Putting sediment impacts in to context using new approaches to comparative assessment in offshore oil and gas decommissioning

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Introduction: Many Oil and Gas (O&G) fields are now approaching the end of their life span and require decommissioning. In the UK full removal of these fields is required under OSPAR Decision 98/3, however in these deep sea environments it may be hazardous, technically challenging, costly and/or ecologically unsound to do so. There is potential for derogation of this Decision for complex structures and in these circumstances a Comparative Assessment (CA) can be conducted of alternative disposal options.

Issues that have had to be addressed include:

- Potential for ecological risk posed by drill cuttings piles and potential contamination of sediments;
- Costs and benefits of sediment disturbance; and
- How can localised sediment impacts be considered in a wider ecosystem context?

Methods: Ramboll Environ has evaluated a range of decommissioning options for clients in order to identify a preferred option, such as remain *in situ*, full or partial removal of infrastructure. For recent evaluations we have adapted the method by Bas et al (2016)[1]. This is based on an ecosystem services approach relying on a scoring system to assess the 'quality' of the habitat followed by environmental economic techniques for valuing the change in habitat services before and after decommissioning.

The projects have adopted the UK CA guidelines requiring consideration of five criteria: safety, environment, technical, societal and economic. The ecosystem services approach accounts for environmental and societal criteria. The assessments integrate impacts spatially and over defined time periods in order to account for environmental recovery following decommissioning.

Results: The assessments rely on site-specific monitoring data, published literature and professional judgment. Headline findings include the following:

- Often there are data gaps for site-specific conditions at these installations and the method proposed by Bas et al (2016) allows for a greater use of professional judgment, whilst accounting for a broader set of indicators than may traditionally be used when valuing environmental damage (impacts);
- Surface contamination associated with drill cuttings piles has been leached or degraded over time (e.g. 15+ years of operational life). Residual contamination is buried deep within piles;
- Piles beneath vertical structures are covered by shells and other debris, which in turn become colonised by benthic organisms providing low potential for bioaccessibility and availability and habitat value whilst undisturbed;
- Decommissioning options vary in their disturbance potential and sediment disturbance affects marine organisms differently;
- This variation across the ecosystem can be captured through the use of a range of relevant indicators (e.g. 62 indicators in one project). A wide range of indicators allows impacts to benthic organisms associated with sediments to be put into a wider environmental context;
- Costs and benefits of decommissioning options vary with infrastructure – it is not a 'one size fits all' management decision.

Discussion: By looking at the relative changes, it is possible to provide an understanding of the greatest losses and gains to ecosystem services and other criteria from decommissioning options to help inform management decisions. Integral to the assessment of environmental and societal criteria is the understanding of the service provided by habitats. The new method provides a holistic assessment of the ecological functioning of the marine ecosystem as a whole and places potential impacts on marine sediments in to a wider environmental context and the economic, safety and technical feasibility contexts.

References: [1] A. Bas, C. Jacob, J. Hay, S. Pioch, S. Thorin. Improving marine biodiversity offsetting: a proposed methodology for better assessing losses and gains. J. Environ. Manag., 175 (2016), pp. 46–59