A Strategic Approach to Cumulative Effects Assessment: Developing Options

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1. Introduction

NIRAS Consulting Ltd (hereafter referred to as NIRAS), supported by AMEC, has been commissioned by the Marine Management Organisation (MMO) to develop a strategic framework for the identification and consideration of cumulative effects that can be applied across all relevant MMO functions. The focus will be on environmental effects, with consideration given to social and economic effects. On the 11th and 12th of December 2013, NIRAS held meetings with the MMO in order to ascertain how each function currently assesses cumulative effects and how a new framework might be applied.

Stakeholder engagement plays a crucial role in ensuring the success of the project, and consultation with the MMO, relevant stakeholders and focus groups is essential to refine the approach for developing the framework.

This document has been prepared in order to gather feedback on the options developed to date, and as such, comments and suggestions are welcomed in the feedback questionnaire provided.

2. Aim and Objectives

The aim of this project is to develop a consistent approach to the identification and consideration of cumulative effects (environmental, social and economic) that can be applied at the strategic level across all relevant MMO functions. The outputs of this project will be applicable for all marine plan areas and all relevant Marine Policy Statement sectors.

There are 5 objectives associated with this project, outlined in the following sections.

2.1. Objective 1 - Collate current evidence relating to potential high level drivers, pressures and pathways/effects on receptors resulting from marine activities.

2.1.1 Overview

The first objective is to collate current evidence from a comprehensive range of sources into a searchable database; for example by activity, pressure, effect and receptor type. The exact format and content of this will depend on the selected approach to the framework (see Objective 4). It is considered that the most appropriate tool to construct the database is Microsoft Office Access, as this will allow the most convenient representation of the level of variation in MMO functions, and allow modularised development during the progress of the project.

The following sections provide an overview of the work undertaken to date. The next phase will be further development of the database including the interactions between the categories. In particular, there will need to be a focus on receptor-pressure interactions for which a number of sources of evidence are being reviewed. Suggestions of further studies with potential to provide useful data or evidence are welcomed in the feedback questionnaire provided.

2.1.2 Data structure

To date, the identification of different ways to structure the information gathered has been a key task. In line with the framework to be selected, categories of effects and cumulative combinations of effects will be defined, forming the basis against which information will be structured. This will allow immediate filtering and sorting of data.

2.1.3 Data categories

Data categories will use a standard format and be selectable depending on the level of detail required by the MMO. For example, activities will be categorised according to UK Marine Policy Statement sectors. It is also possible to identify impacts by general activity (e.g. offshore wind energy) or by more specific activities (e.g. offshore installation of monopile structures by impact piling).

In terms of impacts and pressures, one recommendation is for the use of the categories of impacts and pressures provided in the Marine Strategy Framework Directive (included in Annex III of the Directive[1]), with the addition or elimination of categories depending on the requirements of the framework.

Categories for receptors could also include different levels of detail which are yet to be clarified. Higher, more generic levels might include broad habitat type (e.g. seabed or pelagic) or the taxonomic group of flora and fauna. Descriptors for ecological receptors are also provided in Annex III of the Marine Strategy Framework Directive.

Finally, the linkage between marine activities, their specific geographical locations and the potential environmental and socio-economic impacts is a possible means of data categorisation. Again, the level of detail or reference could vary according to needs and available information. It is considered appropriate that the eleven marine plan areas in England be used, for which information exists regarding the specific activities taking place (MMO, 2013b).

2.1.4 Relevant evidence

A number of published and recognised studies have been identified as potential sources of the relevant information required to populate the database. These include, but are not limited to:

- MMO reports[2], including MMO1048[3] and MMO1049[4];
- Charting Progress 2[5];
- Dredging impacts studies including; Oakwood, 1999; Posford Duvivier, 2001; Royal Haskoning, 2005; Tillin et al. 2011 among others;
- OSPAR (2008): Assessment of the environmental impacts of offshore wind farms; and

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF
[2] The MMO has provided access to most of the reports included in the MMO Evidence and Master Data Register
[3] Practical framework for outlining the integration of the ecosystem approach into marine planning in England
[4] Scoping of a robust strategic assessment tool for co-location of activities in marine plan areas
[5] http://chartingprogress.defra.gov.uk/

- Options for Delivering Ecosystem-based Marine Management (ODEMM) Project; Koss et al. (2011), Robinson and Knights (2011).

For each information source included in the database, a quality assessment will be included, giving a level of confidence in the underlying evidence. Links to sources used will also be provided where possible.

The final stage in database development will be a 'testing' and consultation exercise, through which relevant users can contribute to the specific tailoring and refinements required to ensure that the database satisfies the objectives of the selected framework.

2.2. Objective 2 – Produce guidelines in discussion with MMO staff defining responsibilities for cumulative effects assessment and mitigation

The aim of Objective 2 is the production of a range of options for assigning responsibility for cumulative effects assessment (CEA), mitigation, etc. within regulatory parameters, which MMO personnel can utilise in carrying out their daily functions: for example, marine licensing case officers when reviewing a Cumulative Effects Assessment, as part of a development application or marine planners when considering potential implications of spatial policies.

This toolkit of options, combined with supporting guidance on when and where each option may be appropriate, will aid MMO personnel in their decision making with respect to where the responsibility for assessment, and potentially mitigation, lies (e.g. which applicant/developer), and also in assigning proportionate responsibility in a reasonable manner.

Although the range of approaches needs to be practically, technically and legally sound, the MMO welcomes novel ideas and suggestions in the development of potential options.

A preliminary list of options developed for consultation is presented in Section 4: Objective 2 Options: Assigning Responsibility for Cumulative Effects A.

2.3. Objective 3 – Create a series of summary tables based on the outputs of objective 1

The summary matrices will be a vital link between the evidence database (Objective 1) and the framework (Objective 4). The matrices will demonstrate the possible high level interactions between and within marine activities, and between marine activities and the surrounding region. The matrices form part of the front-end functionality of the database, which, as described above in Objective 1, will initially be set up as a Microsoft Office Access database for the reference of all MMO personnel. The Access database will be set up so that the user can create supporting reports by specifying the parameters of interest (e.g. a wind farm project versus a harbour expansion scheme).

A more detailed narrative discussing the potential strategic level drivers and pressures for each marine activity will be developed according to the requirements of the agreed framework option.

2.4. Objective 4 – Detail a framework to identify and scope-in cumulative effects at the strategic level

The strategic framework itself will comprise a high level flow diagram, or 'decision tree', taking the user through the process of identification and scoping of cumulative effects. This format will ensure that the framework will be high level enough to be applicable across all appropriate MMO functions. Scoping of cumulative effects can be undertaken in many ways and, to reflect this, a number of options for the framework have been produced for further consideration.

A selection of existing frameworks have been researched (for example, MacDonald, 2000; Hegmann et al. 1999; EPA, 2003; Natural England, 2013). The applicability of these frameworks to the MMO as a whole, and their fitness for meeting MMO obligations has been assessed. Using this research and expert judgement as appropriate, a number of options have been produced for discussion and are presented in Section 5 of this document.

The framework will be supplemented by a final report providing further guidance on the necessary inputs and judgements required at each stage of the decision tree, signposting the user to the summary matrices and evidence database where appropriate.

2.5. Objective 5 – Compile desk notes for internal use by marine licensing case officers on the common approach to cumulative effects assessment

Desk notes will be produced for internal use by MMO marine licencing case officers, detailing the application of the proposed framework and guidance for assigning responsibility. These notes will be prepared following consultation with MMO personnel, in order to ensure fitness for purpose.

3. MMO Functions

3.1. Marine planning

Marine planning is one of the major functions of the MMO. The MMO aim to create a new marine planning system designed to bring together the environmental, social and economic needs of the UK's seas. This will ensure a sustainable future for coastal and offshore waters through managing and balancing the many activities, resources and assets within the marine environment.

The Marine Policy Statement, developed by the Department for Environment, Food and Rural Affairs in co-operation with other government departments, provides the strategic framework for all marine plans and currently guides decision-making in the marine area. The marine plans developed for England will guide developers as to where different activities may be permitted, and may indicate any conditions or restrictions that may be enforced. All operators and regulators in an area will be expected to work to the same plan, providing transparency and consistency in decision-making.

The MMO's planning function currently look at CEA within two processes; Sustainability Appraisal of marine plans and within general planning policy development. There are currently only 14 policies in the draft East Plans that are spatially explicit (i.e. the policy only applies in or to certain areas) and this limits the level of CEA that can be undertaken within the Sustainability Appraisal process.

Of these 14 spatially explicit policies, five have extents defined by the MMO and the remainder are tied to third party spatial considerations, such as The Crown Estates lease areas. The MMO planning function have expressed that stakeholders are keen to see more detailed spatially explicit policy developed in the future plans and plan revision.

A matrix of sensitivity of habitat types to pressures[6] was applied to habitat maps and used by the planning team in the East Plans Evidence and Issues report[7] to illustrate habitat vulnerability and the potential for cumulative effects on a sector level (e.g. offshore wind and aggregate extraction). However, confidence in the methods and data was not sufficient at the time for the results to contribute to policy development. There is currently no formal process in place for the inclusion of CEA in plan making, the Sustainability Assessment[8] process is required to make some judgement as to the extent of cumulative effects that occur as a result of marine plans (i.e. policy implementation). In the draft East Plans, policy ECO1 emphasises the need for consideration of cumulative effects, however there was insufficient evidence (including stakeholder agreement) at the time to provide more detailed policy guidance or preferences.

[6] MB0102 - Report No 22: Task 3. Development of a Sensitivity Matrix: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16368 [Accessed 17/01/14]

[7] Evidence and Issues Report for the East Inshore and East Offshore marine plan areas, Chapter 5 http://www.marinemanagement.org.uk/marineplanning/areas/east_issues.htm [Accessed 17/01/14]

[8] Draft Sustainability Appraisal Report - http://www.marinemanagement.org.uk/marineplanning/areas/east_plans.htm [Accessed 17/01/14]

3.2. Licensing

The MMO controls the environmental, navigational, human health and other impacts of construction, deposits and removals in the marine area[9]. Activities are consented through the marine licensing system, under the Marine and Coastal Access Act 2009, which came into force on 6 April 2011.

The MMO is responsible for most marine licensing in English inshore and offshore waters and for Welsh and Northern Irish offshore waters. A marine licence is only required for activities involving a deposit or removal of a substance or object in the UK marine area, as defined in Section 42[10] of the Marine and Coastal Access Act (2009).

In terms of the duties of the MMO's licencing function, CEA is generally dealt with through Environmental Impact Assessments (EIA) undertaken by the applicant and information prepared by the applicant to support Habitats Regulations Assessments (HRA). The MMO considers the information provided within the EIA/HRA and will return to the applicant for more information if necessary. There is currently no overarching process in place to consistently identify projects to be scoped in or out of CEA, and MMO officers generally use their own experience and best judgement. Thus, the licensing team would potentially benefit from the production of external guidance on the reasonable scope (content and presentation) of a CEA in order to inform their assessment of what the applicant provides. For non-EIA and/or HRA projects the licensing function would benefit from guidance setting out what should be considered when assessing whether a CEA should be undertaken for those projects. For example, Water Framework Directive issues might be prompt in this regard.

3.3. Conservation

All public authorities, including the MMO, have a duty to carry out their functions in a way which has regard to the conservation objectives set for Marine Protected Areas (MPAs). These include national designations, such as Marine Conservation Zones (MCZs), and European designations such as Special Areas of Conservation designated under EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora[11] (the Habitats Directive) and Special Protection Areas designated under Council Directive 71/409/EEC on the conservation of wild birds[12] (the Birds Directive). The MMO has powers under the Marine and Coastal Access Act 2009[13] to make byelaws for the protection of features of MPAs (and potential MPAs). They may also issue permits to allow certain levels of activity which a byelaw would normally prohibit.

[9] Broadly, the 'marine area' is the area below the mean high water springs mark, and in any tidal river it is the area to the extent of the tidal influence.
[10] http://www.legislation.gov.uk/ukpga/2009/23/section/42 [Accessed 17/01/14]
[11] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1992L0043:20070101:EN:HTML [Accessed 17/01/14]
[12] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:01:EN:HTML [Accessed 17/01/14]
[13] http://www.legislation.gov.uk/ukpga/2009/23/contents [Accessed 17/01/14]

With respect to the MPAs, when considering potential management measures the MMO currently look at CEA in terms of how activities affect the designated features of a site. This is a receptor driven process. There is currently no fixed process or method in place to do this, although some guidance is provided by statutory nature conservation bodies (SNCBs). Whilst it is relatively simple to review the effects of single activities on particular sites, the challenge is the identification of smaller impacts which might together constitute a cumulative impact.

3.4. Fishing

The MMO are currently working on streamlining the management and regulation of fisheries in England. The Common Fisheries Policy (CFP) is the EU instrument for the management of fisheries and aquaculture, and it is the responsibility of EU member states to make sure that the rules agreed under the CFP are respected. This is the primary role of the MMO fisheries management function.

Generally, the decision making process of the MMO fisheries management function does not specifically take cumulative effects into consideration. The team looks at quotas for allocation to fisherman, scientific research quota allocation and fishing vessel licences. Therefore, the outputs of this project are not likely to be of direct benefit to this team. However, fisheries are likely to be considered as potential receptors, in terms of socio-economic effects.

3.5. Overview of CEA Legislative Requirements

All proposals for projects that are subject to the European Environmental Impact Assessment (EIA) Directive (85/337/EEC) (as amended[14]), must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project. The MMO is responsible for ensuring the requirements of the EIA directive are met in relation to marine licences and harbour orders. This is implemented through The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended[15]) and The Harbour Works (Environmental Impact Assessment) Regulations 1999[16].

The Directive specifically refers to effects on human beings, fauna and flora, soil, water, air, climate, the landscape/seascape, material assets and cultural heritage, and the interactions between them. The Directive requires an assessment of the likely significant effects of the proposed project on the environment. The scope of the assessments should consider the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects at all stages of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects. Developers must ensure they consider both intra-project and inter-project cumulative effects.

[14] Council Directives 97/11/EC, 2003/35/ EC, 2009/31/EC and 2011/92/EU
[15] http://www.legislation.gov.uk/uksi/2007/1518/contents/made?view=plain [Accessed 17/01/14]
[16] http://www.legislation.gov.uk/uksi/1999/3445/regulation/1/made [Accessed 17/01/14]

Separately, the EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora[17] (the Habitats Directive) requires that where a plan or project is likely to have a significant effect on a Natura 2000 site either individually or in combination with other plans or projects, it shall be subject to Appropriate Assessment (AA) of its implications for the site in view of the site's conservation objectives. The Natura 2000 network comprises Special Areas of Conservation (SACs) and Sites of Community Importance (SCI) that are designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive (Council Directive 71/409/EEC on the conservation of wild birds[18]). Protection is also extended in the UK to Ramsar sites. These Directives are implemented in the UK through the Conservation of Habitats and Species Regulations 2010[19] and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007[20] (as amended), for projects outside 12 nautical miles.

In accordance with the Directive, in-combination effects (inter-project cumulative effects) need to be considered for relevant Natura 2000 site features (habitats and species). The process of screening for likely significant effects and, where appropriate, the provision of information to inform an AA is known as a Habitats Regulations Assessment (HRA).

The Marine and Coastal Access Act[21] means that the UK is one of the first countries to strategically plan for all of its marine area. Subsequently, the Marine Policy Statement[22] (MPS) requires that all marine plans take into account cumulative effects. Of particular relevance to the implementation of the MCAA is the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC[23]).

The MSFD identifies the need for marine strategies to apply "an ecosystem-based approach to the management of human activities, ensuring that the collective pressures of such activities is kept within levels compatible with the achievement of good environmental status and the capacity of marine ecosystems to respond to human-induced changes is not compromised (Article 1(3)). The overarching aim of the MSFD is for Member States to introduce measures that will lead to the achievement of Good Environmental Status (GES) in their marine waters by 2020. Accordingly, Member States will develop Marine Strategies for their waters, including:

- An initial assessment (characteristics and status of those waters, their economic and social use, and an analysis of predominant pressures and impacts, covering main cumulative and synergetic effects (Article 8));
- Targets and indicators of GES; and

[17] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1992L0043:20070101:EN:HTML [Accessed 17/01/14]
[18] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:01:EN:HTML [Accessed 17/01/14]
[19] http://www.legislation.gov.uk/uksi/2010/490/contents/made [Accessed 17/01/14]
[20] http://www.legislation.gov.uk/uksi/2007/1842/contents/made [Accessed 17/01/14]
[21] http://www.legislation.gov.uk/ukpga/2009/23/contents [Accessed 17/01/14]
[22] http://www.defra.gov.uk/publications/files/pb3654-marine-policy-statement-110316.pdf [Accessed 07/01/14]
[23] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0056:EN:HTML [Accessed 17/01/14]

- The implementation of monitoring / programmes or measures to achieve or maintain GES.

In the UK, targets and GES indicators have already been identified, and the initial assessment has been finalised, providing a framework which will be used to in the future management of the UK seas (Defra, 2012). Therefore, the possibility of assessing cumulative effects in the context of the MSFD could be of particular interest for this project.

4. Objective 2 Options: Assigning Responsibility for Cumulative Effects Assessment

The MMO is guided by regulations (including EIA and Habitats Regulations, and policy e.g. MPS etc.) for undertaking CEA. For projects that have the potential to adversely affect Natura 2000 sites, the MMO, as the competent authority for many of these cases, is required to carry out AA utilising information provided by the applicant. In other cases, developers are required to complete a CEA as part of the application for a marine licence, which the marine licensing teams are responsible for making a judgement on. The only exception to this is for disposal at sea, where the responsibility for CEA lies with the marine licensing team. In all scenarios, the onus is on the developer to provide information to the MMO, either as a CEA or to inform an in-combination assessment.

Therefore, considering who might be responsible for CEA and mitigation of cumulative effects in the marine environment is a crucial element of the MMO's role, in particular for the marine planning and marine licensing teams. There are a number of aspects to this 'responsibility' in relation to cumulative effects, these include responsibility for:

- The assessment itself – each project is responsible for its own CEA, as is the MMO, however, consideration needs to be given to what is required within an assessment;
- Contribution to an assessment – whereby developers may be required to provide information to enable better assessments and to promote cooperation with other developers; and
- Mitigation – where there is a significant cumulative effect, considering which developer(s) is/are responsible for mitigating the effect.

This section presents a number of suggested options for how responsibility may be assigned depending on the circumstances of each individual case. The development of options for this objective has been guided by experience of working with marine developers and experience of negotiating and completing CEA, primarily as part of the EIA and consenting processes. Discussions with MMO personnel, in addition to in-house experience of working in regulatory environments, have provided insight into how and when the MMO may need to consider who is responsible for CEA.

This document has been prepared in order to gather feedback on the options developed to date, presented in Sections 4.1-4.8, and as such, comments and suggestions are welcomed in the feedback questionnaire provided. Further guidance will be provided in the final report following consultation and refinement of the options into a range of applicable options from which case officers can select the most appropriate on a case by case basis.

4.1. Equal responsibility

It may be appropriate to allocate equal responsibility for a given effect to all contributing applicants/developers. This approach is likely to be applied at an early stage in determining/assigning responsibility for a cumulative effect (i.e. an early stage in project development). Where the spatial/temporal effect is not well defined, it may be most straightforward to assume that all projects/developments contribute equally, until further information becomes available. This may be applicable where there are larger numbers of smaller activities to consider.

In general, individual projects/developments will be working towards developing a project-specific understanding of the cumulative effect. As this work develops, it is likely to become possible to consider apportioning of the effects (see Section 4.3).

4.2. Activity-specific effects

This means of allocating responsibility for cumulative effects is based on a process of elimination of those projects for which there is no linkage between project-specific activity and the effect. For example, responsibility for any contribution to a cumulative collision risk for birds is not likely to be attributed to an aggregate extraction project. However, disturbance and/or loss of benthic habitats could be attributed to both offshore wind farms and to aggregate extraction schemes. When the relevant projects/developments have been identified, it may then be possible to apportion the effect(s).

4.3. Apportioning the effect(s)

Where the cumulative effect is on a particular receptor type (e.g. birds), or an individual receptor (e.g. lesser black-backed gull), then it may be possible to apportion the effect between the contributing projects/developments (e.g. the proportion of the cumulative collision risk attributable to each project/development). It may then be appropriate to allocate responsibility for the effect on a proportional basis (i.e. a project/development may emerge as the principal contributor to the effect, whilst other projects/developments may contribute a proportionally insignificant effect in cumulative terms).

This option is likely to require a significant amount of input from each developer, and potentially an independent cumulative assessment in order to apportion the effect in a sound and reasonable manner. This process may be time consuming, and could require all projects/developments to have reached the point where cumulative EIA and/or HRA has been prepared.

4.4. Scale of effect (spatial and/or temporal)

This option is similar to apportioning the effect(s), but may be more applicable to effects on receptors where the procedure for direct apportioning of effects is less well defined than for ornithological effects (e.g. cumulative collision risk, for which there are best practice accepted procedures for assessment). Such effects may include underwater noise (e.g. the extent of the underwater noise contour) or seabed habitat

loss/disturbance. Allocating responsibility for a proportion of a cumulative effect in this way could include investigation using spatial analysis software (e.g. GIS).

Allocation of responsibility based on the scale of effect may also be useful where, for example, the construction phase of a particular project is significantly longer than other projects/developments contributing to the cumulative effect. The nature of the development and the construction methodology should be taken into account here: a protracted aggregate extraction scheme is unlikely to produce underwater noise contours as large as those associated with the installation of monopile foundations for wind turbines.

4.5. Allocation of responsibilities based on application timeframe

Guidance issued by JNCC and Natural England in September 2013 suggested tiers for cumulative impact assessment. These tiers are as follows:

- Tier 1: built and operational projects;
- Tier 2: projects under construction plus tier 1 projects;
- Tier 3: projects that have been consented (but construction has not yet commenced) plus tiers 1 and 2;
- Tier 4: projects that have an application submitted to the appropriate regulatory body that have not yet been determined, plus tiers 1-3;
- Tier 5: projects that the regulatory body are expecting to be submitted for determination (e.g. projects listed under the Planning Inspectorate programme of projects), plus tiers 1-4; and
- Tier 6: projects that have been identified in relevant strategic plans or programmes plus tiers 1-5.

These tiers provide a hierarchical framework for CEA, and one which may also be useful in allocating responsibility for a particular cumulative effect (or portion thereof). An example is a situation where a number of projects for which reliable data are available (e.g. tiers 1-4) contribute to a cumulative effect which is not considered significant in EIA terms, but after the inclusion of a tier 5 or 6 project, the magnitude of the cumulative effect becomes significant (in EIA terms). Given the potential status of a tier 5 or 6 project (i.e. with data limitations), it is likely to be difficult to define or meaningfully apportion the contribution to the cumulative effect. It might therefore be considered best to determine current responsibilities for the cumulative effect in the absence of the project(s) not yet submitted or consented, and to wait until tier 5/6 projects are submitted before determining responsibilities in respect of them.

4.6. Precedents in previous development applications

Where a project/development activity has been undertaken previously at different sites/by different developers, then it may be beneficial, where possible, to review the processes used in cumulative effects assessment in these applications. The success of previous applications and the reasons for the choice of assessment approach can be a good sense check for current applications, and may help to determine allocation of responsibilities.

4.7. Developer forums hosted by MMO

The MMO, on reviewing the number and type of 1) cumulative effects and 2) individual contributing projects/developments, and at any point in the timeline, may deem it useful to bring developers together to discuss specific cumulative effects. This would provide a unique and transparent opportunity for developers to discuss their individual approaches to impact assessment, and to highlight any key differences in methodology that might have consequences for the allocation of responsibility for a given cumulative effect. There are both time and financial implications to this approach: however, where there are difficulties in reaching agreement or issues of comparison between projects/developments, open debate may be invaluable.

4.8. Consultation with industry bodies

It is considered likely that consultation with industry bodies will be most appropriate and productive in discussing the appropriate mitigation for a cumulative effect. However, in the event that it has not been possible to apportion a cumulative effect using tried and tested methodology (e.g. collision risk), or there is disagreement regarding apportioning or activity-effect-receptor linkages, it may necessary to seek consultation with industry bodies (e.g. BMAPA or The Crown Estate) regarding allocating responsibility for a cumulative effect.

Disputes regarding the contribution to a cumulative effect made by projects/ developments are likely to be resolved through the normal course of project-specific assessment work (e.g. underwater noise modelling).Therefore, it should be mutually agreed that applicants have exhausted this avenue before consultation is sought regarding the allocation of responsibility, which cannot be carried out in the absence of reliable data and analyses. Even so, expert industry advice/opinion could be useful where projects/developments which are very different in character have completed impact assessment, are contributing to a cumulative effect, and agreement has yet to be reached regarding apportioning/responsibility. For example, consider a complex theoretical case where an offshore wind farm may contribute to bird mortality through collision risk, whilst a nearby aviation scheme may contribute to mortality in the same population by bird strike, and another coastal recreation development may have the potential to impact population productivity through habitat removal. These different mechanisms for the effect (an impact on a given population of birds) make comparison of analyses/outputs difficult.

5. Objective 4 Options: Establishing a Cumulative Effects Assessment Framework

The following section describes three potential options for a strategic framework for identifying and scoping cumulative effects. A range of information on similar such frameworks is available in published scientific literature, and a number of reviews of this literature have been carried out (e.g. Natural England 2013, MMO 2013, RenewableUK 2013).

The development of framework options for this project has been guided by the available literature and tailored to meet the needs of the MMO. Discussions with MMO personnel from each function have also provided information on these requirements.

CEA can be undertaken in a number of ways. The circumstances under which CEA is carried out means that a variety of methods and tools could potentially be used. Therefore, it was considered prudent to suggest various potential approaches, outlining the possible implications for each MMO function.

Three options are presented in this section. The concept for each option is described, and the applicability to each MMO function is presented. In summary, the options are:

1. A 'top down' approach, considering CEA beginning with the individual effects of a plan, project or activity;
2. Similar to Option 1, but discusses a more flexible method following the DPSIR[24] model; and
3. A 'bottom up' or systems approach, starting with a receptor and considering all potential effects from all possible sources.

There are similarities between the options and each has positives and negatives, the aim of this consultation is to determine which is the best fit for the work of the MMO (if any) and to gather information and ideas on where improvements could be made.

This document has been prepared in order to gather feedback on the options developed to date, presented in Section 5.1-5.3, and as such, comments and suggestions are welcomed in the feedback questionnaire provided. Further, definitive guidance will be provided in the final report once the framework has been refined and fully developed following consultation.

[24] Driver, Pressure, State, Impact, Response

5.1. Option 1

Option 1 is for a source-led approach which starts with the information available on the effects of one particular activity. This option is based on an understanding of the role of the MMO as a regulatory body, responsible for ensuring sustainable development within the marine environment and considering cumulative effects of human activities. The information required by the MMO in performing these functions is provided by applicants/developers through EIA and HRA, and is required as part of applications for marine licenses. Therefore, a source-led approach is suited to the way the MMO marine licensing teams currently operate.

A similar approach is discussed in Natural England (2013), which suggests a generic framework for CEA of human activities in MPAs. This framework was developed for use by Natural England case officers and based on a literature review of existing frameworks. Information from this literature review and the guidance provided has been reviewed and, whilst it is not wholly applicable to the requirements of the MMO, the general approach and understanding behind it has proven a useful starting point. Another example is suggested by MacDonald (2000), who proposes a linear, step-by-step process, but suggests that, whilst all steps must be carried out in order for the CEA to be completed effectively, in practice the assessment should be iterative and not necessarily carried out in the sequence provided.

The concept for Option 1 has been based on a wide view of available literature, and it is considered that the source-led approach would consist of a number of steps to be undertaken in order to effectively identify cumulative effects. However, the sequence of these steps is applicable in general terms, and may not necessarily be the most appropriate order for every application. Whilst Option 1 provides a prescriptive method, it also means that the tool is less flexible and may tend to require the user to input a substantial amount of information, making it less user-friendly.

This approach provides a clear methodology which ensures a consistent approach across the MMO. For marine licensing, this option provides a clear process in line with the current application process, although the amount of effort required may not be practical when considering that this is a strategic level tool. This approach may also prove to be too prescriptive for marine planning and marine conservation teams. When considering a plan area, it is not possible to be specific, as there are insufficient data available at this scale to effectively make a judgement. In addition, a source-led approach might prove difficult for the marine conservation team, who's approach to CEA is receptor focused.

Step 1: Outline the goals of CEA

The role of MMO varies to some extent within and between functions. Therefore, the initial step in the Option 1 framework allows flexibility by identifying the goals of CEA on a case-by-case basis. For example, by:

- Describing the purpose and aim of the application and the relevant MMO function;
- Identifying the legislation and policy drivers relevant to the assessment; and
- Clarify definitions of relevant terms, for example, 'cumulative' etc.

Step 2: Define activity pressures

The potential pressures which the plan/project/activity exerts need to be identified. Activity/pressure matrices are a potential means of achieving this. This will provide a basis for the scoping of cumulative effects.

Step 3: Spatio-temporal scale of receptors and pressures

The spatial and temporal scale of the plan/project/activity in question and the extent of the pressures identified should be determined. Next, the scale at which the potential pressures may have effect on a receptor should be determined. Standardised guidelines (e.g. foraging range for birds) on how this will apply at the strategic level will be provided, based on the latest, best available evidence. This information then allows the spatio-temporal scale at which each receptor may be affected to be identified. This is the 'footprint' for the cumulative effects scoping exercise.

Step 4: Identify receptor-pressure interactions

Source-pathway-receptor tables are an effective means of identifying receptor-pressure interactions. These will help the user to understand where effects are likely to occur, by identifying the pathways between the source of an effect and any receptors which may be affected. This step is also useful as an early screening stage in the process.

Table 1 provides a few examples of how receptor-pressure interactions can be visualised in this way.

Table 1: Example representation of source-pathway-receptor interactions

Activity	Source	Pathway	Receptor
Offshore Wind Farm	Piling during construction	Underwater noise pressure	Cetaceans
Aggregate extraction	Removal of substrate	Removal of habitat	Benthic species
Aggregate extraction	Removal of substrate	Removal of prey species	Fish species

Step 5: Identify other plans/projects/activities

Within the footprint identified in Step 3 and considering the relevant receptor/pressure interactions identified in Step 4, other plans/projects/activities which may contribute to an effect should be identified. In addition, consideration

should be given to other projects that may have potential to contribute to an effect but may be outside of the spatial footprint, the tiered approach detailed in Section 4.5 would be one way to approach this.

Step 6: Revise spatio-temporal scale

If appropriate, it may be necessary to revise the footprint of the scoping exercise, based on previous steps, where other activities extend beyond the original spatio-temporal scale or where receptors and/or pressures are screened out as a result of the source-pathway-receptor tables.

Step 7: Receptor/pressure interactions of all plans/projects/activities

This step involves considering the pathways between sources and receptors for all plans/projects/activities to be considered in CEA (see Step 5). Any additional pressures identified through consideration of multiple plans and projects, in addition to the initial subject of the exercise, should be highlighted at this stage and scoped in for further assessment. The effects on receptors may extend beyond purely environmental impacts and include, for example, socio-economic impacts.

Step 8: Identify all potential cumulative effects

The receptor-pressures interactions identified in Step 7 should highlight where there are impacts on receptors. This step ensures that those impacts which interact to result in the potential for a cumulative effect are identified to be taken forward to the assessment stage.

Step 9: Consider which developer is responsible for significant cumulative effects and mitigation

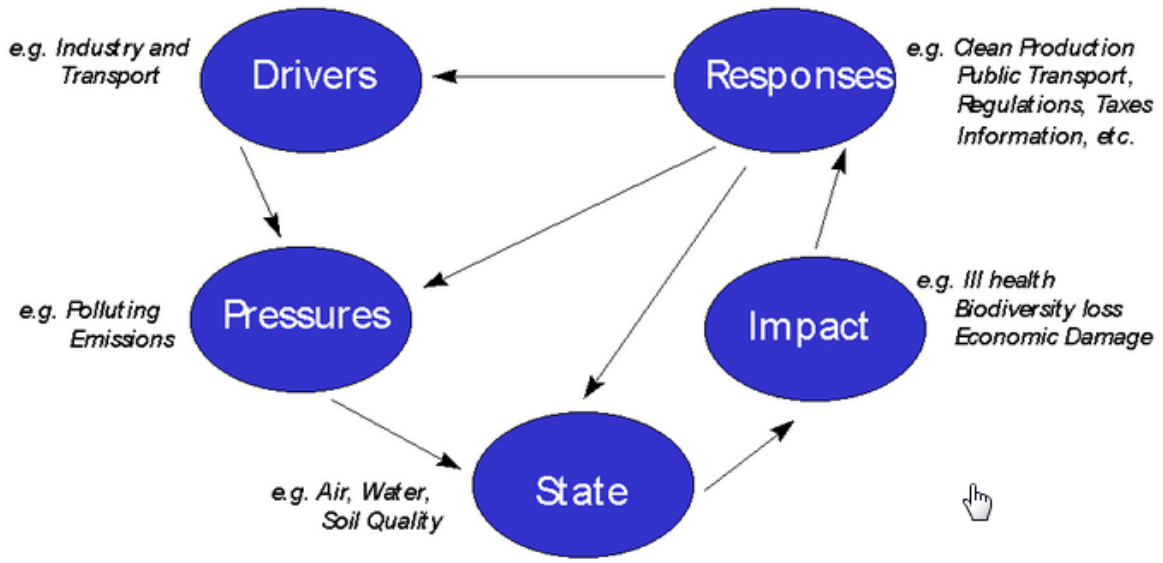
A particular issue for the MMO in CEA is the process of assigning responsibility for the effects. Therefore, the strategic framework will indicate at which point in the process the issue of responsibility should be considered (see Section 4). This will be the final step in the process, before considering the assessment process, as it will depend on which plans/projects/activities have been scoped into the CEA.

5.2. Option 2

Option 2 is guided by the European Environment Agency DPSIR (Drivers – Pressures – State – Impact – Response, see Figure 1) model, allowing for the interactions of effects between human activities and the environment to be considered. It has previously been recommended that this model could be adapted to create a suitable tool for CEA for the MMO, facilitating targeting of issues to be included in the assessment (MMO, 2013a). Whilst allowing for a simplified framework that could be utilised effectively by all MMO personnel, this method has the most potential for future-proofing, due to its flexibility. However, this may also mean that more is left open to interpretation, which may have greater potential for error in its application or inappropriate use. In order to avoid this, clear and uniform definition of the framework components will need to be established (Sekovski, Newton & Dennison, 2012).

According to the DPSIR framework there is a chain of causal links starting with 'drivers' or socio-economic and socio-cultural forces driving human activities that create a series of 'pressures' on the 'state' of the environment, resulting in a change. The state change is considered to involve an 'impact' if certain effects thresholds are exceeded. This will eventually lead to policy actions or 'responses' by society to the impacts.

Figure 1: The DPSIR Model (Source: www.eea.europa.eu)



This option (Option 2) for the strategic framework is described in more detail in the following sections. The option is framed in a series of questions, which lead the user to consider the interactions between the DPSIR components in a way that is relevant to how the MMO operates. The intention is that this would be an iterative approach, with feedback loops throughout the process. These will be considered further, should this option be taken forward.

In a similar way to Option 1, this approach is driven by the source of an effect, which is suited to the way the MMO marine licensing teams currently operate. However, the consideration is at a much higher level, allowing for flexibility in the amount of information required. In this way, the framework can be used effectively across the relevant MMO functions. The marine licensing team, using more specific information provided in an application; the marine planning team, by considering the questions more broadly and; the marine conservation team, as the framework it intended to be iterative and flexible.

Step 1: What is the issue?

Determining the nature of the issue is, in the context of the DPSIR model, the identification of the ***drivers***. This requires the definition of the project/plan/activity in as much detail as possible by gathering/signposting as much detail as possible, for example through a marine licence application or sustainability appraisal. As for Option 1, defining the goals of the CEA will greatly assist the user in setting the scene for the CEA, for that particular case.

Step 2: What pressures occur as a result?

Depending on the nature of the activity identified, the resulting ***pressures*** should be determined; for example, through activity/pressure matrices (see Option 1). This will provide a base from which the scoping of cumulative effects can begin.

Step 3: Which receptors are affected?

Following the DPSIR model, the ***state*** or the characteristics of the environment and ecological receptors need to be identified. The production of source-pathway-receptor tables (as described in Option1) may facilitate this process. These may also screen out some of the pressures identified in Step 2.

Step 4: Define spatio-temporal boundary

To provide a footprint for the interaction between the ***drivers***, ***pressures*** and ***state***, a spatial and temporal boundary is required. Standardised guidelines on how this will apply at the strategic level will be provided, based on the latest, best available evidence.

Step 5: What other activities have the potential to contribute to any effect?

Within the footprint identified in Step 4 and considering the relevant receptor/pressure interactions identified in Step 3, other plans/projects/activities which may contribute to an effect should be identified. In addition, consideration should be given to other projects that may have potential to contribute to an effect but may be outside of the spatial footprint. The tiered approach detailed in Section 4.5 would be one way to approach this. It would be important at this stage to identify any additional pressures based on these other activities.

Step 6: What are the potential effects scoped into the assessment?

According to the DPSIR model, ***pressures*** can result in a change in ***state***, which can be considered to be an ***impact.*** Impacts may include environmental and socio-economic changes. For the purposed of the MMO framework, this stage will also apply to the ***cumulative effect***, as suggested in MMO (2013). This step ensures that those impacts which interact to result in the potential for a cumulative effect are identified to be taken forward to the assessment stage.

Step 7: Who is responsible?

This is part of the ***response*** to the effect. Mitigation and other measures may be put in place to control the level of effect (MMO, 2013). This would need to be considered as the last stage of the process, once all plans/projects/activities have been identified as contributing to a potential cumulative effect and before considering the assessment process.

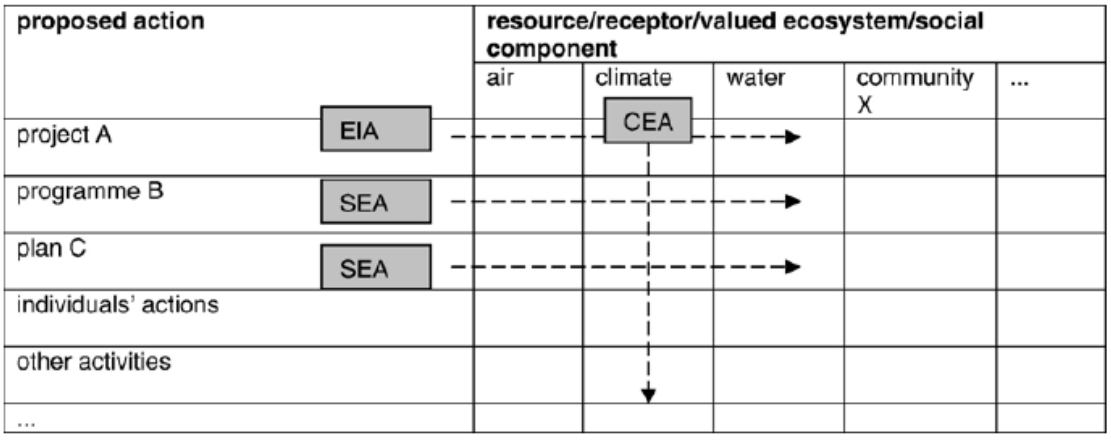
5.3. Option 3

Option 3 outlines the potential for scoping of cumulative effects taking a 'bottom up' or systems approach. From consultation with MMO personnel from different functions, it is clear that this framework will need to be extremely flexible and cover a broad range of activities/purposes. Marine planning case officers are required to take a strategic view of the marine environment, and may be more interested in taking a systems approach to cumulative effects, which looks at potential for effects more broadly, rather than considering the effects of a single project or activity and then identifying what other human activities may contribute to that effect. The marine conservation team also need to consider CEA as a receptor-led approach. This method may be less intuitive for the marine licensing team, as the focus will need to shift from the activity in question to the receptor of an effect. This information should be available within marine licence applications; however, it may prove more time consuming to extract the relevant information.

According to Therivel and Ross (2007), cumulative effects are different to impacts from a single plan or project in that they focus on the receptor rather than the activity. Figure 2 shows how the focus of CEA compares with that of EIA and Strategic Environmental Assessment (SEA). Option 3 has been developed with this in mind, to initially consider the system or the 'receptor' as the key input to the framework at the outset (hence the 'bottom-up' approach).

At the strategic level this approach may not prove to be the most appropriate. The scale for a receptor and any pressures could be much broader than any plan/project/activity with potential to exert pressures on that receptor; resulting in a lengthy process to screen out plans/projects/activities which will not contribute to an effect.

Figure 2: Illustration of the focus of CEA, opposed to EIA/SEA (Therivel and Ross, 2007)



Step 1: Define goals for CEA

As for the previous options, this will help to set the scene for the CEA, on a case by case basis. For this option, this step will involve considering the aims and the purpose of the CEA, including recognition of policy and legislative drivers and defining terms to be used, however, the focus will inevitably be on the environmental, social and/or economic receptors. Receptors to consider may be identified from, for example, marine licence applications or through the Sustainability Appraisal process. As there could potentially be more than one receptor to consider, the following steps need to be carried out for each one identified.

Step 2: Identify potential pressures on each receptor

The pressures which have potential to cause an effect on the receptors identified should be determined. This could be carried out in a similar way to the activity/pressure matrices for the previous options. In addition, there may be more focused information available, for example, in the marine licence application, which may provide further insight into the pressures with potential to cause an effect.

Step 3: Define spatio-temporal scale of receptor/pressures

To provide a footprint for identifying receptor/pressure interactions (Step 4), the spatial and temporal scales of the receptors and pressures require determination. This may cause complications as the scale for a receptor and any pressures could be much broader than any plan/project/activity with potential to exert pressures on that receptor, resulting in a lengthy process to screen out plans/projects/activities which will not contribute to an effect.

Step 4: Receptor/pressure interactions

Source-pathway-receptor tables, as described in Option 1, are an effective means of identifying receptor-pressure interactions. These will help the user to understand where effects are likely to occur, by identifying the pathways between the source of an effect and any receptors which may be affected. This step is also useful as a screening stage in the process.

Step 5: Identify plans/projects/activities that may contribute to an effect

Within the footprint identified in Step 3 and considering the relevant receptor/pressure interactions identified in Step 4, all plans/projects/activities which may contribute to an effect should be identified. In addition, consideration should be given to other projects that may have potential to contribute to an effect but may be outside of the spatial footprint, the tiered approach detailed in Section 4.5 would be one way to approach this.

Step 6: Consider which developer is responsible for significant cumulative effects and mitigation

A particular issue for the MMO in CEA is the process of assigning responsibility for the effects. Therefore, the strategic framework will indicate at which point in the process the issue of responsibility should be considered (see Section 4). This will be the final step in the process, before considering the assessment process, as it will depend on which plans/projects/activities have been scoped into the CEA.

Summary

The aim of this project is to develop a high level, flexible tool to aid the identification of cumulative effects that can be applied at the strategic level across all relevant MMO functions. The outputs of this project will be applicable for all marine plan areas and all relevant Marine Policy Statement sectors.

This document has been prepared in order to gather feedback on the work undertaken to date, in particular on requirements of the evidence database (Objective 1); options for assigning responsibility for cumulative effects (Objective 2); and options for the strategic framework for scoping cumulative effects (Objective 4). As such, comments and suggestions are welcomed in the feedback questionnaire provided. Further, definitive guidance will be provided in the final report once the framework has been refined.

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