



**JNCC Report
No: 624**

**UK Marine Pressures-Activities Database “PAD”:
Methods Report**

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This report is compliant with the JNCC Evidence Quality Assurance Policy
<http://jncc.Defra.gov.uk/default.aspx?page=6675>.

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Summary

The pressures-activities database “PAD” (2018) is a revised version of the PAD (2015) developed by JNCC using the outputs of the Defra-commissioned contract ME5218 (Defra 2015).

JNCC have re-developed the PAD, firstly to re-format and update it to align with NE’s advice on operations and Marine Scotland (MS)/Scottish Natural Heritage’s (SNH) FeAST tools to the extent possible, whilst still maintaining much of the evidence base collated under project ME5218, and secondly to include additional activities that were not included in the 2015 version or the existing tools.

Whilst the key driver for the PAD (2018) update is to support the advice on operations for UK offshore Marine Protected Areas (MPAs), it will also be used for other areas of work including non-MPA projects such as the development of biodiversity indicators for the Marine Strategy Framework Directive (MSFD).

The overall aim is to provide a UK-level product that can be used for inshore and offshore waters, within or outwith of MPAs.

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1 Introduction

1.1 JNCC pressure-activity products

JNCC have undertaken work to gather evidence for the links, or relationships, between marine-based human activities and their associated pressures. In 2013, based on a review of previous attempts to relate human activities with marine pressures, JNCC compiled a pressures-activities matrix¹ (Eassom & Church 2013), summarising the activity-pressure relationships identified within each of the studies. This identified 39 human use activity categories and 34 human pressure types.

To build on this work, in 2015, Defra commissioned a project led by ABPmer and Cefas, and funded by the UK Marine Strategy Framework Directive (MSFD) Biodiversity Indicators Research and Development Funders' Group, to develop the evidence base for these activity-pressure relationships. The project, ME5218, had two main aims:

- to increase the transparency of the identified activity-pressure relationships through the provision of scientifically robust evidence, thereby validating the use of the matrix for the management and monitoring of UK seas; and
- to describe the confidence in the activity-pressure relationships based on the quantity and quality of the evidence found.

The project split the 39 human use activity categories into a standardised list of sub-activities, structured by project stage: pre-construction; construction; operation; and decommissioning. The associated pressures were then identified and evidence for these (sub)activity-pressure relationships was collated through reviews of grey literature, peer-reviewed papers and outputs of related studies, together with expert knowledge. A report and summary were produced (Defra 2015), together with a spreadsheet output. Following this, a Microsoft Access database, the pressures-activities database (“PAD”), was produced and published by JNCC to record the outputs of the literature review in a more user-friendly format.

1.2 Natural England advice on operations

Since publication of the 2015 version of the PAD, further developments in activity-pressure tools have been made. In particular, Natural England (NE) have developed and published their Marine Protected Area (MPA) conservation advice via their [designated sites system](#)². This includes the ‘advice on operations’, an interactive tool which enables users to select an activity type for an MPA and view the pressures likely to be acting on designated features, together with the associated sensitivity of designated features to those pressures.

This tool differs from the PAD (2015) in the range and type of activities included, and has additional evidence for the activity-pressure relationships. NE’s tool includes 87 human activities, covering 18 operation types which are known to occur within English inshore (<12nm) waters, but does not include offshore-specific activities.

¹ [http://jncc.defra.gov.uk/Docs/Combined_P_A_Matrix_Annex2_HBDSEG_Paper_28b\(1\).xlsx](http://jncc.defra.gov.uk/Docs/Combined_P_A_Matrix_Annex2_HBDSEG_Paper_28b(1).xlsx)

² <https://designatedsites.naturalengland.org.uk/>

1.3 Marine Scotland and Scottish Natural Heritage ‘Feature Activity Sensitivity Tool’

Marine Scotland (MS) and Scottish Natural Heritage (SNH) also have an interactive pressures-activities tool known as FeAST. This allows users to identify the pressures caused by activities in Scottish waters, and the likely sensitivity of Nature Conservation MPA features to those pressures. The list of activities used is based on the Standard List of Human Activities in the Marine Environment³ but only includes those activities relevant to Scottish (inshore and offshore) waters. This tool will be updated in the future to include other MPA feature types relevant to Scotland (e.g. Annex I habitats).

2 PAD (2018) aims and objectives

JNCC established that the PAD (2015) needed updating for the following reasons:

- 1) Feedback from users showed that they found the list of sub-activities split into operation types confusing and difficult to use, and that more detailed activities were missing.
- 2) JNCC have recently updated the conservation advice for offshore (>12nm) Marine Protected Areas, including the advice on operations which provides information on the activities capable of affecting site integrity and the achievement of the site’s conservation objectives. As such, there was a need to improve the evidence base for the types of activities that may affect offshore MPAs and their associated features.
- 3) To improve consistency in advice on operations across UK-waters, there was a need to align the PAD with the NE ‘advice on operations’ and MS/SNH ‘FeAST’ tools.

To meet these needs, JNCC have re-developed the PAD, firstly to re-format and update it to align with NE’s advice on operations and MS/SNH’s FeAST to the extent possible, whilst still maintaining much of the evidence base collated under project ME5218, and secondly to include additional activities that were not included in the 2015 version or the existing tools.

Whilst the key driver for the PAD (2018) update is to support the advice on operations for UK offshore MPAs, it will also be used for other areas of work including non-MPA projects such as the development of biodiversity indicators for the MSFD and to support the risk-based approach to biodiversity monitoring.

The overall aim is to provide a UK-level product that can be used for inshore and offshore waters, within or outwith of MPAs.

3 Tables within the PAD (2018)

The revised PAD (2018) is made up of the tables shown below (see Figure 1):

- Activity category
- Activities
- Pressures
- Activity-pressure justification
- Risk profiling of pressures (RPP) score
- Risk factor

³ http://jncc.defra.gov.uk/pdf/Standard_Activity_Definitions.pdf

- Evidence standard
- Confidence score

The information that these tables contain is detailed in the following sections.

3.1 Activity category

The PAD (2018) uses 12 activity categories, based on the JNCC standard list of human activities in the marine environment, as follows:

- Coastal infrastructure
- Coastal management activities
- Defence and national security
- Energy generation
- Extraction (and disposal) of non-living resources
- Extraction of living resources
- Other man-made structures
- Production of living resources
- Recreation and leisure
- Research
- Transport
- Waste management activities

3.2 Activities

The PAD (2018) is made up of 112 marine-based human activities, split by activity category (see Appendix 1 – List of activities). These have been taken from the following sources:

- **NE advice on operations:** 81 activities taken directly from Natural England’s advice on operations;
- **NE advice on operations – revised:** 5 activities based on NE’s advice on operations, but with a slightly revised evidence base;
- **FeAST - revised:** 7 activities based on FeAST, but with a revised evidence base;
- **2015 PAD:** 7 activities from the 2015 version of the PAD with an updated evidence base; and,
- **New (SNCB agreed):** 12 new activities based on consultation with the Statutory Nature Conservation Bodies (SNCBs), including offshore-specific activities.

3.3 Pressures

The pressures list is based on the OSPAR ICG-C pressures list⁴, but has been amended slightly to align with pressures used in the MarLIN marine evidence-based sensitivity assessments (MarESA⁵) to ensure that these two products are compatible. Changes were as follows:

⁴ http://jncc.defra.gov.uk/pdf/20110328_ICG-C_Pressures_list_v4.pdf

⁵ <http://www.marlin.ac.uk/sensitivity/SNCB-benchmarks>

- the names of some pressures were edited (e.g. "Emergence regime changes – local" changed to "Emergence regime changes, including tidal level change considerations");
- some pressures were split into two to allow more detail (e.g. "salinity changes" changed to "salinity increase" and "salinity decrease").
- one new pressure has been added - "vibration".

These changes are listed in Table 1. Any pressures not listed have not been changed.

Table 1: Changes made to the pressures from the ICG-C pressures list to the PAD (2018).

ICG-C Pressure	PAD (2018) Pressure
Penetration and/or disturbance of the substrate below the surface of the seabed - Surface	Abrasion/disturbance of the substrate on the surface of the seabed
Changes in suspended solids	Changes in suspended solids (water clarity)
Death or injury by collision	Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery and structures)
Emergence regime changes - local	Collision BELOW water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery and structures)
Introduction or spread of non-indigenous species	Emergence regime changes, including tidal level change considerations
Penetration and/or disturbance of the substrate below the surface of the seabed - Subsurface	Introduction or spread of invasive non-indigenous species (INIS)
Salinity changes - local	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion
Siltation rate changes	Salinity decrease
	Salinity increase
Temperature changes - local	Smothering and siltation rate changes (Heavy)
	Smothering and siltation rate changes (Light)
Non-synthetic compound contamination - Transition elements and organo-metals	Temperature decrease
N/A	Temperature increase
Water flow (tidal current) changes - local	Transition elements and organo-metal (e.g. TBT) contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC
Wave exposure changes - local	Vibration
	Water flow (tidal current) changes, including sediment transport considerations
	Wave exposure changes

3.4 Activity-Pressure justification

Each activity-pressure (AP) relationship is backed up by evidence from a literature search and/or expert judgement, and these are recorded within the AP justification description.

For the 81 activities taken from the NE advice on operations database, the AP relationships and justification description were taken directly from their database. This evidence was collated by Natural England’s sector specialists, who used a combination of peer reviewed literature, grey literature and expert judgement, supplemented with evidence from the 2015 PAD. Additionally, their sector specialists consulted with industry representatives where needed.

For the remaining activities, the following steps were undertaken:

1. JNCC reviewed the available evidence for each AP relationship using peer reviewed literature, grey literature, the 2015 PAD, and similar activities from the NE advice on operations, and prepared the AP justification description.
2. The AP relationships and justification descriptions were sent out for peer review by SNCB and/or relevant government agency, academic or industry representatives (see Appendix 2).
3. The AP relationships and justification text was updated by JNCC using outputs from the peer review, including a further review of literature where needed.
4. For those AP relationships where a thorough additional review of literature was required, a contract was run with ABPmer. The contractors updated the AP relationships and justification text with further evidence based on a new review of literature and/or expert judgement, in order to address all comments received from the peer review.

The main search engines that were used to find reference material included Google, Google scholar and Science Direct. The types of evidence reviewed included scientific research papers, Environmental Impact Assessments (EIAs), Habitats Regulations Assessment (HRAs) (for development projects), marine status assessment reports (e.g. OSPAR QSR) and sectoral reviews of activities and impacts.

The references used for the AP justification description are denoted by a numeric or alphanumeric code in square brackets. A full list of references associated with these codes is provided with the PAD as a separate download.

3.5 Risk profiling of pressures score and increased risk factor

The risk profiling of pressures (RPP) score and the increased risk factor have been included based on work done by NE within their advice on operations. The RPP score indicates the general risk the pressures pose to the environment under normal conditions, and can be ‘medium-high’ or ‘low’ based on the associated recommendation text (see Table 2). The increased risk factor description is included for all ‘low risk’ pressures, detailing the circumstances in which the risk may increase.

These scores were selected using expert-judgment, and the associated increased risk factor was dependent on the score chosen and the type of activity it relates to.

Table 2: Risk profile of pressure score types and description.

Risk Profile of Pressure	Recommendation
Medium-High Risk	Pressure is commonly induced by activity at a level that needs to be considered further as part of an assessment.
Low Risk	Unless there are evidence-based case or site-specific factors that increase the risk, or uncertainty on the level of pressure on a receptor, this pressure generally does not occur at a level of concern and should not require consideration as part of an assessment.

The following text is from the NE designated sites view advice on operations pages (NE 2018) and describes the RPP and risk factor in more detail:

"Risk profiling of pressures (RPP) is intended to support the application of the new marine conservation advice packages to an assessment of the potential impacts of an activity on the features of an MPA, usually as part of the screening stage of an assessment. The RPP was created to rank the pressures by the general risk they pose to the environment under normal conditions but in no case should be taken as a 'one size fits all' approach as the risk associated to the pressure will be specific for each situation. The RPP is generic and does not constitute a risk assessment and therefore should not be used as such. It should only be used to inform such assessments in conjunction with all available site-specific information."

In the RPPs all pressures assessed as generically posing low risk to features of MPAs are accompanied by supporting text that highlights factors under which the risk associated with the pressure can increase. This text should always be read in conjunction with the associated Activity-Pressure justification. This supporting information should be considered in light of knowledge/evidence relating to the activity and/or site to determine whether the pressure should be given any further consideration in a site-based assessment. It is important to note that there may be additional factors, not mentioned in the supporting text that might result in re-consideration of the risk posed to the feature by the activity, as a result of the pressure. Some low risk pressures may become medium-high risk pressures as a consequence of these additional site-specific factors and users should seek further advice from Natural England's area team staff in these instances.

Conversely, in specific cases pressures assessed as generically posing medium to high risk to features of MPAs may be screened out as part of an assessment on the basis of activity and/or site-specific knowledge/evidence."

3.6 Evidence standards

All the work undertaken on the PAD (2018) followed appropriate evidence quality standards. Details of the relevant standard are recorded in the 'Evidence standard description' within the PAD.

Evidence taken from the NE advice on operations has been completed under NE's evidence quality standards, particularly "Analysis of Evidence" (NESTND024) and "Conservation Advice for MPAs" (NESTND036). More information on these can be found here:
<http://publications.naturalengland.org.uk/category/3769710>

Evidence completed by JNCC followed the JNCC evidence quality assurance (EQA) policy (2014). More information on this can be found here:
<http://jncc.defra.gov.uk/default.aspx?page=6675>

To comply with JNCC Evidence Quality Guidance Note #1 - Bias, Conflicting Evidence and Uncertainty⁶, a confidence score was assigned to all those activity-pressure relationships and associated justifications identified by JNCC – see Section 3.7.

Following Evidence Quality Guidance Note #2 - Peer Review in JNCC Evidence and Advice Provision⁷, the type of advice product was considered to be a ‘Moderate review’, requiring a peer review level of 2A (Internal Peer Review) to 2B (Peer Review involving the SNCBs and relevant agencies). As such the peer review process (see Section 3.4) was undertaken by SNCBs, relevant agencies and internal JNCC staff.

3.7 Confidence score

To comply with the JNCC EQA guidance (see section 3.6), a confidence score was assigned to all activity-pressure relationships identified by JNCC, based on the evidence used for the justification text. This followed the confidence method developed under contract ME5218 (Defra 2015), and used the scores and definitions shown in Table 3.

Note, the evidence taken directly from the NE advice on operations follows the NE evidence quality standards, and thus no confidence score is provided for these activity-pressure relationships.

Table 3: Confidence scores based on evidence type, amount, quality and consistency.

Confidence score	Definition
High	There is a good understanding of the activity-pressure relationship and/or the assessment is well supported by evidence ⁸ . There is consensus amongst the experts.
Medium	Whilst there is an understanding of the activity-pressure relationship, this may be based on limited evidence and/or proxy information. There is a majority agreement between experts; but conflicting evidence/opposing views exist.
Low	There is limited or no understanding of the activity-pressure relationship and/or the assessment is not well supported by evidence. There is no clear agreement amongst experts.

4 References

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<https://designatedsites.naturalengland.org.uk/SiteSearch.aspx> [accessed 10th August 2018]

⁶ http://jncc.defra.gov.uk/pdf/jncc_EQGN_1_BiasandUncertainty.pdf

⁷ http://jncc.defra.gov.uk/pdf/jncc_EQGN_2_PeerReviewofEvidence.pdf

⁸ Evidence is defined as expert opinion or advice, data, methodology, results from data analysis, interpretation of data analysis, and collations and interpretations of scientific information (meta-analysis), peer-reviewed papers, grey literature, industry knowledge and anecdotal evidence (adapted from JNCC 2013).

Appendix 1 – List of activities, by category, used within the PAD (2018) and their sources

CategoryTitle	ActivityTitle	ActivityDesc	Where from
Coastal Infrastructure	Anchorage and moorings: Construction	Creation of new anchorage areas and laying of new moorings (intertidal or subtidal). Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal Infrastructure	Clearance of port and harbour structures and water ways	Periodic, regular or discrete clearance of structures and waterways or debris, sediment, algal growth or similar. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Coastal flood and erosion risk management schemes: Construction	Construction of new coastal defence structures/schemes including seawalls, bunds, revetments, dykes, ditches, beach recharge, groynes, breakwaters etc. Includes consideration of construction works, plant and materials, plus vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Coastal flood and erosion risk management schemes: Operation	Operational effects of coastal defence schemes including accretion of sediment, erosion of intertidal, coastal habitats, on-going sediment recycling schemes, coastal squeeze, operation of sluices, etc. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Hard coastal defences: Maintenance	Maintenance of 'hard' coastal defences including sea walls, groynes, rock armours, wave screens, breakwaters, gabions, cliff stabilisation, floodgates/sl uices. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal Infrastructure	Navigation markers/lights	Operation and presence of navigation marks and lights, including navigation buoys, posts, towers, transit marks, onshore and offshore. Includes maintenance of these structures. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal Infrastructure	Offshore coastal defence structures (wave screens/breakwaters): Construction and operation	Construction and operation of offshore or detached coastal defence structures (intertidal or subtidal) including wave-screens, breakwaters. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations

Coastal Infrastructure	Outfalls/Intake pipes (maintenance/construction/usage)	This considers the construction, maintenance, and ongoing use of an outfalls and intakes pipes. The outfalls pipe could discharge liquids at varying temperatures, salinities, oxygen, nutrient concentrations. Includes consideration of vessels/machinery/vehicles and materials associated with construction, maintenance operational usage of infrastructure.	NE advice on operations
Coastal Infrastructure	Piling: Coastal flood and erosion risk management schemes	Pile driving is the process of forcing a pile (tube, stake, beam, or sheet) into substrate to create a foundation for a structure. Commonly used for construction of foundations for structures including coastal defences. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Piling: Port and Harbours	Pile driving is the process of forcing a pile (tube, stake, beam, or sheet) into substrate to create a foundation for a structure. Commonly used for construction of foundations for structures including coastal defences. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Port and harbour structures: Construction (if relevant see also 'Slipway: Maintenance and construction')	Construction, expansion and new and re development of and within ports and harbours including new port facilities, quaysides, berths, redevelopment of existing infrastructure or construction of new port, marina, harbour. Includes consideration of vessels/machinery/vehicles, and materials associated with activity e.g. jack-up barges, piling plant, dredgers, barges.	NE advice on operations
Coastal Infrastructure	Port and harbour structures: Maintenance (if relevant see also 'Slipway: Maintenance and construction')	Maintenance of 'hard' coastal defences including sea walls, groynes, rock armours, wave screens, breakwaters, gabions, cliff stabilisation, floodgates/sluches. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal Infrastructure	Port and harbours: Operation	Day-to-day operational use of ports and harbours including use of quay sides, port estate, movement of vessels, navigation markers, and lights, supply of fuel/bunkering operations. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Reclaim and land take (e.g. the footprint of coastal defences)	Reclamation of land from below the high-water mark to create new land or as a result of coastal defence footprint. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations

Coastal Infrastructure	Shoreside industry and operations	Shoreside industry and associated operations includes industries found within, close to or in association with port estate e.g. chemical works, oil refineries, factories, processing plants, and other maritime industry. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal Infrastructure	Slipway: Maintenance and construction	Considered the ongoing maintenance (washing down, clearing mud) and construction of a slipway. This does not consider the operational usage of a slipway which is covered by ports and recreation activities. Includes consideration of vessels/machinery/vehicles and materials associated with construction and maintenance of infrastructure.	NE advice on operations
Coastal Infrastructure	Soft coastal defences: Maintenance	Maintenance of 'soft' coastal defences including management of beaches, bunds, ditches/drainage, managed realignment sites, beach/sediment recharge or on-going sediment feeding, management of vegetation, sand dune stabilisation. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal management activities	Agriculture (grazing)	This activity covers the use of coastal areas (in particular coastal salt marshes) for grazing of domestic animals (e.g cows, sheep and horses) and drainage and fertilisation of coastal salt marshes to improve grazing. Includes consideration of machinery/vehicles and materials associated with activity.	New (SNCB agreed)
Coastal management activities	Beach sand extraction	The process of extracting sand from the beach using diggers. Sand is transported via trucks to be used usually for construction. Sand extraction involves a large number of vehicle movements and can result in morphological alterations to the beach.	NE advice on operations
Coastal management activities	Change in forestation	This activity considers (i) the effects of removing existing forests and (ii) afforestation (the planting of trees on land that is currently/ previously had a different habitat. Includes consideration of machinery/vehicles and materials associated with activity.	New (SNCB agreed)
Coastal management activities	Habitat creation	Creation of new areas of intertidal, transitional, freshwater, or terrestrial habitat often as a component of a mitigation/compensation scheme. Could also be for protected species. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Coastal management activities	Herbicide spraying and vegetation removal	Considers the use of sprayers (vehicle/person) mounted and the removal of vegetation from sand, shingle, muddy beaches. Does not consider salt marsh.	NE advice on operations

Coastal management activities	Intertidal recharge	The recharge of intertidal areas for coastal defence schemes or for habitat creation/ mitigation, including beach recharge and recycling of material, recharge of intertidal mud and sandflats, beneficial use of dredged material. Includes consideration of vessels/machinery/ vehicles associated with activity. This activity does not include the act of dredging material from outside of the site.	NE advice on operations
Coastal management activities	Land reclaim	Reclamation of land from below the high-water mark to create new land potentially for new quaysides, coastal defences, port estate. Often involved creation of new wall or hard coastal defence and infilling behind to raise height. Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal management activities	Managed realignment	Managed realignment/retreat of coastline or defences to allow exposure to flooding by the sea or sea water intrusion. In estuaries or open coast, includes controlled/active breaches of defences and uncontrolled breaches by policy of no active management of defence (consciously allowing defences to fail). Includes consideration of vessels/machinery/vehicles and materials associated with activity.	NE advice on operations
Coastal management activities	Sand raking	Considers the use of sand rakes deployed from a vehicle or an individual to groom the beach for aesthetic reasons and to remove marine debris such as seaweed or litter.	NE advice on operations
Coastal management activities	Strandline clearance	Considers the removal of marine litter and organic material such as seaweed that has been deposited on the beach. Where this material is considered unsightly it is often removed by individuals.	NE advice on operations
Defence and national security	Aerial military activity	Military exercises undertaken that involve the use of the air space above the sea, e.g. aircraft flying, air to sea or ground firing with exploding shells.	FeAST - revised
Defence and national security	Sea surface military activity	Military exercises on the sea surface, e.g. boats, surface explosions and surface target towing	FeAST - revised
Defence and national security	Seabed surface military activity	Military exercises undertaken that involve the use of the seabed, e.g. installation and operation of seabed mounted equipment, seabed sampling and degaussing.	FeAST - revised
Defence and national security	Water column military activity	Military exercises undertaken that involve the use of the water column, e.g. submarine use and diving.	FeAST - revised
Energy generation	Exploratory drilling	Exploratory drilling to evaluate commercial viability of geological features.	New (SNCB agreed)

Energy generation	Gas storage operations (carbon capture and natural gas storage)	The deposition/ injection of natural gases or carbon into identified submarine storage sites.	2015 PAD
Energy generation	Heat abstraction	This activity considers the construction, maintenance and ongoing use of heat abstraction exchanger housing, outfalls and intake pipes. The outfall pipes could discharge liquids at decreased temperatures, varying oxygen concentrations and containing pollutants including anti-freeze. Includes consideration of vessels/machinery/vehicles and materials associated with construction, maintenance operational usage of infrastructure.	New (SNCB agreed)
Energy generation	Offshore wind: Construction (if relevant see also Cables)	Seabed preparation (possibly dredging), cuttings/dredging disposal, piling, drilling, anchoring, mooring, vessel movement, vessel discharges/emissions, installation of scour protection, introduction of artificial substrate. This also includes the presence of the turbine structures and foundations – large offshore windfarms will be constructed over many years and the pressures due to the presence of turbines will therefore be present during the construction phase. For cabling please see and include the separate activity.	NE advice on operations
Energy generation	Offshore wind: Decommissioning (if relevant see also Cables)	Vessel movement, vessel discharges, use of jack up barges, removal of structures/scour protection and associated habitat, use of explosives, cutting, drilling, excavation of seabed close to foundations. This also includes the presence of the turbine structures and foundations – large offshore windfarms may be decommissioned over long time scales and the pressures due to the presence of turbines will therefore be present during the decommissioning phase. For cabling please see and include the separate activity.	NE advice on operations
Energy generation	Offshore wind: Operation and maintenance (if relevant see also Cables)	Regular vessel movement, vessel discharges, rotor sweep, lighting, presence of turbine and foundation structures. Also includes use of jack up barges for maintenance and deposition of additional scour protection. For cabling please see and include the separate activity.	NE advice on operations
Energy generation	Oil and gas infrastructure: Construction (see also piling and pipelines)	This activity includes the construction of oil and gas infrastructure in the marine environment including, but not limited to, the installation of rock dump to stabilise jack up rigs, cementing, introduction of other protection material such as concrete mattresses, matting and gravel, the temporary installation of infrastructure (such as pipelines, debris baskets, etc), drilling wells and plugging and abandonment,	NE advice on operations - revised

		accidental effects, vessel movement, installation of subsea infrastructure etc.	
Energy generation	Oil and gas infrastructure: Decommissioning	The plugging and abandonment of wells, removal of structures and associated habitat, use of explosives, cutting, drilling. Disturbance of drill arisings and cuttings. Placement of rock to cover remaining structures or to provide base for jack-up legs. Includes operation by supporting vessels, vessel discharges, use of ROVs, lifting and jack-up rigs.	NE advice on operations
Energy generation	Oil and gas infrastructure: Operation and maintenance	Production/operation, with routine supply, return of wastes to shore, power generation, chemical use, produced water, and re-injection of reservoirs.	NE advice on operations - revised
Energy generation	Oil spills including oil spill response	Oil spills can originate from terrestrial sources, sub-sea or on the surface. These spills can occur nearshore, inshore or within offshore waters. Oil spill response includes, but is not limited to, the use of dispersants, <i>in-situ</i> burning, mechanical recovery and physical removal, the drilling of relief wells or plugging of wells. Other spills associated with oil and gas production, e.g. hydraulic fluids, are not specifically included, but similar pressures may result.	New (SNCB agreed)
Energy generation	Seismic Surveys	Any survey that uses airguns, including 2D/3D/4D and OBC (On Bottom Cabling) surveys and any similar techniques that use airguns.	FeAST - revised
Energy generation	Tidal lagoon/impoundment: Construction	Vessel movement, vessel discharges, lighting, operation of devices and changing water levels.	NE advice on operations
Energy generation	Tidal lagoon/impoundment: Decommissioning	Seabed preparation (possibly dredging), cuttings/dredging disposal, piling, drilling, anchoring, mooring, vessel movement, vessel discharges/emissions, installation of scour protection, introduction of artificial substrate, cabling (see separate activity).	NE advice on operations
Energy generation	Tidal lagoon/impoundment: Operation and maintenance	Vessel movement, vessel discharges, removal of structures/cables and associated habitat, use of explosives, cutting, drilling.	NE advice on operations
Energy generation	Tidal stream: Construction	Seabed preparation (possibly dredging), cuttings/dredging disposal, piling, drilling, anchoring, mooring, vessel movement, vessel discharges/emissions, installation of scour protection, introduction of artificial substrate, cabling (see separate activity).	NE advice on operations
Energy generation	Tidal stream: Decommissioning	Vessel movement, vessel discharges, removal of structures/ cables and associated habitat, use of explosives, cutting, drilling.	NE advice on operations

Energy generation	Tidal stream: Operation and maintenance	Vessel movement, vessel discharges, rotor sweep or other device operation, lighting.	NE advice on operations
Energy generation	Wave: Construction	Seabed preparation (possibly dredging), cuttings/dredging disposal, mooring, anchoring, piling, drilling, vessel movement, vessel discharges/emissions, installation of scour protection, introduction of artificial substrate, cabling (see separate activity).	NE advice on operations
Energy generation	Wave: Decommissioning	Vessel movement, vessel discharges, removal of structures/cables and associated habitat, use of explosives, cutting, drilling.	NE advice on operations
Energy generation	Wave: Operation and maintenance	Vessel movement, vessel discharges, lighting, operation of devices.	NE advice on operations
Extraction (and disposal) of non-living resources	Aggregate dredging	The regular excavation of aggregates (a mixture of sand and/or gravel sediments) for use generally in construction and beach recharge. Seabed sediments are removed through trailing suction or static grab dredgers. Dredging is associated with numerous vessel movements, sediment alteration and resuspension. NOTE: This assessment does NOT include aggregate dredging in the intertidal. Please contact Natural England for advice on intertidal aggregate dredging.	NE advice on operations
Extraction (and disposal) of non-living resources	Capital dredging	Removal of material which has not previously been dredged or has not been dredged for >10yrs. Material often more consolidated than maintenance dredging, method of dredging may vary. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Extraction (and disposal) of non-living resources	Deep sea mining	Deep sea mining is the extraction of minerals such as polymetallic nodules and includes the use of seafloor mining devices, riser and lifting systems and mining support vessels.	New (SNCB agreed)
Extraction (and disposal) of non-living resources	Dredge and spoil disposal	The disposal of dredged materials originating from the seabed.	NE advice on operations - revised and 2015 PAD

Extraction (and disposal) of non-living resources	Maintenance dredging	Periodic or regular removal of material from previously dredged areas, e.g. berths, channels, marinas, can be every few weeks to <10yrs apart. Method of dredging may vary and material may be removed for disposal elsewhere or redistributed within the immediate area. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Extraction (and disposal) of non-living resources	Salvage operations	Includes salvage of vessels or infrastructure, e.g. from oil and gas, wrecked on or near the coast. This activity considers the pressures associated with salvaging, including the removal of wrecked structures and pressures caused by supporting vessels.	New (SNCB agreed)
Extraction (and disposal) of non-living resources	Water abstraction	The temporary or permanent removal of water from the marine environment.	2015 PAD
Extraction of living resources	Demersal seine netting	Activity includes demersal anchor/Danish seines and Scottish seines, as well as beach seines that come into contact with the seabed.	NE advice on operations
Extraction of living resources	Demersal trawling	Activity includes beam trawls, demersal otter trawls, demersal pair trawls (excludes electronic pulse fishing).	NE advice on operations
Extraction of living resources	Diving (incl. removal of living resources)	Collection of target species by divers, snorkelers. Includes recreational diving.	NE advice on operations
Extraction of living resources	Dredging (shellfish)	Activity includes dredging (non-hydraulic) for shellfish e.g. scallops, oysters, mussels (including seed), clams and cockles. Includes dredges towed by vessels and tractors.	NE advice on operations
Extraction of living resources	Electrofishing	Activity that includes trawls that interact with the seabed and use electric fields to fish for shellfish, e.g. razor shells, shrimp or fish (e.g. plaice, sole).	NE advice on operations
Extraction of living resources	Extraction of genetic resources, e.g. bioprospecting (also see other related activities in fishing and dredging)	The commercialization of new products based on the exploitation of useful organic compounds from biological resources. Bioprospecting refers to the second and subsequent phases of the recollection of biological resources for the purposes of further investigation.	2015 PAD
Extraction of living resources	Harvesting - seaweed and other sea-based food (bird eggs, shellfish, etc.)	The gathering and removal of wild seaweed and other sea-based foods by hand, with apparatus such as rakes and forks, including bait digging, or by mechanised harvesting methods.	2015 PAD
Extraction of living resources	Hydraulic dredging	Activity includes hydraulic/suction dredging, e.g. clams, cockles, razor shells.	NE advice on operations

Extraction of living resources	Line fishing	The targeted removal of fish species using static hooks and lines that are left in place for a period of time before being recovered to retrieve the caught fish. Example gear types: hand and pole lines (LHP) and long lines (LL, LLD, LLS).	NE advice on operations - revised
Extraction of living resources	Pelagic fishing (or fishing activities that do not interact with sea bed)	Activity includes gears that do not interact with the seabed e.g. pelagic/mid water trawls, drift nets, pelagic seines and pelagic long lines. Also includes handlines and rod and line angling (vessel-based) (*where no anchoring occurs*).	NE advice on operations
Extraction of living resources	Purse Seining	The targeted removal of fish species using pelagic purse seines.	FeAST - revised
Extraction of living resources	Push nets	This activity includes handheld and small vessel driven push nets for fishing inshore shrimp and prawns.	New (SNCB agreed)
Extraction of living resources	Set (fixed) net fishing	The targeted removal of fish species using static nets that are left in place for a period of time before being recovered to retrieve the caught fish. Example gear types: gillnets (GEN, GN, GNC, GND, GNS, GTR) and boat operated lift nets (LNB).	NE advice on operations - revised
Extraction of living resources	Traps	Activity includes pots, creels and traps, as well as fyke nets and other similar gear.	NE advice on operations
Other man-made structures	Cultural and heritage sites (e.g. wrecks, sculptures, foundations etc)	Presence of historic anthropogenic structures such as wrecks, sculptures and foundations.	2015 PAD
Other man-made structures	Pipelines	Installation, maintenance and removal of pipeline, including operations by supporting vessels.	NE advice on operations
Other man-made structures	Power cable: Decommissioning	Cables sometimes need to be retrieved or accessed for repairs or maintenance, and are then reburied or protected. Additional cable protection can also be added where cable becomes unburied. Other specific pressures can also arise from power cable operation such as local temperature changes and electromagnetic field emission. The activity includes possible localised changes in physical environment as well as hydrodynamic changes through exposed cable/structures on the seabed, as well as vessel movement and anchoring during the operation.	NE advice on operations
Other man-made structures	Power cable: Laying, burial and protection	Methods and ways of laying cables vary depending on the water depth and the diameter of the cable. Submarine power cables have a diameter between 70 and up to 450mm. Cables can be laid either	NE advice on operations

		<p>directly on the seabed, covered with material for protection or buried. The method used will depend on the area, the economic/ operational risk or environmental impacts. Protection is afforded in hazardous areas to avoid cable damage, i.e. where interaction with other activities is possible or likely. The most common method of protection is cable burial. This is usually done by seabed trench excavation through ploughing and hydraulic jetting. However, cables might be laid on the surface of the seabed if the area is unsuitable for burial (e.g. exposed rock or rocky outcrops). Cable protection is added in some cases when protection is needed due to the risk of damage. This can be done through rock placement on the seabed over the cable, mattressing, the addition of split pipe, concrete shells, etc. The activity includes seabed preparation activities (e.g. preparatory dredging, pre-lay grapnel runs, boulder removal, etc.), vessel movements and anchoring within the footprint.</p>	
Other man-made structures	Power cable: Operation and maintenance	Cables sometimes need to be retrieved or accessed for repairs or maintenance, and are then reburied or protected. Additional cable protection can also be added where cable becomes unburied. Other specific pressures can also arise from power cable operation such as local temperature changes and electromagnetic field emission. The activity includes possible localised changes in physical environment as well as hydrodynamic changes through exposed cable/structures on the seabed, as well as vessel movement and anchoring during the operation.	NE advice on operations
Other man-made structures	Telecommunication cable: Decommissioning	When a cable is no longer needed or in use the general rule is the complete removal. However, this is often not feasible or appropriate and alternative approaches exist. When removal is deemed appropriate, cables are retrieved through grabbing and raising. Cables are also frequently disconnected and left buried to minimise environmental effects when the safe use of the seabed for other users is possible. The decommissioning process includes vessel movements and anchoring along the cable route.	NE advice on operations
Other man-made structures	Telecommunication cable: Laying, burial and protection	Methods and ways of laying cables vary depending on the water depth and the use of seabed by other activities. Telecommunication cables have a diameter similar to that of a garden hose, 17-22mm or up to 50mm when protective wire armour is used. Cables can be laid	NE advice on operations

		either directly on the seabed, covered with material for protection or buried. The method used will depend on the area, the economic/operational risk or environmental impacts. Protection is afforded in hazardous areas to avoid cable damage, i.e. where interaction with other activities is possible/likely. The most common method of protection is cable burial. Seabed trench excavation through ploughing and hydraulic jetting is frequently used for burial. However, cables might be laid on the surface of the seabed if the area is unsuitable for burial (e.g. exposed rock or rocky outcrops). Cable protection is occasionally added where there is a reasonable risk of damage. This is usually done by rock placement on the seabed over the cable. The activity includes vessel movements and anchoring within the footprint.	
Other man-made structures	Telecommunication cable: Operation and maintenance	Cables sometimes need to be retrieved or accessed for repairs or maintenance, and are then reburied or protected. Additional cable protection can also be added where cable becomes unburied. The activity also includes vessel movement and anchoring during the operation.	NE advice on operations
Production of living resources	Aquaculture predator control	This activity includes the control of predators in relation to aquaculture resources and does not include the impacts of the structures or other actions related to aquaculture.	New (SNCB agreed)
Production of living resources	Finfish aquaculture	Finfish grown in cages/nets suspended from surface structures or lines. These structures may be anchored to the seabed.	NE advice on operations
Production of living resources	Seaweed aquaculture: Suspended rope/net culture	Seaweed grown on ropes/nets suspended from surface structures or lines. These structures may be anchored to the seabed.	NE advice on operations
Production of living resources	Shellfish aquaculture: Bottom culture	Relaying and harvesting of shellfish (e.g. mussels, oysters, scallops) on suitable areas of intertidal and subtidal substrate. Includes dredging for seed.	NE advice on operations
Production of living resources	Shellfish aquaculture: Suspended rope/net culture	Shellfish (mussels, oysters) grown on ropes/nets suspended from surface structures or lines. These structures may be anchored to the seabed.	NE advice on operations
Production of living resources	Shellfish aquaculture: Trestle culture	Shellfish (e.g. oysters) grown on racks or trestles in the intertidal zone.	NE advice on operations

Recreation and leisure	Firework displays	Include both public and private firework displays. This sub activity only covers shore based displays. Vessel based displays whereby fireworks are set off from a vessel such as a floating barge are not considered.	NE advice on operations
Recreation and leisure	Horse riding and dog walking	This considers activities that involve horses and dogs. When dogs are used for wildfowling this sub activity should also be considered.	NE advice on operations
Recreation and leisure	Leisure (e.g. swimming, rock pooling)	Includes activities where a vessel is not used. Includes surfing but excludes paddle boarding as this activity enables the participant to range over greater distances - reduced site fidelity. Consider event type activities also in this category, e.g. beach cleans, large gatherings of people but consider different scales of impacts.	NE advice on operations
Recreation and leisure	Light aircraft	Could include all types of craft used for recreation in the air e.g. small planes and helicopters, microlights, paramotors, hand gliding, parascending (on beach), parasailing (by boat - impacts from boat should be considered in powerboating).	NE advice on operations
Recreation and leisure	Non-motorised land craft (e.g. sand yacht, kite-buggy)	Activities that are actually occurring on the beach and involve craft. Includes events and competitions.	NE advice on operations
Recreation and leisure	Non-motorised water craft (e.g. kayaks, windsurfing, dinghies)	Activity type examples: kayaks, windsurfing, kite surfing, dinghies, canoes, row boats, paddle boards. This includes all related activity - participation, launching/recovery (may include shore access and may be with trailers), anchoring of any small craft and/or mooring.	NE advice on operations
Recreation and leisure	Powerboating or sailing with an engine: Launching and recovery, participation	Participation is when underway/making way. Launching or recovery is referring to slipway or beach/shore launching (this may include the use of trailers) - this aspect of the activity and associated pressures will not apply to boats kept on the water. This activity includes any motorised boat (includes Personal Watercraft (PWC)) and would also include powerboating races and events.	NE advice on operations
Recreation and leisure	Powerboating or sailing with an engine: Mooring and/or anchoring	Includes impacts from installed moorings, impacts from anchors and impacts of boat when at anchor or mooring. Impacts from boats getting to and from moorings should be assessed in the 'participation' category.	NE advice on operations

Recreation and leisure	Sailing without an engine: Launching and recovery, participation	Participation is when underway/making way. Launching or recovery is referring to slipway or beach/shore launching (this may include trailers) - this aspect of the activity and associated pressures will not apply to boats kept on the water. This activity includes sailing races and events.	NE advice on operations
Recreation and leisure	Sailing without an engine: Mooring and/or anchoring	Includes impacts from installed moorings, impacts from anchors and impacts of boat when at anchor or mooring. Impacts from boats getting to and from moorings should be assessed in the 'participation' category.	NE advice on operations
Recreation and leisure	Wildfowling	Concerns the use of firearms to shoot wild fowl. This does take into account the use of punts - the impact of use of boats from this activity should be considered within the separate relevant category. This does not take into account the use of dogs during wildfowling activities - the impact of dogs should be considered within the separate relevant category.	NE advice on operations
Research	Exploratory drilling	Exploratory drilling to evaluate commercial viability of geological features.	New (SNCB agreed)
Research	Physical Sampling (see also fishing and extraction of genetic resources, e.g. bioprospecting)	Sampling of the seabed, foreshore (intertidal) and/or water column in situ using a variety of marine survey techniques.	New (SNCB agreed)
Research	Marine archaeological research	Marine archaeological research; including the removal of artefacts, the use of vessels and the presence of people.	New (SNCB agreed)
Research	Remote sensing	This includes methods of obtaining data or images from a distance, e.g. from satellites or aircraft and includes LIDAR.	New (SNCB agreed)
Research	Seismic Surveys	Any survey that uses airguns, including 2D/3D/4D and OBC (On Bottom Cabling) surveys and any similar techniques that use airguns.	FeAST - revised
Research	Sonar	The use of echo sounders underwater for research or exploratory purposes as well as military purposes.	FeAST - revised
Transport	Cargo operations and landward transportation	Includes trans-shipment of cargo, loading and unloading of vessels, landside handling, logistics and on-ward transportation e.g. road, rail within port estate. Includes handling of hazardous cargo. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations

Transport	Commercial hovercraft	Use and operation of commercial/non-recreational hovercraft. Singled out from generic vessels due to unique ability to transit across any flat surface land and sea including intertidal, plus noise and speed associated.	NE advice on operations
Transport	Hovercraft	Includes during travel, launching and when stationary (may be beached when not in use).	NE advice on operations
Transport	Vessel anchorages	A place where a vessel is anchored. Covers activity of anchoring generically and use of allocated anchorage areas where ships are permitted to anchor inside and outside harbours/ports. Including consideration of vessels when anchoring, anchored or weighing anchor.	NE advice on operations
Transport	Vessel berths	Operational use of berths including moorings, anchorages and the presence of these structures and vessels using them. Includes consideration of vessels when berthing/berthed, mooring/moored, anchoring/anchored.	NE advice on operations
Transport	Vessel discharges/emissions	Includes operational, incidental and accidental discharges/emissions from all types of vessels, including exhaust fumes, wastes and waste water, sewerage, oils, lubricants and chemicals, marine litter and other flotsam and jetsam.	NE advice on operations
Transport	Vessel maintenance	Vessel maintenance and repair on land and afloat, operation of ship/boatyards, lay-ups, dry docks, designated anchorages including hull cleaning. Includes consideration of vessels/machinery/vehicles associated with activity.	NE advice on operations
Transport	Vessel moorings	Use of vessel moorings and activity associated with mooring of vessel. Mooring is a temporary or permanent structure to which a vessel may be secured, e.g. swing mooring, trot, fore and aft mooring, pile mooring. Includes consideration of vessels when mooring or moored.	NE advice on operations
Transport	Vessel movements	Movement of all commercial or ‘non-recreation’ vessels of all scales, from container ships, tankers, cruise liners to pilot vessels, tugs and small water craft, (including fishing vessels when not fishing).	NE advice on operations
Waste management activities	Power station thermal and nuclear discharges	Thermal or nuclear effluent from power stations.	2015 PAD

Waste management activities	Sewage disposal	The release of waste matter such as faeces or dirty water from sewage treatment facilities.	2015 PAD
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Appendix 2 - List of organisations undertaking peer-review of PAD (2018) for specific activities

Category	Activity	Peer review organisation
Coastal management activities	Agriculture (grazing)	NRW NE
Coastal management activities	Change in forestation	NRW NE
Defence and national security	Aerial military activity	MoD
Defence and national security	Sea surface military activity	MoD
Defence and national security	Seabed surface military activity	MoD
Defence and national security	Water column military activity	MoD
Energy generation	Gas storage operations (carbon capture & natural gas storage)	BEIS
Energy generation	Heat abstraction	NRW
Energy generation	Oil and gas infrastructure: Construction (see also piling and pipelines)	BEIS JNCC
Energy generation	Oil and gas infrastructure: Operation and maintenance	BEIS JNCC
Energy generation	Oil spills including oil spill response	BEIS JNCC
Energy generation	Power station thermal and nuclear discharges	ABPmer
Extraction of living resources	Push nets	JNCC
Extraction (and disposal) of non-living resources	Deep sea mining	Cefas JNCC
Extraction (and disposal) of non-living resources	Dredge and spoil disposal	Cefas
Extraction (and disposal) of non-living resources	Salvage operations	JNCC
Extraction of living resources	Line fishing	JNCC

Extraction of living resources	Net fishing (static)	JNCC
Extraction of living resources	Purse Seining	JNCC
Production of living resource	Aquaculture predator control	NRW
Recreation and leisure	Cultural and heritage sites (e.g. wrecks, sculptures, foundations, etc)	Historic England
Research	Acoustic devices	JNCC
Research	Marine archaeological research (including the removal of artefacts)	DAERA
Research	Remote Sensing	Satellite Oceanographic Consultants
Research	Seismic Surveys	JNCC
Research	Sonar	JNCC
Extraction (and disposal) of non-living resources	Sewage disposal	Environment Agency
Extraction (and disposal) of non-living resources	Water abstraction	Environment Agency
Extraction of living resources	Extraction of genetic resources, e.g. bioprospecting (also see other related activities in fishing and dredging)	Galway University
Research	Exploratory drilling	ABPmer*
Extraction of living resources	Harvesting - seaweed and other sea-based food (bird eggs, shellfish, etc)	ABPmer*

*Note, other relevant organisations were asked to peer review these activities but no response was received.