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REGULATION AND MANAGEMENT OF MARINE AGGREGATE DREDGING IN ENGLAND

Marine dredged sand and gravel make an important contribution to regional supplies of building materials used in England. Marine aggregate dredging however, is known to result in effects to the receiving environment which, if not properly controlled, could cause adverse impacts to a wide range of receptors. As the marine area around England gets busier, competition for space comes with regulatory challenges and an integrated marine management approach that uses a robust planning system is required. This article discusses the regulation of aggregate dredging in England and provides an overview of the sector's importance in providing primary aggregate.

The importance of marine aggregates

The dredging of marine mineral resources (sand and gravel) from the seabed around England and Wales is an important means of winning primary aggregate (comprising sand, gravel and crushed rock). On average, around 90% is used by the construction sector, meeting 20% of the sand and gravel demand in England and Wales (The Crown Estate, 2021). This makes it a key resource in supporting the delivery of major infrastructure projects that support government policies related to ensuring energy security and combating climate change.

For example, marine dredged aggregate is likely to play a key role in future port, nuclear and offshore wind farm developments in addition to beach replenishment and flood defence works. The current annual level of extraction stands at 15-20 million tonnes and has the potential to increase to up to 29 million tonnes by 2030 (The Crown Estate, 2021). This is largely because of growing constraints on the availability of terrestrial supplies. It is therefore important to ensure this finite, strategic resource is planned for, managed and extracted in the most sustainable manner possible.

Regulatory background

Aggregate dredging is highly regulated and in England controls have been in place since the 1960s. Historically, The Crown Estate issued "During Pleasure" licences to aggregate operators in its capacity as the owner of the seabed and in turn owner of non-energy marine minerals. In 1968, the non-statutory Government View (GV) procedure was established whereby permission to dredge would only be issued subject to the government being satisfied that predicted impacts to the environment would not result in unacceptable deleterious impacts to marine receptors. The Crown Estate, which lease

FIGURE 1

The trailer suction hopper dredger Britannia Beaver, operated by Britannia Aggregates Ltd, entering the port of Newhaven, East Sussex. Image courtesy of Britannia Aggregates.

marine mineral extraction on almost the entirety of the continental shelf of England, Wales and Northern Ireland, continue to have a role in marine aggregate extraction through the award of commercial licences and such arrangements have been in place since the mid-1990s. Such production agreements assign exclusive rights to companies to extract sand and gravel through a competitive tender process, subject to any necessary regulatory consent.

The UK has some of the best marine aggregate resources in the world.

The earlier permissions issued to dredging operators lacked robust assessment of potential impacts and formal impact assessments were not routinely undertaken. In 1988, the European-wide directive was introduced on "the assessment of the effects of certain public and private projects on the environment" (85/337/EEC). It requires that an environmental assessment be carried out before consent is granted for projects that are deemed to likely have a significant effect on the environment. This, together with a growing awareness of environmental issues, saw the GV procedure revised.

From 1989, operators were required to undertake an Environmental Impact Assessment (EIA) to support their application for a dredging licence. Two further pieces of secondary legislation that transpose the EIA Directive into UK law were introduced in 2007. The Marine Works (EIA) Regulations (SI 2007:1518) require activities (such as aggregate dredging) that may pose a risk to navigation could trigger the need for consent under section 34 of the Coast Protection Act (1949) (CPA). While the EIA and Natural Habitats (Extraction of Minerals by Marine Dredging) (England and Northern Ireland) (SI 2007: 1067) places further requirements on applicants including monitoring conditions that are attached to "Dredging Permissions".

More recently, The Marine and Coastal Access Act (MCAA 2009) received Royal assent in November 2009 and secondary legislation was subsequently drafted that repealed the EIA and Natural Habitats (Extraction of Minerals by Marine Dredging) (England and Northern Ireland) (SI 2007: 1067). The CPA consent (and licence required under the Food and Environment Protection Act 1985) was replaced from

6 April 2011 and any aggregate dredging activity within the UK marine area (as de fined in section 42 of the MCAA 2009) now requires a Marine Licence.

The Marine Management Organisation (MMO)

The Marine Management Organisation (MMO) is the marine manager in England (with marine licensing in Wales being undertaken by Natural Resources Wales and by Marine Scotland in Scottish waters) and was established in 2010 through the MCAA 2009. The MMO is the principal body responsible for providing a holistic approach to marine management and licensing around England within the UK marine area. A white paper laid before parliament in 2007 (DEFRA, 2007) included provision for establishing the MMO and set out requirements for modernising the marine licensing system that existed at the time.

An objective of the new marine licensing system adopted in the MCAA 2009 was to provide a regime that is streamlined and designed to provide a better, more consistent and cost effective and efficient system that is easier to use by applicants (DEFRA, 2007). The MMO has a key duty when exercising its functions to be a champion of sustainable development in the marine area. Central to the MMO exercising its functions is therefore to champion sustainable development. Generally, "sustainable development" is defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs (defined in the 1987 Brundtland report). Such a holistic approach allows the MMO to consider the wider benefits of proposed developments alongside potential impacts and ensure a balance is struck between competing uses – an approach that adopts the principles of better regulation and is flexible, targeted, proportionate and risk based.

The Marine Bill white paper set clear guidance for establishing exemptions for activities that are so insignificant that they should not be regulated at all. The white paper established principles to disapply from the licensing regime certain activities that might include minor construction projects. The MCAA 2009 aims to promote a risk-based and proportionate approach to licensing and exemptions Orders are intended to promote growth while protecting other uses of the sea in a balanced way.

The Deregulation Act 2015 also places certain requirements on regulators to have regard to the desirabilty of promoting economic growth – known as the "Growth Duty". The 2015 Act requires regulators to have regard to how their regulatory activities might affect economic growth and competitiveness; under the 2015 Act, regulators must also have regard to the need to minimise any disproportionate impact of regulation on activities with an aim of delivering efficiency in regulating business activities while keeping the costs to businesses to a minimum.

Marine planning

The MCAA 2009 established the legal basis for marine planning, while the UK Marine Policy Statement (MPS) (HM Government, 2011) provides the policy framework and the context for marine plans. Marine plans put into practice the objectives for the marine environment that are identified in the MPS alongside the National Planning Policy Framework (NPPF) and the Localism Act 2011 (DEFRA, 2011).

The MPS recognises the contribution of the sustainable marine aggregate extraction

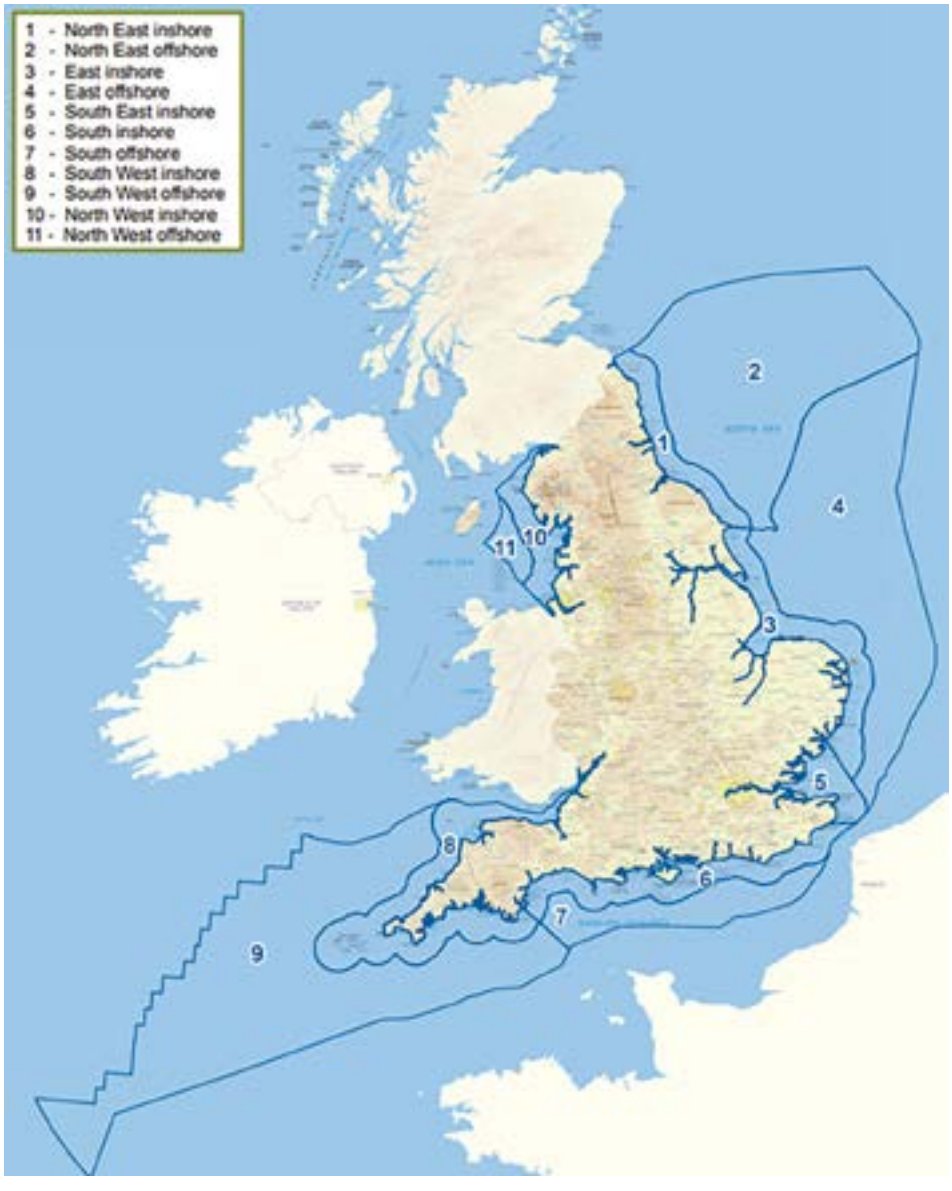

FIGURE 2

Marine plan areas in England.

in section 3.5.1: "The UK has some of the best marine aggregate resources in the world. Marine sand and gravel makes a crucial contribution to meeting the nation's demand for construction aggregate materials, essential for the development of our built environment. (...) The extraction of marine dredged sand and gravel should continue to the extent that this remains consistent with the principles of sustainable development, recognising that marine aggregates are a finite resource and in line with the relevant guidance and legislation."

In relation to marine plans, the MPS states in section 3.5.5 that, "Marine plan authorities should as a minimum make provision within marine plans for a level of supply of marine sand and gravel that ensures that marine aggregates (along with other sources of aggregates, including recyclates) contribute to the overarching government objective of securing an adequate and continuing supply to the UK market for various uses. In doing so, marine plan authorities should consider the potential long-term requirement for marine-won sand and gravel, taking into account trends in construction activity, likely climate change adaptation strategies and major project development."

The MPS follows (see section 3.5.6) that regulators should base their decisions on sustainability criteria, taking into account the existing seabed and aggregates usage, along with the need to safeguard reserves for future extraction. The statement concludes that a regulatory approval should only be granted if the proposed aggregate dredging is environmentally acceptable.

Marine plans set out priorities and directions for future development within the plan areas, inform sustainable use of marine resources and help marine users understand the best locations for their activities, including where new developments may be appropriate. The MMO is responsible for preparing marine plans in England. On 23 June 2021, the North East, North West, South East and South West plans were published, joining the existing South and East areas. As result, for the first time all England's seas, an area of approximately 230,000 km^2, are covered by marine plans (Figure 2). Each of the marine plan areas has a plan with a long-term (20 years) view of activities and will be reviewed every three years.

It should be noted that each marine plan is specific to the area it covers and the policies may vary depending on, for example, available resources, environmental characteristics and sensitivities, and the existing uses of the sea. This is reflected in the policies relating to aggregate extraction.

For example, the plan policies in the East inshore and East offshore marine plan areas apply the intent set out in national policy taking account of the regional and national importance of the region for marine aggregate supply, and of the spatially discrete areas in which commercially viable deposits of sand and gravel are found. The policies are drafted in a hierarchical way such that policy AGG1 affords the highest level of protection and policy AGG3 requires other forms of marine development to take into account the need to safeguard aggregate reserves for future extraction (HM Government, 2014):

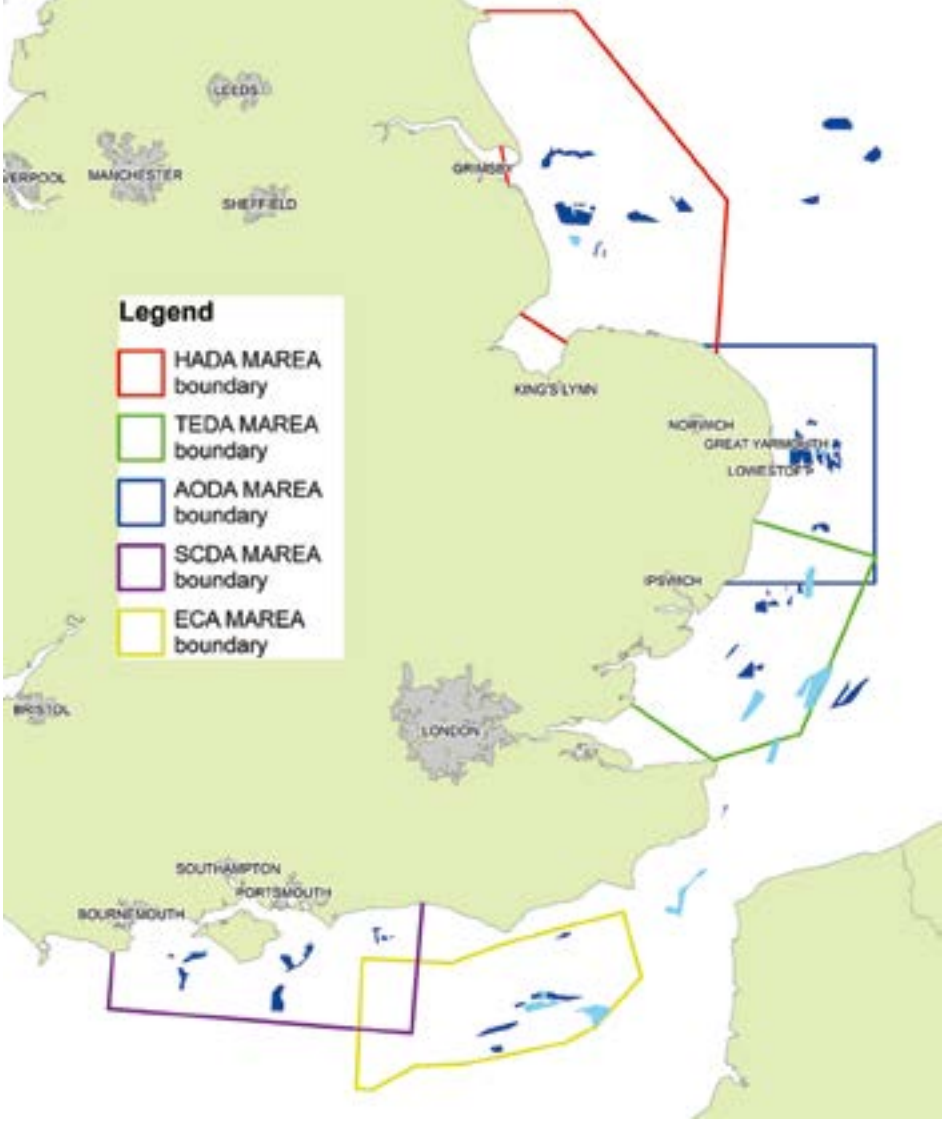

FIGURE 3

MAREA regions: Humber Aggregate Dredging Association (HADA), Thames Estuary Dredging Association (TEDA), Anglian Offshore Dredging Association (AODA), South Coast Dredging Association (SCDA), East Channel Association (ECA).

Policy AGG1
Proposals in areas where a licence for extraction of aggregates has been granted or formally applied for should not be authorised unless there are exceptional circumstances.

Policy AGG2
Proposals within an area subject to an Exploration and Option Agreement with The Crown Estate should not be supported unless it is demonstrated that the other development or activity is compatible with aggregate extraction or there are exceptional circumstances.

Policy AGG3
Within defined areas of high potential aggregate resource, proposals should demonstrate in order of preference:

a) that they will not, prevent aggregate extraction.
b) how, if there are adverse impacts on aggregate extraction, they will minimise these.
c) how, if the adverse impacts cannot be minimised, they will be mitigated.
d) the case for proceeding with the application if it is not possible to minimise or mitigate the adverse impacts.

As per section 58 of the MCAA 2009, public authorities (including the MMO) must take any authorisation or enforcement decision in accordance with the appropriate marine policy documents, unless relevant considerations indicate otherwise.

Marine licensing process

Section 66 of the MCAA 2009 identifies activities that require a marine licence and specifies in section 66(9), "To carry out any form of dredging within the UK marine licensing area (whether or not involving the removal of any material from the sea or sea bed)". This includes the extraction of marine aggregates from the seabed.

Schedule A2, regulation 10 of the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017 (the Marine Works Regulations) lists, "Extraction of minerals by fluvial or marine dredging". Since the activity is listed in Schedule A2 of the Marine Works Regulations, an Environmental Impact Assessment (EIA) is required if it is likely that the aggregate dredging will have a significant effect on the environment. In such cases, the MMO would normally undertake EIA screening by determination to assess the proposed works. In practice, due to the characteristics and location of aggregate dredging, most applications for dredging generally require an EIA and are screened into EIA by agreement under regulation 5 of the Marine Works Regulations.

All England's seas, an area of approximately 230,000 km², are covered by marine plans.

While each application is reviewed on its own merit, aggregate dredging projects frequently require Water Framework Directive (WFD) assessment, along with Habitats Regulations Assessment (HRA) and Marine Conservation

FIGURE 4
Lincshore Beach Nourishment scheme being undertaken by Van Oord. Photo © Van Oord.

In addition to individual surveys, substantive reviews are undertaken for every marine licence every five years.

Zone (MCZ) assessment if they are capable of impacting marine protected areas. Additionally, aggregate dredging generally requires an assessment of the likely physical effects (e.g. changes in wave height) on the receiving environment and implications the activity may have on coastal erosion. Such assessment is normally submitted in the form of a Coastal Impact Study (CIS). The aggregates industry usually undertakes extensive pre-application engagement to inform their assessments and draft an environmental statement to support the application for a marine licence.

Importantly, environmental assessments for the marine aggregate sector are undertaken at both the individual project (site level), but also on a regional basis. The aggregates industry has voluntarily completed a number of Marine Aggregate Regional Environmental Assessments (MAREAs) comprising broad-scale environmental characterisations covering the main regions of interest for dredging that help inform site-specific assessments (Figure 3). Through the review of MAREAs, the MMO can use the best available evidence to assess the potential cumulative impacts of multiple aggregate sites within each region.

The British Marine Aggregate Producers Association (BMAPA) and The Crown Estate, in consultation with Defra, the MMO, Natural England, JNCC, Historic England and Centre for Environment, Fisheries and Aquaculture Science, have produced Good Practice Guidance providing an overview of the environmental assessments, monitoring, mitigation and management methods in aggregate dredging (BMAPA, The Crown Estate, 2017).

The MMO does not make its decisions in isolation and consults widely on applications for aggregate marine licences. For example, the environmental statement and supporting evidence, are publicised and the MMO consults on the proposed activity for 42 days in accordance with sections 16 and 17 of the Marine Works Regulations. While the exact list of consultees is determined on a case-by-case basis, consultation is typically undertaken with a broad range of advisers including:

- Centre for Environment, Fisheries and Aquaculture Science (Cefas);
- Natural England;
- Joint Nature Conservation Committee;
- Historic England;
- Environment Agency;
- Inshore Fisheries and Conservation Authorities;
- Trinity House;
- Maritime and Coastguard Agency;
- UK Hydrographic Office;
- The Crown Estate;
- Royal Yachting Association;
- Local Port/Harbour Authority; and
- National Federation of Fishermen's Organisations.

The MMO also considers representations submitted by members of the public and stakeholders who may have an interest in the proposed dredging activity. The MMO evaluates representations received and drafts a determination having regard to the need to protect the environment and human health, prevent interferences with legitimate uses of the sea and any other matters the MMO thinks relevant. Following this robust decision-making process, a marine licence may be granted unconditionally, subject to conditions or the application refused.

Management and monitoring of marine aggregates extraction

While each aggregate application is reviewed on a case-by-case basis and any regulatory decision informed by the consultation process, there are several measures secured within a marine licence through licence conditions. This ensures that any aggregate extraction is undertaken in accordance with impact prediction and on a sustainable basis.

Surveys and monitoring

A marine licence would typically permit 15 years of dredging activity, which is reflected in the term of commercial licences issued by The Crown Estate. However, prior to commencement of aggregate dredging, the licence holder is required to undertake a number of pre-dredge baseline surveys. Such surveys generally require bathymetry, side scan sonar and seabed grab sample data to be collected. The licensed activity may not commence until the MMO discharges the pre-commencement requirements conditioned on the Marine Licence.

The conditions on the licence will then require various site-specific operational phase monitoring throughout the life of the project to assess the effects of dredging on the environment, with the frequency and coverage of such monitoring specified in the licence conditions. All the information submitted is then summarised through annual compliance reporting.

In addition to individual surveys, substantive reviews are undertaken for every marine licence every five years. Such reviews collate all the data submitted within the preceding 5-year period in order to enable comparison with the predictions in the environmental statement. This enables assessment of the impacts of the licensed activity and informs decisions on future operations.

It is a condition on aggregate dredging marine licences that dredging vessels must be fitted with an approved Electronic Monitoring System (EMS), which automatically records the date, time and location of dredging activities. EMS has been a requirement for marine aggregate extraction in UK waters since 1993. The latest EMS generation comprises a robust, secure black box-based system with an independent GPS to track vessel position and acoustic sensor to indicate vessel dredging status, with a data log recording frequency of 10 seconds. All data recorded are encrypted and analysed to ensure compliance with marine licence conditions. The Crown Estate administer the system, process all EMS records and share data with the relevant regulators. Any irregularities can then be investigated by the MMO who can undertake any necessary compliance enforcement actions. The EMS reports, covering summary of the dredging activities, EMS breakdowns and out of zone dredging, are published annually by The Crown Estate to ensure full transparency (The Crown Estate, RH DHV, 2019).

Following completion of dredging activity, there is a further requirement for post-dredge monitoring in order to assess the condition of

FIGURE 5

The trailer suction hopper dredger Sospan Dau, operated by Boskalis Westminster, undertaking beach nourishment work at Elmer, West Sussex. Image courtesy of Andrew Bellamy.

seabed and any changes that occurred as result of dredging.

Mitigation and management

The marine licence regulates the amount of material that can be extracted from the seabed (along with the minimum thickness cap of the remaining resource), along with the location and timing of dredging activity and the manner (dredging technique) in which extraction can take place.

Potential impacts on sensitive species or habitats are commonly mitigated through conditions on screening restrictions. Such restrictions may range from a complete ban on "screening" (the mechanical process of re-sizing and separating the material during dredging operations) in a particular location to limiting screening to certain times of the year (e.g. so as to avoid key life stages of commercial fish species). Seasonal restrictions may also be conditioned in order to prevent any dredging activity from impacting environmental receptors during sensitive periods.

The MMO will also condition dredging exclusion zones in order to protect areas where the thickness of resource remaining on the seabed approaches the capping layer (required to ensure seabed sediments remain similar at the end of extraction) along with conservation and heritage features. Such zones contain a suitable buffer around the receptor to ensure further impacts from ongoing dredging activity are avoided.

In order to protect features of archaeological interest, prior to commencement of dredging, the MMO must approve project-specific mitigation measures developed with archaeological curators in line with the guidance note "Marine aggregate dredging and the historic environment" developed by BMAPA and English Heritage (BMAPA, English Heritage, 2003). The note provides practical advice on assessing, evaluating, mitigating and monitoring the impact of marine aggregate dredging on archaeological features. The protocol states that all finds of archaeological interest should be reported.

The aggregate dredging can also be managed through the use of active dredge areas, which limit the area of seabed that can be dredged at any one time. This restricts the extent of dredging activity within the licensed area, limiting the potential impacts to the environment and the other uses of the sea. The licence holders' compliance with both dredging exclusion zones and active dredge areas is monitored and enforced using EMS data.

There are a number of other conditions attached to marine licences to manage potential impacts. For example, to manage the spread of invasive non-native species, conditions in relation to hopper washing

Potential impacts on sensitive species or habitats are commonly mitigated through conditions on screening restrictions.

restrict the locations and manner in which it can be undertaken. Marine licences generally permit removal of less than 50 m^3 of any residual material and hopper washing outside of any exclusion zones. There are also various steps taken in order to manage impacts to other users of the sea. For example, fisheries liaison meetings are periodically held between the MMO, aggregate operators and fishers to facilitate their co-existence. Marine licences also condition compliance with the Fisheries Code of Practice (BMAPA, MMO, The Crown Estate, 2015) covering requirements of timely pre-commencement notification of active dredge areas and dissemination of updates to the fishing industry throughout the dredging operations. This ensures that the licensed activities do not interfere with any fishing activity.

Engagement and transparency

The MMO is fully committed to transparency and maintains a public register in accordance with section 101 of MCAA 2009. The register contains marine licence applications and decisions, along with assessments to support licence applications, supporting evidence and consultation responses. The MMO maintains regular dialogue with the aggregates industry, its representative trade body BMAPA and relevant primary and scientific advisors including Cefas, JNCC, Natural England and Historic England. The MMO also liaises closely with The Crown Estate as the seabed owner.

This extensive engagement enables the MMO to pool the necessary resources and expertise to resolve issues at a strategic level through interaction between the regulators, industry and scientists. The aggregates sector is a mature sector and has benefited from a decade of multidisciplinary research to improve understanding and knowledge of the environmental implications of marine aggregate extraction, funded through the marine Aggregate Levy Sustainability Fund (ALSF) (BMAPA, The Crown Estate, 2013). Strategic oversight of the programme, which ran from April 2002 until March 2011, was delivered through a steering group comprising of the MMO, other government departments, agencies, advisers, the marine aggregate industry and The Crown Estate. Additionally, the outputs from the ALSF helped to inform how the marine aggregate sector is presently managed.

Building on the concepts of the previous ALSF research and strategic cooperation, the Regional Seabed Monitoring Plan (RSMP) approach was developed and jointly funded by the MMO, marine aggregate industry, Defra, Welsh Government and The Crown Estate. This innovative project delivers the seabed monitoring required to fulfil the conditions of marine licences for aggregate extraction on regional basis, covering the main marine aggregate extraction areas. The RSMP surveys have been undertaken since 2014, providing a robust and coordinated way of data gathering, creating opportunities for cost savings for the industry and helping regulators to evaluate the potential cumulative and in-combination effects of existing and proposed future dredging activity.
This wider research effort led to compliance requirements shifting focus towards the seabed conditions necessary for the marine environment recovery and monitoring activities moving away from the traditional analysis of benthic communities to greater focus on changes in seabed sediment type over time. This successful, coordinated approach between regulators, advisers, policy leads and industry is often considered an example of best practice by the wider marine community.

The Crown Estate, BMAPA and the aggregates industry are also committed to improving the effective and sustainable management of the seabed through transparency and accountability. In 1999, The Crown Estate and BMAPA issued a statement of intent (the "Area Involved" initiative) committing to reviewing all marine aggregate extraction over a rolling five-year period with a view to minimise the area of seabed dredged. Included within the initiative was a commitment to surrender areas no longer containing useful resources of sand and gravel, and to publish an annual report detailing the extent of dredging within the licensed areas. The latest (23rd) report (BMAPA, The Crown Estate, 2020) shows the ongoing commitment to this voluntary initiative. The 2019 20-year review of the "Area Involved" initiative (BMAPA, The Crown Estate, 2018) shows an overall reduction in both the area of seabed licensed and the area of seabed dredged, helping to minimise the environmental footprint of aggregate dredging activity.

Conclusions

The seas around the UK are becoming busier given the expansion of various activities not least offshore windfarms. Such competition for space comes with regulatory challenges. An integrated marine management approach using marine planning has been developed, together with a risk-based approach to regulation, to manage competing interests, requiring decision makers to use best available evidence and ensure finite resources are managed sustainably.

Summary

The extraction of marine aggregate in the English marine area is highly regulated and must be undertaken in line with relevant policy and plans (unless relevant considerations indicate otherwise). There are several safeguards within the regulatory framework that ensure the risk to environmental receptors and other uses of the sea are minimised. In addition, when production operations cease, the seabed sediments must be left to a similar condition to that which existed before dredging operations commenced to allow for the benthic recolonisation and recovery of dredged areas. The regulation and management of aggregate extraction also require extensive stakeholder engagement so that wider uses are considered, dredging operations are sustainable and the seabed managed effectively. This article discusses the regulation of aggregate dredging in England and provides an overview of the sector's importance in providing primary aggregate.

Acknowledgements and disclaimer

We would like to thank Mark Russell (BMAPA) and Nick Everington (The Crown Estate) for comments on an earlier draft of this paper. Any omissions or errors are those of the authors. The above does not represent statutory advice and licence applicants must seek their own legal advice. Each licence application is considered on its own merit and it is recommended that the MMO is consulted at the earliest opportunity in order to provide case-specific advice.

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Shaun is an aquatic environmental scientist with over 20 years consultancy and regulatory experience. He has extensive international experience and has led projects in the UK, Ireland, Kuwait, Hong Kong, Macau, China and St Helena. He is presently the Head of Strategic Marine Licensing at the Marine Management Organisation (MMO), responsible for technical advice to the licensing team, managing the training framework and internal audit, briefing ministers and strategic advice to policy officials. Shaun has managed a diverse range of marine casework including offshore renewable energy installations (wind, wave, tidal), nuclear new builds, carbon capture and storage, pipelines, cables and interconnectors, sewerage infrastructure, port and harbour developments and marine aggregates.

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