MASTER THESIS

The Comparative analysis of marine governance between the Netherlands and Norway for offshore oil pollution

Thesis by
Poornimashree Ashokan
Student Number: 2274868

Thesis Supervisors
Dr. Kris. R.D. Lulofs
Dr. M.J. Arentsen

Faculty of Behavioural, Management and Social Sciences

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ABSTRACT

Oil pollution is considered as one of the major environmental challenges across the globe. Discharges from oil wells or oil rigs, from pipelines and crude oil tankers, are inherent to the sector. The offshore oil production, though beneficial for the economic growth of many countries, is to be held highly responsible for oil pollution in the seas. That pollution severely threatens the marine biodiversity. Some discharges are legal, some others are illegal and sometimes concern accidental spills. To mitigate this problem, several governance measures were initiated for minimizing discharges and thus impacts on the marine environment. This study focuses on oil discharge and efforts to reduce oil pollution. This is done by a comparative analysis of the marine governance measures of Norway and the Netherlands. The aim is to assess which country has better marine governance measures in use to minimize oil pollution to a greater extent. The governance measures studied for this research involve regulations and policies on paper and in use as they are implemented respectively in the Netherlands and Norway. Implementation is seen as a crucial impact on the effectiveness of regulations and policies. Recommendations will be provided on possible improvements.

Keywords: offshore, oil pollution, marine biodiversity, marine governance, the Netherlands, Norway.

TABLE OF CONTENTS

ACKNOWLEDGEMENT 2
ABSTRACT 3
LIST OF TABLES 7
LIST OF FIGURES 8
LIST OF ACRONYMS 11
CHAPTER 1 INTRODUCTION 13
1.1 BACKGROUND 13
1.2 PROBLEM STATEMENT 16
1.3 RESEARCH OBJECTIVE 17
1.4 RESEARCH QUESTIONS 17
1.5 OUTLOOK ON THIS THESIS 17
CHAPTER 2 LITERATURE REVIEW 18
2.1 THE IMPACTS OF OFFSHORE OIL POLLUTION IN NORWAY 18
2.1.1 The Barents Sea 18
2.1.2 Norwegian Sea 19
2.1.3 Oil spill cases in Norwegian Continental Shelf 19
2.1.3.1 Case 1 Ekofisk Bravo oil spill (1977) 19
2.1.3.2 Case 2 Statfjord oil spill (2007) 20
2.2 THE IMPACTS OF OFFSHORE OIL POLLUTION IN THE NETHERLANDS 20
2.2.1 Dutch part of the Wadden Sea 20
2.2.2 Dutch part of the North Sea 20
2.2.3 Oil spill cases in the Dutch Continental Shelf 21
2.2.3.1 Bow Jubail accident in the North Sea (1977) 21
2.3 INTERNATIONAL AGREEMENTS SIGNED FOR THE PREVENTION OF OIL POLLUTION 21
2.3.1 UNCLOS 22
2.3.2 International Maritime Organization (IMO) 23
2.3.3 MARPOL 23
2.3.4 OSPAR Commission 24
2.3.5 Bonn agreement 25
2.4 MARINE GOVERNANCE SYSTEMS IN NORWAY 26
2.4.1 Zero discharge policy 26
2.4.2 Oil spill response policy 26
2.4.3 Marine spatial planning policy 27
2.4.4 Ecosystem Approach – based management policy 28
2.4.5 Regulations 28
2.5 MARINE GOVERNANCE SYSTEMS IN THE NETHERLANDS 30
2.5.1 Trilateral policy in the Wadden Sea 30
2.5.2 Oil spill response policy 32
2.5.3 Marine spatial planning policy 33
2.5.4 Ecosystem based management policy 33

2.5.5 Regulations 34
2.5.5.1 Discharge regulations State Supervision of Mines (SSM) 34
2.5.5.2 Monitoring 34
CHAPTER 3 RESEARCH DESIGN 36
3.1 RESEARCH FRAMEWORK 36
3.2 DEFINING THE CONCEPTS 38
3.3 RESEARCH STRATEGY 38
3.3.1 Research Units 39
3.3.2 Research Boundaries 39
3.4 DATA COLLECTION AND ANALYSIS 39
3.4.1 Data collection 39
3.4.2 Data analysis 40
3.5 DATA VALIDATION 41
3.6 RESEARCH ETHICS 41
3.7 ANALYTICAL FRAMEWORK 41
CHAPTER 4 ANALYSIS OF OFFSHORE OIL POLLUTION AND ITS IMPACTS 43
4.1 INTRODUCTION 43
4.2 OIL SPILLS AND ITS IMPACTS IN NORWAY 43
4.2.1 Barents Sea 45
4.2.2 The Norwegian Sea 46
4.3 OIL SPILLS AND ITS IMPACTS IN THE NETHERLANDS 47
4.3.1 Dutch part of the North Sea 48
4.3.2 Wadden Sea 50
4.4 POINT OF COMMONALITY OF THE SPECIES VULNERABLE TO OIL SPILLS 51
CHAPTER 5 ANALYSIS OF MARINE GOVERNANCE SYSTEMS IN THE NETHERLANDS AND NORWAY 52
5.1 INTRODUCTION 52
5.2 INTERNATIONAL AGREEMENTS ADDRESSING OFFSHORE OIL POLLUTION IN THE NETHERLANDS AND NORWAY 52
5.2.1 UNCLOS 52
5.2.2 IMO 54
5.2.3 MARPOL 54
5.2.4 OSPAR 55
5.2.5 Bonn Agreement 55
5.3 MARINE GOVERNANCE SYSTEMS IN NORWAY 57
5.3.1 Zero discharge policy 57
5.3.2 Oil spill response policy 57
5.3.3 Marine spatial planning policy 58
5.3.4 Ecosystem – Based management policy 59
5.3.5 Regulations 60
5.4 MARINE GOVERNANCE SYSTEMS IN THE NETHERLANDS 61
5.4.1 Trilateral policy 61
5.4.2 Oil spill response policy 62

5.4.3 Marine spatial policy 63
5.4.4 Ecosystem based management policy 64
5.4.5 Regulations 64
CHAPTER 6 DRAWBACKS OF THE IMPLEMENTED POLICIES AND REGULATIONS 66
6.1 INTRODUCTION 66
6.2 DRAWBACKS OF POLICIES AND REGULATIONS 66
6.2.1 Norway 66
6.2.2 The Netherlands 67
CHAPTER 7 ACHIEVEMENTS OF THE IMPLEMENTED POLICIES AND REGULATIONS 70
7.1 INTRODUCTION 70
7.2 NORWAY 70
7.2.1 Zero discharge policy 70
7.2.2 Spill response policy 70
7.2.3 Marine spatial planning policy 71
7.2.4 Ecosystem based management policy 72
7.2.5 Regulations 73
7.2.5.1 Monitoring 73
7.2.5.2 Surveillance 73
7.2.5.3 Prosecution 73
7.3 THE NETHERLANDS 75
7.3.1 Trilateral policy and the Oil spill response policy 75
7.3.2 Marine spatial planning policy 77
7.3.3 Ecosystem based management policy 78
7.3.4 Regulations 79
7.3.4.1 Monitoring 79
7.3.4.2 Surveillance 79
7.3.4.3 Prosecution 79
7.4 IMPROVEMENT OF MARINE GOVERNANCE SYSTEMS IN NORWAY AND THE NETHERLANDS 83
CHAPTER 8 CONCLUSION AND RECOMMENDATIONS 86
8.1 CONCLUSION 86
8.2 RECOMMENDATIONS 87
8.3 FUTURE RESEARCH 88
REFERENCES 89
APPENDICES 97
Appendix 1 Interview questionnaire for Norway and the Netherlands 97
Appendix 2 Consent Form 99
Appendix 3 Interview information 101

LIST OF TABLES

Table 1 - The largest oil spills in Norway related to offshore activities and shipping accidents (SINTEF, 2020) (Page 2).....16

Table 2 - Types of oil spills visible in the Sea (Bonn Agreement, 2016) (page 11).....25

Table 3 - Sources of the Research perspective 37

Table 4 - Collection of data for each sub research questions 39

Table 5 - Data analysis for each sub research questions 40

Table 6 - Marine species and their vulnerability towards offshore oil discharges in the Barents Sea (WWF, 2003) (Forsgren & Christensen-dalsgaard, 2009).....45

Table 7 - Marine species and their vulnerability towards offshore oil discharges in the Norwegian Sea (Norwegian Ministry of Environment, 2009) 47

Table 8 - Marine species and their vulnerability towards offshore oil discharges in the Dutch part of the North Sea (Schulz et al., 2017).....49

Table 9 - Marine species and their vulnerability towards offshore oil discharges in the Wadden sea (Schulz et al., 2017).....50

Table 10 - Space allocations for offshore activities in the Netherlands (The Ministry of Transport, Public Works and Water Management, The Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015).....64

Table 11 - Reduction of offshore oil discharges and spills through aerial surveillance (Bonn Agreement 2008), (Bonn Agreement, 2009), (Bonn Agreement, 2011), (Bonn Agreement, 2012), (Bonn Agreement, 2014), (Bonn Agreement, 2015), (Bonn Agreement, 2017), (Bonn Agreement, 2016).....74

Table 12 - Reduction of offshore oil discharges and spills through aerial surveillance (Bonn Agreement 2008), (Bonn Agreement, 2009), (Bonn Agreement, 2011), (Bonn Agreement, 2012), (Bonn Agreement, 2014), (Bonn Agreement, 2015), (Bonn Agreement, 2017), (Bonn Agreement, 2016).....82

Table 13 - Improvement of marine governance systems in the Netherlands and Norway 85

Table 14 - Interview information.....101

LIST OF FIGURES

Figure 1 - Oil spills in the sea (ITOPF, 2011) (page 2) 13
Figure 2 - Effects of oil spills in the marine species (Yuewen & Adzigbli) (page 2) 14
Figure 3 - Oil production in the Netherlands (Worldometer, 2017) 14
Figure 4 - Offshore oil production in Norway (U.S. Energy Information Administration, 2019) (page 2) 15
Figure 5 - Dead Guillemot in the Barents Sea (WWF, 2003) (page 6) 18
Figure 6 - Ekofisk Brave oil spill (European Maritime Safety Agency, 2013) (page 37) 19
Figure 7 - Statfjord oil spill (European Maritime Safety Agency, 2013) (page 38) 20
Figure 8 - Bow Jubail spill in the Netherlands (Offshore Energy, 2018) 21
Figure 9 - Exclusive Economic Zone (European Maritime Safety Agency, 2013) (page 9) 23
Figure 10 - Special areas under MARPOL (European Maritime Safety Agency, 2013) (page 10) 24
Figure 11 - Flow diagram of emergency preparedness in Norway (Know & Arbo, 2014) 27
Figure 12 - Spatial planning process for offshore oil operations in Norway (Hoel, 2010) 28
Figure 13 - Norwegian Environmental Assessments for offshore operations (Bakke et al., 2011) (page 3) 29
Figure 14 - Flow diagram of regulating authorities for offshore oil production in NCS (Arstad, 1995) 29
Figure 15 - Organizational structure of the Trilateral policy (Klöpper, 2019) (page 4) 30
Figure 16 - Wadden Sea Area and the Conservation Area (Schulz et al., 2017) (page 6) 31
Figure 17 - Collaboration scheme for the smeared birds (Netherlands Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea, 2009) 32
Figure 18 - Organizational structure for oil response policy in the Netherlands (ITOPF, 2018) 33
Figure 19 - Flow diagram of regulating authorities for offshore oil production in NCS (Ministry of Economic Affairs, 2013) 34
Figure 20 - Flow diagram of regulating authorities for monitoring in offshore oil production in NCS (Dutch Fuel Oil Victim Research, 2020) 35
Figure 21 - Schematic representation of the research framework 37
Figure 22 - Schematic representation of the analytical framework 41
Figure 23 - Oil spill cases and its spill volume in Norway (SINTEF, 2020) (page 2) 43
Figure 24 - Ekofisk oil spill and its impacts on marine species (Dahl et al., 1983) 44
Figure 25 - Statfjord oil spill and its impacts on marine species (Kystverket, 2016) 44
Figure 26 - Barents Sea oil discharge impacts on the marine species (WWF, 2003) (Forsgren & Christensen-dalsgaard, 2009) 45
Figure 27 - Norwegian Sea oil discharge impacts on the marine species (Norwegian Ministry of Environment, 2009) 46

Figure 28 - Oil spill and its spill volume in the Dutch part of the North Sea (Dutch Safety Board, 2020) 48
Figure 29 - Dutch part of the North Sea oil spill impacts on the marine species (Dutch Safety Board, 2020) 48
Figure 30 - Dutch Part of the North Sea oil discharge impacts on the marine species (Hugenholtz, 2008) (Leopold, 2017) (Hara & Morandin, 2010) 49
Figure 31 - Wadden Sea oil discharge impacts on the marine species (Schulz et al., 2017) 50
Figure 32 - Point of commonality for most affected species due to offshore oil spills in the Netherlands and Norway 51
Figure 33 - Maritime zones in Norway (UNCLOS, 2009) (Harsson & Preiss, 2011) (The Arctic Institute Center for circumpolar security studies, 2020) 53
Figure 34 - Maritime zones in the Netherlands (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015) 54
Figure 35 - Major role of IMO (International Maritime Organization, 2009) 54
Figure 36 - MARPOL regulations (Bonn agreement, 2015) 55
Figure 37 - OSPAR regulations (Carpenter, 2015) (OSPAR commission, 2016) 55
Figure 38 - Aerial surveillance process in Bonn agreement (Bonn Agreement, 2015) 56
Figure 39 - Aerial surveillance in Norway and the Netherlands (Bonn Agreement, 2015) 56
Figure 40 - Precautionary principle (The Norwegian Oil Industry Association, 2005) 57
Figure 41 - Oil spill response in Norway performed by NCA (Norwegian Coastal Administration, 2020) 58
Figure 42 - Marine spatial planning in Norway (Norwegian Ministry of Environment, 2009) 59
Figure 43 - Five-point scale based on the vulnerability of the species due to the oil spills (Norwegian Ministry of Environment, 2009) 59
Figure 44 - Oil discharge regulations in Norway (Arstad, 1995) (Bakke et al., 2011) (Bennear, 2015) (Lee & Neff, 2011) 60
Figure 45 - Norwegian oil spills prosecution triangle (Library of Congress, 2020) 61
Figure 46 - Trilateral policy in the Netherlands (South Baltic Programme, 2010) (Klöpper, 2019) 62
Figure 47 - Oil spill response in the Netherlands (ITOPF, 2011) 63
Figure 48 - Marine spatial planning in the Netherlands (Vrees, 2019) (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015) 63
Figure 49 - Ecosystem based management in the Netherlands (Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2016) 64
Figure 50 - Discharge regulations in the Netherlands (European Space Agency, 2020) 65

Figure 51 - Prosecution triangle for oil discharges in the Netherlands (Dakhorst, 2015) 65
Figure 52 - Diagrammatic representation of drawbacks in policies and regulations in Norway (Norwegian Oil and Gas Association, 2017) 67
Figure 53 - Drawbacks of policies and regulations in Norway (Norwegian Oil and Gas Association, 2017) 67
Figure 54 - Diagrammatic representation of drawbacks in policies and regulations I the Netherlands Vollaard, 2017) (Camphuysen & Vollaard, 2015) 68
Figure 55 - Drawbacks of policies and regulations in the Netherlands (Vollaard, 2017) (Camphuysen & Vollaard, 2015) 69
Figure 56 - Achievement of reducing offshore oil discharges through zero discharges (Norwegian Environmental Agency, 2020) (Norwegian Petroleum, 2020) 70
Figure 57 - Reduction of oil spills in Norway (Norwegian Environmental Agency, 2020) 71
Figure 58 - Achievement of marine spatial planning policy in Norway (OECD, 2020) 71
Figure 59 - Ecosystem based management policy (Olsen et al., 2007) (Norwegian Environmental Agency, 2020) 72
Figure 60 - Achievements of regulations in Norway 73
Figure 61 - OSPAR data showing reduction in oil discharges and its concentrations in Norway (OSPAR, 2015) 74
Figure 62 - Stringent prosecution in Norway 75
Figure 63 - Example for stringent prosecution for offshore oil spills in Norway (Cedre, 2020) 75
Figure 64 - Achievement of trilateral policy in the Netherlands (Schulz et al., 2017) 76
Figure 65 - Key elements for achieving the reduction of offshore oil spills in the Netherlands (South Baltic Programme, 2010) (Klöpper, 2019) 76
Figure 66 - Main factors that were responsible on the achievement of marine spatial planning policy (European Commission, 2018) 77
Figure 67 - Major factors for the achievement of the marine spatial planning policy in the Netherlands (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015) 78
Figure 68 - Achievements of the regulations in the Netherlands 79
Figure 69 - OSPAR data showing reduction in oil discharges and its concentrations in the (Netherlands (OSPAR Commission, 2016) 80
Figure 70 - Declination of dead sea birds from offshore oil pollution (Camphuysen, 2019) 81
Figure 71 - Stringent prosecution for offshore oil pollution in the Netherlands 82

LIST OF ACRONYMS

ACOPS	Advisory Committee on Protection of the Sea	22
BAT	Best Available Technologies	55
BEP	Best Environmental Practices	55
DCS	Dutch Continental Shelf	21
EA	Ecosystem Approach	28
ECM	Environmental Condition Monitoring	29
EEM	Environmental Effects Monitoring	29
EEZ	Exclusive Economic Zone	22
EIA	Environmental Impact Assessment	28
EIF	Environmental Impact Factor	26
EMS	Ecological Main Structure	31
ERS	European Remote Sensing	35
EZ	Ministry of Economic Affairs	34
IMO	International Maritime Organization	21
IOPC	International Oil Pollution Compensation	22
ITOPF	International Tankers Owner Pollution Federation Limited	13
IUCN	International Union for Conservation of Nature	22
ICZM	Integrated Coastal Zone Management	61
I & M	Ministry of Infrastructure and the Environment	32
LME	Large Marine Ecosystem	18
LNV	Ministerie Van Landbouw, Natuur en Voedselkwaliteit (Ministry of Agriculture, Nature and Food Quality)	31
MSFD	Marine Strategy Framework Directive	33
MPAs	Marine Protected Areas	33
MARPOL	International Convention for the Prevention of Pollution from Ships	21
MEPC	Marine Environmental Protection Committee	23
NCA	Norwegian Coastal Administration	26
NCS	Norwegian Continental Shelf	19
NGO	Non – Governmental Organization	22
NIOZ	Netherlands Institute for the Sea Research	31
NPCA	Norwegian Pollution Control Authority	16
NPD	Norwegian Petroleum Directive	16
NSD	North Sea Directorate	34
NSN	North Sea Network	24
NSO	Dutch Fuel Oil Victim Study	35
NZG	Dutch Sea-Bird Group	31
OECD	Organization for Economic Co-operation and Development	13
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic	21

PBA	Planning and Building Act	27
PEEN	Pan European Ecological Network	31
PKB	Key Planning decision of the Wadden Sea	31
PSSA	Particularly Sensitive Sea Area	30
RWS	Rijkswaterstaat	14
SACs	Special Areas of Conservation	31
SAPs	Special Protection Areas	31
SAR	Synthetic Aperture Radar	25
SINTEF	Stiftelsen for Industriell og Teknisk Forskning (The foundation for Scientific and Industrial Research at the Norwegian Institute of Technology	15
SLAR	Side Looking Airborne Radar	25
SPCA	State Pollution Control Authority	16
SSM	State Supervision of Mines	34
SZW	Ministry of Social Affairs and Employment	34
TGC	Trilateral Government Council	30
TMAP	Trilateral Monitoring Assessment Programme	61
TWSC	Trilateral Wadden Sea Cooperation	30
UNCLOS	United Nations Convention on the Law of the Sea	21
UNCTAD	United Nations Conference on Trade and Development	22
WWF	World Wildlife Fund	15

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Seas, covering 75% of the world, contains valuable natural resources, food, energy, and various minerals, offering economic growth and human well - being (Prasad Singh et al., 2019) (Grip, 2017). To acquire these natural resources, the most common activities performed in the sea were commercial shipping, fisheries, and offshore oil production (Rayner et al., 2019). Generally, offshore oil production is considered as a valuable source and activity that facilitates economic growth in OECD and non-OECD countries and has resulted in huge oil demand (Prasad & Anuprakash, 2016). Globally, the total offshore oil production has been increased up to 25% (21.5 million barrels per day) (Florence, 2015).

Since there is an increased oil demand, the production activities in the oceans were expanded, resulting in oil pollution in the marine environment and this oil pollution is in the form of oil spills releasing toxic substances in the marine environment that could be from legal (normal operations) or illegal as in accidental spills in offshore rigs blowout with the tankers carrying the crude oil. Moreover, the dissemination of oil spills on the sea surface is driven by the waves, winds, and the currents (ITOPF, 2011). Also, the oil toxicity level in the marine environment relies on the (figure 1 below) composition and the characteristics of the oil spills in the sea (Prasad & Anuprakash, 2016).

- The oil spills with low viscosity float on the sea surface and these spills do not reach the water columns in depth.
- The oil spills with high dilution capacity can penetrate easily into the water columns and reaches the profundity of the sea surface.
- If the release of oil in the marine environment persists for a longer period until the time of release, the visibility of spills can be seen, and eventually, the oil substances were diluted and infiltrate into the water columns currents (ITOPF, 2011).

Figure 1- oil spills in the sea (ITOPF, 2011) (page 2)

Typically, the contact of the marine species with oil spills was through the following ways,

- Either direct consumption of oil substances or by eating prey that was in contact with oil (ingestion).
- Marine species having immediate contact with the oil spills (Ober, 2019).

Therefore, the offshore oil spills have serious effects on marine species; marine wildlife, marine mammals, and marine sea birds and in fatal cases to death. These effects were skin irritation, weakening of the immune system, reproductive damage, and liver disease (Yuewen & Adzigbli, 2019).

Figure 2 below explains the effects of offshore oil spills in the marine ecosystem.

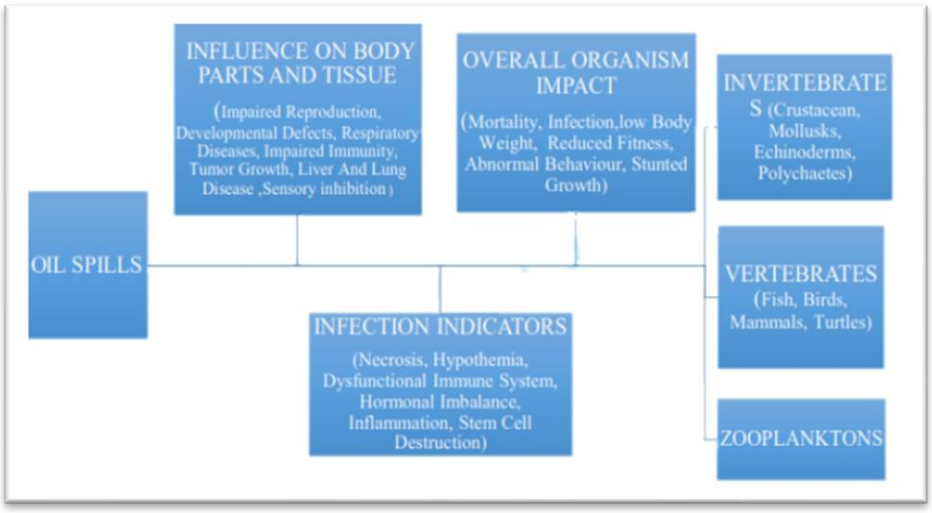


Figure 2- Effects of oil spills in the marine species (Yuewen & Adzigbli) (page 2)

Concerning the Netherlands, the total oil production accounts for 70,128.43 barrels per day (figure below) (Worldometer, 2017). As a result, this oil production has led to a serious problem in the marine environment. To overcome this problem, the Netherlands has formulated its policies and regulations for mitigating offshore oil pollution. (Leopold, 2017).

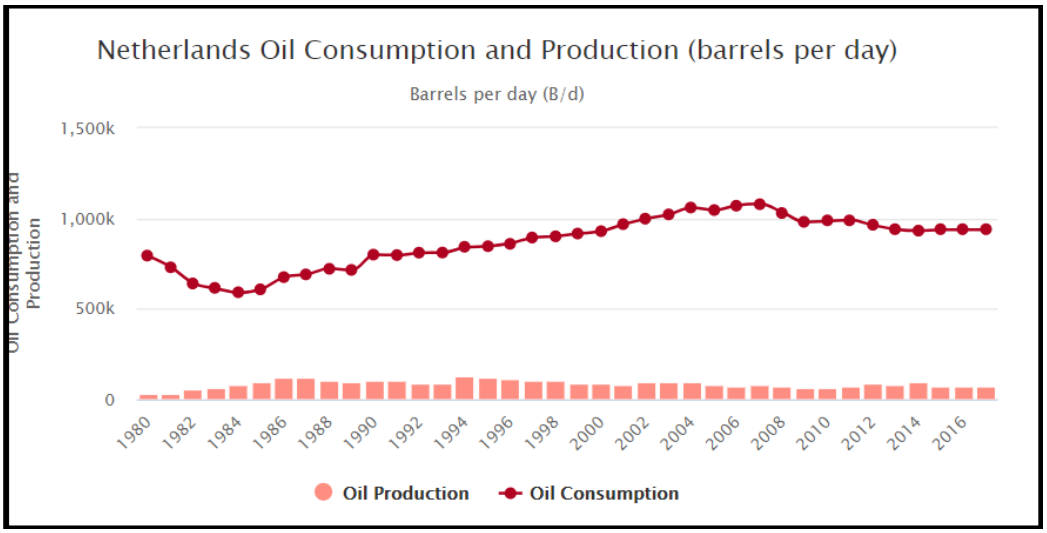


Figure 3- Oil production in the Netherlands (Worldometer, 2017)

The government authorities and their role in addressing the oil spills were as follows:

- Rijkswaterstaat (RWS) (the Dutch maritime and marine management organization) – Authority responsible for cleaning the oil spills in the Sea.
- Municipalities – Responsible for managing the coastal areas.
- Ministry of Agriculture, Nature, and Food quality – Responsible for implementing the policy for marine species protection.
- The Ministry of Infrastructure and Development (Infrastructuur Milieu) – Responsible for managing the spatial activities in the Dutch part of the North Sea and also in spill response within their territory (Vrees, 2019).
- Petroleum Activities Act is the liability act passed for penalizing the offender responsible for the oil spills.

- The mining act is the important legislative body for issuing for the licensing of offshore exploration and oil production operations.
- Civil Liability Convention is the legal authority for issuing the liability damage of the oil spills in the Netherlands (Ministry of Infrastructure and Water Management, 2016).

Even with the implemented policies and regulations, offshore oil spills appear to be an ongoing issue in the Netherlands that has resulted in significant loss of marine species (Hara & Morandin, 2010) (Schulz et al., 2017). As a notable example, the Bow Jubail (2018) accident, the major crude oil tanker accident in the port of Rotterdam where around 217.4 tonnes of crude oil was spilled on the sea. The effects had profound impacts on the marine flora and around 100 sea birds were discovered with oil slicks on their bodies (Dutch Safety Board , 2020).

In order to highlight the gaps that led to the mentioned ecological problems, this study focused on understanding the other marine governance interventions for solving this problem. In this regard, the researcher chose Norway as a comparative case to mirror the policy and regulation gaps in the Netherlands. The selection of Norway was based on the fact that it is one of the world's leading offshore oil-producing countries in the offshore oil production in the world producing up to 1.98 million barrel per day and with the exports; approximately 1.37 million barrels/ day (figure below) (Norwegian Ministry of Trade, Industry and Fisheries & Norwegian Ministry of Petroleum and Energy , 2017) (U.S Energy Information Administration, 2019).

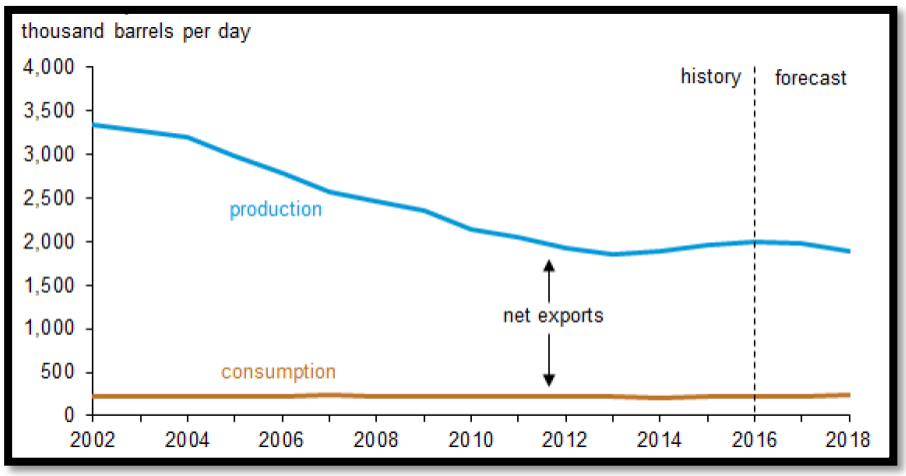


Figure 4- Offshore oil production in Norway (U.S Energy Information Administration, 2019) (page 2)

Similarly, in Norway, offshore oil pollution had detrimental impacts on the marine environment (WWF, 2003) (Norwegian Ministry of Environment , 2009). As a result, policies and regulations were implemented for the prevention and control of offshore oil spills in the marine environment. Though they are similar in intent, in the application they are different (Knol & Arbo, 2014) (Norwegian Ministry of Environment , 2009) (Norwegian Coastal Administration , 2020). Moreover, the Norwegian authorities were dynamic in developing many policies and regulations in the previous years as a response to several oil spill cases. These cases were shown in table 1 (SINTEF, 2020).

Offshore (crude oil, tonnes)			Vessels (fuel oil, tonnes)			
Year	Name	Volume	Year	Name	Location	Volume
1977	Ekofisk	20000	1981	Deifovos	Heleglandskysten	1000
1992	Statfjord	1000	1989	Mercantile Marica	Sognesjøen	340
2003	Draugen	750	1990	Azalea	Haugesund	330
2005	Norne	400	1991	Sonata	Ålesund	200
2006	Draugen	100	1992	Arisan, Runde	Runde	150
2007	Statfjord	4400	1997	Leros Strength	Karmøy	150
2008	Statfjord	70	2000	Green Ålesund	Haugesund	100
			2004	Rocknes	Bergen	560
			2007	Server	Fedje	520
			2009	Full City	Langesund	1200

Table 1- The largest oil spills in Norway related to offshore activities and shipping accidents (SINTEF, 2020) (Page 2)

The governmental bodies accountable for implementing the policies and regulations in Norway were:

- The Norwegian Petroleum Directive (NPD) is the regulation that creates authority and procedures for issuing the offshore oil exploration and production license.
- The Norwegian Pollution Control Authority (NPCA) monitors the oil discharges in the sea.
- The State Pollution Control Authority (SPCA) monitors the oil discharges in the sea
- The Norwegian Ministry of Energy and Industry is responsible for regulating the oil discharges (Bakke et al., 2011).
- The Norwegian Ministry of Environment is the legal directive that undertakes the environmental issues in Norway (Norwegian Ministry of Environment , 2009).

All in all, this study used similarities and differences between the two countries in carrying out a comparative analysis based on the marine governance systems. The reason for this comparison is to identify the opportunities for the exchange of relevant experience in this field. Therefore, recommendations were provided for both countries to improve their marine governance.

1.2 PROBLEM STATEMENT

The offshore oil production in the Netherlands and Norway is responsible for oil pollution in the sea and harms the marine biodiversity. Physically, it takes more than 25 years to remove the oil spills from the sea. The occurrence of oil pollution either on a minor scale or major scale has serious biological effects on the marine environment (Carpenter, 2019). To mitigate this problem, governance measures were undertaken by adopting policies and regulations. This research assesses the drawbacks in the policies and regulations that hinder the effective marine governance between the two countries and in identifying the country that has assisted better marine governance in minimizing oil pollution. The research also provides some recommendations for both the countries based on featuring their achievements of policies and regulations for improving their marine governance.

1.3 RESEARCH OBJECTIVE

The objective of this research is to compare the marine governance systems of the Netherlands and Norway by analyzing the recent incidents and the influencing factors to identify the involved risks and the drawbacks in each country's policies and regulations. Furthermore, these to elaborate on the extent of reducing oil pollution. Accordingly, recommendations were provided for improving their marine governance systems.

1.4 RESEARCH QUESTIONS

Do the governance systems of the Netherlands and Norway address oil discharges in an appropriate way, and how could these systems be improved?

To answer the core question, the following sub-questions were made,

1. How do oil-related activities, risks, and incidents in the Netherlands and Norway damage the Dutch and the Norwegian marine eco-systems?
2. How do the governance systems in the Netherlands and Norway prevent offshore oil pollution?
3. Are the governance systems in use in the Netherlands and Norway appropriately taking action to reduce oil discharge and are the efforts effective, efficient, and legitimate?
4. How can the governance systems in the Netherlands and Norway be improved?

1.5 OUTLOOK ON THIS THESIS

In chapter 2, the results of the literature study were done to provide backgrounds and to contextualize and embed the research was presented. International agreements and governance arrangements in Norway and the Netherlands are presented in a multi-level perspective. In chapter 3 the research design is presented. In chapters 4 to 7 the research questions 1 to 4 are sequentially elaborated. Thereafter, in chapter 8 the conclusions and some observations and outlooks regarding the problem statement, research and practice will be discussed.

CHAPTER 2 LITERATURE REVIEW

This chapter presents the results of the literature study done to provide backgrounds and to contextualize and embed the research. The outlook of the chapter: in 2.1 the impacts of the offshore oil pollution in the Netherlands and Norway were described, in section 2.2 International agreements are mentioned and international agreements signed aiming at mitigating the oil pollution are described. Thereafter in section 2.3, Norwegian marine governance measures are described and 2.4, Dutch marine governance measures are described.

2.1 THE IMPACTS OF OFFSHORE OIL POLLUTION IN NORWAY

The following illustration below gives the general impacts of oil pollution in the Dutch part of the Sea and the Wadden Sea and along with the case study.

2.1.1 The Barents Sea

The Barents Sea in the Northeast Atlantic is highly recognized for its vast marine ecosystem and it accounts for one of the Large Marine Ecosystem (LME) among the 64 LMEs in the world. The advection mechanisms from the Norwegian sea and the local production of plankton support the growth of large fish communities, benthos, sea birds, and marine mammals. In addition to that, the North Sea Arctic cod (*Gadus morhua Linnaeus*) in the Barents Sea ranks first in the world since it contains highest cod stock than any other countries in the world and the Norwegian spring-spawning herring (*Clupea harengus*) living in this sea has been recorded with significant population growth for a longer period (Forsgren & Christensen-dalsgaard, 2009).

Being situated in the high latitude, with low temperature and insufficient light decreases the tendency of the sea in degrading the oil and results in the stagnation of petroleum hydrocarbons (Forsgren & Christensen-dalsgaard, 2009). Generally, these substances possess high volatility and this does not help the oil slicks to escape from the ice. Subsequently, this stagnation results in the increase of toxicity in the sea and destroy the marine flora and fauna (WWF, 2003).

On the other hand, the sea bird colonies in the Barents Sea were ecologically valued across the globe and thus valued as one of the largest sea bird colonies in the world. The most important species in the colonies were Puffin (*Fratercula*), common guillemot (*Uria aalge*), little auk (*Alle alle*), razorbill (*Alca torda*) and black guillemot (*Cepphus grille*). These above-mentioned species were highly affected by the oil spills in this sea. Apart from these species, the diving ducks (*Aythyinae*) also have considerable impacts on oil spills where the slicks sticking to the feathers result in incapability in flying and leads to death. Despite the major spills, minor incidents also caused major damage to these species. It was identified that in Varanger-fjord, Brünnich's guillemot (can be seen in figure 5) was found dead because of the operational oil spills in the Barents Sea with an increased mortality rate between 10 and 20 thousands (WWF, 2003).

Figure 5 - Dead Guillemot in the Barents Sea (WWF, 2003) (page 6)

2.1.2 The Norwegian sea

The biodiversity in the Norwegian Sea is enriched with sea bird populations. There are total of 870,000 bird species with 127000 breeding ones. From the breeding species, the most common were Atlantic puffin (*Fratercula arctica*), black-legged kittiwake (*Rissa tridactyla*), common guillemot (*Uria aalge*) and the Northern fulmar (*Fulmarus glacialis*) (International Council for the Exploration of the Sea, 2019).

Conducting various offshore oil production operations in the Norwegian Sea, the discharges or the spills have reduced the population of the following species, viable fish stocks namely, Norwegian spring-spawning herring (*Clupea harengus L*), blue whiting (*Micromesistius poutassou*), Northeast Atlantic mackerel (*Scomber scombrus Linnaeus*) and Northeast Arctic saithe (*Pollachius virens*). Other fish species in the deep Norwegian sea, blue ling (*Molva dypterygia*), Greenland halibut (*Reinhardtius hippoglossoides*) and redfish (*Sciaenops ocellatus*) were also affected by oil pollution (Norwegian Ministry of Environment, 2009).

Despite the aforementioned biodiversity species in the Norwegian Sea, the sea birds are the most affected ones from offshore oil pollution. Their vulnerability towards the oil spills depends on the following characteristics, size, and present population, quick recovery of bird species, and the proportionality of populations. These bird species having immediate contact with the oil spills cause serious physical as well as biological damage and sometimes lethal effects. These lethal effects on the sea birds were due to short-term acute exposure, toxic exposure, and long-term interactions with the affected ones (Forsgren & Christensen-dalsgaard, 2009). Further, the most affected ones in the offshore oil spills were North fulmar (*Fulmarus glacialis*), less black-backed gull (*Larus fuscus*), and black-legged kittiwake (*Rissa tridactyla*) (Norwegian Ministry of Environment, 2009).

2.1.3 Oil spill cases in Norwegian Continental Shelf

Besides the several spill cases, the below mentioned cases were highly considered for its spill volume.

2.1.3.1 Case 1 Ekofisk Bravo oil spill (1977)

The blowout occurred on 22nd April 1977 and was recognized as the largest oil spill in the Norwegian Continental Shelf (NCS) (figure below). Around 32,000 tonnes (equal to 202,380 barrels) of oil were released into the sea. Subsequently, the investigations were undertaken by the Norwegian Pollution Control Board in which the ecological damage was found to be low (European Maritime Safety Agency, 2013). According to (Dahl et al., 1983), the effects were mainly on the marine phytoplankton and zooplankton at the community level. These effects in these marine organisms were due to the modifications of diatoms that alters the regular functioning of the marine microorganisms.

Figure 6- Ekofisk Brave oil spill (European Maritime Safety Agency, 2013) (Page 37)

2.1.3.2 Case 2 statfjord oil spill (2007)

The statfjord oil spill is the second-largest oil spill in the NCS after Ekofisk blowout. About, 3000 tonnes of oil were released in the sea during the loading operations in the tanker (figure below) and the total coverage of oil in the sea was up to 23 km^2 (European Maritime Safety Agency, 2013). Since the spill was diluted at a faster rate, the fishes and other marine organisms were affected by the oil spills (Kystverket, 2016).

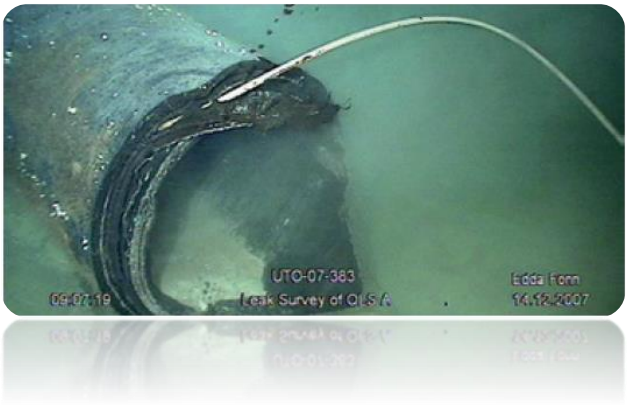


Figure 7- Statfjord oil spill (European Maritime Safety Agency, 2013) (page 38)

2.2 THE IMPACTS OF OFFSHORE OIL POLLUTION IN THE NETHERLANDS

2.2.1 Dutch part of the Wadden Sea

Wadden sea located in the intertidal zone stretches on the coast of the three countries, the Netherlands, Germany, and Denmark. The Wadden Sea is one of the richest marine biodiversity reserves with several microhabitats that are responsible for the ecological functions of the sea. In general, there are 10,000 species of marine flora and fauna exist in the Wadden Sea. About 2300 species exist in the salt marshy areas and 2700 species in the marine and brackish areas alone. Also, it is the dwelling area for several diversified species, particularly migratory bird species. In total there are 52 variety of bird species and among these 41 were migratory bird species. Moreover, the formation of tidal flats and the sea marshes were also responsible for developing the marine ecosystems in the Wadden Sea and considered as the largest habitat dwelling in Europe. The Wadden Sea ecosystem highly accounts for natural, scientific, economic, and social value (Schulz et al., 2017).

Moreover, Wadden sea is located in the North of the country and in open interaction with the North Sea, was easily affected by offshore oil pollution. The impacts of oil spills in the birds were first detected in the Dutch part of the Wadden Sea. The bird species, shelduck (*Tadorna*), common Eider (*Somateria mollissima*), and Herring Gull (*Larus argentatus Pontoppidan*) become highly vulnerable to the oil spills in the Wadden Sea (Schulz et al., 2017).

2.2.2 Dutch part of the North Sea

The North Sea belonging to the Atlantic Ocean is situated along the coastline of the following countries, France, Germany, the Netherlands, Belgium, Denmark, Norway, and the United Kingdom. The total area of the North Sea is about 575,000 km^2 with 57, 000 km^2 alone is Dutch territory. The pelagic bird species found on the Dutch part of the Sea were cormorant (*Phalacrocoracidae*), black-backed gull (*Larus marinus*), common scoter (*Melanitta nigra*) and Eider duck (*Somateria* mollissima), red-throated diver (*Gavia stellate*) and arctic tern (*Sterna paradisaea*) and the most common bird species is the Common Guillemot (*Uria aalge*). In addition to that, the Dogger bank near the Dutch coastline consists of varieties of bird species, kittiwake (*Rissa tridactyla),* Razorbill (*Alca torda*), gannets (*Sula bassana*) and gulls (*Laridae*) and other marine species, plaice *(Pleuronectes),* sand eel *(Ammodytes marinus),* haddock *(Melanogrammus platessa) and* white-sided dolphin *(Lagenorhynchus acutus)* (Hugenholtz, 2008).

During the offshore oil operations, the discharged oil ultimately poses deadly effects on the breeding birds within the vicinity of that area. The decrease in breeding birds could reduce the existence of many diversified bird species (Leopold, 2017).
Correspondingly, the pelagic birds dwelling near the operational areas get extremely affected because of their feathers being stuck in the oil slicks which eventually halt the birds from flying and changes the physical characteristics with increased hypothermia. Additionally, the oil slicks on the water surface will decrease the floating capacity (Buoyancy) of the birds on the sea. Other effects include loss of reproductive capacity in the breeding birds and requires longer duration for breeding maturity (Hara & Morandin, 2010).

2.2.3 Oil spill cases in the Dutch Continental Shelf (DCS)

The following case study below explains the oil spills in the Dutch Continental Shelf (DCS)

2.2.3.1 Bow Jubail accident in the North Sea

The Bow Jubail accident (2018), in the port of Rotterdam, is considered as one of the major oil spill accidents in the Netherlands. During the accident, around 217.4 tonnes of oil is released into the sea (figure below). The spills had significant effects on marine flora and fauna and more than 500 sea birds were found with oil slicks on their body (Dutch Safety Board, 2020) (Dutch Safety Board, 2020). Moreover, 1000 mute swans (*Cygnus olor*) with cormorants (*Phalacrocoracidae*) and ducks (*Anatidae*) were chiefly affected by oil spills (European Oiled Wildlife Assistance, 2019).

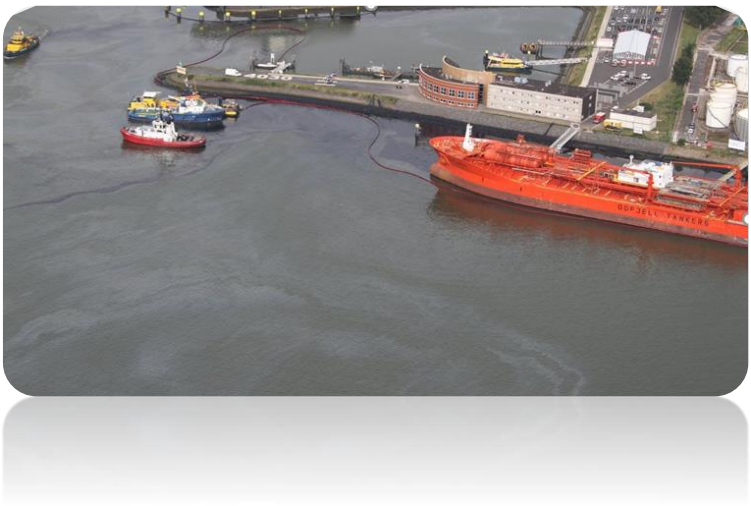


Figure 8- Bow Jubail spill in the Netherlands (Offshore Energy, 2018)

2.3 INTERNATIONAL AGREEMENTS SIGNED FOR THE PREVENTION OF OIL POLLUTION

The offshore oil production and transport of oil and oil semi-products are a highly internationalized and global sector. Coordinated supra national initiatives to deal with risks and spills started more than half a century ago. This section elaborates on some major international organizations and international treaties. This contextualizes the international multi-level setting of national marine governance systems like in the Netherlands and Norway. The oil spill issue has empowered the world nations to develop governance measures in alleviating oil pollution with several international agreements and treaties. At first, the International Maritime Organization (IMO) of 1948 is the first international agreement signed for regulating the sea activities. Other international agreements signed for the oil pollution prevention are United Nations Convention on the Law of the Sea (UNCLOS) of 1982, The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) of 1978, International Convention for the Prevention of Pollution from Ships (MARPOL) of 1973 and Bonn agreement of 1969.

These agreements are typified with regulations and policies for controlling, monitoring, and preventing the oil spills. The responsibilities of the above agreements involve controlling and monitoring of the oil spills in the marine environment (Anyanova, 2012) (Carpenter, 2011). Apart from the above-mentioned International organizations, the private sectors also play a crucial role in combating oil pollution. Accredited organizations engaged in preventive tasks for oil spills are:

- The International tankers Owner Pollution Federation Limited (ITOPF) was one of the earliest organizations formed to prevent the oil spills were of 1968 which is authoritative for the oil spill compensation scheme (ITOPF , 2019).
- ACOPS (Advisory Committee on Protection of the Sea) is an Environmental NGO that underpins the administration in conducting exploration research based on oil pollution. The administrative bodies include the OSPAR convention, the Arctic Council, the International Maritime Organization, the International seabed Authority and the London Convention (ACOPS, 2020).
- IUCN (International Union for Conservation of Nature) has a primary role in preserving and maintaining marine biodiversity (United Nations, 2012).
- WWF (World Wildlife Fund) for nature is an environmental NGO that handles marine species management and takes action on clean-up operations in the seas (United Nations, 2012).
- International Oil Pollution Compensation (IOPC) was built up in the year 1992 in which the legal framework is begun from the other conventions of civil liability for pollution damage of 1969 (also known as civil liability convention) and the International Convention on the Establishment of an International Fund for oil pollution of 1971 (also known as fund convention) which is also compensation scheme for the oil spills (IOPC FUNDS , 2019) (UNCTAD , 2012).

After this overview, we now take a closer look at some of the major international treaties.

2.3.1 UNCLOS

UNCLOS (United Nations Convention on the Law of the Sea) came into practice in the year 1982 with a general agreement for 168 member states consisting of the legal framework related to various sea activities (Pretlove & Blasiak, 2018). The main aspect of this legal framework is the Exclusive Economic Zone (EEZ) where the member states engaged in the sea activities should ensure that these activities should not exceed 12 nautical miles (figure 9) starting from the baseline of the activity area to the territory (within the territorial sea borders). In addition to that, the states were permitted to use the coastal zone beyond their territory (contiguous zone) but should be below 24 nautical miles which are relatively followed in offshore operations. The main purpose of EEZ is to ensure the protection and preservation of the marine species through coordinated responsibility by the member states (UNCLOS, 2012).

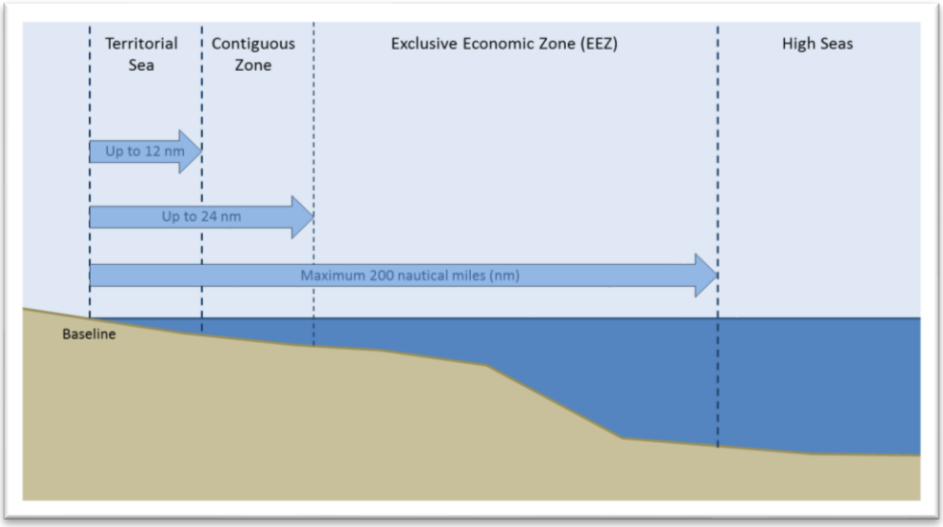


Figure 9- Exclusive Economic Zone (European Maritime Safety Agency, 2012) (page 9)

Regarding offshore oil production, the member states have been issued with sovereign rights not only for oil exploration and production but also for conserving the marine species within the EEZ. To enhance the production activities in EEZ and the legal decisions in certifying artificial islands, installation structures (oil wells and oil rigs) were given with permits for each member states (UNCLOS, 2012).

2.3.2 International Maritime Organization (IMO)

International Maritime Organization was implemented in 1959 with a general agreement signed among 164 countries containing strategical objectives in protecting the marine environment through the enforcement of several regulations in mitigating the oil pollution (International Maritime Organization, 2011) (Singhota, 1995). The technical department of IMO, the legal committee, Marine Environmental Protection Committee (MEPC), the technical Cooperation committee, and the facilitation committee monitors and provides data on the oil spills (shipping and offshore operations) (International Maritime Organization, 2011).

Among the various committees, the Marine Environment Protection Committee of 1973 takes the major action in preventing oil pollution through offshore activities.

The member states addressing the oil pollution from offshore operations do this as follows,

- Organizing assembly with the member countries in discussing the oil pollution problems and the pollution legislation along with state response towards the oil spills.
- Offering technical support in regional as well as a national scale.

Additionally, the International Convention for the Prevention of Pollution (MARPOL 73/78) came into practice in 1973 through IMO (European Maritime Safety Agency , 2012).

2.3.3 MARPOL

The International Convention for the Prevention of Pollution (MARPOL 73/78) (1973) of Annexure I addresses the oil spills in the seas. It regulates the oil discharge from the various sources, legal and illegal oil discharges from the ships (merchandise ships and ships carrying crude oil), operational oil discharges, and the accidental spills from the oil rigs or oil wells during the operations (MARPOL 73/78 Practical Guide, 2015). MARPOL is one of the important international conventions that are being managed by IMO, and also called as “Marine Environment Protection Act”. According to Annexure I of MARPOL 73/78, the member states, flag state, port state, and the coastal state were agreed to coordinate in identifying the oil spills through monitoring, sufficient procedures in reducing the complexity in reporting and the gathering of evidence of the reported oil spills (Carpenter, 2015).

According to MARPOL, special areas in the seas (mentioned in figure 10 below) were considered as the important ecological areas and the most densified areas where several human activities, shipping activities, and offshore operations were protected and monitored. The oil discharges in those special areas were highly prohibited and considered as offensive action (European Maritime Safety Agency , 2012).

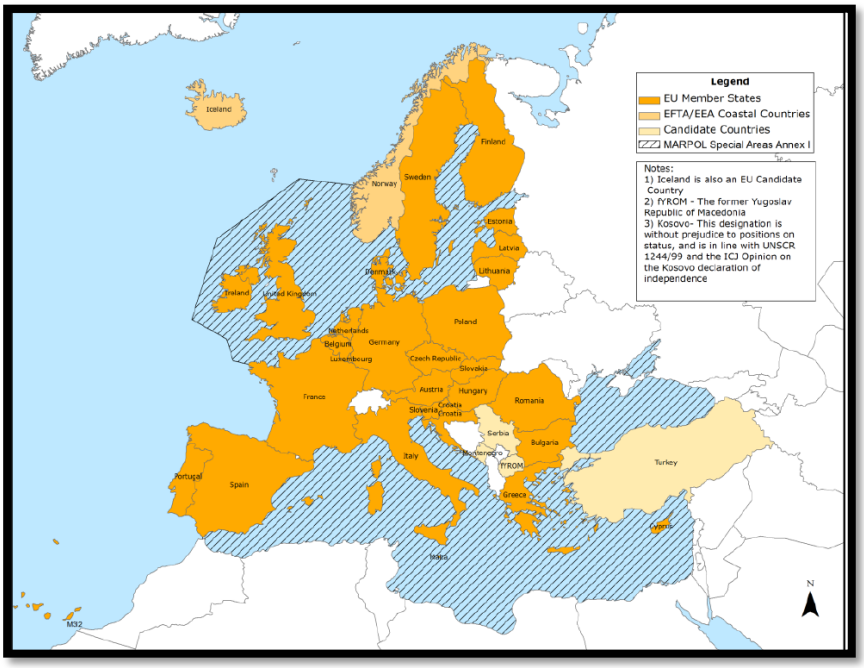


Figure 10 - Special areas under MARPOL (European Maritime Safety Agency, 2012) (page 10)

On the other hand, the oil operations in the rigs and the crude oil tankers undergo surveys and inspections to determine whether the mechanical facilities were sufficient to meet the discharge standards. The facilities inspected were equipment systems and the quality of the fitting arrangements. Also, the renewal of the IOPPC (International Oil Pollution Prevention Certificate) is mandatory and to be done periodically of not more than 5 years for the surveys. Moreover, the quantity of oil discharged in the seas should be registered in the "Oil Record Book" as evidence to provide these data during the survey and inspection (Djadjev, 2015). Moreover, the oil discharge standards permitted for the oil tankers should not exceed 30 liters per nautical mile in the regular areas (Djadjev, 2015) (European Environment Agency, 2001).

2.3.4 OSPAR Commission

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) (1978) involves several contracting parties, United Kingdom, Switzerland, Sweden, Spain, Portugal, Norway, Netherlands, Luxembourg, Ireland, Iceland, Germany, France, Finland, Denmark, and Belgium. The OSPAR region is classified into five types, Region I Arctic water, Region II the greater North Sea, Region III Celtic Seas, Region IV Bay of Biscay, and Region V Iberian Coast (Carpenter, 2015).

This convention consists of a coordination committee, a technical committee, and the jurists and the linguist's committee. Each committee has a team manager and their responsibility is to submit the data before the next meeting. For the implementation of International regulations, the North Sea Network (NSN) of Investigators and Prosecutors is chiefly accountable and these regulations have been incorporated in the Bonn Agreement. Most importantly, all the contracting parties were allowed to implement sufficient mitigation measures to lower oil pollution and in conserving the marine biodiversity. The measures taken by all contracting parties can be harmonized into a common measure in solving the oil pollution problems (Carpenter, 2015).

To maximize the environmental performance and in minimizing the potential harm caused by offshore oil discharges in the sea, the OSPAR commission has regulated the discharge standard in disposing of the oil which should not exceed 30mg/l (OSPAR Commission , 2009).

2.3.5 Bonn agreement

Bonn agreement (1969) is an aerial surveillance programme implemented to detect the oil spills in the marine environment. The detection of oil spills on the marine environment is through remote sensing and visual observation. During the surveillance, the oil spills were detected through the thickness and the color ranging from 0.04 µm to more than 200 µm (table 2 below).

For the offshore oil discharges, it should not exceed in length more than 12 nautical miles and the immersing depth should be less than 25 meters (Bonn Agreement, 2016). The main radar technologies that are applied for the observation and the detection of oil spills were Side Looking Airborne Radar (SLAR) and the Synthetic Aperture Radar (SAR). Among these above-mentioned radars, the common technology applied for detection is the SLAR and the SAR applied along with the remote sensing for satellite surveillance (European Maritime Safety Agency , 2012).

Code	Description - Appearance	Layer Thickness Interval (µm)	Litres per km^2
1	Sheen (silvery/grey)	0.04 to 0.30	40 – 300
2	Rainbow	0.30 to 5.0	300 – 5000
3	Metallic	5.0 to 50	5000 – 50,000
4	Discontinuous True Oil Colour	50 to 200	50,000 – 200,000
5	Continuous True Oil Colour	More than 200	More than 200,000

Table 2- Types of oil spills visible in the Sea (Bonn Agreement, 2016) (page 11)

Despite the before mentioned efforts, the offshore oil spills are still a perpetuating issue (Ober, 2019) (Zhang et al., 2019) (European Maritime Safety Agency , 2012) . Moreover, permits for legalized discharge in offshore oil production created difficulty for the marine species to recuperate from the impacts of the spills (European Maritime Safety Agency , 2012) (United Nations Environmental Programme , 2015). When it comes to the illegal discharges, it is the deliberative actions taken by the operator in discharging the oil either at nonpeak hours or in an isolated area and the night hours. It is worth to mention that the illegal discharge is more critical when compared to the legal discharge and the reasons for the operators in undergoing this offensive action:

- Economic benefits in minimizing the operating and maintenance costs.
- Low possibilities in getting caught and being prosecuted and penalized. Also, the penalty levied on the offenders is low and not effective.
- The illegal oil discharges save time when compared to the time required for the regular discharging operations (European Maritime Safety Agency , 2012) (Vollaard, 2017).

Furthermore, the accidental spills are always unpredicted, even a minor spill from the offshore areas can cause severe acute pollution in the seas resulting in fatal effects on the marine species. It requires immediate action in lowering the impacts of oil spills (Zhang et al., 2019).

2.4 MARINE GOVERNANCE SYSTEMS IN NORWAY

Implemented regulations and policies were as follows:

2.4.1 Zero discharge policy

Norwegian Government enforced the strict environmental performance for the oil industries to minimize the oil discharge as low as possible. So, the government decided to establish a policy for lowering the oil discharge limits called zero discharge policy (The Norwegian Oil Industry Association, 2005) . This policy was implemented in the year 1996 in Norwegian Continental Shelf and has its legal framework originated from the precautionary principle with a combination of ecosystem-based governance (Knol & Arbo, 2014).

The reason to have a precautionary principle as its base for the legal framework is that during the oil production, in the marine sensitive areas, any uncertainty events that might increase the discharge oil spills in the sea should be halted and the clean-up operations must be done immediately with the technologies for lowering the effects of the spills.

According to the Norwegian Pollution Control Authority (NPCA), the oil industries need to report their discharge data periodically for receiving the permit to proceed upon further production operations. This enables the industries not only in creating the record data for oil discharged routinely but also in identifying the specific technologies that can be applied for minimizing the oil spills. Moreover, the Environmental Impact Factor (EIF) tool is applied to this policy to support the industries for better environmental practices in oil discharges (The Norwegian Oil Industry Association, 2005).

2.4.2 Oil spill response policy

The emergency preparedness of the Norwegian Coastal Administration (NCA) has its main objectives in detecting the oil spills and taking immediate action in mitigating the oil pollution. During the spills, if the polluter is unable to provide sufficient measures required in lowering the oil spills, then the Norwegian Coastal Administration will undertake the clean-up operations in the place of the polluter (Bjerkemo, 2020).

Moreover, the main aim of this preparedness is to oblige all the offshore industries to have adequate measures during the emergency operations, such as accidents in the well blowouts or ships containing crude oil and the required measures should have a quick response in minimizing the extent of spread of the oil spills and also its impacts. The implementation of this emergency preparedness has been divided into two types (as mentioned in figure 11), public preparedness and the private preparedness and the public preparedness is again subdivided into central and local or municipality preparedness (Norwegian Coastal Administration , 2020). This emergency preparedness consists of 16 contingency depots including spill control equipment, skilled professionals, small boats, highly advanced surveillance aircraft, and eight coast guard vessels along with oil recovery installation (Bjerkemo, 2020).

Further to this, the offshore industries before committing themselves in the oil production in the arctic should prove to the government that they have sufficient response services in mitigating the oil spill risks. This response prioritizes not only on the contingency planning (risk response) but also focuses on the prevention actions and the working mechanism is categorized into two types, the prevention phase, and the combating phase. This system was highly focused on the North Sea and the Norwegian Sea. Since the Barents Sea was also part of the NCA, the government decided to implement this response policy on the Barents Sea (Knol & Arbo, 2014).

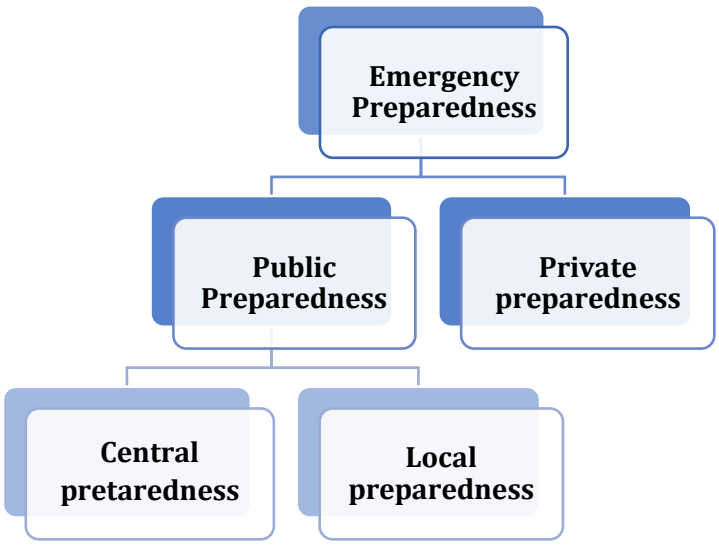


Figure 11- Flow diagram of emergency preparedness in Norway (Knol & Arbo, 2014)

2.4.3 Marine spatial planning policy

The marine spatial planning policy uses an integrated management plan involving the combination of various sectors, shipping, fishing, and offshore sectors for the economic as well as ecological benefits. The first land-use planning in the marine areas was first initiated by the Planning and Building Act (PBA). The stakeholders involved in this policy were municipalities and the private sector owning the respective area. In general, there are two plans for the spatial policy, municipal master plan, and the zoning plan, and these plans were designated as a legally binding force. The usage of the areas in the seas should be a minimum of one nautical mile and not more than that from the baseline (Schütz, 2018).

Moreover, for managing the planning process of the offshore oil operations in Norway, the following stages (as mentioned in figure 12) Were carried out. At the first stage, the analysis of marine resources has been done in determining the availability of natural resources, the valuable ecological areas that are being used for offshore operations, and the socio-economic aspects of those areas. In stage 2, assessing the impacts of oil pollution through various sources, legal or illegal discharges through the offshore oil production activities and accidental spills from the oil rigs or crude oil tanker and its detrimental effects on the marine environment will be determined. In the final stage, the analysis of the knowledge gaps in the present spatial planning policy and the solutions to fill the gaps were assessed (Schütz, 2018).

Apart from that, stakeholders, despite their participation is necessary for the development of the operational activities and also support in increasing the environmental performance through the facilitation of various mechanical equipment, especially for the discharge operations (Hoel & Olsen, 2010).

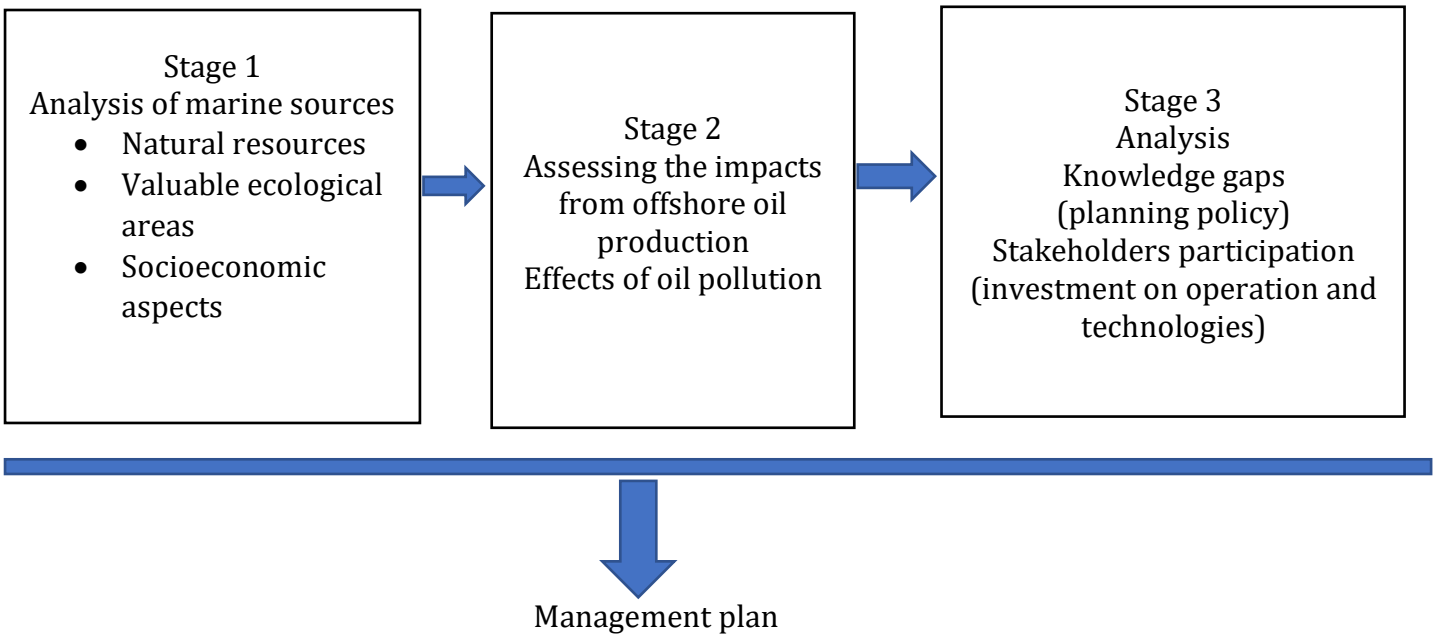


Figure 12- Spatial planning process for offshore oil operations in Norway (Hoel & Olsen, 2010)

2.4.4 Ecosystem Approach - based management policy

This policy is based on the Ecosystem Approach (EA) and has a fundamental goal of preserving the marine ecosystem against oil pollution on a long-term perspective. The development of the legal framework and the enforcement of this policy is established through the Nature Management Act and the new Marine Resources act. Other than that, the legal framework, in general, contains the purpose, management goals, and the principles for alleviating oil pollution (Hoel & Olsen, 2010). Based on this policy, the seas, the Barents Sea, Norwegian Sea, and the Norwegian part of the North Sea performing offshore operations are included in the Norwegian EEZ extending up to one nautical mile. In some legal aspects, the identification of areas that are highly sensitive to the oil spills was under huge consideration and these offshore installations were kept 12 nautical miles away from the territorial limit. These areas were called the "protected areas" for the marine diversity conservation with the increased ecological value of the aquatic species. In these protected areas, the important marine species were monitored to ensure their survival and maintaining their total population from not becoming vulnerable to oil pollution (Hoel & Olsen, 2010).

2.4.5 Regulations

Before proceeding with the offshore exploration in the sea, the relevant government authorities will conduct an Environment Impact Assessments (EIA) (figure 13) for the particular area to analyze the net oil production and its impacts on the marine environment. Also, the determination of the environmental impacts during the operational stages; development, production, and finally the decommissioning were found (Bakke et al., 2011). Moreover, the important regulating authorities responsible for monitoring the oil discharges were (figure 14) the Ministry of Energy, Norwegian Petroleum Directorate (NPD), and the State Pollution Control Authorities (SPCA) and Norwegian Environmental Agency (Statens forurensningstilsyn) (Arstad, 1995).

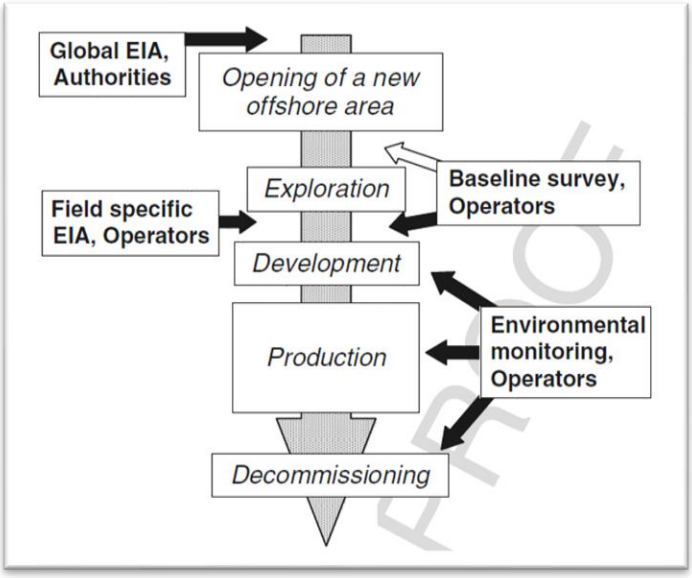


Figure 13 - Norwegian Environmental Assessments for offshore operations (Bakke et al., 2011) (page 3)

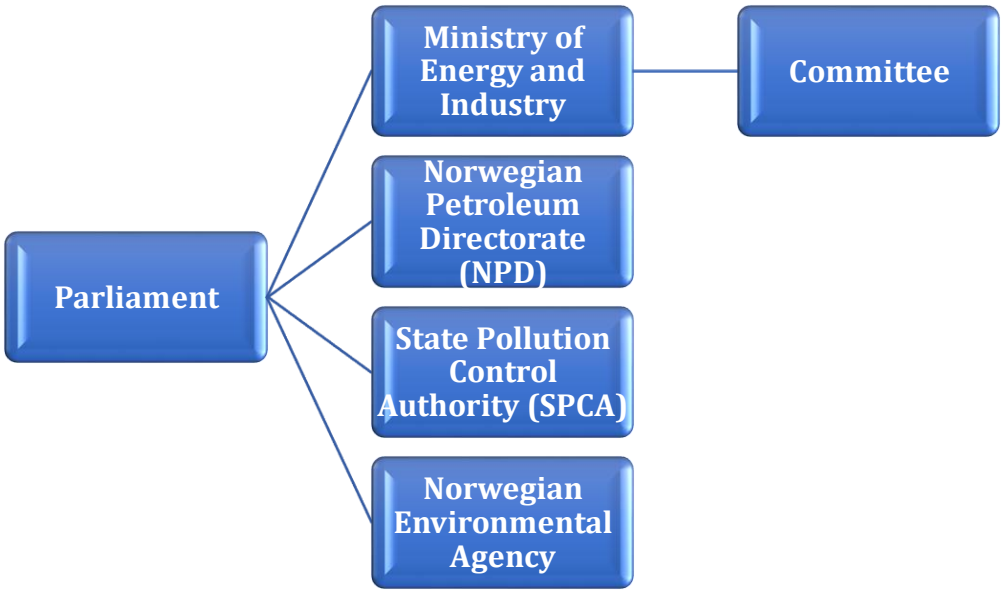


Figure 14 - Flow diagram of regulating authorities for offshore oil production in NCS (Arstad, 1995)

Among the above-mentioned regulating authorities, the Ministry of energy and Industry is highly accountable in regulating the offshore oil discharges and it has committee members from various sectors and research institutions. The committee members handle the data collection and the monitoring of oil spills in the sea (Arstad, 1995**)**.

The implemented regulations of the State Pollution Control Authority were highly dependent on the "polluter pays" principle. According to this principle, the industries should take their responsibility (own investments) in self-monitoring of the oil discharged into the sea. Additional assistance in performing environmental monitoring is provided in the Norwegian Pollution Control Authority (NPCA) 2001 guidelines. Despite these guidelines, SPCA also recommends the offshore operators to widen their knowledge for applying the advanced strategies and procedures in environmental monitoring (Bakke et al., 2011).

The development of the monitoring strategies was done on the separation of Continental Shelf into 11 regions. The water column monitoring is divided into types, Environmental Condition Monitoring (ECM) and the Environmental Effects Monitoring (EEM). ECM is used for the determination of the current conditions of the

marine species in the vicinity of the offshore operations and EEM is used in analyzing the effects on the marine species due to the oil discharges in the sea (Bakke et al., 2011). As stated in the Petroleum Activities Act (1996), the discharge of oil in the sea will be seriously monitored, obliging the offender to pay for the liability damage and the liability is based on the types of licenses they receive (Bennear, 2015).
The penalization for the liability damage is based on the operator's actions in handling the oil discharges. If the operator was unable to clean up the spills, then subsequently all the licenses will be provided with liability fine and these fines depend upon the profit gained from the oil well operations (Bennear, 2015).

2.5 MARINE GOVERNANCE SYSTEMS IN THE NETHERLANDS

The implemented policies and regulations in the Netherlands were as follows:

2.5.1 Trilateral policy in the Wadden Sea

The trilateral policy is the Trilateral Wadden Sea Cooperation (TWSC), a general agreement signed among the three countries, the Netherlands, Germany, and Denmark for the prevention of oil pollution and in maintaining the ecological quality of the marine habitats in the Wadden Sea. In the organizational structure of the Trilateral policies (figure 15), the top hierarchical position is Trilateral Government Council (TGC) following the Wadden Seaboard and the Common Wadden Sea Secretariat. The results of data collected through the survey for oil spills in the Wadden Sea is reported in the TGC meeting happening in every three to four years (Klöpper, 2019).

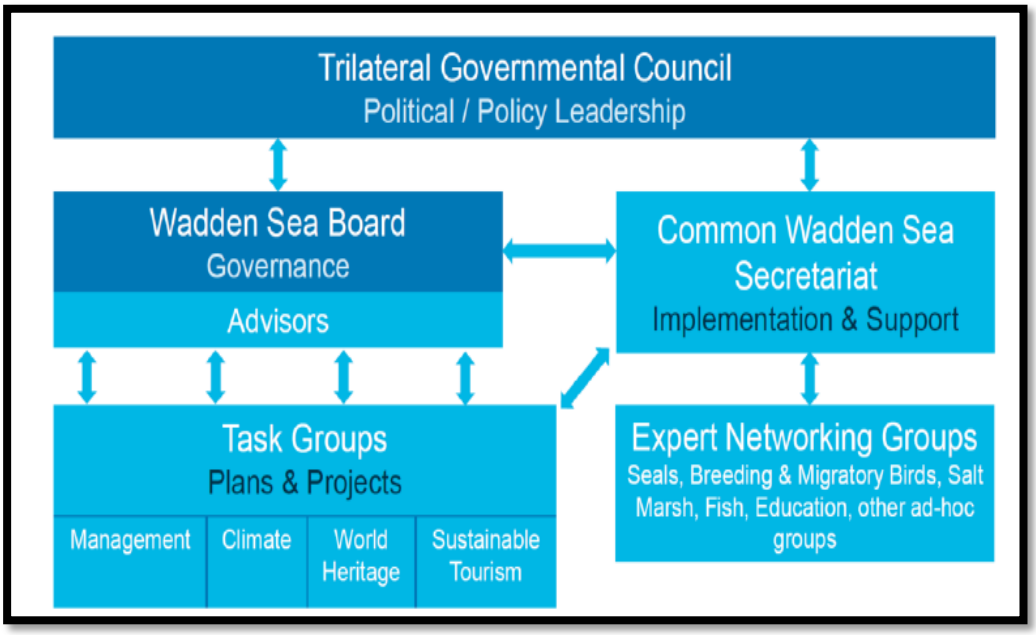


Figure 15 - Organizational structure of the Trilateral policy (Klöpper, 2019) (page 4)

Wadden Sea Conservation Area

In general, the total area of the Wadden sea is about 14,700 km2 with 11,200 km2 as a conservation area (figure below). According to IMO, the area covered by the Wadden Sea is considered as Particularly Sensitive Sea Area (PSSA) with total coverage of 13,000 km2 (Schulz et al., 2017).

Figure 16 - Wadden Sea Area and the Conservation Area (Schulz et al., 2017) (page 6)

Moreover, the Dutch part of the Wadden Sea is a nominated property embodied with Ecological Main Structure (EMS). EMS is a national body with the principal goal of preserving the marine flora and fauna from the various human activities in the sea. In addition to that, the areas under EMS have been extended along with the Pan European Ecological Network (PEEN) (Schulz et al., 2017). There is a strategical approach applied in the Dutch part of the Wadden Sea, the National physical planning approach; the key planning decision of the Wadden Sea (PKB) (1980). This approach constitutes the Nature Conservation Act and the Spatial Planning Act. The areas under the Nature Conservation Act, nature areas or the Special Areas of Conservation (SACs) and the Special Protection Areas (SAPs) are the nature reserves and on January 2017, these areas were also designated under the Nature Protection Act and consist of policy objectives which are stated in the cabinet meetings (Schulz et al., 2017.).

For the offshore oil spills in the Netherlands, the analysis of the total cadavers of the bird species was determined through the monitoring of the beached birds along the Dutch coast and the responsive action taken against the oil spills is the collaboration scheme for the smeared birds (Samenwerkingsregeling opvang Besmeurde Vogels) (Schulz et al., 2017.).

The main authorities in the collaboration scheme (figure 17 in taking measures on the oil spills in the Dutch part of the Wadden Sea were,

1. Rijkswaterstaat (RWS) - The authoritative that undertakes the actions in cleaning up the oil spills found along the coast.
2. Municipalities – management of the coastal areas
3. Ministry of Agriculture, Nature and Food Quality (LNV)– The authoritative in implementing the policy for the marine species protection.
4. The Dutch Sea-Bird Group (NZG) and the Netherlands Institute for the Sea Research (NIOZ)- Analyses the oil spills and its effects on the marine species (Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea, 2007).

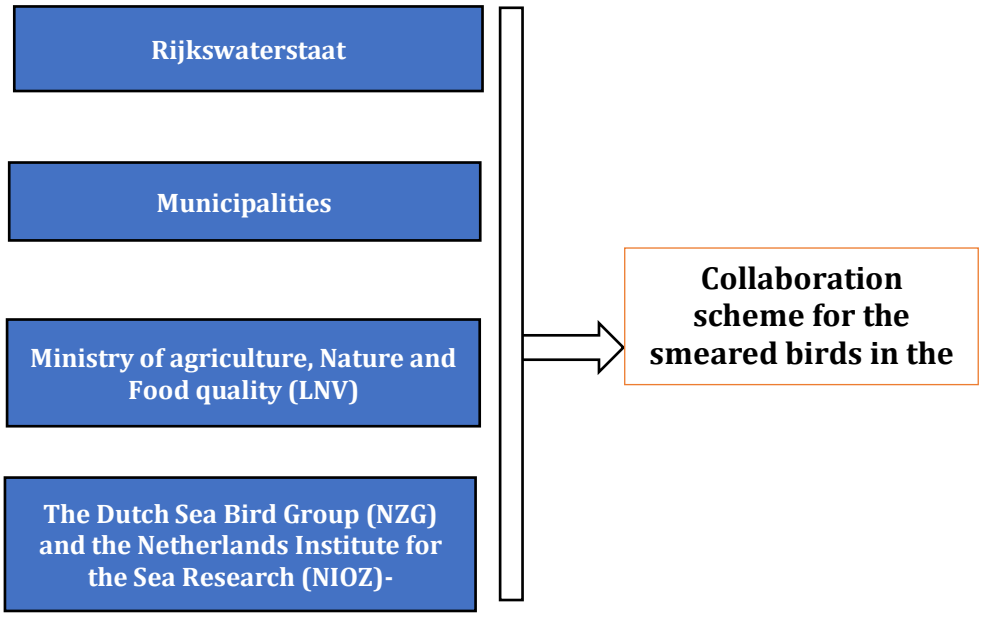


Figure 17 - Collaboration scheme for the smeared birds (Netherlands Ministry of Transport, Public Works and Water Management, Rijkswaterstaat North Sea, 2009)

2.5.2 Oil spill response policy

The authority that undertakes the clean-up operations for oil spills is the Ministry of Infrastructure & Environment (Infrasrtructuur & Milieu) (figure below). Mostly, the clean-up operations were done by Rijkswaterstaat (in charge of national waters) and the provincial waterstaat (in charge of provincial waters). Among these two, the most common authority for spill response (especially for offshore major accidents) is the Rijkswaterstaat. It consists of pollution response vessels and contracted vessels to clean and recover the spilled oil as much as possible. These vessels are capable of recovering 15,000 m^3 of oil within three days.

Besides the above-mentioned authorities, the municipalities (Municipal ports of Rotterdam and Amsterdam) are also authoritative in the contingency plans but on the local scale (with range under 5 m^3 from the shore). During the clean-up operations in the sea, the oil industries should take immediate action in lowering the effects of oil spills in the sea ahead of the arrival of governmental authority.
Mostly, the response operations involve mechanical recovery with mechanical dispersions done through the ship's propellers. For the surveillance, the aircraft consisting of side-looking airborne radar and infrared sensing equipment was used and the authoritative is the Netherlands Coast Guard (ITOPF , 2018).

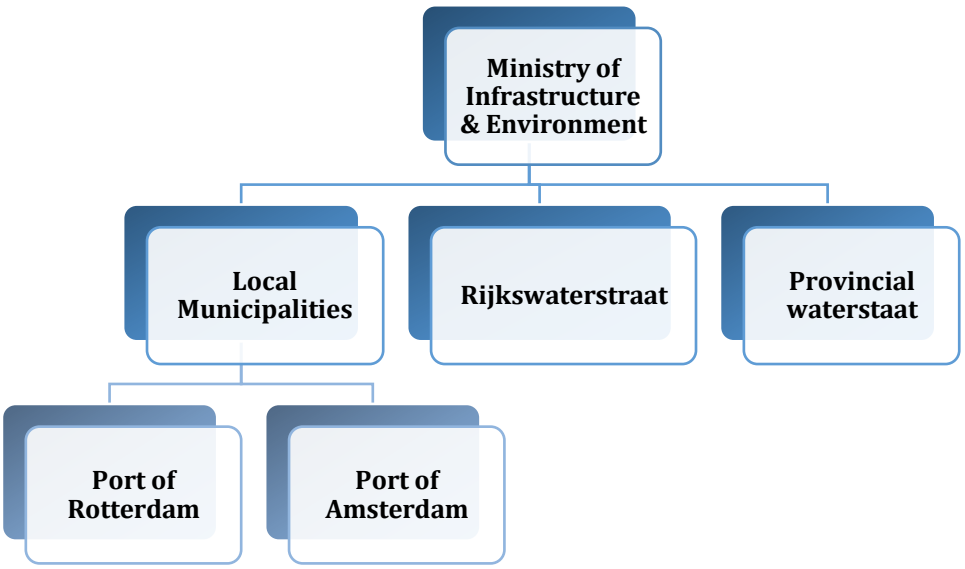


Figure 18 - Organizational structure for oil response policy in the Netherlands (ITOPF, 2018)

2.5.3 Marine spatial planning policy

The area in the Dutch Economic Zone covers up to 57, 000 km^2 which equals 1.5 times the total area and activities, shipping, fishing, and offshore oil operations is always intense in this zone. The core objective of this policy is the preservation of the marine ecosystems in this zone.
The developed measures in the marine spatial planning were explained below,

- Spatial Monitoring & permit tracking system and the opportunity maps

In this Zone, the space utilized for the Offshore oil operations was monitored (spatial monitoring) and this monitoring also provides data on the types of permits issued on that particular area. To increase the ecological value near offshore activities, the opportunity maps were used to

1. Identify the areas that are enriched with marine species.
2. Identify the areas with high ecological value where the offshore operations have been conducted.
3. Identifies the areas that are suitable for offshore activities in the future.

Moreover, the areas with high ecological values involve, Friese Front, Klaverbank, and Doggerbank, and these areas were considered as Marine Protected Areas (MPAs), and these areas were strictly monitored for the oil spills (Vrees, 2019).

- Issuing permits using Integrated (spatial) assessment framework

After issuing the permits for oil operations, the spatial assessment needs to be carried out and the framework of this assessment consists of five elements,

1. Determination of land space allocated for operational activities.
2. Identifying the application of operational activities performed in the sea.
3. Increasing the precautionary measures to alleviate the spill effects on the marine environment.
4. Identifying the location type and assessing its space utilization.
5. Enabling other preventive measures and compensation of the spill effects on the marine biodiversity (Vrees, 2019).

2.5.4 Ecosystem based management policy

The Ecosystem based management policy is derived from the Marine Strategy Framework Directive (MSFD) and embodies two strategical approaches, the ecosystem approach, and the precautionary principle approach. The authority responsible for this policy is the Ministry of Infrastructure and Environment.

The policy measures involve,

- The Mining Act issues permits not only for oil exploration and production but also for the oil discharges in the sea.
- To lower the accidents in oil rigs or platforms and the oil tankers, Seveso III has been initiated and this directive has its primary goal of preserving the marine environment from oil pollution.
- Despite the permits, it is essential in carrying out an environmental impact assessment to analyze the effects of oil spills or discharges on the marine environment, and if the effects are lethal then it requires compensation.

Despite the Mining Act, other authority in position in issuing the permits were the Nature Conservation Act (1998) and the Flora and Fauna Act. These acts provide permits for the areas, EEZ and the Natura 2000 areas. The permits in the Natura 2000 areas include new discharge standards, pipeline maintenance, and the emergency abatement of drilling operations. In addition to that, these acts facilitate spill assessment and the species protection test (marine species or habitats) (Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2016).

2.5.5 Regulations

2.5.5.1 Discharge regulations State supervision of Mines (SSM)

State Supervision of Mines (SSM) is the main governmental body that regulates the oil discharge operations from the offshore activities. It works under three governmental authorities, Ministry of Economic Affairs (EZ), Ministry of Social Affairs and Employment (SZW), and the Ministry of Infrastructure and Environment (I &M) (figure below) (Dakhorst, 2015). In general, SSM performs sudden inspection flights in the oil rigs or platforms and the tankers, and these flights were operated by National Police Unit. During the inspection, the discharge oil sample will be collected and tested in the laboratory to check whether the discharged oil has met the standards. If not, subsequently it leads to prosecution (Ministry of Economic Affairs , 2013).

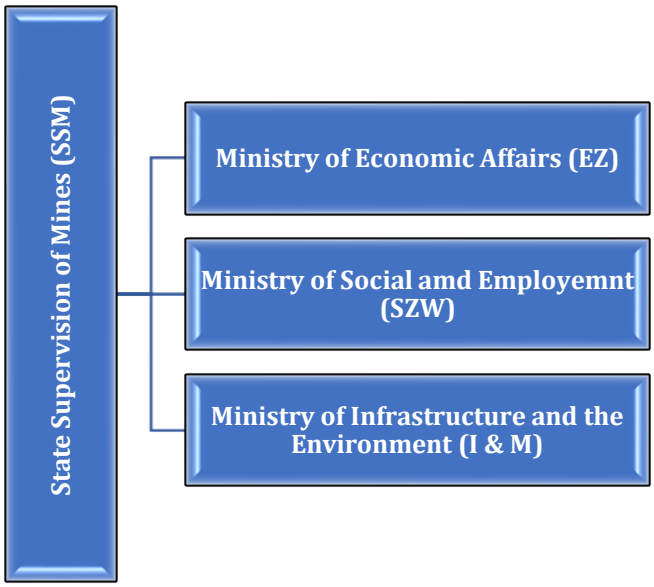


Figure 19- Flow diagram of regulating authorities for offshore oil production in NCS (Ministry of Economic Affairs, 2013)

2.5.5.2 Monitoring

1. Aircraft monitoring

The North Sea Directorate (NSD) monitors the oil spills from the production platforms and the oil tankers. It comes under the governmental body, Rijkswaterstaat. The monitoring is done through,

- The aircraft with time allocation of 1200 hours every year.

- The images received from the ERS (European Remote Sensing) of twice or thrice per week and the satellite information will allow the NSD to organize the flight plan for monitoring the sea.
- Immediate or sudden inspection in the offshore platforms or the tankers (European Space Agency, 2020).

2. Beached Bird Surveys

The beached bird surveys are the customary monitoring technique applied to identify and analyze the bird species type, and its effects due to oil pollution (seabirds and coastal water birds). In general, it is known that the sea birds were highly vulnerable to oil pollution. During the oil discharges from the oil rigs or platforms and the tankers, the sea birds has immediate contact with the oil and get affected internally (organ failure) as well as externally (physical damage) and reaches the shore either dead or with fatal injuries.

Moreover, the Governmental bodies authoritative for the monitoring identifies and records the total number of oiled sea birds on the shore (Camphuysen & Heubeck, 2015). The most common organizations accountable in monitoring the oiled sea birds for the government are, the Dutch Fuel Oil Victim Study (NSO) and the Dutch Seabird Group (NZG) (figure below) (Dutch Fuel Oil Victim Research , 2020).

The standard procedures involved in the beached bird surveys were as follows,

- Determination of bird species found dead on the shore.
- Observation and recording of oil slicks spread on the feathers and other body parts of the causalities and also, reporting the casualty's condition.
- The recording of the dead sea birds was done by, date, location, a total kilometer of the survey conducted, visibility of oil from the shore, characteristics of discharged oil, name of the observers reported the incident, and the total count of beached oil birds.
- The records were transferred to the digital database in analyzing the outcomes for possible solutions (OSPAR Commission, 2005).

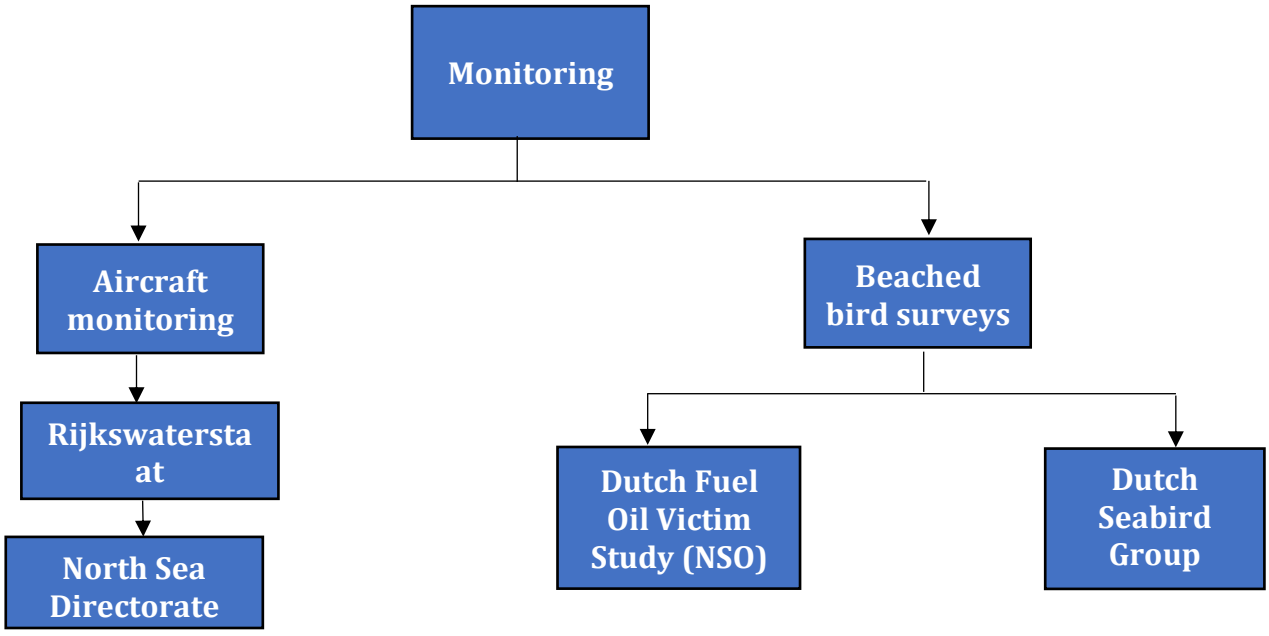


Figure 20 - Flow diagram of regulating authorities for monitoring in offshore oil production in NCS (Dutch Fuel Oil Victim Research, 2020)

CHAPTER 3 RESEARCH DESIGN

In this chapter, the research framework is formulated to achieve the research objective and the research questions.

3.1 RESEARCH FRAMEWORK

According to (Verschuren et al., 2010) guidelines, the research framework is the step by step process done to achieve the research objective. To achieve the desired objective, schematic representation was formulated. Thus, the various steps involved in the research framework is as follows,

Step 1: Characterizing the objective of the research project

The objective of this research is to compare the marine governance systems of the Netherlands and Norway for offshore oil pollution by analyzing the past and recent incidents and the influencing factors to identify the involved risks, International agreements signed by both countries, and their policies and regulations in addressing offshore oil pollution. Moreover, the achievements and the drawbacks of each country's policies and regulations were identified to evaluate the efficacy and problems in the marine governance systems. Furthermore, recommendations were provided for both countries for improving the governance systems in the future.

Step 2: Determining the research object

The research objects are the governance systems encompassing the government actors, International agreements, National policies, and regulations implemented in preventing offshore oil pollution.

Step 3: Establishing the nature of the research perspective

The context of the research was based on the marine governance system between the Netherlands and Norway for offshore oil pollution. Initially, the study examined the international agreements that came into practice for the prevention of oil pollution. Thereafter, the research is focused on the implemented marine governance systems in the Netherlands and Norway involving policies and regulations. Moreover, the comparison of the implemented policies and regulations was done through the identification of their achievements and the drawbacks which eventually helped in providing potential recommendations for both the countries in improving their marine governance systems. On the whole, the analysis mentioned above was done through the evaluation. So, the nature of the research perspective is evaluation research.

Step 4: Determining the sources of the research perspective

The data collection for the research involves two sources, the literature study, and the interviews. At first, the marine biodiversity and its impacts from offshore oil pollution, International agreements, and the marine governance systems in the Netherlands and Norway for the prevention and reduction of offshore oil pollution were discussed. In the analysis of marine governance systems in the Netherlands and Norway, the preliminary research was done through a literature study involving International agreements and the implemented policies and regulations in the Netherlands and Norway. Since the research partially constitutes to achievements and drawbacks of the implemented policies and regulations in the Netherlands and Norway, the estimated results were acquired through, comprehensive data from the literature study and the interviews with representatives for addressing offshore oil pollution in the Netherlands and Norway.

Key concepts	Theories and Documentation
- Offshore oil pollution - International agreements - Marine governance	- Documents about marine biodiversity and its impacts on offshore oil pollution in the Netherlands and Norway. - Documents on International agreements addressing the oil pollution - Documents on marine governance systems in the Netherlands and Norway - Preliminary research is done on both the countries

Table 3- Sources of the Research perspective

Step 5: Making a schematic presentation of the research framework

The schematic representation below explains the process involved in achieving the research objective and the research question

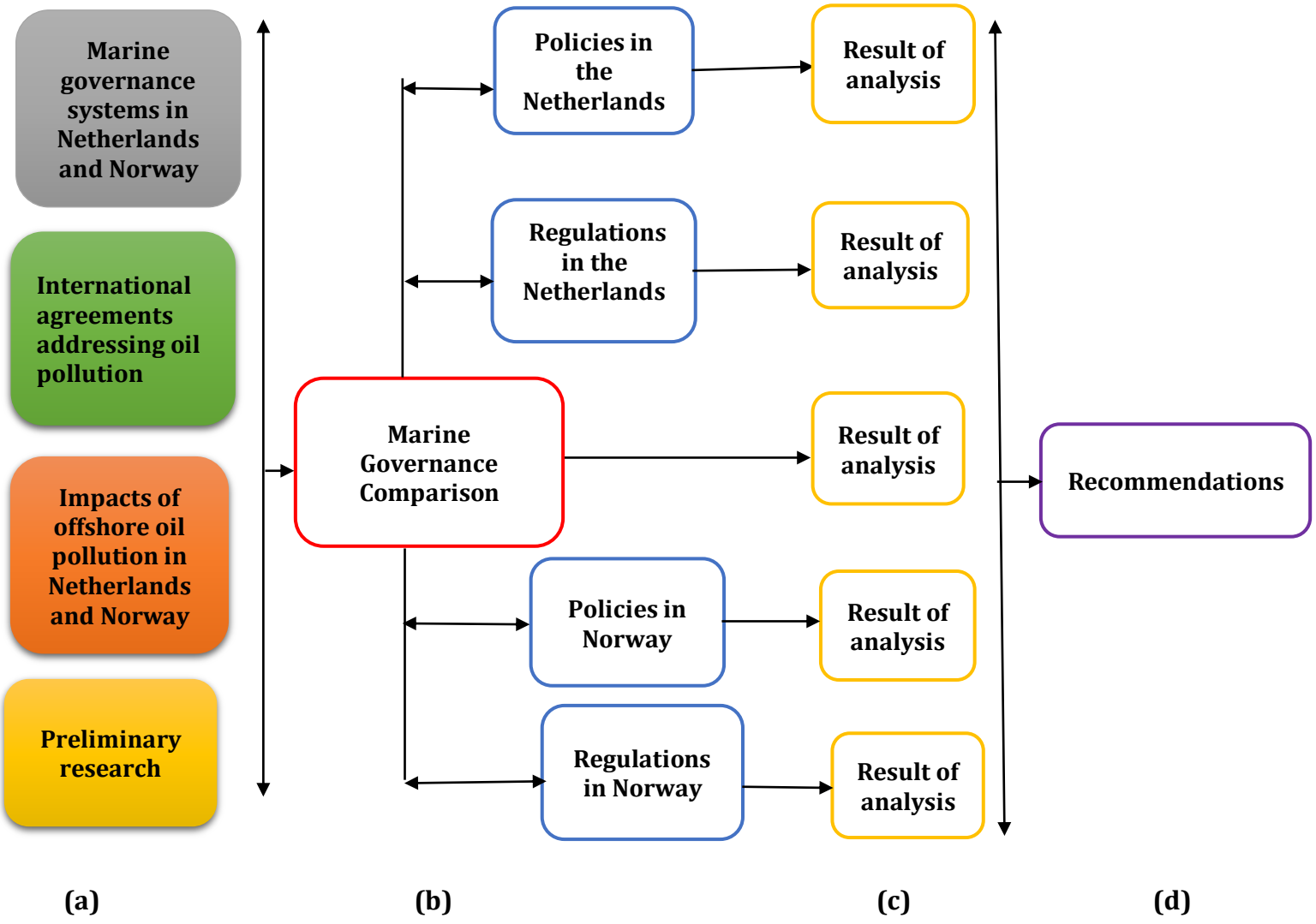


Figure 21 - Schematic representation of the research framework

Step 6: Formulating the research framework in the form of arguments which are elaborated

a) Literature study based on the impacts of offshore oil pollution, International agreements, and the marine governance systems in the Netherlands and Norway for the prevention of offshore oil pollution.
b) To analyze the research objects for the research.
c) To compare the marine governance between the Netherlands and Norway through the analysis of research objects.
d) Recommendations for the improvement of marine governance in the Netherlands and Norway.

Step 7: Checking whether the framework requires any change

No changes were done.

3.2 DEFINING THE CONCEPTS

The following key concepts were determined for the research

Offshore oil pollution – Effects of oil production due to legal or unintentional discharge, illegal or unintentional, and the accidental spills that have severe impacts on the marine environment.

International agreements – It is the bilateral or multilateral agreement signed between two countries or more countries for the prevention of oil pollution.

Marine governance – it embodies the policies, regulations, actions affairs to address marine pollution and involves state actors, non-state actors, and stakeholders.

3.3 RESEARCH STRATEGY

The research strategy constitutes the methods that can be applied in reaching the desired research objective. The methods to achieve the research objective highly involves the gathering and processing of the data to address the research questions (Verschuren et al., 2010).

As can be seen, the adoption of research strategy in the research has imparted major support in acquiring the validated data for the completion of the research questions. This data collection is done through a comprehensive literature study and in-depth interviews with relevant experts.

To answer the first research question, the findings relied on the marine ecosystem and the influence (impacts) of offshore oil pollution on this ecosystem. The analysis performed in answering the research question was from the literature study.

For answering the research question, the analysis carried out had its focus on the International agreements and the governance systems in the Netherlands and Norway. The analysis was the same as the first research question (dependent on literature study).

Since the third question needs to highlight the drawbacks of the implemented policies and regulations. It requires both the literature study and interviews. Most importantly, the interviews conducted was not only help in answering the research questions but also giving an insight into scrutinizing the analysis for the conclusion.

In the fourth question, the analysis highlights the achievements of the implemented policies and regulations in the Netherlands and Norway. The featuring of achievements in the analysis has helped the researcher in

providing possible recommendations for both the countries to improve the efficiency of marine governance systems.

3.3.1 Research Units

The research units were the Netherlands and Norway since the entire study in overall was focused on the comparative analysis of marine governance for offshore pollution of these two countries. In marine governance, the regulations and policies undertaken by these two countries were analyzed.

3.3.2 Research Boundaries

Throughout the research, the total period allocated for the completion of the thesis has been considered. Based on these time considerations, the study was focused on the International agreements, implemented policies, and regulations in the Netherlands and Norway and does not focused on other topics generally. Besides that, one of the major constraints was the participant's availability for the interviews and this is mainly for the Netherlands.

3.4 DATA COLLECTION AND ANALYSIS

3.4.1 Data collection

The data collected for the research was intended to answer the research questions. The research questions were answered through literature study and interviews

Research questions	**Gathering of information for the questions**	**Data source**	**Data collection method**
1. What do oil-related activities, risks, and incidents look like in the Netherlands and Norway, and what damage is at risk in Dutch and Norwegian marine eco-systems?	Biodiversity and its impacts due to offshore oil pollution in the Netherlands and Norway	Secondary data: Literature review: using peer-reviewed and grey literature	Desk research through online searches of articles
2. How do the marine governance systems in the Netherlands and Norway prevent offshore oil pollution?	International agreements addressing the offshore oil pollution Policies and regulations in the Netherlands. Policies and regulations in Norway	Secondary data: Literature review: using peer-reviewed and grey literature	Desk research through online searches of articles

3. Are the governance systems in use in Netherlands and Norway appropriately taking action to reduce oil discharge and are the efforts effective, efficient, and legitimate?	Drawbacks in the implemented policies and regulations (Monitoring or surveillance, controlling, and the prosecution)	Primary data: Interviews with the governmental bodies Secondary data: Literature review: using peer-reviewed and grey literature	Interviews were conducted in skype Desk research through online searches of articles
4. How can the governance systems in the Netherlands and Norway be improved?	Featuring the achievement of regulations and policies on decreasing oil offshore pollution in the Netherlands and Norway.	Primary data: Interviews with the governmental bodies Secondary data: Literature review: using peer-reviewed and grey literature	Interviews were conducted in skype Desk research through online searches of articles

Table 4- Collection of data for each sub research questions

3.4.2 Data analysis

In general, the data analysis in research will provide either qualitative or quantitative data in answering the research questions.

Gathering of information for the questions	**Data analysis**
Biodiversity and its impacts of offshore oil pollution in the Netherlands and Norway	Qualitative analysis Quantitative analysis
International agreements in addressing offshore oil pollution Policies and regulations in the Netherlands and Norway	Qualitative analysis
Drawbacks in the implemented policies and regulations (Monitoring or surveillance, controlling, and the prosecution) in the Netherlands and Norway	Qualitative analysis
Achievements of the implemented policies and regulations in the Netherlands and Norway	Qualitative analysis Quantitative analysis

Table 5- Data analysis for each sub research questions

3.5 DATA VALIDATION

The data validation of this research was through the literature and interviews. Moreover, the data gathered from the interviews have a significant role in the analysis. To avoid bias, it has been verified with the other relevant literature. Apart from that, in the literature, the authors might provide different interpretations, it was verified with the other similar literature. Overall, the conclusion and recommendations provided were based on the author's observations and reflections which was made through the literature study and interviews conducted to answer the research questions for addressing the main research question.

3.6 RESEARCH ETHICS

According to the University of Twente ethics Policy of 2019, any research including humans must ensure that the conducted interviews have followed the ethical standards. Since interviews were part of the research, research ethics were highly considered. Moreover, this research has abided the ethical standards of the ethics policy.

Before the interviews, the informed consent form was filled by the interviewees for their approval on conducting the interviews. The potential participants involved in the interview were aware of the procedures on deciding which particulars (personal/company) needs to be written for the research. During the research period, the interviewee was able to cancel their participation for the interview anytime. Besides that, the data gathered from the interviews were never used for personal benefits and these data were erased after the completion of the thesis.

3.7 ANALYTICAL FRAMEWORK

The analytical framework (Verschuren et al., 2010) is the model that represents the approaches in answering the research questions.

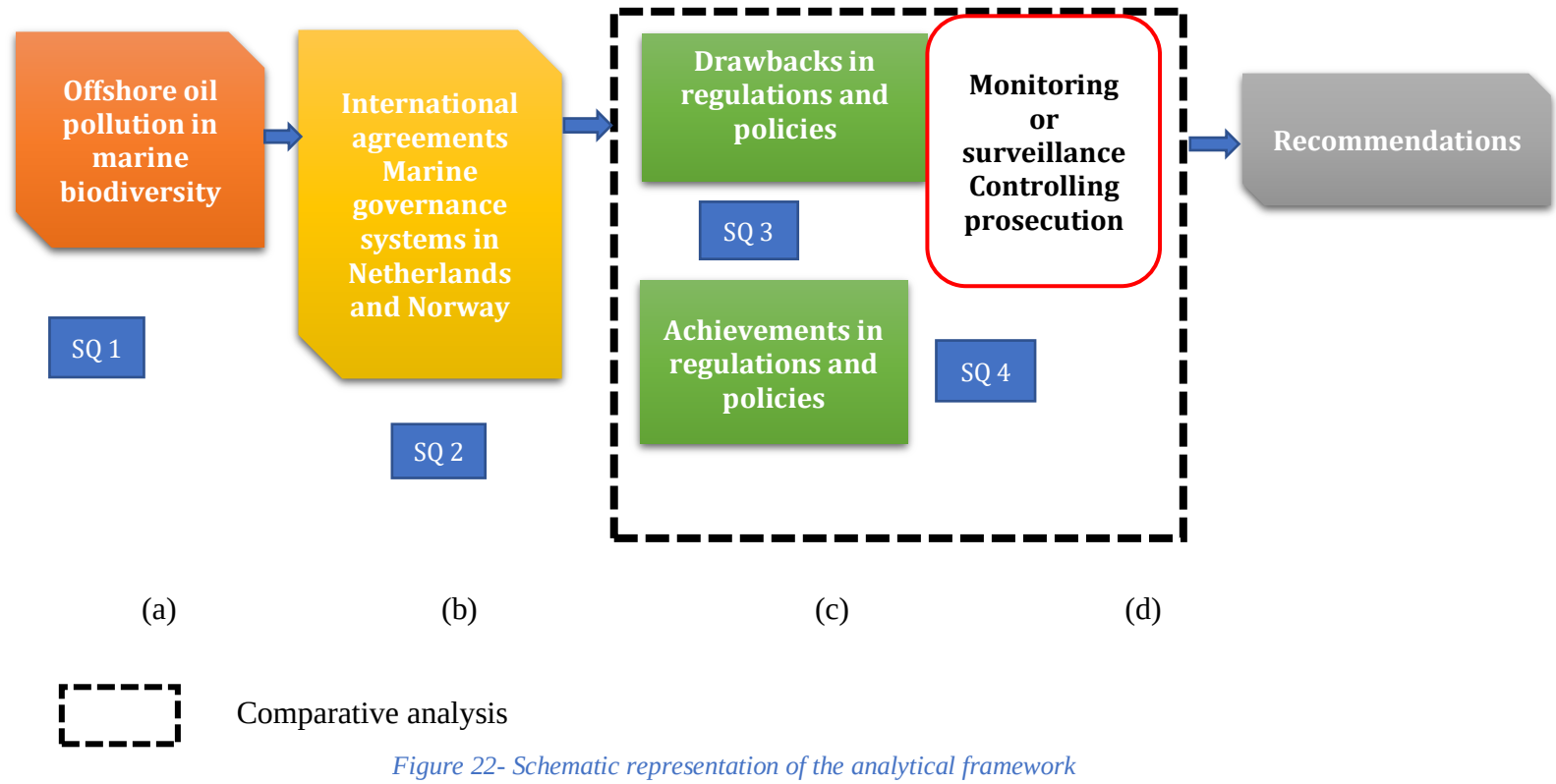


Figure 22- Schematic representation of the analytical framework

The data analysis for the following framework will be elaborated as follows:

a) At first, the literature study was conducted extensively on marine biodiversity in the Netherlands and Norway. Following are the impacts of offshore oil pollution and for providing notable examples, relevant cases were illustrated. The data analysis throughout this phase incorporates both qualitative and quantitative assessments.

b) Secondly, the study puts its emphasis on the International agreements and the marine governance systems in the Netherlands and Norway. For the International agreements, the study covered the following topics, UNCLOS, MARPOL, OSPAR IMO, and the Bonn Agreement. The rest of the desk research covers the implementation of policies and regulations in the Netherlands and Norway for the mitigation of offshore oil pollution. Altogether, the analysis of this phase is qualitative research.

c) This phase has been classified into two categories. Firstly, the drawbacks of the implemented policies and regulations were analyzed from the two sources, literature study, and interviews. In the literature study, the preliminary information on the drawbacks of policies and regulations were collected. To enlighten the gathered information, the interviews were conducted. Moreover, these interviews not only provided supplementary information but also provided significant data to complete the analysis. For the achievements of the implemented policies and regulations, the process was the same as done in analyzing drawbacks. In featuring the achievements of the implemented policies and regulations in the Netherlands and Norway, it helped the researcher in identifying the knowledge gaps. To sum up, the analysis performed in answering the third and fourth research questions helped the researcher to perform the comparative analysis of the marine governance for the Netherlands and Norway.

d) Last but not least, in the final step, recommendations were drawn from the before mentioned steps to guide the Netherlands and Norway. These recommendations were aimed to help the Dutch and the Norwegian governments to improve their marine governance systems.

CHAPTER 4 ANALYSIS OF OFFSHORE OIL POLLUTION AND ITS IMPACTS

Research question 1) How do oil-related activities, risks, and incidents in the Netherlands and Norway damage the Dutch and the Norwegian marine eco-systems?

To answer the first question, the analysis was done by a literature study to investigate the causes and impacts of the NCS and DCS oil spills. A focus was on identifying the volume of spills and their impacts on marine environments. To enunciate the analysis, graphical representation of various species and their impacts due to oil spills were performed.

4.1 INTRODUCTION

Offshore oil production in the Netherlands and Norway has been responsible for causing catastrophic effects on the marine ecosystem substantially because of intentional or unintentional discharges and also the accidental spills. These production activities devalue the marine ecosystem where the spill effects cause the marine species to suffer lethal damage and in extreme circumstances death.

4.2 OIL SPILLS AND ITS IMPACTS IN NORWAY

From the investigation of the different case studies of the offshore oil spill cases in Norway, it was notified that the productional activities in the NCS have experienced many accidental spills (figure 23) with the dynamics in the tons of oil spilled. However, these spills imposed less damage to the marine ecosystem (SINTEF, 2020).

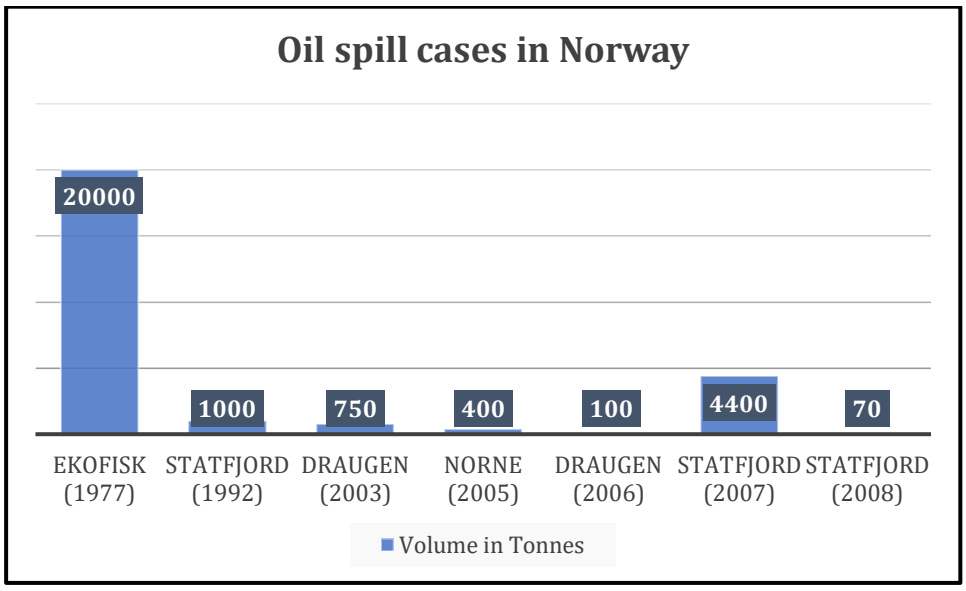


Figure 23 - Oil spill cases and its spill volume in Norway (SINTEF, 2020) (page 2)

As an illustration, the author selected two cases, Ekofisk and statfjord oil spills for the research to analyze the impacts of the oil spills, and subsequently, it was notified that these spills provided fewer impacts in the marine species (SINTEF, 2020).

Ekofisk oil spill

The Impacts of this oil spill were seen only on marine phytoplankton and marine zooplankton (figure 24) (Dahl et al., 1983).

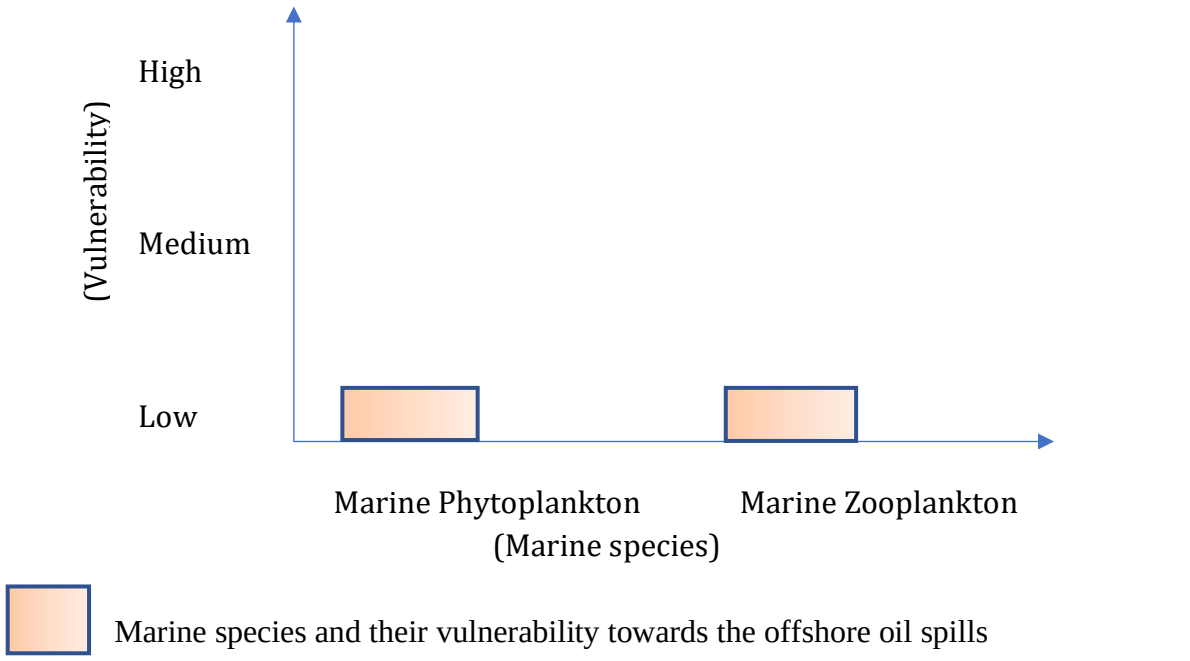


Figure 24 - Ekofisk oil spill and its impacts on marine species (Dahl et al., 1983)

Statfjord oil spill

In statfjord incident, the spills caused low damage to the marine phytoplankton, marine zooplankton, and fishes (figure 25) (Kystverket, 2016).

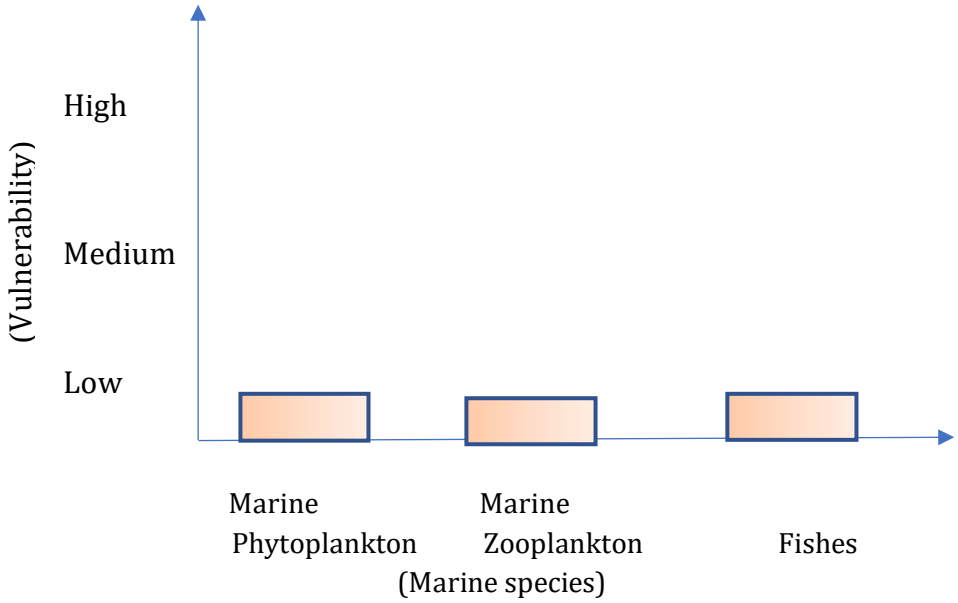


Figure 25 - Statfjord oil spill and its impacts on marine species (Kystverket, 2016)

Even though the spill intensity and its impacts mentioned in these cases were less, typically speaking, the impacts from oil discharges were consequential. For example, the seas, the Barents Sea, and the Norwegian

Sea regardless of their spill cases have affected the marine ecosystem from oil discharges considerably (Kystverket, 2016).

4.2.1 Barents Sea

To start with, the Barents Sea located in the arctic regions, during the harsh climate, the discharges in the sea takes a longer period to dissipate and dissolve. In worst cases, it gets trapped in a particular area and eventually, allows the marine species (marine benthos, sea birds, fishes, and marine mammals) for physical contact. This contact destabilizes the functioning of the marine species. Among the following marine species, the vulnerability is indeed intense to sea birds (see figure 26) where the physical dysfunction in most cases leads to death and few species rarely withstand the fatal effects of the discharges or spills on the sea. Similarly, the fishes were next vulnerable species because of their consummation of dispersed oil slicks in the water columns and followed by marine benthos and marine mammals with least affected to oil discharges or spills (WWF, 2003) (Forsgren & Christensen-dalsgaard, 2009).

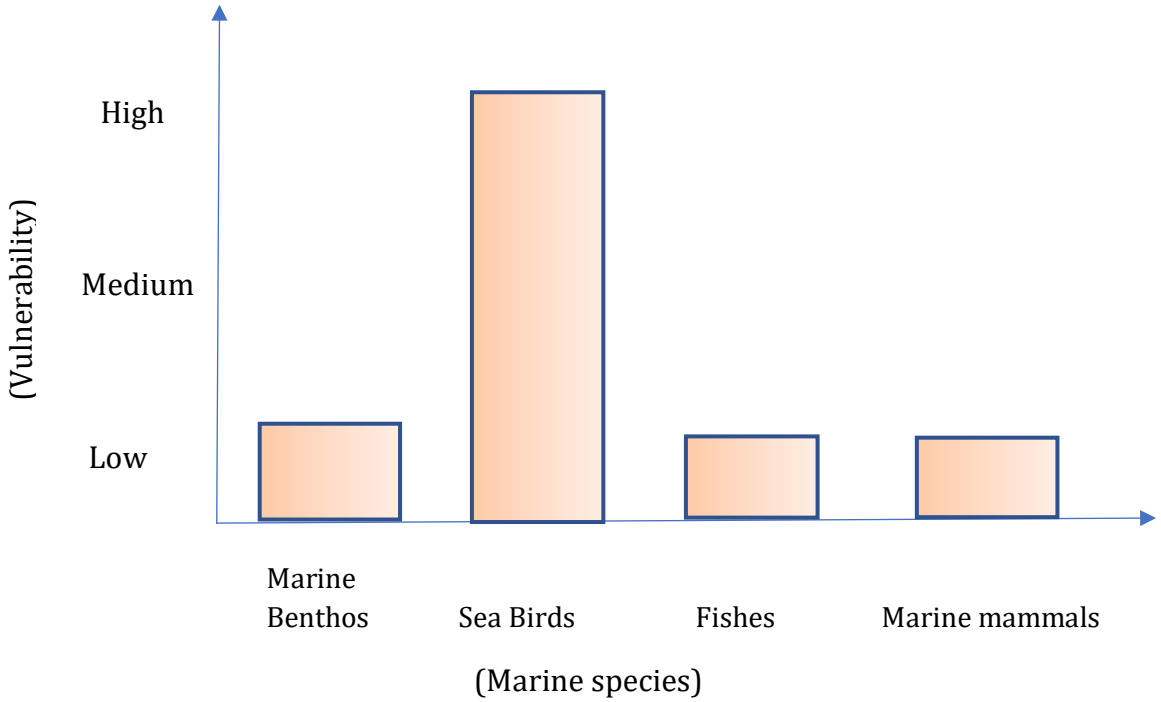


Figure 26 - Barents Sea oil discharge impacts on the marine species (WWF, 2003) (Forsgren & Christensen-dalsgaard, 2009)

To categorize the vulnerability of various marine species of the Barents Sea, the following table has been constructed**,**

Species	Vulnerable level		
	Low	Medium	High
Marine Benthos			
Coral reefs	✓		
Sponge communities	✓		
Sea Birds			
Puffin (*Fratercula arctica*)			✓
Common guillemot (*Uria aalge*)			✓
Little auk (Alle alle)			✓

Razorbill (*Alca torda*)			✓
Black guillemot (*Cepphus grille*)			✓
Fishes			
Norwegian-Arctic cod (*Gadus morhua*)		✓	
Capelin (*Mallotus villosus*)		✓	
Haddock (*Melanogrammus aeglefinus*)		✓	
Northeast Arctic Saithe (*Pollachius virens*)		✓	
Norwegian spring-spawning herring (*Clupea harengus L*)		✓	
Walrus ringed seal (*Pusa hispida*)		✓	
Bearded seal (*Erignathus barbatus*)		✓	
Common harbor seal (*Phoca vitulina*)		✓	
Grey seal (*Halichoerus grypus*)		✓	
Whale (*Cetacea*)		✓	
Beluga whale (*Delphinapterus leucas*)		✓	
Narwhale (*Monodon monoceros*)		✓	
Rare bowhead (*Balaena mysticetus Linnaeus*)		✓	

Table 6- Marine species and their vulnerability towards offshore oil discharges in the Barents Sea (WWF, 2003) (Forsgren & Christensen-dalsgaard, 2009)

4.2.2 The Norwegian Sea

Identically, the Norwegian Sea also has the same geographical characteristics as the Barents Sea with major impacts on the sea birds (figure below), moderate on the fishes, and minor damage on the marine benthos (Norwegian Ministry of Environment, 2009).

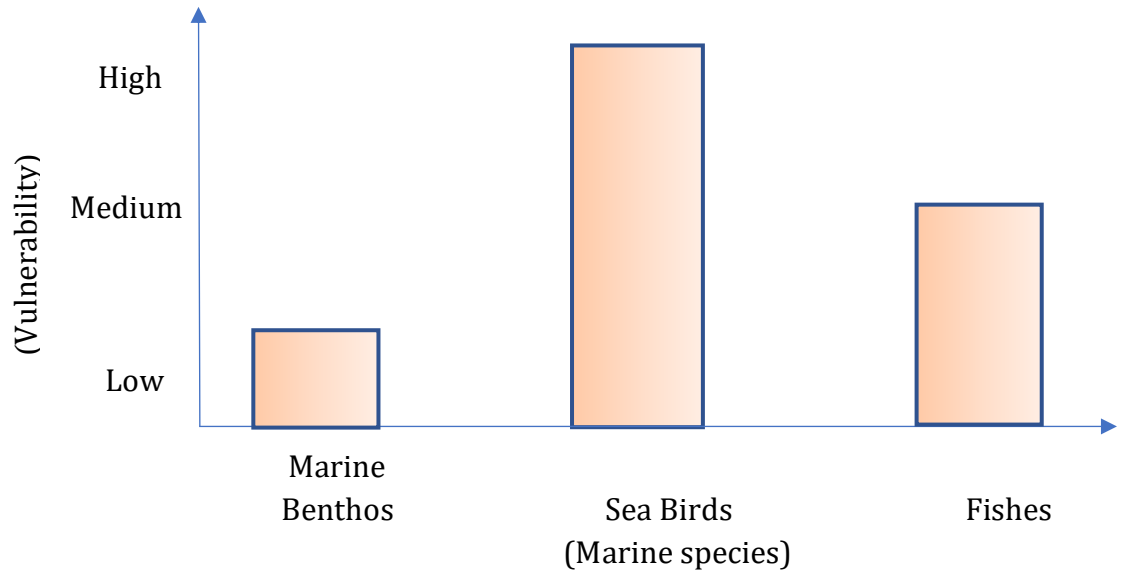


Figure 27 - Norwegian Sea oil discharge impacts on the marine species (Norwegian Ministry of Environment, 2009)

Species	Vulnerable level		
	Low	Medium	High
Marine Benthos			
Coral reefs	✓		
Sponge communities	✓		
Sea Birds			
Atlantic puffin (*Fratercula arctica*)			✓
Black-legged kittiwake (*Rissa tridactyla*)			✓
Common guillemot (*Uria aalge*)			✓
The Northern fulmar (*Fulmarus glacialis*)			✓
Less black-backed gull (*Larus fuscus*)			✓
Fishes			
Norwegian spring-spawning herring (*Clupea harengus L*)		✓	
Blue whiting (*Micromesistius poutassou*)		✓	
Northeast Atlantic mackerel (*Scomber scombrus Linnaeus*)		✓	
Northeast Arctic saithe (*Pollachius virens*)		✓	
Blue ling (*Molva dypterygia*) Greenland halibut (*Reinhardtius hippoglossoides*)		✓	
Redfish (Sciaenops ocellatus)		✓	

Table 7- Marine species and their vulnerability towards offshore oil discharges in the Norwegian Sea (Norwegian Ministry of Environment, 2009)

4.3 OIL SPILLS AND ITS IMPACTS IN THE NETHERLANDS

Generally, the spill cases in the Netherlands were minimum and one of the highest spills recorded was the Bow Jubail accident (2018) (figure below), with profound effects on the sea birds than other marine species (figure 29) (Dutch Safety Board, 2020).

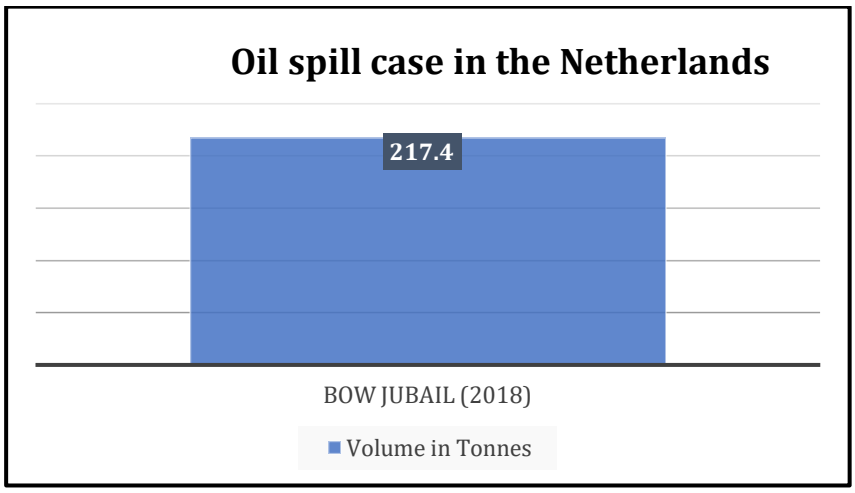


Figure 28 - Oil spill and its spill volume in the Dutch part of the North Sea (Dutch Safety Board, 2020)

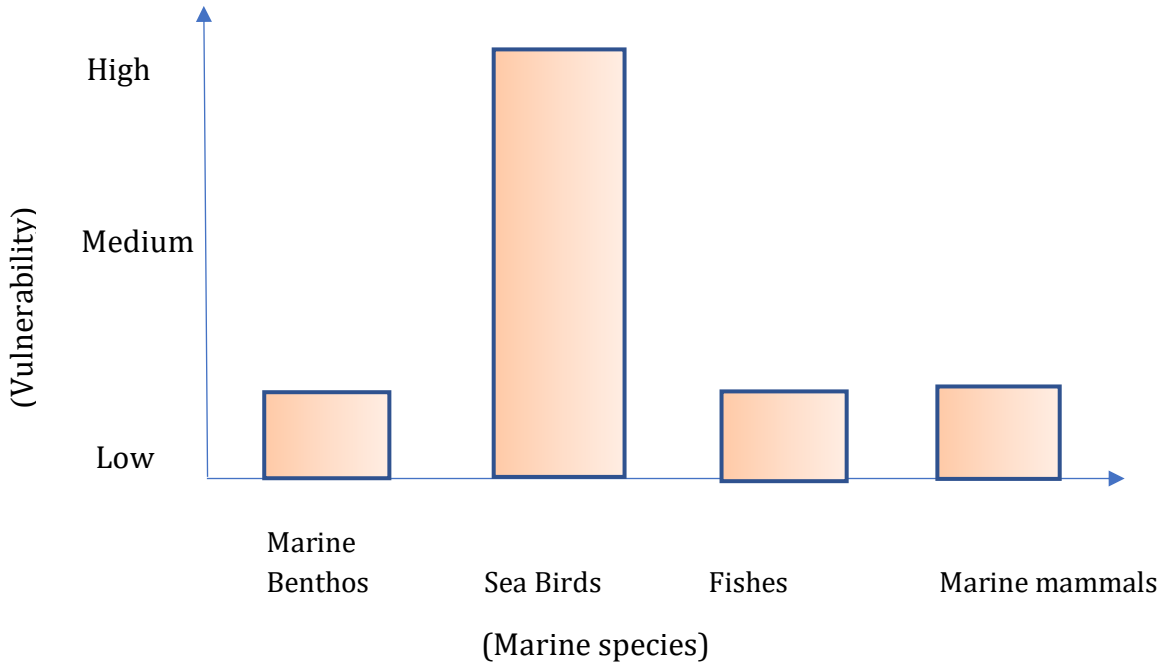


Figure 29- Dutch part of the North Sea oil spill impacts on the marine species (Dutch Safety Board, 2020)

4.3.1 Dutch part of the North Sea

In addition, the Dutch part of the North Sea being situated on highly active locations (i.e. Southern part), several offshore operations will always be intense resulting in increased oil discharges. The more oil discharges from offshore operations, the greater the impacts on the marine ecosystem. Likewise, in NCS, the impacts in the DCS also experienced the same, where the sea birds have become highly vulnerable to oil pollution (figure below). Besides that, the remaining species encountered fewer impacts than marine sea birds (Hugenholtz, 2008) (Leopold, 2017) (Hara & Morandin, 2010).

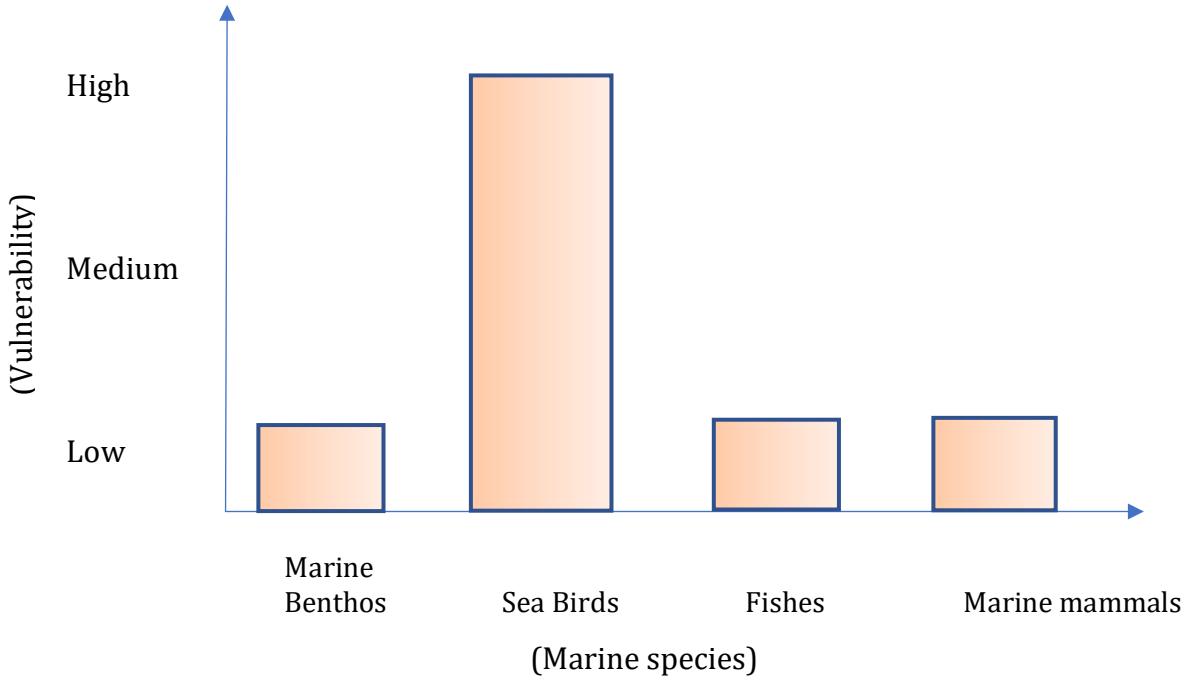


Figure 30 - Dutch part of the North Sea oil discharge impacts on the marine species (Hugenholtz, 2008) (Leopold, 2017) (Hara & Morandin, 2010)

Species	Vulnerable level		
	Low	Medium	High
Marine Benthos			
Coral reefs (*Anthrozoa*)	✓		
Sponge communities (*A. compressa*)	✓		
Sea Birds			
Cormorant (*Phalacrocoracidae*) black-backed gull (*Larus marinus*)			✓
Common scoter (*Melanitta nigra*) Eider duck (*Somateria* mollissima)			✓
Red-throated diver (*Gavia stellate*)			✓
Arctic tern (*Sterna paradisaea*)			✓
Common Guillemot (*Uria aalge*)			✓
Kittiwake (*Rissa tridactyla,*			✓
Razor bill (*Alca torda*)			✓
Gannets (*Sula bassana*)			✓
Gulls (*Laridae*)			✓
Plaice *(Pleuronectes)*			✓

Fishes			
Sand eel *(Ammodytes marinus,*	✓		
Haddock *(Melanogrammus platessa)*	✓		
White-sided dolphin *(Lagenorhynchus acutus)*	✓		
Marine Mammals			
Common Seal (*Phoca vitulina*)	✓		

Table 8 – Marine species and their vulnerability towards offshore oil discharges in the Dutch part of the North Sea (Hugenholtz, 2008) (Leopold, 2017) (Hara & Morandin, 2010)

4.3.2 Wadden Sea

Furthermore, in the Wadden Sea, during the discharges or any accidental spills, the effects were the same as in the Dutch part of the North Sea; mostly on the sea birds (figure below). Underneath the graph, the table is drawn to categorize the various species and their vulnerability towards the offshore oil spills or discharges (Schulz et al., 2017).

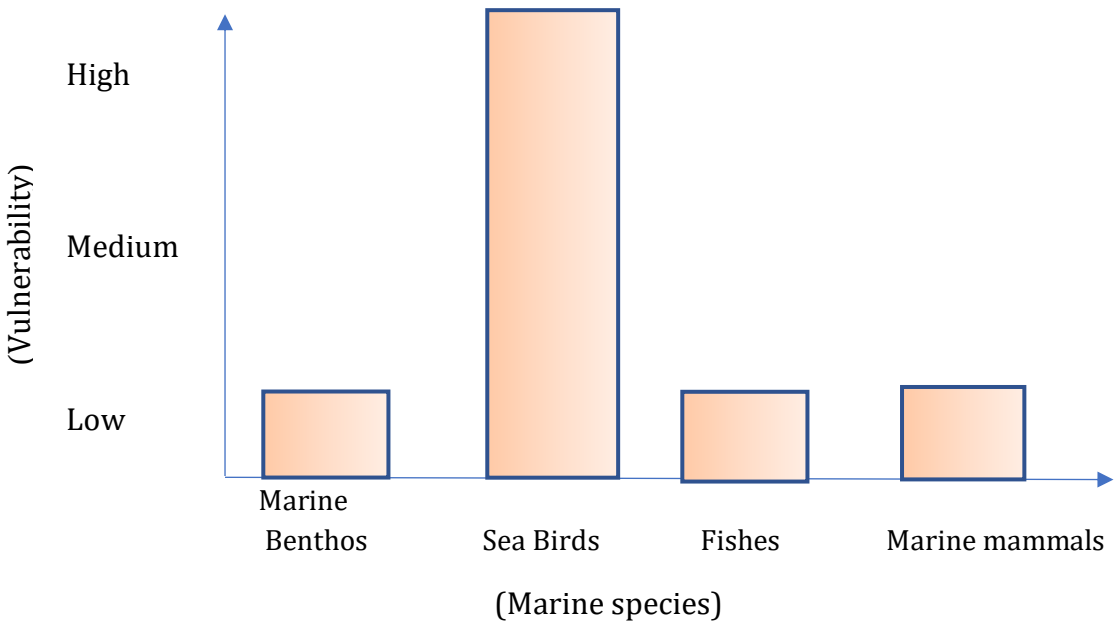


Figure 31 - Wadden Sea oil discharge impacts on the marine species (Schulz et al., 2017)

Species	Vulnerable level		
	Low	Medium	High
Marine Benthos			
Coral reefs	✓		
Sponge communities	✓		
Sea Birds			

Shelduck (*Tadorna*)			✓
Common Eider (*Somateria mollissima*)			✓
Herring Gull (*Larus argentatus Pontoppidan*)			✓
Fishes			
Sand eel *(Ammodytes marinus),*	✓		
Herring *(Clupea harengus)*	✓		
Mackerel *(Scomber scombrus)*	✓		
Marine mammals			
Common seal (*Phoca vitulina)*	✓		

Table 9- Marine species and their vulnerability towards offshore oil discharges in the Wadden sea (Schulz et al., 2017)

4.4 Point of commonality of the species vulnerable to oil spills

Thereupon, from the impacts of the offshore oil pollution in the Netherlands and Norway, it can be concluded that the spills had detrimental impacts on the marine sea birds. These above-mentioned sea birds are the most common species and are easily affected in NCS and DCS. Therefore, figure 32 below depicts the marine species existing on NCS and DCS where the marine sea birds are located in the point of commonality featuring as most vulnerable ones to oil spills in the Netherlands and Norway.

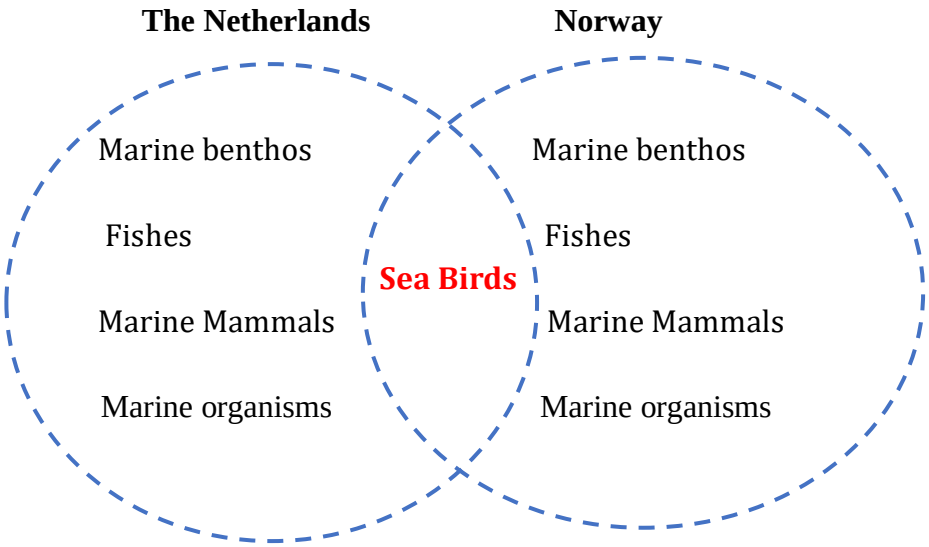


Figure 32 - Point of commonality for most affected species due to offshore oil spills in the Netherlands and Norway

CHAPTER 5 Analysis of Marine Governance systems in the Netherlands and Norway

Research question 2) How do the governance systems in the Netherlands and Norway prevent offshore oil pollution?

The study carried out in response to the second research question is based on the marine governance systems, including different International agreements and policies and regulations implemented in the Netherlands and Norway to address offshore oil pollution.

5.1 INTRODUCTION

The impacts of oil pollution have led several countries to strengthen the marine governance systems, one of the main outcomes were the establishment of International agreements, UNCLOS, IMO, OSPAR, MARPOL, and Bonn agreement on the prevention and reduction of oil pollution. Therefore, the Netherlands and Norway are thus involved in the countries signing the agreements referred to above. Besides signing these agreements, the Netherlands and Norway have implemented several policies and regulations aimed at minimizing oil pollution both in order to comply with the agreements and to move beyond.

5.2 INTERNATIONAL AGREEMENTS ADDRESSING OFFSHORE OIL POLLUTION IN THE NETHERLANDS AND NORWAY

5.2.1 UNCLOS

Norway

Generally speaking, maritime zones in Norway are of five types, Territorial sea, contiguous zone, Exclusive Economic Zone (EEZ), coastal state, and the Continental shelf. Among these zones, offshore activities were carried out in the Exclusive Economic Zone (figure below) and this zone is frequently monitored for its oil production and discharge operations. Apart from the EEZ, other zones, the contiguous zone has limited activities because of the resource's availability, the coastal state is mainly prioritized for the marine biodiversity conservation and the Continental Shelf is also for the production activities. Moreover, authorities in the coastal state not only monitor the activities within their territory but also other maritime zones for oil pollution (UNCLOS, 2009) (Harsson & Preiss, 2011) (The Arctic Institute Center for circumpolar security studies , 2020).

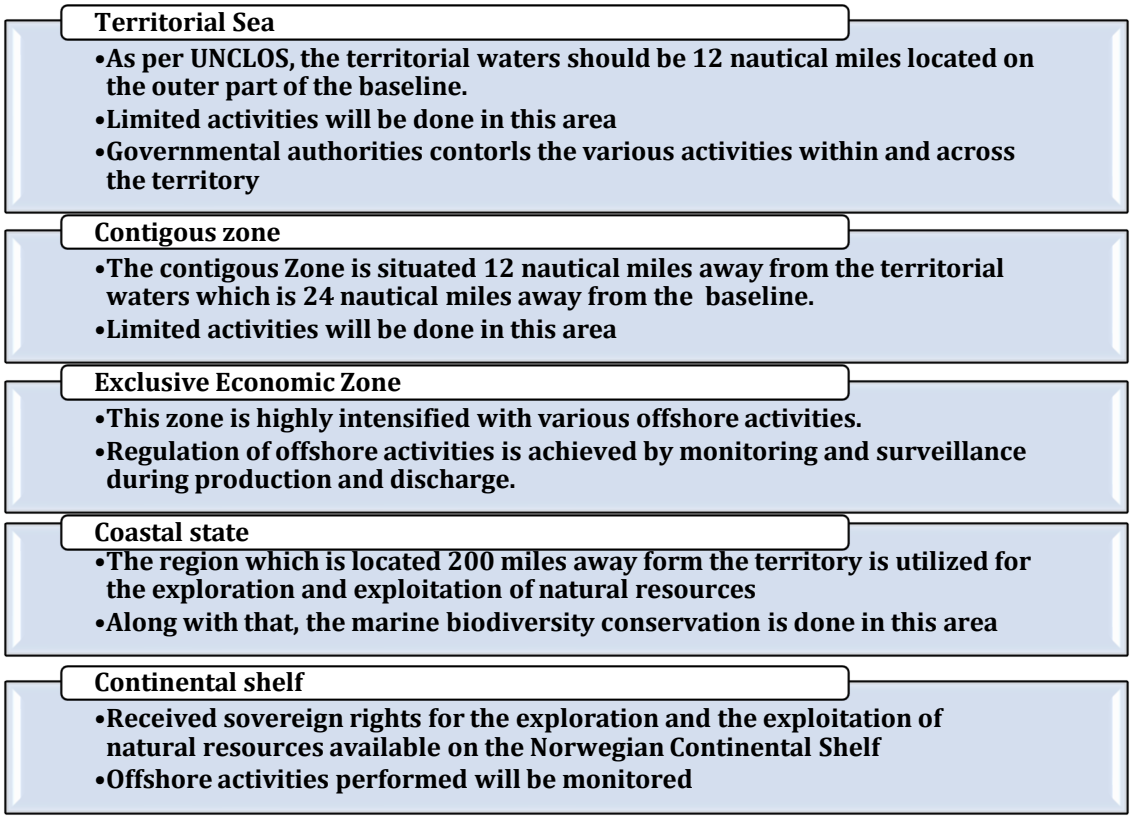


Figure 33 - Maritime zones in Norway (UNCLOS, 2009) (Harsson & Preiss, 2011) (The Arctic Institute Center for circumpolar security studies , 2020)

The Netherlands

In the Netherlands, the maritime zones were the Dutch territorial waters, Exclusive Economic Zone (EEZ), connecting zone, and the accident prevention zone for the Dutch part of the North Sea (figure below). Similarly, like Norway, the offshore activities were immense in the Dutch EEZ. Thereafter in the connecting zone with minimized production activities based on the resources available there and in the accident prevention zone, mitigation measures for environmental damage must be ensured. All these zones have been monitored for the detection, prevention and reduction of oil spills and its impacts on the marine biodiversity (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs., 2015).

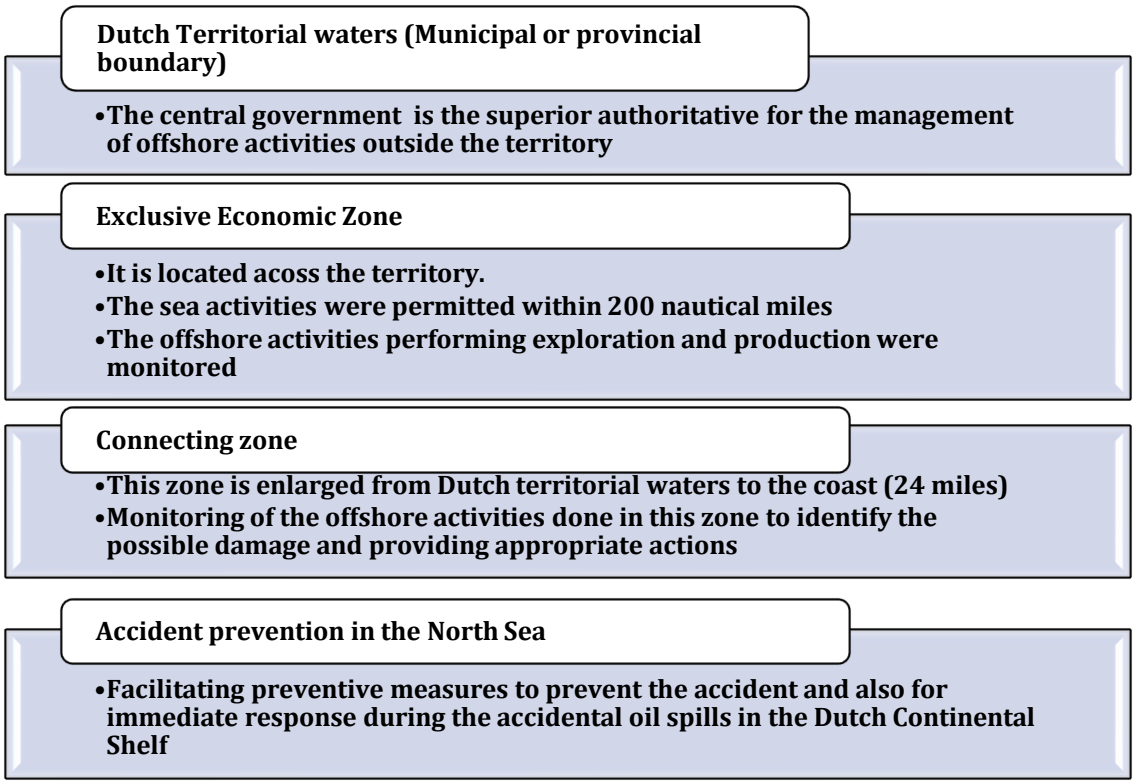


Figure 34 - Maritime zones in the Netherlands (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015)

5.2.2 IMO

In general, IMO is highly recognized for oil spills accident prevention on the seas. In case of any accidents in the Netherlands and Norway, the spill control and prevention are done as soon as possible to reduce the damage to the marine environment (figure below). Regardless of their damage to the marine environment, IOPC covers their liability expenses, and most importantly, the area will undergo serious monitoring to prevent further accidents or damages in the future (International Maritime organization , 2009).

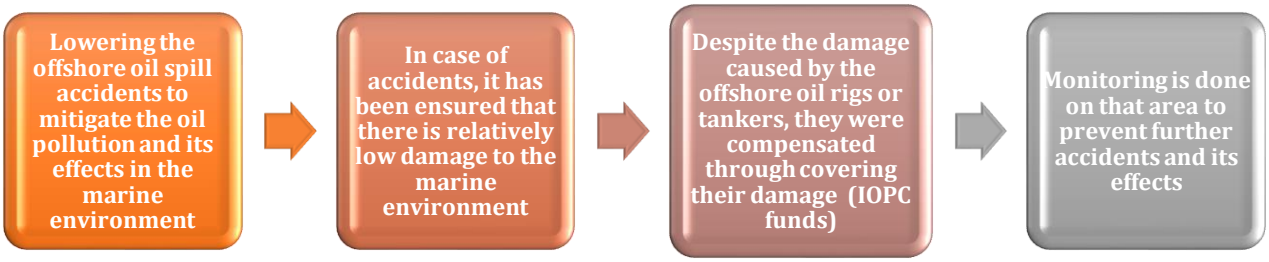


Figure 35 - Major role of IMO (International Maritime Organization, 2009)

5.2.3 MARPOL

MARPOL (Annexure I) has its ultimate goal of regulating oil discharges in the North Sea. Furthermore, in the NCS and DCS, special areas containing high ecological value are prohibited for oil discharges and, in the event of any disposal, less than 30 liters per nautical miles (figure below). Also, the rest of the areas with oil production should ensure that the discharge standards do not exceed 15 ppm (fewer impacts and are easily dispersed with limited visibility) (Bonn Agreement, 2015).

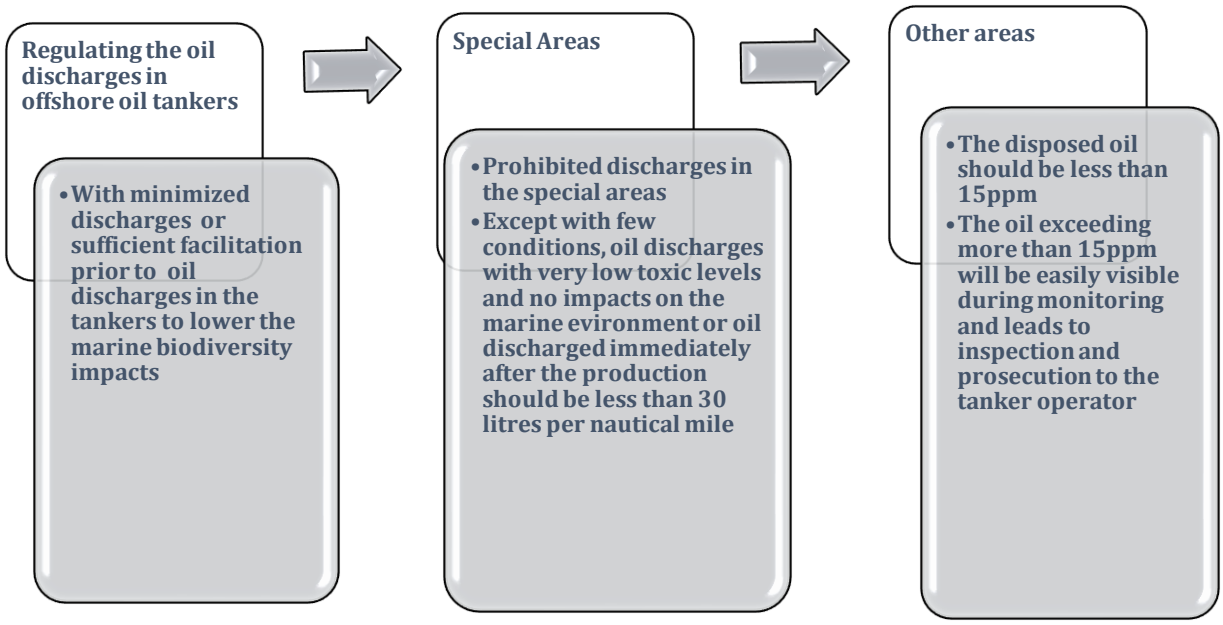


Figure 36 - MARPOL regulations (Bonn agreement, 2015)

5.2.4 OSPAR

The OSPAR regulations were intended to assert the application of the precautionary principle (BAT or BEP) to maintain the discharge standards (below 30mg/l or less than 15 ppm) before oil discharge operations in the offshore activities. If any oil discharges exceeding the discharge standards or illegal discharges in the NCS and DCS, eventually undergo inspection and if proven to exceed the discharge standards, consequentially, facing the prosecution (figure below) (Carpenter, 2015) (OSPAR Commission , 2016).

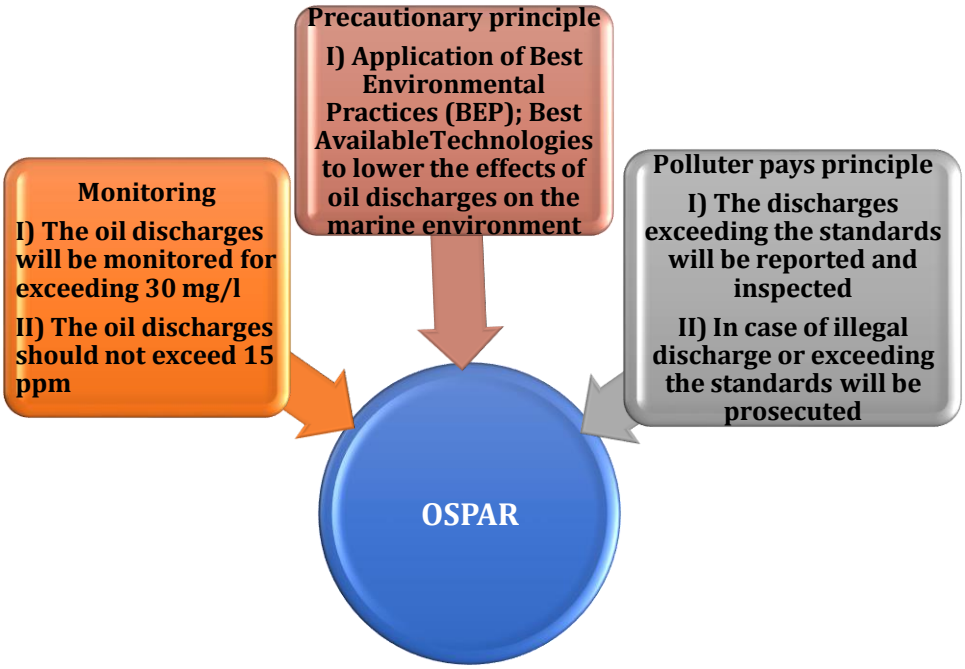


Figure 37 - OSPAR regulations (Carpenter, 2015) (OSPAR Commission , 2016)

5.2.5 Bonn Agreement

Aerial surveillance plays an important role in the detection of oil spills in the NCS and DCS, in particular as mentioned above, the discharges standards exceeding 15 ppm. In any occasion of encountering either illegal or exceeded discharge standards, at first, validating proof will be collected (through SLAR, visual observation,

and photography) (figure 38) to confirm the polluter's guilty of discharges and if proven, it leads to prosecution which depends upon the numbers of evidence collected (total number of discharges and how serious the impacts were on the marine environment) (Bonn Agreement, 2015). Finally, figure 39 explains the functioning of surveillance for oil pollution in the Netherlands and Norway.

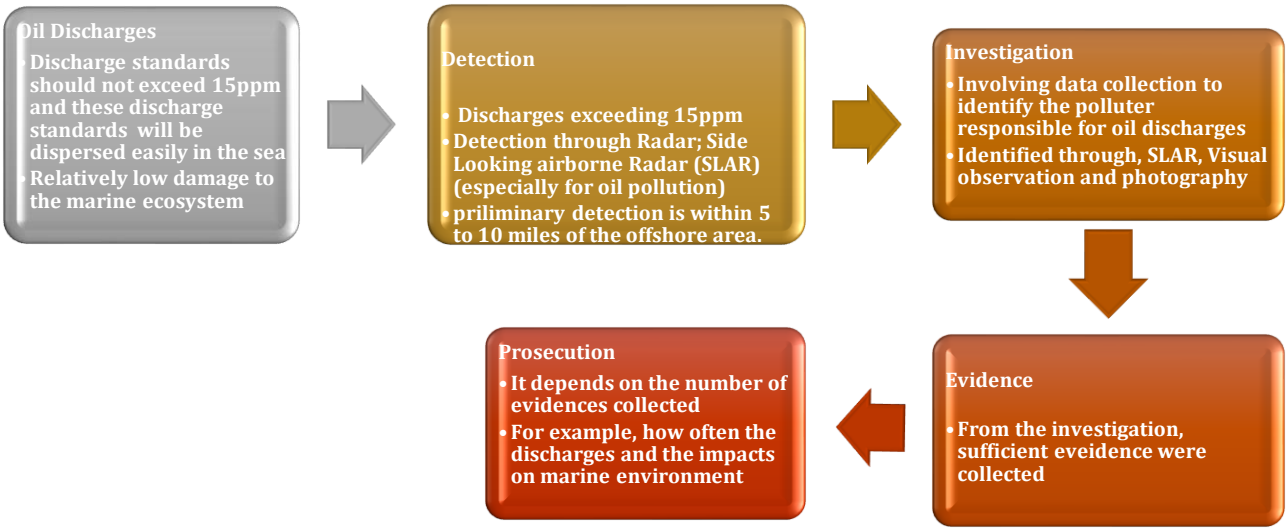


Figure 38 - Aerial surveillance process in Bonn agreement (Bonn Agreement, 2015)

Norway

satellite surveillance

- **The satellite surveillance were done daily**
- **Other surveillance is done through Helicopters and gathering of supplementary imformation is from European Maritime Safety Agency and it is done on daily basis**

Inspections

- **Minimum inspections (14 to 15 interviews per year) and also interviews were conducted with the operators for the verification procedures**
- **provision of yearly reports from the offshore oil industries containing the data on discharge standards and the EIF report**
- **Operations having high risks will undergo more inspections (checking the system and the equipment)**

The Netherlands

satellite surveillance

- **Coast guards were responsible in conducting surveillance 1200 hours per year (in the Dutch part of the North sea) and also in daily basis over 365 days**
- **The equipments, two remote sensing aircraft, specialized radar, SLAR airborne radar were applied for detecting the oil spills**
- **The discharged oil, less than 15ppm cannot be detected and the minimum visibility standards to detect the oil spills (40 to 50 ppm)**

Figure 39- Aerial surveillance in Norway and the Netherlands (Bonn Agreement, 2015)

5.3 Marine governance systems in Norway

5.3.1 Zero discharge policy

According to this policy, the oil discharges from the various sources (accidental spills or discharges from the oil rigs or platforms and the oil tankers) should be lowered as much as possible. This is achieved by Best Available Technologies which is highly beneficial in extracting the large quantity of oil at the possible extent and reduces the discharges considerably. Correspondingly, the remaining oil residues were undergone cleaning in the process itself to meet the discharge standards. This entire process (Best Environmental Practices) involving several technologies in lowering and cleaning the oil discharges is the application of the precautionary principle (figure below). Every offshore oil production industry before their discharge operations need to determine Environmental Impact Factor to evaluate whether the discharged oil is below the "no effect" limit for the lowest possible damage or no damage to the marine species (The Norwegian Oil Industry Association, 2005).

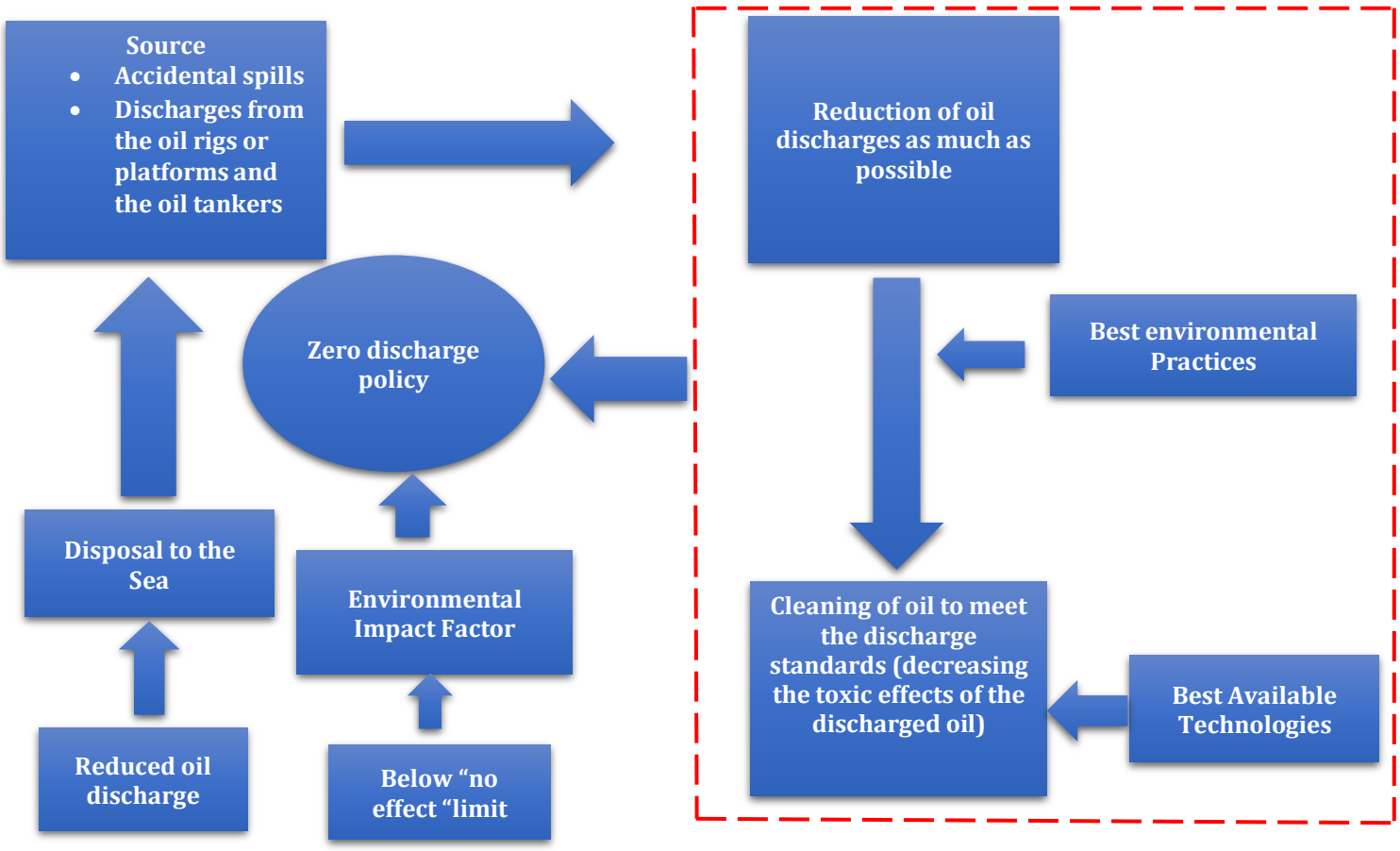


Figure 40 - Precautionary principle (The Norwegian Oil Industry Association, 2005)

5.3.2 Oil spill response policy

The offshore industries before conducting the production operations need to prove (an obligatory requirement) that they have sufficient facilities to handle the oil spill in case of any accidents; identifying, mitigating, and reducing the spills with minimal impact on the marine environment. The Norwegian Coastal Administration, being an important governmental body in handling the acute oil spills follows these procedures, initially, the

detection of spills through surveillance or aircraft, preparation or creation of a plan in performing response actions, facilitation of equipment's and persons, initial preference to rescue and preserve the marine species affected from oil spills, application of technologies in lowering, cleaning and recovering the oil spills from the sea (figure below). Then, environmental surveys need to be conducted to check the extent of damage to the marine species and along with the continuous monitoring of that area for any further spills in the future (Norwegian Coastal Administration , 2020).

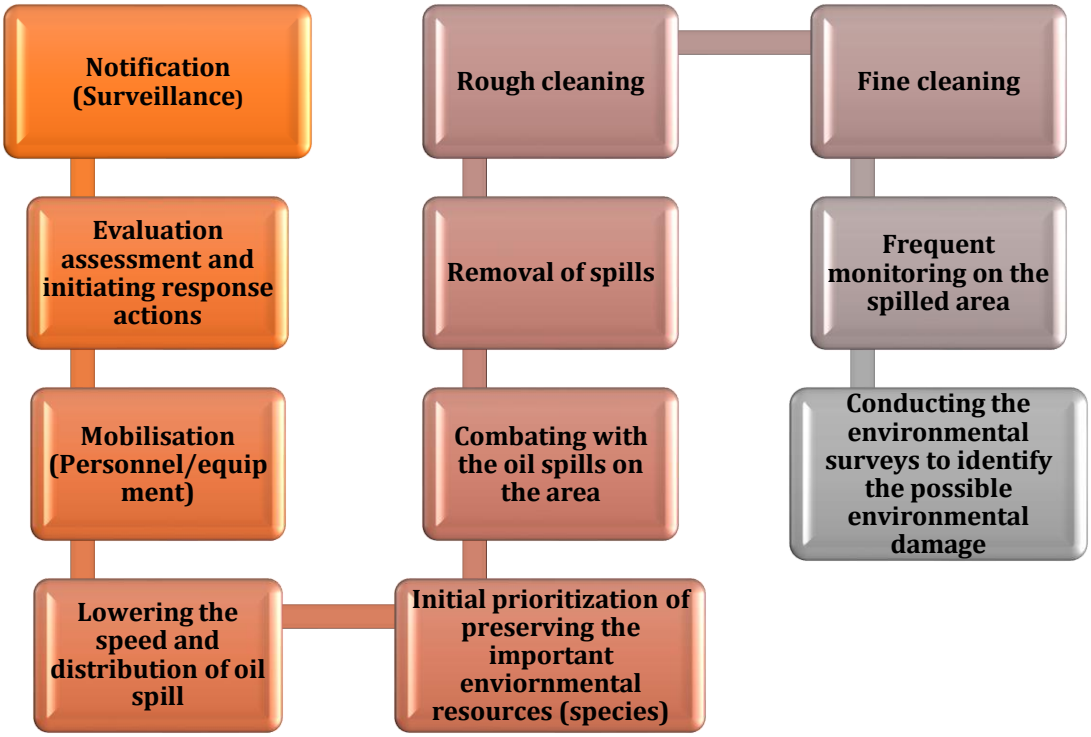


Figure 41 - oil spill response in Norway performed by NCA (Norwegian Coastal Administration, 2020)

5.3.3 Marine spatial planning policy

At the time of allocation of areas for offshore oil exploration and production, it is essential in assessing the natural resources, the types of species available, and also the usage of natural resources in that particular marine environment. And thereafter, if the marine species in that area are highly vulnerable to the continuous discharges, subsequently, the mitigation measures in the reduction of oil discharges and continuous monitoring were done. Notably, assessments will be carried out in the oil rigs or platforms and the oil tankers to check their performance standards for the oil discharges and identifying the potential effects of these discharges on the marine species (figure below). These assessments were mainly undertaken by respective stakeholders on their implementation of an integrated management plan to address the oil discharges (Norwegian Ministry of Environment , 2009).

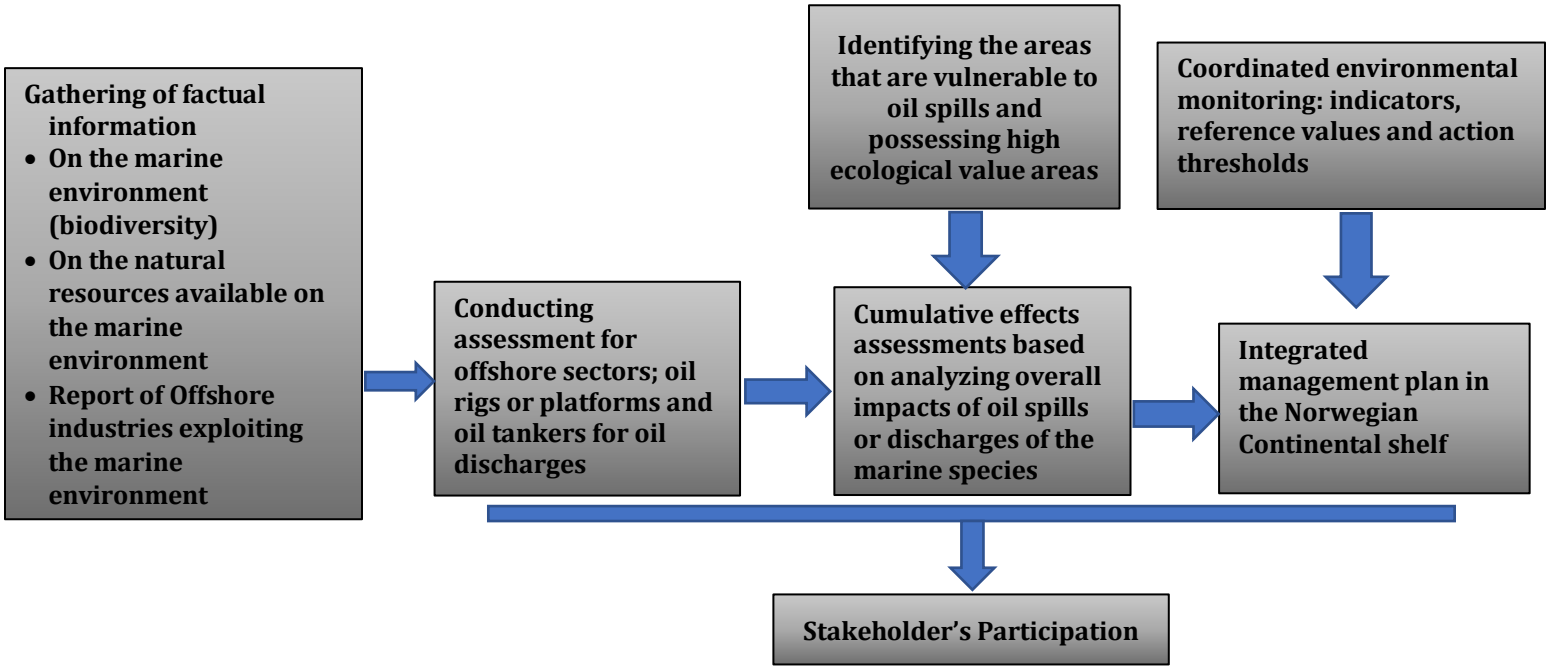


Figure 42 - Marine spatial planning in Norway (Norwegian Ministry of Environment, 2009)

5.3.4 Ecosystem-Based management policy

In considering the marine species and becoming vulnerable to oil spills, this policy evaluates the level of impacts of the marine ecosystem. This evaluation concerning various impact levels is categorized as the following, insignificant, minor, moderate, major, and catastrophic (figure below). Suppose, the identified impacts were minor, it indicates that the effects were minimum in the marine ecosystem with relatively low deaths to the marine species. If the impact levels were identified as moderate, major, and catastrophic, then it indicates that the marine species on that locality is highly vulnerable to oil spills, in extreme cases leading to death. Thereby, the areas under this category were continuously monitored, and also temporary halting of production operations were done to minimize the oil discharges in the sea (Norwegian Ministry of Environment , 2009).

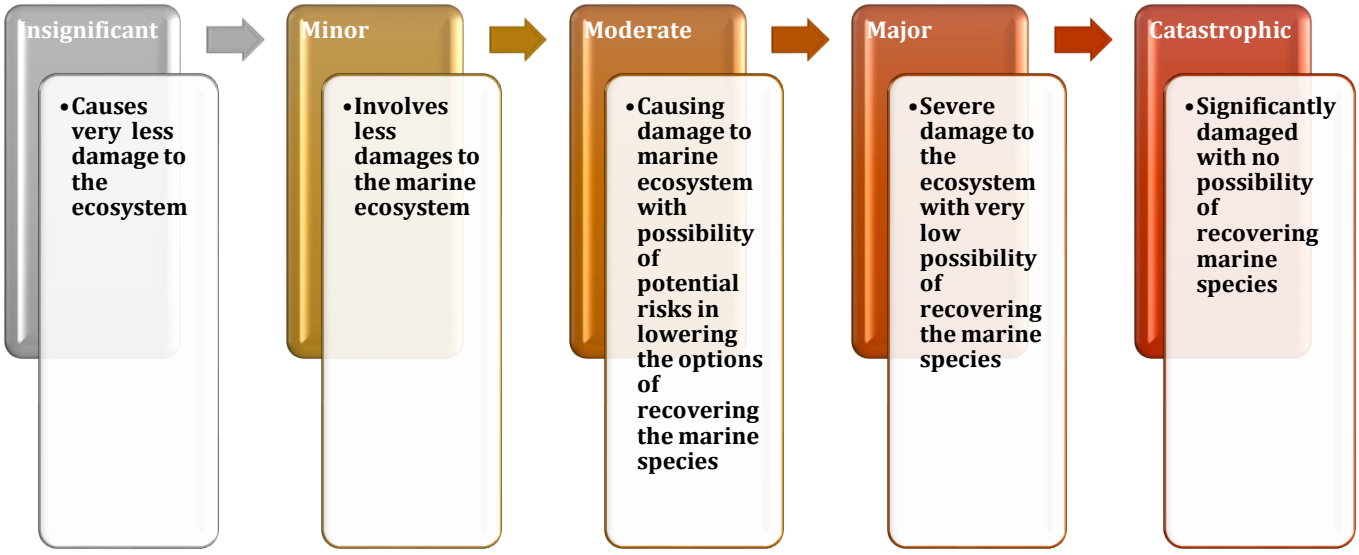


Figure 43 - Five-point scale based on the vulnerability of the species due to the oil spills ((Norwegian Ministry of Environment, 2009)

5.3.5 Regulations

The discharge regulations implemented in Norway ensures that the oil discharges need to comply with the following procedures prior to their disposal in the sea,

1. At first, treating the oil using Best Available Technologies (Best Environmental practices) to lower its toxic effects. Promptly, Environmental Impact Assessment was carried out to identify the spill effects in the marine environment before discharging in the sea. The application of BAT is for maintaining the discharge standards,
    - Should be less than 30mg/l (as per the OSPAR regulations)
    - Should be less than 15 ppm (as per Bonn agreement)

    Altogether, the whole process of treatment to meet the discharge standards based on the consideration of marine biodiversity is called the precautionary principle.
2. Further, the discharges were undergone monitoring and surveillance, if any cases,
    - Exceeding of the discharge standards
    - The practice of illegal discharges (see figure 44)

the production platforms or the rigs and the oil tankers will be reported to the police to check the sufficient facilitation of treatment technologies and the interview with the operator for the reasoning of exceeding discharge standards and the illegal discharges.

If proven, then the prosecution will be severe and it depends upon the net production profit and the damage caused to the marine environment (Arstad, 1995) (Bakke et al., 2011) (Bennear, 2015) (Lee & Neff, 2011) (Library of congress , 2020). Also, the severity of prosecution regarding the pollution and its damage were explained in figure 45.

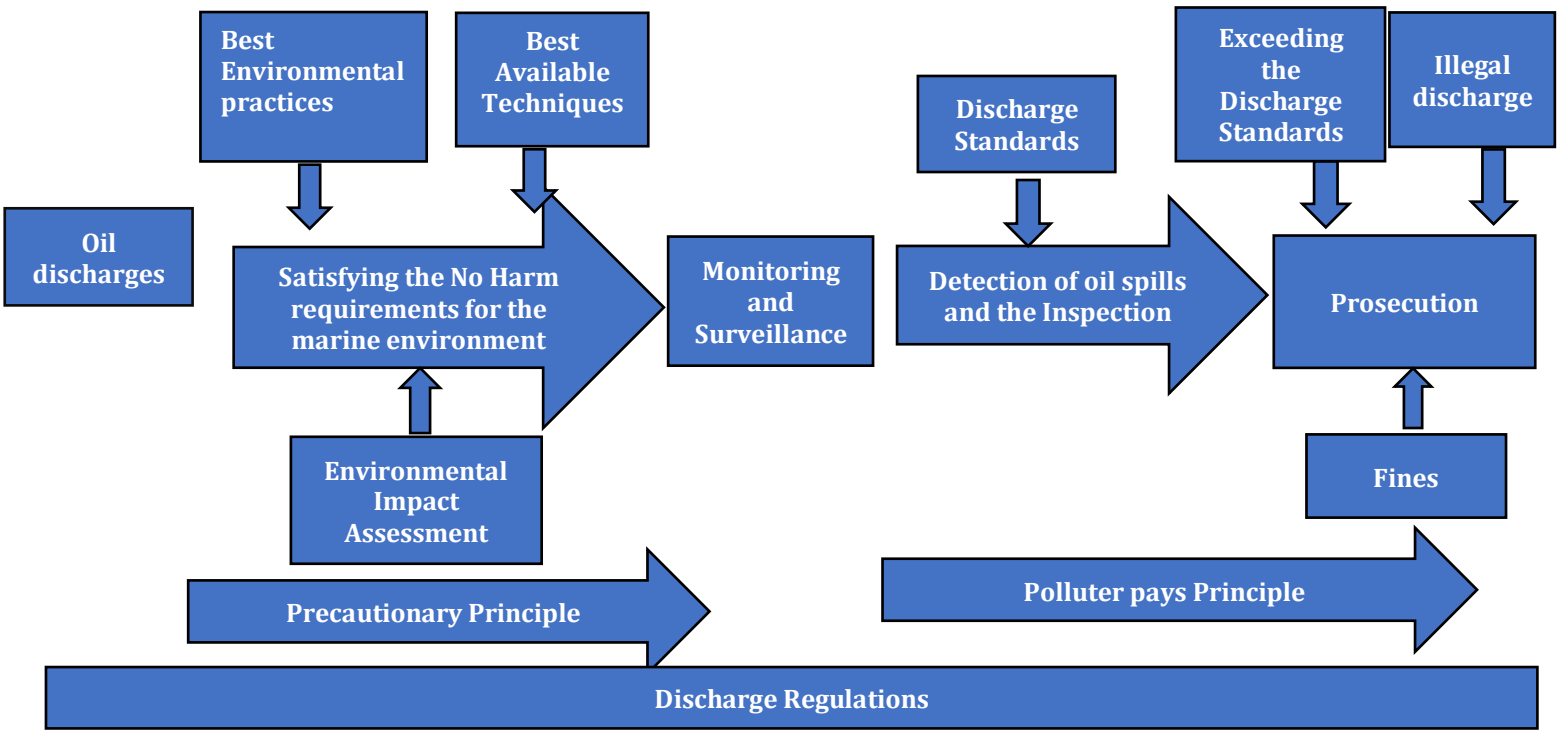


Figure 44- Oil discharge regulations in Norway (Arstad, 1995) (Bakke et al., 2011) (Bennear, 2015) (Lee & Neff, 2011)

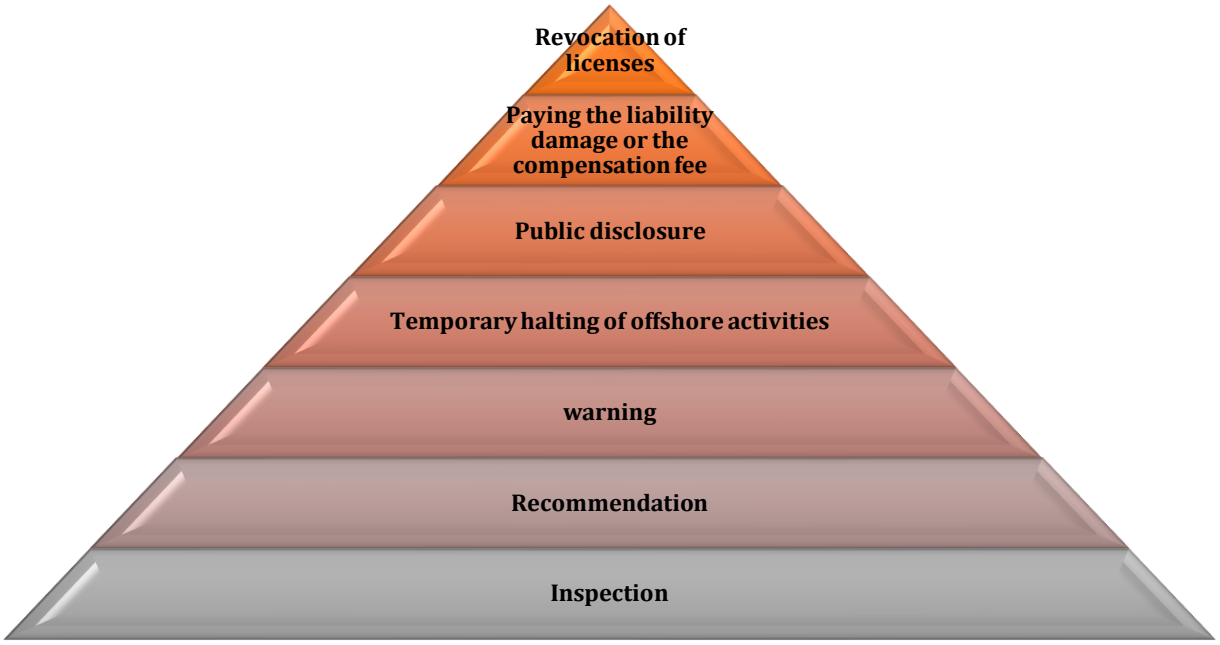


Figure 45- Norwegian oil spills prosecution triangle (Library of congress, 2020)

5.4 Marine governance systems in the Netherlands

5.4.1 Trilateral policy

The major elements of this policy were, Trilateral Monitoring Assessment Programme (TMAP), Future Mapping and Monitoring Needs, Innovation in mapping and monitoring, and the application of ICZM tools (see figure 46).

Trilateral Monitoring Assessment Programme (TMAP)

It plays an essential role in the monitoring of oil spills and marine biodiversity in the Wadden Sea. Under this programme, any detection of oil spills in the Wadden Sea will be immediately reported to the relevant authority for immediate action to lower the oil spills and its effects. Moreover, this programme also prioritizes biodiversity and evaluates the spill impacts on the marine species.

Future Mapping and Monitoring Needs

The importance of future mapping and monitoring is to assess the areas for offshore exploration and production having low ecological importance and in monitoring those areas,

1) For oil discharges and its effects in the allocated areas in the Wadden Sea.
2) If any production platforms in the valuable ecological valuable areas, strict monitoring and if damage has been identified halting of activities or in worse case relocation of activities.

Innovation in mapping and monitoring

For innovation mapping, the application of advanced technologies to identify the areas that are left out of the map can be utilized for offshore exploration and production. Moreover, these mapping provides data not only for areas suitable for production and exploration but also for the undiscovered areas enriched with marine biodiversity. The identification of areas will have major application in the future by

1) In case of spill cases, the relocation of activities to these areas
2) Total identification of undiscovered areas will be useful in monitoring the areas with high ecological values, in case of any illegal discharge was found or for preservation purposes.

The application of ICZM (Integrated Coastal Zone Management) tool for oil spills

ICZM is a management tool consisting of vision, shared principles, targets, and policies for the conservation of marine environment against various oil pollution activities. The following principles involved in the ICZM were as follows,

- The precautionary principle – Besides the consideration of scientific evidence as valid proof of oil spills from offshore activities, significant management measures were undertaken priorly in minimizing offshore activities and its effects on the sea.
- Principle of Translocation – If the oil production is located in the area sensible to the marine species, then the activities can be translocated to another area.
- Principle of compensation – If the production activities cannot be translocated or unavoidable, subsequently, compensation has to be provided.
- Principle of Restoration – Enhancing the affected marine biodiversity from production activities through restoration.
- Principle of Best Available Techniques and Best Environmental Practices – For the maintenance of the discharge standards.
- Principle of Avoidance – Minimizing the activities and their effects.
- Principle of Careful Decision Making – Providing decisions using the data collected for production activities and its impacts (South Baltic Programme , 2010) (Klöpper, 2019).

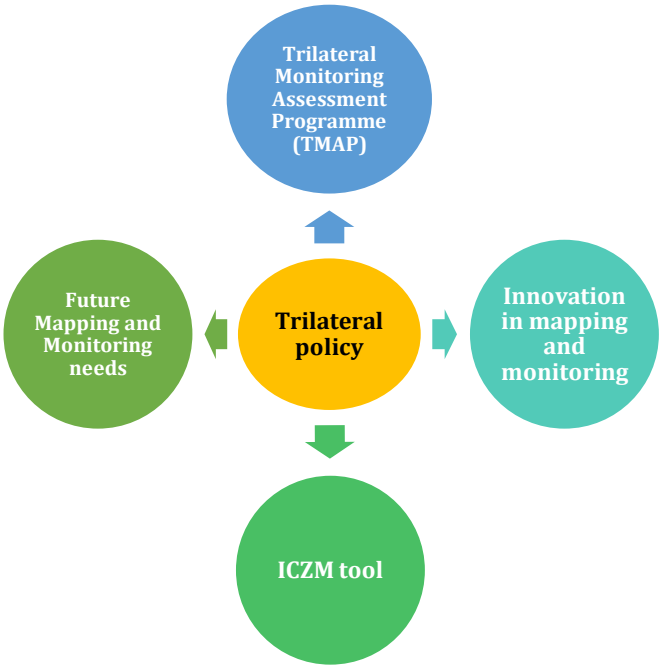


Figure 46- Trilateral policy in the Netherlands (South Baltic Programme, 2010) (Klöpper, 2019).

5.4.2 Oil spill response policy

The accidents in offshore oil rigs or production platforms and the tankers were detected through surveillance and immediate response were initiated from the relevant governmental bodies addressing the oil spills in the sea. After reaching the location, initially, the marine species were rescued and isolated from these spills. Subsequently, the oil spills were contained by avoiding its dissemination and recovered as much as possible (figure below). Moreover, these places were undergone with serious monitoring to avoid accidents in the future (ITOPF, 2011).

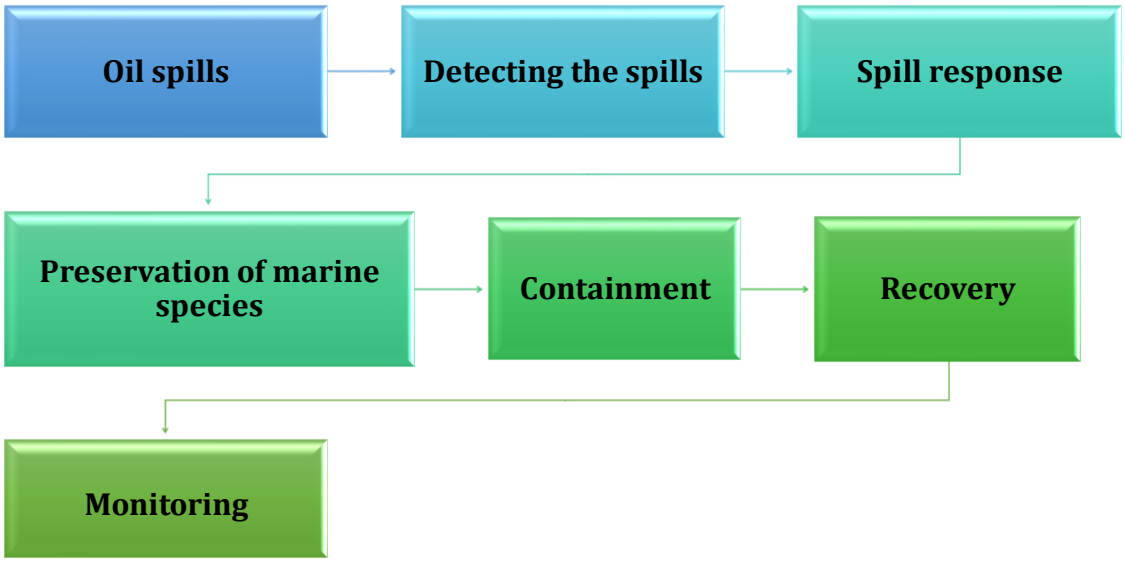


Figure 47 - Oil spill response in the Netherlands (ITOPF, 2011).

5.4.3 Marine spatial policy

This policy outlines the enhancement of spatial development and it is achieved through the opportunity maps and integrated assessment framework. In the opportunity maps, the received permit was given to those areas having minimum ecological significance, and besides, the areas possessing either low or no ecological value should be made efficient as possible. Other than that, the integrated assessment framework (figure below) undertakes the claiming of permits from the industries for the areas having diversified marine species and provides decisions for future activities. Furthermore, the discharges were monitored for detecting the oil spills and the species damage (Vrees, 2019) (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015).

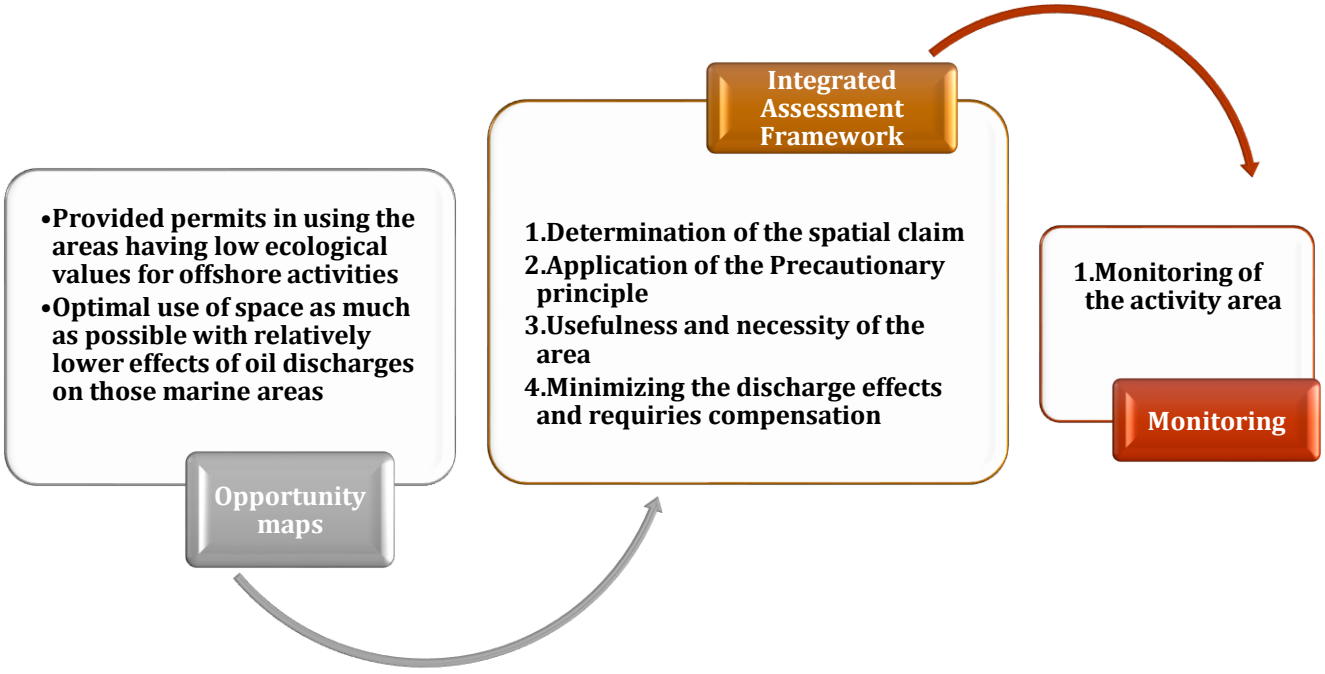


Figure 48 - Marine spatial planning in the Netherlands (Vrees, 2019) (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015)

The table below explains the space allocation for offshore activities in the Netherlands

Activity	Choice of location/Efficient use of space	Application of the precautionary principle	Usefulness & necessity	Compensation
Offshore oil production	As optimum as possible	Yes, and mandatory	Based on the guidelines of the marine spatial policy for utilizing the space for offshore oil production	Depends on significant effects identified in the Environmental Impact Report

Table 10 - Space allocations for offshore activities in the Netherlands (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015)

5.4.4 Ecosystem based management policy

This policy typically focuses on the conservation of the marine environment from oil pollution. As mentioned above, the offshore industries were obliged to perform the impact assessments for evaluating and minimizing the impacts through the oil discharged into the sea. Moreover, this policy consists of an area-based approach (figure below) where the allocation of permits depends upon the type of locations chosen for oil production operations. In addition, the offshore industries causing any damage to the ecosystem has to provide compensation for the restoration of marine biodiversity. Furthermore, the application of the precautionary principle (using BAT) is mandatory to ensure that the oil discharges comply with the discharge standards for not causing any damage to the marine environment (Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2016).

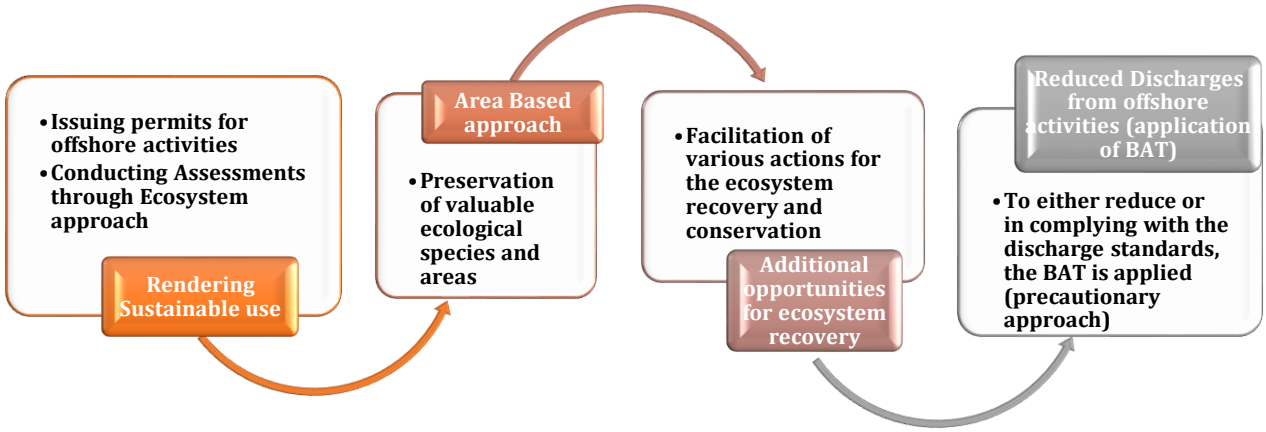


Figure 49- Ecosystem based management in the Netherlands (Ministry of Infrastructure and the Environment & Ministry of Economic Affairs, 2016)

5.4.5 Regulations

1. The oil discharges in the Netherlands were the same as Norway with the discharge standards need to meet the following,
    - Should be less than 30mg/l (as per the OSPAR regulations)
    - Should be less than 15 ppm (as per Bonn agreement)
2. These discharge standards were attained through the application of Best Available Techniques. The discharges exceeding the standards or any illegal discharges were detected in the surveillance and monitoring, initially, it will be reported to the prosecutor and the police for the inspection (figure 50).
3. If proven with sufficient evidence and the polluter found guilty for polluting the sea, subsequently, there is prosecution with a huge fine (European Space Agency, 2020).

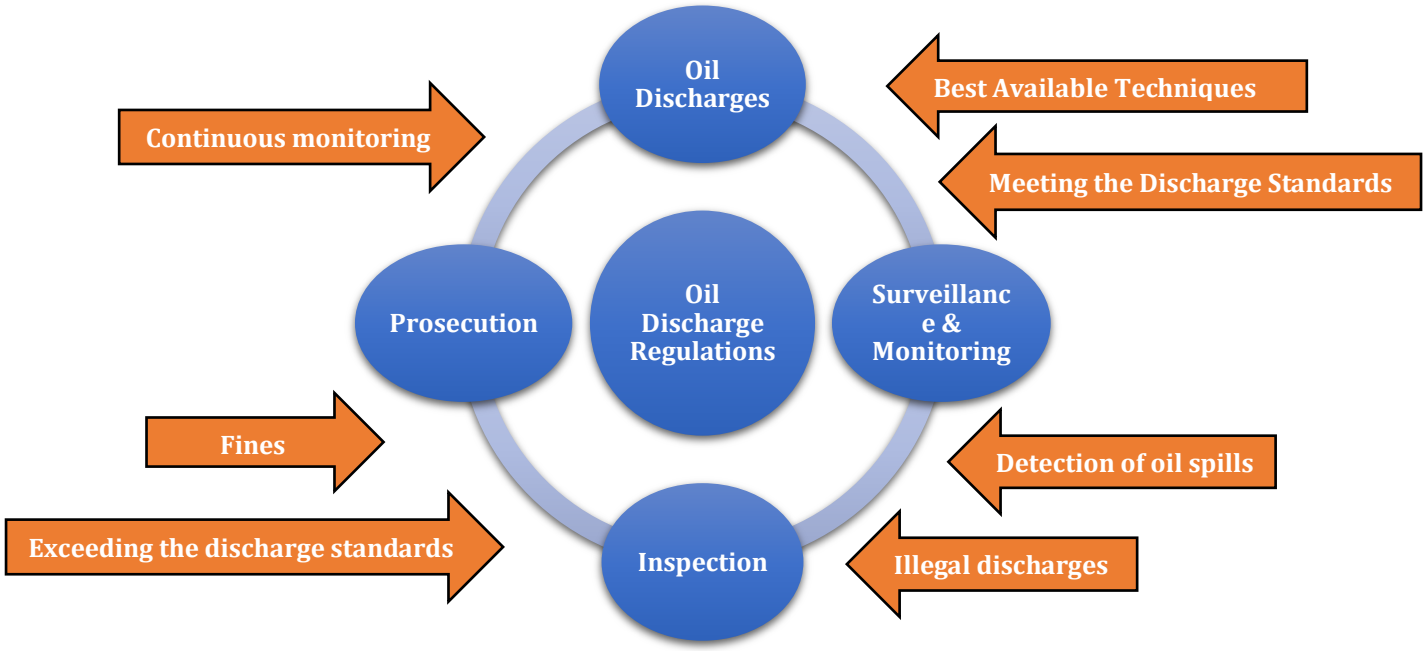


Figure 50 - Discharge regulations in the Netherlands (European Space Agency, 2020)

Inspection and prosecution

Figure 51 below explains the prosecution for oil discharges in the Netherlands

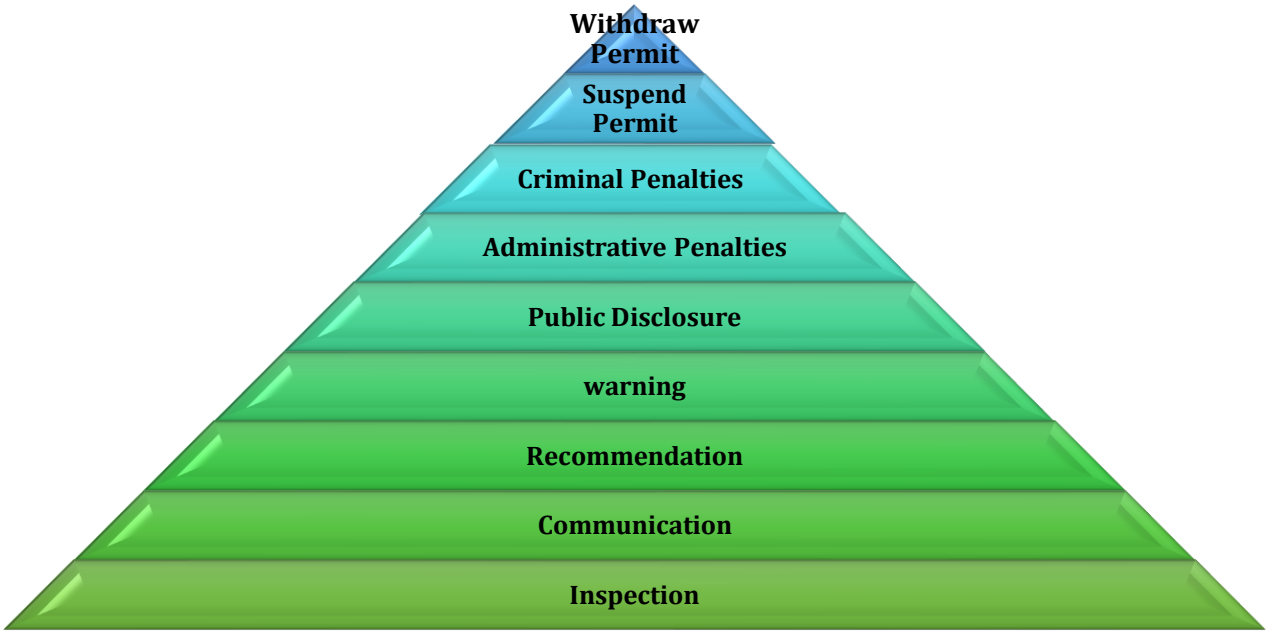


Figure 51- Prosecution triangle for oil discharges in the Netherlands (Dakhorst, 2015)

CHAPTER 6 Drawbacks of the implemented policies and regulations

Research question 3) Are the governance systems in use in the Netherlands and Norway appropriately taking action to reduce oil discharge and are the efforts effective, efficient, and legitimate?

This chapter analyzes the efficacy of the marine governance systems in the Netherlands and Norway. The focus is upon whether the implemented policies and regulations in the Netherlands and Norway show weaknesses and inadequacies. In answering research question 3 on the drawbacks of marine governance systems, two methods were adopted, desk research and in-depth interviews.

6.1 Introduction

The marine governance systems in the Netherlands and Norway despite their efforts in minimizing offshore oil pollution might also have drawbacks that inhibit the performance of good marine governance systems. In this chapter, the drawbacks of the implemented policies and regulations are elaborated.

6.2 Drawbacks of policies and regulations

6.2.1 Norway

The International agreements and the policies and regulations in Norway have played a crucial role in curbing offshore oil pollution. The above-mentioned management measures in chapter 5, were adequate in abating the accidental oil spills, illegal discharges, or exceedance of discharge standards with low marine environmental impacts. However, there is high oil production which potentially leads to more oil discharges. It is because, NCS has many oil platforms, most of which were older ones; which score less supportive regarding the new treatment technologies. Since there is less possibility of replacing old treatment technologies with new technology, oil discharges during the production will also continue. These aged platforms with a lack of facilitation have a higher possibility of accidents and a higher risk of releasing a larger quantity of oil spills (Norwegian Oil and Gas Association , 2017). Moreover, the aspect of old platforms and old technology was acknowledged in one of the interviews, the interviewees expressed that older production platforms were declared to be shut down. But the government has prolonged the shutdown date because to increase production as much as possible. So, the central core of this problem was due to the government's expectancy on increasing more oil production yield from the offshore industries which benefits the country on increasing the exports on oil and its related products globally (Economic benefits).

As production was made exemplary, the permits have been issued for offshore activities. Because of this, the increased production consequentially leads to more discharges and these discharges affect the marine ecosystem.

Apart from that, the interviewee also argued that Norway being a vast country, the management measures for space allocation for the offshore exploration and production were not sufficient. Space is nor scarce and that leads to a culture that does not fully focus upon minimizing spatial impacts and risks.

Figure 52 and 53 explains the lack of marine governance systems aroused because of the abovementioned drawbacks.

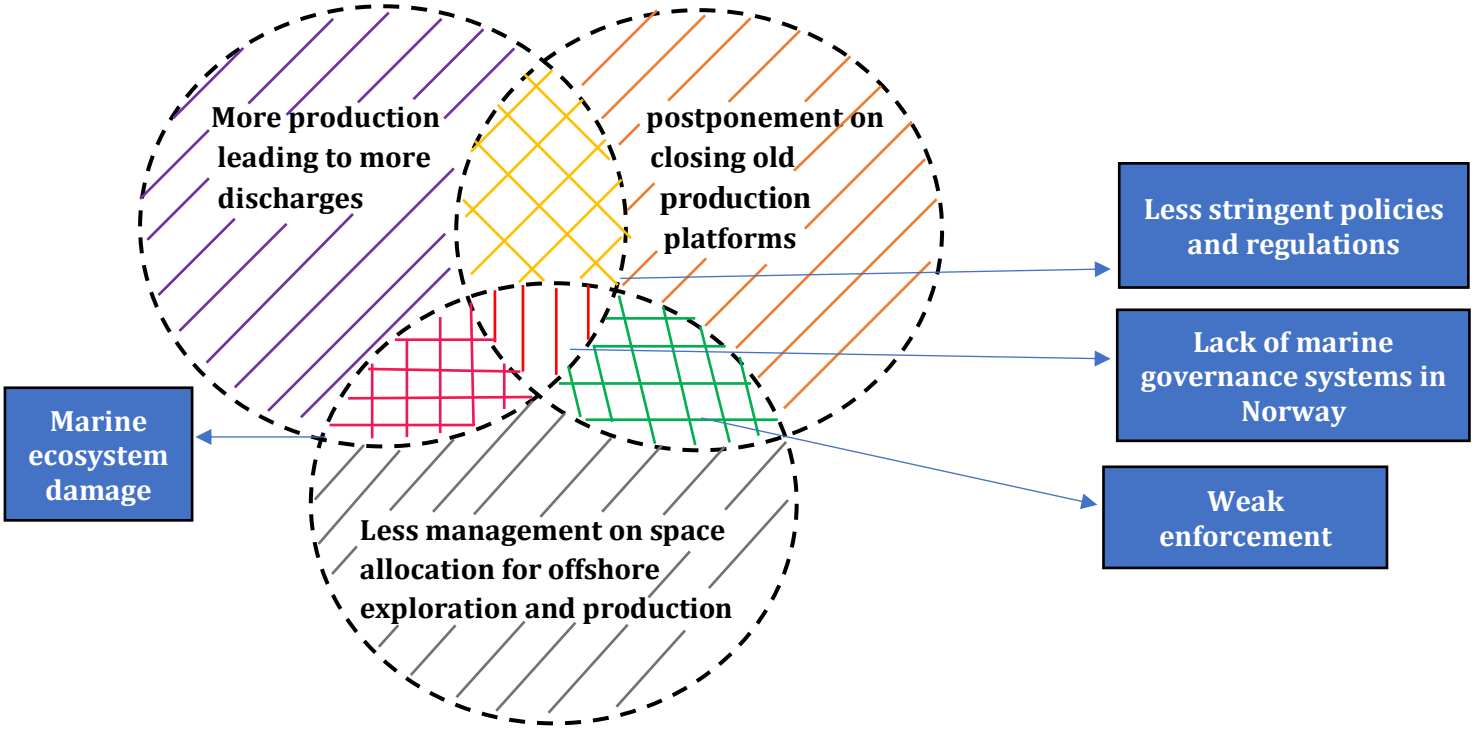


Figure 52 - Diagrammatic representation of drawbacks in policies and regulations in Norway (Norwegian Oil and Gas Association, 2017)

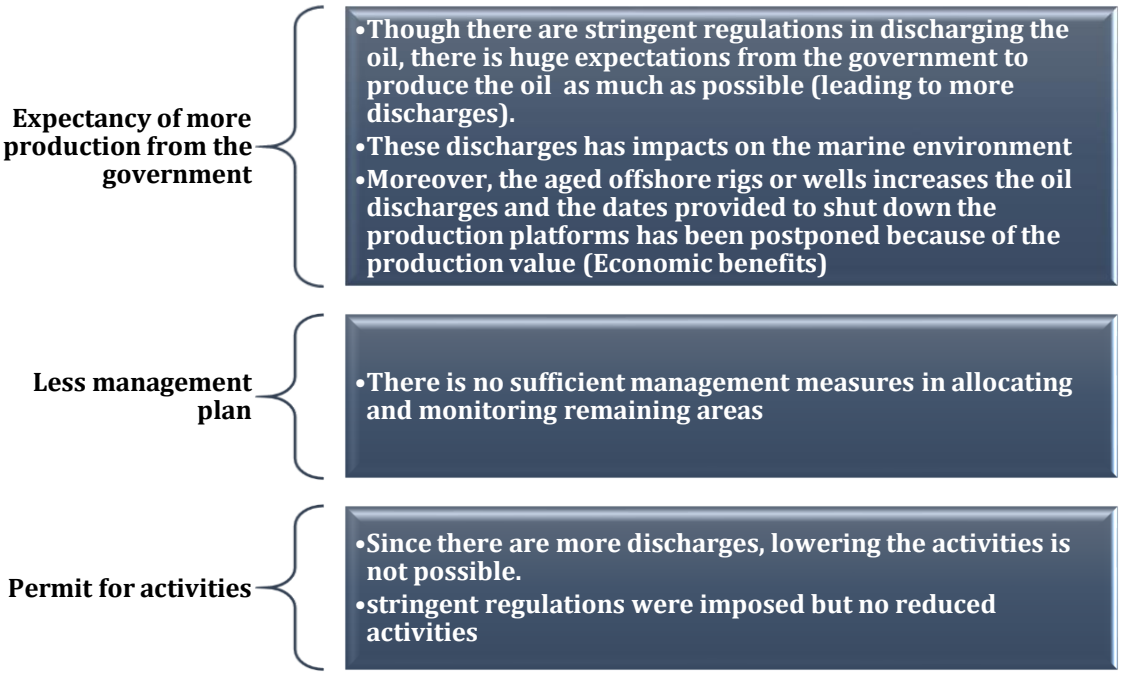


Figure 53 - Drawbacks of policies and regulations in Norway (Norwegian Oil and Gas Association, 2017)

6.2.2 The Netherlands

In the Netherlands, regardless of their track record of little spill cases, the effects on the marine ecosystem were intense (these effects were mentioned in chapter 4). Although there is little oil discharge in the Netherlands, the provision of permits for facilitating the exploration and production activities is seen as problematic. The main reason for this problem is based on the common principle that, the resources should be used as much as possible and it is not always done. Moreover, the gathering of evidence is very important.

It is known that the detection of oil spills was primarily through aerial observation. In case, the identification of spills was done by radar, the prosecution will not proceed. If sufficient evidence were not provided, because for instance evidence is based on radar, then, in the court, the case never endures. Most importantly, the polluter is often capable of committing the crime with a minimum probability of getting caught, if they emit oil on purpose. And also they often are calculating actors that are aware of the type of penalty and severity of the penalty imposed on them which leads them to involve in such violating actions (Vollaard, 2017) (Camphuysen & Vollaard, 2015).

Figure 54 and 55 illustrate the lack of marine governance systems in the Netherlands.

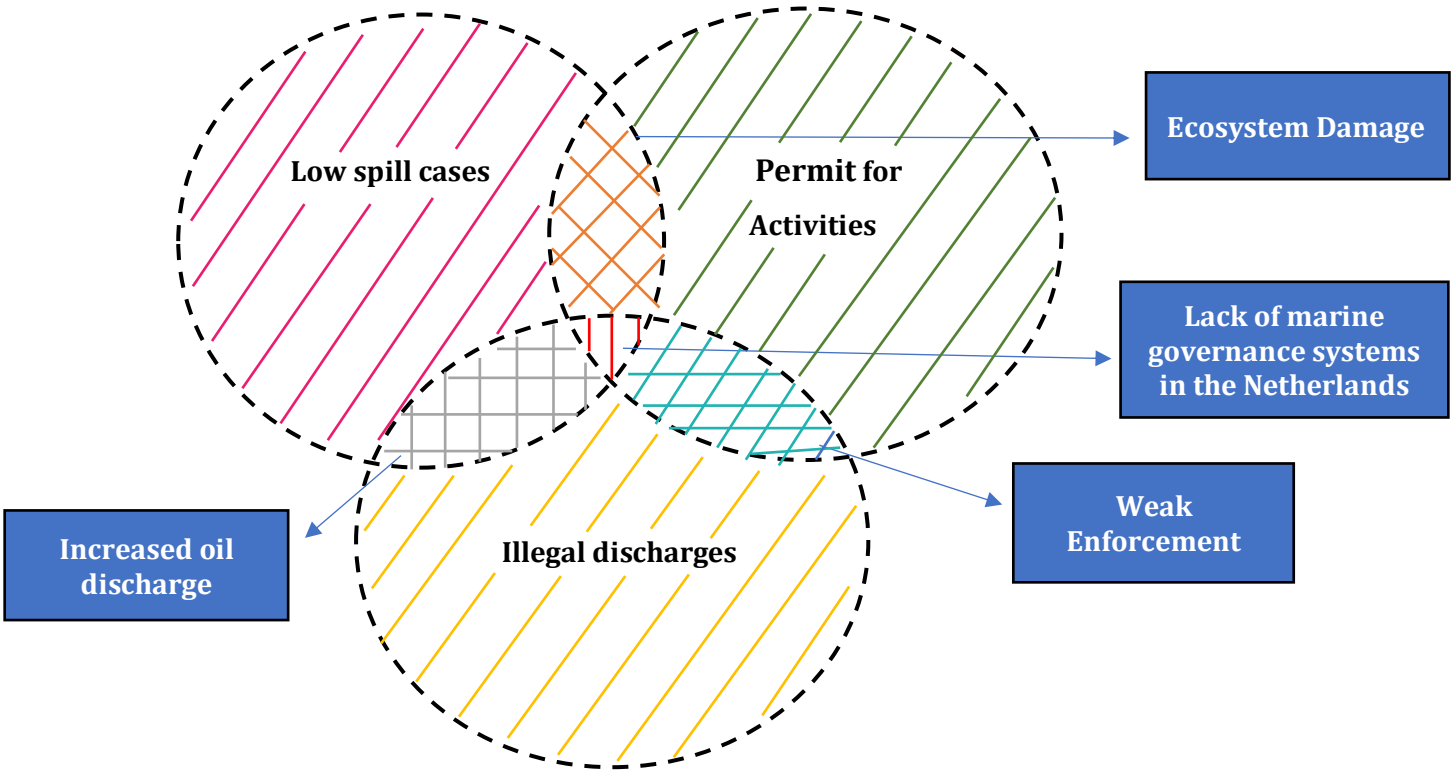


Figure 54 - Diagrammatic representation of drawbacks in policies and regulations in the Netherlands (Vollaard, 2017) (Camphuysen, 2016)

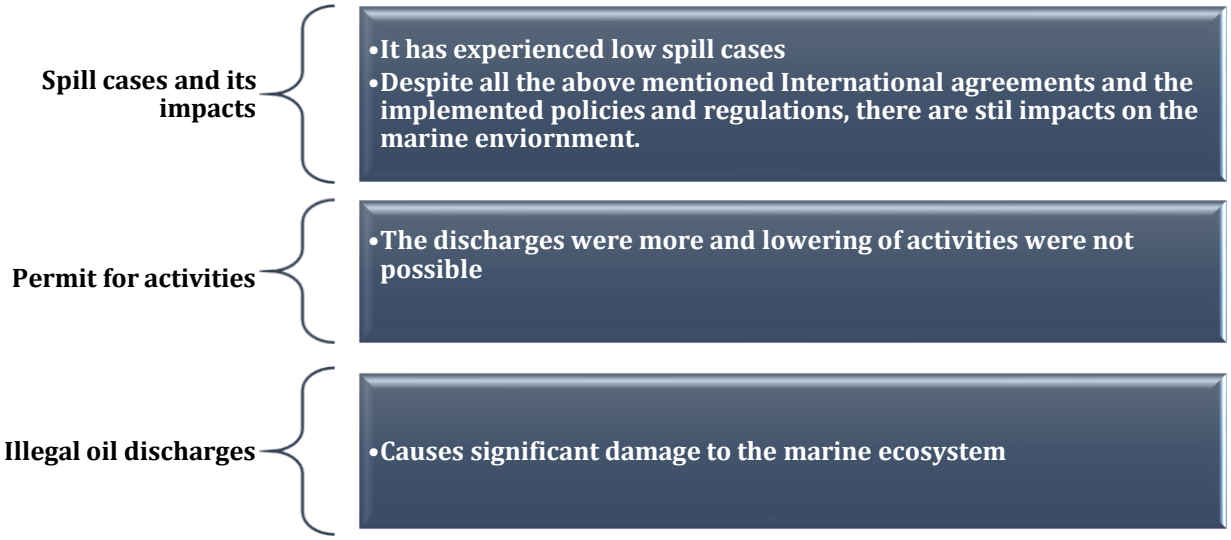


Figure 55 - Drawbacks of policies and regulations in the Netherlands (Vollaard, 2017) (Camphuysen & Vollaard, 2015)

CHAPTER 7 Achievements of the implemented policies and regulations

Research question 4) How can the governance systems in the Netherlands and Norway be improved?
This question is elaborated through desk research and interviews. Initially, the desk research was based on whether these implemented policies and regulations are effective in reducing and mitigating the oil discharges in the Netherlands and Norway. Also, this has provided the potential opportunities to improve the marine governance systems in the Netherlands and Norway. Additionally, the interviews conducted were to gather supplementary information on how these policies and regulations are successful in reducing the oil discharges significantly.

7.1 Introduction

The implemented policies and regulations in the Netherlands and Norway had major benefits in terms of decreasing offshore oil pollution. The above policies and regulations, besides their continuous efforts in reducing the discharges and spill accidents, were also able to lower the effects on the marine ecosystem.

7.2 Norway

7.2.1 Zero discharge policy

The implementation of this policy was a potential benefit which certainly reduced the oil discharges more effectively. First of all, this policy at its early phases of implementing did not seems to cause substantial improvement in discharge reduction. And afterward, over the years, the discharges were not only reduced but also reached the value to zero. This discharge value "zero" is about to be maintained until now as you can see in the figure below. Moreover, the discharge value indicates that it is "no effect limit" (Norwegian Environment Agency , 2020).

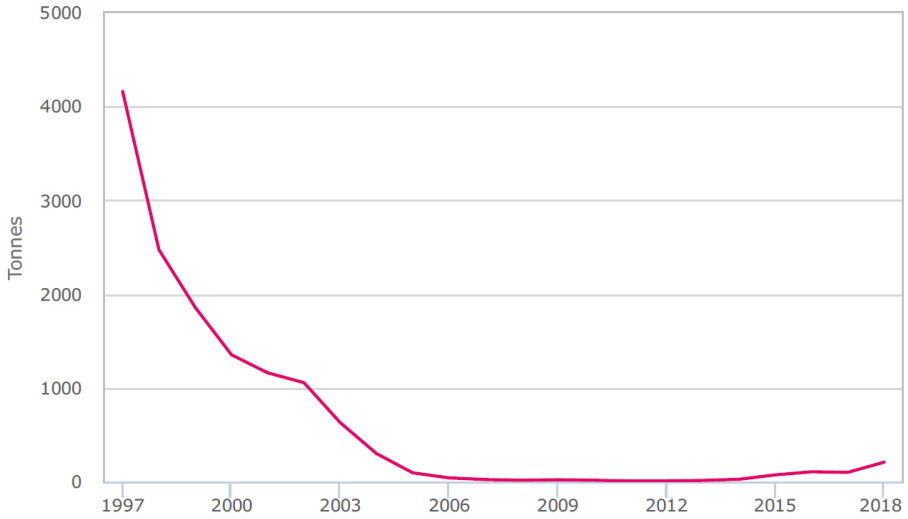


Figure 56 - Achievement of reducing offshore oil discharges through zero discharges (Norwegian Environment Agency , 2020) (Norwegian petroleum, 2020)

7.2.2 Spill response policy

As can be seen from chapter 4, Norway has experienced many spills and some events contributed to increased spill volume. From the figure 57, it is apparent that this policy has tremendously reduced the oil spill accidents with Regardless of the dynamics over the number of accidents and the spill volume (Norwegian Environmental Agency , 2020).

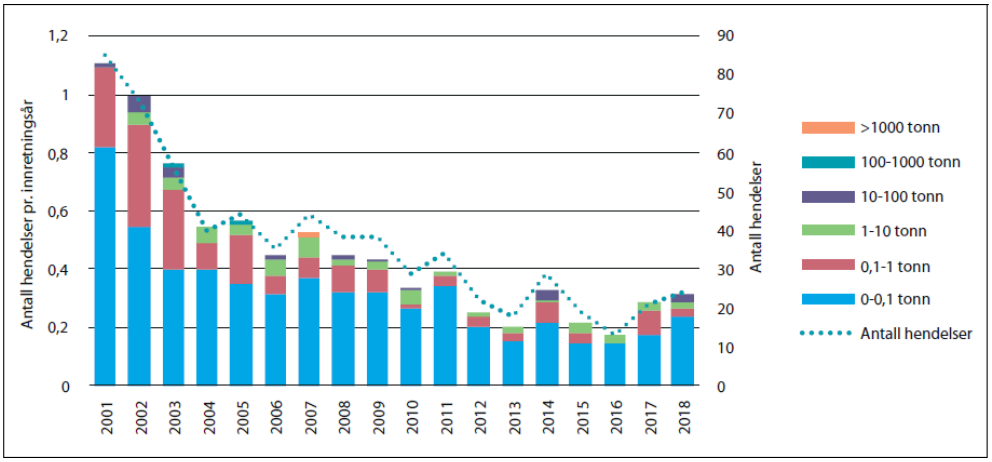


Figure 57 - Reduction of oil spills in Norway (Norwegian Environmental Agency, 2020)

Antall Hendelser – No of Events
Antall Hendelser pr. Innretningsår – Number of events per facility year
Antall Hendelser – No of Events

7.2.3 Marine spatial planning policy

The accessibility of areas for offshore activities depends not only on the data obtained from the standard research but also through supplementary research which supports the further establishment of activities by segregating vulnerable and non – vulnerable areas from oil pollution (figure below). During the allocation of areas, the industries might claim particular areas for oil production which could result in the conflicts among the governmental bodies and the offshore industries. To resolve these conflicts, the data from supplementary research helps the government in providing an alternative solution for space allocation (OECD , 2020).

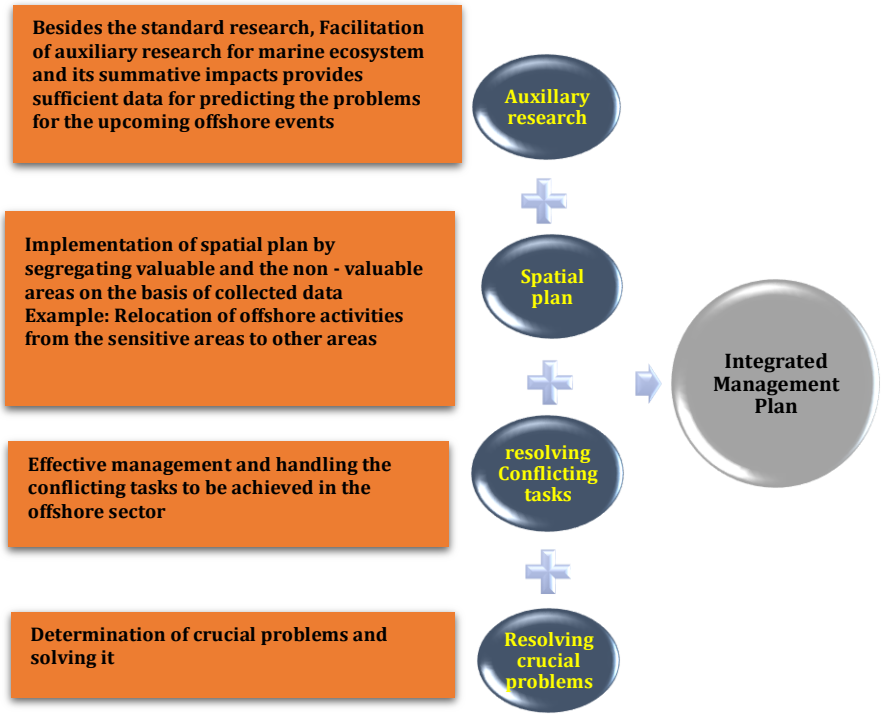


Figure 58 - Achievement of marine spatial planning policy in Norway (OECD, 2020).

7.2.4 Ecosystem based management policy

This policy has achieved its target of reducing the impacts on the marine ecosystem through an area-based management plan were the areas allocated for offshore activities were mainly of less ecological importance. These areas being prioritized were based on reducing production activities in ecologically sensitive areas. Besides the allocation, this policy ensures that oil production in those areas has sufficient facilities for the treatment of oil before its discharge to the sea for minimizing its effects on the marine ecosystem (figure below). Furthermore, this policy also made an obligatory requirement where any damage to the marine ecosystem must be restored for the conservation of the marine ecosystem (Norwegian Environmental Agency , 2020) (Olsen et al., 2007).

In this case, one of the interviewees stated that there is a prohibition of activities during the spring season since it is a breeding period for most marine bird species. In autumn and winter, the activities were allowed to perform but with stringent requirements.

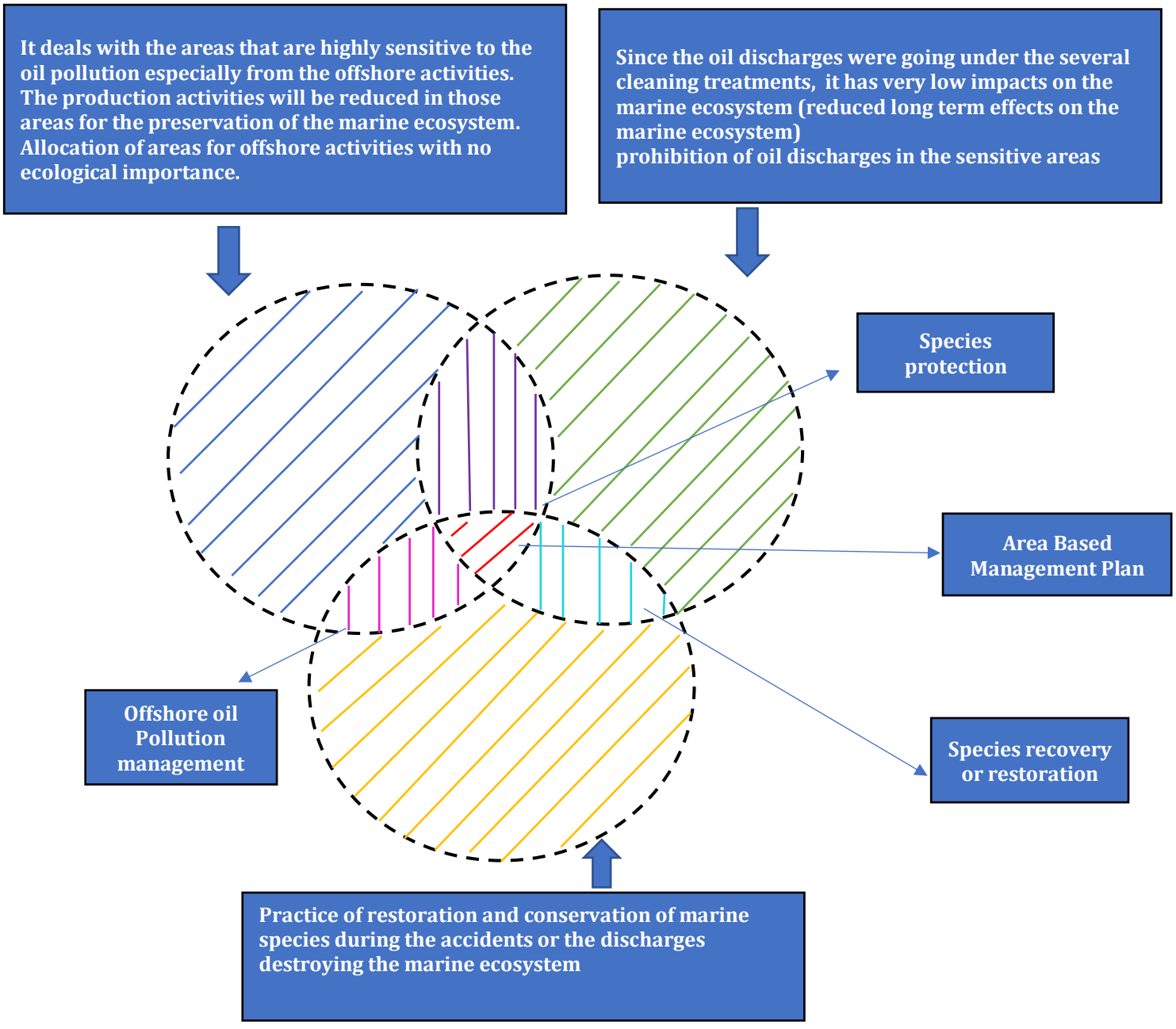


Figure 59 - Ecosystem based management policy (Olsen et al., 2007) (Norwegian Environmental Agency, 2020)

7.2.5 Regulations

7.2.5.1 Monitoring

To solidify the implemented regulations, Norway has implemented new discharge standards; from 30 mg/l to 12 mg/l (figure 60) to reduce the oil discharge impacts on the marine environment. Moreover, these discharge standards were consequently able to reduce the discharges to a further extent (figure 61). Based on this context, one of the interviewees echoed that, the government financially contributed more to technologies. With the help of these technologies, it can be reduced from 12 mg/l to 5 mg/l. The interviewee also mentioned that the monitoring tools (EIF and marine management tools) were very helpful in identifying the discharge impacts and enabling them to take preventive steps from further damage to the marine environment.

7.2.5.2 Surveillance

The aerial surveillance has been one of the major significant contributors in preventing the oil spills (accidental spills and the illegal discharges) over the decades. From the table 11, it is obvious that the oil spills detected were predominantly reduced (decreased to zero in the few years) which is indeed the greatest achievement.

7.2.5.3 Prosecution

The Prosecution is very severe, where proven of illegal discharges lead to the fine of one million Norwegian kroner (figure 62). Moreover, this was stated in of the interviews, where interviewee argued that, during the inspection, if the justification provided by the polluter does not comply with the discharge standards, it leads to the complete shutdown of the company and also with the notable example, for the prosecution which is about the Statfjord oil spill (Cedre , 2020) where the government has levied a fine of 25 million Norwegian Kroner (figure 63) for recovery operations and damage imposed on the marine environment. For the inspection, the spotted oil spills were reported to the police.

The source (figure 60) was of this information was gathered from the interviews.

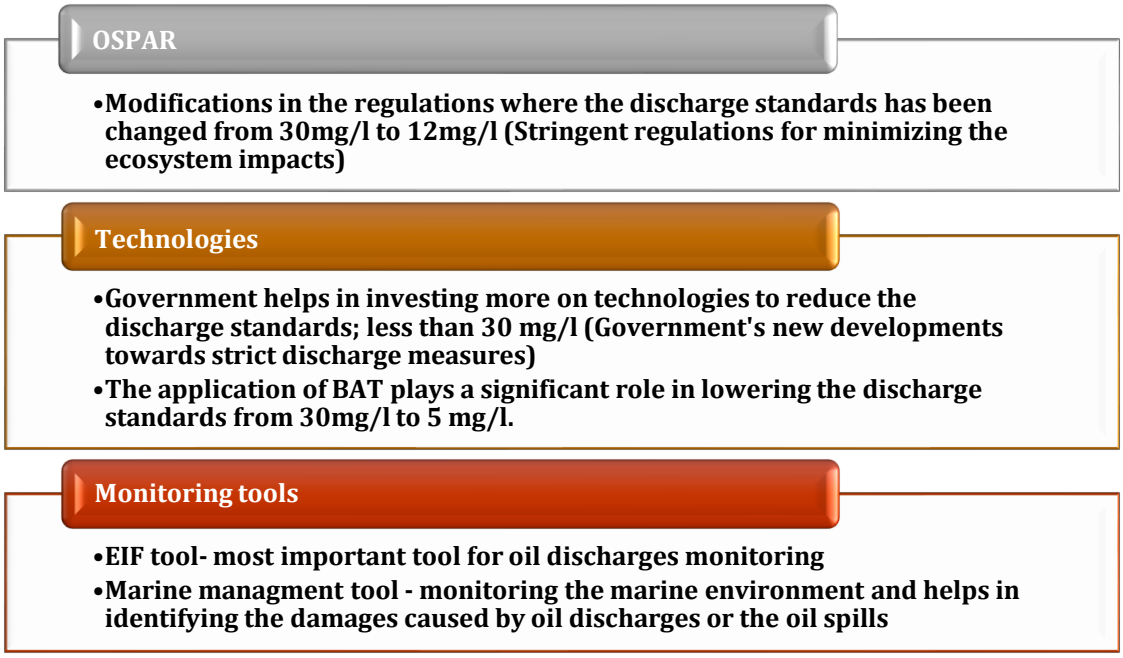
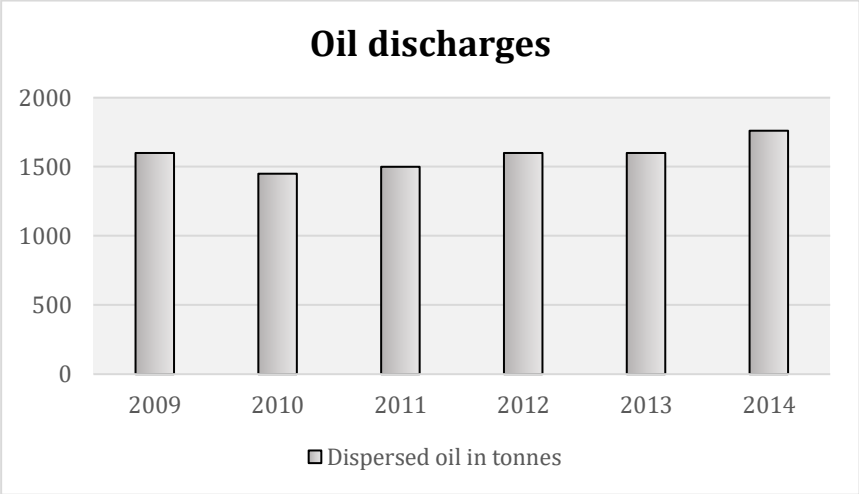


Figure 60- Achievements of regulations in Norway

Hence, the following figures illustrates the stringent regulations for offshore oil spills in Norway.

Monitoring



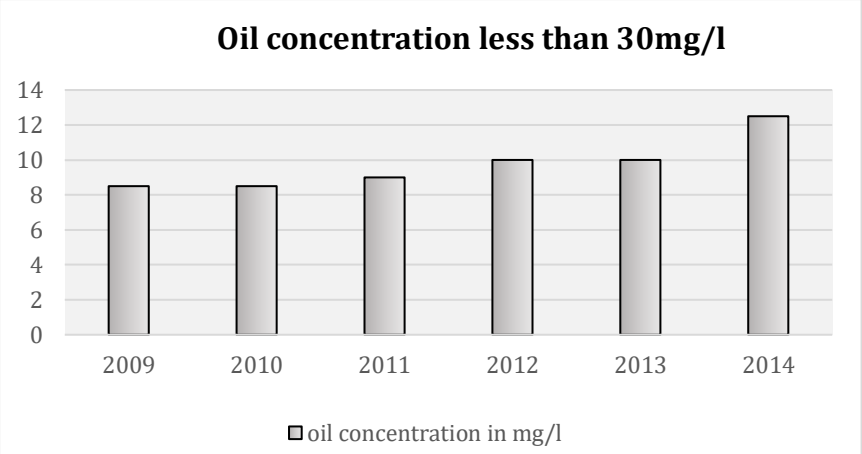


Figure 61 - OSPAR data showing reduction in oil discharges and its concentrations in Norway (OSPAR, 2015)

Surveillance

Country	Year	No of flights	No of flight hours			No of offshore detections			No of detections identified as oil	Estimated volume m^3	Polluter rigs
			Daylight	Darkness	Sum	Daylight	Darkness	Sum			
Norway	2008	0	0	0	0	0	0	48	0	0	0
	2009	0	0	0	0	48	0	48	0	0	0
	2011	5	460.00	0	10	26	0	0	12	135.20	8
	2012	2	460.00	0	0	0	0	0	25	26	10
	2014	0	549.00	0	0	26	0	0	0	0	0
	2015	0	559.00	0	0	0	0	0	0	0	0
	2016	0	0	0	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0	0	0	0
	2018	0	0	0	0	0	0	0	0	0	0

Table 11 - Reduction of offshore oil discharges and spills through aerial surveillance (Bonn Agreement , 2008) (Bonn Agreement, 2009) (Bonn Agreement , 2011) (Bonn Agreement , 2012) (Bonn Agreement , 2014) (Bonn Agreement, 2015) (Bonn Agreement , 2017) (Bonn Agreement, 2016)

The source of this information was gathered from the interviews.

Prosecution

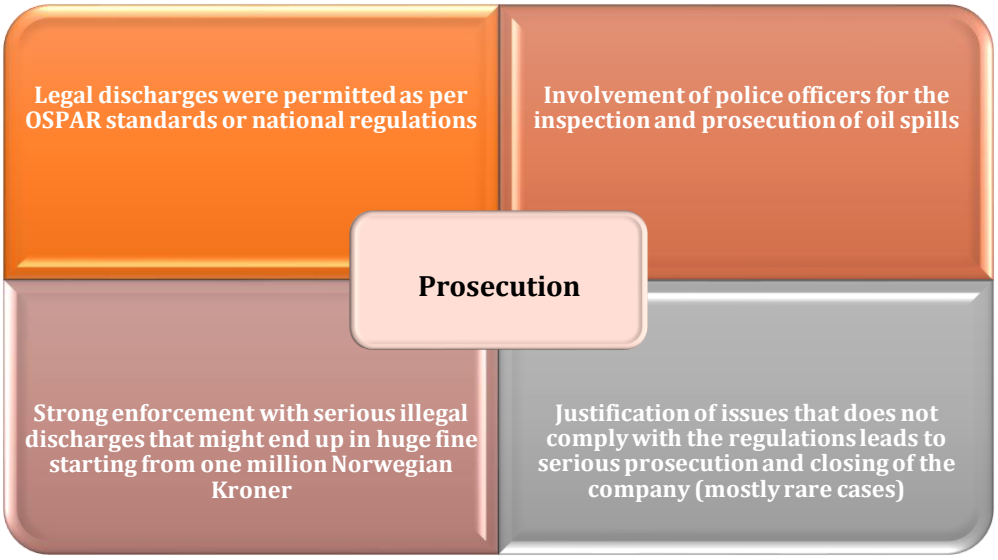


Figure 62- Stringent prosecution in Norway

Example

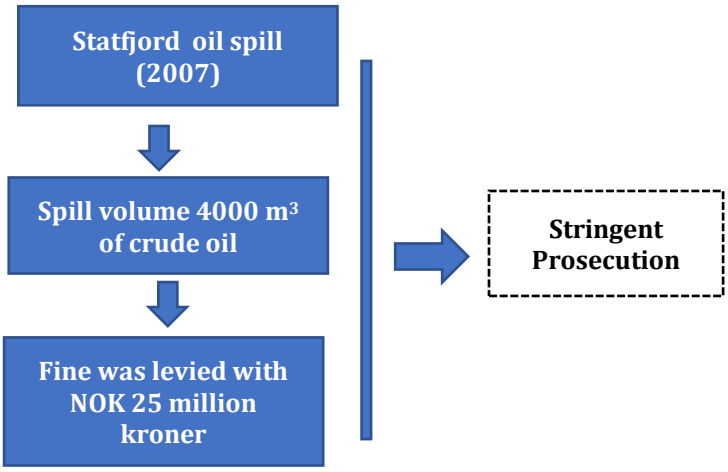


Figure 63 - Example for stringent prosecution for offshore oil spills in Norway (Cedre, 2020)

7.3 The Netherlands

7.3.1 Trilateral policy and the Oil spill response policy

Although the Netherlands has experienced a limited number of spills, the spill volume has been reduced gradually for years (Schulz et al., 2017). Markedly, in the Wadden Sea, the spills (figure 64) have seen a radical change within a few years. Moreover, it is achieved through the important elements (mentioned in figure 65) of the trilateral policy (South Baltic Programme , 2010) (Klöpper, 2019).

Oil spill response in the Wadden sea

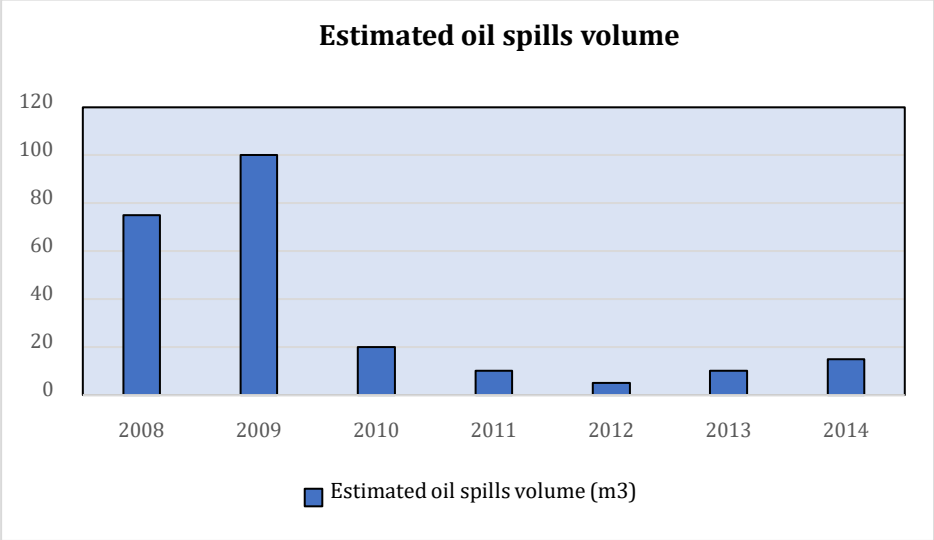


Figure 64 - Achievement of trilateral policy in the Netherlands (Schulz et al., 2017)

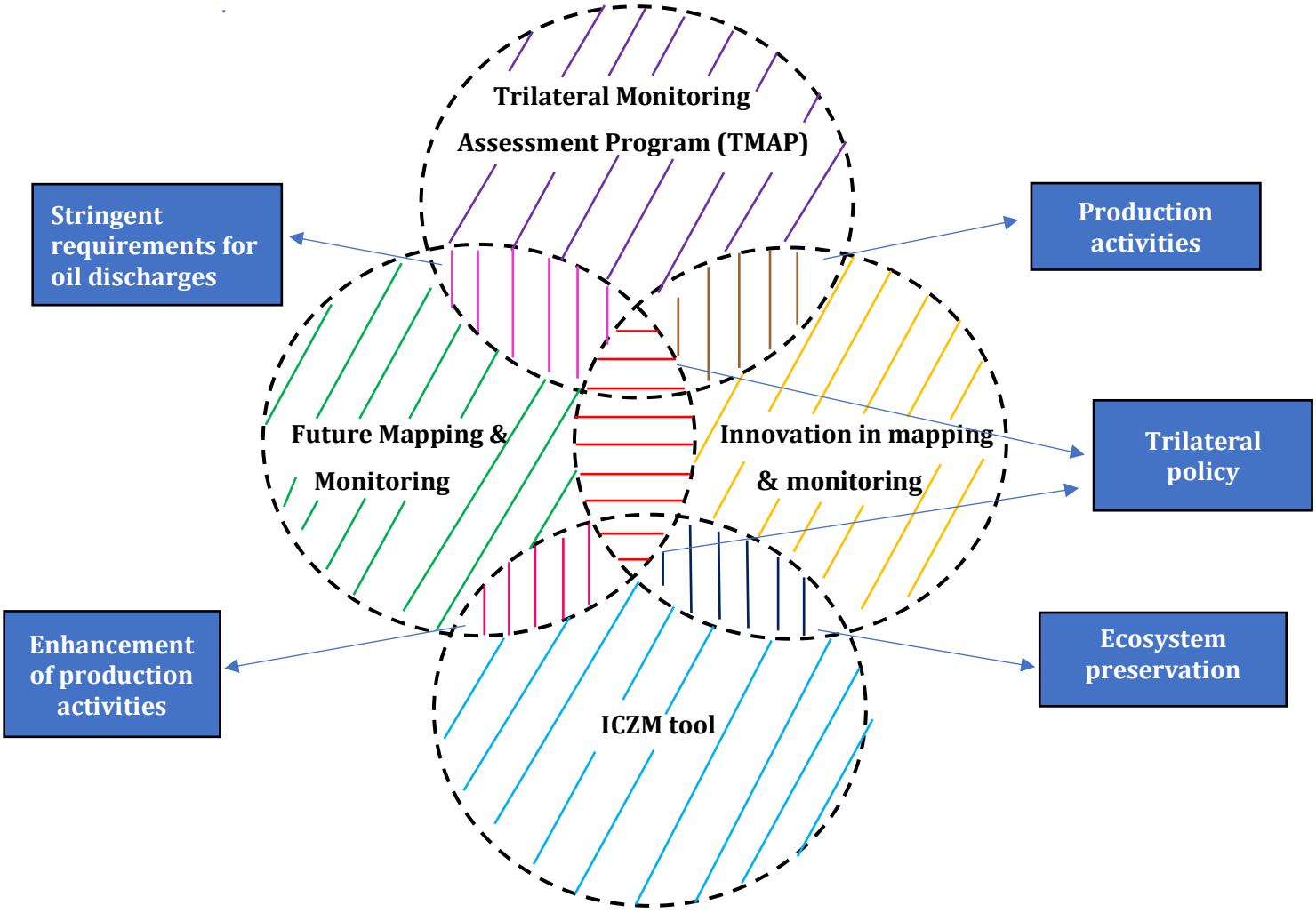


Figure 65 - Key elements for achieving the reduction of offshore oil spills in the Netherlands (South Baltic Programme, 2010) (Klöpper, 2019).

7.3.2 Marine spatial planning policy

The key drivers that made this policy successful were planning regulations, Environmental assessments, and accident prevention (figure 66 below). To begin with, the planning regulations consist of planning activities for oil production and require facilitation of technologies to prove that the discharge operations do not cause damage to the marine environment and in fact, the area will be monitored to check the production discharges. On top of that, the industries should conduct various impact assessments to check any damage to the marine environment before the offshore oil production and discharge operations. As equally important, the industries should make sure that they have sufficient equipment to mitigate and recover the spilled oil during spill accidents. Moreover, these drivers had their foundation from opportunity maps, integrated assessment framework, and integrated assessment framework which has been explained in chapter 5 (European Commission, 2018).

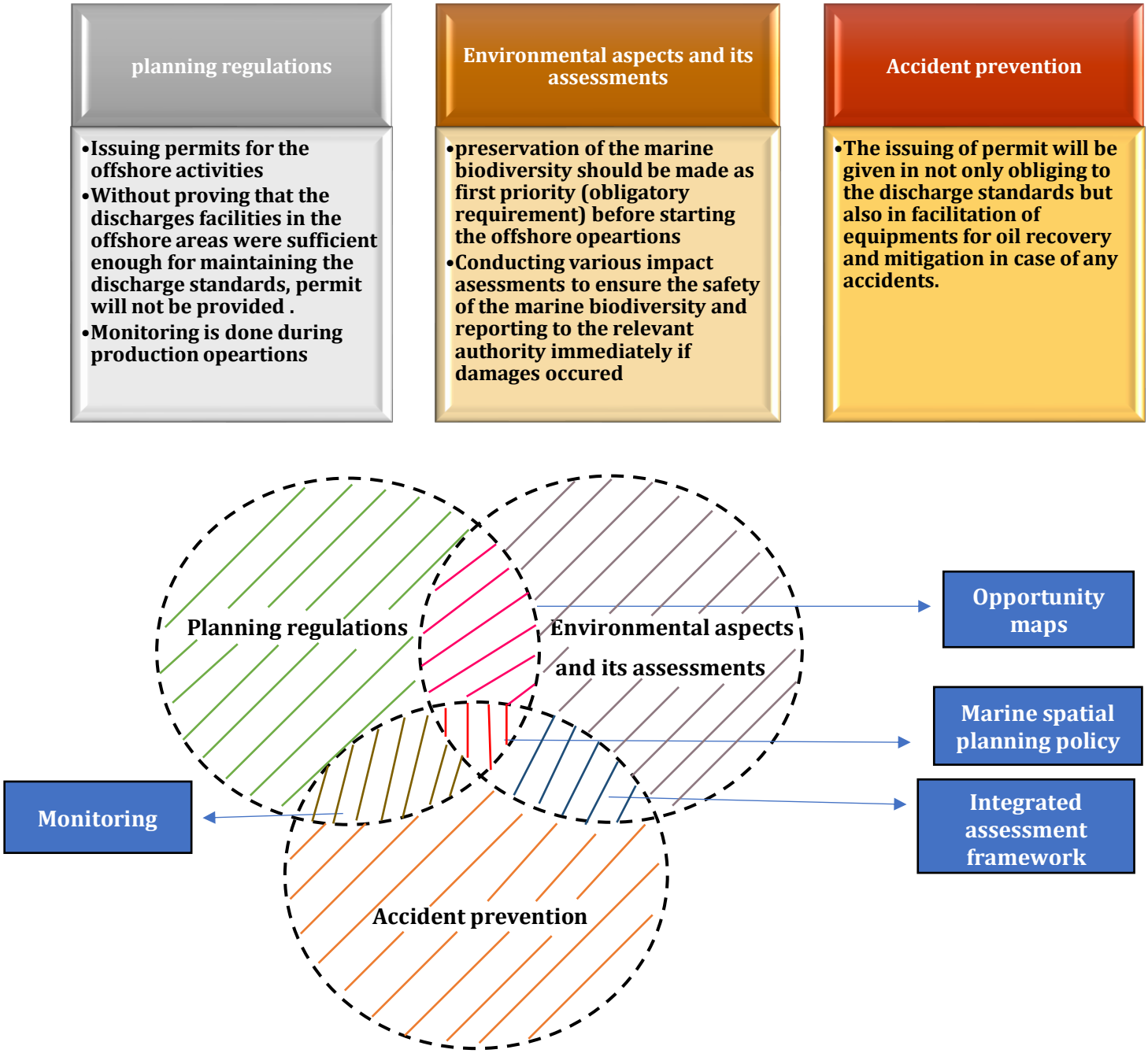


Figure 66 - Main factors that were responsible on the achievement of marine spatial planning policy (European Commission, 2018).

7.3.3 Ecosystem based management policy

This policy has the following factors, basic protection/ precautionary principle, appropriate assessment, alternative solutions, reasoning, and compensating measures. Every above-mentioned factor has special features (see the figure below) being major support in the reduction and prevention of oil discharges or spills in the Netherlands. Moreover, these factors have been interconnected with the following, the rendering of sustainable use, marine ecosystem protection, the application of BAT, additional opportunities for an ecosystem that has been explained in chapter 5 (South Baltic Programme , 2010) (Klöpper, 2019).

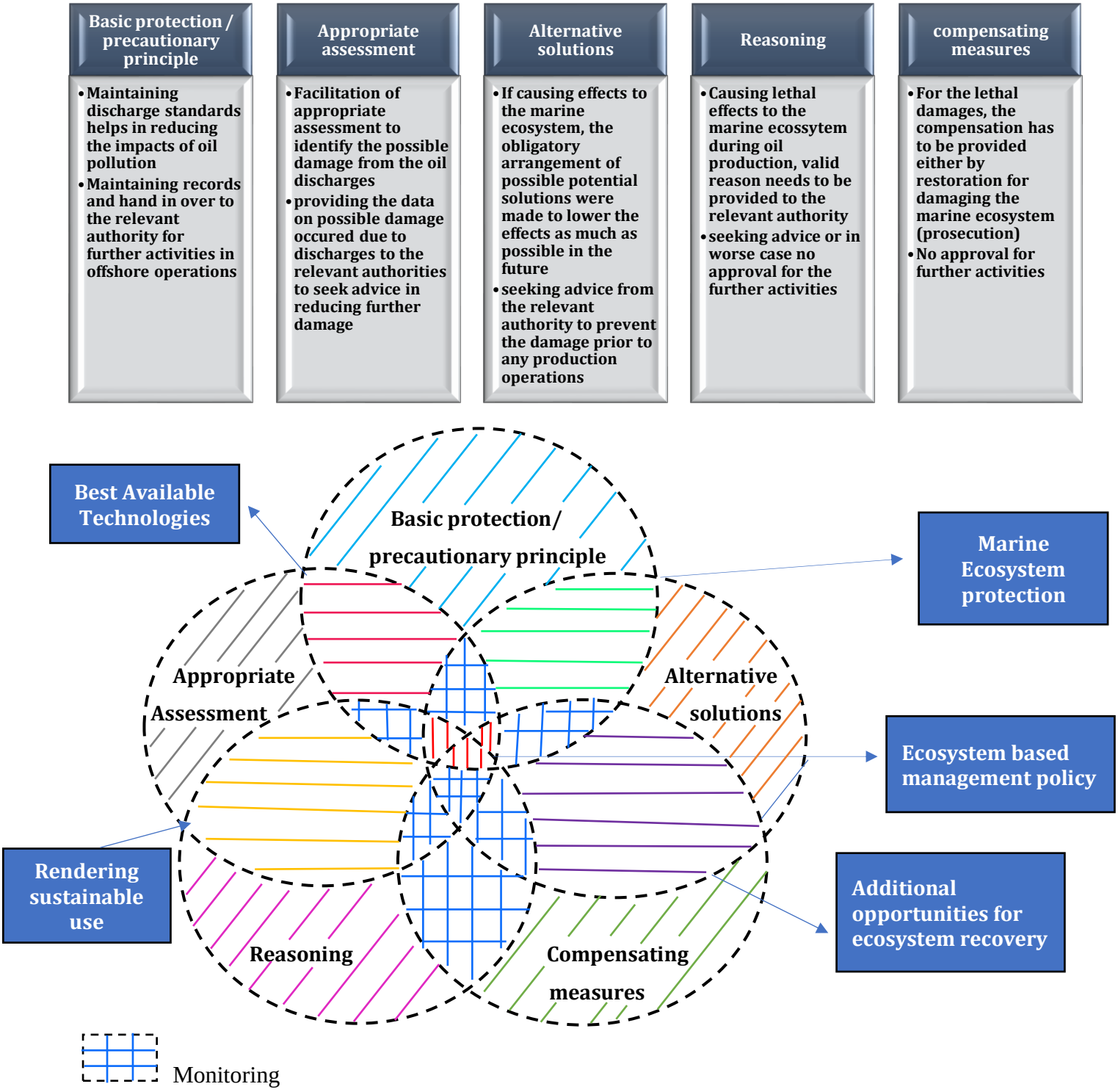


Figure 67 - Major factors for the achievement of Ecosystem based management policy in the Netherlands (The Ministry of Transport, Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Economic Affairs, 2015

7.3.4 Regulations

7.3.4.1 Monitoring

The oil discharges and their discharge concentrations (figure 68) has been decreased. Importantly, either discharge values or concentration standards, despite their dynamics were constantly maintained (figure 69). To acknowledge the monitoring system in the Netherlands, one of the interviewees responded that, MARPOL regulations helped the governmental bodies for the detection and inspection of any illegal discharges or exceedance of discharge standards and also stressed a point that oil spills have been lowered significantly in the Netherlands for the past ten years. Moreover, the figure below is proof that the death of sea birds from offshore oil spills has been gradually decreased (figure 70).

7.3.4.2 Surveillance

For the past 10 to 20 years there is a reduction in the number of oil spills (table 12) because of the repeated surveillance in the Dutch part of the North Sea. From the table, it can be seen that there is a tremendous change in the spill volume.

7.3.4.3 Prosecution

To illustrate the spill operations and prosecution, the interviewee expressed that, the penalty is severe ranging from 5000 to 50000 euros (figure 71) and also if any accidents happen in any oil rigs where the facilitation of equipment was not sufficient to mitigate the oil spills, then, the government undertakes the spill operation but levies huge fine which is based on the clean-up operations provided from the government and the damage to the marine environment.

Following figures explains the achievements of the implemented regulations on reducing the offshore oil spills and discharges in Norway. The source (figure 68) was gathered from the interview.

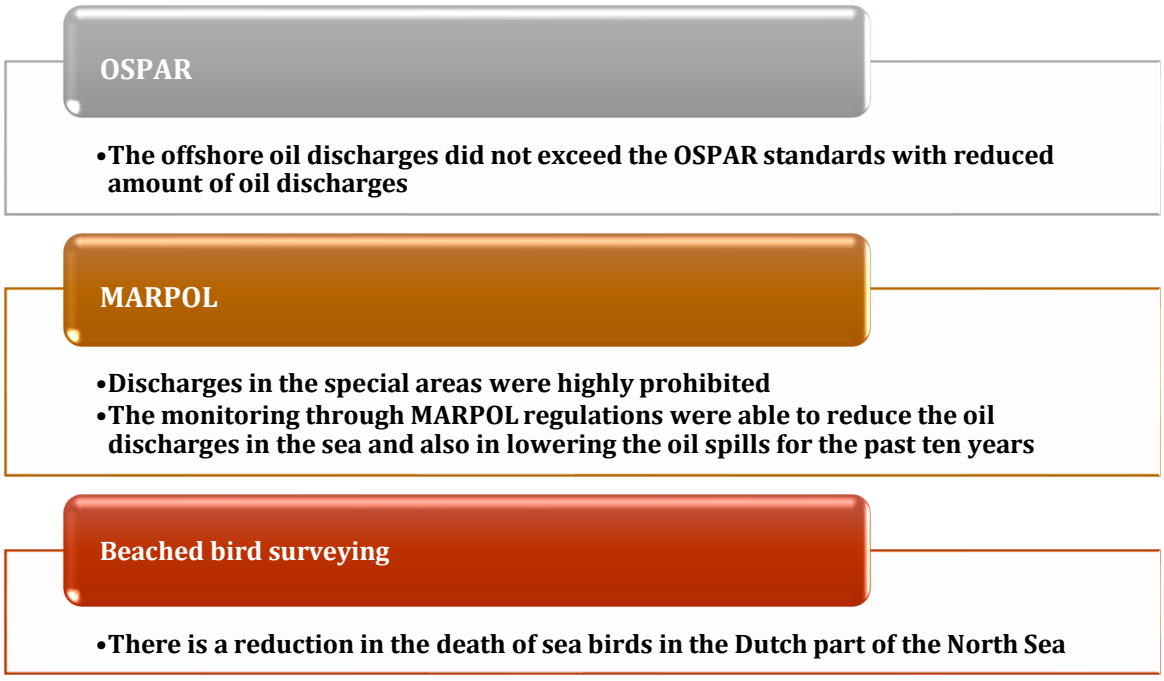


Figure 68 - Achievements of the regulations in the Netherlands

The following figures below explains the stringent measures taken against the offshore oil discharges

Monitoring

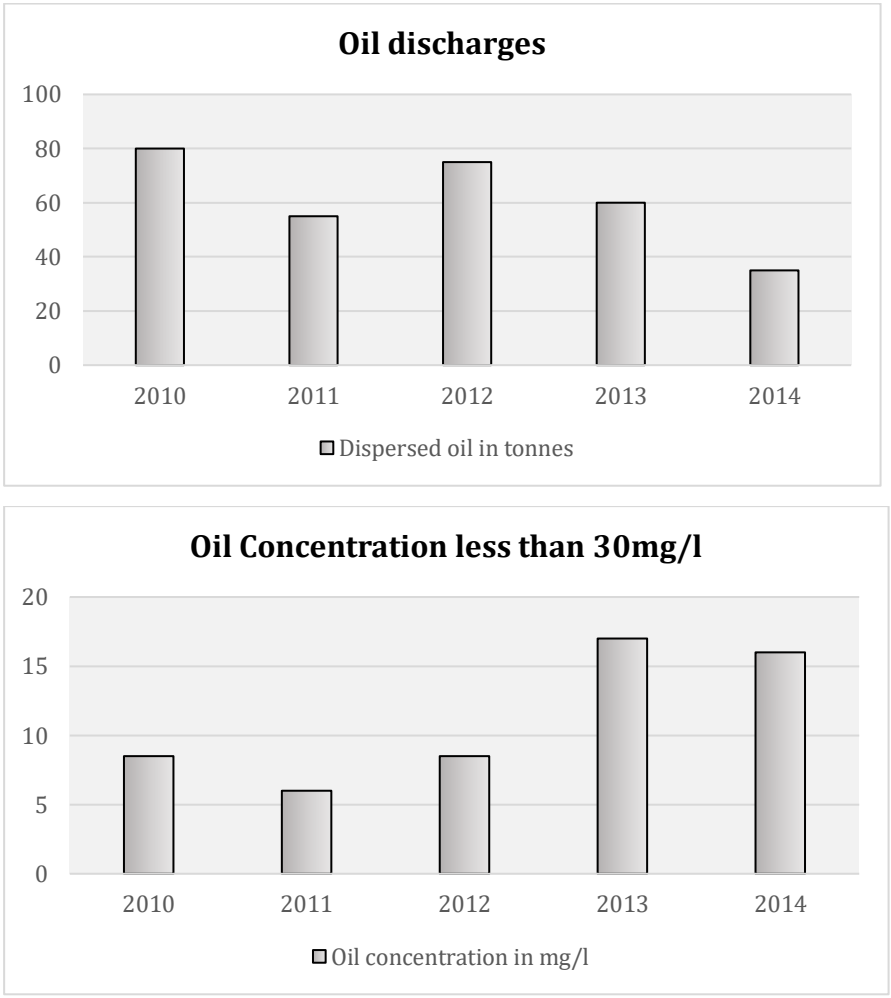


Figure 69- OSPAR data showing reduction in oil discharges and its concentrations in the Netherlands (OSPAR Commission, 2016)

Beached birds surveying

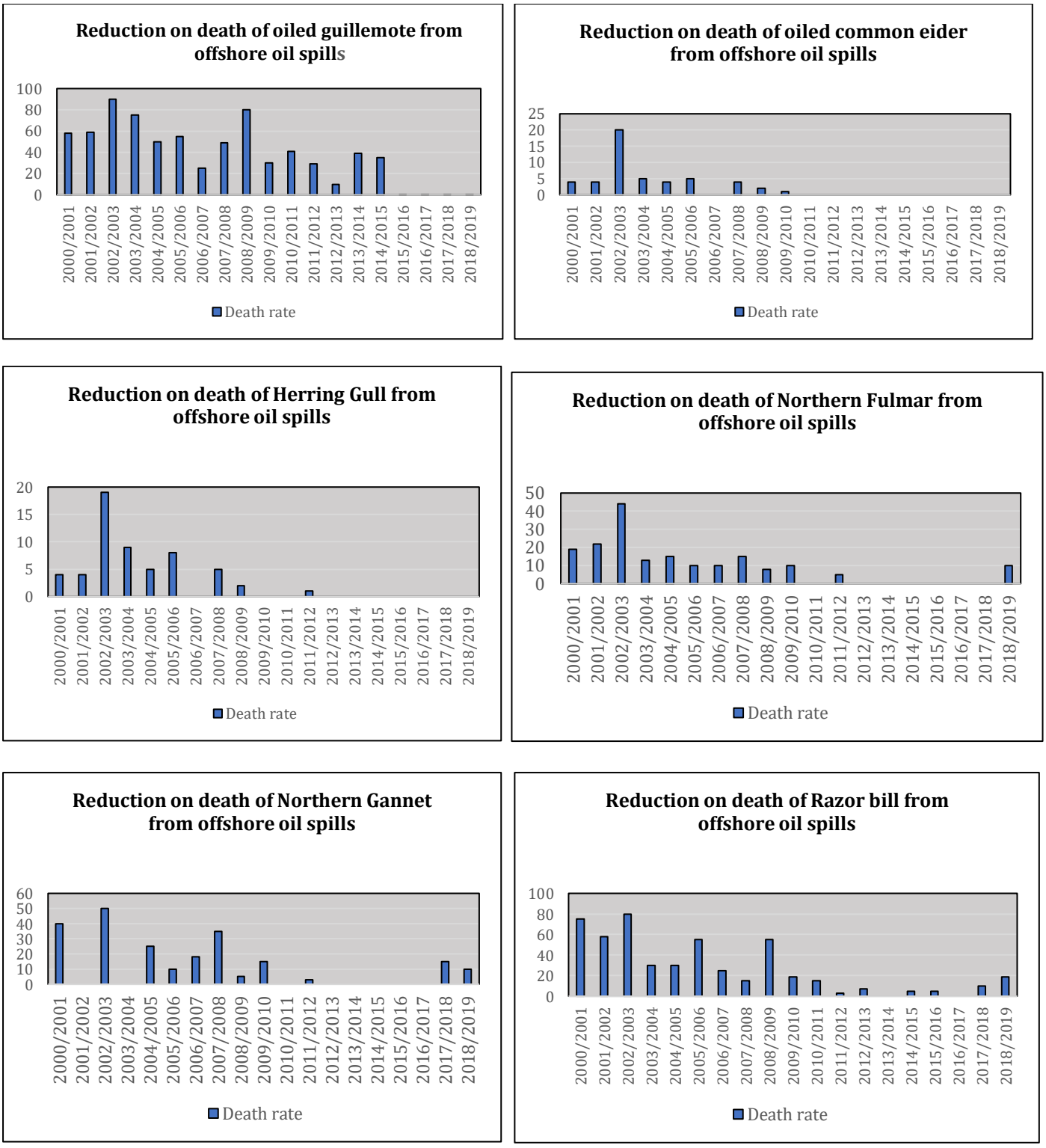


Figure 70 - Declination of dead sea birds from offshore oil pollution (Camphuysen, 2019)

Surveillance Bonn agreement

Country	Year	No of flights	No of flight hours			No of offshore detections			No of detections identified as oil	Estimated volume m^3	Polluter rigs
			Daylight	Darkness	Sum	Daylight	Darkness	Sum			
The Netherlands	2008	5	12.16	0	12.16	19	0	19	17	3	15
	2009	6	17.05	0	17.05	25	0	25	16	3.99	22
	2011	0	0.00	0.00	0.00	0	0	0	0	0	0
	2012	0	0	0	0	0	0	0	0	0	0
	2014	0	0	0	0	0	0	0	0	0	0
	2015	5	680.00	150.00	830.00	128	21	149	21	33.53	1
	2016	5	859.54	1069.45	209.51	173	15	188	16	6.18	1
	2017	5	0	0	0	0	0	0	0	0	0
	2018	11	37.35	0.00	37.35	18	0	18	9	0.51	9

Table 12 - Reduction of offshore oil discharges and spills through aerial surveillance (Bonn Agreement, 2008) (Bonn Agreement, 2009) (Bonn Agreement , 2011) (Bonn Agreement , 2012) (Bonn Agreement , 2014) (Bonn Agreement, 2015) (Bonn Agreement , 2017) (Bonn Agreement, 2016)

Prosecution

Figure 71 - Stringent prosecution for offshore oil pollution in the Netherlands

7.4 Improvement of marine governance systems in Norway and the Netherlands

The previous section of this chapter explained the achievements of the implemented policies and regulations in the Netherlands and Norway. This section presents the opportunities for improving their marine governance systems by providing suggestions through understanding and implementing or modifying the policies and regulations from each other that could help them in not only overcoming their drawbacks but also in providing long term solutions for the future perspective.

- **Zero discharge policy (Norway)** – One of the greatest achievements for mitigating the offshore oil pollution in Norway is the implementation of a zero-discharge policy where it was able to reduce the discharge volume to zero. Most importantly, the oil discharges should maintain the "zero effect" limit. which could benefit the Netherlands in not only reducing the discharge volume substantially but also in lowering the severity of spills on the marine ecosystem.
- **Trilateral policy (the Netherlands)** – The enforcement of this policy in the Netherlands had been a major advantage on lowering the spill cases, discharges and their effects through the following elements: TMAP (Trilateral Monitoring Assessment Program), ICZM (Integrated Coastal Management Tool), future mapping and innovation in mapping and monitoring. All of these elements have played a pivotal role in tackling the offshore oil pollution in the Netherlands, which Norway can recognize by implementing this policy for improvising their marine governance systems.
- **Oil spill response policy (The Netherlands and Norway)** – In general, this policy was necessary and significantly supportive of reducing the offshore spill accidents and its volume in the Netherlands and Norway. Moreover, both the countries have shown improvement exceptionally in lowering the spill cases. However, the spill cases and their volume differ on the basis of the installation of the facilities in both the countries (where Norway has more offshore facilities than the Netherlands). Despite the several installations and spill cases, Norway was able to reduce the spill volume which the Netherlands can learn from them; policy functioning on handling the spill cases in an effective way. Although the Netherlands experienced low spill cases, this could helpful in preventing the spill cases in the future.
- **Marine spatial planning policy** – For Norway, the facilitation of the additional research for allocating the space for offshore production activities was chiefly useful in identifying the areas of low ecological importance and provided possibilities of installing new offshore facilities in those areas. Nevertheless, there is still issues in allocating the spaces for offshore activities. In order to customize this policy, Norway can introduce the application of an integrated assessment framework being used in the Netherlands for spatial planning which seemed to be impactful.
- **Ecosystem based management policy** – Typically, this policy prioritizes the marine ecosystem. In Norway, the establishment of an area-based management plan has been developed in not only preserving the marine species but also in the identification of marine ecosystem enriched areas to avoid the productional activities in those areas. Also, in the Netherlands, there are several factors (Basic precautionary principle, marine ecosystem protection, additional opportunities for ecosystem recovery, and rendering sustainable use) that have supported in protecting the marine species from oil spills and discharges. In this case, both countries could gain by understanding the efficacy of this policy from each other to enable better marine ecosystem protection activities in the future.
- **Regulations**
  - ***Monitoring* –** As per OSPAR regulations, the discharge standards obliged for the Netherlands and Norway were, 30 mg/l. In order to make the discharge standards more stringent, Norway has implemented their discharge standards ranging from 12 mg/l to 5 mg/l which indeed, resulted in a significant decrease of oil discharges from offshore operations and their effects. So, the Netherlands could take into account increasing their stringency towards oil discharges by implementing these

discharge standards. Moreover, the beached bird surveying in the Netherlands provided prodigious results in decreasing the sea bird casualties from offshore oil pollution (protection and preservation of marine species). Norway could, therefore, consider giving priority to beached bird surveying for monitoring the oil spills or discharges and conservation of marine species (sea birds).

- ***Prosecution*** – The prosecution can be made more stringent in the Netherlands to minimize the practice of illegal discharges where the spill detection through radar was not highly considered for prosecution in the Netherlands. Instead, the prosecution through aerial surveillance can be strongly enforced in a way where polluters should be aware of the serious consequences of polluting the sea. To achieve that, the Netherlands can,
    1. Increase the range of penalties as followed in Norway.
    2. Completely shut down the facility in case of proven illegal discharges.

The following table explains the diagrammatic representation of marine governance systems in the Netherlands and Norway and the provisioning of ways on improving it by learning from each other.

Marine Governance systems in Norway

Marine Governance systems in Norway

Marine governance systems in the Netherlands / Norway	Trilateral policy	Oil spill response policy	Marine spatial planning policy	Ecosystem based management policy	Regulations	Improvement of marine governance systems in the Netherlands and Norway to learn from each other	
						The Netherlands	Norway
Zero discharge policy	Yes / Yes	No/No	No/No	No/No	No/No	Zero effect limit	TMAP ICZM tool Future mapping & monitoring and Innovation in mapping and monitoring
Oil spill response policy	No/No	Yes/Yes	No/No	No/No	No/No	Reduction Quantity	Despite more facilitations, the Spill volume has been reduced
Marine spatial planning policy	No/No	No/No	Yes/Yes	No/No	No/No	Facilitation of Supplementary Research	Opportunity maps, Integrated assessment framework
Ecosystem based management policy	No/No	No/No	No/No	Yes/Yes	No/No	Application of Area based management plan	Key factors applied in the Dutch ecosystem based management policy
Regulations	No/No	No/No	No/No	No/No	Yes/Yes	Modification Of discharge standards from 30 mg/l to 12 mg/l. Also, the increased penalty.	The implementation of beached bird surveying

Marine Governance systems in Norway

Table 13 – Improvement of marine governance systems in the Netherlands and Norway

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSION

The author's dissertation had its major purpose in conducting the comparative analysis for the Netherlands and Norway that combats the offshore oil pollution through the marine governance systems. This disquisition was exemplified to understand the marine governance systems (International agreements, policies, and regulations) in the Netherland and Norway; identifying the achievements and drawbacks in not only addressing the research objective and the core research question but also in filling the knowledge gaps. For addressing the central research question, four sub research questions were extracted from it. Overall, this chapter focuses on the epitome of the results as mentioned in the previous chapter followed by providing potential recommendations to improvise the marine governance for the long-term perspective. Through these recommendations, the author gives some insights for other researchers on guiding them for future research.

How do oil-related activities, risks, and incidents in the Netherlands and Norway damage the Dutch and the Norwegian marine eco-systems?

Based on the analysis conducted in the preceding chapters (chapter 4), it was apparent that the offshore oil spills caused by accidents and illegal discharges have had several physical and psychological impacts on the marine ecosystem physically as well as psychologically and in the fatal circumstances to death in the Netherlands and Norway. Concerning Norway, it had come through many spill cases, ironically, the impacts on the marine ecosystem of these oil spill cases were not that severe. However, the regular oil discharges from the production operations in NCS were the major contemplation factors elevating the deadly consequences on the marine species. In the Netherlands, regarding the spill cases, it was low but the effects had some serious effects on the marine ecosystem. Despite the spills, the discharges have also imposed several effects on the marine species. Moreover, the vulnerable species to the oil spills were the sea birds leading to increased casualty in these two countries. These offshore oil productions irrespective of spill accidents, in general, have been a major cause in the declination of various species in NCS and DCS.

How do the governance systems in the Netherlands and Norway prevent offshore oil pollution?

As previously stated, the oil spills and operational discharges were the inducing factors for the enforcement of marine governance for protecting and conserving the marine ecosystem for the future. This was accomplished through the establishment of several international agreements, UNCLOS, MARPOL, IMO, OSPAR, and Bonn agreement. These agreements had its prime dedication on decreasing oil pollution significantly which has been well encountered in Norway and the Netherlands. Apart from that, Both the countries have developed and implemented their policies and regulations which helped them on strengthening the marine governance systems. As a result, the implementation of policies and regulations has been highly supportive,

1) In providing instantaneous facilitation for offshore oil production accidents.
2) In decreasing the oil discharges during production operations
3) In lowering the casualty cases of marine species

Nevertheless, these policies and regulations also have drawbacks that minimize the efficacy of the marine governance systems which was addressed in the subsequent paragraph.

Are the governance systems in use in the Netherlands and Norway appropriately taking action to reduce oil discharge and are the efforts effective, efficient, and legitimate?

The marine governance systems in the Netherlands and Norway amidst their continuous measures on curbing the offshore oil discharges, do have drawbacks which lower the operational effectiveness of the Marine governance systems. In Norway, the lack of spatial management has resulted in the utilization of ecologically valuable areas for offshore oil production activities that lead to the damage of the marine ecosystem. One of the most crucial factors is that the government's requirements from offshore oil production industries on providing more yield lead to more discharges and also their ignorance in shutting down the aged production platforms which certainly is a serious issue (showing the profitable intentions) increasing the oil pollution.
In the Netherlands, perhaps their low production when compared to Norway, has increased discharges chiefly affecting the marine ecosystem. Moreover, there is a practice of illegal discharges, one of the major drawbacks leading to increased oil pollution and consequentially, causing irreversible damage to the marine ecosystem.

How can the governance systems in the Netherlands and Norway be improved?

From the analysis conducted on addressing the fourth sub research question, it was clear that the implemented policies and regulations in the Netherlands and Norway had contributed to its utter commitment on decreasing offshore oil pollution which notably, have not only minimized the oil spills and the discharge volume but also its impacts on the marine species (prioritizing the preservation of marine species). Moreover, the stringent requirements included in the policies and regulations for the reduction and prevention of discharges helped in increasing the efficiency of the marine governance systems in the Netherlands and Norway.
Most importantly, the implemented policies and regulations rather than benefitting their own countries also guide and supports each other on increasing the efficiency of the marine governance systems for the future long-term perspective.

All in all, the marine governance in the Netherlands and Norway were adequate in preventing and mitigating offshore oil pollution and its effects on the marine ecosystem. Moreover, the data gathered from the interviews were really helpful in providing significant results for this disquisition. Despite the single interview conducted for the Netherlands, the data for the analysis was sufficiently balanced through the literature study.

Both countries have shown substantial improvements concerning the reduction in the oil spill cases, oil discharges, and their damages on the marine species. But the policies and regulations in Norway have proved to be more effective on decreasing the oil spills gradually and also, some policies and regulations can be separately highlighted for their effectiveness in reducing the oil discharges significantly. On the whole, it can be concluded that Norway has better marine governance than the Netherlands.

8.2 RECOMMENDATIONS

Since the marine governance systems and its functions in the Netherlands and Norway have been of paramount importance in preventing and controlling the offshore oil pollution and their impacts. Also, it is essential to improve their governance systems which have been addressed in chapter 7. If both the countries were able to adopt policies and regulations from each other then it leads to,

- Elimination of possible drawbacks in the implemented policies and regulations (learning from each other).
- Increasing the efficacy of every implemented policies and regulation to make the governance systems more robust.

8.3 FUTURE RESEARCH

This disquisition underscored the marine governance between the Netherlands and Norway against offshore oil pollution, which covered most of the relevant topics. Also, other topics were not highlighted which could be explored in the future. Notably, investigation on private sectors; their roles and responsibilities in combating oil pollution and preservation of marine species and also their collaboration with the government on addressing the oil pollution,

- Spill response through the facilitation of several cleaning equipment during accidents.
- Conducting laboratory tests on identifying the nature and characteristics of oil spills to determine its level of harm to the marine environment.
- Most importantly, rescue operations in saving the marine species during spills accidents and conducting various surveys and tests for identifying the species effects (level of vulnerability) towards the oil spills and discharges.

This topic might increase the research opportunities and will be appealing for future researchers to continue with.

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APPENDICES

Appendix 1 Interview questionnaire for Norway and the Netherlands

Norway

1. From the literature study, it has been known that there are many offshore oil spill cases with the considerable amount of oil release in the sea and caused lethal effects on the marine environment. To mitigate the oil pollution, governance system has been enforced. Do you think that the international agreements (UNCLOS OSPAR, MARPOL and Bonn agreement) and the current policies and regulations are performing well enough in mitigating the oil pollution?
2. There are several policies implemented in addressing offshore oil pollution in Norway, for example,
    - The zero-discharge
    - The spill response policy - contingency planning or the emergency preparedness
    - Ecosystem-based management plan policy
    - Marine spatial planning

How effective are these policies in minimizing the oil spills on the marine environment?

3. From the implemented regulations, it has been identified that the following needs to be done prior and during the oil production,
    - Environmental Impact Assessment (EIA)
    - Monitoring - the monitoring, Environmental Effects Monitoring (EEM), Environmental Condition Monitoring (ECM)
    - Prosecution - the Petroleum Activities Act (1996), the discharge of oil in the sea will be seriously monitored, obliging the offender to pay for the liability damage and the liability is based on the types of licenses the offshore industries receive.
    - Using BAT (Best available Technique) and BEP (Best Environmental Practices)

Are these implemented regulations were efficient in reducing the legal and illegal significantly? and were the discharge standards met with minimized harm to the marine environment through effective monitoring, surveillance, and prosecution?

4. What are the disadvantages of these implemented policies and regulations with respect to the monitoring, surveillance and prosecution?
5. What do you think can be done in improving the marine governance systems in Norway? Are these implemented policies and regulations were sufficient enough or modifications need to be done? and what are the added policies that you think it made a difference? And if there are any policies you think need more enforcement or new ones to be added?

The Netherlands

1. From the literature study, it has been known that there are oil spill cases with the considerable amount of oil release in the sea and caused lethal effects on the marine environment. To mitigate the oil pollution, governance system has been enforced. Do you think that the international agreements (OILPOL, UNCLOS OSPAR, MARPOL and Bonn agreement) and the current policies and regulations are performing well enough in mitigating the oil pollution?

2. There are several policies implemented in addressing offshore oil pollution, for example,
    - Trilateral policy for wadden Sea
    - Marine Spatial Planning policy
    - Ecosystem Based Management policy
    - Oil spill response policy

How effective are these policies in minimizing the oil spills on the marine environment?

3. In the Netherlands, the implemented regulations involve,
    - Monitoring – Beached Bird surveys and the aircraft monitoring.
    - Prosecution – According to the State Supervision of Mines, during inspection, if the oil discharges failed to meet the discharge standards, eventually penalty will be imposed on the offender.
    - Using BAT (Best available Technique) and BEP (Best Environmental Practices).

Are these implemented regulations were efficient in reducing the legal and illegal significantly? and were the discharge standards met with minimized harm to the marine environment through effective monitoring, surveillance, and prosecution?

4. What are the disadvantages of these implemented policies and regulations with respect to monitoring, surveillance and prosecution?
5. What do you think can be done in improving the marine governance systems in the Netherlands? Are these implemented policies and regulations were sufficient enough or modifications need to be done? and what are the added policies that you think it made a difference? And if there are any policies you think need more enforcement or new ones to be added?

Appendix 2 Consent Form

Comparative analysis of marine governance between the Netherlands and Norway for offshore oil pollution

Project Information

- The research will assess the marine governance systems in the Netherlands and Norway for offshore oil pollution and identifies the country that has offered better marine governance systems in abating the oil pollution and along with that possible recommendations for the improvement of the governance systems were also provided.
- The participants selected for the research will assists the researcher in providing data on how dynamics were the implemented policies and regulations for offshore oil pollution in the Netherlands and Norway. This data could benefit the researcher to analyze the drawbacks and achievements of the implemented policies and regulations for oil pollution in the Netherlands and Norway. The prevailing interviews will not provide any discomfort to the participants and ensures the safety of their identity. This research has been reviewed and approved by the BMS Ethics Committee.
- If the interviewees are not interested in participating for interviews, they can terminate their participation at any time.
- No personal information about the participants will be collected or processed for the research. The gathering of data will be based on the research oriented. Regarding the data, the participants can be decisive in informing,
    1. The collected data that can be added for the research.
    2. The collected data that cannot added for the research (confidentiality).
- The prevailing interviews for the research will be recorded (Audio/ Video).
- The recordings of the interviews (Video/Audio) will be secured and deleted after the completion of thesis project.
- The data gathered from the research will not be utilized for personal benefits (In avoiding the exploitation of data for other purposes).
- To Contact for further information for the interviews, please see the third page.

Consent Form for Comparative analysis of marine governance between the Netherlands and Norway for offshore oil pollution

YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes	**Yes**	**No**
Taking part in the study		
I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	□	□
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	□	□
I understand that taking part in the study involves Comparative analysis of marine governance between the Netherlands and Norway for offshore oil pollution	□	□

Use of the information in the study

I understand that information I provide will be used for Comparative analysis of marine governance between the Netherlands and Norway for offshore oil pollution	□	□
I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.	□	□
Possible extra questions:		
If you want to use quotes in research outputs then add extra question: I agree that my information can be quoted in research outputs	□	□
If you want to use named quotes, then add extra question: I agree that my real name can be used for quotes	□	□
If written information is provided by the participant (e.g. diary) then add extra question: I agree to joint copyright of the [*specify data*] to [*name of researcher*]	□	□
You may also need to obtain dated consent for specific activities when those activities are optional. Whether an activity is required or optional must be clearly described in the main body of the information sheet. Some common optional research activities are included below:		
Consent to be Audio/video Recorded		
I agree to be audio/video recorded. Yes/no	□	□

Future use and reuse of the information by others

I agree that my information may be shared with other researchers for future research studies that may be similar to this study or may be completely different. The information shared with other researchers will not include any information that can directly identify me. Researchers will not contact me for additional permission to use this information. (Note: This separate consent is not necessary if you will only store and share deidentified data)	□	□
I give the researchers permission to keep my contact information and to contact me for future research projects.	□	□
I give the researchers permission to keep my contact information and to contact me for future research projects.	□	□

Signatures

_____	_____	_____
Name of participant [printed]	Signature	Date

For participants unable to sign their name, mark the box instead of sign

I have witnessed the accurate reading of the consent form with the potential participant and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

_____	_____	_____
Name of witness [printed]	Signature	Date

Appendix 3 Interview information

No	From	Interview Date
Interviewee 1	Norwegian Coastal Administration	2nd of July
Interviewee 2	Norwegian Environment Agency	6th of July
Interviewee 3	Rijkswaterstaat	8th of July

Table 14 – Interview information