bulk carriers to be safe and environmentally favourable in all operating conditions. Moreover, ships must have strength, safety and stability to reduce pollution risks to the marine environment due to structural failures leading to collapse or loss of integrity (IMO, 1974).

3.5. Conclusions

This chapter provides an overview of some conventions and agreements under the International Maritime Organization and the United Nations to prevent marine pollution from ships, liability and compensation.

There are many regulations and procedures to reduce oil spills, and it provides insight as to why some practices are successful. We note that some measures are better dealt with at regional levels and others through international conventions, making it clear why it is important to consider differences in capabilities and interests (Hassler, 2016).

We perceive those environmental risks of a global nature require global agreements. For example, oil tankers construction and operation need to be governed by international regulations. Despite suggesting that flag state responsibility should be more enforcement activated as an essential tool to prevent substandard vessels, the challenge of the emergence of open registries has made it very difficult.

Countries have different interests in combating marine pollution. Coastal countries with coastlines along significant sea traffic are more proactive towards stricter regulations because they are more vulnerable to oil spills. They also expect these countries to press the international regime for more powerful global regulations without barriers to collective action and significant domestic benefits.

Chapter Four: Regulatory Framework on Oil Spill Contingency Planning

4.0. Introduction.

There are many challenges that the marine environment faces due to the presence of human activities (OECD, 2020). Those activities negatively impact the environment and, in turn, on sustainable development, leading to economic losses and environmental degradation. Oil pollution caused by ships and offshore oil installation is one activity that places persistent pressures on the marine ecosystem (Ministry environment, 2017).

As consequences emanating from environmental disasters; international, regional and local communities need to conserve the environment to the extent possible (EEAA, 2016). Scientific and technological development has made significant improvements in developing methods for preserving the environment. Notwithstanding, these scientific and technical means and methods do not seem to provide the necessary protection for the environment or its resources unless there are firm and binding provisions that ensure safety and oblige individuals and groups to avoid actions deemed harmful to the environment (Hassler, 2016).

This chapter proceeds to review the framework of the Egypt oil spill contingency plan and then conclude with oil pollution and a response action plan for the English Channel and the North Sea region as the best practice for planning comparative analysis with Egypt. The European Maritime Safety Agency (EMSA) performs an essential role in monitoring and preserving European waters pollution and many areas of safety.

4.1. National legislation in Egypt related to OSCP.

Over the past decades, Egypt has adopted many laws and regulations related to environmental protection. In 1994, Environmental Law No. 4 was issued and considered as the principal legislation in Egypt that regulates shipping and oil

exploration and includes many control-mechanisms for reducing the risks of oil spills and other pollutants from ships (ITOPF, 2018; Letch, 2014).

Environmental Law No. 4 sets several provisions to control oil pollution caused by marine and land sources in coastal and marine areas. Law No. 4 contains two chapters. The first chapter covers Pollution from marine sources such as oil tankers, merchant ships and oil rigs, while the second chapter covers regulations for oil pollution caused by land sources (REMB, 2008).

According to Environmental Law No. 4, the Environmental Affairs Agency is responsible for the general environmental policy and plans for protecting the environment and follow-up actions through coordination with the competent authorities. Moreover, the Environmental Affairs Agency is responsible for strengthening environmental relations between Egypt and other countries (Ministry of Environment, 2009).

4.2. The National Oil Spill Response Plan (NOSCP).

In 1986, the Egyptian Environmental Affairs Agency (EEAA) issued the National Oil Spill Contingency Plan (NOSCP). Also, over the past years, there have been assessment plans to comply with OPRC 90 requirements (ITOPF, 2018).

The NOSCP functions under the Egypt National Environmental Disaster Management Plan. According to Article 25 of Law No. 4, The EEAA shall prepare the National Oil Spill Contingency Plan and keep it up to date. The National Oil Spill Contingency Plan (NOSCP) aims to lay the national foundations for preparing and dealing with incidents of oil spills into the marine environment of Egypt under the umbrella of the Environmental Affairs Agency (NOSCP, 2009).

The national oil spill contingency plan (NOSCP) provides the framework for implementing Egypt's responsibilities under the Barcelona and Jeddah agreements to conserve the Mediterranean and the Red Sea environment (NOSCP, 2009).

Oil companies under national law must have contingency plans and equipment capable of responding effectively to spills of up to 300 tons. Also, the Suez Canal Authority has established a contingency plan to respond to spills within and near the Suez Canal (ITOPF, 2018).

The consequences after grounding the vessel Ever Given in the Suez Canal led to the National Committee for Combat Marine Oil Pollution meeting to determine the preparedness of the oil spill contingency plan. Also, the necessity of the availability of technologies through combat oil spills centres and coordination between all the concerned authorities (Egypt daily news, 2021; WriteCaliber, 2021).

4.3. Scope of the Oil Spill Contingency Plan.

The Egyptian coast extends to more than 3000 km along the Red Sea and the Mediterranean Sea with an Exclusive Economic Zone (EEZ) up to 65 nautical miles in the Red Sea and 82 nautical miles in the Mediterranean Sea (Letch, 2014). The NOSCP covers the marine waters under the jurisdiction of Egypt, including ports, inland waters, and exclusive economic waters (EEZ). On land, it includes the foreshore and any adjacent land affected by the oil spill (NOSCP, 2009).

4.4. Components of Egypt Oil Spill Contingency Plan.

Egypt's NOSCP to combat oil pollution is divided into four parts. Part A deals with the preparation of national oil pollution contingency plans, in addition to the function and duties of EEAA and all supporting parties. Part B deals with the responsibility for regulating the control measures on the scene of an incident. Part C contains vital information and data needed by those in charge of combating pollution operations, Such as connection points, equipment available at each site, and a summary of wind and ocean currents. The annexes contain an overview of the international conventions and local laws that govern civil liability and compensation (NOSCP, 2009).

4.5. The tiered approach to oil spill response.

The Environmental Affairs Agency cooperates with the petroleum sector to ensure that all the marine units operating within the Egyptian sovereignty prepare and update their plans for oil pollution related contingencies. In cases of oil pollution, the operator must notify the Environmental Affairs Agency immediately of the circumstances of the accident to assess the required processes. Egypt's response to oil pollution under the NOSCP is a three-tiered approach, as briefly described in the following:

4.5.1. Tier One

In the event of spills as small as 100 cubic metres, local port authorities and oil companies will carry out clean-up operations under their own site-specific oil pollution emergency plan. At the same time, coastal governorates will provide a coastal response (ITOPF, 2018).

4.5.2. Tier Two

Tier Two oil spill incidents require the regional capacity in the area, including equipment and tools, to respond to more significant spills above Tier One that need more effort and time (IPIECA, 2019). The tier two oil spill is a medium-sized spilt greater than 100 cubic meters, however, in the case of oil pollution accidents with a volume of fewer than 1000 tons, which occur in one of the oil sites, the Egyptian Petroleum Corporation will coordinate in the control measures, but in the event of the need for additional capabilities and assistance from outside the oil companies' sector, the Egyptian General Petroleum Corporation must request, due to a large amount of oil spilled, the Egyptian General Petroleum Corporation must request the Environmental Affairs Agency EEAA to take over the command and coordinate the required oil spill combat oil operations (NOSCP, 2009).

4.5.3. Tier Three

Tier Three oil spill requires national capacity and sometimes needed international assistance to respond to major spills that need additional capabilities and expertise

due to the amount of pollution, complexity or potential impacts (IPIECA, 2019). The Tier Three oil spill is a major oil spill greater than 1000 cubic meters, where in the event of an oil spill higher than 1000 tons. It requires all available national resources, which may include requesting assistance through regional cooperation agreements with border nations or international support from the Petroleum Industry. EEAA will take control of any of the three-tiered incidents within the jurisdiction of Egypt, and EAA will invite the Emergency Response Committee for related assistance and advice (NOSCP, 2009).

4.6. Institutional Arrangements for Egypt NOSCP.

Many authorities and institutions are involved in managing the national contingency plan to combat marine oil pollution. One of the most important pressures is coordination between the concerned authorities at all response levels (EEAA, 2016). In addition, these institutions still suffer from a harsh bureaucracy that affects the information flow and the integration between them (Leach, 2014). Institutional Arrangements related to NOSCP, namely:

4.6.1. Egyptian Environmental Affairs Agency EEAA.

The Environmental Affairs Agency is responsible for preparing Egypt to deal with and respond to oil pollution incidents in a strategic manner. In addition, it is the governmental body responsible for coordinating the policies of the various authorities towards preparing for pollution incidents and control measures, including international procedures (NOSCP, 2009).

4.6.2. National Contingency Planning Committee.

To assist the Environmental Affairs Agency in preparing and updating the national emergency plan to combat oil spill pollution (NOSCP, 2009).

4.6.3. Emergency Response Committee.

In a major oil pollution incident Tiers Two or Three, the Environmental Affairs Agency shall designate the operations commander. According to the procedures, the Emergency Response Committee can call to provide assistance and advice. Membership of the Emergency Response Committee will be on an ad hoc basis, depending on the nature of the incident and the expertise required (NOSCP, 2009).

4.7. Obligations of the Support Institutions.

4.7.1. Maritime Transport Sector of the Ministry of Transport.

Under the national contingency plan, the responsibility of the maritime transport sector is to supervise and inspect the work of port authorities in implementing the national contingency plan including monitoring the illegal discharge of oil.

4.7.2. Egyptian General Petroleum Corporation

The Egyptian General Petroleum Corporation is the Egyptian authority responsible for monitoring all oil companies operating in Egypt. According to Environmental Law No. 4 Annex 38, the Egyptian General Petroleum Corporation is the administrative organization responsible for monitoring pollution resulting from the exploration and exploitation of petroleum resources (EEAA, 2009).

4.7.3. Suez Canal Authority.

Under the NOSCP, the Suez Canal Authority (SCA) has the following rights and obligations:

- The Suez Canal Authority is responsible for preparing and implementing a local contingency plan to combat oil pollution in line with the requirements of the national contingency plan; and
- The Suez Canal Authority is responsible for assigning the operations commander to combat marine oil pollution incidents at the first and second-tier. Also, to coordinates with the Environmental Affairs Agency to manage pollution incidents at the third tier from ship accidents in the Canal.

4.7.4. Ministry of Defence (Navy)

The naval force has the main duty to protect the territorial waters and the exclusive economic zone. The navy satisfies these obligations by carrying out regular patrols to inspect regional and international waters, report any pollution incident, and take floating oil samples for analysis.

4.7.5. Arab Academy for Science, Technology and Maritime Transport (AAST)

AAST holds training courses on ways and methods of managing marine pollution control operations. The training is prepared annually in agreement with the Environmental Affairs Agency based on the needs of the national contingency plan to combat oil pollution.

4.8. NATIONAL COMBAT STRATEGY

The NOSCP indicated that the national strategy for combating oil spills prohibited ships and oil installations from draining oil in the territorial sea or the exclusive economic zone. In addition, the process will base on the following points:

- Stop or decrease the oil leakage from the origin;
- If the oil spill does not threaten the marine resources of the coastal environment, monitor the oil spill;
- Attempt to combat and remove oil from the sea by mechanical means;
- Dispersant use is limited and under the National Dispersant Policy use;
- Protection of sensitive areas according to the priorities of NOSCP; and
- Shoreline clean-up.

4.8.1. Actions for control the oil from the source

The priority of the ship's captain operating the offshore platform or oil terminals is to terminate the oil leak to the extent possible. In addition, the operator must identify the source of the leak, estimate the amount leaked into the marine environment and ensure the most appropriate equipment available is ready for use (NOSCP, 2009).

4.8.2. Monitoring the oil slick and Coastal Resources

The purpose of this procedure is to leave the oil stain dispersed by natural factors. However, it is a measure taken in minor oil spills and without sensitive resources threatened by pollution. Monitoring oil slicks and coordinating the necessary process is the responsibility of the Environmental Affairs Agency (NOSCP, 2009).

4.8.3. Mechanical recovery of oil at sea

Recovery of oil spills from the sea by mechanical methods are the preferred method as they are less harmful to the environment. However, the possibility of recovering oil spills by mechanical means depends on several factors, including the available equipment, characteristics of the spilt oil, weather and the oil spill location. Previous combat operations have proven the efficiency of this method if the thickness of the oil layer increases by booms.

4.8.4. Application of dispersants

Dispersion occurs naturally but at slow rates that are unreliable in the case of large oil spills. The dispersants work to break up the oil slick into tiny oil droplets spread in the water column, in addition to preventing the oil slicks from re-gathering. The use of oil dispersants is one of the processes that may damage marine organisms because the dispersants have harmful impacts on the marine ecosystem if not used properly. However, the use of dispersants will be applied in a controlled manner by the EEAA under the NOSCP.

4.8.5. Protection of sensitive areas

Regarding Updating the NOSCP, the EEAA conducted a comprehensive survey for all Egyptian coasts in cooperation with the National Institute for Marine Sciences, Fisheries and the Central Administration of Protected Areas; it aims to identify areas with environmentally sensitive or areas of economic importance. Moreover, that survey divided Egyptian shores into three degrees, high, medium and low, according to their sensitivity to oil pollution.

4.8.6. Shoreline clean-up

The responsibility for cleaning Pollution that reaches the shores will be under the EEAA, in cooperation with the region's governorate where the pollution incident occurred. The EEAA will determine the best method to clean the coasts in proportion to the characteristics of the threatened resources that may be affected by the oil clean-up operation (NOSCP, 2009).

4.9. Review a Specific Case of North Sea Region Regarding oil spill Action Plan

The European Union has a coastline of more than 10,000 km, with more than 12,000 commercial ports and many ships sailing in European waters (EMSA, 2014).

There are numerous similarities between the Red Sea (Gulf of Suez) and the North Sea region, particularly in terms of the density of ship traffic and shipping activities, in addition to the threats resulting from oil spills caused by ships or fixed oil installations. There are more than 1,000 offshore oil and gas installations in Europe, most of which concentrate in the North Sea (EMSA, 2013). Moreover, the importance of tourism for the Red Sea and the North Sea regions and the economic benefits are significant in those areas.

At this juncture, this chapter delves into North Sea Regional plans in relation to oil spill response and preparedness. The objective is to conduct a comparative analysis for extracting best practices for consideration from an Egyptian context. To this end, this section reviews the specific case response action plan for the English Channel and the North Sea region.

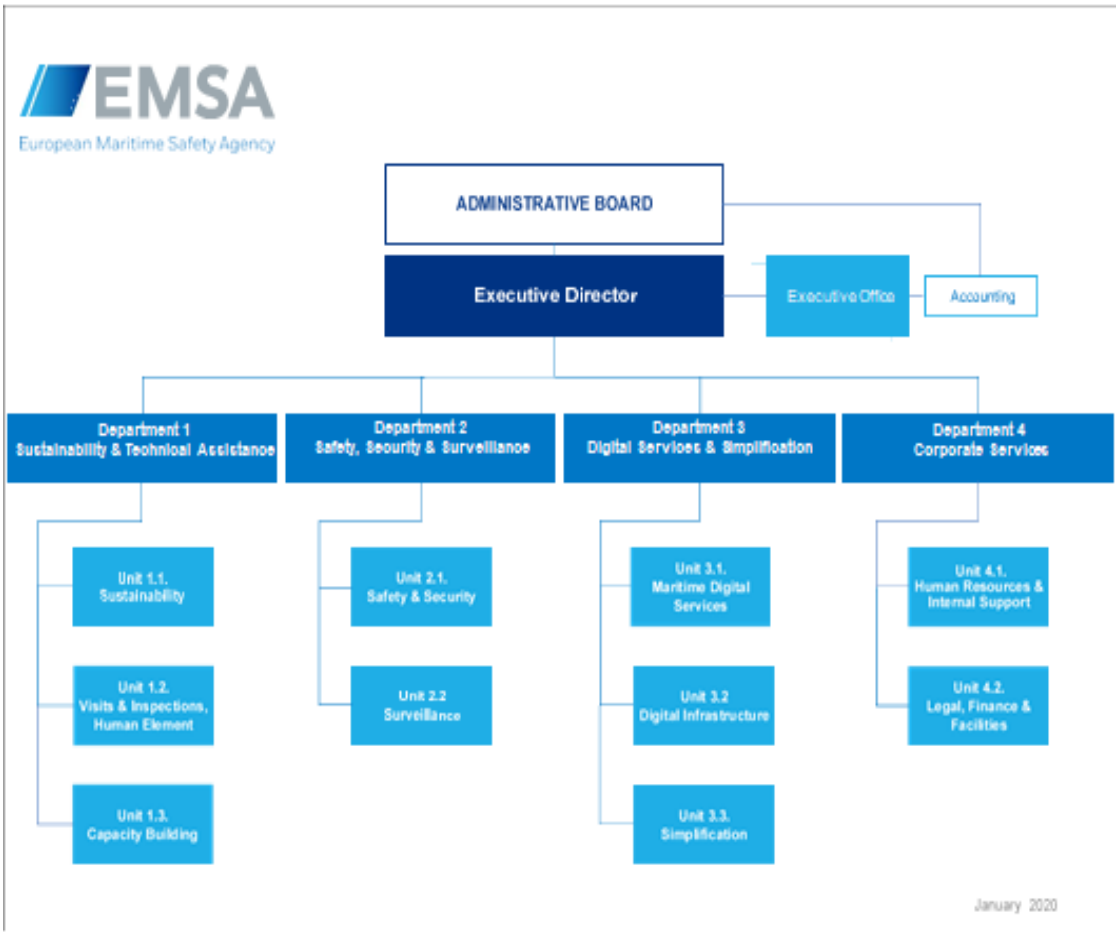
4.10. European Maritime Safety Agency (EMSA): Action Plan for Oil Pollution Preparedness and Response.

The European Maritime Safety Agency (EMSA) has a legal obligation to respond to pollution from ships and fixed oil installation. In 2002 EMSA was established under the European Parliament and the European Council. EMSA aims to ensure a high standard, an effective maritime safety and security level, and prevent pollution from ships and oil, gas installations, and oil spill response (EMSA, 2021).

4.10.0. European Maritime Safety Agency (EMSA) Structure

EMSA has an integrated regulatory framework that facilitates cooperation between the EU Member States and the European Commission in several areas. It consists of several committees, the administrative board on top of the structure and ten units under four departments (EMSA, 2013).

Figure 11 shows the organizational structure of EMSA



Source (EMSA, 2020).

EMSA has developed a structured framework that serves as a foundation when developing pollution response measures. The Administrative Board of EMSA has adopted an action plan that entered into force in 2004. Moreover, the action Plan for

Response to Marine Pollution from Oil and Gas Installations was adopted and entered into force in 2013 (EMSA, 2013).

4.10.1 EUROPEAN MECHANISMS

European mechanisms are represented in the establishment of community development to support and strengthen member states and contribute to improving the capabilities of member states to respond in the case of oil spills in addition to providing a community mechanism that covers both civil protection and marine pollution. There are two main tools in EU legislation related to preparedness and response to marine Pollution: these two instruments legal structures complement each other

- Resolution No. 2850/2000/EC of the European Parliament laying out the Community Framework for Cooperation In the accidental or intentional field in marine pollution cases; and
- Council Resolution 2001/792/EC placed a mechanism to facilitate cooperation and assistance in civil protection.

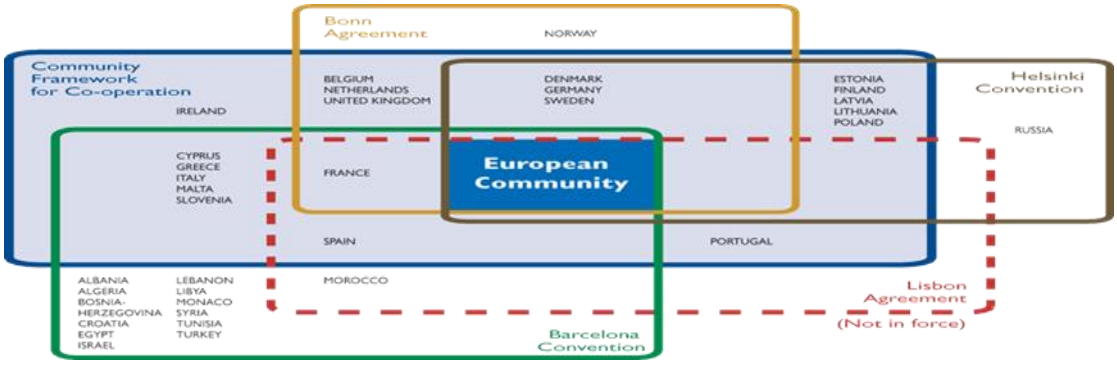
4.10.2. The Cooperation in the Marine Pollution

Under Resolution No. 2850, the European Parliament and the Council established a framework for cooperation in accidental and intentional Marine Pollution.

The role of the framework is to defines the procedures to be implemented for the provide the following:

- Support member states at all levels to protect the marine environment;
- Participate in improving the capabilities of member states to respond in cases of oil spills;
- Facilitate and promote practical assistance among the Member States concerning oil pollution preparedness; and
- Strengthen cooperation among the Member States regarding compensation (EMSAA, 2004).

The following figure 12 shows the regional agreements covering European waters and the countries involved with them



Source EMSA, 2004

Where we see Bonn Agreement covering the North Sea and the importance as a tool in preserving the marine environment, then we illustrate EMSA activities to combat marine pollution from ships and oil installations (EMSA, 2005)

4.11. EMSA ACTIVITIES

EMSA activities initially focused on combating marine oil pollution from ships Until March 2013, extending its mandate to oil and gas installations within the current framework (EMSA, 2014). EMSA should provide coastal states with additional means to support the oil pollution response in the event of oil pollution from ships and offshore installations (EMSA, 2004; EMSA, 2014).

Three distinct points:

4.11.1. Operational assistance

EMSA provides additional and effective means for coastal states should they request support in response to pollution (EMSA, 2004). EMSA has established a network of reserve vessels for oil spill response in and around the European coast. This network could be used by ships for sending request for assistance within the European range. EMSA response services are available to any country requesting assistance to combat oil pollution in European waters (EMSA, 2013).

4.11.2. Co-operation and Coordination

In 2007, The Consultative Technical Group Marine Pollution Preparedness and Response (CTGMPPR) was established by EMSA, in which cooperation is carried

out within the framework of the Technical Advisory Group for Preparedness and Response to Marine Pollution. The CTG MPPR is to enable the exchange of information and best practices among national experts. The CTG MPPR provides a platform for the Member States to improve preparedness and response to accidental and intentional Pollution from ship sources (IMSA, 2014).

4.11.3. Information

The Agency will work to collect and share information in the field of marine pollution response with the support of the Member States of the European Union and the European Commission. Furthermore, the Agency will facilitate exchanging the best available technical techniques to respond to Pollution from marine accidents.

4.12. Conclusion

This chapter defines a set of legislative and local measures to meet the international obligations to combat marine pollution in both the Gulf of Suez and the North Sea Regions. It also defines the bodies and their responsibilities and the various stakeholders related to combating marine pollution.

The chapter explained the administrative and organizational structure of the various national bodies and institutions of Egypt, especially the NOSCP, in charge of pollution and marine environmental protection matters. We notice that those departments apparently vary in terms of mandate, capabilities and expertise in the field of environmental management.

What is also noted in this chapter is that the Gulf of Suez, similar to the North Sea, is a critical transboundary area in so far as it connects shipping chains between economically interconnected countries and continents. Hence, both the above areas have garnered international attention broadly owing to the fact that those regions witness generic activities and developments, such as oil exploration and tanker activities.

Moving forward, this chapter outlined the procedures and action plans to be taken into consideration by the concerned agencies involved with different Tiers of oil

pollution according to the oil spill contingency plan, the set of available equipment, and how to respond to oil pollution. This investigation has led to the finding that in terms of preparedness, the NOSCP (of Egypt) Egypt shall ensure that oil companies have contingency plan in place for dealing with Tier One oil spills. In cases of Second and oil spills that fall under the category of Second and Third Tiered oil spills, Egypt's NOSCP shall be operationalized. Fortunately, oil spills under Tier Three have not yet occurred in Egypt. However, the author stresses that there is a significant need for capacity building in relation to the above and the need for further studies to determine the extent of oil spill preparedness in the country to identify gaps to ensure the compatibility with international best practices given that the last updates were carried out by Egypt's NOSCP in 2009.

With a view to clarifying the mechanisms and levels of coordination between and among these various parties together with the Environmental Affairs Agency --- the subsequent chapter will provide a comparative analysis with the North Sea region that serves as a model in the opinion of the author.

Chapter Five: A comparative Analysis

5.0. Introduction

This chapter is comprised of a comparative analysis between the Gulf of Suez and the North Sea regional oil pollution regimes. This study is conducted with a view to identifying best practices that could be utilized to fill out some of the existing gaps that persist in the Gulf of Suez in relation to oil pollution response and preparedness. The rationale behind the comparative study primarily stems from the similarities between the Gulf of Suez and the North Sea in relation to shipping activities, oil exploration and the causes of oil pollution in both regions.

Marine oil pollution could have many environmental, social and health impacts on the Gulf of Suez and the North Sea (Spellman 2017; IPIECA, 2020). In addition to the economic consequences represented in the booming tourism activities in the North sea region (Carpenter, 2016), especially in the Gulf of Suez as a part of the red sea, tourism is considered as one of the primary national income sources in Egypt (Assilzadeh & Gao, 2010).

The North sea region is geographically surrounded by the United Kingdom, France, Norway, Denmark, Germany, the Netherlands, and Belgium (Bonn Agreement, 2021; Carpenter, 2016). On the other hand, the Gulf of Suez is a part of the Red Sea with coastal States including Egypt, Sudan, Eritrea, Yemen, Saudi Arabia, Jordan, and Israel (Tesfamichael & Pauly, 2016).

We recognise that IMO and the United Nations have played a significant role in preventing and reducing marine pollution over the past decades. To achieve this, IMO has made significant efforts in the past to protect the marine environment from pollution caused from ship sources. These efforts include the adoption of many important conventions and regulatory guidelines related to marine pollution (Karim, 2016). To this end, this chapter will first observe IMO conventions related to the prevention of marine oil pollution and implementation on the Gulf of Suez and the

North Sea regions, then proceed with conducting a comparative analysis of the preparedness and response in both regions to extract noteworthy developments that could be considered for improving the existing Gulf of Suez oil pollution regime.

5.1. International Efforts for Marine Oil Pollution Preventions

As noted in Chapter three, many international conventions were adopted in the past. Within the scope of this chapter, the author seeks to analyze and examine the impacts of implementing these conventions to curb oil pollution in the Gulf of Suez and the North Sea.

Studying the history of marine pollution prevention, we recognize that international conventions and protocols resulted from major oil pollution incidents, especially in the North Sea region, such as the Tory Canyon accident near the English Channel (Carpenter, 2016). Over the years, the development of tools, regulations and technologicy led to the curb of oil spills. However, the risk of a major oil spill still exists all over the world (Chen et al., 2019). In addition, oil spills due to oil exploration and shipping activities are a source of huge damage to marine ecosystems and massive economic losses that impacts the local economy and coastal community (Chen et al., 2019).

The need for sustainably exploiting the sources of marine resources and shipping activities leads to an emphasis on the Gulf of Suez and the North Sea to set out a plan for more efforts toward ocean sustainability.

Moreover, oil spills represent a major threat to the environment worldwide, even in the presence of strong legislation. Therefore, reducing the risks and negative impacts of oil spill is one of the priorities of Goal 14 of the United Nations 2030 Agenda on Sustainable Development in relation to the conservation and sustainable use of the oceans and seas (Dalaklis et al., 2019).

5.1.1. UNCLOS Efforts “charter of the ocean” for Marine Pollution Prevention

We realise that the definition of pollution of the marine environment in United Nations Convention on the Law of the Sea (UNCLOS) takes a precautionary approach that has a comprehensive impact on the international legal framework to prevent pollution and damage to the marine environment (Karim, 2016).

Through analysing the framework of UNCLOS we notice that it is founded on four tools: general obligations, Flag State jurisdiction, Coastal State jurisdiction, which we have already mentioned, and the fourth tool, which is the multilateral agreements (Dalaklis et al., 2019).

Multilateral agreements is one of the most important tools of UNCLOS under Annex 211(3) that explains the importance of international cooperation between two or more countries for cooperative arrangements to prevent and control pollution for protecting the marine environment (UNCLOS, 1982)

Countries surrounding the North Sea and Gulf of Suez regions are parties to UNCLOS. When comparing both regions, we recognize the strong efforts and effectiveness of international cooperation in the North Sea region in combating and controlling marine oil pollution, which is higher than the Gulf of Suez region.

5.1.2. IMO Efforts for Marine Pollution Prevention

IMO has made many efforts since established by adopting many international legal instruments related to marine pollution, prevention, response, and compensation, covered in Chapter Three. In retrospect, IMO has taken two important directions to control marine pollution, the first being ships-source pollution, and the second direction being national preparedness and response to oil pollution.

One of the essential tool of IMO is MARPOL73/78, which is playing a significant role in reducing marine pollution from ships in the North Sea and the Gulf of Suez. Under the MARPOL convention, both regions are special areas due to their sensitive nature and high ship traffic. However, more limitation obligations are placed for them regarding the disposal of oily water in the Gulf of Suez and the North Sea

(MARPOL, 1978). There is still a question about IMO's push for a "zero-discharge policy" and whether it will be sufficient to control oil pollution in the Gulf of Suez and the North Sea (Carpenter & Kostianoy, 2019).

Under MARPOL requirements, IMO has developed the "Guideline for the Development of Oil Pollution Contingency Plans on Board Ships" (SOPEP Guideline) to assist shipowners in preparing contingency plans in case of oil pollution from ships (Dalaklis et al., 2019).

We also notice that IMO has used headings in international conventions related to oil pollution, indicating that oil pollution certainly has harmful impacts on the environment (Hildebrand et al, 2019). That leaves no uncertainty about taking adequate measures and tools to protect the marine environment from these harmful effects. IMO acts as a platform through which countries in a particular area can cooperate when the marine pollution of this area is intense. Also, they are obliged by the regulations and rules implemented by IMO (Carpenter & Kostianoy, 2018).

On the other hand, IMO provided several guidelines and recommendations to support all stakeholders. Such as in 2016, IMO published the guideline bearing the title "Use of Sorbents for Oil Spill Response" to regulate the usage of sorbents in response to oil pollution incidents. In addition, IMO has issued guidelines on International Offers of Assistance and is working to provide a framework through regional and multilateral agreements to establish comprehensive international assistance offers for oil pollution incidents (Dalaklis et al., 2019).

5.2. Critical Analysis of International Efforts with Concerned Regions

These rules and standards set by international organizations must be implemented effectively by countries to balance commercial activities and, at the same time, protect the marine environment (UNEP, 2012).

The North Sea and the Gulf of Suez regional action plans and activities related to oil pollution prevention were implemented in the context of IMO conventions as well as

the recognition that sustainable methods of preservation is required. These standards and actions plans for oil pollution have been developed over the past decades in response to major oil disasters, especially in the North Sea region.

Moreover, one of the essential tools referred to by UNCLOS and the IMO Memoranda of Understanding (MoU) is the need for regional cooperation among countries of regions that are highly affected by pollution due to exploration activities and intensive shipping to control pollution in these areas. The regional agreement tool is applied on the North Sea and Gulf of Suez regions marked by varying degree of variable effectiveness.

5.3. Regional Efforts for Marine Pollution Prevention on Gulf of Suez

The Gulf of Suez is the northern part of the Red Sea, characterized by the unique biodiversity, strategic and economic influence on the globe because of the Suez Canal. The increase in various activities led to high pressures on the marine environment, out of which oil pollution is one of the greatest. However, oil pollution is transboundary in nature and requires regional cooperation to determine their causes and effects and coordinated management measures (PERSGA, 2021).

In 1982, the "Regional Agreement to Preserve the Environment of the Red Sea and the Gulf of Aden" (PERSGA) was established and title the Jeddah Convention. The aim was to cooperate with the region's countries and coordinate efforts to preserve the marine environment and safeguard it from pollution. In 1985, the Jeddah Convention entered into force whereby the participating parties included Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan and Yemen (PERSGA, 2021).

The Jeddah Convention worked to reduce oil pollution in the Red Sea by adopting another important tool aptly known as “The Action Plan for the Preservation of the Marine Environment and Coastal Areas of the Red Sea and Gulf of Aden.” In addition, PERSGA includes different programs, such as the protection of biodiversity and the climate change program in cooperation with the United Nations Environment, the World Bank and IMO (UNEP, 2021).

However, in the other part of the red sea, in 1995, Egypt, Israel and Jordan adopted a regional approach to protect the marine environment of the Gulf of Aqaba. This coordinated effort materialized into "Upper Gulf of Aqaba sub-regional contingency plan with Israel and Jordan."

Figure 13 Red Sea, Source (Tesfamichael & Pauly, 2016)

5.4. Critical Analysis and Regional Efforts

We are aware that regional agreements in the Red Sea have played a major role in combating the effects of marine pollution and different shipping activities. However, it did not achieve the required level of effectiveness and compliance. As marine

pollution issues resulting from various activities still impact the Gulf of Suez, which led to the Gulf of Suez lagging behind regions such as the North Sea in terms of preventing marine pollution.

The author observes that the essence of multilateral agreements lie in improving port state control and being a unique mechanism to support member states in achieving compliance with environmental obligations, safety and reducing pollution from ships (Dalaklis et al., 2019)

The increasing pressures on the Red Sea, including the biodiversity and coral reefs led the regional countries to implement and develop regional conventions and tools to reduce the impacts of marine oil pollution from different sources such as overexploitation of resources, high levels of pollution and weak control, these serious challenges will require the regional countries bordering the Red Sea for effective regional cooperation; however, political tensions between governments in the region present a significant challenge to collaboration and hinders the usage of a standardized monitoring method (Kleinhaus et al., 2020).

Moreover, the political conflicts on the Yemen coast increases the risks of oil pollution. Such occurred from the floating oil storage tanker off the coast of Yemen, which contained approximately one million barrels of oil, and began to leak due to these conflicts (Kleinhaus et al., 2020).

According to the Egyptian Ministry of Environment's report in 2016, the figure shows that the Red Sea still constitutes the highest percentage of environmental pollution incidents (EEAA, 2016).

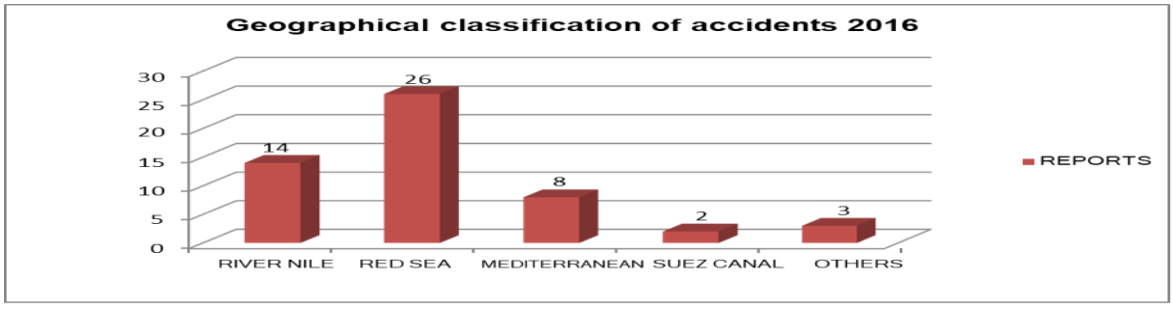


Figure 14 percentage of environmental pollution incidents Source (EEAA, 2016)

Supporting the aforementioned, the following section will analyse the regional agreements and instruments established to protect the North Sea from oil pollution.

5.5. North Sea Regional Efforts towards Marine Pollution Prevention

Over the past decades, the North Sea region has implemented and developed many tools, agreements, initiatives and action plans to protect the region from oil pollution caused by various activities such as mining, oil exploration and shipping activities (EMSA, 2005).

Figure 15 North Sea Region Source: (Baschek et al. 2015)

Over the past decades, many developments have occurred in the region. The most important was the Bonn Agreement and the OSPAR Convention that served as effective tools for cooperation in pollution incidents in the North Sea. In addition, the European Union, EMSA and the North Sea countries have taken a participatory approach in terms of resource sharing. In 1983 aerial surveillance was introduced to detect oil spills (BONN, 2019)

The Dublin Conference in 2010 was the beginning of the development of a long-term action plan for the Bonn Agreement in line with the new developments and challenges in maritime transport. All parties decided to establish a BE-AWARE

project. It aimed to assess the risks and impacts of marine pollution in the North Sea region and issue recommendations to consider (O.K. Bjerkemo et.al, 2016)

However, new challenges emerged, such as offshore wind farms and developments in ship design and CleanSeaNet Detections. All this requires innovative and effective ways to keep pace with events. Undoubtedly, the key to the success of the Bonn Agreement in sustainable marine development is cooperation and the exchange of knowledge and resources (BONN, 2019)

The Bonn Agreement has changed the policy containing tools and provisions in the past. It was the policy of action and reaction, but today the perspective has changed to a proactive approach in maintaining sustainable development and staying one step ahead.

5.6. Comparative Analysis of the Efforts between the Gulf of Suez and North Sea in Marine Pollution Prevention

After illuminating many similarities between the Gulf of Suez and the North Sea and the risks of oil pollution due to several activities in both of them, the researcher seeks to conduct a comparative analysis of the regional efforts in the Gulf of Suez and the North Sea.

The dense ship traffic in both the Gulf of Suez and the North Sea due to their importance in global trade has led to the development and improvement of pollution prevention efforts over the years. Moreover, international organizations have made many efforts to reduce pollution and its impact on the marine environment by issuing regulations and conventions binding on all parties over the years.

When comparing the Gulf of Suez and the North Sea on reducing oil pollution, we notice similarities in the objectives of respective action plan of both regions. However, there is a significant difference in capacity building and implementation approaches. One of the most crucial differences between the North Sea and the Gulf of Suez is the level of cooperation among the region's countries and data

flowing, information and experiences among them. This comparison also showcases that the Gulf of Suez and the Red Sea region require cooperation and regional approaches to preserve the marine environment because pollution is cross-border in nature (Kleinhaus et al., 2020). Therefore, the North Sea countries' cooperation is better represented in the Bonn Agreement.

In the past decades, the North Sea countries realized the importance of cooperation at the regional and international levels to reduce marine pollution. It has made a lot of efforts through frameworks such as international and regional conventions and recommendations (Carpenter, 2018). Moreover, many developments are done in the Bonn Agreement during this period to protect the marine environment based on common interests. All these circumstances led to a significant decrease in oil pollution incidents. However, the North Sea is still an area of dense shipping passages and large oil production. Therefore, it becomes clear that it is important for all parties to the Bonn Agreement to cooperate through unifying existing efforts. After years of cooperation in the North Sea region, the action plan develops to cover strategic aims in four areas, which are pollution prevention through collective enforcement, promoting compliance with the MARPOL Convention, Promoting effective emergency preparedness, and organizing the optimal response (BONN, 2019).

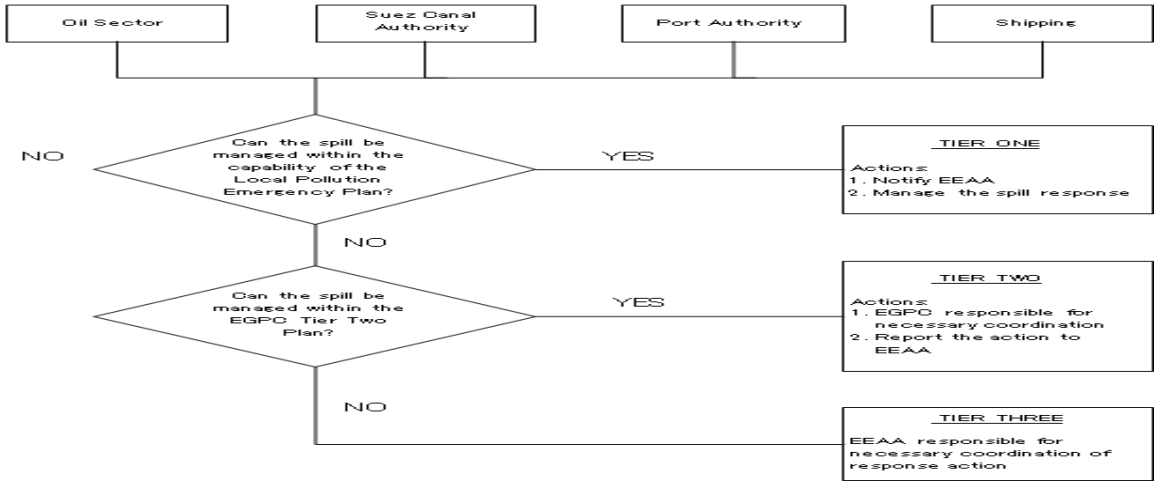
While the Jeddah Convention covers the Gulf of Suez region following the MARPOL 73/78 Convention and the UNCLOS, it recommended that the coastal states cooperate and coordinate rights and duties related to protecting and preserving the marine environment from pollution. The Jeddah Agreement did not include specific control measures and actions, and therefore, the mechanisms take the form of protocols that allow states to take actions on particular problems (PRSGA, 2021)

It is clear from above that efforts of the Gulf of Suez to prevent oil pollution did not reach the level of the North Sea, where it needs effective cooperation and an action plan that contains specific measurements and actions for countries.

5.7. A comparative analysis of OSCP institutional framework in Gulf of Suez and North Sea

Institutions and committees play an essential role in the development and efficiency of the OSCP to combat oil pollution incidents. the most important institutions and stakeholders are the Egyptian Environmental Affairs Agency (EEAA), the Egyptian Marine Safety Agency, the Suez Canal Authority (SCA), the Port Authorities in Egypt, the General Egyptian Organization for the Protection of the Coast, the Egyptian General Petroleum Corporation (EGPC), the General Department of Surface Water Police, the Tourism Development Authority, Ministry of Defence (Navy) and other designated agencies.

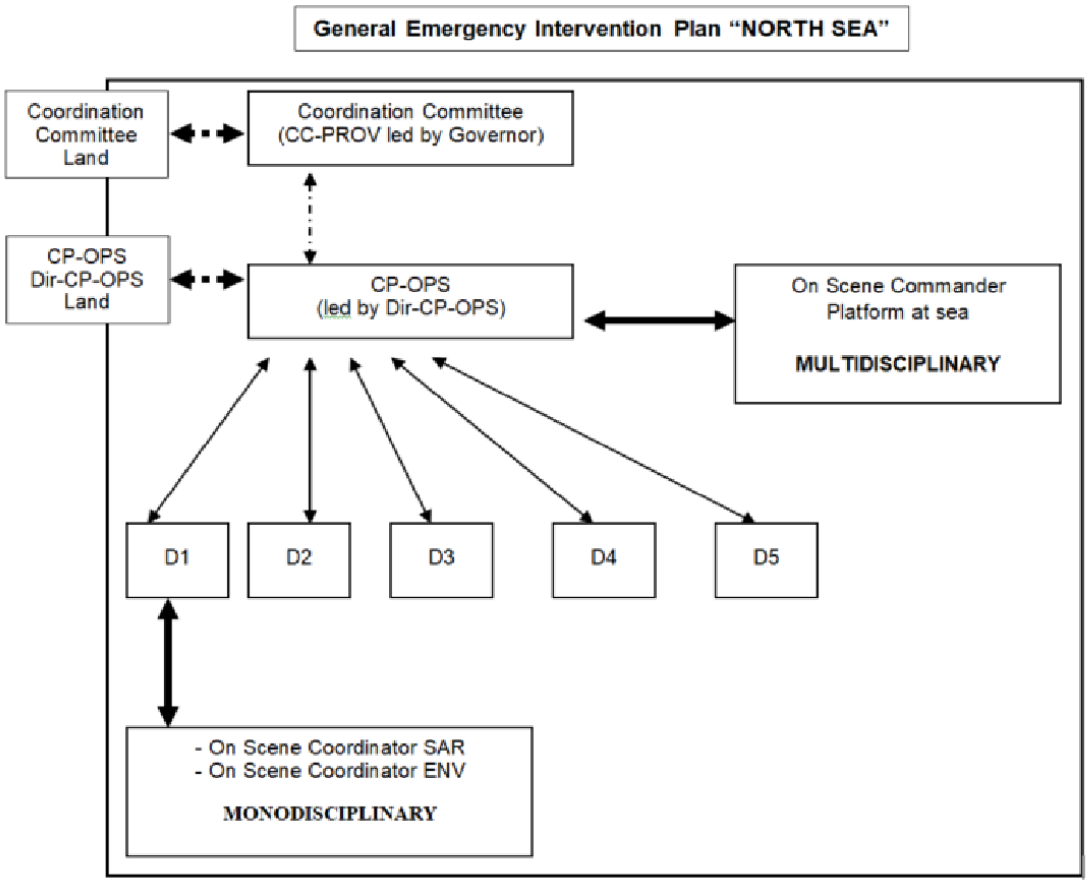
Diagram 16: Authorities and institution engaged with EEAA



Source (EEAA, 2009)

In the North Sea region, we find that the institutional framework for combating marine pollution in case of a major incident at sea the General Emergency and Intervention Plan North Sea (GEIP) is activated and contains two coordinating bodies, namely, command centre operations or CP-OPS, to ensure operational coordination and the Regional Coordination Committee (CC-PROV), to provide comprehensive crisis management in addition to the five disciplines (Bonn Agreement, 2001).

This figure 17 showing overall organizational structure as defined in the GEIP NORTH SEA (Bonn Agreement, 2001)



Source (Bonn Agreement, 2001)

In 2007, EMSA established the Consultative Technical Group for Marine Pollution Preparedness and Response (CTG MPPR) and provided a platform for member states to improve preparedness and response to oil pollution from ship sources and oil installations. The purpose of the CTG MPPR is to enable and enhance the exchange of information as well as to identify current and future priority actions in this field.

In comparison Gulf of Suez and North Sea regions, the researcher found that many institutions and committees participate in both of them for combating marine pollution; however, the process in the Gulf of Suez was hobbled by a heavy-handed bureaucracy and lack of integration (leach, 2014; Barsoum, 2018). Therefore the

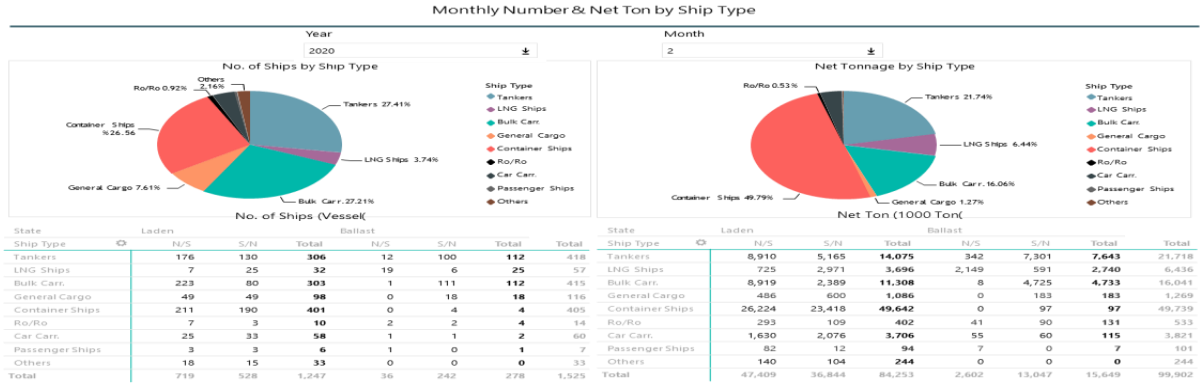
integrated approach is one of the most critical challenges facing these organizations and institutions (REMB, 2008). There is an urgent need for coordination and information exchange between institutions.

According to the Egyptian Oil and Gas newspaper, although Egypt has a contingency plan to combat oil pollution, it lacks integration and a lack of transparency between institutions (REMB, 2008; leach, 2014).

5.8. Comparative analysis of the potential causes of the oil spill in the Gulf of Suez and the North Sea

Through research and study of the main reasons that cause oil pollution in the Gulf of Suez, we found the oil spills are related to the following reasons (REMP, 2008; El-Magd et al., 2021):

1. Dense ships traffic in the Gulf of Suez and oil spills accidental or intentional from vessels is one of the leading causes of oil pollution (Kostianaia et al., 2020). According to the reports of the Suez Canal Authority, the number of ships and cargo passing through the Suez Canal for the February 2020. The report shows that oil tankers represent the highest passage rate of 27.41%. A total of 418 oil tankers passed the Suez Canal in February 2020. Also, statistics shows that the total number of all ship types passed through the Suez Canal reach 18,880 vessels in 2019.



State	Laden			Ballast			
Ship Type	N/S	S/N	Total	N/S	S/N	Total	Total
Tankers	176	130	**306**	12	100	**112**	418
LNG Ships	7	25	32	19	6	**25**	57
Bulk Carr.	223	80	**303**	1	111	**112**	415
General Cargo	49	49	**98**	0	18	**18**	116
Container Ships	211	190	**401**	0	4	**4**	405
Ro/Ro	7	3	**10**	2	2	**4**	14
Car Carr.	25	33	**58**	1	1	**2**	60
Passenger Ships	3	3	**6**	1	0	**1**	7
Others	18	15	**33**	0	0	**0**	33
Total	719	528	1,247	36	242	278	1,525

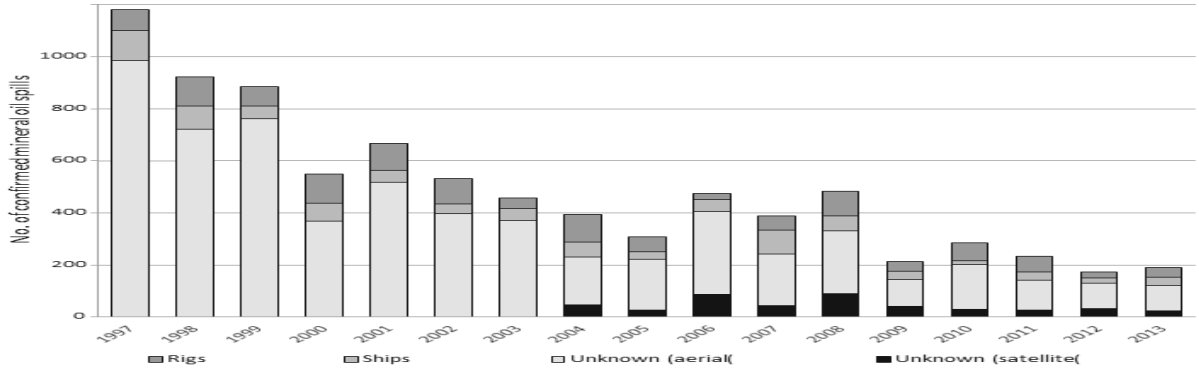
State	Laden			Ballast			
Ship Type	N/S	S/N	Total	N/S	S/N	Total	Total
Tankers	8,910	5,165	**14,075**	342	7,301	**7,643**	21,718
LNG Ships	725	2,971	**3,696**	2,149	591	**2,740**	6,436
Bulk Carr.	8,919	2,389	**11,308**	8	4,725	**4,733**	16,041
General Cargo	486	600	**1,086**	0	183	**183**	1,269
Container Ships	26,224	23,418	**49,642**	0	97	**97**	49,739
Ro/Ro	293	109	402	41	90	**131**	533
Car Carr.	1,630	2,076	**3,706**	55	60	**115**	3,821
Passenger Ships	82	12	94	7	0	**7**	101
Others	140	104	**244**	0	0	**0**	244
Total	47,409	36,844	84,253	2,602	13,047	15,649	99,902

Figure 18 Suez Canal report in February 2020, Source (Suez Canal Authority, 2020)

2. Offshore oil installations are also considered as one of the major sources of oil pollution in the Gulf of Suez (Kostianaia et al., 2020). According to the State of the Environment Report of Egypt 2016, oil pollutions resulting from ships or oil fields installations is one of the main sources of oil spilled in the marine environment, leading to the deterioration of marine ecosystems, such as coral reefs changing their characters and losing their balance.

3. Oil spills from unknown sources continues Gulf of Suez and represents a severe threat to the marine environment (Lech, 2014; EEAA, 2016). This is similar to the North Sea region given the primary sources of oil pollution in the North Sea is shipping activities, offshore installations and unknown oil spill sources (Bonn Agreement, 2019). These activities had severe impacts on the North Sea region, which raised international concerns. Nevertheless, it is leading to the development of international cooperation between states in this sensitive region.

According to the data from Bonn Agreement Annual Aerial Surveillance Reports available for the years 1990–2019, it is possible to identify the causes of oil spills are from shipping activities, oil installations and unknown sources.
This figure 19 shows oil spill causes in the North Sea Regions.



Source (Carpenter, 2018)

The figure below shows an overview of oil slicks observed during Bonn Agreement aerial surveillance activities during 2019 by estimated size.

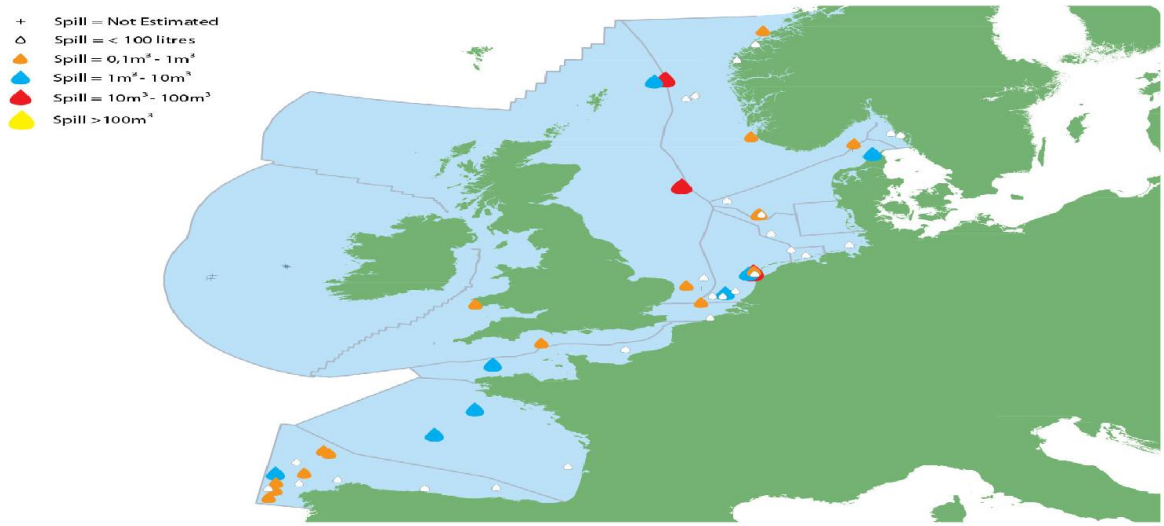


Figure 20 oil slicks observed during Bonn Agreement, Source (Bonn Agreement, 2019)

5.9. Comparative analysis of Response and preparedness in OSCP for Gulf of Suez and North Sea

Response to large oil spills require a set of instantaneous decisions. Taking decisions means that all participants are adequately prepared, make critical decisions, and mobilize resources in the shortest possible time. A fully developed contingency plan is not just a written oil spill combat document; it includes all the practical requirements needed for an immediate and effective response to oil spills (ITOPF, 2014). Through the study and the research of OSCP in the North Sea region and Gulf of Suez, the researcher will consider three factors that play an essential role in the range preparedness and response of OSCP, namely:

- Appropriate assessment of potential threats
- Response equipment
- The surveillance and detection of marine pollution

5.9.1. Appropriate assessment of potential threats

Risk assessment is one of the important steps in contingency planning to ensure that plans are going in the context of the risks we aim to address. Data provides

information on the most common causes of spills, which helps to determine the risks posed to the area (ITOPF, 2014).

When compared with the North Sea region, the author found a high similarity in the potential risks due to heavy ship traffic, large oil tankers, and explorations and oil installations. However, an assessment of the possible consequences the author noted that countries of the North Sea region have realized these consequences as a result of the Tory Canyon accident in 1967 and have strived to create tools and develop a contingency plan aligned with the BONN agreement.

Also, after the ship *Ever Given* ran aground in Suez Canal on 23 March 2021, there grew an urgent need to assess the risks and potential consequences in case of serious oil pollution in the Gulf of Suez.

5.9.2. Response equipment

After being notified of a serious pollution incident, the Environmental Affairs Agency coordinates all operations through a Central Operations Room (COR) for crisis management. In addition to the Oil Pollution Response Centres in Egypt, A regional response centre has been established in Sharm El-Sheikh and four other centres across the Red Sea and the Mediterranean Sea that were equipped with oil pollution combat equipment. Furthermore, the Suez Canal Authority (SCA) also has a stockpile of equipment to combat oil pollution in the canal (ITOPF, 2018; EEAA, 2016).

The figure 21 shows Locations of Oil Spill Response Centres in Egypt

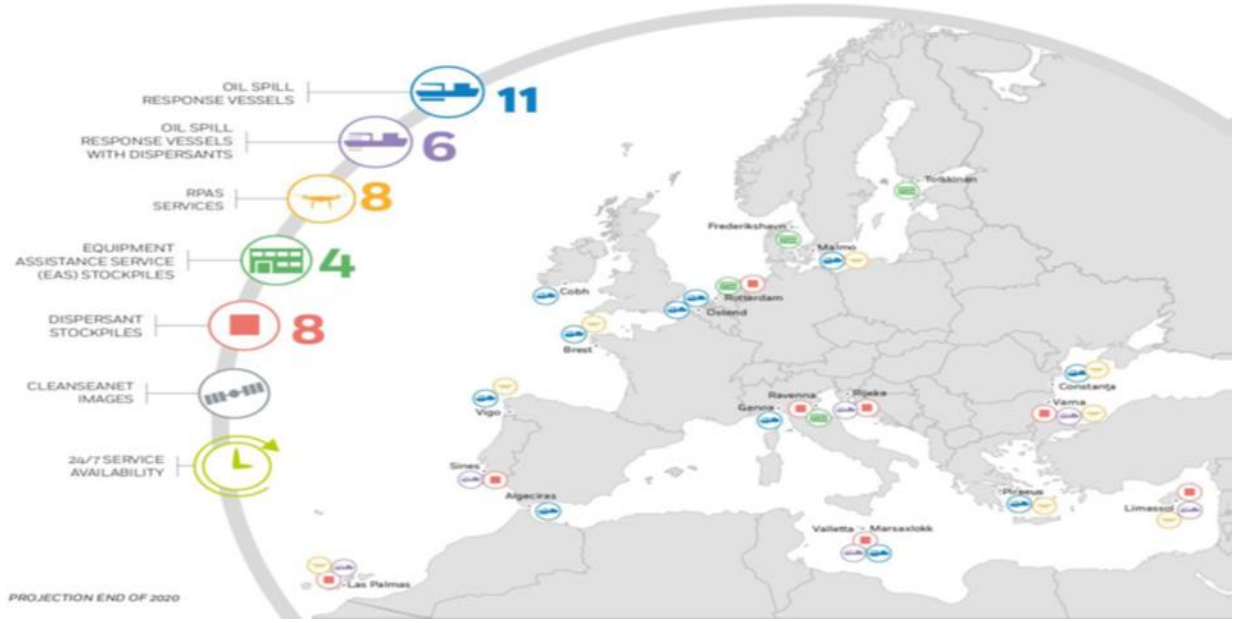
Sour (EEAA, 2008)

In the Gulf of Suez, limited equipment and tools available to combat oil pollution and capacity-building are among the most important challenges facing the implementation of the contingency plan in serious oil spill cases (Bashat, 2005; Leach, 2014).

According to ITOPF 2018 Country and Territory Profiles, Egypt shares oil pollution combat equipment with several national stakeholders, which are governmental and private sectors. The Egyptian government maintain a limited number of specialized response equipment in the regional centre in Sharm El Sheikh and a certain reliance place on the industry and port authorities (ITOPF, 2018).

However, in North Sea regions, when a distress signal of severe marine pollution is received, the Maritime Rescue and Coordination Centre (MRCC) in Ostend will notify the Maritime Security Centre (MIK) and other services to follow the procedure of the National Contingency Plan for the North Sea called “North Sea Public Contingency and Intervention Plan” or GEIP(Bonn Agreement, 2019).

Figure 22: Network of EMSA Contracted Vessels, Dispersants & Equipment Stockpiles at End of 2020



Source (EMSA, 2020)

The European Maritime Safety Agency (EMSA) has a legal obligation to respond to pollution from ship sources and fixed oil installations. EMSA has established an ‘’Equipment Assistance Service’’ (EAS) in specific locations. EAS contains oil pollution response equipment to complement and support the resources of member states. It covers all the European water and provides high-capacity equipment, ready at all time for mobilised use (EMSA, 2020).

Comparing the Gulf of Suez and the North Sea in terms of equipment and services available in relation to oil spills, we recognise that the difference is vast in the equipment and the capacities available in the North Sea. As for the Gulf of Suez, there is a need for capacity building and equipment development.

According to Egypt’s Environmental Ministry news on 31 March 2021, the need to update the NOSCP to deal with any oil spill incidents into the Egyptian marine environment and external accidents, and the need for the availability of equipment and technologies through oil spill combat centres.

5.9.3. The surveillance and detection of marine pollution

The monitoring process is one of the important steps for preparedness and responses in cases of oil pollution to the relevant parties, which gives a clear picture to the respondents of the pollution situation, the required response procedures and the possible consequences (IPIECA, 2019). The early detection and quantification of the pollution acting as a warning and supporting decision-making whereby time factor is important (Abou El-Magd, 2021).

In the Gulf of Suez, the oil pollution monitoring system depends on the naval forces patrols in the area and on reporting from the source of pollution (NOSCP, 2009). The lack of a permanent monitoring system presents a barrier to the ability to alert the EEAA to take any necessary measures, which would preserve the ecosystems (Kostianaia et al., 2020; Abou El-Magd, 2021). There is an urgent need to establish a satellite monitoring system for the northern part of the Red Sea and the (Gulf of Suez) in order to control oil pollution (Kostianaia et al., 2020).

The North Sea region has two bodies that monitor marine pollution, the OSPAR Committee for Monitoring Performance Standards for Oil and Gas installations. The second is the Bonn Convention Secretariat, which performs aerial monitoring by satellite (Carpenter, 2016). In 2007, EMSA launched a service to detect oil pollution and spill caused by ship sources using "CleanSeaNet satellite". This service is available to all member states (EMSA, 2013).

In terms of surveillance and detection of marine pollution, the author submits that the Gulf of Suez is a long way away from the North Sea when it comes to advanced technological tools to protect the North Sea area.

5.10. Conclusion

This chapter explains the importance of international conventions and the efforts made by the IMO to curb marine pollution. Also, it illustrated the importance of implementation of conventions and regulations in both Gulf of Suez and North Sea regions, which has had a significant impact on reducing marine pollution from shipping activities in both regions over the years. All of this reflects the extent of efforts made to protect the marine environment and achieve the sustainability of shipping.

This chapter has demonstrated through a comparative the existing gaps in the response and preparedness to oil pollution prevention in the Gulf of Suez. One of most noteworthy points highlighted was the emphasis on effective regional cooperation in the Gulf of Suez and clear strategies for partnerships.

The comparative analysis of the Gulf of Suez and the North Sea illustrated the importance of developing mechanisms to achieve the required goals. MARPOL 73/78 and UNCLOS highlighted the importance of cooperation between countries. These traditional environmental laws help strengthen regional agreements that include broad objectives such as risk assessment of pollution activities and monitoring methods.

Chapter six: Summary and Recommendations

6.1 Summary of Findings

Over the past decades, there have been many developments in the domain of marine oil pollution. International organisations and bodies have developed conventions and regulations to reduce oil pollution. Consequently, countries have a conscientious duty apply these laws and incorporate them into their domestic legislation to protect their marine environments. In Egypt, we notice that the primary legislation regulating shipping activities and oil exploration is Environment Law No. 4 of 1994. The law includes restrictions to reduce the risks of oil spills from ships and oil installations in the exclusive economic zone in Egypt. However, there is a lack of enforcement of most laws and regulations that have, over the years, led to many illegal practices (EEAA, 2016).

Also, Egypt has ratified many conventions related to preventing marine oil pollution, such as MARPOL73/78, OPRC Convention and the regional agreements. However, there are critical challenges that limit cooperation and effective implementation in line with best practices. These bureaucratic challenges, in the end, inhibit effective implementation.

Oil pollution of the ocean has become a significant issue. It has attracted politicians, environmental scientists, and different parties because of its complex and impacts on economic, political and social aspects. This research highlights the importance of regional agreements as a mechanism to assist the participating countries in the region to comply with environmental obligations related to reducing oil pollution.

Marine oil pollution in the Gulf of Suez was, and remains one of the primary issues for the region of the Red Sea that is very rich in marine biodiversity and forms a part of the region's cultural heritage. Moreover, the Gulf of Suez region has gained importance because it has the Suez Canal at its disposal --- the most critical passage for shipping in the world. The Canal is a focal point of connection between

the world's countries and directly controls the movement of global trade and the economy of the nations.

This research has compared efforts to prevent oil pollution in the Gulf of Suez and the North Sea regions. The researcher submits similar traits in objectives between regional agreements of the above two regions. However, The Gulf of Suez region lags behind the North Sea in terms of effective cooperation and regional partnerships as countries have varying levels of obligation when it comes to achieving pre-determined agreements. Therefore, the authors asserts that the government of Egypt needs to develop a clear and effective strategy to ameliorate partnerships in that region. In addition, the author observes that effective regional cooperation and partnerships have a positive impact, as is the case in the North Sea region. The collaboration between the region's countries provides a very successful example of how effective cooperation by all parties following strategic legislative measures have positively affected marine pollution in the past decades (Carpenter, 2018). Countries in the Gulf of Suez regions can take that direction from the North Sea as good practices tools.

Noteworthy in this context is MARPOL, one of the many efforts of IMO, that has placed both the Gulf of Suez and the North Sea as special areas due to their sensitive nature and the intensity of shipping. However, states must monitor ships and oil explorations activities. In the North Sea, they have applied aerial surveillance and launch satellite surveillance. Still, in the Gulf of Suez, this cannot be stated, which lacks tools for surveillance and monitoring to detect marine pollution. Historically and contemporarily, oil pollution remains at a high risk on the Egyptian coasts from many sources. Regardless, the Gulf of Suez does not have a continuous system to monitor oil pollution in the marine environment (El-Magd et al., 2021).

Moreover, the emergency plan allows defining roles and responsibilities, determining effective strategies, and setting procedures. Therefore, the effective response to oil spills depends on the efficiency and preparedness of organisations

and individuals in charge. However, the contingency plan needs to be improved and updated by continuous development (ITOPF, 2014).

When developing a contingency plan, the foundation must work with the relevant stakeholders to determine priorities and finding adequate and timely information. Also, the contingency plan needs to be tested through exercises. The exercises will raise the participants' awareness and define the roles and responsibilities in an actual oil spill response.

Fortunately, Egypt has a National Oil Spill Contingency Plan (NOSCP) in place. However, it cannot effectively manage the massive exploration and tanker activities to preserve the Gulf of Suez marine environment and its exposure to oil spills in a manner marked by readiness (Leach, 2014).

In general, the technological developments led to the increase in shipping activities and oil exploration over the years, which will require the countries to develop necessary measures and tools to curb increasing rates of oil pollution and practical and cooperation by the affected countries through an effective regional agreement.

To this end, this study conducted comparative research to identify the gaps and challenges facing the Gulf of Suez region to reduce oil pollution and identify feasible recommendations. Also, this research analysed the efforts of both the UNCLOS and IMO for oil pollution prevention. Moreover, very limited research has have been conducted on oil pollution control mechanisms (El-Magd et al., 2021). That was the motivation of this research.

SWOT analysis is crucial for analysing internal factors, including strengths, weaknesses, and external factors, including opportunities and threats, which can lead the administrators to their strategic decisions (Gürel, 2017).

6.2. SWOT Analysis

In this study, SWOT analysis will help evaluate the strengths, weaknesses, threats and opportunities in relation oil spill preparedness and response in the Gulf of Suez. Subsequently, recommendations will be submitted based on the SWOT analysis**.**

6.2.1. Strengths

- **A well-defined legal structure**; the survey questionnaire indicates that Egyptian laws and legislation have many provisions that are strongly committed to protecting the marine environment;
- **A well-coherent organizational structure**; where many bodies and committees participate in the national emergency plan to combat oil pollution. In addition, the legislation defines the role and responsibilities of these bodies (NOSCP, 2009);
- **Compatibility with international policy**; Egypt has signed most of the international conventions related to pollution prevention and response, in addition to negotiating several regional agreements such as PERSGA; and
- **Red sea tourism is highly attractive**, especially in the northern part (Gulf of Suez).

6.2.2. Weaknesses

- **Bureaucrac**y; the survey questionnaire for Egypt Oil spill preparedness and response indicates the institutions are hobbled by heavy bureaucracy;
- **Lack of integration among institutions**; the survey questionnaire answers indicate that we need a comprehensive data flow and integration between and among the institutions;
- **Lack of transparency among institutions and ministries**; where we notice that there is a desire to cover up oil spills so that tourism is not impressed (leach, 2014);
- **Weak implementation and enforcement**; the survey questionnaire answers indicate that we need to constrain the violations of oil spills. However, there is more effort was required by the Ministry of environment for strengthening the enforcement mechanism;
- **Poor surveillance and monitoring**; according to answers from the survey questionnaire, indicates the Gulf of Suez does not have a continuous system for monitoring oil pollution;

- **Inadequate resources and equipment**; the Gulf of Suez requires the equipment and capacity building to respond effectively to major oil spills such as oil spill response vessels;
- **Drills**, the survey questionnaire indicates that drills are needed more frequently in tier three oil pollution and the reality, technologies and expertise on the drills; and
- **Risk assessment**, the NOSCP need to review the existing framework frequently to assess the challenges.

6.2.3. Opportunities

- **Raising cultural awareness**; will encourage the increase of citizens participation in legislation aimed at reducing the effects of pollution.
- **Effective regional agreements**;
- **Developing port-reception facilities**; answers from the survey questionnaire indicates the importance of developing reception facility-based mechanisms to encourage shipmasters to dispose of oily waste correctly.
- **Sustainable management**; Egypt supports the recommendations of the United Nations Conference on Environment and Development (UNCED) 1992 for integrated coastal zone management (ICZM) for sustainable development. The integration of sectors, institutions and levels of government is considered the most crucial feature of coastal zone management (Tabet & Fanning, 2012);
- **Compliance with international conventions**, which contain strategic tools in reducing and preventing oil pollution; and
- **Development of Egypt-based IMO programs**, to improve the promotion of marine environmental protection.

6.2.4. Threats

- **Poor governance**, we recognise Egypt comes under centralised and bureaucratic systems, as the state is the centre of power and decision-making. However, the approach to good governance depends on integration, reform and actual participation, and these practices are absent (Tabet & Fanning, 2012);
- **The Gulf of Suez a major route for maritime transportation**;
- Oil pipelines pose a risk to of oil spill;
- Past major oil spill accident;
- Increased oil and gas exploration; and

- Both intentional or accidental oil spills from ships are not considered in tandem.

According to the SWOT analysis, we are formulating those recommendations that can improve response and preparedness for the oil pollution in the Gulf of Suez.

6.3. Recommendation

This thesis analysed the prevailing issues surrounding global and regional oil pollution. Based on this research and analysis, the researcher concluded that the effective preparedness and response to the oil spill in the Gulf of Suez is inadequate. Therefore, the researcher recommends the following to address the existing gaps.

Developing a Regional Agreement: Effective regional agreements between the Red Sea countries became clear from the research the great importance of these regional treaties if the state parties play their effective and efficient role to achieve the common goals of the region in curbing oil pollution. We recognise the Gulf of Suez region is covered by the Regional Agreement for the Preservation "of the Environment of the Red Sea and the Gulf of Aden (PERSGA)". It aims to protect the marine environment from oil pollution by implementing the regional cooperation protocol "combating pollution by oil and other harmful substances in contingency". However, it has not reached the required level due to the different interests of countries. Therefore, all the efforts of the regional countries need to join effectively and the willingness of the regional states to participate in pollution prevention efforts with a comprehensive plan and support from NGOs.

Effective Cooperation: Effective international cooperation between and among countries. The individual countries usually lack sufficient resources and equipment to respond effectively to major oil spills. This is where neighbouring countries can quickly provide this through cooperation. In the case of the Gulf of Suez, the regional governments are usually a faced with similar difficulties. Close and effective international cooperation is a vital need.

Efforts of International Conventions: The importance of international conventions generally enhances efforts to prevent marine oil pollution, such as the MARPOL73/78 and UNCLOS, and their significant influence on reducing marine pollution caused by ships. The countries of the region must comply and implement these tools in line with developments.

IMO Efforts: The importance of the IMO efforts is to assist developing countries in capacity building by supporting their human and institutional capacities. IMO has established an Integrated Technical Cooperation Program (ITCP). This program will improve the compliance and promotion of marine environmental protection, which lead to clean waters and coasts through integrated coastal zone management. This results in the development of tourism, particularly in the Gulf of Suez region, which is considered one of the main sources of national income.

Environmental Awareness: Raising environmental awareness and spreading ideas of ecological sustainability through many government programs and agencies, also working to raise awareness of the impacts of environmental deterioration and the depletion of natural resources. Moreover, protecting the right of future generations to these resources, the Ministry of Environment and agencies are responsible for raising awareness by preparing awareness programs through mechanisms, including seminars and workshops.

Law Enforcement: As a part of the state's effort to protect the marine environment from pollution, the Environmental Protection Law was established in 2004 and had enough legislation regulating the requirements of pollutants in Egypt. However, the lack of enforcement of most of these laws and regulations has led to many illegal practices. Therefore, the law to be enforced and strengthened fines to prevent these wrong practices

Governance Regime: Eradicate the pressure caused by bureaucracy between institutions and parties related to oil pollution prevention and establishing a new mechanism to facilitate the flowing data and information. Additionally, states should

work towards effective integration between and among institutions and parties that deal with oil spill contingency plan.

Surveillance and Monitoring: Establish a continuous system for monitoring oil pollution in the marine environment of the Gulf of Suez for which time is an important factor. In addition, surveillance and monitoring support law enforcement and identification of the source of pollution. The “Synthetic Aperture Radar (SAR)” monitoring and open source data is an effective method for detecting oil spill incidents and reducing the rate of pollution cases as the polluter will be careful to avoid being penalised (El-Magd et al., 2021).

Regional Network centres: Establish integrated centres for equipment assistance services in specific locations covering all waters of the Red Sea and containing oil pollution response equipment to supplement and support the resources of member states. Also, it provides high-capacity equipment that is always ready for packing and use.

National Contingency Plans Updated: There is an urgent need to review the national contingency plans for the oil spill to check the current risk assessment. Therefore, it is important to provide the tools and equipment associated with the evaluation and ensure the availability of the latest technologies through the oil combat centres.

Role of Port states and Flag states: Port states and Flag states should be proactively engaged in inspecting ships to ensure compliance with operational procedures under the rules of the MARPOL Convention. Moreover, we see the port state control has developed mechanisms in implementation through memoranda of understanding (MoUs), which effectively coordinates ship inspections.

Reception Facilities: Develop waste reception facilities at ports and work on more efficient reception facilities to improve compliance with requirements.

Chapter seven: Conclusion

7.1.1 General Remarks:

The Red Sea is characterised by unique geographical feature given that it is a narrow basin. In addition, it contains numerous coral reefs and associated ecosystems. The Gulf of Suez is located in the northern part of the Red Sea with long and sensitive coasts, which connects the shipping and oil trade routes between the East and the West.

We observe that oil spill disasters are sudden occurrences. However, when such incidents take place, we notice that it causes massive losses in the marine environment, the property and the local activities of the state. Where tourism activities are one of the essential activities in the Gulf of Suez and an important source of national income, which can be affected by oil pollution (Assilzadeh & Gao, 2010).

We recognise that oil is the main source of energy for all countries around the world. Also, maritime transportation will remain the main vehicle for transporting oil and petroleum products to the global market from oil sources to consumers. Notwithstanding, the continuous improvement in the construction of oil tankers, port facilities and oil exploration activities, oil spills will remain as a common phenomenon. Therefore, the OSCP should be willing to respond immediately and effectively to oil spill incidents in addition to dealing with the possible consequences.

7.1.2 Chapters Conclusions

This thesis contains a synthesis of findings from five main chapters. Final concluding remarks are based on those crucial findings.

7.1.2.1 Chapter 2:

From literature reviewed, it is noted that the potential threats for the Gulf of Suez region from oil pollution emanate from several factors, including oil installations, oil

exploration activities, oil terminals and pipelines, the intensity of ship traffic and associated shipping activities. According to the reports of the EEAA, the repeated oil spill incidents in the Gulf of Suez region occur from different sources. All of these are evidence of the actual and expected risks that require attention and the urgent need to provide efficient capabilities to address response and preparedness operations to manage crises and disasters with the necessary skill and immediately. However, the marine environment of the Gulf of Suez and its living and non-living resources represent a vital strategic base and play an essential role in economic growth and prosperity. Hence the close relationship between development trends and the preservation of the marine environment can achieve overall sustainable interests and goals.

Moreover, it emphasises the Suez Canal's importance in the Shipping domain of the Red Sea as well as its overall importance to the international shipping trade. More than 238 million tons of oil, petroleum products and gas were recorded transiting the Suez Canal in 2019 with a total of 18,880 vessels. The above statistics only adds to the confirmation that threats from oil spill will likely remain unchanged.

7.1.2.2 Chapter 3:

The excessive activities that appear in different seas represent a threat to the integrity of marine ecosystems in general. These activities prompted the international community to engage with national and regional counterparts to address the phenomenon of oil pollution and take the necessary measures and actions for oil spills to prevent, preparedness and combat if it occurs.

In the past decades, due to the major oil spills disasters that caused environmental damage due to large quantities of oil into the sea. The countries are aware of these risks and henceforth, took the initiative to mandate the IMO to implement the negotiations to address this phenomenon.
Subsequently, the findings from the cursory overview of International Regimes for Oil Pollution prevention from Ships illustrated that importance of conventions and

regulations promulgated by the IMO and the United Nations in preventing marine pollution from ships, liability and compensation.

IMO made an effort to develop the international legal regime by adopting international instruments that are marked by a responsive characteristic and in compliance with the requirements of preventing marine pollution and addressing its waste. Additionally, with a focus on targeted measures to combat oil pollution, IMO's works towards that direction has led to the adoption of many conventions, the most important of which is MARPOL and OPREC. The IMO has taken two important directions to control marine pollution. The first is pollution from ships. The second trend is national oil pollution preparedness and response, which has significantly impacted reducing marine pollution from shipping activities in both regions over the years. In addition, the IMO acts as a platform on which countries in a particular region can cooperate when marine pollution in that region is severe.

Moreover, the UNCLOS has addressed some of the significant gaps in marine environmental law, as pollution is no more under the freedom of the seas, and the states are obligated to prevent marine pollution.

7.1.2.3 Chapter 4:

This chapter has reviewed the framework of the oil spill contingency plan in Egypt also explains the administrative and organizational structure of the various national bodies and institutions that combat marine pollution. In addition to the procedures and action plans that must be taken into account by the relevant agencies concerned with different levels of oil pollution under the oil spill contingency plan.

Findings from this chapter denote that the Gulf of Suez is similar to the North Sea, a transboundary area that connects shipping chains between economically interconnected countries. Consequently, both of the above areas have garnered international attention because those regions witness activities and developments, such as oil exploration and tanker activities. Moreover, the study reviewed the oil spill action plan for the North Sea concerning the response to the oil spill and

preparedness to extract the best practices, benefit from and apply them to the Gulf of Suez.

7.1.2.4 Chapter 5:

This chapter explains the importance of the efforts made by the IMO to curb marine pollution. Also, it illustrated the importance of implementation of conventions and regulations in both Gulf of Suez and North Sea regions. Nevertheless, the importance of the sustainability of maritime transport appears in a wide range of conventions and recommendations aimed at reducing marine pollution. Therefore, sustainable maritime transport represents the backbone of sustainable development. Moreover, the inherent obligation under international conventions is seen to have improved the sustainability-mindset of maritime transport in both the Gulf of Suez and the North Sea areas. It is observed that the Gulf of Suez did not lag behind in developing laws and local legislation reflecting international environmental regulations. All these efforts seem to have had a lot of impact on a downward trend of marine pollution, especially oil pollution resulting from shipping activities in these regions.

This chapter conducted a comparative analysis between preparedness and response to the contingency plan for oil spills in the Gulf of Suez and the North Sea. From the analysis of this study, it is found that the Gulf of Suez region lags behind the North Sea in the areas of preparedness and response as the countries in the Gulf of Suez region have different interests and varying levels of commitment towards achieving agreements. Therefore, the Gulf of Suez needs effective regional cooperation and effective partnerships. Moreover, findings from this study also indicates that regional cooperation agreements are one of the primary tools promoted by UNCLOS. Therefore, the governments need to set clear strategies and identified partnerships in regional agreements to achieve the desired objectives outlined in UNCLOS and the UN 2030 Agenda for Sustainable Development.

At the regional level, the Gulf of Suez and the Red Sea region established a legal framework in 1982 in the form of the Jeddah Convention "Regional Convention for

the Conservation of the Red Sea and Gulf of Aden Environment". Its goals are similar to the North Sea region. However, the Gulf of Suez needs Immediate and practical work to implement all international agreements related to marine environment pollution and effective cooperation and implementation mechanisms.

7.1.2.5 Chapter 6:

This chapter summarises findings in relation to pollution issue, where it remains one of the main and important issues in the Gulf of Suez region. Subsequently, the SWOT analysis was used to assess strengths, weaknesses, threats, and opportunities relating to oil spill preparedness and response in the Gulf of Suez to obtain the recommendations.

As explained earlier, many challenges are facing the Gulf of Suez. The risk assessment of oil pollution was one of the most important challenges. So the risk evaluation should be regularly reviewed to align with technological and industrial developments for an effective contingency plan.

Moreover, law must intervene and apply to those who cause the most severe disasters that pollute the marine environment due to the various activities that overexploitation nature and not be lenient in pursuing those that threaten the safe marine environment. Additionally, the Surveillance and Monitoring system will help enforce the law by establishing a continuous system to monitor and control oil pollution in the marine environment of the Gulf of Suez.

In addition, the Gulf of Suez needs to adopt a better mechanism for exchanging information between countries and international governmental and non-governmental organizations on environmental issues, characterized by activity, accuracy and far from procedural and formal aspects, to use it in the face of any threats against the marine environment.

7.1.3 Concluding Remarks:

In conclusion, this thesis has achieved the research objectives through a comprehensive analysis of preparedness and response to marine pollution in the Gulf of Suez region and comparing it with the North Sea Action Plan for oil spills. Moreover, the research reviewed, Conventions and regional agreements related to oil pollution and the role and efforts of IMO and UNCLOS, hence to identifying possible solutions and recommendations in the context of the Gulf of Suez.
The concerned community needs to move forward to protect and secure the Gulf of Suez and its marine ecosystems from the dangers of oil spills. Therefore, the most urgent goal is immediate progress to protect the Red Sea marine environment by governments of all countries in the region and to keep away from the political tensions between the governments in the region for sustainability and the future of the next generation.

Governments have to direct the media and adopt effective means to spread environmental awareness, enhance its programs, and call for its preservation and familiarise individuals with oil pollution threats. As well as increasing publications, research and specialized periodicals in this field, which bear the nature of guidance and direction for dealing with the marine environment, bring out a saturated generation of environmental education advocates for it.

Ultimately, changing mindset is in order. Precautionary measures must be adopted. All sources of oil pollution, especially petroleum oil, and oil comprised organic compounds, must be contained and monitored. Responsibility is private and public, so every individual needs to be aware of their role, and governments must be aware of their responsibilities and duties.

Reference:

Assilzadeh, H., & Gao, Y. (2010). Designation of an interactive oil spill management system. Disaster Prevention and Management: An International Journal.

Bonn Agreement. (2019). Annual report on aerial surveillance for 2019 https://www.bonnagreement.org/publications.

Bonn Agreement. (2001). The Bonn Agreement Counter Pollution Manual, https://www.bonnagreement.org/publications

Bashat, H. (2005). Challenges of oil spill response in Egyptian coastal zone overlooking the Mediterranean and the red sea. In International Oil Spill Conference. American Petroleum Institute

Board, M., Board, O. S., & National Research Council. (2003). Oil in the sea III: inputs, fates, and effects. national academies Press.

Carpenter, A. (2019). Oil pollution in the North Sea: the impact of governance measures on oil pollution over several decades. Hydrobiologia, 845(1), 109-127.

Chen, J., Zhang, W., Wan, Z., Li, S., Huang, T., & Fei, Y. (2019). Oil spills from global tankers: Status review and future governance. Journal of cleaner production.

Carpenter, A. (Ed.). (2016). Oil pollution in the North Sea. Springer International Publishing.

Carpenter, A., & Kostianoy, A. G. (Eds.). (2018). Oil Pollution in the Mediterranean Sea: Part I: The International Context (Vol. 83). Springer.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Dalaklis, D., Besikci, E. B., Larsson, J., Christodoulou, A., Johansson, T. M., Pålsson, J., ... & Juszkiewicz, W. (2019). South Baltic Oil Spill response through clean-up with biogenic oil binders project: The SBOIL handbook. Maritime University of Szczecin.

Doelle, M. (2006). Climate Change and the use of the dispute settlement regime of the law of the sea Convention. Ocean Development & International Law, 37(3-4), 319-337

Egypt daily news. (2021). Egypt's Environment Ministry reviews plan to combat marine oil pollution, (2021, Jun, 02). https://dailynewsegypt.com/2021/06/02/egypts-environment-ministry-reviews-plan-to-combat-marine-oil-pollution/

El-Magd, I. A., Zakzouk, M., Ali, E. M., & Abdulaziz, A. M. (2021). An Open Source Approach for Near-Real Time Mapping of Oil Spills along the Mediterranean Coast of Egypt. Remote Sensing, 13(14), 2733.

EEAA. (2016). Annual Report of the Ministry (2016), http://www.eeaa.gov.eg/en-us/mediacenter/reports/annualreports.aspx

Egypt National oil spill contingency plan (NOSCP). 2009. https://www.eeaa.gov.eg/en-us/topics/general/crises/emergencyplans.aspx

European Maritime Safety Agency, Action Plan for Oil Pollution Preparedness and Response, 2004. http://www.emsa.europa.eu/opr-documents/action-plans/item/486-the-pollution-preparedness-a-response-activities-of-the-european-maritime-safety-agency-report-2009.html

EMSA. (2020). Agency Structure , http://www.emsa.europa.eu/about/agency-structure.html.

Gürel, E., & Tat, M. (2017). SWOT ANALYSIS: A THEORETICAL REVIEW Uluslararası Sosyal Araştırmalar Dergisi The Journal of International Social Research.

Gouda, E. A. (2015). Obstacles to sustainable tourism development on the Red Sea Coast. Int J Innov Educ Res, 3(3).
Julian, H (2010, Jun, 24) Egyptian oil spill in Red Sea. Arutz Sheva. https://www.israelnationalnews.com/News/News.aspx/138250#.UgsEWNKods.

Hakapää, K. (2005). Foreign ships in vulnerable waters: coastal jurisdiction over vessel-source pollution with special reference to the Baltic Sea. International Journal of Legal Information, 33(2), 256-266.

Hassler, B. (2016). Oil spills from shipping: a case study of the governance of accidental hazards and intentional Pollution in the Baltic Sea. In Environmental governance of the Baltic Sea (pp. 125-146). Springer, Cham.

International Maritime Organization. (2020). Introduction to IMO International maritime organization. http://www.imo.org

IMO. (2010). Manual on oil pollution section IV. London: Author
International maritime organization. (1990). International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Oil-Pollution-Preparedness,-Response-and-Co-operation-(OPRC).aspx

International maritime organization. (1990). International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC). https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Oil-Pollution-Preparedness,-Response-and-Co-operation-(OPRC).aspx

International maritime organization. (1969). International Convention on Civil Liability for Oil Pollution Damage (CLC).

https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Oil-Pollution-Damage-(CLC).aspx

International maritime organization. (2001). International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER). https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Civil-Liability-for-Bunker-Oil-Pollution-Damage-(BUNKER).aspx

International maritime organization. (1992). International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND). https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-the-Establishment-of-an-International-Fund-for-Compensation-for-Oil-Pollution-Damage-(FUND).aspx

International maritime organization. (1978). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-Standards-of-Training,-Certification-and-Watchkeeping-for-Seafarers-(STCW).aspx

International maritime organization. (1974). International Convention for the Safety of Life at Sea (SOLAS). https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx

International maritime organization. (2010). Manual on oil spill risk evaluation and assessment of response preparedness.

International maritime organization. (1973). International Convention for the Prevention of Pollution from Ships (MARPOL). https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

IPIECA. (2019). Oil spill preparedness and response: An introduction. https://www.ipieca.org/resources/good-practice/oil-spill-preparedness-and-response-an-introduction-2019/

IPIECA. (2020). Sustainability reporting guidance for the oil and gas industry, Module 4 Environment. https://www.ipieca.org/our-work/sustainability/performance-reporting/sustainability-reporting-guidance/

ITOPF. (2014). TIP 16: contingency planning for marine oil spills. http://www.itopf.com/knowledge-resources/documents-guides/document/tip-16-contingency-planning-for-marine-oil-spills/

ITOPF. (2018). country & territory profiles Egypt A Summary of Oil Spill Response Arrangements & Resources Worldwide, https://www.itopf.org/knowledge-resources/countries-territories-regions/countries/egypt/

IPIECA. (2020). Sustainability reporting guidance for the oil and gas industry March 2020, https://www.ipieca.org/our-work/sustainability/performance-reporting/sustainability-reporting-guidance/

ITOPF. (2020). Oil Tanker Spill Statistics 2020, https://www.itopf.org/knowledge-resources/data-statistics/statistics/

ITOPF. (2014). TIP 13: Effects of oil pollution on the marine environment. https://www.itopf.org/knowledge-resources/documents-guides/document/tip-13-effects-of-oil-pollution-on-the-marine-environment/

ITOPF. (2017). the international law regarding ship-source pollution liability and compensation: evolution and current challenges, https://www.itopf.org/knowledge-resources/documents-guides/the-international-law-regarding-ship-source-pollution-liability-and-compensation-evolution-and-current-challenges-2017/

Johnson, L. S. (2004). Coastal state regulation of international shipping. Oceana Publications, Dobbs Ferry, NY(USA). 216, 2004.

Jernelöv, A. (2010). The threats from oil spills: now, then, and in the future. Ambio

Kostianoy, A. G, & Carpenter, A. (2018). History, sources and volumes of oil pollution in the Mediterranean Sea. In Oil Pollution in the Mediterranean Sea. Springer, Cham.

Kleinhaus, K., Al-Sawalmih, A., Barshis, D. J., Genin, A., Grace, L. N., Hoegh-Guldberg, O., ... & Fine, M. (2020). Science, diplomacy, and the red sea's unique coral reef: it's time for action. Frontiers in Marine Science, 7, 90.

Kostianaia, E. A., Kostianoy, A., Lavrova, O. Y., & Soloviev, D. M. (2020). Oil pollution in the Northern Red Sea: a threat to the marine environment and tourism development. In Environmental Remote Sensing in Egypt (pp. 329-362). Springer, Cham.

Karim, M. S. (2016). Prevention of Pollution of the marine environment from vessels. Springer International Pu.

Li, Y., Lin, C., Wang, Y., Gao, X., Xie, T., Hai, R., ... & Zhang, X. (2017). Multi-criteria evaluation method for site selection of industrial wastewater discharge in coastal regions. Journal of Cleaner Production.

Lily Leach, (2014) Egypt's oil spill preparedness. Egypt Oil and Gas Newspaper, https://egyptoil-gas.com/features/egypts-oil-spill-preparedness/

Ministry of Environment. Egyptian Environmental Affairs Agency. (2008). Regional Environmental Management Improvement Project (REMIP). https://www.eeaa.gov.eg/en-us/mediacenter/reports/projectstudies/remip.aspx

Ministry of Environment, Egyptian Environmental Affairs Agency, Egypt State of the Environment Report (2016). http://www.eeaa.gov.eg/en-us/mediacenter/reports/soereports.aspx

Maritime Transport Sector (2019). Commercial ports. https://www.mts.gov.eg/en/sections/10/1-10-Commercial-Ports. Accessed 30 Mar 2019

Moller, T. H., Molloy, F. C., & Thomas, H. M. (2003). Oil spill risks and the state of preparedness in the regional seas. In International Oil Spill Conference (Vol. 2003, No. 1, pp. 919-922). American Petroleum Institute.

Mohd Rusli, M. H. B. (2012). Balancing shipping and the protection of the marine environment of straits used for international navigation: a study of the straits of Malacca and Singapore.

Ministry of Environment. Egyptian Environmental Affairs Agency.(2019) Environmental Information and Monitoring Program (EIMP) , Annual report for 2019. https://www.eeaa.gov.eg/en-us/mediacenter/reports/projectstudies/eimp.aspx

Ministry of Environment. (2009). Egyptian Environmental Affairs Agency, Environmental Protection Law. http://www.eeaa.gov.eg/en-us/laws/envlaw.aspx

Ministry of Environment. Egyptian Environmental Affairs Agency. (2009). National Emergency Plan for Facing Marine Oil Pollution Accidents. https://www.eeaa.gov.eg/en-us/topics/general/crises/emergencyplans.aspx

National oceanic and atmospheric administration. 2021. How does oil impact marine life. https://oceanservice.noaa.gov/facts/oilimpacts.html

OSPAR Commission, 2010. The Quality Status Report 2010—Chapter 7—Offshore Oil and Gas Industry. OSPAR Commission, London.

https://qsr2010.ospar.org/en/downloads.html

PERSGA. (2021). Consolidated Jeddah Convention. http://persga.org/jeddah-convention.

Spellman, F. R. (2017). The science of environmental pollution. CRC Press.

Schiffling, S., & Valantasis Kanellos, N. (2021). Ship Happens: Ever Given and Forgotten.

Suez Canal Authority (2019). Monthly number and net ton by ship type. /NavigationStatistics. https://www.suezcanal.gov.eg/English/Navigation/Pages/NavigationStatistics.aspx

Suez Canal Authority. (2017). Canal history. https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/CanalHistory.aspx

Suez Canal Authority. (2017). New Suez Canal. https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/NewSuezCanal.aspx.

Suez Canal Authority. (2017). About Suez Canal. https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/AboutSuezCanal.aspx.

Suez Canal Authority. (2020). Navigation Statistics, Monthly Number & Net Ton by Ship Type https://www.suezcanal.gov.eg/English/Navigation/Pages/NavigationStatistics.aspx

Tabet, L., & Fanning, L. (2012). Integrated coastal zone management under authoritarian rule: An evaluation framework of coastal governance in Egypt. Ocean & coastal management.

Tesfamichael, D., & Pauly, D. (Eds.). (2016). The Red Sea ecosystem and fisheries (Vol. 7). Springer.

UNEP. (2021). Red sea and Gulf of Aden. https://www.unep.org/explore-topics/oceans-seas/what-we-do/working-regional-seas/regional-seas-programmes/red-sea-and.

UNEP. (2012). state of the Mediterranean marine and coastal environment. https://wedocs.unep.org/bitstream/handle/20.500.11822/8278/-The%20State%20of%20the%20Marine%20and%20Coastal%20Environment%20Mediterranean%20_%20MAP%20series%20100-19962377.pdf?sequence=3&isAllowed=y

UN. (1982). United Nations Convention on the Law of the Sea (UNCLOS). https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm

United Nations. (2020). Publication, issued by the United Nations Conference on Trade and Development (UNCATAD). Review of maritime transport. 2020. https://unctad.org/webflyer/review-maritime-transport-2020

WriteCaliber. (2021). Egypt's Environment Ministry reviews plan to combat marine oil pollution. https://news.writecaliber.com/oil-gas-egypt-egypts-environment-ministry-reviews-plan-to-combat-marine-oil-pollution/

Zhang, B., Matchinski, E. J., Chen, B., Ye, X., Jing, L., & Lee, K. (2019). Marine oil spills—oil pollution, sources and effects. In World seas: an environmental evaluation (pp. 391-406). Academic Press.

Appendices

Appendices I: Questionnaire for Egypt on Oil spill preparedness and response

Dear Participant.

Thank you for agreeing to participate in survey questionnaire as part of my research project, which is a partial fulfillment of the requirements for the Master's degree of Science in Maritime affairs at the World Maritime University in Malmo (WMU), Sweden

I am conducting a research on Dissertation Topic '' Challenges and potential for Egyptian oil spill contingency plan a comparative study for improving Oil Spill Preparedness: case study Gulf of Suez and English Channel"

This research will includes the results data of the survey questionnaire and involving data for research purposes, therefore the research will provide information on the degree of preparedness and response to the oil spills in Egypt.

Anonymzed research data will be archived on a secure drive linked to a World Maritime University email address. All the data will be deleted after completion of the research.

Your participation in the questionnaire survey is highly appreciated

Student's name: Nasreldin Ahmed

Specialization: Ocean Sustainability. Governance and Management (OSGM)

E-mail: w1904533@wmu.se

Bio-data of respondents

Please tick (x) the appropriate box

I. Gender of the respondent

I. Male

2. Female

2. Qualifications background of the respondent

1. Primary level

2. High School

3. Technical vocational

4-Bachelor level

5-Researcher

6- Others

3-What is your work institution?

Queries related to oil spill preparedness, contingency planning, risk assessment, Training, Drills and monitoring

4-Are you aware of the National Oil Spill Response Plan in Egypt?

6- In the development of Egyptian oil spill contingency plan, what are factors considered the most prominent in the planning process?

7-What is the particular role your organization play in oil spill preparedness and response?

8-In your perspective, what should be done to improve the National Oil Spill Contingency Plan in Egypt?

9-What is the particular role your organization expected to play in oil spill planning and preparedness in the event of an oil spill occurring?

10-Has your organization involved in oil spill response training and skill development programs relating to oil spill contingency planning and response?

11-Are the training programs sufficient and effective in implementing the response and preparedness in the event of an oil spill?

12-In your perspective what can be done to improve future training?

13- What are the main challenges for implementing the oil spill contingency plan in Egypt?

14-From your perspective, for the oil spill contingency plan in Egypt, how many times are required to conduct the tier 3 level exercises and drills?

15-Is Egypt willing and capacitated to deal with major oil spills such occur?

16-What is the system available for monitoring the seas to prevent marine oil pollution, especially the Gulf of Suez region?

17- In your opinion, what is required for improving the marine oil pollution monitoring system?

Thank you