# AN ANALYSIS OF DAMAGES TO NATURAL RESOURCES: A CASE STUDY OF AO PHRAO, SAMED ISLANDS


**BY**

**MISS TAMON NAKAPRAWING**


**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF LAWS IN BUSINESS LAWS (ENGLISH PROGRAM)**

**FACULTY OF LAW**

**THAMMASAT UNIVERSITY**

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THESIS

BY

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ENTITLED

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was approved as partial fulfillment of the requirements for
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## ABSTRACT

When the sea is contaminated with oil, it causes long-term damage and negatively impacts on marine life and the environment. Oil spills often leave behind environmental devastation and both people and the State are hardly compensated for the long-term effects of this kind of disaster. This is partly because it is difficult to assess the actual damage in an oil spill case.

The recent PTTGC oil spill in the Gulf of Thailand has raised important questions: “How to calculate the cost of oil spill damage?” and “Who will bear the cost of environmental damages?”. Surprisingly, there is no legislation specifically addressing on environmental damage assessment and liability for natural resource restoration. The only existing laws which are only partially relevant to oil spills are the Thai Civil and Commercial Code, Acts on Navigation of Thai Waters Act, B.E.2456 (1913) and The Enhancement and Conservation of National Environmental Quality Act, B.E.2535 (NEQA 1992) and given the extreme consequences and costs involved with oil spills, it is necessary to have rules or specific guidelines concerning with natural resource damage assessment.

While the government agency faces the problem of how to calculate the value of natural resources damaged by an oil spill and prove environmental damage in litigation, the court also faces the difficulty in assessing and awarding damages regarding natural resources. To sum up, the problem of how to calculate natural resource damages exists on the government entity’s side and the judge’s side. Using economic methods to assess damages to natural resources has been recognized in many countries except Thailand. Some countries also apply the damage schedule.

This thesis will focus on PTTGC’s oil spill case and an analysis of damages to natural resources caused by oil spill, propose a summary of methodologies for natural resource damage assessment and describe the process which the United States of America (U.S.A.) and other countries use to solve similar problem by developing measures focused on damage assessment, to contribute the proper remedies for oil spillage cases.

The conclusions are as follows:

Economic methods or alternative methods should be applied to identify reasonable damages related to the environment. For Thailand, the official reform measures on regulations, guidelines and working mechanisms concerning damage assessment should be proposed and conducted. Effective provisions in order to lay down a legal framework for the concerning authorities to deal with these problems should be proposed.

The term “value of natural resources” and “damage” following Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA), should be defined in the Act in order to avoid misinterpretation and make the terms clearer. The scope of coverage of the term “damage” in the NEQA should also include “the damage to marine ecosystems, biodiversity, habitat, marine aquatic resources, species distribution and species reproduction” in order to ensure that the interpretation of the court will cover these areas.

A Natural Resource Damage Assessment Institution should be established to be responsible for technical and research support together with the assessment, monitoring, and training process.

**Keywords**: natural resource damage assessment, damages, damage to natural resources, PTTGC oil spill, Ao Phrao

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Ms. Tamon Nakaprawing

Thammasat University

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# LIST OF ABBREVIATIONS

| Symbols/Abbreviations | Terms |
|---|---|
| PTTGC | PTT Global Chemical Public Company Limited |
| PPP | Polluter Pays Principle |
| NRDA | Natural Resource Damage Assessment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| SARA | Superfund Amendments and Reauthorization Act |
| CVM | Contingent Valuation Method |
| DOI | United States Department of the Interior |
| EPA | United States Environmental Protection Agency |
| NOAA | National Oceanic and Atmospheric Administration |
| HEA | Habitat Equivalency Analysis |
| OPA | Oil Pollution Act |
| NEQA | Enhancement and Conservation of National Environmental Quality Act |
| CCC | Thai Civil and Commercial Code |
| BP | British Petroleum Company |
| RMA | Resource Management Act |
| NZIER | New Zealand Institute of Economic Research |
| MEPL | Marine Environmental Protection Law of the People's Republic of China |
| EDA | Environmental Damage Assessment |

# CHAPTER 1
# INTRODUCTION

## 1.1 Background and Problems/Issues

Oil spills occur again and again in many nations of the world. As long as oil consumption is demanded, this will also continue to affect our environment. The problem of oil spills exists because oil transportation via pipelines is one of the most widespread options and caused the problem of oil spills. It is cost-effective and can also carry enormous amounts of crude oil compared to other means of transportation.[1] The oil is also transported by sea. Many ocean based oil spills resulted from that. Furthermore, oil spills can be caused by these following factors: mistakes from human activities, oil tankers and equipment breakdown, intention to spill oil and natural disasters.[2] While oil companies have improved offshore oil spill prevention and response methods, oil leakage still occurs at a heavy cost to marine environment systems, the economy, and the livelihood of coastal communities.

In Thailand, oil spill victims generally have received little compensation in environmental civil cases in the recent years. The injured person and State have also experienced difficulties in claiming indemnification from oil companies who usually downplay the impact of the accident in order to avoid paying compensation or simply to deny civil liability. Oil companies involved in oil spill damage typically aim for an out-of-court settlement in order to avoid protracted disputes, higher costs from litigation and risks of uncertain court awards.[3] As a result, the outcome of settlements hardly

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[1] Institute for Energy Research, **"***Oil shipments by rail, truck, and barge up substantially*", http://www.instituteforenergyresearch.org/2013/09/09/oil-shipments-by-rail-truck-and-barge-up-substantially/ (accessed on December 17, 2014)

[2] Office of Response and Restoration, National Oceanic and Atmospheric Administration, US Department of Commerce, "*How Do spills happen?*" http://response.restoration.noaa.gov/training-and-education/education-students-and-teachers/how-do-spills-happen.html (accessed on December 17, 2014)

[3] Coulter Boeschen, "*Advantages of Settling your injury lawsuit out of court*", http://www.alllaw.com/articles/nolo/personal-injury/advantages-settle-lawsuit-out-court.html (accessed on December 17, 2014)

covers all damage to the affected people and environment. The potential risk of oil spills remains in Thailand throughout many crossing shipping routes and pipeline transportation due to the high amount of oil consumption all over the country.

According to Thailand Marine department's report, more than 200 oil spill incidents have occurred between 1973 and 2012.

| Year(s) | Times |
|---|---|
| 2012 | 6 |
| 2011 | 3 |
| 2010 | 8 |
| 2009 | 7 |
| 2008 | 7 |
| 2007 | 12 |
| 2006 | 15 |
| 2005 | 10 |
| 2004 | 10 |
| 1997-2003 | 83 |
| 1973-1996 | 64 |
| **Total** | **225** |

**Table 1.1: Oil spill statistics in Thailand, Marine Department, Ministry of Transport of Thailand**
**(Source: http://www.md.go.th/safety_environment/04_4.php)**

Despite prevention methods, oil spills still occur leaving behind environmental devastation.

**Background: Details on PTT Global Chemical Plc's oil spill**

Crude oil was spilled from an offshore pipeline operated by PTT Global Chemical Plc (PTTGC) at Map Ta Phut terminal. According to PTTGC's report [4], the sequence of incidents was as follows;

Evidence of oil leakage in the flexible hose was discovered at 06.50 a.m. on July 27, 2013, causing crude oil to be discharged from a vessel to the Refinery, located 20 kilometers Southeast of Map Ta Phut seaport, Rayong province.

Oil spillage from the leakage was approximately 50,000 liters or equivalent to 316 barrels as revealed by PTTGC before closing the pipeline.

PTTGC relieved the oil spill by performing these duties;

Promptly shutting the pipeline valve to prevent further leakage.

Clean-up process of the spill by collecting oil from the sea surface, and spraying oil-spill dispersants both by ships and by aircraft. [5]

Relevant government agencies, including , the First Naval Area Command, the Marine Department, Industrial Estate Authority of Thailand, the Pollution Control Department, the Department of Disaster Prevention and Mitigation, were officially informed and asked for their clean-up collaboration.[6]

On the next day, a total of 10 ships were deployed by the PTTGC, the Marine Department, the Royal Thai Navy, and the IRPC Public Company Limited in addition

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[4] PTTGC, "*PTTGC's report"*, http://www.pttgc-oilspill.com/Blog/Progress/8 (accessed on December 1, 2014)

[5] Offshore Energy Today, *"Oil spill hits Thai tourism. Greenpeace Calls for Drilling Ban"*, http://www.offshoreenergytoday.com/gallery-oil-spill-hits-thai-tourism-greenpeace-calls-for-drilling-ban/ (accessed on January 2, 2015)

[6] PTTGC, Press Release: Issue 2, "*Oil Spills into the Sea 20 Kilometres Southeast of the Beach*", http://www.pttgcgroup.com/en/news/press/223/8/issue-2-oil-spills-into-the-sea-20-kilometres-southeast-of-the-beach (accessed on November 7, 2014)

to an aircraft from the Oil Spill Response Limited. [7] The Oil Spill Response Limited is an industry owned co-operative to perform effectively oil spill response wherever they occur.[8] The oil slick reached Ao Phrao (Phrao bay) at 10.00 pm on July 28, 2013. [9] The beach was blackened. PTTGC's workers cleaned up the oil slick on the shore by placing the absorbent pad and boom along the shoreline to prevent dispersal of oil spillage.

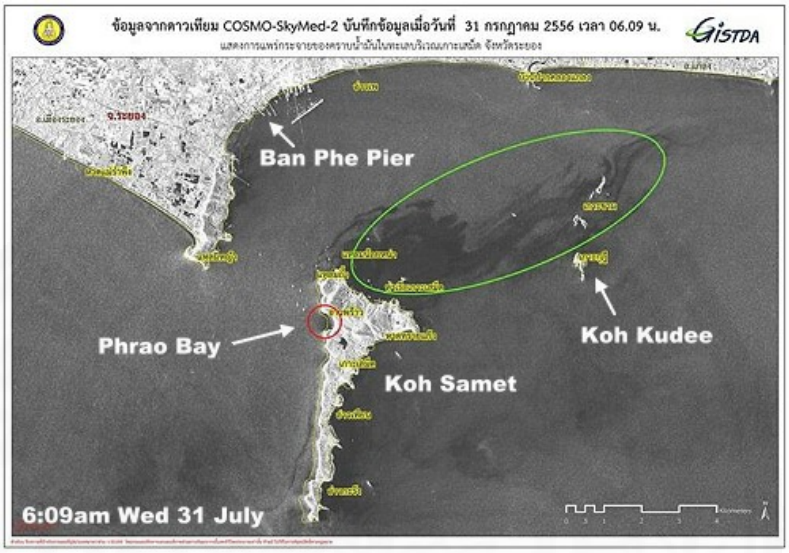


**Figure 1.1: Satellite image recorded on July 31, 2013 at 06.09 am. (Source: Geo-Informatics and Space Technology Development Agency (GISTDA))**

The area within the big circle in the image above shows the area of the oil slick (notice the darker shade of grey which symbolizes the oil contaminated area) and the small circle shows that Ao Phrao beach was covered with oil.

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[7] John Wardrop, "*Report John Wardrop attended the Rayong Oil Spill Response, Thailand"*,http://www.seerassociates.com.au/edit/Service_Sheets/Gulf%20of%20Thailand%20Spill%20July%202913.pdf?6-09-2013%2012:08:27%20PM (accessed on November 7, 2014)

[8] Oil Spill Response Limited, "*About us*", http://www.oilspillresponse.com/about-us, (*accessed on November 8, 2014*)

[9] Thairath online, "*Devastation of Ao Phrao, White beach turns into Black beach*", http://www.thairath.co.th/content/360216, Thairath online, July 30, 2013, (accessed on July 7, 2014)

The Director-General of the Marine Department and PTTGC commanded operation teams responsible for debris and oil residue collection from the shore by the Royal Thai Navy and civil volunteers.[10] One week later, Ao Phrao seemed back to its normal condition.

**Environmental Damage Assessment: PTT Global Chemical Plc's oil spill**

PTT Global Chemical Plc's oil spill is a major oil spill in Thailand. In Thailand, there are no current specific laws or guidelines that focus on civil liability for damage caused by oil spillage and its environmental damage; it can be difficult to find a great solution for these questions: "How to determine natural resource injury from oil spill?" and "Who will bear the cost of environmental damages?" regarding recent oil spills in the Gulf of Thailand.

The only existing laws which are only partially relevant to oil spills are the Thai Civil and Commercial Code, Acts on Navigation of Thai Waters Act, B.E.2456 (1913) and The Enhancement and Conservation of National Environmental Quality Act, B.E.2535 (NEQA 1992).

Due to the severe harm to natural resources resulting from a spill, it is necessary to have specific guidelines and effective provisions in order to have a legal framework for the concerning authorities to deal with an analysis of damages to natural resources caused by an oil spill, measures focused on assessment, working mechanisms and remedies for oil spillage cases in the future.

## 1.2 Hypothesis

Harm to the environment is difficult to assess and highly complex, considering its effects to species and natural habitats. The Thai traditional method of damage

[10] Bangkok Post, "*Fishermen hit by oil slick*", http://www.bangkokpost.com/print/362211, **Bangkok Post,** July 30, 2013 (accessed on January 7, 2015)

calculation for the judge is currently based on the court's discretion. Thailand does not have guidelines for the court of justice, or provisions to lay down the methods, regarding how to evaluate natural resource damages or the methods of calculating the damage to the affected environment. The problem of acceptability and accountability of the valuation methods used in damage assessment of natural resources is the major obstacle for the case, relating to environmental damage or destruction of natural resources in the Thai court. No provisions and guidelines concerning natural resource damage assessment were contained in Thailand.

The following concerns need to be answered.

(1) The monetary value of natural resources damaged by the oil spill.

(2) How to award reasonable damages for oil spillage cases.

(3) Measures focused on damage assessment to natural resources, working mechanisms and remedies for oil spillage cases.

Economic methods of natural resource damage assessment are widespread among many countries except Thailand. Analysis of the Oil Spill damage and its impact on Marine Interests using economic methods can be considered a good alternative for the Thai Court and relevant government authorities to adopt, concerning natural resource damage assessment. Moreover, there are some new developed methods in foreign countries, for example, damage schedule approach and the judicial authentication of environmental pollution damage to natural resources.

## 1.3 Objectives of Study

(1) To analyze the Oil Spill damage due to PTTGC's oil leakage in the environmental impact on marine interests.

(2) To identify the current problems of the traditional method of calculation in environmental damages caused by oil spills in Thailand, comparatively with the laws and methods applied in previous oil spill cases in foreign countries in order to find

appropriate ways to assess or quantify the environmental damage caused by the oil spill in Ao Phrao's case.

(3) To briefly introduce and compare each method and calculate damages, in order to provide effective mechanisms that are suitable to remedy the State for environmental damage caused by an oil spill.

(4) To analyze and compare Thai compensation systems and working mechanisms, relating to compensation for ecological damages caused by an oil spill, with the United States of America, Europe, New Zealand and China, in order to put forward proper improvements or amendments of Thai compensation system and guidelines. This may encourage a progressive and innovative calculation framework for compensating ecological damages and laws of Thailand.

## 1.4 Scope of the Thesis

This thesis mainly focuses on methods to calculate or identify damage caused by an oil spill to natural resources. It will also compare and analyze valuation methods to be used for natural resource damage assessment in Thailand, especially in Ao Prao's case. It will analyze the weaknesses of current Thai Environmental Laws and practices in comparison with foreign laws and practices to consider if economic methods or other methods under foreign practices should be applied in Thailand or not. It does not focus on liability for damage to business sectors. Only an analysis of damages to natural resources will be provided.

## 1.5 Methodology

This thesis is generally based on documentary research concerning the sources and analysis of textbooks, legal articles and journals, documents, foreign and Thai court decisions, publications, reports of the government authority, fieldwork, and other related sources.

## 1.6 Expected result

(1) To understand the background of calculation methods involved in the previous cases of natural resource damage assessment.

(2) To deeply understand the current problems of natural resource damage assessment in Thailand.

(3) To identify the differences between laws and guidelines in Thailand and the United States of America, New Zealand, Europe and China, regarding the calculation methodologies for natural resource damage assessment and working mechanisms.

(4) To provide appropriate solutions to fully compensate the State from injured natural resources, by proposing an array of new mechanisms or guidelines.

(5) To improve its effective compensation systems and practices regarding natural resource damage assessment in Thailand.

(6) To raise awareness regarding the importance of oil spill damage calculation to natural resource especially for judges, members of the National Legislative Assembly, legal scholars, government authorities and oil companies.

# CHAPTER 2
# ECONOMIC VALUE OF NATURAL RESOURCES

This chapter is concerned with valuation methods used to analyze the environmental impact and natural resource damage assessment. This chapter will also point out the economic aspects of natural resources which were based on laws and how to calculate the oil spill damage via economic methods.

## 2.1 How much does it cost for oil spill damage to natural resources: Economic valuation and Impact analysis

In respect to economic analysis of damage calculation and legal implementation, economic methods or theories can give useful ideas to be applied in legal system and practices. In order to restore the natural resource into the previous position, ways to calculate the cost of pollution damages is not easy. Valuation techniques must be used to identify the monetary value of environmental damage.

## 2.2 Legal doctrine for Environmental Damage Liability

One of the most popular legal doctrines for environmental damage liability is "Polluter Pays Principle" or "PPP" Doctrine.

### 2.2.1 Polluter Pays Principle (PPP)

The Polluter Pays Principle (PPP) is one of the most recognized principles of environmental policies. The polluter pays principle states that "whoever is responsible for damage to the environment should bear the costs associated with it." [11] The Organization for economic Co-operation and Development (OECD) is the first international organization to refer this principle and recommend the polluter pays principle as the 'Guiding Principle Concerning the International Economic Aspects of

[11] The United Nations Environmental Programme (UNEP), "*The United Nations Environmental Programme, Taking Action*", at 3

Environmental Policies' in 1972. [12] Many countries have adopted the Polluter Pays Principle as a fundamental component of internal environmental liability law.

OECD defines this principle as "The principle according to which the polluter should bear the cost of measures to reduce pollution according to the extent of either the damage done to society or the exceeding of an acceptable level or standard of pollution."[13] This principle's aim is to address who should bear the costs of reparation, atonement and clean-up of oil pollution. This principle indicates that the costs of pollution and the cost of measures to reduce pollution should be borne by the person liable for causing the pollution. The Polluter Pays Principle has been mentioned as one of the recognized principles in many regional and international conventions.

### 2.2.2 The Economic Value of Natural Environments and Resources

Natural resources provide the high values to individuals and society. Marine natural resources connect to economic and national growth, especially States or countries which generally depend on fisheries and tourism. Oil spills also threat to the National economic system.

Natural resource valuation is not a simple task since it normally raises the question of how to measure the natural resource's value. The World Bank's Operational Policy on EA (OP 4.01) states that "environmental costs and benefits should be quantified to the extent possible, and the economic values should be attached where feasible." [14] Purpose of Sustainable development is to provide equivalent point between maintenance of healthy environment and economic development.

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[12] Environmental Committee, "*Recommendation of the Council on Guiding Principles concerning International Economic Aspects of Environmental Policies*", 26 May 1972 - C(72)128

[13] Glossary of Environment Statistics, "*Studies in Methods*", Series F, No. 67, United Nations, New York, 1997.

[14] Environment Department, World Bank, "*The Impact of Environmental Assessment, A Review of World Bank Experience*"**, World Bank Technical Paper No. 363**

The total economic value of natural resource can be explained in many forms. However, the two main categories are as follows;

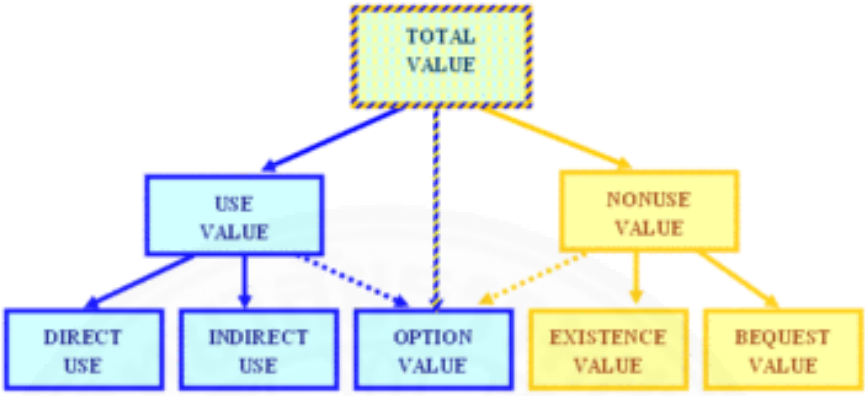


**Figure 2.1: The total economic value**

(Source: http://www.eoearth.org/article/Total_economic_value, Accessed on December 2, 2014)

Total values can be divided into as follows:

**2.2.2.1 Use Value**

"Use value or value in use" is the utilization of a good and or service. Adam Smith is of the opinion that the word "value" has two different meanings. The first is called "value in use" and is to identify actual use or the utility of goods consuming. Other is "value in exchange" which describes the power of purchasing other goods which the possession of that object conveys.[15]

Some scholars further divided "Use value or value in use" into 2 categories;

**Direct Use Value** is the value calculated from the direct use of natural resource for example, hunting, direct consumption, income from selling marine products. Direct

[15] Economic theories, "*Economic: Adam Smith Theory Of Value*", http://www.economictheories.org/2008/07/adam-smith-theory-of-value.html (accessed on December 2, 2014)

use is considered as goods which can be extracted, consumed, or directly enjoyed. Direct use includes both consumptive and non-consumptive. Collection of fruits, mushrooms, herbs, plants, hunting and fishing are considered as "consumptive uses". It also shows that one environment can consist of both consumptive and non-consumptive uses. For example, a forest had attracted tourists in term of enjoyment, observing, photography or ecotourism while forest products such as timbers, fruits or mushrooms would appeal to forest dwellers.

**Indirect Use Value** is referred to as the non-extractive use value which assess on the services that an environmental resource provides. [16] Indirect use value is the value of natural resource which cannot be sold directly.

In conclusion, Use Value is one method for assess damage to natural resources that is affirmed by the U.S. Law. It contains the provision of the regulations respecting assessment of damages to natural resources that normally consider on replacement value, use value, and ability of the ecosystem or resource to recover following 42 U.S.C *§* 9651*(*c*)(*2*)(B) (*1982 *& Supp. IV 1986)*.[17]

**This category can be further subdivided to option value.**

**Option Values**

Option value can be described as the value that people choose to have this option available for future uses. [18]

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[16] Center of Excellence in environmental Economics, Madras School of Economics, "*Environmental Valuation*", http://coe.mse.ac.in/dp/Ecosystem%20Services.pdf (accessed on December 2, 2015)

[17] 42 U.S.C *§* 9651*(*c*)(*2*) (*1982 *& Supp. IV 1986)*

[18] Forestry Department of Food and Agriculture Organization of the United Nations, "*Forest valuation for decision making-The Values, benefits and costs to consider in forest valuation*"

#### 2.2.2.2 Non- Use value or Existence Value

The non-use value or the existence value is called for the values or benefits that humans lay on things in order to know the value of something that exists. There are values not connected with actual use. Natural resource may have both use and non-use value.

To clarify, in case of National Park area in Mae-Wong, Mr. A would like to protect such area and prevent from dam construction because he realizes the Non-Use value of that area. He also wishes to have it in the future. His opinion is that the construction of the dam would yield little benefit, as compared to the effects on the environment. However, the Non-Use value is difficult to measure.

**Bequest Value**

Bequest value is the non - use value that person would like to reserve natural resource for his or her children in the future. [19] Furthermore, they would be willing to reduce all factors that concerning with the future environmental damages without their own benefit's perspective.[20]

Valuation of Direct-use is the easiest. For Indirect-use's valuation is more complex while the most difficult is the Non-Use value. [21]

## 2.3 Economic Methods for Valuation of Natural Environments and Resources

The U.S.A. was the first country to adopt economic methods to measure environment damage.

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[19] *Id*.

[20] Tanya O' Garra. "*Bequest Values for Marine Resources: How Important for Indigenous Communities in Less-Developed Economies*", **Environmental and Resource Economics** (n.p.:Springer, 2009)

[21] Environment Department, World Bank, *supra* note 14

### 2.3.1 Market Price or Market Value Approach

It is the easiest way for the assessment of natural values based on market price. This approach also can be called as Market-based methods. This method derives from the use of market price's information. Market Prices method is traditional economic way to measure damage in environment.

The fact that the market price or market value approach is based on the price of goods sold in the market, there will be a substantial problem for the goods that do not have market price. Most natural resources do not have the exact market value because they are not traded on a market, for example, carbon dioxide absorbers and wildlife habitat.

The case of *Commonwealth of Puerto Rico v. S.S. Zoe Colocotroni*, it was an oil spill off the coast of Puerto Rico in 1973 caused by oil tanker. The district court and the court of Appeal affirmed the Market Price or the Market Value Approach to assess damage assessment by consideration of the market prices of biological supply house catalogue.[22] The court held that the applicable measure is 'the cost reasonably to be incurred by the sovereign or its designated agency to restore or rehabilitate the environment in the affected area to its pre-existing condition, or as close thereto as is feasible without grossly disproportionate expenditures'.[23]

The District court awarded USD 5,526,583.20. Later on, the defendants argued that the diminution of the market value of the affected coastal land must be taken into account, instead of the replacement cost of organisms.[24]

A previous case provided evidence that the valuation of damage was based on market price or commercial price was raised up in United States before the enactment

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[22] Commonwealth of Puerto Rico et al., v. S.S. Zoe Colocotroni, 456 F.Supp. 1327 (D.C.P.R. 1978), Commonwealth of Puerto Rico et al., v. S.S. Zoe Colocotroni, 628 F.2d 652 (1st Cir. 1980), cert denied, 450 US 912 (1981)
[23] 33 USC §2702 (b (2) (a): 2706 (a)
[24] *Id.*

of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Oil Pollution Act.

### 2.3.2 The Revealed Preference Approaches

#### 2.3.2.1 Hedonic Pricing Method

The hedonic pricing method is mostly used to estimate the economic values for natural resource or ecosystem by considering their impact on market goods. [25] To give an example, in order for us to decide to buy a house or condominium, we normally consider factors[26] which includes environment's factor. Regarding environment's factor, it consists of air and water quality, flooding risk, noise and landscape view. OECD 2006 suggested that "Hedonic pricing" is one of the methods to quantify the economic value of natural assets.[27]

In Thailand, a case study of Suvarnabhumi airport, Bt3.80 billion was paid by Airports of Thailand Public Company Limited (AOT) [28] to the noise-affected residents around Suvarnabhumi airport. It can be said that environmental factors affect the quality of life for locals. Therefore, it affects the housing price in the real estate market. Price or renting fees of houses in cleaner environments are generally more expensive than houses in polluted or noisy areas.

The disadvantage of this method is that there must be the data or records on real estate price and rents in order to compare with the current price after the environment around there is polluted. Another obstacle is that in one area, the housing costs for renting and buying varies. Even though, the house is located at the same area, the housing prices and rents can be different.

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[25] Ece Ozdemiroglu, **Resource Equivalency Methods for Assessing Environmental Damage in the EU**, June 3, 2008

[26] Sunee Chedsadawarangkul, Thitinant Wareewanich, and Duangta Saranrom, "*The factors which affected the decision process making to buy townhouses of Wangthong Group (Public) Company Limited*", **Valaya Alongkorn Rajabhat University Graduates Journal**, No.3 October 2009 – January 2010.

[27] OECD, "*Liability for Environmental Damage in Eastern Europe, Caucasus, and central asia (EECCA): Implementation of good international practices*", at 18

[28] Thansettakij Year 32, issue 2, 796, October 29, 2012

#### 2.3.2.2 Production Function Method or Productivity methods

The productivity method is applied in cases where natural resources are used to produce goods in the market by considering their contribution in the production of goods.[29] The productivity method is normally selected to be used, for example, the quality of water in irrigation systems normally affects agricultural crops. In cases where pollution affects quality of water, the cost of irrigation or purification will be higher.

Ecosystem services means the advantages human beings obtain from ecosystems. These following details have been identified under the service:

**Provisioning services** - the products derived from ecosystems such as fishes, fruits, timber and wool;[30]

**Regulating services** - the benefits received from the regulation of ecosystem processes;[31] Samples are as follows:

Trees diminish air pollution. Therefore, forests can help for air-quality maintenance.

Climate regulation: Temperature and climate can be affected by ecosystem and nature. [32]

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[29] Christopher M. Fleming and Averil Cook, "*The Recreational Value of Lake McKenzie: An Application of the Travel Cost Method*", per presented at the 51st Annual Conference of the Australian Agricultural and Resource Economics Society, Queenstown, New Zealand, 13 – 16 February, 2007.

[30] UNEP, "*Ecosystems and Human Well-being: A Framework for Assessment"*, http://www.unep.org/maweb/documents/document.300.aspx.pdf (accessed on July 14, 2015)

[31] *Id.*

[32] Mark Christensen, "*Valuation of Natural Assets under the Resource Management Act*", http://www.andersonlloyd.co.nz/wp-content/uploads/2013/08/Valuation-of-Natural-Assets.pdf, (accessed on July 14, 2015)

Natural hazard protection, for example, landslides, land erosion and floods.

**Cultural services** - intangible benefits obtained from ecosystems through spiritual value, cognitive development, reflection, recreation, tourism and aesthetic experiences; [33]

**Supporting Services** - supporting services that are necessary for the production of all other ecosystem services, for instance, nutrient cycling, primary production and soil formation.[34]

For examples, in case of Ao Phrao which is situated in Koh Samed, one of the most popular beaches in Thailand. The value of natural resource in this area should be concerned with "provisioning services" if we consider on fishes and marine products caught in the sea in Samed's area or "cultural services" due to purposes of recreation, diving, relaxation and tourism. Last, it is also connected with supporting services due to the fact that Ao Phrao is a food source and habitat for marine lives in the sea. It can contribute the food chains for living things.

**2.3.2.3 Travel Cost method**

This method is normally applied in cases for recreational sites. This method can assess the value of things that do not have "selling price" or are not sold in the market. Travel Cost method is frequently used by applying travel cost to measure the economic benefits of natural resources. Entry Ticket fees, on-site-expenditures, amount of travel time spent and/or the opportunity cost of travel time, fuel costs are all considered as "Travel costs". [35]

These questions can be used to measure the value of natural resources under this method; How many days do you use the beach?, How much money do you

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[33] *Id.*
[34] *Id.*
[35] *Id.*

spend to reach the beach?, How long do you normally stay?. [36] According to the previous questions, the demand curve, average time spent, average daily expense can be presented.[37] Hence, the total value of beaches can be revealed under this method after processed by the economists.

Therefore, the travel cost method can be referred as one of the best appropriate method for non-market goods by measuring the value as much as cost that people are willing to pay in order to reach the place.

However, there is a problem in cases where natural resources are categorized as "non-visiting places" or restricted areas that people are not allowed to enter. Therefore, we cannot estimate travel costs in these cases.

### 2.3.3 The Stated Preference Approaches

This approach is survey based approach. Survey is admissible in economic valuation since it derives from investigation by providing questions in order to receive feedback and information.

#### 2.3.3.1 Contingent Valuation Method (CVM)

CVM uses survey to determine the willingness to pay or the willingness to accept for goods and services that are not traded on the market. [38]As stated earlier, information can be collected by surveys. It can be used for measuring both the use and the non-use values. Sample of the non-use value is that people feel pleasure from a nice view of a beach, however it would not be easy to value it by using market price. Contingent valuation surveys are designed to measure this type of value.

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[36] Centre for Economics and Community Economic Development, The Open University of Tanzania, "*OEV 210 ENVIRONMENTAL ECONOMICS*", at 53
[37] *Id.*
[38] Edward H.P. Brans, **Liability for Damage to Public Natural Resources Standing, Damage and Damage assessment**, at 154

It generally provides a scenario that things can be sold and purchased. In order to value economic benefits, this method typically involves the survey asking opinions of the respondent in order to gain information on how much money respondents of the survey would like to spend to protect this type of natural resources or agree to accept for destruction of environment.[39] The surveys consider what value the public lay down on natural resources. The amount of money will be multiplied by the number of people who is affected by oil spill.

Contingent Valuation Method has affirmed in the government's methods and previous decisions of court. In 1979, One of State agency, The U.S. Water Resources Council proposed this method as recommended methods for considering the benefits of federal water and related land resource project. [40] In Exxon Valdez's case, "Contingent Valuation" was introduced and proposed by the plaintiff in court to valuate environmental damage.[41]

Structure of Questionnaire in Contingent Valuation Method is different from normal survey by providing more information to create better understanding to respondents and visualize respondents, for example, in the case of Exxon Valdez , they included photos of the area before and after the incident, photos of examples of marine life which were killed by the spill, a map identifying the area of oil slick, data of wildlife at the time of the oil spill such as the number of dead birds and a chart comparing pre-spill animal estimation and post-spill estimation.[42]

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[39] Sameer H. Doshi, "*Making the Sale on Contingent Valuation"*, **Harvard John M. Olin Center for Law, Economics, and Business Fellows' Discussion Paper Series**, August 2007

[40] Raymond J. Kopp, Werner W. Pommerehne, Norbert Schwarz (Dr. phil.), **Determining the Value of Non-marketed Goods: Economic, Psychological, and policy relevant aspects of contingent valuation methods**.,1997

[41] Richard T. Carson , Robert C. Mitchell , Raymond J. Kopp , Paul A. Ruud , "*Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill*", **Environmental and Resource Economics** 25 (2003)

[42] Kenneth F. McCallion, **Fordham environmental law review**, Volume 3 Issue 2, 2011, http://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1339&context=elr (accessed on October 10, 2014)

However, there are many factors which must be taken into account under this method as follows;

1. Answer in the survey may be inaccurate with the actual behavior.[43]

2. Survey results may be changed because of the wording used in the survey.[44]

3. Depending on survey will contribute the question about the scientific validity.

Some scholars trust that this method can produce estimates reliable enough to be a starting point for a judicial process of damage assessment. [45] In Daubert v. Merrell Dow, the court ruled that Contingent Valuation Method can be used since it is the best available procedure for loss assessment, especially when the market-based method is not appropriate. [46]

There are many controversies on the use of the Contingent Valuation Method, such as the respondents cannot define the monetary values for the loss of natural resource and some do not take survey seriously. The above situations will lead to inaccurate results.

However, Contingent Valuation Method was challenged in American court in the case of General Electric Co. v. NOAA. General Electric Co. participated in a challenge to a final rule issued by the National Oceanic and Atmospheric Association ("NOAA") pursuant to the Oil Pollution Act.[47] General Electric Co. claimed that this rule is considered as arbitrary and capricious standard. [48] The reason behinds this claim is that the rule allowed trustees to recover the non-use value. However, the Court of

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[43] M W Jones, "*Natural Resource Damage Assessments for Oil Spills: Policy Considerations Underlying the Evolution of the Department of the Interior's Regulations,* **Villanova Environmental Law Journal** 491 at 519 (1990)

[44] P M Manus, "*Natural Resource Damages from Rachel Carson's Perspective: A Rite of Spring in American Environmentalism*" 37 29 **Wm.&Mary L. Rev.** 381 at 449-450 (1996)

[45] D M Stager, "*From Kepone to Exxon Valdez Oil and Beyond: An Overview of Natural Resource Damage Assessment*" (1995) 29 **U.Rich L. Rev.** 751 at 775

[46] Daubert v. Merrell Dow Pharmaceuticals, 509 U.S. 579 (1993)

[47] Edward H.P. Brans, *supra* note 38 at 147

[48] General Electric Co. v. NOAA, 128 F.3d 767 (D.C. Cir 1997)

Appeal held that NOAA did not do anything wrong by applying the non-use value and the use of CVM. [49]

#### 2.3.3.2 Contingent Choice Method

This is another survey-based method since respondents are asked to choose one choice of different circumstances. This method is similar to the Contingent Valuation Method as a hypothetical method. Generally, people are asked to make decision based on simulation. The major difference compared to the Contingent Valuation Method, is that the values can be concluded by considering people's tradeoff. Respondents will not state the value amount clearly in contingent choice method.[50] The choice they made will directly refer to the value of natural resources.

## 2.4 The Cost-Based Approach (Cost Avoided, Replacement and Substitute cost methods)

Natural resources are estimated based on the costs of avoiding damages, the cost of replacing ecosystem services, or the cost of providing substitute services. Cost based valuations are usually commissioned since it is more convenient to value costs of producing benefits than the value themselves. However, many scholars trust that the value is not connected to costs. It also provides only rough indicator which may not be accurate.[51]

1) Damage cost avoided method;

The method is concerned with "the costs avoided from the destruction of ecosystem".[52] This method assumes that the costs of avoiding damage can help to

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[49] *Id.*

[50] Dennis M. King, Marisa Mazzotta, "*Contingent Choice Method*", http://www.ecosystemvaluation.org/uses.htm (accessed on October 10, 2014)

[51] Archariya Wongburanavart, "*A Comparative Study of Natural Resource Damage assessment in USA and Thailand*", 2011, at 24

[52] Suzanne van der Meulen & Jos Brils, "*Ecosystem Services (ES) in river basin management – background information and discussion document*" http://www.levenmetwater.nl/static/media/files/vdMeulen_-_Ecosystem_services_and_river_basin_management.pdf (accessed on October 15, 2014)

estimate the value of ecosystems and potential physical damage to property. However, it is often difficult to estimate damage avoided.

2) Replacement cost method;

It is impossible to replace one destroyed natural resource with new natural resource. Many scholars suggest that replacement is not a good way to valuate natural resource but rather program of action [53]. When restoration is too expensive or total loss, replacement is a good choice. For example, the value of mangrove ecological service costs USD 60,000 for flood barrier. Therefore, valuation results for the environment tend to be undervalued.

## 2.5 The Benefit Transfer Approach

This method is one economic approach used by estimating the monetary values in previous research or studies to apply and assess the value of an effect in another similar situation. [54]

This approach can be concluded simply in the following figure;

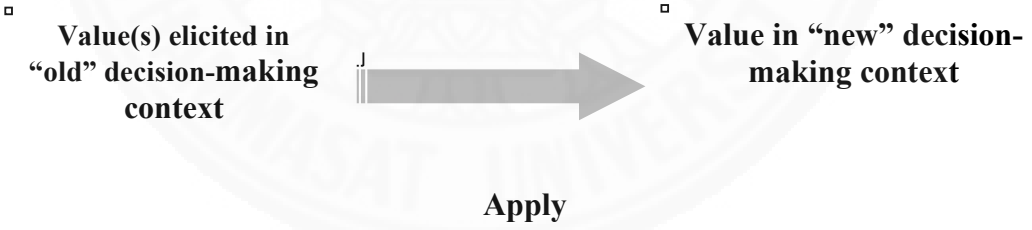


**Figure 2.2: The Benefit Transfer Approach**

(Source: Ece Ozdemiroglu, Resource Equivalency Methods for Assessing Environmental Damage in the EU, June 3, 2008)

[53] F B Cross, "*Natural Resource Damage Valuation"* (1989) 42 **Vanderbuilt Law Review** 269 at 298.

[54] U.S. Environmental Protection Agency, "*Models & Tools*" http://www.epa.gov/ttnecas1/econdata/Rmanual2/7.3.html (accessed on October 3, 2014)

U.S. Environmental Protection Agency advises that if there is one previous study, in order to apply such information to the new situation, you must apply with per-unit value estimation.[55] However, we must compare between the loss of wrong decisions from the transferred value of complete study from one site to another site and the cost of conducting new study. If new study to that site is not complicated, we must conduct the new study at that site in order to avoid inaccuracy. This method is not complicated when compared with other kinds of method.

In Trader's case, the court has guaranteed the non-market values by using the lost beach days.[56]

## 2.6 The Restoration - Based Approach/Habitat Equivalency Analysis (HEA)

This method can be called the Habitat Equivalency Analysis (HEA). It was applied by the National Oceanic and Atmospheric Administration (NOAA) to determine the compensation connected to damage to the ecosystem. This method is used by NOAA to claim damages against parties responsible for natural resource damage resulting from oil spill incidents, vessel groundings, discharges of hazardous substances or other damaging actions.[57] To apply HEA method, we look at the service or the lost services that the ecosystem provides to the biotic component.

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[55] Subhendu K. Pattanayak, V. Kerry Smith and George Van Houtven, "*Improving the Practice of Benefits Transfer: A Preference Calibration Approach*" (n.p.:Springer, 2007) 3

[56] Michael Bowman and Alan Boyle, **Environmental Damage in International and Comparative Law Problems of Definition and Valuation**, (n.p.: Oxford University Press, 2002) 35

[57] The Under Secretary for Oceans and Atmosphere (NOAA Administrator) acts on behalf of the Secretary of Commerce as a Federal trustee for natural resources under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"; 42 U.S.C. § 9601 *et seq*.), the Clean Water Act (33 U.S.C. § 1251 *et seq*.), the National Marine Sanctuaries Act (16 U.S.C. § 1431 *et seq*.), and the 1990 Oil Pollution Act ("OPA"; 33 U.S.C. § 2701 *et seq*.).

Trustees who acts on behalf of the public, may seek to claim the damages as primary restoration for recovery of the injured area and to assess compensatory restoration which is the interim loss of services occurring prior to full recovery.[58]

Habitat equivalency analysis is specifically designed to determine the compensation to the State to reconcile injuries to the ecosystem and the lost services the ecosystem provides to the biotic component.



[58] Department of Commerce*, "Habitat Equivalency Analysis: An Overview*", http://www.darrp.noaa.gov/library/pdf/heaoverv.pdf (accessed on December 15, 2014)

# CHAPTER 3
# FOREIGN LAWS REGARDING NATURAL RESOURCE DAMAGE ASSESSMENT

In the past, it is questionable that how come Economics has connection with laws. Each country has their own methods to deal with the natural resource damage assessment. Laws and procedures in many countries were recently adjusted to apply economic methods to provide more consistent, reasonable and acceptable solution for use in policy planning, law enforcement and litigation. This chapter will explore how the U.S.A., European Union, China and New Zealand deal with the natural resource damage assessment.

## 3.1 Natural Resource Damage Assessment in the United States of America

Laws in the United States are derived from these five following sources: constitutional law, statutory law, treaties, administrative regulations, and the common law which case law is included in this area. [59] The United States Constitution gives legislative powers to two chambers of congress as stated under Article I, Section 1, of the United States Constitution.[60]

### 3.1.1 Scope of Compensation under the U.S. Laws

The main difference between Thai judicial system and U.S. system is that under American Law, the primary responsibility of jury is to be "the judges of the fact" by consideration of the evidence provided.[61] However, evidence to be considered must be

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[59] Thomas R. Van Dervort , "*American Law and the Legal System: Equal Justice Under the Law*", (N.p.: Cengage Learning, 2nd ed., 2000) 52

[60] Article I, Section 1 "*All Legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives*."

[61] State Bar of Michigan, "*Your role as a juror*", https://www.michbar.org/file/publications/pdfs/YourRoleJuror.pdf (accessed on June 15, 2016)

admissible in the court. Judges in the U.S.A. normally decide a question of law. [62]In Thailand, there is no jury system.

An example of the case that jury did not award damages;

**MDL Litigation regarding Texas City Refinery Ultracracker Emission,** ***No. 10-UC-0001 (56th Jud. Dist. Tex. Oct. 10, 2013)***

In this case, approximately 48,000 plaintiffs filed claims against the refinery company for personal injury and property damage. Each plaintiff filed a claim for $200,000, plus another $10 billion for the group in punitive damages, towards a charitable purpose. The goal of punitive damages is not only to compensate the injured plaintiffs, but to punish and deter the wrongdoers by awarding further damages in addition to the actual damages. However, in this BP case, the Texas jury's verdict did not award any damages, despite finding that BP had flared approximately 500,000 pounds of noxious chemicals.[63]

### 3.1.2 Statutes Concerning Natural Resource Damage Assessment and Methods designed to determine the damages in the U.S.A.

At the federal level, there are several interesting statutes concerning civil liability of damage to natural resources and economic methods. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Oil Pollution Act of 1990 (OPA) provides framework for bringing natural resource damage claims. Both laws are different in term of the substance. CERCLA identifies liability for the injured natural resources caused by hazardous substance, but OPA identifies liability for the injured natural resources caused by discharges of oil.

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[62] *Id.*

[63] *In re: MDL Litig. regarding Texas City Refinery Ultracracker Emission*, No. 10-UC-0001 (56th Jud. Dist. Tex. Oct. 10, 2013)

#### 3.1.2.1 The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act is commonly known as "Superfund".[64] It was enacted in 1980. [65] CERCLA was originally introduced after the tragedy of Love Canal. [66]

**Love Canal disaster**

The Love Canal disaster is an example of toxic waste in a residential area. From 1942 to 1953, the Hooker Chemical Company (subsidiary of Occidental Petroleum) misused a canal they dug in Love Canal, a neighborhood of Niagara Falls, as a chemical waste dump. The contaminated canal was filled with approximately 21,000 tons of industrial waste, including carcinogens, halogenated organics, chlorobenzene, and dioxin.[67]. In 1953, the land was sold by the company to the local school board for $1, where they built the 99th Street School.[68]

A few years later, the toxic waste was discovered, along with a high amount of respiratory disorders, miscarriages, mental illnesses, nervous breakdowns, urinary tract disorders, and other health problems. On May 17, 1980, the Environmental Protection Agency (EPA) declared, based on evidence from blood tests, that

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[64] Environmental Protection Agency, **"***Summary of the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)"* http://www2.epa.gov/laws-regulations/summary-comprehensive-environmental-response-compensation-and-liability-act (accessed on December 1, 2014)

[65] Environmental Protection Agency, "*CERCLA Overview*", http://www.epa.gov/superfund/policy/cercla.htm (accessed on December 4, 2014)

[66] Justin Ripple, "*Love Canal disaster and the origin of CERCLA: Part 1*", http://www.banksinfo.com/blog/love-canal-disaster-origin-cercla/ (accessed on December 4, 2014)

[67] Geneseo The State University of New York, "*Love Canal—A Brief History*", http://www.geneseo.edu/history/love_canal_history (accessed on December 4, 2014)

[68] Mother Nature Network, "*America's 10 worst man-made environmental disasters*", http://www.mnn.com/earth-matters/wilderness-resources/photos/americas-10-worst-man-made-environmental-disasters/love#ixzz35Lk6hI7J (accessed on December 4, 2014)

chromosome or genetic damage was found in Love Canal residents.[69] A lawsuit filed by 1,328 Love Canal residents totaled nearly $20 million, with $1 million separated for a Medical Trust Fund. From 1994 to 1995, Occidental Petroleum agreed to pay an additional $98 million for New York State's clean-up costs, and $129 million for the federal government's clean-up costs & continued maintenance of the chemical waste treatment at Love Canal.[70]

Public awareness from the Love Canal toxic disaster constituted a new legislation for polluters to be responsible for cleaning up their toxic waste sites as shown in the 1980 CERCLA Act or known as Superfund. Tax on petroleum and chemical industries is set up. [71]

The CERCLA constitutes these following rights;

Right to identify sites where toxic substances have been released or might be released, and result in dangerous effects to human health, welfare, or the environment and establish regulations involved in closed and abandoned hazardous waste sites and pose liability for potentially responsible parties who likely cause environmental harm from releases of hazardous waste at closed and abandoned sites.

Right to impose clean-up or take action to remedy and report requirements on the private sector.

Right to seek the parties responsible for the releases pay for the clean-up activities or Right to Cost Recovery for a party that removes hazardous material.

Right of the Congressional to mandate in order to clean-up or remove from closed hazardous waste sites and to provide emergency help in toxic

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[69] Center for Health, Environment and Justice, "*Love Canal*", http://chej.org/about-us/story/love-canal/ (accessed on December 4, 2014)
[70] Boston University, "*History: Chronology - Key Dates and Events at Love Canal*", http://www.bu.edu/lovecanal/canal/date.html (accessed on December 4, 2014)
[71] United States Environmental Protection Agency, *supra* note 66

emergencies.[72] CERCLA can be considered as a response and reporting act more than an extensive regulatory act.[73]

**Natural Resource Damage Assessment under CERCLA**

Definition of Natural Resources under CERCLA is "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States ... any State or local government, any foreign government, [or] any Indian [T]ribe."[74] Regarding the trustees who performed the duty of natural resource damage assessment, they refer to the President, or authorized representative of any State who act on behalf of the public as "trustee" to recover damages as accordance with CERCLA.[75] The President has a right to declare regulations dealing with damage assessment for natural resource.

Measurement of Damages is indicated under Section 107(f)(1). This section states that it shall "not be limited by the sums which can be used to restore or replace" the subject's natural resources.[76] Natural Resource Damage Assessment is under Section 301(c). "Standard procedures for simplified assessments requiring minimal field observation" is specified in this section. The "simplified assessments" refer to the methods of establishing measures of damages, based on units of discharge or release in affected areas. Furthermore, the replacement value and the ability to form the ecosystem back in normal condition also be considered as factors for assessment.[77]

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[72] Agency for Toxic Substances and Disease Registry, "*ATSDR Background and Congressional Mandates*", http://www.atsdr.cdc.gov/about/congress.html (accessed on December 4, 2014)

[73] FUSRAP Public Information Center, *"Fact Sheet CERCLA/Superfund*", http://fusrapmaywood.com/factsheet/cercla.html (accessed on December 1, 2014)

[74] CERCLA §101 (16)

[75] CERCLA §107(f)(1)

[76] CERCLA §107(f)(1)

[77] Environmental Protection Agency, "*NRD Related Statutory Information*" http://www.epa.gov/superfund/programs/nrd/statute.htm#301%28c%29 (accessed on December 14, 2014)

Previously, the court applied the 'lesser-of rule' in CERCLA cases. Under the rule, the court will determine both the lost market value of natural resources and the cost of restoration. The court will award compensation that is lower or lesser. Now, the court has avoided to apply the 'lesser-of rule' for CERCLA cases due to the fact that the lost market value of natural resources is insufficient for restoration. It is mostly lower than the cost of restoration. [78]

**Problems of CERCLA**

CERCLA is not a paradigm of clarity or precision. It has been criticized frequently for unskillful drafting and numerous ambiguities attributable to its precipitous passage. [79]

**3.1.2.2 The Superfund Amendments and Reauthorization Act (SARA)**

On October 17, 1986, there was an amendment of CERCLA by the Superfund Amendments and Reauthorization Act (SARA) to revise CERCLA's provisions which expedite clean-up procedure, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) which includes the specific steps for clean-up activities, the Community Right-to-Know Act and the taxing authority.[80]

**3.1.2.3 The Oil Pollution Act of 1990 (OPA)**

The Oil Pollution Act (OPA) of 1990 was passed after the Exxon Valdez case in Alaska to provide a system of financial responsibility laws, compulsory liability

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[78] Edward H.P. Brans, *supra* note 38 at 60

[79] Shelby D. Green, "*Understanding CERCLA Through Webster's New World Dictionary and State Common Law: Forestalling the Federalization of Property Law*", http://digitalcommons.pace.edu/lawfaculty/742/ (accessed on January 10, 2015)

[80] Department of Environmental Quality, "*SARA Title III, SARA Title III: The Emergency Planning and Community Right-to-Know Act (EPCRA)",* http://michigan.gov/deq/0,4561,7-135-3307_29815_4137---,00.html (accessed on January 10, 2015)

insurance and compensation to natural resource damage. Therefore, this law is also considered as "financial responsibility laws".[81] This law shifted the cost of oil pollution to the polluter's shoulder as demonstrated "polluter pays principle" theory.

Following The Oil Pollution Act (OPA) 1990, Section 1002(a) requires the responsible party or polluter pay for:

(1) Damages specified in subsection (b) that result from the discharged oil. Subsection (b) refers to "any removal costs incurred by any person for acts taken by the person which are consistent with the National Contingency Plan and **damages regarding Natural Resources**, Real or Personal Property[82], Subsistence Use[83], Revenues[84], Profits and earning capacity[85] and public services.[86]"

The term of "Damages to Natural Resources" concludes as follows;

**Damages for injury to, destruction of, loss of, or loss of use of natural resources.**

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[81] Rawle O. King, "*Deepwater Horizon Oil Spill Disaster: Risk, Recovery, and Insurance Implications*", http://www.cnie.org/NLE/CRSreports/10Aug/R41320.pdf (accessed on January 10, 2015)

[82] "Damages for injury to, or economic losses resulting from destruction of, real or personal property, which shall be recoverable by a claimant who owns or leases that property."

[83] "Damages for loss of subsistence use of natural resources, which shall be recoverable by any claimant who so uses natural resources which have been injured, destroyed, or lost, without regard to the ownership or management of the resources."

[84] "Damages equal to the net loss of taxes, royalties, rents, fees, or net profit shares due to the injury, destruction, or loss of real property, personal property, or natural resources, which shall be recoverable by the Government of the United States, a State, or a political subdivision thereof"

[85] "Damages equal to the loss of profits or impairment of earning capacity due to the injury, destruction, or loss of real property, personal property, or natural resources, which shall be recoverable by any claimant."

[86] "Damages for net costs of providing increased or additional public services during or after removal activities, including protection from fire, safety, or health hazards, caused by a discharge of oil, which shall be recoverable by a State, or a political subdivision of a State."

The reasonable costs of assessing the damage.[87] Apart from injury to natural resource, the responsible party can be held liable for the reasonable cost of assessing the damage to natural resource.

(2) Removal costs incurred. [88]

Definition of "Removal costs" is "(…)the costs of removal that are incurred after a discharge of oil has occurred or, in any case in which there is a substantial threat of a discharge of oil, the costs to prevent, minimize, or mitigate oil pollution from such an accident (…)"[89]

In conclude, a responsible party is liable for all legitimate costs incurred from oil spill for both private party and government entity. Not only clean-up cost can be requested under OPA, but also these following losses;

Injury to natural resources;

Loss of personal property;

Economic Loss;

Loss of subsistence use of natural resources;

Loss of revenues derived from destroy of property or natural resource injury;

Loss of profits derived from loss of property or natural resource injury;

Costs of providing extra public services during or after oil spill response.[90]

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[87] 33 U.S.C. §2702(b)(2), SEC. 1002 (b)(2)," Damages for injury to, destruction of, loss of, or loss of use of, natural resources, including the reasonable costs of assessing the damage, which shall be recoverable by a United States trustee, a State trustee, an Indian tribe trustee, or a foreign trustee."

[88] 33 U.S.C. §2702(a), SEC. 1002. (a) "IN GENERAL.,Notwithstanding any other provision or rule of law, and subject to the provisions of this Act, each responsible party for a vessel or a facility from which oil is discharged, or which poses the substantial threat of a discharge of oil, into or upon the navigable waters or adjoining shorelines or the exclusive economic zone **is liable for the removal costs and damages specified in subsection (b) that result from such incident.**"

[89] 33 U.S.C. §2701(31), SEC. 1001 (31)

[90] Jonathan L. Ramseur, **Oil Spills in U. S. Coastal Waters: Background, Governance, and Issues for congress***,* at 12

**Natural Resource Damage Assessment under OPA**

The Oil Pollution Act (OPA) provides scope of work for trustees who assess and perform the essential duty of assessing the damages to affected natural resources and imposing the parties to be responsible for restoration.[91] Other than the removal costs, "the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of, the damaged natural resources" can be recovered under the OPA.[92] The reasonable cost of assessing the damage can also be obtained by the trustee for damage to natural resources.[93] Under the OPA, natural resource damages are recovered by trustees of the United States, state trustees, Indian tribe trustees, or any foreign trustees.[94]

Section 2704 provides details of limits on liability. Nevertheless, this limit will not be applied in case of the damage was resulted from gross negligence or willful misconduct of, or the violation of an applicable federal safety, construction, or operating regulation by, the responsible party, an agent or employee of the responsible party, or a person acting pursuant to a contractual relationship with the responsible party (except where the sole contractual arrangement arises in connection with carriage by a common carrier by rail).[95] The limits on liability are varies depending on the type and size of the vessel and facility.

Trustees under the OPA can cover many types of trustees: representatives of federal, state, and local government due to jurisdictions.[96] Therefore,

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[91] Kristina Alexander, Congressional Research Service, "*The 2010 Oil Spill: Natural Resource Damage Assessment Under the Oil Pollution Act* "
[92] 33 U.S.C. §2706(d), SEC. 1006 (d)
[93] Michael Faure, Albert Verheij, "*Shifts in Compensation for Environmental Damage"*, **Tort and Insurance Law**, Volume 21, at 173
[94] 33 U.S.C. §2701(20), SEC. 1001 (20)
[95] 33 U.S.C. §2704 ( C) (1) , SEC. 1004 ( C) (1)
[96] 33 U.S.C. §2706(a). OPA §1006 (a)

officials from each trustee can work cooperatively with the other trustees to evaluate of injuries to natural resources.

Section 1006(e)(2) of the OPA lays down the rule of Rebuttable Presumption and Judicial Review that any determination and assessment of damages shall have "the force and effect of a rebuttable presumption" in any administrative or judicial proceeding.[97] Therefore, under rebuttable presumption's rule, after the trustees who act on behalf of the Public provide the result of damages as evaluated by the trustees, the responsible parties can present alternative evidence or information in order to show that the damages as presented by the trustees are not considered appropriate or reasonable.[98] The public must be recovered for the loss of natural resource, starting from the time of injury until full recovery.[99]

Under the rule, the NRDA process is divided into these phases:


**Figure 3.1: Phases under NRDA process**

The OPA prevents double recovery of damages by providing that "There shall be no double recovery under this Act for natural resource damages, including with respect to the costs of damage assessment or restoration, rehabilitation,

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[97] "(2) REBUTTABLE PRESUMPTION .,.Any determination or assessment of damages to natural resources for the purposes of this Act made under subsection (d) by a Federal, State, or Indian trustee in accordance with the regulations promulgated under paragraph (1) shall have the force and effect of a rebuttable presumption on behalf of the trustee in any administrative or judicial proceeding under this Act."

[98] 61 Fed. Reg. at 440, 443 (1996) (codified at 15 C.F.R. pt. 990).

[99] 61 Fed. Reg. at 484 (1996)

replacement, or acquisition for the same incident and natural resource."[100] It means that in case more than one trustee is involved, they have to cooperate with each other to seek damages for the injury to natural resources. There also will be the designation of the lead trustee. [101]

Trustees may submit the claim to the U.S. Coast Guard National Pollution Funds Center (NPFC) when the responsible party denied to take necessary steps or when there is no responsible party. NPFC will investigate if there is the causal link between the accident and injury to the natural resources and if the assessment and restoration plan are sufficient.[102] The trustees can choose what method should be applied and deemed appropriate for damage assessment.[103]

The main comparison is that like the CERCLA, the OPA guarantee the right of states to perform the duty as trustees in order to protect, preserve trust natural resource and to recover damages for injury to natural resources.[104]

#### 3.1.2.4 The Clean Water Act (CWA)

Similar to the CERCLA and the OPA, The Clean Water Act empowers trustees to perform duty of natural resource damage assessment. This Act is the general Federal law concerning with water pollution control in the United States**.** It can be categorized into these following major parts;

First Part is concerned with provision to authorize federal financial assistance for municipal sewage treatment plant construction.

Second Part is the regulatory requirements that apply to industrial and municipal dischargers.[105]

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[100] 33 U.S.C. §2706 (d) (3); OPA §1006 (d) (3)
[101] 61 Fed. Reg. 443 (1996). Cf.33. CFR136.207
[102] Edward H.P. Brans, *supra* note 38 at 50
[103] *Id.*
[104] CERCLA 42 U.S.C. §9607(f); OPA 33 U.S.C. §2702 (b)
[105] Claudia Copeland, "*Clean Water Act: A summary of the Law*", at 2

The term "discharge" used in Section 110.11 of the Clean Water Act as including but not being limited to any spilling, pumping, pouring, leaking, emitting, emptying, or dumping into the marine environment.[106] The act also proposes "best available technology" to be required and used for controlling toxic substance in industry.

The Environmental Protection Agency (EPA) and Coast Guard are empowered to assess administrative penalties. It also authorizes Department of Justice to act on behalf of EPA and Coast Guard to sue polluter. Section 311 of Clean Water Act deals with Oil and Hazardous Substances Liability and lay down administrative penalties based upon the number of barrels of oil released. [107] Section 311(b)(7) of the Clean Water Act provides for civil penalties for unpermitted discharges of oil of up to $37,500 per day of violation or up to $1,100 per barrel of oil discharged.[108] If the owner, operator, any person in charge of a vessel or offshore facility are considered to had willful misconduct or grossly negligent, the limit of $4,300 will apply. Therefore, under the Clean Water Act, a polluter has to liable from $1,100 to $4,300 per barrel of spilled oil.[109]

Damages under the CWA, it includes clean-up costs and the cost of restoring or replacing natural resources. No definition of the term "natural resources" has been provided.[110]

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[106] United States Environmental Protection Agency, Section B. Clean Water Act Requirements, http://www.epa.gov/dfe/pubs/pwb/tech_rep/fedregs/regsectb.htm,accessed on January 10, 2015

[107] Section 311 of CWA "(A) Violations. Any owner, operator, or person in charge of any vessel, onshore facility, or offshore facility--

(i) from which oil or a hazardous substance is discharged in violation of paragraph (3), or

(ii) who fails or refuses to comply with any regulation issued under subsection (j) to which that owner, operator, or person in charge is subject, may be assessed a class I or class II civil penalty by the Secretary of the department in which the Coast Guard is operating or the Administrator."

[108] 33 U.S.C. § 1321(b)(7)(A); 40 C.F.R. § 19.4.

[109] Kevin McGill, huffingtonpost, "*US court reaffirms BP is liable in Gulf oil spill*", http://www.huffingtonpost.com/2014/11/06/bp-liable-gulf-spill_n_6115430.html , June 11, 2014. (accessed on January 10, 2015)

[110] Michael & Albert, *supra* note 94 at 164

### 3.1.2.5 State models

Even though the U.S.A. provides the rules for the damage assessment, each state can implement their own rules and regulations for damage assessment. Samples are as follows:

**Washington**

Washington has released the Washington's compensation schedule under the Washington Administrative Code (WAC) as a method for natural resource damage assessment.

"Compensation schedule" is defined as "the set of procedures enumerated in WAC 173-183-300 through 173-183-870 to determine the public resource damages resulting from an oil spill for cases in which damages are not quantifiable at a reasonable cost."[111]

The schedule is used after a formal pre-assessment investigation and when the restoration of the injury to natural resource is not feasible or in case the damages are not considered as "a reasonable cost". The schedule provides a dollar-per-gallon damage.

Trustee shall adopt rules establishing a compensation schedule for the discharge of oil as accordance with the Revised Code of Washington (RCW). The amount of compensation assessed under this schedule generally considers many factors, such as the volume and type of the oil spillage, the severity of the effects, characteristics of the oil spilled, and the sensitivity of the affected area, including the location of the spill, habitat and living resource sensitivity, recreational use area and the proximity of the spill to important habitats for birds, aquatic mammals, fish, or to species listed as threatened or endangered species.[112]

This schedule has been used to apply in more than 100 cases. The sample of the case is the Norsac Forest Oil Spill, which applied the schedule for damage

[111] WAC 173-183-100
[112] RCW 90.48.366(1)(2)

assessment. The total of USD 122,696 or USD 19.60 per gallon is derived from the compensation schedule.[113]

**Florida**

Florida also enacted their own compensation schedule which is used for assessment of damage caused by small discharges, that is to say 25 to 30,000 gallons. For the lesser spill, they will use a fixed amount of USD25. [114] Section 376.121 of the 2015 Florida Statutes lays down the rule about the Florida Compensation schedule that in order to "avoid unnecessary speculation and expenditure of limited resources to determine these values, the Legislature hereby establishes **a schedule for compensation** for damage to the state's natural resources and the quality of said resources."[115]

This compensation schedule using for small discharges is not the final answer for the damage assessment for injury to natural resources. The department may use other methods of calculating natural resources damages in accordance with federal rules implementing the Oil Pollution Act of 1990, as amended.[116]

### 3.1.3 Importance of Natural Resource Damage Assessment

Natural Resource Damage Assessment and Recovery (NRDA) is empowered by these following Acts due to the different nature of contamination;

The Comprehensive Environmental Response,Compensation, and Liability Act (CERCLA);[117]

The Clean Water Act (CWA);[118]

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[113] Edward H.P. Brans, *supra* note 38 at 169
[114] *Id.* at 170
[115] FLA STAT § 376.121
[116] *Id.*
[117] 42 U.S.C. § 9607(a)(4)(C).
[118] 33 U.S.C. § 1321(f)(5).

The Oil Pollution Act of 1990 (OPA);[119]
The National Marine Sanctuaries Act;[120]
The Park System Resources Protection Act.[121]

NRDA does not directly assist individuals affected by an oil spill and does not provide for punitive damages. [122] Trustees under NRDA conspires a recovery plan that require liable parties to pay for. The Trustees can file a case against the liable party under NRDA for damages.

### 3.1.4 Interesting Cases Regarding Natural Resource Damage Assessment in the U.S.A.

#### 3.1.4.1 Ohio v. Department of Interior

This case is concerning with the sought review of Department of the Interior regulations regarding the recovery of money from liable party for spills of oil or hazardous substances that cause damage to natural resources.

The Department of Interior was instructed by the D.C. Court of Appeals to give equal weight when assessing natural resource damages between the use and the non-use value. The contingent valuation method is stated in Ohio case as an acceptable method for calculating the option values and the existence values.[123]

The court addressed this issue by suggesting that the U.S. Department of Interior (DOI) must not limit to use only the market price method, but the court should apply "all reliably calculated the use values".[124]

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[119] 33 U.S.C. § 2702(b)(2)(A).
[120] 16 U.S.C. § 1436.
[121] 16 U.S.C. § 19jj-1.
[122] Kristina Alexander, *supra* note 92
[123] State of Ohio v. U.S. Department of Interior,880 F.2d 432, 464 (1989)
[124] Michael & Alan, *supra* note 56 at 220

The contingent valuation method is a valuation method that apply the result of survey to evaluate the potential and to value natural resources. According to this case, the contingent valuation method is recognized as "reliable method" and should be selected as it is the most basic method to evaluate non-use value of national resources. [125]

According to the case Ohio v. U.S. Department of Interior (880 F.2d 432 D.C. Cir., 1989)[126], the court did not apply the DOI's method regarding the damage assessment and avoid traditional economic measure (market prices).

The Department of the Interior issued regulation regarding natural damage assessment under Section 301 (c) of CERCLA in 1988, but this section is revoked based on the reason that "certain aspects of the rules favored limiting recovery to the lost use values". The market value is included as well. [127]

The National Oceanic and Atmospheric Administration (NOAA) issued recommendation or guideline on damage assessment under Oil Pollution Act in 1992. NOAA suggested a substantial advantage of "Contingent Valuation" as "it can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including the lost passive-use values". [128]

### 3.1.4.2 Exxon Valdez

Exxon Valdez, the oil tanker collided with Bligh Reef and spilled more than 11 million gallons of crude oil into Prince William Sound, Alaska in March 24,

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[125] Winai Ruangsri, "*Environmental Value Assessment: Experience from the U.S. Court, Material for Academics seminars on new approaches for development in environmental justice*", Rabibhadanasak Research Institute and Judicial Training Institute, Office of the Judiciary, 2009

[126] State of Ohio v. U.S. Department of Interior,880 F.2d 432, 464 (1989)

[127] Michael & Alan, *supra* note 56 at 220

[128] John Martin Gillroy, Joe Bowersox, **The Moral Austerity of Environmental Decision Making: Sustainability, Democracy and Normative argument in policy and law** (n.p.: Duke University Press Books, 2002) 166

1989.[129] The oil affected more than 1,300 miles of Alaska and destroyed coastal ecosystem.[130] Case was filed by affected people who were injured including fishermen. The U.S. District Court decided that Exxon must responsible for $507.5 million and award of punitive damages of $5 billion. Later, the Ninth Circuit stated that punitive award was too excessive and reduced to $2.5 billion.[131] Punitive Damage was void according to The Supreme court, since the court pointed out that the award was too high and unreasonable since there is no evidence of Exxon's misconduct or evil action. It was too excessive when compared with the compensatory damages awarded by the jury (approximately $507.5 million). It should not above the amount of compensatory damages.[132]

"Contingent Valuation method" was proposed by the plaintiff in the court and the court also agreed to use it to valuate environmental damage in term of the non-use values. Therefore, Exxon Valdez's case applied monetary approach, validity of the non-use value of natural resources and Contingent Valuation method. [133] In this case, the surveys were produced to determine what people would like to pay to prevent the loss in services by the Exxon Valdez. Approximately 1,000 people took the surveys. The result of the median willing to pay was USD31. The lost passive use value of USD 2.8 billion was derived from the multiplying the willing to pay by the number household in the U.S.[134] However, this result has not used for the settlement agreement.

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[129] Sarah Graham,"*Environmental Effects of Exxon Valdez Spill Still Being Felt*", (2003), http://www.scientificamerican.com/article/environmental-effects-of/ (accessed on October 13, 2015)
[130] Exxon Valdez, No A89-0095-CV (Consolidated), 1996 U.S. Dist. LEXIS 8173 (D. Alaska June 11, 1996)
[131] *Id.*
[132] Venulex Legal Summaries 2008 Q3, Special section at 1, "*Supreme Court Vacates $2.5 billion Punitive damages award against Exxon*"
[133] Dale B. Thompson, "*Valuing the Environment: Courts' Struggles with Natural Resources Damages*", University of St. Thomas, Vol.32, No. 1(2002), at 58
[134] Edward H.P. Brans, *supra* note 38 at 160

### 3.1.4.3 Deepwater Horizon oil spill (BP's Oil Spill)

This is the biggest environmental case in U.S. history and one of the largest oil spillage. On April 20, 2010, there was an explosion at BP Deepwater Horizon drilling rig located at 40 miles away from the Louisiana coast. The British oil company (BP) had spread 4.9 millions of barrels of oil into the Gulf, killed 11 workers and injured 17 workers.[135] Leaked oil also damaged marine life and shores around there.

The reasonable remedies and levels of impact and was allowed to be determined under The Natural Resources Damage Assessment (NRDA) by trustees of affected states and the federal government.[136] A federal appeals court panel has decided that BP was liable for Federal Clean Water Act damages stemming from the 2010 Gulf of Mexico oil spill, the latest loss for the oil giant as it fights court decisions that could ultimately bring $18 billion in penalties. Many researchers suggested that lost direct and passive use values can be calculated by using the contingent valuation method.[137]

The $20 billion escrow fund also paid by BP is served for individual losses of business owners, losses of subsistence use of natural resources, losses of opportunities to fish and to indemnify the workers as a result of the BP oil spill.[138] There is a $75 million cap on how much oil companies could be required to pay for economic damages resulting from oil spills as provided by federal law. The escrow fund or government backgrounder does not have a liability cap.

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[135] The ocean portal team, Smithsonian National Museum of History, "*Gulf Oil Spill*", http://ocean.si.edu/gulf-oil-spill (accessed on October 13, 2014)
[136] Kristina Alexander, *supra* note 92
[137] Sherry Larkin, **Association of Environmental and Resource Economists (AERE) Newsletter** Vol. 36, No. 1 May 2016, "*The Deepwater Horizon Oil Spill: Overview of Process and Economic Loss Research for the State of Florida*", http://www.aere.org/newsletters/documents/AERE%20Newsletter%20May%202016%20%20FINAL.pdf (accessed on October 13, 2014)
[138] Sarah Miley, University of Pittsburgh School of Law, "*BP to set aside $20 billion in escrow to pay oil spill damage claims",* http://jurist.org/paperchase/2010/06/bp-to-set-aside-20-million-in-escrow-to-pay-oil-spill-damage-claims.php (accessed on October 13, 2014)

The cap of compensation fund system under the OPA, compensation for Natural Resource Damages included, is considered to be insufficient in big oil spill incident like Deepwater Horizon oil spill. Fund for restoration project of Gulf environmental damage is received from the civil penalties of $1 billion from unpermitted discharges of oil under the Clean Water Act.[139]

### 3.1.4.4 United States of America v. Melvin A. Fisher

In 1992, there is a treasure hunt diving in Florida Keys National Marine Sanctuary. The defendants were alleged of illegally destroyed seagrasses approximately 1.63 acres. [140] Habitat Equivalency Analysis (HEA) was used in this case. NOAA which is a trustee obtained an award totaling USD 351,648 for the cost of assessment and response process to sanctuary resources[141] and of USD 26,533 in interest as entitled to recover. [142] The court has an opinion that this method is considered the most appropriate technique and not expensive.

Monetary compensation is awarded by a court to start restoration project specifically in the seagrass habitat. For injuries to seagrass resources, NOAA has used the off-site restoration by using same species of seagrass for scaling compensatory restoration project. The purpose of HEA is that the environment can be repaired through the restoration project that offers the natural resource of the comparable value (same kind and quality).

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[139] United States Environmental Protection Agency, "*Summary of Criminal Prosecutions*",http://cfpub.epa.gov/compliance/criminal_prosecution/index.cfm?action=3&prosecution_summary_id=246 (accessed on October 13, 2014)

[140] United States v. Melvin A. Fisher, Kane Fisher, Salvors, Inc., a Florida Corporation, in Personal, M/v Bookmaker, M/v Tropical Magic, Their Engines, Apparel, Tackle, Appurtenances, Stores and Cargo, in Rem, M/v Dauntless Court of Appeals for the Eleventh Circuit, Case No. 92-4799 docket://gov.uscourts.ca11.92-4799 (accessed on October 13, 2014)

[141] B. Ornitz†,M. Champ, **"***Oil Spills First Principles: Prevention and Best Response, 2002*" (n.p.: Elsevier Science, 2002) 217

[142] 16 U.S.C. § 1443(A)(1)(B) "INTEREST ON THAT AMOUNT CALCULATED IN THE MANNER DESCRIBED UNDER SECTION 2705 OF TITLE 33"

HEA always has been applied for the case of seagrass injuries if meet the three requirement by NOAA;

1) The primary category of lost on-site services needs to concern with the biological function.

2) It is possible to create restoration projects that provide services of the same condition and are comparable in value to those lost.

3) Enough information on the required HEA input parameters exist or possible to collect such information.[143]

### 3.1.4.5 The American Trader

The American Trader, the oil tanker spilled 416,598 gallons of oil into the Pacific ocean near California, covered many beaches. This case is interesting that the State of California team (SOC) claimed for these following losses:

Clean-up costs;

Loss of marine wildlife;

Loss recreational value from the closure of several beaches. Surfing and general beach recreations were included in this loss. The SOC team has to calculate the number of beach visits that had been affected and a lost beach day. To clarify, they compared between "the number of beach visitors that would visit the beach at the time of oil spill and after the beach closure's period" and "the number of actual visitors to the beach at the time of oil spill and after the beach closure's period." [144] Problem for calculation is that the potential beach travelers will travel in other beaches.

Due to the fact that there is no record of resources and times for valuation, the SOC used "a benefit transfer approach". This approach has been mentioned in chapter 2 that this method is used by estimating the monetary values in previous studies to apply and assess the value of an effect in new place in another similar situation.

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[143] Martin Richard Perrow, A.J. Davy, **Handbook of Ecological Restoration: Restoration in practice**, Volume 2l, at 154

[144] Michael & Alan, *supra* note 56 at 33

In this case, The SOC team has applied a value-per-beach-study conducted by Bell and Leeworthy of beach visitors in Florida. This study provided that a value per beach trip is approximately $13.9 which the inflation was included[145]. The loss of the recreation values is $10,188,500 which the lost leisure fishing and whale watching were included.[146]

Finally, the SOC team has proposed with the figure of $14,500,000 million to the court. Attransco's economists or the Trader's owner team argued that the estimate of the damages was too high, it should be approximately $607,200. In this case, no claim was submitted for the loss of the non-use value.

In December 1997, the final judgment of damages by jury is approximately $12.7 million in lost recreational values (the loss of use of public beaches and other public resources), plus $5.3 million in civil liability and $4.37 million in all relevant costs.[147] We can see that the problem of the lack of predictability for the methods to be used in damage assessment case still exists among economists. Different method of calculation leads to different result.

#### 3.1.4.6 The 1996 North Cape Oil Spill

This case is about the recovery of lost ecological services because the spill killed lobsters, clams, fishes, mussels and seabirds. It also affected the beach-nesting habitat of birds and the marine environment. The trustee estimated the overall cost of the restocking program at USD 9.9 million. The trustees applied the benefit transfer method to evaluate the value of boat angler trip. [148] This assessment was based on the study in the same or comparable environment from the boat owners that were used for the same purpose. [149] Finally, the agreement was settled in December 1999. The responsible party agreed to restock lobsters at the same cost as estimated by the

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[145] Bell and Leeworthy, "*Recreational Demand by Tourists for Saltwater Beachdays*" (1990) **Journal of Environmental Economics and Management**, 18 (3), at 189-205
[146] Michael & Alan, *supra* note 56 at 34
[147] *Id.* at 35
[148] Edward H.P. Brans, *supra* note 38 at 91
[149] *Id.* at 151

trustee, to finance the fund regarding restoration project. This settlement agreement was approved by the U.S. District Court for Rhode Island.

### 3.1.5. Analyze of each method used in the U.S.A.

In the U.S.A., there are several federal statutes that empower public authorities to perform the duty as "trustees". Trustees have empowered by the principles of the common law public trust and *Parens Patriae doctrines*.[150] Public Trust doctrine provides the right for trustees to protect and preserve the trust or environmental resources. It also includes the recovery of compensation in the case of injury to trust resources in tort.[151] *Parens Patriae doctrines* authorize a state to represent citizen's individual's right and to sue as *Parens Patriae* on behalf of its citizen. [152]Trustees have revealed that these methods as indicated under table below were used to consider the damage assessment by various agents.

| | Number of cases in which method was used by: | | | |
|---|---|---|---|---|
| | Reporting trustee | Another trustee | Consultant to trustees | At least one trustee or consultant |
| Own valuation tool, other | 27 | 3 | 1 | 29 |
| Benefit transfer | 5 | 3 | 2 | 9 |
| Appraisal method, market price analysis | 5 | 0 | 6 | 11 |
| Travel cost, averting behavior analysis | 3 | 1 | 6 | 13 |
| Contingent valuation | 1 | 0 | 4 | 5 |
| Habitat equivalency analysis | 8 | 10 | 3 | 15 |
| Type A model; NOAA formula; factor income, hedonic, or conjoint analysis | 0 | 0 | 0 | 0 |

**Table 3.1: NRDA Methods Used by Different Agents**

**(Source: http://www.ecy.wa.gov/programs/wr/hq/pdf/nrdamc_ando.pdf)**

According to the previous table, it shows that assessment methods are varies and not strict in practice in The U.S.A. Trustees can also use own valuation tool for

[150] Edward H.P. Brans, *supra* note 38 at 50
[151] The Restatement (Second) of Trusts, S 177.cmt. a (1959)
[152] Edward H.P. Brans, *supra* note 38 at 55

their reports or conduct some studies by themselves. [153] "Own valuation tool" has been explained as "any formal damage-assessment tool", for example, a lookup table or decision tree (graphical representations of alternative choices for business to make decision).[154] Trustees use Habitat equivalency analysis as frequent method aside from own valuation tool method.

| | Number of cases in which method was used and the following resource was among those injured: | | | | | |
|---|---|---|---|---|---|---|
| | Ground water | Surface water | Wetland | Air, other | Fish, wildlife | Recreation, cultural |
| Own valuation tool, other | 18 | 16 | 8 | 6 | 13 | 2 |
| Benefit transfer | 4 | 8 | 4 | 3 | 6 | 5 |
| Appraisal method, market price analysis | 5 | 7 | 2 | 5 | 4 | 2 |
| Travel cost, averting behavior analysis | 5 | 7 | 5 | 6 | 6 | 5 |
| Contingent valuation | 5 | 5 | 3 | 3 | 3 | 2 |
| Habitat equivalency analysis | 7 | 11 | 8 | 6 | 11 | 3 |

**Table 3.2: NRDA Methods Used for Varied Types of Injured Resources (Source: http://www.ecy.wa.gov/programs/wr/hq/pdf/nrdamc_ando.pdf)**

This above table provides that varied NRDA methods are applied for damage assessment. In almost types of natural resources as indicated above, Own valuation tools is the most popular methods among trustees which perform the duty of damage assessment excluding in term of the recreational and cultural resource.

[153] Amy W. Ando, Madhu Khanna, Amy Wildermuth, Suzanne Vig, "*Natural Resource Damage Assessment: Methods and Cases*", **WMRC Report**, Waste management and Research Center, A Division of the Illinois Department of Natural Resources, July 2004

[154] Business case studies LLP, "*Decision tree analysis"*, http://businesscasestudies.co.uk/business-theory/strategy/decision-tree-analysis.html#ixzz3bvxHjQql (accessed on July 4, 2014)

The Latter is Habitat equivalency analysis. This method has been used in many cases since it is considered as a usual way to quantify "Replacement services provided equals the quantity of lost services". [155]

## 3.2 Natural Resource Damage Assessment in Europe

### White Paper (EC, 2000)

The European Commission has issued its white paper on Environmental Liability and the recovery of damages for injury to public natural resources in February, 2000.[156] The difficulty to assess or quantify environmental damage has occurred in many countries in Europe due to the application of the guidelines on economic valuation of environmental damage into national level. [157] The European Commission has adopted the study of Environmental Liability called "The White Paper". The White Paper concluded that there should be the community framework directive to deal with the Environmental Liability. Primary goal of the White Paper is to restore damage for Natura 2000 sites. The Environment Council has held the meeting on March 30, 2000, where environment ministers also support the framework.

**The main content of the White paper contains these following aspects;**

(1) The "Polluter pays" principle; polluter is the liability party for the damage reparation.

(2) Damage to be covered; these following damage have been categorized under the White Paper.

a) Environmental damage, which can be further divided into:

aa) Damage to biodiversity, and

ab) Damage in the form of contamination of sites.

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[155] Amy W. Ando et al., *supra* note 154

[156] Michael & Alan, *supra* note 56 at 323

[157] OECD, *supra* note 27

b) Traditional damage, which includes damage to health and property damage. Under the White paper, Environmental damage should be compensated as well as traditional damage (damage to health and property).

Two types of environmental damage are meant to be covered, namely contamination of sites and damage to biodiversity. [158]

**Methods for damage assessment**

The Environment Council has an idea that "the restoration costs" should be applied for calculation if the damage may possibly restore or for cases that the environment is feasible to restore.[159] The White Paper therefore chose "the restoration costs" as the preferred method for damage assessment.

The paper also points out the importance of the "valuation criteria for the damaged natural resource". [160] The polluter must also have to compensate for the value of the damaged natural resources and the cost associated with assessing the damage.[161] The weak point of this method is that it cannot be applied for irreparable damage. For cases where damages are irreparable, the white paper suggests to use "Economic valuation of biodiversity damage".

The White Paper's goal is to return the affected natural resources to its baseline condition, or to its original condition prior to the damage.[162] Therefore, previous record of data and reference data will be applied to determine.

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[158] European Commission, "*Study on Valuation and Restoration of Biodiversity Damage For the Purpose of Environmental Liability*", COM(2000) 66 final, 9 February 2000, http://ec.europa.eu/environment/legal/liability/pdf/biodiversity.pdf, (accessed on February 2, 2016)

[159] European Commission, "*White Paper on environmental liability*", http://ec.europa.eu/environment/legal/liability/pdf/el_full.p , at 19

[160] *Id.*

[161] White Paper, para 4.5.1.

[162] Michael & Alan, *supra* note 56 at 328

Under the White Paper, there should be a minimum standard for applying the regime. People can claim for damages under this EC system only for "**significant damage"**, necessary elements of "significant damage" [163] are as follows;

(1) The damage covered by the system would show a long term reduction in species on the site.

(2) The damage would affect the diversity of species or the risk of reduction of species within the site.

(3) The damage would reduce the habitat of species.

(4) The damage would make the difference in the specific structure, functions or the balance of habitats which cause unsustainable ecosystem and has effect to species in that area.

When the restoration is unfeasible, the cost of alternative solutions will be applied as method to assess damages. Samples of the cost of alternation solution are as follows: the cost of the purchase of land to be re-created as a habitat which replaces the affected site (a habitat with functions comparable to those of the original site).

The disadvantage of the EC White Paper is that it is not clear in some point, for example, there is no provision about the monitoring cost for the restoration action, even though this cost is substantial[164] and the necessary elements above are not in detail the White Paper does not state about the clear damage assessment process. The White Paper does not give details as to what conditions or when the method is to be used.[165]

**Environmental Liability Directive**

Apart from the White Paper, EU proposed the Environmental Liability Directive concerning with the issue of the Prevention and Remedying of Environmental

[163] White Paper, para 3.6.1 – 3.6.2
[164] Michael & Alan, *supra* note 56 at 323
[165] Edward H.P. Brans, *supra* note 38 at 207

Damage in 2004 in order to lay down the civil liability of the liable person for causing environmental damage. This Directive has proposed due to the gap national liability regimes in Europe.

The Environmental Liability Directive is applicable to the damages occurred to water (includes ground water, river and other surface water, and coastal water), land, protected species or habitats as defined under Article 2 of this Directive. [166] ANNEX II stipulates the remedying of environmental damage. **It states that "Remedying of environmental damage, in relation to water or protected species or natural habitats, is achieved through the restoration of the environment to its baseline condition by way of primary [167] , complementary [168] and compensatory remediation[169]"**.

Under this Directive, the "primary remediation" referred to the any remedial measures which contribute the damaged natural resources and/or impaired services back to baseline condition. The "baseline condition" is the condition before the incident occurred. [170] Damage under this Directive covers both physical and service (or functional) damage. The liable party will be held responsible for the reasonable cost of restoration. If restoration is considered as unable to perform, we will re-establish

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[166] "Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
*Official Journal L 143 , 30/04/2004 P. 0056 - 0075* , http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32004L0035

[167] *Id.*

[168] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 ANNEX II 1 (b) "Complementary remediation is any remedial measure taken in relation to natural resources and/or services to compensate for the fact that primary remediation does not result in fully restoring the damaged natural resources and/or services."

[169] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 ANNEX II 1 (c) "Compensatory remediation is any action taken to compensate for interim losses of natural resources and/or services that occur from the date of damage occurring until primary remediation has achieved its full effect"

[170] Lucas Bergkamp, Barbara Goldsmith, "**The EU Environmental Liability Directive: A Commentary**", Oxford University Press (2013)

elsewhere the same level of environment and habitat equivalent to the one affected or destroyed.[171]

In case “primary remediation” does not result in restoring natural resources to its baseline stage[172], “complementary remediation” will be undertaken.”. “The baseline” can be considered as the reference standard for environmental damage assessment. Additionally, “compensatory remediation” will be undertaken to compensate for the “interim losses”.[173]

"Costs" means costs which are justified by the need to ensure the proper and effective implementation of this directive including these following costs;

- the costs of assessing environmental damage,
- the costs of an imminent threat of such damage,
- the costs of alternatives for action as well as the administrative, legal, and enforcement costs,
- the costs of data collection and other general costs, monitoring and supervision costs.[174]

Details of Major oil spills in Europe (Global Cost estimates, amount of claimed and paid compensation)

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[171] Michael & Alan, *supra* note 56 at 336

[172] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 ANNEX II

[173] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 ANNEX II 1 (d) “interim losses means losses which result from the fact that the damaged natural resources and/or services are not able to perform their ecological functions or provide services to other natural resources or to the public until the primary or complementary measures have taken effect. It does not consist of financial compensation to members of the public.”

[174] Article 2(16) EU directive on environmental liability

| | Amoco Cadiz | Tanio | Aegean Sea Tanker | Braer | Sea Empress | Erika |
|---|---|---|---|---|---|---|
| **Estimated Cost of damages (Million British pounds)** | 430.6 - 494.2 | n.a | n.a | n.a | 68.1-129.3 | 526.2-611.0 |
| **Compensation claimed (Million British pounds)** | 469.9 | 110.7 | 233.1 | 154.4 | 56.0 | 83.2 |
| **Compensation paid (Million British pounds)** | 91.4 | 34.3 | 11.0 | 57.8 | 34.7 | 15.1 |
| **Quantity of oil spill (tons)** | 220,000 | 13,500 | 80,000 | 86,500 | 72,000 | 19,800 |
| **Contaminated Coastline(km)** | 350 | 200 | 100 | 40 $km^2$ | 150-200 | 400 |

**Table 3.3: Summary of major oil spills in Europe**
**(Source: http://otvm.uvigo.es/investigacion/informes/documentos/archivos/ Prestige_Hayetal.pdf )**

The above information in the table is derived from the available source or reports regarding the major oil spills. It shows that there is the obviously different between the estimated cost of damages and compensation paid to victims. The estimated cost of damages is regularly higher than the value of the claimed amount and the paid amount. Analysis of major oil spills took place in Europe are as follows;

**1.The Amoco Cadiz**

The Amoco Cadiz ran aground on March 16, 1978 near Northern Brittany coast in France. Due to the wreck after the severe weather, 220,000 tons of oil was leaked into the sea. More than 350 kilometers of coastline were contaminated and covered by oil spill. [175]

Two weeks following the oil spill, it was found that there are millions of the tolls of sea urchins, mollusks, oysters, fishes and deep-sea organisms. Almost 20,000 dead birds are killed since the oil covered their feathers. [176] In 1978, it was estimated to have caused US$250 million in damage to fisheries and tourist amenities. The French government presented claims totalling US$2 billion to United States courts.

At that time under the CLC regime, 77 million French Francs or approximately 20.4 million Pounds is a limit of the liability of the owner of the ship. [177] The victims of the case and French authorities filed a claim in Chicago, United States. The compensation claimed and paid are indicated in the previous table.

**2.The Tanio Spill**

Tanio broke in two off the coast of Brittany, France on March 7, 1980. Approximately 13,500 tons of oil was spilled into the sea, covering Breton coast. This coast was affected by the TORREY CANYON spill and the AMOCO CADIZ respectively. [178] The situation was getting worse due to the weather condition at the time of the accident. Around 1,700 birds were killed from the incident as well as oyster

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[175] Olivier Thebaud, Denis Bailly, Julien Hay, Jose Perez, "*The cost of oil pollution at sea: an analysis of the process of damage valuation and compensation following oil spills, 2005*", at 3

[176] Hazardous Materials Response and Assessment Division, Seattle, Washington NOAA, "*Oil Spill Case histories 1967-1991 Summaries of Significant U.S. and International spills, September 1992, Report No. HMRAD 92-11*" http://response.restoration.noaa.gov/sites/default/files/Oil_Spill_Case_Histories.pdf, (accessed on June 30, 2014)

[177] Consello da Cultura Galega. Sección de Ciencia, Técnica e Sociedade, "Economic, social and environmental effects of the Prestige oil spill", at 191

[178] ITOPF, "*TANIO, France, 1980*" http://www.itopf.com/in-action/case-studies/case-study/tanio-france-1980/, (accessed on June 30, 2014)

and other marine organisms. The claim filed by the French authorities is derived from the effect to marine environment, oil recovery and clean-up costs.

The IOPC Fund deals with oil spill case for the first time. According to the Conventions, the ship-owner's liability was limited to 11,8 million French Francs (2,5 million 2001 Pounds), and the IOPC Fund's intervention to 244,7 million French Francs (51,4 million 2001 Pounds). [179] The compensation claimed and paid are indicated in the table 3.3.

**3.The Aegean Sea Tanker Oil Spill**

The Aegean Sea ran aground off the port of La Coruna in Spain on December 3, 1992. Approximately 80,000 tons of oil was carried, of which an unknown amount was spilt. The oil tanker was burning and leaking most of the oil to the sea. It affected 100 kilometers of coastline in North-West Spain. It comprises of salmon farming, crab, shellfish and lobster businesses. Benthic organism and muddy sediments were affected by this major oil spill.[180]

The total claims of €289.6 million, were submitted before the criminal and civil courts. The case is reached by settlement agreement in October 2002, between the Spanish Government, the owner of the vessel, and the International Oil Pollution Compensation (IOPC) Funds for compensation in the result of €54 million. [181]

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[179] Olivier Thébaud, Denis Bailly, Julien Hay, José Pérez, *supra* note 176

[180] Dolors Pastor, Jaume Sanchez, Cinta Porte and Joan Albaiges, "*The Aregean Sea Oil Spill in the Galicia Coast (NW Spain). I. Distribution and Fate of the Crude Oil and Combustion Products in Subdital Sediments*", **Marine Pollution Bulletin** Vol.42, No.10, 2001, at 895 http://otvm.uvigo.es/investigacion/informes/documentos/archivos/aegean%20sea%20distribution.pdf/ (accessed on June 30, 2014)

[181] ITOPF, "*AEGEAN SEA, Spain, 1992*", http://www.itopf.com/in-action/case-studies/case-study/aegan-sea-spain-1992/ (accessed on June 30, 2014)

**4.The Braer**

The spilling of The Braer approximately 86,500 tons of oil happened on January 5, 1993 in the sea. [182] The spill contributed to the restriction of the catch of fish and shellfish along the affected coast. It is a serious problem since fishing and aquaculture industry is very important to this area. Fish farming had to stop an operation after the oil spill due to the appearance of oil slick in the seawater. It can be considered as an apparent effect from the oil spill. The enormous impact is that in the following months after the oil spill, it became more difficult to sell Shetland seafood at premium prices.[183] Shetland has been widely known as the perfect breeding place which provides high quality of seafood, especially salmons. Oil spill was sensitive to the environment around Shetland and the reputation of Shetland seafood.

**5.The Sea Empress**

The Sea Empress was going to deposit its oil cargo at the Texaco oil refinery. It ran aground and hit the rock on the February 15, 1996, at the entrance of the port Milford Haven, in the United Kingdom. Approximately 72,000 tons of oil spilt into the sea and surrounding coast. [184] Marine life, wildlife and birds who had lived near Pembrokeshire Coast National Park were affected from this incident. The effect of the spill has shown in the form of bird wings which were covered in the oil. [185] It also has effect to tourist and recreational area. Economic conservation/non-use costs for this spill is calculated by applying a replacement cost to numbers of observed strandings of each marine species. [186] Furthermore, this case further used "the benefit transfer method" to estimate the non-use value. This case applied three previous studies to

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[182] Olivier Thébaud, Denis Bailly, Julien Hay, José Pérez, *supra* note 176, at 3
[183] Science of The Total Environment Volume 186, Issues 1–2, 16 July 1996, Pages 127, "*Marine Mammals and The Marine Environment*", http://www.sciencedirect.com/science/article/pii/0048969796050917 (accessed on June 30, 2014)
[184] Olivier Thébaud, Denis Bailly, Julien Hay, José Pérez, *supra* note 176, at 4
[185] Swansea University, "*Sea Empress Oil Spill – Birds*", http://www.swansea.ac.uk/empress/birds/birds.htm/ (accessed on June 30, 2014)
[186] European Commission Directorate-General Environment, Final Report, MEP and EFTEC, "Study on the valuation and restoration of damage to natural resources for the purpose of environmental liability", B4-3040/2000/265781/MAR/B3, at 74

estimate and assess the non-use value in this current case. The compensation claimed and paid are indicated in the table 3.3.

**6. The Erika accidents**

Approximately 19,800 tons of oil was leaked into the sea according to the Erika's incident. The Erika ran aground in the Atlantic coast of Brittany in France, on the December 12, 1999. The above mentioned coast has covered by the oil at the end of the month of oil spill's incident.[187] It took around 9 years until the decision came out. On January 16, 2008, Total SA, Giuseppe Savarese (the shipowner), Antonio Pollara (the handler) and Rina (the expert company) were convicted to pay indemnities of 192 million Euro or approximately 280 Millions USD, plus individual penalties. The age of the ship which is almost 25 years old is an important factor for the consideration of the court, and the discontinuity of maintenance system.[188]

## 3.3 Natural Resource Damage Assessment in New Zealand

The Resource Management Act 1991 (RMA) is the law concerning the valuation of natural resource. It is not direct law to measure natural resource damage assessment. However, it shows that economic valuation on natural resource is considered as an important thing to concern. [189]

This Act concerns with discharges from ships, offshore installations and environmental matters both onshore and offshore of territorial sea within 12 miles from shore of New Zealand. Regional council also take into consideration of any applications for waste discharges within this zone in this area. [190]

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[187] Olivier Thébaud, Denis Bailly, Julien Hay, José Pérez, *supra* note 176, at 4
[188] LBOLLACK, "*Erika : amende maximale pour les coupables, dont Total in French*", http://www.lesechos.fr/16/01/2008/lesechos.fr/300233996_erika---amende-maximale-pour-les-coupables--dont-total.htm (accessed on June 30, 2014)
[189] Mark Christensen, *supra* note 32
[190] Maritime New Zealand, "*Legislation, regulations and conventions*" , https://www.maritimenz.govt.nz/public/environment/legislation-regulations.asp (accessed on June 30, 2016)

As of May 2013, non-market valuations do not seem to have played a key role in New Zealand. Effort to measure the value of natural assets in New Zealand became highlight in May 2013. The New Zealand Institute of Economic Research (NZIER) announced the paper called **"Valuing Natural Assets"**, explains that the value of natural assets is intangible but it needs to be evaluated in order to provide the right information for decision maker.[191]

In New Zealand, practitioners, legal scholars and Environmental Court pointed out that there is instability in economic valuation methods. Following Court decisions on the Denniston Mine and the Mount Cass Windfarm, "the uncertainty over economic valuation is a problem needing remedy rather than an issue to be excluded from consideration".[192]

In New Zealand, Tanker owners will responsible for oil spill damage up to limit.[193] Pollution damage which exceeds such limit, reasonable costs of reinstatement of the environment, and loss of profits caused by impairment of the environment will be provided by The Fund Convention. However, in New Zealand, no laws or guidelines directly refer to methods of natural resource damage assessment.

### 3.4 Natural Resource Damage Assessment in China

The People's Republic of China has put its best effort into implementing laws enacted to protect environment, especially marine environmental protection. Compensation for the environmental damages arising from oil spill was also recognized under the laws.

In this section, we will analyze about Chinese Laws and current practices on damage assessment to natural resources in China.

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[191] New Zealand Institute of Economic Research (NZIER) , "*Valuing Natural Assets*", NZIER Working Paper 2013-03, Wellington, May 2013

[192] Official Journal of the Resource Management Law Association of New Zealand Inc., Resource Management journal, at 9

[193] Center for Marine Environmental Sciences, "*Civil Liability for offshore drilling in New Zealand waters*", http://www.marum.de/Page5465.html (accessed on June 30, 2016)

### 3.4.1 Background of Relevant Chinese Laws and Compensation System

Several oil spill incidents have occurred in China. Maritime Safety Administration or MSA is an administrative agency to deal with pollution damage, prevent and reduce the damage to marine environment.

The Marine Environment Protection Laws (MEPL)

This law is generally called as "MEPL". Article 71 of MEPL provided that the State competent agency in marine accident has a right to perform clean-up operations in marine accident from oil spill in order to reduce damage to environment.[194] It is a compulsory action needs to be performed by the concerning agency. It ensures that when the marine incident occurs, the State competent agency will take all necessary steps to reduce pollution damage to the marine environment.

Article 90 of MEPL deals with the damage and compensation. This article imposes liability to person who causes harm to marine environment. Such person shall be required to compensate the State when the State suffers losses from the damages to marine ecosystem, marine aquatic resources and marine nature reserves on the total value of natural resources so destroyed. [195] This article states that marine environment

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[194] Article 71 of MEPL "If vessels occur maritime incidents causing or being likely to result in major pollution damages to the marine environment, the State competent authority being in charge of maritime affairs shall have the power to take compulsory measures to avoid or decrease pollution damage.

If vessels and facilities occur maritime incidents at the high sea resulting in consequences of major pollution damage or threat to the sea areas under the jurisdiction of the People's Republic of China, the State competent authority being in charge of maritime affairs **shall have the power to take corresponding measures necessary for pollution damages** which has caused or likely to cause."

[195] Article 90 of MEPL "Those who causes pollution damage to the marine environment shall eliminate the damage and compensate the losses; in case of pollution damage to the marine environment resulting entirely from the intentional act or fault of a third party, third party shall eliminate the damage and be liable for the compensation. If the State suffers heavy losses from the damages to marine ecosystems, marine aquatic resources and marine nature reserves, the department invested by this law with the power of marine environment supervision and administration shall, on behalf of the

supervision and other authorities have a right to claim for environmental damage compensation from the polluters.

### 3.4.2 Chinese Practices for Environmental Damage Assessment

At first, China also faced with the problem of the scope and assessment method for marine environment damage in oil spill case. China has recognized the Environmental Damage Assessment or referred as "EDA". Environmental Damage Assessment or "EDA" means the combination of economic methods, reports from specialists and other useful technical approaches to evaluate the severe of damage to the environment and turn out to be the basis for compensation.

The guidelines for Assessment of Marine Oil Spill Ecological Damage (HY/T 095-2007) and the Technical Guidelines for Assessment of Marine Ecological Damage (Trial implementation) (2013) were issued by the State Oceanic Administration of China in order to be guidelines for the concerning authority. [196] More importantly, the Judicial Identification Office of the State Marine Environment Monitoring Center was set up to study on methods for marine ecological damage assessment.[197] In case of oil spill's accident, there must cause the dead toll of fishes. In China, damage assessment must be concerned with these organizations.

**The Ministry of Agriculture** is held responsible for the calculation methods for Economic Loss Caused by Fishery Pollution Accidents which limits the economic losses caused by fishery pollution accidents to the direct economic loss and the cost for restoration of natural fishery resources.

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State, put forward compensation demand to those who are responsible for the damages."

[196] EU-China Environmental Governance Programme, "*General situation of legislation and practice of environmental damage assessment and compensation*", April 2014**,** at 6

[197] *Id.*

Types of method provided by the Ministry of Agriculture are as follows: Direct calculation method, Comparative method, Site-specific harvesting method, Corralling statistical method, Statistical estimation method, Survey statistical method, Simulation experimental method, Production effect method, Production statistical method, Expert assessment method, Fish eggs and larvae estimation method and other methods.[198] We can notice that there are many different kinds of method provided by the Ministry of Agriculture in China.

**The State Oceanic Administration** provides the Technical Guidelines for Assessment of Marine Ecological Damage (Trial implementation) which set up the scope of marine ecological damage to these following; the cost for preventive measures, the loss until the restoration period has been done, the cost for marine ecosystem restoration, and other costs for monitoring, experiment and assessment. [199]

The damages can be evaluated from the expense for restoring the marine ecosystem return to its baseline condition. Furthermore, the economic loss during the restoration period is also included. The expense of replacement project can be applied for identify value of marine ecological damage in case remediation does not result in restoring the damaged natural resources.

**The Ministry of Environmental Protection** released the Paper of the Recommended Calculation Methods for the Loss Caused by Environmental Pollution Damage. The scope of environmental pollution damage under this paper is that the ecological environmental resource damage will cover the cost for investigation, assessment, remediation and restoration project. Other damages fall in the assessment scope can be considered under the scope of environmental pollution damage.

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[198] *Id.* at 8
[199] *Id*

#### 3.4.2.1 The Judicial Authentication

The most important feature is **"The Judicial Authentication of Environmental Pollution Damage to Natural Resources**". Due to the fact that the parties in litigation in China often oppose on environmental pollution damages, the judicial authentication has proposed to tackle the difficulty in this type of cases. Judicial Authentication consists of the analysis and assessment of the impact to natural resources by the experts in Marine Physics, marine creatures and ecologists. [200] The assessment will be presented in the form of "Authentication report". China has followed the experiences from other countries in establishing the Judicial Authentication Name-List System as selected by the judge and parties involved.[201] This name-list needs to be screened and qualified by the Court. In China, in oil spill case, the Maritime Court has the right to commission authentication in case of marine pollution damages.

"The Judicial Authentication" is the activity that allows expert witness to apply science, specific methods, specialized skill and past experiences to test authenticate and identify damage to environment in the case. Specific methods can consist of the experiment, observation, formula or other methods. The Right relates to authentication activities, for example, checking records, site surveys, experiments have recognized in China. Expert Witness applies specialized knowledge to help the judge to determine the facts in environmental case. Expert Witness in Chinese legal system is quite different from other countries.

The Authentication Report of Shandong Marine Judicial Authentication Centre has explained that in a case of oil spillage, the claimant asked for the damages of RMB 10 million for damages to sea, marine lives and clean-up costs. The expert witness performed the Judicial Authentication by using specific formula to calculate the damages caused by the oil spill and identifying the effect of petroleum hydrocarbon

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[200] Wu Lijing and Zhang min, "*Judicial Authentication of Maine Pollution damages*", at 264

[201] People's Court Commission Judicial Authentication Regulations, art 3 and 5.

and marine ecology. The report has shown that the damages cause by an oil spill should end up in the amount of RMB 2 million.[202]

The Authentication Report has recognized in China as a proof which can be taken into consideration of the court. This report is powerful than witness oral testimonies and written documents.[203]

**Problems of Environmental Damage Assessment in China**

Many scholars point out that no clear provisions under the Chinese laws to identify the environmental damage assessment. The environmental damage assessment is considered in the past as constitution of many problems: Difficulties in proceedings, not many research institution and law criteria.[204] However, the Ministry of Environmental Protection in China has issued the recommended guideline for the natural resource damage assessment.

The problem of the lack of law for Environmental Damage calculation in China also has been raised by scholars. Environmental disputes in China have been essentially solved by administrative resolutions, not by court judgment.[205]

**3.4.2.2 Previous cases in China**

**1) Hai Li Case**

This case is concerning with the oil spill incident. The expert witness in this case applied "the simulated experiment and mathematic model" to identify the severe of environment damage to marine lives and other ecosystem. [206] The

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[202] Shandong Marine Department, "*The Authentication Report of Shandong Marine Judicial Authentication Centre*", 2002, no.16

[203] Supreme Court's Regulations about Civil Procedure Testimony, 2001, 33, art. 77

[204] Dr. YU Fang, Eu-China Environmental Governance Programme, "Comparative Policy and Practice Study" (December 2012) at 10

[205] *Id.*

[206] Marine Bureau of People's Repubic of China. "*Hai Li' Oil Spill Pollution Damages Compensation Case*", Chapter II of the Attachment of China Ships Oil Spill Emergency Plan (March 2003)

authentication report has revealed and contributed the settlement of a compensation of USD 600 thousand in total. [207]

**2) Tasman Sea vessel**

In 2002 the State Oceanic Administration authorized its North China Sea Branch to file a lawsuit for marine EDC against the Tasman Sea vessel. HY043-1997 is the standard regarding the System and specifications for identification system of oil spilled. It specifies the oil spill monitoring and investigation and provides variety of identification methods. [208] However, the dispute about damage assessment method for marine environment damage was highlighted in dissemination.

Furthermore, this case is very important because the Chinese maritime court also ruled that the owners of Tasman sea have to responsible for economic loss (RMB 17 million or approximately USD 2.5 million) to fishermen because of the harmful effect to marine ecological environment in the accident location. [209]

## 3.5 New Tools of Damage assessment

### 3.5.1 The Damage Schedule

The damage schedule is an alternative method of valuing environmental damage. One of scholars named Heyde suggests that a pre-established fixed schedule of loss should be suggested or used to apply for damage assessment to natural resources.[210] A compensation or damage schedule approach has been developed to provide economic damages when the information collected is insufficient or the

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[207] Michael G. Faure and James Hu, **Prevention and Compensation of Marine Pollution Damage: Recent developments in Europe, China and the US** (2006), at 271

[208] EU-China Environmental Governance Programme, "*General situation of legislation and practice of environmental damage assessment and compensation*", April 2014, at 5

[209] Yuna Huang, **Recoverability of Pure Economic Loss Arising from Ship-source Oil Pollution** (n.p.: LIT Verlag, 2011) 249

[210] JM Heyde, "*Is Contingent Valuation Worth the trouble?*"(1995) U.Chi. L. Rev 331 at 350

information cannot be collected. It is based on the character of liquidated damages because it is difficult to calculate the actual value of the loss. He has an opinion that relationship between each creature in nature is really complex.

In the author's opinion, the damage schedule should be a good answer to deal with the calculation of damage to natural resources since it can provide reliable and predictable damages under the form of table or schedule which consists of the list of payment that will be required in the event of a loss. Furthermore, its value can deter people or company from the action that make pollution or contamination. Placing monetary values to environmental damage by using the designed schedules with the fixed compensation can show the community judgment on value of environmental resource and changes in environmental and the resource value. The designed schedule is derived from the assessment of community preferences with respect to changes in natural resource value. [211]

Damage schedule is derived from a questionnaire. Questionnaire contains paired comparison questions. Respondents from the community will choose the loss that is considered as the most important in their eyes. [212] This information will be summarized into the scale values of natural resource losses. Scale values will be developed into the designed schedules with fixed compensation.

Damage schedule can provide these following advantages;

1) Less time-consuming when compare with other kinds of method.

Damage schedule is a quick tool for calculation of damages. No need to collect more evidences or even ask people to place monetary value to the losses.

2) Providing reliance and predictability to related company or business.

Damage schedule shows amount of the fixed damages in advance or before the environmental change or oil spill's incident. This information shown in the

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[211] Ratana Chuenpagdee, Jack L. Knetsch, and Thomas C. Brown, "*Environmental Damage Schedules: Community Judgments of Importance and Assessment of Losses*", February 2001, at 1

[212] *Id.*

schedule can make more effective deterrence of the bad conduct to natural resources. It also avoids uncertainty in data collection after the contamination.

3) Not costly;

The associated costs by using pre-determined fixed schedule is quite lower than other current kinds of damage assessment.[213] Fixed schedule is appropriate to apply in which other type of damage assessment method is unavailable or difficult to evaluate. [214]

4) Avoid subjective factor which can provide unfairness of the damage calculation;

Compensation normally depends on the court who considers the damages. Therefore, the damage schedule can provide harmonization and greater fairness of similar treatment in similar cases.

However, from Pearson's research, the damage schedules approach seems to provide exaggerates value.[215]

[213] *Id.* at 2.
[214] *Id.* at 3
[215] Saif M. Al-Ghais, Walter H. Pearson, "*Protecting the Gulf's Marine Ecosystems from Pollution*" (n.p.: Springer, 2008) 226

# CHAPTER 4
# THAI LAWS, PRACTICES ON DAMAGE CALCULATION AND APPLICATION TO AO PHRAO'S CASE

Natural resource damage assessment is unorganized and inconsistent in Thailand. Currently, Thailand has no specific law relating to compensation from oil pollution and natural resource damage assessment. The Acts on Navigation of Thai Waters Act, B.E.2456 (1913), The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA) and Thai Civil and Commercial Code never define the rule or propose guidelines of calculation for environmental damages.

## 4.1 Damage calculation in Thailand

### 4.1.1 How to calculate damage to natural resources in Thailand

The effects of oil spills can spread to various types of natural resources such as surface water, wetland, fish, plants and animals on the beach. Thailand has confronted the problem of damage assessment, and how to calculate the monetary values of compensation to the natural resources. The existing process will be as follows:

(1) The State as a claimant will claim for damages to natural resources and provide all necessary information and evidence to prove the damage to the court.

(2) The court will consider whether the amount of claimed damages is reasonable, by considering the number of animals killed by the oil spill and other methods. The existing method used by the Court for calculation of damage to natural resources is not appropriate. Courts generally count how many marine animals and fish are killed, or are likely to be killed, by the oil spill, but it cannot compensate all of the damage to natural resources. Calculation of damages in an environmental case cannot be easily evaluated since it should be based on the biological value and the importance of such an environment. It is difficult to identify the damage to natural resources in a case where marine animals are not directly killed, but may still suffer from habitat damage.

While a specific calculation system, guidelines, standards or formulas were proposed for natural resource damage assessment in foreign countries, it appears that Thailand is generally concerned with the discretionary power of judges based on the details as explained by the claimant.

In an oil spill, the Thai judges sometimes award damages based on the amount of dead marine animals. As a consequence, it cannot compensate all of the damage to natural resources regarding the biological damage when marine animals are not directly killed, but suffer from habitat damage and other severe consequences.

### 4.1.2 Interesting Cases Regarding Natural Resource Damage Assessment in Thailand

#### 4.1.2.1 Kliti Creek Case

A good example of an environmental case is the well- known case of Kliti Creek, in which the Pollution Control Department avoided performing necessary restore and recovery damage within the appropriate time. This case is related to lead contamination in Lower Kliti Village in Kanchanaburi Province from a lead mine**.** At least eight Karen ethnic villagers are believed to have died from lead poisoning, and several people have been affected from lead contamination in the stream.[216]. Villagers also consume water from the river for daily life and feed for their animals. The lead mine was closed by Thailand's Department of Mineral Resources.

The case involved a dispute in relation to an administrative agency performing official duties required by the law with unreasonable delay, according to

[216] Montri Sillapamahabundit, "*Court-Annexed Alternative Dispute Resolution in Environmental Cases: Developments in Thailand*", http://asianjudges.org/wp-content/uploads/2013/11/Session-7-ADR-thailand-Mr.Montri.pdf (accessed on June 30, 2014)

Section 9 (2) [217] and 42[218] of Act on Establishment of Administrative Courts and Administrative Court Procedure, B.E. 2542.

Therefore, the Pollution Control Department was sued in the Administrative Court. The Supreme Administrative Court ordered the Pollution Control Department to pay for the costs of food for 22 Kliti villagers from November 1, 2002 to August 27, 2004, amounting to 700 Baht/month, with an interest of 7.5 percent per year. It totaled to 17,399.55 Baht/person. Another part was for future costs of food for 22 Kliti villagers, amounting to 700 Baht/month, based on the fact that the affected villagers, were unable to obtain food from the stream, and have to buy food from other sources. The Court further awarded the cost of the damage from exploitation of natural resources, the environment and the biological diversity from August 28, 2004 to June 26, 2012 to the villagers, totaling159,800 Baht for the the Kliti villagers.[219]

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[217] "Administrative Courts have the competence to try and adjudicate or give orders over the following matters: (1) the case involving a dispute in relation to an unlawful act by an administrative agency or State official, whether in connection with the issuance of a by-law or order or in connection with other act, by reason of acting without or beyond the scope of the powers and duties or inconsistently with the law or the form, process or procedure which is the material requirement for such act or in bad faith or in a manner indicating unfair discrimination or causing unnecessary process or excessive burden to the public or amounting to undue exercise o discretion;
(2) the case involving a dispute in relation to an administrative agency or State official neglecting official duties required by the law to be performed or performing such duties with unreasonable delay;
(3) the case involving a dispute in relation to a wrongful act or other liability of an administrative agency or State official arising from the exercise of power under the law or from a by-law, administrative order or other order, or from the neglect of official duties required by the law to be performed or the performance of such duties with unreasonable delay";

[218] Section 42 of Act on Establishment of Administrative Courts and Administrative Court Procedure, B.E. 2542 states that **"**Any person who is inevitably aggrieved or injured or who may inevitably be aggrieved or injured in consequence of an act or omission by an administrative agency or State official or who has a dispute in connection with an administrative contract or other case falling within the jurisdiction of an Administrative Court under section 9 may, provided that the redress or alleviation of such grievance or injury or the termination of such dispute requires a decree as specified in section 72, file a case with an Administrative Court".

[219] The supreme administrative court No. 597/2551

Regarding the case of the Appeal Court's Decision No. 1048/2554, the Pollution Control Department took action against Lead Concentrated (Thailand) Co., Ltd., along with the Company Directors. The Seventh District Court of Appeal ruled that, due to the fact that the Company Directors acknowledged the mine released lead during operation, they must be held jointly liable for the compensation in the amount of 1,341,962.54 Baht, with an interest of 7.5 percent per year, with the defendant no. 1. However, the damages to natural resources, which is derived from the reason that the villagers cannot use water from the creek, cannot be requested by the Pollution Control Department. Such damages must be claimed by the villagers instead of the Pollution Control Department.

**4.1.2.2 The sinking of a sugar barge in the Chao Phraya River in 2007**

The Administrative agency, Ang-thong province, and Ayutthaya province reported the primary expenses to the Pollution Control Department, totaling Baht 21,423,798.67, which derived from expenses for clean-up operations and dealing with the fish which died in the Chaophraya river in Ang-thong province and Ayutthaya province [220] as empowered by Section 96 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA). It can be broken down into the expenses of the Pollution Control Department for Baht 1,942,025, Office of the Permanent Secretary of Ministry of Natural Resources and Environment for Baht 683,590.65, Ayutthaya province for Baht 18,768,015.67, and Marine Department for Baht 30,167.35.[221] The Pollution Control Department subsequently forwarded the evidence and information to the Office of the Attorney-General to claim in the case.

In regards to the damage to the environment regarding fish and marine animals, compensation for the above mentioned damage can be claimed under Section

[220] The Pollution Control Department, "*The sinking of a sugar barge in the Chao Phraya River*", http://www.pcd.go.th/info_serv/water_chaoprayariver.html (accessed on June 30, 2014)
[221] *Id.*

97 of The Enhancement and Conservation of National Environmental Quality Act of 1992. [222] This provision also empowers the State to claim for the destruction, the loss, and the damage to natural resources owned by the State or belonging to the public domain. State authority, which is an authorized agency to monitor, control and preserve of the natural environment, in this case referred to the Department of Fisheries to collect all substantial evidence and details. Evidence and information as collected will be submitted to the Office of the Attorney-General for consideration and further processing in the court.

While the first case of the sinking of a sugar barge in the Chao Phraya River occurring in 2007 is still in court's proceeding, the second case of the sinking of a sugar barge in the Chao Phraya River has happened in 2011.[223]

## 4.2 The case of Ao Phrao (Phrao Bay)

### 4.2.1 Background of PTT Global Chemical Plc's oil spill

This is not the first time that oil was spilled into the sea in Thailand. Koh Samed is one of the best places in Thailand to enjoy white and golden sand beaches. On July 27, 2013, around 50,000 litres of crude oil (or equivalent to 316 barrels) leaked from an offshore pipeline operated by PTT Global Chemical (PTTGC) off the coast of Map Ta Phut, Rayong province**.**

To prevent additional leakage, PTTGC shut down the pipeline valve. PTTGC operated the clean-up process from the sea surface using oil-spill dispersants.

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[222] Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 "Any person who commits an unlawful act or omission by whatever means resulting in the destruction, loss or damage to natural resources owned by the State or belonging to the public domain shall be liable to make compensation to the State representing the total value of natural resources so destroyed, lost or damaged by such an unlawful act or omission."

[223] Thaiecoalert.org, "*Ecological Alert and Recovery – Thailand*", http://thaiecoalert.org/th/pollution/26 (accessed on November 7, 2014)

[224] Government authorities, including the Marine Department, and the Royal Thai Navy, and the private sectors such as the IRPC Public Company Limited and the Oil Spill Response Limited, also worked together to do their best to intercept the oil spill. [225] Unfortunately, oil arrived in Ao Phrao at 10.00 pm on the next day. [226] Located at the west coast of Khao Laem Ya-Mu Koh Samed National Park, the golden sand of Ao Phrao was covered by the oil slick.

Ao Phrao's resorts had to be closed until the clean-up and rehabilitation processes were completed. The oil also caused serious damage to marine life. Ao Phrao had rebounded surprisingly quickly, and only a faint smell of oil remained. Even though Ao Phrao seems to rebound, as the oil slick was removed and the beach looked golden again, its marine ecosystem was already devastated.

In the beginning, "Preliminary environmental assessment" was conducted at Ao Phrao by biological scientists and researchers. In early November of 2013, or around 3 months after the oil spill, Ao Phrao officially reopened to tourists.[227] This was just a few months after the oil spill, clean-up operations, and improvement program on water standard and monitoring processes had taken place. Udom Kraiwatnussorn who was the secretary to the Natural Resources and Environment Minister, informed that the sea was back to normal condition at the end of September. [228]

### 4.2.2 Damage in Ao Prao's Case concerning with natural resources

Ao Phrao hardly recovered from the long-term effects of this oil spill disaster. Even with the clean-up operation to restore the sea surface and the shores of Koh Samed back to normal condition, its marine ecosystem was already devastated.

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[224] Offshore Energy Today, *supra* note 5
[225] John Wardrop, *supra* note 7
[226] Thairath, *supra* Note 9
[227] Suriyan Panyawai, Nation, issue October 29, 2013, "*Ao Phrao to reopen on Friday after oil spill*"
http://www.nationmultimedia.com/national/Ao-Phrao-to-reopen-on-Friday-after-oil-spill-30218176.html (accessed on June 30, 2014)
[228] *Id.*

**Details of damage to natural resources in this case can be summarized as follows;**

#### 4.2.2.1 Impact to coral reefs

The coral reef is a habitat and primary source of food for marine animals. Because the reef at Ao Phrao had been bleached, it materially affected the marine ecosystem and business related to the marine environment. In an environmental and ecological test performed on February 21, 2014, Dr. Somphob Rungsupa, from the Aquatic Resources Research Institute of Chulalongkorn University, demonstrated that the quality of Sea water was acceptable However, the Water Petroleum Hydrocarbon rate at Ao Phrao was 15 times higher than Ao Waii in the same island. [229] PTTGC agreed to pay 166 million Baht to the Pollution Control Department for the coral reef restoration project, which lasted until year 2017.

#### 4.2.2.2 Impact to the fishes, crabs, shellfishes and other marine lives

The PTTGC oil spill incident was a disaster to the natural environment. This incident took a deadly toll on crabs, fishes, shellfishes and other marine lives. Shrimp and oyster fisheries along the coast were also affected.

In many situations, the marine animals were not killed, yet may still have suffered from habitat damage or damage to the marine food chain. Ao Phrao is an important bay in Samed islands nursery or habitat area.

**Shellfishes**

Because of Ao Phrao's oil spill incident, the crab populations have to survive the oil slick. Many crabs were killed by exposure to hydrocarbons in the surface waters, and oil poisoning can also absorb into the bodies of crabs. The damaged ecosystem has affected the crab populations and distribution.

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[229] Isranews, issue date August 1, 2014, http://www.isranews.org/isranews-news/item/31766-sea01.html (accessed on June 30, 2014)

Dr. Suchana Chavanich, who has extensive experience in marine biodiversity research, and specialized in the coral reefs, from the Department of Marine Science, Faculty of Science, Chulalongkorn University states that oil slicks affect shellfishes on the shore.[230] When shellfishes contact the oil, they accumulate oil, directly affecting the internal organs, growth, and reproduction system.

**Fishes**

Fishes around Koh Samed were seriously affected by the oil spill. After the oil spill, the lab tests on seafood from Koh Samed's fish markets conducted by Chulalongkorn University, found mercury contamination. [231]

When oil contaminates seawater, fishes are mostly unable to avoid exposures to oil. The widespread pollution from the oil spill kill thousands of fishes. The Department of Fisheries Director-General, Wimol Jantrarotai, gave an example that at first glance, when their habitats become abnormal[232], Marine animals will move from polluted water on the surface into unpolluted deeper water.

Fishes are sensitive to abnormal changes to their environment because they can digest oil. The oil is absorbed into fish's tissues via physical contact to the skin or absorption through the gills. [233] Oil spills cause gill injuries to aquatic animals. Oil also affects the survival of eggs and larva.

The substandard of seawater quality demonstrated the effects of oil spills on the environment. Monitoring and assessment of seawater quality in Samed islands has been conducted once every week until 17 weeks after the spill, and there are 12 stations located in various locations around Samed islands (Nadan beach, Lookyon

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[230] Daily News, issue date August 30, 2013, http://m.dailynews.co.th/News.do?contentId=141076 (accessed on June 30, 2014)
[231] Bangkok Post, *"Tests find mercury in Ao Phrao sea water"*, http://www.bangkokpost.com/news/local/364487/dangerous-mercury-levels-found-at-ao-phrao.**, Bangkok Post,** 14 August 2013 (accessed on June 30, 2014)
[232] Bangkok Post, *supra* Note 10
[233] Save Virunga, "*Virunga Oil Spill for Dummies*", July 6, 2012, http://savevirunga.com/2012/07/06/virunga-oil-spill-for-dummies/

beach, Ao Saikaew, Ao Phai, Ao Tubtim, Ao Chor, Ao Nuan, Ao Wongduan, Ao Waii, Ao Kew, Ao Phrao and Ao Noina). The result is that the mercury concentration in seawater was beyond the standard (0.1 Micrograms/Litre) in the areas of Ao Tubtim and Ao Phrao for the first week. In the following week, the mercury concentration in seawater was beyond the standard level in every station. The mercury concentration went back to normal level after 3 weeks.[234]

The seawater Petroleum hydrocarbon (TPH) concentrations after the spill were above the standard level in every station for the first week. The seawater concentrations of 11 locations, except in Ao Phrao, returned to normal levels after 4 weeks. The seawater TPH concentration level for Ao phrao was back to standard level 12 weeks later. [235] The restoration project was scheduled from year 2013 to 2015, except for the coral reef and beach restoration. The coral reef and beach restoration project was scheduled to end in 2017.

According to the provision of Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA), the States or government authority exercising the power of the State can, on behalf of the State, file a claim against the polluter to receive damages for natural resources. [236] In terms of damage to natural resources, the State is certified as "an injured person". In the event of a major oil spill like this case, the State has the right to claim for compensation for damage caused by an oil spill to natural resources.

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[234] The Pollution Control Department News, issue dated 25 July 2557, http://www.pcd.go.th/Public/News/GetNewsThai.cfm?task=lt2014&id=17179, (accessed on July 14, 2015)

[235] *Id.*

[236] Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 "Any person who commits an unlawful act or omission by whatever means resulting in the destruction, loss or damage to natural resources owned by the State or belonging to the public domain shall be liable to make compensation to the State representing the total value of natural resources so destroyed, lost or damaged by such an unlawful act or omission."

### 4.2.3 Relevant Laws on Environmental Damage Assessment in Thailand and Application of Laws to Ao Phrao's case

To analyze the compensation for damage caused by PTTGC's oil spill, the basic concept under Thai Laws needs to be considered. The connection between Thai provisions and this oil spill incident will be described.

#### 4.2.3.1 Acts on Navigation of Thai Waters Act, B.E.2456 (1913)

The 14th Amendment of this Act was introduced in B.E. 2535 (1992). Section 119 bis has been added and describes that a person who pours or throws, by any means whatsoever, oil and chemical products into any river, canal, marsh, reservoir or lake, or the sea within the Thai waters, which can cause poisoning to any living thing, or harm the environment, or cause danger to navigation, will be liable to an imprisonment for a term not exceeding three years, or for a fine not exceeding sixty thousand Baht, or to both, and shall also responsible for any expenses incurred in the cleaning or rehabilitating thereof.[237]

Aside from imprisonment and fine punishment, when anyone violates this provision, he or she must be responsible for clean-up or removed costs, and other expenses, incurred from the action as indicated under Section 119 bis. This Section is different from The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA) **since it does not empower** the State **to claim for compensation from environmental damage.**[238] This section applies to this oil spill incident. PTTGC will be liable for clean-up expenses or other expenses from the oil leakage.

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[237] Section 119 bis. of Acts on Navigation of Thai Waters Act (The14th Amendment) *"No person shall pour, throw, or do by any means whatsoever* ***oil and chemical products*** *into any river, canal, marsh, reservoir or lake which is a communication path or for a common use of the public or the sea within the Thai waters, so that it may poison any living things or harm the environment or cause danger to the navigation thereto. Any person who violates this provision shall be liable to an imprisonment of not exceeding three years or a fine of not exceeding sixty thousand Baht, or to both, and shall also compensate any expenses incurred in the cleaning or rehabilitating thereof."*

[238] อำนาจ วงศ์บัณฑิต**, กฎหมายสิ่งแวดล้อม**, พิมพ์ครั้งที่สอง กรุงเทพฯ:วิญญูชน, 2551(Amnat Wongbandit, "*Environmental Law*" ( 2nd ed. Bangkok:Winyuchon, 2008), at 543)

#### 4.2.3.2 The Enhancement and Conservation of National Environmental Quality Act, B.E.2535 (NEQA 1992)

The Enhancement and Conservation of National Environmental Quality Act (NEQA) was first issued in 1975. The last amendment occurred in 1992. This is the first Law which aims to enhance and conserve the National Environment and empower authorities to hold accountable those responsible for damage to natural resources. Later in 1992, there were amendments of this Act, adding the detail of conservation and solutions to environmental problems, and indicating environmental right and civil liability for damages to the environment.

- **Section 96 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA)**

Under Section 96, the NEQA imposes liability on owners or possessors of point source of pollution which is the cause of death, bodily harm or health injury of any person or has caused damage in any manner to the property of any private person or of the State. The compensation or damages to which the owner or possessor of the point source of pollution shall be liable, according to the foregoing first paragraph, shall mean to include all the expenses actually incurred by the government service for the clean-up of pollution arisen from such incident of leakage or contamination.

However, the exceptions under subsection (1) - (3) also can be applied if it can be proved that such pollution, leakage, or contamination is the result of *force majure* or war, an act done in compliance with the order of the government or State authorities and an act or omission of the person who sustains injury or damage,

or of any third party who is directly or indirectly responsible for the leakage or contamination.[239]

The polluter can therefore be exempted from the liability under this section. Courts can decide on the defendant's liability from strict liability regime [240] which the polluter must be liable without fault or negligence. This is the main difference in comparison with Section 420 of The Thai Civil and Commercial Code (CCC).

According to the last paragraph of section 96, which states that "The compensation or damages to which the owner or possessor of the point source of pollution shall be liable according to the foregoing first paragraph shall mean to include all the expenses actually incurred by the government service for the clean-up of pollution arisen from such incident of leakage or contamination.", it shows that there is a right to make a claim for clean-up charges and all the expenses actually incurred from the cleaning operations derived from such incidents of leakage or contamination. It describes that clean-up costs can be claimed from incident of leakage or contamination. Therefore, PTTGC or the owner of the point source of pollution shall be liable for all clean-up costs which were paid by government agencies.

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[239] Section 96 of The Enhancement and Conservation of National Environmental Quality Act of 1992 states that "If leakage or contamination caused by or originated from any point source of pollution is the cause of death, bodily harm or health injury of any person or has caused damage in any manner to the property of any private person or of the State, the owner or possessor of such point source shall be liable to pay compensation or damages therefore, regardless of whether such leakage or contamination is the result of a willful or negligent act of the owner or possessor thereof, except in case it can be proved that such pollution leakage or contamination is the result of

(1) *Force majure* or war.

(2) An act done in compliance with the order of the Government or State authorities.

(3) An act or omission of the person who sustains injury or damage, or of any third party who is directly or indirectly responsible for the leakage or contamination.

The compensation or damages to which the owner or possessor of the point source of pollution shall be liable according to the foregoing first paragraph shall mean to include all the expenses actually incurred by the government service for the clean-up of pollution arisen from such incident of leakage or contamination."

[240] The Pollution Control Department*, "Recommendations for Laws and Regulations for Environmental Protection and Operating Mechanisms for Control and Enforcement*", 2540, at 13

- **Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA)**[241]

This section indicates civil liability to a person who commits an unlawful act or omission which effects and causes consequence of destruction, loss or damage to "natural resources owned by the State or belonging to the public domain". Such a person shall be liable to make compensation to the State representing **the total value of natural resources** destroyed, lost or damaged by such an unlawful act or omission. Public domain is linked to Section 1304 of the Thai Civil and Commercial Code. According to the provision in this law, the States or government authority are exercising the power of the State or on behalf of the State, to file a claim against the polluter to receive damages for natural resources.

It is interesting that the term "the value of natural resources" has not been defined in this Act or even explained in any court's decision. Therefore, the total value of natural resources destroyed, lost or damaged by such an unlawful act or omission can be described in many different ways and under the opinion of the court.

The main difference between Section 96 and Section 97 of the NEQA is that Section 96 is about the pollution resulting in death, bodily harm or health injury of any person, or **damage to the property of any private person, or of the State**. Therefore, the plaintiff in Section 96 is the private person or the State who can claim for such damage and injury. Section 97 describes the damage to the environment. Section 97 empowers the State to claim for the destruction, loss or damage **to natural resources owned by the State or belonging to the public domain**. Therefore, the State is the only entity who can claim for damages under Section 97 of the NEQA.

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[241] Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 "Any person who commits an unlawful act or omission by whatever means resulting in the destruction, loss or damage to natural resources owned by the State or belonging to the public domain shall be liable to make compensation to the State representing the total value of natural resources so destroyed, lost or damaged by such an unlawful act or omission."

**Applying to Ao Phrao's case:**

The two above mentioned sections under The Enhancement and Conservation of National Environmental Quality Act of 1992 are based on the polluter pays principle since the polluter must responsible for all costs arisen from an oil spill. [242] PTTGC's Oil Spill had caused a serious impact on the marine ecological environment.

"Point Source of Pollution" under Section 96 is defined under Section 4 of the same Act as "any community, factory, building, structure, vehicle, place of business or activity or any other thing from which pollution is generated.". We can say that it can be anything related to the generation of the pollution. Therefore, pipeline of PTTGC can be considered as "Point Source of Pollution".

If we apply existing legislation with PTTGC's case, PTTGC committed an omission of oil leakage and oil pollution came from PTTGC, therefore, PTTGC is the polluter of this incident. Thus, such company must be liable for all costs and damage, associated with this incident, including but not limited to medical bills, loss of income for business sectors such as hotels, resorts, restaurants, taxis, Thai massage shops, boat transfer businesses, street merchants, diving equipment rentals and damage to the above mentioned business's employees, costs of reparation and atonement, and clean-up arisen from such incident of leakage or contamination, following Section 96 of the NEQA, if they are considered appropriate by the Court.

It is clear that this law (the NEQA) does not have provisions to show how to evaluate the natural resource which have been damaged. Justice Winai Ruangsri has pointed out that the problem of acceptability and accountability in the valuation method used in damage assessment of natural resources is the major obstacle for the case relating to environmental damage or destruction of natural resources[243], and causes

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[242] Susan Wolf & Anna White , "*Environmental Law*" , 1st ed.(London :Cavendish Publishing,1995), at 7

[243] ACPECT Conference 2010, "*Environmental Law in Thai Supreme Court Green Bench*" (2010)

delay in processing environmental cases. Harm to the environment is highly complex and difficult to assess.

The Thai Civil and Commercial Code also includes the tort law relevant to the compensation as it supplements the Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA).

As there is no law to govern the calculation of natural resource damage assessment, the court must regard the rule under Section 438 of Thai Civil and Commercial Code (CCC), which considers the circumstances and the seriousness of the violation in order to award compensation. Tort law is categorized within the law of obligation, and it is found in the Thai Civil and Commercial Code (CCC), Sections 420 to 452 (Book II, Title V) including liability, compensation of wrongful acts and exemptions to liability (justifiable acts). The objective of civil litigation is to seek the court's order to bar the defendant from performing a certain action, or to receive compensation.

Section 438 of Thai CCC states that "The Court shall determine the manner and the extent of the compensation according to the circumstances and the gravity of the wrongful act". Compensation may include restitution of the property of which the injured person has been wrongfully deprived, or its value as well as damages for any injury caused. The court has discretion to award damage that they considered as proper for the circumstances and the gravity of the wrongful act according to section 438 of the same code. [244] The circumstances and the gravity of the wrongful act are under the judge's discretion. No specific law, proper rule or guideline were enacted to deal with damage assessment in Thailand.

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[244] Section 438 of CCC states that "The Court shall determine the manner and the extent of the compensation according to the circumstances and the gravity of the wrongful act.

Compensation may include restitution of the property of which the injured person has been wrongfully deprived or its value as well as damages for any injury caused"

### 4.2.4 Other damage caused by PTTGC's oil spill and the company liability

Due to the author's primary research at Samed Islands during December 7-10, 2014 (1 Year and 5 months after the oil spill), discussions with affected persons in Ao Phrao, surveys and interviews took place. Workers in the Samed islands also received compensation of their salary or the same rate of pay as if they were working for their employers. Most of the affected population were satisfied with the monetary compensation and response by PTTGC.

However, some of the affected, including, hotel staff and massagers, were not satisfied with the amount of money received, since their incomes are not only based on salary, but also tips from tourists. Tips are an importance source of income for hotel staff and massagers. Moreover, the Artisanal fishermen of Rayong province and the business sectors who were affected from the oil leak filed civil lawsuits against PTTGC for damage relating to the oil leak and sought repayment for income that was lost because of the oil leak.

For natural resource damage assessment, the author had been told that the collection of beach sand, marine animals, and water samples had been done after the spill. The result from the Pollution Control Department also revealed the pollution from the oil spill incident. Fishermen said that the oil spill caused massive loss of species that live in the Rayong sea. [245] PTTGC's oil spill therefore lead to serious impact on fisheries and mariculture resources, and affected their rights to fish. Their opinion was that the compensation as paid by PTTGC was lower than what they should have record. The estimated economic losses of between 300,000 and 3 million Baht were claimed for the three-year period after the spill, to the fisheries workers who were fired due to low post-spill catch rates.[246]

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[245] Thaipublica online newspaper, issue date November 28, 2014, http://thaipublica.org/2014/11/oil-spill-10/ (accessed on January 10, 2015)

[246] Bangkok Post, "*PTTGC sued over Rayong spill*", http://www.bangkokpost.com/print/422546/, **Bangkok Post**, July 26, 2014 (accessed on January 10, 2015)

Fishermen also filed an Administrative case in the Rayong Administrative Court against PTTGC and government agencies for failing to properly handle the spill, which included the Rayong Provincial governor, the Marine Department, the Pollution Control Department, the Department of Marine and Coastal Resources, and the company. The above mentioned organizations must also be responsible for the impact of the oil spill as they failed to properly respond to the situation.

Another arguable interpretation under Section 420 of CCC concerns the words "injury to any right of another person". This leads to an ambiguous interpretation of Section 420.[247] The court will decide what kind of damage can be compensated, and what kind of rights should be protected under this section. As an employer, PTTGC can also be liable for damage caused by employees following Section 425 of CCC, if the oil leakage derived from a wrongful act committed by their employees during the course and scope of employment. After the compensations are made by the employer, the employer is entitled a reimbursement from the employee under Section 426.

**4.2.5 Problems existing in methods used by the court and concerning authority in Thailand**

When the ocean is contaminated by oil, it causes problems and influences on a marine environment. Thailand, and many countries, face several obvious problems-specifically the problem of how to calculate the monetary values of compensation to the natural resources. This problem relates to both the government entity's side and the judge's side. While the government agency faces the problem of how to prove environmental damage and the value of natural resources, the court also faces the difficulty to assess and award damage to natural resources.

Due to the Pollution Control Department Order No. 216/2552, the Director General of the Pollution Control Department authorized the Provincial Governor

[247] Section 420 of The Thai Civil and Commercial Code "A person who, willfully or negligently, unlawfully injures the life, body, health, liberty, property or any right of another person, is said to commit a wrongful act and is bound to make compensation therefore."

(except the Governor of Bangkok) to act on his behalf, to perform the duty of natural resource damage assessment, claim for compensation from a person who committed an unlawful act, or omission by whatever means, resulting in the destruction, loss, or damage to natural resources, and take action regarding the control of pollution under the NEQA, only in its own locality. [248]

A reason behind this order is due to the fact that the destruction, loss or damage to natural resources took place in another province outside Bangkok, and it is not convenient for the Pollution Control Department to collect information and evidence at the contamination site. Some evidence easily disappears before reaching the site. However, the Provincial Governor must report to the Director General of the Pollution Control Department for all steps that were performed. Therefore, the Rayong Provincial Governor has authorization to perform the duty of natural resource damage assessment, take action against PTTGC, and claim for compensation.

Delay is caused in processing environmental cases, as the local authority has no specialized background or skills to estimate environmental damages. Another cause for concern is the judge's opinion, since there is no specific calculation system or guideline to lay down the rules or formulas for natural resource damage assessment, and the lack of damage assessment standards. The traditional approach provides inconsistency for many cases regarding compensation claims.

The existing method used by the Court for calculation of damage to natural resource is imperfect. The value of a natural resource must be determined from the Use Value and Non - Use Value. The damage to the environment should also focus on the change in ecosystem functioning. For example, fish help coral reefs in term of balancing nutrients and ecosystem in the area; damaging the coral reefs also affect the fish habitat and shelter.

[248] The Pollution Control Department Order No. 216/2552


**Figure 4.1: Valuing the Impact of oil spill in Ecosystem Change**

The court generally counts how many marine animals or fishes are potentially killed by the oil spill, or estimates the number of affected marine species which cannot compensate all of the damage to the natural resources. Calculation of damage in an environmental case cannot be easily evaluated, since it is based on the biological value and importance of such an environment. Habitat damage and the reproduction system of marine animals should also be considered in natural resource damage assessment. The marine environment should be protected to secure an ecological balance.

To summarize, "damage" from oil pollution can spread to various types of natural resources such as surface water, wetland, fish, plants, and animals on the beach. The traditional approach used by the Thai court to evaluate damage to natural resources is not appropriate, as it is based on the discretionary power of judges, who might be inaccurate as there is no guideline, law, or regulation to measure the damage and the severity of the harm.

Natural Resource Damage Assessment (NRDA) is the legal process adopted by the US federal government to assess and restore damage to natural resources after an oil spill, providing economic methods to calculate the damage and methods to assess environmental damage in both the use and the non-use value. Applying this idea in the Thai compensation system would be a good solution, especially in oil spill cases.

### 4.2.6 Problems existing in applying Thai current methods for Ao Phrao's oil spill

The problematic issues will be explained as outlined below. In regards to the oil spill which occurred in Map Ta Phut seaport on July 27, 2013, the following issues must be considered;

#### 4.2.6.1 Problems of Character of oil spill case and lack of measurement or damages calculation when damage occurred for environmental cases in Thailand;

**Character of an oil spill case**

As explained earlier, an oil spill is more complicated than an ordinary Tort case. Damage from an oil spill is difficult to reckon. The impact of oil spills is concerned with these following categories; costs of the clean-up operation, costs to prevent oil from coming up on the beach, clean-up costs or replacement costs for private and public property, and impact to the environment and economy of commercial business, both in terms of direct and indirect impact. [249] Placing the value on natural resources is not an easy task, but it allows courts to "assess damages for environmental harm, deters future pollution, and helps insure protection for natural ecosystems".[250]

Ecological impact caused by an oil spill is not straightforward like other kind of impacts. An oil spill is an acute environmental disruption and a disaster to the natural environment. It is difficult to evaluate, since marine animals are not directly killed, yet may still suffer from habitat damage or reduced reproduction. If the damage creates irreversible changes to the environment, it is also considered "Ecological impact".

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[249] Olivier Thébaud, Denis Bailly, Julien Hay, José Pérez, "*The cost of oil pollution at sea: an analysis of the process of damage valuation and compensation following oil spills*", at 7

[250] Cross, "*Natural Resource Damage Valuation*", 42 Vand. L. Rev. 269, 270 (1989).

Lack of Damage Valuation to a natural resource is one of the huge barriers in Thailand. The Damage calculation is the process of calculating the damage to affected people and State. The liability of company which caused an oil spill under Thai laws is comprised of Tort liability under Thai Civil and Commercial Code, The Enhancement and Conservation of National Environmental Quality Act of 1992 and the Acts on Navigation of Thai Waters Act, B.E.2456 (1913). After the major oil spill, an immediate answer of damage quantification to the natural resource is urgently required. The lack of an effective mechanism will end up with the cost being paid by the State to restore or remediate the damage to the natural resource, instead of the polluter.

There are no guidelines to deal with civil liability of an oil spill which can provide a way to calculate the damage and how to assess environmental damage. The standard for an environmental impact assessment mechanism is highly called for. Calculation of damages cannot be easily evaluated, since it is based on the biological value and importance of such environment.[251]

**4.2.6.2 Problems of State action to seek for damages to the environment**

The State or the authorized government agency must claim for compensation from environmental damage as provided by Section 97 of the NEQA. PTTGC shall be liable to pay for the total value of natural resources destroyed, lost, or damaged by an unlawful act or omission as claimed by the State. Section 97 of the NEQA empowers the State or government agency as authorized by the State, to claim for compensation from environmental damage.[252] The Pollution Control Department

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[251] ณรงค์ ใจหาญ, "มาตรการในการเยียวยาความเสียหายในคดีสิ่งแวดล้อม", เอกสารการสอนชุดวิชา กฎหมายสิ่งแวดล้อม หน่วยที่ 8-15 (ฉบับปรับปรุงครั้งที่ 1), มหาวิทยาลัยสุโขทัยธรรมาธิราช สาขาวิชานิติศาสตร์, นนทบุรี: สำนักพิมพ์มหาวิทยาลัยสุโขทัยธรรมาธิราช สาขาวิชานิติศาสตร์, 2552, น 15-52. (Narong Jaiharn, Measures for damage recovery in environmental cases, class material environmental laws unit 8-15 1st revision) Faculty of Law, Sukhothai Thammathirat Open University, 2009)

[252] Amnat, *supra* note 239 at 543

has the authority to set the standard for the pollution control and management, enforce against the polluter, establish a fine and liability for polluters and seek for compensation as established under the law.[253]

Initially, PTTGC shall be liable to make compensation to the government agency or representative organization on behalf of State, representing the total value of natural resources destroyed, lost, or damaged by such an unlawful act or omission. Their actions affect the rights of the State to use and benefit from the marine environment.

However, the Rayong Provincial Governor has the authorization to perform the duty of natural resource damage assessment and take action against PTTGC, and claim for compensation from PTTGC for the destruction, loss, or damage to natural resources as authorized by the order of the Pollution Control Department.[254]

In the United States, in addition to Federal Laws, there is a State Water Control Law §62.1-44.15 under Code of Virginia Year 2013, which lays down the rule that the State Water Control Board shall have the duty and the authority to study, investigate all problems regarding the quality of state waters, provide reports and recommendations[255], and investigate any large-scale killing of fish.[256] The report that is prepared by the State Water Control Board to the public is very thoroughly documented. When the water is contaminated, as much information as possible has been recorded. In the U.S.A., a quick response to the fish killed would be treated as an emergency response situation. Essential information from the field work would be collected in the investigation report, in order to determine the cause of death, conditions that lead to the death, and the size and number of each species killed by the incident. [257] Investigators would receive the chemical analysis and biological laboratory report

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[253] USAID, "*Environmental Compliance and Enforcement in Thailand: Rapid Assessment*", October 2004, at 5
[254] The Pollution Control Department Order No. 216/2552
[255] State Water Control Law §62.1-44.15 (2)
[256] State Water Control Law §62.1-44.15 (11)
[257] Virginia Department of Environmental Quality, VIRGINIA, "*FISH KILL INVESTIGATION GUIDANCE MANUAL*", (2nd ed. March 2002),

of species collected, and put the result in the report. This final report is also made available to the public.

This is such a substantial difference with Thailand, since no official report made by a relevant government agency has been released to the public.

#### 4.2.6.3 Problems of Thai Laws

**The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA)**

According to Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA) or other provisions, the term **"value of natural resources"** has not been clarified and defined in the Act.

When considering the term "value of natural resources", it can be shown that the interpretation of this term is varied. Some would include the determination of the non-use value. In contrast, some may not interpret the term value to cover a non-use value. Therefore, "the total value" of natural resources destroyed, lost ,or damaged by such an unlawful act or omission can be described in many different ways.

Moreover, the NEQA1992 does not provide the definition of "**damage** to natural resources" as stated in Section 97, and it is unclear if damage to natural resource covers both physical and functional (service) damage. According to the process of natural resource damage assessment, the details of the steps should be clearly indicated in NEQA or the Ministerial regulation.

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www.deq.virginia.gov/Portals/0/DEQ/Water/Guidance/022002.pdf (accessed on July 14, 2015)

**Regulations of the Office of the Prime Minister on cooperation of environmental law enforcement B.E. 2550**

Regulations of the Office of the Prime Minister on cooperation of environmental law enforcement B.E. 2550 specifies measure and cooperation method between government and private entity to protect and restore environmental damage. According to this regulation, the government authority needs to prove the following damages;

1.Damages deemed to be received from the damaged environment;

2.Damages derived from a government statement of expenditures or other funds in order to restore the damaged environment or ecosystems back to normal condition;

3.Opportunity costs for investment in other projects or policy;

4.Damages of responsibility gained for health care that is deemed to happen in the future.

5.Continuing Damages deemed to occur in the future. [258]

However, scholars discuss measure and method available under this Law as "Internal regulations amongst government authority", not law. This regulation should be fully enforced and applied. Due to the author's research, this regulation has not been applied to previous environmental cases.

**Thai Civil and Commercial Code**

Thailand has confronted inflexible laws, regulations, and practices. These are the following disadvantages of Thai Civil and Commercial Code to apply with Ao Phrao's case. Under Thai Civil and Commercial Code, Tort law is available for the claim of compensation of Damages. Section 420 of Thai Civil and Commercial Code concerns the liability based on fault or fault based liability. Compensation for injured

[258] Regulations of the Office of the Prime Minister on cooperation of environmental law enforcement B.E. 2550

parties is described under Section 438 of Thai Civil and Commercial Code, as well as damages to natural resource.

Under Section 438 of Thai Civil and Commercial Code, the consideration of the circumstances and the gravity of the wrongful Act is a general concept that is mainly used for the court to apply with the natural resource damage assessment case. No specific laws cover the determination of compensation of damage to natural resources. Sections 438 - 442 of Thai Civil and Commercial Code can be applied with the natural resource damage assessment's case - for example, the partial fault of injured party under Section 442.[259]

**4.2.6.4 Lack of specialized environmental staffs and human resources**

The lack of specialized human resources can be seen from the previous decision. The Prakanong Public Prosecutors filed a case against the Central Chemical Public Company Limited, who released an oil and chemical substance into the Chraopraya river without any permission. The trial court and court of appeals decided that such company action fell under the Section 119 bis of Acts on Navigation of Thai Waters Act, B.E.2456 (1913) [260], and further awarded damages of 1,000,000 Baht to the Marine Department, based on the circumstances of the company action in order to compensate any expenses incurred in the cleaning or rehabilitation process.

Because of the violation of this provision, the company was responsible for clean-up or removed costs and other expenses incurred from the action as indicated under Section 119 bis. However, the situation went wrong. Thai Supreme Court Decision No. 638/2538 demonstrated that the Phrakanong public prosecutor did not raise the specific issue of the expenses paid by the Marine Department to recover the Chraopraya river in the plaint. The Supreme court therefore reversed the judgments of

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[259] Section 442 of Thai Civil and Commercial Code, "If any fault of the injured party has contributed in causing the injury, the provisions of Section 223 shall apply mutatis mutandis."

[260] Amnat, *supra* note 239 at 543

the trial court and the court of appeals. Each issue must be raised by a party to a suit. If a party does not raise an issue, the court cannot consider that issue.

The result was that no compensation was awarded to the Marine Department in this case. It is questionable why the public prosecutor neglected to prove the expenses, which should have been included in the plaint. In the end, it caused a huge mistake to the case. **This case shows the lack of skill of the representative authority to claim for damage to the environment. The consequence is that the clean-up costs and follow-up restoration costs are unfortunately paid by the government, not the polluter.**

In China, it is interesting that not only the Research Centre of the State has been established to deal with environmental damage assessment but also the local agencies have been set up -for example, the Kunming Centre for Environmental Pollution Damage Identification and Assessment. Another important mention is "The Judicial Authentication of Environmental Pollution Damage to Natural Resources", which has been proposed in China.

The lack of specialized human resources to deal with environmental damage assessment and the specific organization that is primarily responsible for environmental damage assessment have caused a huge problem of unnecessary delay to claim for damages to natural resources caused by oil spills.

#### 4.2.6.5 Lack of environmental research

In Thailand, there is no record or research on silt before an oil spill incident. Dr.Thorn Thamrongnawasawadi from Kasetsart University stated that Thailand has "never limited the level of hydrocarbon contamination in the ground of the sea or silt, since we have never studied on it." [261] Therefore, we cannot examine how severe the spill of oil was from the ships to the beach in Ao Phrao's case by comparing what is recorded before and after the oil spill incident. For this reason, there

[261] Isranews agency, issue date 5 March 2014, http://www.isranews.org/thaireform-other-news/item/27697-oil-spill_27697.html (accessed on June 30, 2014)

is a call for more environmental research, records, and regulations on the standard of the ground of the sea or silt.

#### 4.2.6.6 Other Problems

It is not clear from the text of Thai laws or any previous decisions as to **what kind of loss can be recovered**. Economic losses may or may not be included. OPA provided the right for a claimant to recover damages for the loss of profits and impairment of earning capacity resulting from damage to a natural resource.[262]

In many cases, an administrative agency or State official will avoid performing the official duties and necessary recovery damage within the appropriate time, or as required by the law. [263] One of the more wrongful government actions was the case of the **Supreme Administrative Court No. 597/2551,** with respect to the Pollution Control Department, who lost the case in the Supreme Administrative Court and was ordered to compensate 22 Kliti villagers**.** The supreme Court referred to it as failure to perform duties. Currently, this decision would still be a good sample for latter cases in which the government agencies neglect official duties required by the law to be performed, or perform such duties with unreasonable delay.

Regarding the controversial Xayaburi Hydroelectric Power Project, the Thai Administrative Court ruled that the plaintiffs, a Network of Thai people living in provinces along the Mekong River, have a legal standing to bring a lawsuit against the defendants, which include Thai government authorities and contractors of the Xayaburi project, for the failure to comply with the relevant laws, particularly their willful disregard of any environmental impacts that the project may cause to environmental quality and community interests. [264] It is interesting that the government authorities in Thailand often fail to perform their duty when it is concerned with the damage to a natural resource.

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[262] 33 U.S.C. § 2702 (b) (E)
[263] Section 9 (2) and 42 of Act on Establishment of Administrative Courts and Administrative Court Procedure
[264] The Thai Administrative Court ruling No. 8/2557

In an oil spill case in Thailand, the damage is connected to many departments and working mechanisms, which include the government authorities of the Department of National Parks, Wildlife and Plant Conservation, the Pollution Control Department, the Marine Department and the Department of Marine Coastal resources and local authorities, who work together in damage assessment. The process of damage assessment should be made considerably faster and more straightforward than before.

### 4.2.7 Comparison of Thai Practices and Foreign Practices Regarding Natural Resource Damage Assessment

**USA**

The U.S.A. is one of the first countries to completely recognize a compensation system for environmental damage. The U.S.A. has set up compensation systems by studying economic methods and theories, observing from previous cases, and developing these into new ideas of damage calculation.

**Legislation system**

The CERCLA, Oil Pollution Act, and Clean Water Act, are implemented to provide methods for environmental damage compensation and liability claim. The process of quantifying the damage resulting from an oil spill is referred as "Natural Resource Damage Assessment" or NRDA.

In the CERCLA and the Oil Pollution Act, the definitions of Natural Resource Damage Assessment are closely similar.[265] **The amount of damages refers to the amount and cost of restoring the injured natural resources to baseline condition. It also includes compensation for the interim loss of injured resources pending recovery (the interim loss in the natural resource's value from the time of the incident until full recovery) and the cost of a damage assessment**.[266]

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[265] CERCLA §101(16) and OPA §1001(20)

[266] Code of Federal Regulations Department of Interior Natural Resource Damage Assessments [43 CFR Part 11] and [15 CFR Part 990].

Not only are provisions provided in the U.S.A., but also applicable methodologies of Natural Resource Damage Assessment and working trustees on natural resource damage assessment: DOI and its subordinate organizations, and/or National Oceanic and the Atmospheric Administration (NOAA), and/or responsible parties, with the participation of relevant federal and state departments, such as the Department of Agriculture and the EPA. In Thailand, we face a lack of methodologies for Natural Resource Damage Assessment.

**Assessment step**

In order to quantify the damages to animals in oil spill cases, the government agency uses records from site surveys in the contamination area to form an estimation of the number of animals affected. The NRDA team will release the number of killed animals and the number of oil-affected animals as shown in the investigation report and make this available to the public. [267] In Thailand, an assessment step for a natural resource is not clearly identified and not be forced to be revealed to public.

The target of NRDA in the U.S.A. is generally based on the primary restoration options, such as restoring the damaged natural resource to its pre-damage condition (Baseline condition).

**Fund system**

A Special fund system for environmental damage compensation is the main financing source for compensation and restoration in the U.S.A., in accordance with the ratification of the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992, often referred to "Fund Convention", while Thailand has not set up the fund system.

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[267] UC Davis School of Veterinary Medicine, Oiled Wildlife Care Network, "*Natural Resource Damage Assessment*", http://www.vetmed.ucdavis.edu/owcn/oiled_wildlife/nrda.cfm (accessed on June 14, 2015)

The Oil Pollution Act uses the cost of restoring the destroyed resources to the baseline condition, together with the interim loss in value of natural resources. The trustee will find a range of restoration alternatives, which includes: (a) a primary restoration component, and (b) a compensatory restoration component. The measure under the White Paper and the Oil Pollution Act is to assess damages by using the cost of the restoration measure, not by placing the monetary value on the lost natural resource services. [268]

However, there are several differences between the U.S. NRDA rules and the White Paper; for instance, the EC commission has emphasized the cost and benefits of a restoration plan in the White Paper. Other factors are unspecified in the White Paper. [269] Even though the U.S.A. has good provisions and clear language as indicated in the CERCLA and the OPA, there is still a delay for trustees to start an assessment. The problem is derived from the following reasons[270]:

The lack of experience of trustees;

The complicated issue regarding the valuation of damage to a natural resource:

The absence of the guideline for trustees.

**China**

China has established a judicial authentication management system. "The Judicial Authentication" in China allows expert witness to apply science, specific methods, specialized skill, and past experiences to test, authenticate, and identify damage to an environment in the case. Specific methods can consist of the experiment, observation, formula, or other methods. This is such an interesting idea.

The Judicial Authentication in China varies from the expert witness under Thai Law. For instance, the Judicial Authentication Name-List System is

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[268] Michael & Alan, *supra* note 56 at 333
[269] *Id.*
[270] Edward H.P. Brans, *supra* note 38 at 70

recognized in China. The Authentication Report is recognized in China as a powerful proof which can be taken into the consideration of the court. The report also can be considered as more powerful and reliable of proof than witness oral testimonies and written documents.[271]

Various and different methods for a calculation system in China, apart from similar methods under the U.S. legal system, have been recognized, such as the statistical estimation method, production effect method, simulation experimental method, Fish eggs and larvae estimation method, and other interesting methods.

**Europe**

Under the White Paper, the term "damage" is clearly identified as environmental damage, which includes: Damage to biodiversity, Damage in the form of contamination of sites and Traditional damage. Furthermore, the clarification of "significant damage" is also include under the White Paper. In contrast, the Thai NEQA does not explain the term "damage".

Thailand does not have a Directive that provides the term "remediation" or systematizes the step of remediation. Under the EU Directive, the primary remediation relates to any remedial measures which cause the damaged natural resources and/or impaired services return to the baseline condition. The condition before the incident occurred is the explanation of baseline condition.[272] If "primary remediation" does not result in restoring natural resources to its baseline stage, "complementary remediation" will be undertaken. Next, "compensatory remediation" will be undertaken to compensate for the "interim losses".[273]

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[271] Supreme Court's Regulations about Civil Procedure Testimony, 2001, 33, art. 77

[272] Lucas Bergkamp & Barbara Goldsmith, *supra* note 171

[273] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 ANNEX II 1 (d) "interim losses" means losses which result from the fact that the damaged natural resources and/or services are not able to perform their ecological functions or provide services to other natural resources or to the public until the primary

The White Paper is not as specific. The White Paper does not provide the indication of what is the appropriate restoration measure, [274] and does not give much detail as to what conditions each method will be used, which can cause difficulty in providing an appropriate solution.

Analogous between the EC White Paper and the U.S. Oil Pollution Act, is the White Paper paragraph 4.5.1 which affirms to use the restoration cost as the first step to determine damages by considering the restoration costs for the recovery of the monetary value of the lost restoration service. The European Commission expresses a clear preference for restoration cost as the elementary measure of damages. This is closely similar to the approach applied by the US trustees under the CERCLA and the OPA. [275] U.S. rules and the EC White Paper prefer an assessment of damages on the cost of restoration measures. The European Commission also guarantees the ability to use the economic valuation methods to determine reasonableness, and use it as the method of damage assessment when there is an injury to a natural resource that is irreparable and no other alternative solutions are provided.

The White Paper suggests to use a reasonableness test or cost-benefit analysis (CBA). However, it does not provide what means are considered preferable to use. [276] The reasonableness test concerns the weight of these factors, the costs of a restoration plan, the extent to which the restoration plan supports natural recovery, the effects to non-injured species and habitat from the proposed plan, the cost-effectiveness of the measures, and other reasonable factors.[277]

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or complementary measures have taken effect. It does not consist of financial compensation to members of the public.

[274] Michael & Alan, *supra* note 56 at 328

[275] Michael & Alan, *supra* note 56 at 332

[276] Edward H.P. Brans, *supra* note 38 at 209

[277] *Id.*

However, the main difference between the U.S. rules and the White paper is that the White Paper does not consider the recovery of interim losses from the incident until full recovery, while it is taken into account under the U.S. rules.

**New Zealand**

According to the primary research, the economic valuation on a natural resource is concluded as an important thing to consider under the Resource Management Act 1991 (RMA). In New Zealand, no laws or guidelines are directly concerned with methods of natural resource damage assessment, and this characteristic is closely similar to the Thai system. However, non-market valuation approaches have been applied by the decision-maker for environmental valuation in policy planning in New Zealand. [278]

### 4.2.8 Analysis on what method is suitable for damage assessment in Thailand and Ao Phrao's Case

There is one question "Why do we need to know or estimate the benefits of a natural resource? ". Reasons behind this are to consider the value of a natural resource in order to claim for damages, and/or apply the value in the project planning process. We find the true value of a natural resource to compare with the benefits of its construction project. To define the value of a natural resources, it is not important that such natural resources must be sold in the market. The value of natural resources can be measured by how necessary they are to people and the environment.[279]

Discretionary power of judges might be inaccurate, as there are no guidelines to measure the damage and what amount should be compensated. It is obvious that there are many differences in each judge's discretion and calculation

[278] New Zealand Institute of Economic Research (NZIER), *supra* note 192
[279] Dr. Alberto Longo, Department of Economics and International Development, University of Bath, "*The methods to estimate the monetary value of the environment*", http://www.czp.cuni.cz/czp/images/stories/Vystupy/Seminare/2005%20LS%20Oceno vani%20ZP/longo_methods.pdf (accessed on May 22, 2015)

method. It therefore raises one question: Is it possible to find a reasonable basis for calculation damage to the environment? Normally, the judge takes into account details from the facts provided by individuals. The outcome of the cases would be different due to the lack of a standard. Providing a scheme or guideline to calculate the damage and how to assess environmental damage under Thai laws would l be a good idea.

Thailand should follow another country, for example, the U.S.A., since there are many useful economic methods in the U.S.A., which include market price analysis, Hedonic Pricing Method, Travel cost method, Contingent Valuation method, and Habitat Equivalency Analysis (HEA) to deal with damage assessment.

**Application of Market price analysis**

In Ao Phrao's case, the market price of fish can be applied to calculate the damage assessment in an oil spill incident case by comparing the market prices before and after an incident happens. This approach appraises the economic value in a commercial market.


**Figure 4.2: Comparison under market price method**

After an oil spill incident, water pollution to the marine system occurs, which leads to the closure of the commercial fishing area. The market price can be the first method to be selected in an oil spill's case, since the primary natural resources affected is aquatic animals, especially fishes that are generally caught for commercial activity.

Furthermore, under the market valuation method, lost profits, the decreased property values, and the decreased renting prices can also be applied to

measure damage to a natural resources.[280] Because this method is quite easy, it can be considered as a convenient way to measure damage to an environment.

Cons of the market price method

First, as a result of the oil spill, the coral reefs at Ao Phrao had been bleached. Coral reefs are prohibited to trade in the market, and no market value has ever been recorded. Therefore, the first disadvantage of this method is that we are unable to know the value of some specific resources. It is a substantial problem to apply the Market Price Method in the oil spill case.

Second, the main concern is that when fishermen cannot catch fish in Ao Phrao area, the price of fish can be increased due to the shortage and imbalance of demand and supply. However, it can also be lower than previously. The result would not be accurate, since many factors can affect the market price as well such as consumption behavior, which will affect demand and supply of fisheries product.

**Application of Contingent Valuation**

"Contingent Valuation" should be considered as a good method to apply, as it can be used in many cases due to its flexibility. "Contingent Valuation" is suggested by The National Oceanic and Atmospheric Administration (NOAA) for wide use as "it can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values". The contingent valuation method is stated in the Ohio v. Department of Interior case in the U.S.A. as an acceptable method for calculating option and existence values. It is considered to be very flexible in estimating value of natural resources. Therefore, "Contingent Valuation" should also be applied in Thailand to valuate environmental damage, if the law allows to do so.

A questionnaire in the Contingent Valuation Method would provide visual information to respondents. For example, providing photos of the beach, sea, and

[280] M W Jones, *supra* note 43, at 503

marine animals compared between the pre-spill and post-spill; record of dead marine life and birds; and a chart comparing the pre-spill and post-spill estimation. The contingent valuation method can be considered as the most basic method to evaluate the non-use value of national resources.

In the author's opinion, focus groups under this method would be local people in Ao Phrao's area. In order for the result to be the most accurate, the wording used in the survey and questions should be easy to understand for local people, and in a way that lead respondents to give an unbiased answer.

Complex questions and explanations in the survey content based on scientific and statistics analysis might not be appropriate to use in the survey for damage assessment. Simple questions should suit Ao Phrao's oil spill the most. After the data and surveys are collected, a data checking process should be included to review the data quality.[281]

The EC White Paper points out that the contingent valuation method can be costly if measuring a large number of victims.[282]

**Application of Habitat Equivalency Analysis**

In my point of view, the Habitat Equivalency Analysis is a good alternative for damage assessment. The Habitat Equivalency Analysis can show the utility losses that are equivalent to the damage to a natural resource. This method is used in the U.S.A. to claim damages against parties responsible for natural resource damage resulting from oil spill incidents. It focuses on the service or the lost services that the ecosystem provides to the biotic component, which is considered the best way

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[281] William H. Desvousges, F. Reed Johnson, Richard W. Dunford, Kevin J. Boyle, Sara P. Hudson, and K. Nicole Wilson, "*Measuring Nonuse Damages Using Contingent Valuation:An Experimental Evaluation of Accuracy*"(2nd ed.)

[282] European Commission, "*White Paper on environmental liability*", http://ec.europa.eu/environment/legal/liability/pdf/el_full.p , at 20

to assess the value of a natural resource. However, this method is not flexible in some situations.

The application of several economic methods to measure the natural resource damages in Ao Phrao's case are as follows:

| Economic methods | Application |
|---|---|
| **1. Market Price or Market Value Approach** | This is "Market-based methods". Under this method, we will consider the impact of oil spills on market goods. Fish around Koh Samed are seriously injured by oil spills.<br><br>The value of damaged fishes will be calculated by the number of fishes killed by the oil spill multiplied by the price of the fishes.<br><br>However, this raises the issue of a conserved resource that is prohibited or unable to trade in the market. For example, coral reefs. The consequence is that no market price method can be used as a standard for the valuation of the natural resources. |
| **2. Hedonic Pricing Method** | The price of marine products, for example, dried and frozen seafood from the Samed Islands or the place near the contaminated site, will be priced less than products from other places which have not been affected by the oil spill.<br><br>However, this method is mostly applied to variations in housing prices that reflect the value of local environmental attributes. The selling price of hotels in |

| | |
|---|---|
| | the location of Ao Phrao or the contaminated site would be lower than the non-affected area due to the quality of the environment. |
| **3. Production Function Method or Productivity methods** | The productivity method is applied in cases where natural resources are used to produce goods in the market by considering their contribution in the production of goods.[283] Due to the above explanation, the author has an opinion that it cannot apply to this oil spill's case since it is too complex to assess. |
| **4. Travel Cost method** | Ao Phrao, Samed islands is a recreational site. The travel Cost method can be applied by measuring the economic benefits of the natural resources or how much people are willing to pay to travel in the site. Entry Ticket fees, on-site-expenditures, amount of travel time spent and/or the opportunity cost of travel time, and fuel costs can be all considered as "Travel costs". After processing by an economist, the demand curve and the consumer surplus would be shown. The value of Ao Phrao can be processed and revealed under this method. |
| **5. Contingent Valuation Method (CVM)** | This method can measure both the use and the non-use values of natural resources by surveys. Surveys may be taken by stating the maximum amount they would be willing to pay with, yes and no questions and the multiple choices of given prices.<br><br>In order to measure the value of natural resources, surveys under this method would provide information to create a better understanding to respondents as follows; |

[283] Christopher & Averil, *supra* note 29

| | |
|---|---|
| | - Photos of marine lives which were killed by the spill;<br>- Comparison photos of the area before the oil spill with after the oil spill;<br>- A satellite photo or map identifying the area of the oil slick;<br>- A chart comparing pre-spill estimation and post-spill estimation of fishes, shellfishes, crabs.<br><br>The public determines the values of the natural resources via the surveys, and that value later becomes a monetary amount. |
| **6. Contingent Choice Method** | Under this method, respondents will be asked to make a decision or choose one choice based on a simulation. The Contingent Choice Method must provide an explicit description of the destruction of the natural resources resulting from the oil spill for the respondent's consideration.<br><br>The choice they make will directly refer to the value of the natural resources. The designed choices can be used to evaluate damage in the environmental case. |
| **7. The Restoration - Based Approach/Habitat Equivalency Analysis (HEA)** | This method can be called the Habitat Equivalency Analysis (HEA). It is applied by looking at the service or the lost services that the ecosystem provides to the biotic component in Ao Phrao's case. |

**Table 4.1: Application of economic methods in Ao Phrao's case**

Apart from Economic Methods, there are some useful approaches for environmental damage assessment.

**Application of Community preference-based damage schedule**

A damage schedule can be considered an alternative method of valuing environmental damage, since the relationship between each creature in nature is very complex. The damage schedule is not just produced by one person - it needs to be produced by the community.

In the view of oil production and exploration companies, damage schedules can lead to predictability in the form of a fixed table or schedule. Such a schedule can obstruct companies from the event which makes pollution or contamination. The company would therefore put in more effort to prevent the oil spill.

An alternative of placing monetary values towards environmental damage is to use the designed schedules with a fixed compensation which can show community judgment on the value of an environmental resource, and changes in the environmental and resource value. The designed schedule is derived from the assessment of community preferences with respect to changes in natural resource value. [284]

A compensation schedule approach has been developed to provide economic damages when collected information is insufficient or cannot be collected. Some scholars believe that a damage schedule can provide a quick calculation of damages in a less time-consuming fashion compared to other methods. Another advantage is that there would be no need to ask people to place a monetary value on the losses.

In the author's opinion, a damage schedule is not appropriate to be the basis of damage calculations for natural resources in Thailand, as it is difficult to apply in Thailand.

Using a damage schedule can further lead to these problems;

**An inaccurate valuation result**;

[284] Ratana Chuenpagdee et al, *supra* note 212

A damage schedule cannot provide an accurate result of valuation of environmental losses. Also, a completely optimal allocation cannot be achieved under this valuation.[285]

**Different factors must be taken into account when the oil spill incident took place.**

First, each place has a different environment, atmosphere, and variety of natural resources, and therefore compensation to the environment must be awarded differently. An obvious disadvantage is that a damage schedule is generally based on general information and evidence. In the author's point of view, the natural resources in environmental conservation areas must be valued more than in abandoned areas.

Second, each oil spill incident comes from neglect or deliberate action of the polluter. Negligence is less serious than deliberate or willful action. Compensation and penalties arising from the willful misconduct should be more severe and placed higher than negligence. The damage schedule cannot account for this determination.

Third, the polluter's response to the spill should be included in determining the value of damaged natural resources. In truth, the recovery of an affected area tends to be more effective if the polluter pays attention to recovering the damage by providing the best facility for its clean-up operation, as well as a well-planned restoration program so that the affected area can be recovered rapidly.

**To summarize, an accurate valuation result from a damage schedule is hard to achieve under damage schedules in Thailand's context.**

[285] *Id.* at 3

# CHAPTER 5
# CONCLUSIONS AND RECOMMENDATIONS

**Conclusions and Recommendations on problems concerning recovery from damages in oil spill case**

## 5.1 Conclusions

Natural resource damage assessment is really unorganized and inconsistent in Thailand. The traditional economic valuation approach by counting the death toll of marine life or the use of a single method are not sufficient to deal with natural resource damage assessment in oil spill cases. Oil spill incident materially affects the well-being, living, body mechanism and reproduction system of marine animals and corals in the affected area. Marine life died immediately, and after that, people were unable to fish and enjoy their lives. Despite efforts to remove oil from the surface, adverse effects to the environment and natural resources persist.

The U.S.A. is one of the developed countries that have laid the basis for a structural natural resource damage assessment system either by theory and practical experience. The valuable experiences of the U.S.A. in terms of NRDA have been extensively studied and pave the way for other countries in the world. Different kinds of damage assessment methods should be applied in practice to generate an estimate of damage or monetary value of destroyed resources in oil spill cases in Thailand.

Economic analysis is just one of the many different methods used in natural resources damage assessment. However, economists should work together with experts or the concerning government authorities to calculate or claim damage to natural resources in order to develop rational methods to be used in natural damage assessment.

In the author's opinion, the application of economic valuation analysis for natural resource damage assessment does not aim to overrule discretionary power of judges. Judges will have the full independent right to decide on the cases. Issuing guidelines on how to calculate environmental damages by the Court of Justice should be implemented to visualize and avoid obstacles in determining injuries and assessing damages for judges sitting in environmental cases.

## 5.2 Recommendations:

1. Firstly, the term "**the value of natural resources**" following Section 97 of The Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA) should be defined in the Act in order to avoid misinterpretation and make the term clearer. When the term "the value of natural resources" is not clearly defined, it may lead to various interpretations. In the author's opinion, "the total value" of natural resources destroyed, lost or damaged by an unlawful act or omission under NEQA, should be defined to conclude both Direct Use Value and Indirect Use Value as widely accepted in foreign countries.

As described in Chapter 2, the value of natural resources is not simply limited to "Consumptive Use Value". For natural resources, the total value is not only "Use value". Both the Use Value and Non-Use Value" can be contained in the value of natural resources. The Non-Use Value or Existence value is an indirect value. The Non-Use value also covers "the option value"- to preserve natural resources in order for future generations to experience a particular environmental amenity, "the existence value"- a willingness to pay simply to help preserve the existence of natural resources and "the Bequest value" which is the Non–Use Value that a person would like to reserve natural resources for future generations. ‑Existence-value can be revealed in surveys under the contingent valuation method as people will be asked to place monetary value on things or natural resources.

However, in the author's point of view, only the Use Value (both Direct Use Value and Indirect Use Value) should be taken into account for the total economic value calculation for natural resource damage assessment since the application of Non-Use value is hard to achieve without controversy. It must be used with care and thorough discretion. Therefore, the Non-Use Value should not be taken into consideration of the term "Value" in Thailand as it is beyond the scope that can be accepted in Thailand.

The NEQA1992 does not provide the definition of "damage to natural resources"; it is unclear that damage to natural resources extends to "functional (service) damage" or not. As previously explained, it is difficult to identify damage to natural resources in

those cases where marine animals are not directly killed but may still suffer from habitat damage or ecosystem damage. To clarify, two marine organisms can live together in order to get benefits from the other without affecting the life of each other. When one organism is damaged, this scenario is also considered as "functional damage".

Therefore, it is further suggested that the scope of coverage of the term "damage" in the NEQA should also include "the damage to marine ecosystems, biodiversity, habitat, marine aquatic resources, species distribution and species reproduction" in order to ensure that the interpretation of the court will cover these areas. It is also interesting that in many cases, the pollution also contributes to the decrease of birthrates as a consequence of adverse effects on reproduction systems.

In the author's opinion, the definition of **"damage"** in Section 97 of the NEQA should be specified as **"the damage to marine ecosystems, biodiversity, habitat, marine aquatic resources, species distribution and species reproduction and/ or other damage that considered appropriate"**. The benefit of adding the definition of "damage" in the NEQA is to cover damage to diversity, habitat, marine aquatic resources, species distribution, species reproduction and other types of damage. Under the term specified above, the damage to the habitat and reproduction systems of marine aquatic resources are included.

The author has an opinion to include the above mentioned definitions in NEQA because the NEQA is a specific law to deal with pollution. Damage to natural resources is more specific. The Thai Civil and Commercial code deals with many areas of laws such as property, tort, business organization. The term "damage" does not easy to define in the Thai Civil and Commercial code because it relates to personal injuries, property damage and other areas.

2. Since there are no specific regulations or guidelines dealing with civil liability of oil spills which can provide a model to calculate the damage and how to assess environmental damage, the improvement of standards for environmental impact assessment mechanism is highly called for. Without the guidelines or guidance, it will be difficult for authorities to handle damage assessment.

Normally, the judge collects details from the facts provided by litigants or the

State in this case and takes them into account. Decisions on natural resource damage assessment are hard to make because no market prices are provided for some kinds of natural resources. The outcome of the cases would be different or inconsistent due to the lack of standards for judges to follow.

Providing internal regulations for judges to calculate the damage and how to assess environmental damage under Thai laws will be a good idea. The outcome of compensation awards will be more reasonable and more consistent than previous cases.

In reality, the process of passing laws takes longer time than the guidelines. If a specific law is too difficult to enact, the author suggests issuing **"Guidelines on how to calculate environmental damages"** by the Court of Justice in order to ensure that courts' response is consistent and standardized in their awarding of damages. These guidelines should also consult with the other environmental research centers. Economic measures as stated in chapter 2 should be applied for the Ao Phrao case and other environmental cases in the future.

Not only should the Court of Justice study economic measures for valuation of natural environments and resources, but also the Pollution Control Department or other concerning authorities should. In China, the Ministry of Environmental Protection released the Paper of the Recommended Calculation Methods for the loss caused by environmental pollution damage. It will be a great idea for Thai government agency to follow.

The application of economic valuation analysis should be applied to help the judges in the determining of natural resources damage assessment, especially in the Ao Phrao case. For instance, the court may employ the contingent valuation method or benefit transfer as part of the calculations in environmental damage cases. Nonetheless, economic methods are just one of the models for the Court of Justice to apply to the cases.

3. Applying interesting methods from other countries in the Thai compensation system would be a good solution in oil spill cases. In China, there are various types of method provided by the Ministry of Agriculture, for example, Direct calculation method, Comparative method, Site-specific harvesting method, Corralling statistical

method, Statistical estimation method, Survey statistical method, Simulation experimental method, Production effect method, Production statistical method, Expert assessment method, Fish eggs and larvae estimation method and other methods as stated in chapter 3.[286]

4. The process of natural resource damages assessment should be clearly specified under the laws or regulations as well. Government agencies spend a lot of time which causes the delay of action for performing their duty in natural resource damage assessment. This problem is caused by the lack of a clear damage assessment methodology in the laws or regulations. The government agencies face the problem of how to identify environmental damage and the value of natural resources.

Many developed countries, such as the U.S.A., have set up compensation systems which comprise of these areas: the scope of compensation to environmental pollution, steps of damage assessment, investigation reports, public participation and guidelines by the Court of Justice to award damage in the environmental cases. They also set up an administrative agency to study and develop calculation methods, processes and systems for damage assessment and compensation compatible with their background and national system.

According to the process of natural resource damage assessment, these steps should be clearly indicated in NEQA or the Ministerial regulation:

1) The pre-assessment phase: it involves pre-screening, data and sampling collection from the spill site and determination of restoration actions.

2) Restoration planning phase: it focuses on the processes to determine and quantify injuries to natural resources and services and planning for restoration projects.

3) Restoration implementation phase: implement restoration plan will force responsible parties to comply with the plan.

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[286] *Id*, at 8

The above suggestion has been partially adopted from the Natural Resource Damage Assessment under the Oil Pollution Act in the U.S.A.

5. A Natural Resource Damage Assessment Institution should be established to be responsible for technical and research support together with the assessment, monitoring and training process. This institution should include economists, ecologists, scientists and legal officers. Because of the understanding of biology, ecology and economics can help trustees to deal with Natural Resource Damage Assessment cases.

In other countries like China, the configuration of assessment agencies is also established to deal with environmental damage assessment. In China, the local agencies have also been set up to deal with environmental damage assessment. Whereas China has multiple local agencies, the Italian system has just one agency. In Italy, the Italian National Institute for Environmental Protection and Research (ISPRA) is also set up as the sole professional agency for Environmental Damage Assessment. ISPRA performs duty of scientific and technical support in oil spill incidents and other marine pollution emergencies. [287] Both China and Italy have good systems.

It would be ideal to have this kind of organization in Thailand. Thailand should set up an agency or a commission that can be considered as an administrative agency mainly responsible for natural resource assessment and how much oil spillage impacts the ecology. Cooperation with the university will also strengthen the damage calculation system and damage assessment.

Technical experts may also be appointed by the court under Section 99 of Thai Civil Procedure Code. However, the author has an idea that these appointments should be similar to "The Judicial Authentication" of Environmental Pollution Damage to Natural Resources under the Chinese Legal System. As a result of judicial authentication, the assessment will be released in the form of "Authentication reports"

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[287] European Global Ocean Observing System, "*Italian National Institute for Environmental Protection and Research (ISPRA)*", http://eurogoos.eu/member/ispra-institute-for-environmental-protection-and-research-ispra/ (accessed on July 1, 2015)

by the technical experts that allow the court to apply specialized knowledge, methods and past experiences to test, authenticate and identify damage to the environment in the case.

6. A limitation of time for the government agency to complete the process of natural resource damage assessment should be amended from ten years (general limitation of time) to two years. The claim should be submitted in the court to challenge natural resource damages within two years because the money that the state will be received as damages can be used for restoration and recovery of damage to natural resources. Ten years might be too late to recover damage to natural resource. We also discovered the delay of environmental damage cases which the State can claim under Section 97 of the Enhancement and Conservation of National Environmental Quality Act of 1992 (NEQA). In the author's point of view, the Government has to take the responsibility of getting payments from the operator as soon as possible. This is precisely what the government seeks to achieve.

Otherwise, the authorities could be considered negligent, as they have failed to protect the interests of the State concerning destruction of the environment from an oil spill incident. It is also connected with the loss of a sustainable use of natural resources by villagers in the area.

7. Supporting more environmental research by government authority and the development of valuation standards should be enacted. For example, seawater-quality tests can show the level of petroleum hydrocarbon and mercury of seawater to determine the oil spill's impacts on marine and coastal ecology. Environmental information and researches were based on scientific evidence in different areas can be extremely useful and contribute to greater knowledge. This empowers government authority on environmental policies or rules. It also makes judges understand the impact and helping them make a decision. For instance, judges can simply use information of silt in seawater or marine animals in Ao Phrao area from research to compare the level of hydrocarbon in silt before and after an oil spill.

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