

Environmental Impact Assessment for Offshore Oil and Gas Projects

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INTRODUCTION

In Japan, offshore oil and gas projects are not legally subject to Environmental Impact Assessments (EIAs). Operators who carry out exploratory drilling usually voluntarily conduct EIAs and submit reports to a public authority. Given that the Japanese Government is now officially promoting offshore development, we believe that developing Japanese EIA guidelines more aligned with what is used globally (referred in this paper as “global” EIAs), is necessary to help operators evaluate environmental impacts and regulators (the Japanese Ministry of Economy, Trade and Industry [METI]) review EIAs accordingly (METI 2019).

With the objective of proposing global EIA guidelines for offshore oil and gas projects to METI, we examined EIA reports in countries with abundant experience in this industry. This paper outlines our study results, focusing on (1) assessment methodologies; and (2) assessed specific environmental impacts within each EIA.

METHODS

We analyzed 58 EIA reports developed in five countries (the United Kingdom [U.K.], Norway, the United States [U.S.], Brazil, and Australia) that mandate EIAs for offshore oil and gas projects (see Table 1). The EIA reports were classified into four project phases: exploration, drilling, development & production, and decommissioning. The number of EIA reports for each project phase was 7, 15, 19, and 14, respectively. Australia was excluded from the total count because their EIA reports included all project phases in one report.

Assessment Methodologies within the EIA Reports

To observe trends in assessment methodologies, we analyzed EIA reports in two stages. Between 2014 and early 2015, we analyzed 40 publicly available EIA reports developed in five countries (U.K., Norway, U.S., Brazil, and Australia) (“First Study”). In 2016–2017, we examined 18 publicly available EIA reports developed after the First Study, in three countries (U.K., Brazil, and Australia) (“Second Study”). In the Second Study, we excluded Norway and selected the U.K. as a country representing the development of offshore oil and gas projects in the North Sea; and also excluded the U.S. because the legal requirements for EIAs are different compared to the other countries we researched (i.e., the public authorities conduct EIAs, not the operators).

Assessed Specific Environmental Impacts within the EIA Reports

To examine what specific environmental impacts are included in global EIA reports, we analyzed specific environmental impacts in the 55 EIA reports (the abovementioned three Australian EIA reports were excluded). We organized this information in a matrix by project phase (see Figure 2 for an example matrix for the drilling phase). The matrix shows *project activities* and *receptors*.

Table 1. Number of Analyzed EIA Reports

Project Phase	U.K.	Norway	U.S.	Brazil	Australia
Exploration	— ¹	— ¹	3 (3/0)	4 (3/1)	3 (2/1)
Drilling	7 (6/1)	3 (3/0)	None ²	5 (3/2)	
Development & Production	8 (4/4)	3 (3/0)	3 (3/0)	5 (3/2)	
Decommissioning	9 (2/7)	2 (2/0)	3 (3/0)	— ¹	
Subtotal	24 (12/12)	8 (8/0)	9 (9/0)	14 (9/5)	3 (2/1)
Total	58 (40/18)				

Notes: Numerical values indicate the total number of analyzed EIA reports (number of EIA reports analyzed in the First Study / number of EIA reports analyzed in the Second Study).

1: “—” indicates that EIA reports are not required under the laws and regulations in the indicated project phase in the specified country.

2: In the U.S., drilling activities are subject to EIA reports but are “Category Exclusions,” where EIA reports are not required in practice, thus EIA reports for drilling are not available.

As a method to weight the importance of each assessed specific environmental impact within the EIA reports, we conducted the following calculation:

- (1) Calculate a weighted rate by country and by project phase (i.e., the number of EIA reports that assessed a specific environmental impact out of the number of total analyzed EIA reports).
- (2) Average this weighted rate by the number of analyzed countries for the project phase, and multiply by 100 to express as a percentage.

See the example below of how we derived a weighted rate for impacts of “drilling fluid and cuttings” (project activity) on water quality (receptor):

	U.K.	Norway	U.S.	Brazil
Number of EIA reports that included/evaluated impacts of drilling fluid and cuttings on water quality	5	1	0	5
Total analyzed EIA reports for the Drilling Phase (from Table 1)	7	3	None	5

Weighted rate for impacts of “drilling fluid and cuttings” on water quality (resulting weighted rate shown in Figure 2):
 $\{(5/7+1/3+5/5)/3\} \times 100 = 68$ (Rounded off)

A weighted rate of 100 means that all analyzed EIA reports evaluated the specific environmental impact. Thus, the closer the weighted rate is to 100, the more EIA reports evaluated this specific environmental impact. In this study, we defined a “globally assessed” specific environmental impact as a weighted rate that exceeds 50.

RESULTS AND DISCUSSION

Assessment Methodologies within the EIA Reports

Through our study, we found that almost all the EIA reports differentiated two types of impacts: (1) impacts of planned activities, such as discharge of domestic wastewater; and (2) impacts caused by accidental events, such as blowout.

Impacts of Planned Activities

In general, we found several types of assessment methods utilized in the EIA reports. The “Risk Assessment” approach examined risk levels by combining significance and likelihood of impacts (see Figure 1 for an example of a risk assessment matrix). Other methods included qualitative assessments without scoring, evaluation by combining significance of impacts and importance/sensitivity of receptors, and evaluation by combining recovery period receptors and scope of effects.

		Magnitude of Effect				
		5	4	3	2	1
Likelihood of occurrence	5	High	High	Moderate	Moderate	Low
	4	High	High	Moderate	Moderate	Low
	3	High	High	Moderate	Low	Low
	2	High	High	Moderate	Low	Low
	1	High	Moderate	Low	Low	Low

Figure 1. Example of a Risk Assessment Matrix Used in the U.K. (BP 2011)

Table 2 below shows the different types of assessment methods used by each country for specific environmental impacts of planned activities. Norway’s EIA reports incorporated various assessment approaches, which differed by report, while the U.S. Bureau of Ocean Energy Management (BOEM), a U.S. public authority for offshore oil and gas projects, qualitatively assessed impacts. Brazil used their own methodology in the EIA reports as specified in *NOTA TÉCNICA 10/2012*, developed by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), the Brazilian environmental regulating authority. They evaluated the magnitude of impacts and environmental sensitivity, with reference to 11 complementary indicators (e.g., spatial reach, durability of impacts, etc.), and holistically evaluated the importance/weight of impacts by combining the two factors. In the U.K. and Australia, the “Risk Assessment” approach was used in all EIA reports (12 and 2 reports, respectively). Therefore, we considered the “Risk Assessment” approach to be the mainstream approach in this industry. We found that Australia used the “Risk Assessment” approach in both the First and Second studies, while we observed a change in methods in the U.K. In the Second Study, 5 out of 12 of U.K.’s EIA reports used the “Risk Assessment” approach, while the other 7 EIA reports used other methods. It is unclear why we saw this change, since the EIA reports do not mention the reason.

Table 2. Methods Assessing Impacts of Planned Activities

	First Study	Second Study
U.K.	Risk Assessment (All)	Risk Assessment (5 of 12) Qualitative (2 of 12) Other (5 of 12)
Norway	Differed depending on the report	Not studied
U.S.	Qualitative (All)	Not studied
Brazil	Own method (All)	Own method (All)
Australia	Risk Assessment (All)	Risk Assessment (All)

Note: The description in parentheses show the number of EIA reports.

Impacts Caused by Accidental Events

In almost all the EIA reports from the U.K., Norway, Brazil, and Australia, the “Risk Assessment” approach was used to assess impacts potentially caused by accidental events. The U.S. used qualitative assessments. Therefore, for the assessment of impacts of accidental events, we identified the “Risk Assessment” approach as the mainstream in this industry.

Assessed Specific Environmental Impacts within the EIA Reports

As described in the Methods section, we identified and analyzed specific environmental impacts by project phase that more than half of the EIA reports assessed, represented as a weighted rate. We believe that these are specific environmental impacts commonly assessed in the oil and gas industry, and therefore should be included in any EIA report. Table 3 below summarizes frequently assessed specific environmental impacts found in the First and Second studies, denoted with a weighted rate (as described in the Methods section). Assessed project activities appear to characterize each phase, such as the use of air guns in the exploration phase, noise pollution caused from drilling and cutting in the drilling phase, production water in the development & production phase, and seabed disturbance by the removal of subsea facilities in the decommissioning phase. Air quality, water quality, fauna and fisheries are often examined as receptors in any project phase, as can be seen in Table 3.

Table 3. Specific Environmental Impacts Assessed in More Than Half of Analyzed EIA Reports by Project Phase

Project Activity	Receptor
Exploration	
Air gun	Fish, whales, dolphins, reptiles, protected areas and species, fisheries (all 100)
Leakage of hydrocarbon by vessel collision	Fish, whales, dolphins, birds (all 100)
Presence of vessel	Fisheries (100)
Drilling	
Emission from rig	NOx (76), SOx (64), VOC (64), CO ₂ (66)
Emission from vessels	NOx (80), SOx (69), VOC (75), CO ₂ (70)
Discharge of chemicals	Water quality (73), benthos (74)
Discharge of domestic wastewater	Water quality (73)
Noise caused by drilling	Whales (68), dolphins (62)
Drilling for fluids and cuttings	Water quality, benthos (all 73)
Blowout	Water quality (68), plankton (57), benthos (68), fish (79), whales (79), dolphins (63), birds (64), fisheries (86)
Presence of vessels	Fisheries (68)

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Project Activity	Receptor
Development & Production	
Emission from production facility	NOx (55), Greenhouse gases (51)
Emission from generators	NOx (64), Greenhouse gases (64)
Emission from vessels	NOx (64), Greenhouse gases (61)
Production water and cleaning wastewater	Water quality (57), fish (64)
Discharge of chemicals	Water quality (60)
General waste	Water quality (58)
Blowout	Whales (59), birds (62), fisheries (73)
Decommissioning	
Emission from vessels	NOx (100), SOx (80), VOCs (52), CO ₂ etc. (83)
Emission from helicopters	NOx (61), SOx (57), CO ₂ etc. (61)
Discharge of domestic wastewater	Water quality (52)
Seabed disturbance by removal of subsea facilities	Marine users (54)

Note: The numerical values shown in parentheses are the calculated weighted rates, as described in the Methods section.

Further Research

We observed a change in assessment methods for examining the impacts of planned activities in the U.K., while we saw no change in the EIAs in other countries. In the next study, we plan to further look into why we are seeing this change in the U.K.'s EIAs. Regarding specific environmental impacts, these might change and evolve with the advancement of technology, and therefore we believe that it would be useful and meaningful to continue analyzing the trends. In addition to this study, it is necessary to examine other aspects of the EIA reports to articulate more content and substance in the EIA guidelines to METI, such as how to conduct baseline surveys, make predictions, and identify stakeholders.

CONCLUSION

We analyzed 58 EIA reports for offshore oil and gas projects, focusing on assessment methods and assessed specific environmental impacts, developed in the U.K., Norway, the U.S., Brazil, and Australia. Regarding assessment methods, we found that all EIA reports developed in the U.K. during the First Study (up until 2015) used "Risk Assessment" approaches, but several other approaches were used in reports developed after 2015. We believe that the "Risk Assessment" approach was one of the mainstream methods used in EIA reports then, but might not be any more, and therefore needs further investigation. Regarding our analysis of specific environmental impacts, we recommend that EIAs include an assessment of specific environmental impacts whose weighted rates are above 50, as described in the Methods section.

We believe that our findings will help EIA practitioners working on offshore oil and gas developments review and improve EIA processes by understanding trends in global EIAs. Beyond that, the findings from this study could help examine and consider options on how to conduct EIAs for the use and development of marine resources other than oil and gas.

ACKNOWLEDGEMENTS

We express our gratitude to the Nippon Foundation, whose support in 2018 made this study possible.

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