Cumulative effects assessment: common principles and practical implementation

Adrian Judd

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World Class Science for the Marine and Freshwater Environment



Why me?

- Co-chair of the OSPAR cumulative effects group our task is to undertake a CEA for the North East Atlantic
- Assessment will be part of the Quality Status Report 2021 (and Intermediate Assessment 2017)
- Main focus is CEA at regional sea scale
- Many issues also relevant to project level CEA



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http://www.ospar.org/work-areas/cross-cuttingissues/intermediate-assessment-2017-resources





Because legislation says we have to

To protect the environment

To inform decisions on sustainable use and development

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Is CEA an assessment of everything?



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Science



http://odemm.com/



CEA is not just about counting and matrices

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CEA – requires knowledge of activities and pressures

Example: Aggregate extraction potential pressures:

- 1. Selective extraction non-living resources
- 2. Abrasion
- 3. Selective extraction of species
- 4. Water flow rate changes
- 5. Changes in siltation
- 6. Smothering
- 7. Underwater noise
- 8. Introduction of synthetic compounds
- 9. Introduction non-synthetic compounds
- 10. Introduction radionuclides

Evidence of pressure?

- 1. Extraction or abrasion not both
- 2. Selective extraction of species
- 3. Water flow rate changes
- 4. Changes in siltation background level dependent
- 5. Smothering substrate & community dependent
- Noise: <500 Hz is ≡ merchant vessel travelling at modest speed / >1kHz extracting gravel is noisier than extracting sand¹

¹http://resource.isvr.soton.ac.uk/staff/pubs/PubPDFs/Pub1 _2617.pdf



CEA – requires knowledge of evidence

Aggregate extraction pressures:

Evidence of effect?

- 1. Extraction / abrasion
- 2. Selective extraction of species

Recovery (MALSF) :

- Licence condition layer of sediment at least 0.5m thick to be left over the underlying strata
- recovery of both substrate composition and associated biota is relatively fast in high energy environments characterised by sands that are colonised by mobile opportunistic species with a high rate of growth and reproduction.
- recovery of both substrate composition and associated biota is relatively slow in stable coarse substrata where the resident fauna is slow-growing and has complex interactions between components of the community that develop over many years

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https://www.thecrownestate.co.uk/media/5711/aggregatedredging-and-the-marine-environment.pdf





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Halpern, et al 2008

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http://science.sciencemag.org/content/319/5865/948

Expanded from initial concepts in Judd et al 2015



Other points for consideration in CEA

- What is the baseline?
- Requirement is to assess cumulative <u>effects</u>
- Additive vs synergistic vs antagonistic effects
- Positive as well as adverse effects
- Climate change and prevailing conditions
- Making the best of the evidence we have
- Design the approach around the available data (do not force the data to fit the approach)
- Be clear of the CEA purpose and how it can be used in management
- Do the outputs show what you think they do?

Centre for Environment Fisheries & Aquaculture Science Expanded from initial concepts in Judd et al 2015

http://cmscoms.com/wp-content/uploads/2015/09/Principles-for-cumulativeeffects-assessment-2015-54-254-262.pdf



Is CEA difficult?



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CEA for the OSPAR Quality Status Report



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'Bow-ties' describing impact chains being derived from assessment sheets for each OSPAR indicator

* ICES. (2014). Report of the Joint Rijkswaterstaat/DFO/ICES Workshop: Risk Assessment for Spatial Management (WKRASM), 24–28 February 2014, Amsterdam, the Netherlands. ICES CM 2014/SSGHIE:01. 35 pp. http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGHIE/2014/WKRASM2014.pdf

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Understanding effects and consequences

Establish relationships between impact chains – to determine parameters for CEA



Next steps



- Completed first draft bow-ties for 32 common indicators
- making some simple aggregations of indicators in terms of ecosystem 'compartments' and drivers
- From these aggregations we are starting to build in likely linkages / cumulations of effects (e.g. linkages / pathways from indicators on contaminants in sediment & water column to indicators on contaminants in benthos, fish and higher predators)
- Once linkages established we can choose the appropriate qualitative or quantitative methods to assess the cumulative effects identified

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Thank you

adrian.judd@cefas.co.uk

www.cefas.co.uk

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