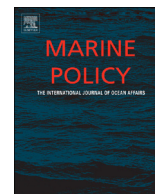




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Data challenges and opportunities for environmental management of North Sea oil and gas decommissioning in an era of blue growth

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ABSTRACT

Maritime industries routinely collect critical environmental data needed for sustainable management of marine ecosystems, supporting both the blue economy and future growth. Collating this information would provide a valuable resource for all stakeholders. For the North Sea, the oil and gas industry has been a dominant presence for over 50 years that has contributed to a wealth of knowledge about the environment. As the industry begins to decommission its offshore structures, this information will be critical for avoiding duplication of effort in data collection and ensuring best environmental management of offshore activities. This paper summarises the outcomes of a Blue Growth Data Challenge Workshop held in 2017 with participants from: the oil and gas industry; the key UK regulatory and management bodies for oil and gas decommissioning; open access data facilitators; and academic and research institutes. Here, environmental data collection and archiving by oil and gas operators in the North Sea are described, alongside how this compares to other offshore industries; what the barriers and opportunities surrounding environmental data sharing are; and how wider data sharing from offshore industries could be achieved. Five primary barriers to data sharing were identified: 1) Incentives, 2) Risk Perception, 3) Working Cultures, 4) Financial Models, and 5) Data Ownership. Active and transparent communication and collaboration between stakeholders including industry, regulatory bodies, data portals and academic institutions will be key to unlocking the data that will be critical to informing responsible decommissioning decisions for offshore oil and gas structures in the North Sea.

1. Introduction

In an era of rapid global change and increasing international regulations, comprehensive environmental datasets are required to manage marine economic activities and facilitate blue growth (i.e. the long-term strategy to support sustainable growth in the marine and

maritime sectors, [12], https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en). For the North Sea, a basin with a long history of economic exploitation now entering a period of transition, this is a particularly pertinent issue. Whilst the shipping, fishing, and oil and gas industries have dominated the basin historically, the use of, and stakeholders in, the North Sea are diversifying [39]. For example, offshore

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renewables, marine biotechnology, cruise tourism, maritime surveillance, aggregates dredging and large-scale offshore aquaculture [39] have emerged in recent decades, with new activities under development. The management and decommissioning of redundant oil and gas infrastructure provides an excellent case study to explore how environmental considerations are balanced against economic realities and whether society has access to adequate scientific data to underpin management decisions [29]. To achieve the best outcomes, decisions on the timescale, methodology and monitoring of decommissioning must be supported by sound environmental data. The big challenge is to collect, collate and interpret the data required at appropriate spatial and temporal scales across the North Sea to make informed decisions.

The North Sea is a shared resource between Belgium, Denmark, France, Germany, the Netherlands, Norway and the United Kingdom. These states include part of the North Sea in their territorial waters and other EU Member States have claims to its resources (e.g. through fishing quotas). Oil and gas reserves have been exploited near the coast since the 1850s [7] and commercial offshore exploration began in earnest in the 1960s. North Sea oil and gas exploration and production is ongoing, but after over 40 years of production the more mature fields are now being decommissioned. To date, the oil and gas industry has brought economic growth to the region, for example to the UK through an estimated 375,000 jobs and over £100 billion in tax revenue between 1998 and 2014 ([15], other estimates vary). By contrast, decommissioning is expected to cost the UK state and private companies £40 billion by 2040 [35], before opening areas of the North Sea that have been exclusively exploited by the oil and gas sector for 50 years to new economic activities. Decommissioning of offshore structures will be an important environmental and economic issue with competing priorities from stakeholders. The options for decommissioning each rig in the North Sea will vary by installation as each has individual characteristics; however, each decision needs to consider the wider ecological context. By collating the environmental data the industry has amassed since the 1970s, there is the potential to reduce the costs of assessing decommissioning scenarios for individual installations, more readily inform stakeholders of the environmental costs and benefits of each approach and build public trust that wider environmental considerations are incorporated into the decision-making process.

This paper aims to highlight the emerging themes and issues associated with collection and access to environmental data for the North Sea. It focuses on the long-term management of environmental data collected by the oil and gas industry, whilst drawing on examples from other industries. The discussions are the result of a North Sea Blue Growth Data Challenge workshop held in February 2017 and organised by the University of Edinburgh through the INSITE research programme (see Acknowledgements). Discussion workshops have proven value when promoting the integration of monitoring activities across North Sea countries [46]. The overall objective of the workshop was to bring together members of the scientific community, government regulators and the oil and gas industry to discuss the challenges and opportunities surrounding data relevant to decommissioning; and the issues surrounding sourcing and maintaining environmental data for the offshore energy industries. Over 30 representatives from industry, academia, online data portals, government science and regulators attended with discussion including the current availability of environmental data for the North Sea, example case studies from academia using industry data, potential quick wins and long term aims. Each presentation block was followed by a semi-structured breakout discussion giving the three themes addressed in this paper: (1) the present situation and challenges; (2) the opportunities; (3) the best way forward to promote and enable sharing environmental data.

2. Present situation and challenges

The North Sea requires comprehensive temporal and spatial data to differentiate between human-driven influences on the ecosystem and

natural variation. The position of the North Sea as the mixing point between water masses makes it a region of high climatic variation. It is strongly influenced by the North Atlantic Oscillation (NAO, [41]) which drives changes in species distributions and environmental conditions over relatively short time frames [11,17]. Long-term and broad scale trends in ecological variability, together with an understanding of causes of variation, are necessary to assess environmental quality [16]. It is also likely that the environmental baseline is shifting due to climate change [22]. Deciphering human impacts in this dynamic ecosystem is further confounded by a long history of human activity (notably fishing, see [28]), but a relatively short history of environmental monitoring. Only with the data to provide a holistic overview of North Sea ecology can environmental surveys and assessments be compared to an appropriate baseline.

Extensive efforts have been made in recent years to collect and collate marine environmental data at local, national and international levels. The most relevant of these projects for the North Sea is EMODnet: the European Marine Observation and Data Network [5]. EMODnet is a network of organisations funded by the European Maritime and Fisheries Fund (EMFF) as part of the European Commission's Marine Knowledge 2020 strategy to support the implementation of EU's Integrated Maritime Policy (IMP). The overarching aim of the network is to convert Europe's otherwise fragmented marine data landscape into an interoperable data sharing framework, adopting the “collect once, use many times” data philosophy (INSPIRE Directive 2007/2/EC). This is achieved by pulling together Europe's many data sources [45], processing and harmonising the data in accordance with international standards, and making the information freely available through online data portals. EMODnet categorises data by scientific discipline (geology, biology, chemistry, physics) and by general thematic categories such as seabed habitats, bathymetry and human activities. These thematic data portals are supplemented by an overarching central portal (www.emodnet.eu) which acts as an information hub and gateway to the network's data and information resources. It also provides a number of additional data services to browse, visualise and retrieve data layers from various disciplines and themes simultaneously. The work is achieved by more than 150 organisations including national/regional data centres, hydrographic offices, geological services and thematic data aggregators that collate, process and host data that is then made available through both their own websites and the EMODnet portals. For example, MEDIN (Marine Environmental Data Information Network, <http://www.oceannet.org/>) facilitates and coordinates UK marine environmental data sharing. At present, the data standards employed by MEDIN for UK datasets exceed those set by EMODnet and, for now, it is understood that MEDIN will remain part of the EMODnet network after the UK leaves the EU [34].

EMODnet has amassed datasets for a wide range of environmental parameters. The North Sea basin is now one of the best-covered marine areas in Europe for environmental monitoring. However, a recent “stress test” of available datasets to assess a range of environmental scenarios identified key data gaps and questions over data quality and comparability [23]. Geological, chemical and physical datasets were, for the most part, available and compatible across the basin, however, habitat information and biological and ecological parameters were found to be much more difficult to obtain, collate and standardise. Time-series datasets monitoring species distributions and populations over time are rare, and the occurrence of unidentified organisms, which are not recorded in a standardised way, in datasets can limit their use [50]. Qualitative data can be difficult to standardise and quality control (including species identification, [48]), and these datasets often tend to be more problematic to identify and access than quantitative data (e.g. weather measurements).

Gaps in available marine environmental data arise for two main reasons. One is a genuine monitoring gap, i.e. the data have never been collected. Whilst this may be the primary cause of data gaps in other seas, the North Sea has seen many studies, monitoring surveys and

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