Boosting offshore wind skills for environmental professions

Investigation into improving offshore wind skills and recruitment from academia

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Further information

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Executive summary

The UK Government has made offshore wind (OWF) a core part of its future energy strategy. Statutory Nature Conservation Bodies (SNCBs) and the Marine Management Organisation (MMO) perform a statutory role in the consenting process of OWF and need to grow their workforce to match the increased demand from intensified OWF development activity.

The University of Hull were contracted to identify the range of job roles and skills needed to deliver environmental advice in the SNCBs and MMO, the key academic institutions active in marine environmental sciences, and the scope and options for boosting environmental content relevant to the OWF sector with a view to enhancing future recruitment into the respective organisations.

Skills relevant to SNCBs' statutory functions specific to OWF include an understanding of the effects of different OWF technologies on the marine environment, environmental assessment reporting techniques, and marine environmental regulations.

The content of courses applicable to the needs of SNCBs and MMO, provided by a selection of the leading academic institutions, was reviewed to identify current provision and scope opportunities for enhancement.

Resulting from those reviews, the University of Hull propose the following recommendations for academic institutions and SNCBs to improve the provision of OWF skills for future recruitment into DEFRA family roles.

Recommendations for SNCBs and the MMO to engage with institutions to:

- Identify existing relevant modules, with the aim of promoting access to all marine environmental science courses.
- Develop new modules that teach the ecological effects of different OWF technologies at different stages of a typical OWF lifecycle and the possible spatial extent of OWF arising from government targets.
- Provide material for inclusion in lectures on the role of SNCBs and case studies of issues in OWF permitting.
- Provide guest lectures and workshops within partnered academic institutions.
- Ensure modules provide practical experience of performing reviews of EIA and HRA OWF effects, and providing technical guidance for the results.
- Field courses should provide opportunities for OWF relevant ecological and habitat investigation and assessments.

- Develop new OWF focussed marine environment Masters courses that build upon the modules and further understanding of all relevant ecologies, regulations and assessment methods.
- Propose subjects for Masters dissertations with SNCB staff offering to perform supervision.
- Consider providing funded PhD Scholarships focussed on marine environmental sciences and policy.

Recommendations for actions within SNCBs and MMO:

- Provide short placements and Year-in-Industry placements that would be taken as part of a marine environmental science degree.
- Establish, refresh and expand internship programmes.
- Provide modern apprenticeships.

Many of the recommendations to improve skills training and applied learning would also increase the visibility of SNCBs and MMO within academic institutions. Recommendations to further increase visibility:

- SNCBs Area teams should partner with local relevant academic institutions to foster closer relationships.
- Encourage more papers to be written based on SNCB-commissioned reports, with academics and SNCB staff as co-authors.
- Attend industry recruitment events to promote SNCBs' and MMO opportunities.
- Describe the active and positive involvement of job roles and the SNCBs in achieving Net Zero and combating the climate and biodiversity emergencies.
- Engage with student and professional networks to promote the OWF industry.
- SNCB staff should be encouraged and supported to become honorary fellows and senior fellows at academic institutions.

SNCB and MMO were also recommended to:

- Opportunities and support provided for career development should be clearly established and promoted, e.g., support toward gaining membership of relevant professional institutions.
- Ensure that there are clearly defined career paths.
  The competencies required to progress within current job roles and for further career progression need to be clearly defined.

The combination of relevant skills provision from institutions, increased visibility of SNCBs/MMO and clear opportunities for personal development of staff is expected

to improve recruitment of people with the right experience, aptitude and training to meet the sectors growing workforce needs.

Contents

List of Tables

List of Figures

List of Abbreviations

DEFRA	Department of Environment, Food and Rural Affairs
EcIA	Ecological Impact Assessment
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
GotW	Grants on the Web
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee (The)
MMO	Marine Management Organisation (The)
MRE	Marine Renewable Energy
NE	Natural England
NERC	Natural Environment Research Council
NRW	Natural Resources Wales
NS	NatureScot
OWEAP	Offshore Wind Enabling Actions Programme

OWEC	Offshore Wind Evidence and Change (programme)
OWF	Offshore Wind farms/deployments
SNCBs	Statutory Nature Conservation Bodies
STEM	Science, Technology, Engineering and Maths
UCAS	Universities and Colleges Admissions Service
UKRI	UK Research and Innovation Council (The)

1. Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The UK Government has made offshore wind a core part of its future energy strategy, designed to meets demands for renewable electricity whilst contributing significantly to carbon emission reduction and to meeting Net Zero targets by 2050. The renewable energy sector will, therefore, need to increase its workforce to match the demand and grow in capacity to deliver.

The University of Hull have been commissioned to research provision of skills and recruitment to meet the needs of the key bodies who are responsible for providing the nature conservation advice to offshore wind farm developers and decision makers. The key bodies are the Statutory Nature Conservation Bodies (SNCBs), comprising Natural England, NatureScot and Natural Resources Wales, which are responsible for nature conservation in their respective nations of the United Kingdom (UK); The Department of Environment, Food and Rural Affairs (DEFRA), which are responsible for Northern Ireland; The Joint Nature Conservation Committee (JNCC) which is the statutory environmental adviser to the UK government and devolved administrations; and the environmental regulator, the Marine Management Organisation (MMO) which, as the independent regulator for England's seas, is tasked with protecting and enhancing the marine environment, and enabling sustainable development.

The advice to Government from these statutory bodies is key in ensuring that the offshore wind sector develops in a sustainable way. Therefore, sourcing the people with the right academic backgrounds, aptitudes and training to become part of the workforce to service this growing new industry will be increasingly challenging.

The purpose of this report is to research and provide recommendations on routes to closer integration of academic provision and the applied marine environmental and biological sciences with relevance to the offshore wind sector with a view to boosting the skills and aptitude of potential candidates for future recruitment into the SNCBs and MMO.

2. Requirements

The University of Hull were required to research and recommend routes to closer integration of academic provision and applied environmental / biological/ marine science with relevance to the offshore wind sector. This is with a view to raising the profile of evaluating the environmental impacts and benefits of the offshore wind sector as an exciting area of future employment and boosting the skills of people coming out of higher education to match the needs of this part of the sector.

To meet the requirement, the University of Hull took into consideration the following elements:

1. Scope the types of job roles and skills needed within the MMO and statutory conservation bodies taking into account the projected increase in offshore wind up until at least 2030.
2. Review and list the range of universities / colleges providing courses which contain strong elements of relevance to these requirements (e.g., environmental legislation, marine biological sciences, offshore renewable energy) and summarise course content for each.
3. Identify the leading academic institutions from the above longer list (probably those active in relevant research).
4. Scope the range of what might additionally be provided within the leading providers (e.g., new offshore wind courses / modules).
5. Open discussions with key providers to explore appetite to increase environmental content of courses of direct relevance to offshore wind in collaboration with SNCBs and MMO.
6. Explore opportunities to increase applied learning through placements, apprenticeships etc.
7. Make recommendations for different bodies to take forward including how they might improve their own profiles within academic institutions (i.e., define current situation, define desired situation), outline ways of delivering this.

For this report the University of Hull was instructed to only consider the competencies for delivery and ecological specialist roles within the SNCBs. Although landscape is an important consideration of nature conservation advice it was not included as a part of this study.

3. Element 1: SNCBs and MMO requirements

Task:

Scope the types of job roles and skills needed within SNCBs and the MMO taking into account the projected increase in offshore wind up until at least 2030.

Method:

Existing job roles, descriptions and skills framework were collated from information sourced from the SNCBs and MMO.

Additional skills that would be beneficial to consenting offshore wind farms (OWF) were identified.

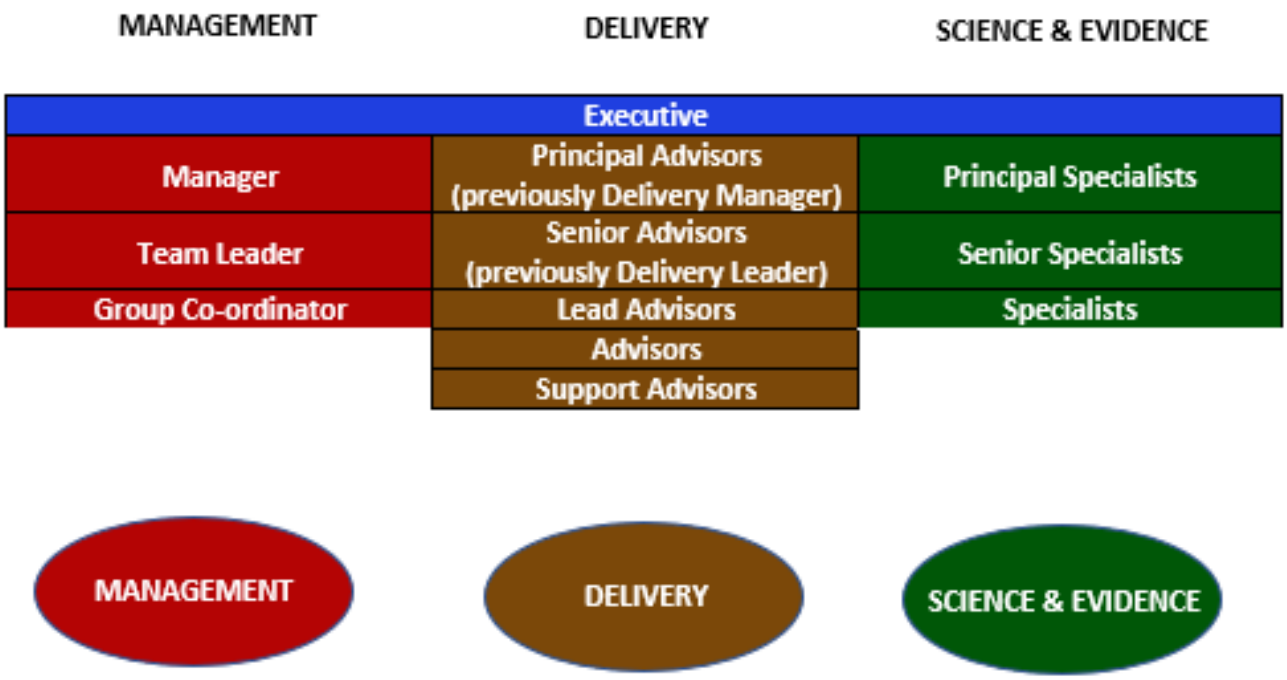
Existing roles

SNCBs are statutory consultees on offshore wind farms and marine plans. The MMO are the marine licensing authority for English waters (and Northern Irish offshore waters), and are responsible for preparing marine plans for England. To fulfil their statutory function with regard to license applications submitted for offshore developments by industry stakeholders, SNCBs and the MMO require advisory and specialist staff. To accommodate the expected growth in OWF related work required to meet government ambitions, SNCBs and MMO will need to increase their workforce, across all roles, over the period to 2030.

All of the roles are performed at increasing levels of responsibility (Figure 1) that align with standard Civil Service grades, as described in the Civil Service competency framework (Civil Service, 2018). Figure 1 shows grades within different work disciplines, this includes:

- Management: Manager, Team Leader, Group Co-ordinator
- Delivery: Principal Advisors (previously Delivery Manager), Senior Advisors (previously Delivery Leader), Lead Advisors, Advisors, Support Advisors
- Science & Evidence: Principal Specialists, Senior Specialists, Specialists

Figure 1: Natural England Roles and Grades Framework



For Civil Service grades refer to Table 1.

Advisory roles in SNCBs are usually based in area teams. The role's main function is to deliver on marine environmental casework, using technical understanding of marine industry impacts on the natural environment.

Officers (in NRW and MMO) perform regulatory functions, assessing marine license applications in line with national and international regulations. Officers also develop marine plans and the marine planning system. The roles can be located at centralised offices, or based in any DEFRA group office in the case of the MMO. Natural Resources Wales (NRW) performs both Advisory and Regulatory functions for Welsh waters. Natural England (NE) provides the Advisory function and the Marine Management Organisation (MMO) fulfils the Regulatory function around England. NatureScot (NS) provides the Advisory function and Marine Scotland fulfils the Regulatory function around Scotland. The JNCC is the statutory adviser to the UK government and devolved administrations, providing scientific and technical expertise on nature conservation, and skills in working with other organisations.

Specialists are a centralised resource that provide detailed input to Advisers and Officers as required to perform their duties. Specialists advise on and commission research, prepare technical assessments of complex data and inform policy related to their area of expertise.

SNCB and MMO staff require a good understanding of the fundamentals of ecology as well as the physical and biological aspects of the marine environment. They need to be able to identify features of conservation interest in those environments. An understanding is required of the sensitivities of marine habitats (coastal, estuarine and offshore), and how human activity interacts with and impacts upon them. Knowledge of marine policy and legislation relevant to the role and grade is essential.

The roles and grades referred to in the production of this report were provided by NE and sourced from NRW, the MMO and the Joint Nature Conservation Committee (JNCC). The roles are listed in Table 1 and the full requirements and duties of the roles can be found in Appendix 1.
Not all roles were provided for all SNCBs. However, each of the different roles at all grades were provided, distributed amongst the SNCBs. Where a role was not provided there was enough commonality from partner SNCB roles to identify the competencies required. Specialists' area of expertise (e.g., marine ornithology) have been recorded for the roles provided, however, the level of competencies required would be common irrespective of particular specialism.

Table 1: Civil Service Grades and SNCBs Roles Provided

Grade	Natural England		Natural Resources Wales				MMO		JNCC
	Adviser	Specialist	Adviser	Officer	Specialist		Officer	Officer	Adviser
EO	Marine Major Casework Adviser						Marine Planner	Marine Licensing Case Officer	
HEO	Marine Lead Adviser (Marine Major Casework)	Specialist Marine Ornithology	Senior Adviser, Offshore Renewable Energy Programme	Senior Officer, Marine Licensing			Offshore Wind Planner		Offshore Industries Adviser
SEO	Senior Adviser	Senior Specialist Marine Ornithology			Specialist Adviser, Marine Industries and Energy	Specialist Adviser, Maritime Ornithology	Senior Marine Planner	Senior Licensing Manager	Offshore Industries Advice Manager

EO = Executive Officer; HEO = Higher Executive Officer; SEO = Senior Executive Officer.
Grade titles (e.g., Senior Executive Officer) are distinct from role titles (e.g., Senior Adviser).
The roles descriptions, including duties and skills, have been included in Appendix 1 of this report.

Additional skills

The Government has set a target of 40GW of offshore windfarm capacity by 2030 in order to help meet the UKs commitment to Net Zero. Therefore, SNCBs and the MMO will require an understanding of windfarm installation, decommissioning and repowering methodologies, and how they interact with the marine environment and ecology. The potential ecological effects and feedback cycles resulting from the scale of offshore windfarm deployments throughout an operational lifetime will also need to be understood.

To help to address these medium to long term priorities the following skills were identified. The skills (listed below) adhere to the structure and principles conceived by the MMO (Appendix 1, MMO Strategic Renewables Unit Candidate Packs) to meet growing offshore wind deployments, and align with Natural England's approach to offshore wind (NE, 2021).

OWF technologies:

- Understanding of marine renewable energy (MRE) and OWF technologies and deployment methods.
- Understanding the environmental benefits and impacts (henceforth, effects) of OWF deployments, compensation measures, and the effects of net gain in the marine environment.

Environmental assessment and reporting techniques:

- Good analytical skills, experience of working with and interpreting data and evidence, and an understanding of relevant tools or methods.
- Management of large datasets, 'big data'.
- Understand the process, need and scope of environmental impact assessments (EIA), ecological impact assessments (EcIA), habitats regulations assessment (HRA) and screening and scoping reports.
- Ability to undertake technical and environmental assessments with regard to relevant legislation: OSPAR, MSFD, Habitats Regulations, Marine Conservation Zones, Marine Plan Policy and the Water Framework Directive.

Marine planning and policy:

- Understanding of marine planning, marine management and environmental regulations.
- Understanding of applying policy or technical guidance to delivery of advice, or through planning or decision-making.
- Understanding the impact of OWF on other sectors and the wider context for socio-economic activity in the marine environment.
- Understanding of strategic research and evidence programmes led by government and the industry, such as Offshore Wind Enabling Actions programme (OWEAP), EcoWind and the Offshore Wind Evidence and Change (OWEC) programme.

4. Element 2: academic provision

Task:

Review and list the range of universities / colleges providing courses which contain strong elements of relevance to the requirements outlined in Element 1 (e.g., environmental legislation, marine biological sciences, and offshore renewable energy) and summarise course content for each.

Method:

The University of Hull created a list of key search terms related to environmental management, environmental science and marine ecology disciplines, and OWF development.

Search Terms:

Ecology, Environment, Environmental Management, Environmental Science, Marine Science, Marine Biology, Oceanography, Offshore Wind, Renewable Energy and Sustainable Energy.

The search function of Prospects (Prospects, 2022a) and Universities and Colleges Admissions Service (UCAS, 2022) were used to discover academic institutions with courses applicable to marine and/or ocean biology, ecology, zoology (e.g., BSc, MSc). Relevant subjects are henceforth referred to collective as marine environmental sciences.

A high-level review of courses was performed. The published content of selected courses was further reviewed in cases where there was a potential for relevancy; e.g., did a particular acoustics module include marine acoustics?

Engineering courses (e.g., BEng, MEng) were excluded as they did not provide suitable academic content for SNCBs' requirements.

Institutions providing relevant courses

The search identified 70 academic institutions with courses related to the search terms above (Table 2). The full list of courses by institution can be found in Appendix 2.

Table 2: All UK Academic Institutions with Relevant Courses

Institution Name	Institution Name
University of Aberdeen	University of Leeds
Aberystwyth University	University of Leicester
Anglia Ruskin University	University of Lincoln
Bangor University	Liverpool Hope University
Bath Spa University	University of Liverpool
Blackpool and the Fylde College	Manchester Metropolitan University
Birkbeck University	University of Manchester
University of Birmingham	Newcastle University
University of Bolton	University of Northampton
Bournemouth University	Northumbria University, Newcastle
Bridgend College	Nottingham Trent University
University of Brighton	University of Nottingham
University of Bristol	The Open University
Bristol UWE	University of Oxford
Brunel University	University of Plymouth
Cardiff University	University of Portsmouth
University of Chester	Queen Mary University
Cornwall College	Queens University Belfast

Table 2: All UK Academic Institutions with Relevant Courses

Institution Name	Institution Name
University of Cumbria	University of Reading
University of Dundee	Royal Holloway
University of East Anglia	University of St Andrews
University of Edinburgh	University of Salford
Edinburgh Napier university	Sheffield Hallam University
University of Essex	University of Sheffield
University of Exeter	University of South Wales
University of Glasgow	University of Southampton
University of Gloucestershire	University Centre Sparsholt
University of Greenwich	Scotland's Rural College (SRUC)
Heriot-Watt University	University of Sterling
University of Hertfordshire	University of Suffolk
University of Highlands and Islands	Swansea University
University of Huddersfield	Teesside University
University of Hull	University College London
Keele University	Ulster University
University of Kent	University of Wales Trinity St David
Kingston Maurward College	University of Worcester

Table 2: All UK Academic Institutions with Relevant Courses

Institution Name	Institution Name
Kingston University London	York St John
Lancaster University	University of York

Institutions in alphabetical order.

5. Element 3: leading academic institutions

Task:

Identify the leading academic institutions, from those discovered in Element 2, through their active involvement in research.
Identify research activity, as measured by the value of grants awarded for research, and the numbers of papers published, that were of relevance to the SNCBs and MMOs statutory functions.

Method:

Funding for academic research was sourced from the Natural Environment Research Council (NERC) and Innovate UK.

NERC grants were accessed through the Grants on the Web (GotW) portal (NERC, 2022). The GotW portal's included filter tools that were used to select grants awarded to the Biodiversity category within the Marine environmental science area. The results provided were available as Excel tables; these were downloaded and filtered further to only include UK academic institutions.
The awarded grant details were recorded; duplicate entries were removed.
The same process was applied to Science Topics relating directly to offshore and marine renewable energy. The results were checked for relevance and the awarded grant details were recorded.

Innovate UK grants were accessed through its section of the UK Research and Innovation Council (UKRI) website (Innovate UK, 2022). The provided spreadsheet of all Innovate UK funded projects from 2004 was downloaded and filtered to restrict the results to only include academic institutions and address region to the UK. The public description was then searched using the following terms and combinations thereof:

- Benthic
- Bird
- Cetacean
- Human Impact
- Marine: adaption, biology, bird, conservation, ecology, geology, geotech, geophysics, mammal, mitigation, recovery, science and zoology

- Ornithology
- Ocean: adaption, biology, bird, conservation, ecology, geology, geotech, geophysics, mammal, mitigation, recovery, science and zoology
- Offshore: adaption, bird, conservation, ecology, geology, geotech, geophysics, mammal, mitigation, recovery and zoology
- Renewable Energy
- Wind: adaption, bird, conservation, ecology, geology, geotech, geophysics, mammal, mitigation, recovery and zoology
- Wetland

The search results were checked for relevance, the awarded grant details were recorded, and any duplicate entries removed.

Total funds of all grants awarded and the number of grants awarded from NERC and Innovate UK were tallied for each institution and recorded in the academic institutions master spreadsheet (Appendix 2).

The Web of Science database of published scientific papers (WoS, 2022) was searched to determine the total publications per institution and provide an indication of research activity. The total publications in each category gave an indication of topic-specific research activity generated by means other than UKRI funding (e.g., EU, Defra, Royal Society). The totals were recorded in the academic institutions master spreadsheet (Appendix 2).

Expert opinion was sourced from academics with significant expertise and experience in relevant disciplines. The purpose was to provide additional information and context that would not be available from a desktop study.

Leading institutions

The leading academic institutions were identified by the combined inputs from awarded research funding, research activity and expert review. The Leading Institutions are provided in alphabetical order and does not constitute a ranked table.

Table 3: Leading Institutions

Institution	Sum of Grants	Research Activity
University of Aberdeen	£4,757,915	4250

Table 3: Leading Institutions

Institution	Sum of Grants	Research Activity
Bangor University	£5,203,204	1412
Cardiff University	£3,290,265	1364
University of East Anglia	£13,737,491	3104
University of Edinburgh	£3,047,573	3587
University of Exeter	£6,613,168	4744
Heriot-Watt University	£2,113,350	861
University of Hull	£523,850	1615
University of Liverpool	£1,993,996	3779
Newcastle University	£2,749,993	1255
University of Plymouth	£5,046,353	6178
University of Portsmouth	£618,183	867
University of Southampton	£26,513,151	3036
University of St Andrews	£8,113,549	5625
University of Strathclyde	£540,076	1340
Swansea University	£2,284,641	2272

Leading academic institutions for marine environmental sciences, in alphabetical order.
Research Activity was determined by the number relevant marine environmental sciences papers published (Appendix 2).

All of the leading institutions were actively engaged in marine environmental sciences, some of those institutions had also undertaken research regarding the ecological or environmental impacts of OWF or MRE deployments.

The Universities of Aberdeen, Edinburgh and St Andrews collaborated to research how MRE deployments influence habitat use.

The Universities of Aberdeen, Edinburgh, Exeter, Plymouth and Southampton collaborated on research using state of the art modelling techniques to assess the levels of ecological effects of MRE deployments.

The University of Exeter wase awarded funding for research quantifying the effects of fishing exclusion zones around MRE and OWF deployments.

The University of Hull was awarded funding to research the environmental impacts of OWF deployments.

The University of St Andrews was awarded funding to research and develop models that predicted effects of gravity based OWF on distribution of sand eels, seabirds and marine mammals.

6. Element 4: new provision

Task:

Scope the range of what might additionally be provided within the leading academic institutions; e.g., new courses / modules within marine environmental sciences relating to the effects of OWF development.

Method:

The content of courses applicable to the needs of SNCBs and MMO, provided by a selection of the leading academic institutions identified in Element 3, was reviewed and summarised.

The additional skills required by the SNCBs and MMO, identified in Element 1, were compared against the provision and capabilities of the leading academic institutions.

Additional provision required from the leading academic institutions to meet the needs of SNCBs and the MMO was identified.

Summary of leading institutions courses

All of the leading academic institutions were found to have significant and diverse capabilities in marine environmental sciences. Five of the leading academic institutions were selected to be reference examples used to illustrate this element. A mechanistic method, of the greatest amount of research funding awarded, was used to determine the selection of the reference examples. The number of reference examples and method of selection was decided prior to commencing research, inclusion does not constitute a preference toward any academic institution.
Due to the anticipated strength of the leading academic institutions and the modular nature of course provision, the expectation was that recommendations arising from the review would be consistent across academic institutions.

All of the shortlisted institutions already host courses specific to marine environmental sciences. The Universities of East Anglia, Exeter, Hull and Southampton and Bangor University also host science and engineering courses in OWF and MRE. The renewable energy courses could potentially provide useful input when developing modules relevant to SNCB and MMO's function.

The commonly taught modules and skills with broad relevance are shown in Table 4.

The commonly taught modules covered research and analysis skills, environmental regulation and marine ecologies, as well as experience working on a project acting as an environmental consultancy professional.

The review found instances where multiple marine environmental science courses relevant to SNCB function (e.g., marine ecology, biology and science) were provided, but not all relevant modules were available on every course. The instances where relevant modules were not available to all relevant courses has been indicated in the table and key.

Table 4: Modules Relevant to SNCBs and MMO Function

Skill		Institution				
		University of Southampton	University of East Anglia	University of St Andrews	University of Exeter	Bangor University
Research	Field	Y	Y	Y	Y	Y
	Monitoring	Y	N	N	N	Y
	Lab	Y	Y	Y	Y	Y
Analysis	Quantitative	Y	Y	Y	Y	Y
	Qualitative	Y	Y	Y	Y	Y
	Ecological Modelling	Y	Y	1	N	N
	GIS	Y	Y	Y	Y	Y
Regulation	Legislation / Policy	Y	Y	N	Y	Y
	EIA	N	Y	N	N	Y
	Marine Management	Y	Y	2	Y	Y
Consultancy Professional		Y	Y	N	Y	Y
Ecology	Benthic	Y	N	N	N	Y
	Invertebrates	2	Y	Y	N	Y
	Vertebrates (non-mammal)	Y	Y	Y	Y	Y
	Mammal	Y	N	Y	Y	Y
Marine Sediment		1	Y	N	1	2

Key: ▭ (Y) Included in courses, ▭ (N) Not included in courses, 1. Not available in Marine Biology, 2. Only available in Marine Biology

Further courses and modules of particular relevance to SNCBs and the Further Skills identified in Element 1 are summarised below. As noted previously, it should be expected that the other leading academic institutions would also offer courses and modules of particular relevance to the SNCBs and MMO.

University of Southampton

Environmental Consultancy (MSc): The course is not marine specific. Includes modules on environmental law, assessing significance, mitigation, monitoring and management of environmental impacts, as well as big data.

Seafloor Exploration and Surveying (module): How to integrate and interpret a range of seafloor data types, and report results accurately.

Marine Geoarchaeology (module): Assessment of both wrecks and submerged archaeological landscapes in coastal and full marine settings.

Advanced Quantitative Methods (module): Exploring and managing Big Data in the environmental context.

University of East Anglia

Energy Engineering with Environmental Management (MSc): Teaches renewable energy extraction from wind, wave and water currents, as well as environmental policy and planning issues. The theory of environmental impact assessments is an optional module. No content regarding impacts of OWF was readily identifiable.

University of St Andrews

Marine Bioacoustics (module): Techniques used to study marine acoustics. Teaching includes the impacts of, as well as assessment and mitigation of, anthropogenic noise.

University of Exeter

Exploitation of the sea (module): This module covers issues regarding exploitation of resources and their associated impacts, including energy extraction. No content regarding impacts of offshore windfarms was readily identifiable.

Bangor University

This institution provides courses in the Welsh language, relevant to the requirements of NRW.

Marine Mammal Science (module): Includes acoustics and population movement. No content on the impact of anthropogenic noise was readily identified.

Renewable Energy (module): A module provided within Marine Biology and Environmental Science regarding renewable energy technologies and energy storage. No content regarding ecological impacts was readily identifiable.

Marine Conservation & Exploitation (module): Threats and impacts to marine biodiversity and habitats, as well as conservation and rehabilitation methods. No content regarding impacts of offshore windfarms was readily identifiable.

Ornithology (module): Teaches the diversity, ecology, behaviour and adaptive specializations of birds. No content regarding impacts of offshore windfarms was readily identifiable.

Additional provision

Many of the institutions provide teaching that covers some of the Further Skills identified in Element 1. However, there is still scope to increase or tailor content to be more specifically relevant.

The following recommendations are proposed to fill the gap in academic provision.

SNCBs and the MMO should engage with institutions to identify existing relevant modules, with the aim of promoting access to all marine environmental science courses.

SNCBs and the MMO should engage with academic institutions to develop new modules for marine environmental science courses that would fill the remaining skills gaps. Examples of options for new modules include the following.

OWF technologies:

- Modules should be developed that teach the ecological effects of different technologies at different stages of a typical OWF lifecycle (installation, operation and decommissioning).
- Awareness of the possible spatial extent of OWF should be included, this would be drawn from Marine Spatial Plans as well as Round 4 and Scotwind OWF auctions. High level overview of OWF technology and methodology selection could be sourced from existing OWF or MRE courses.
- Marine environmental sciences OWF focussed Masters courses should be developed that build upon the modules and further understanding of all relevant ecologies, regulations and assessment methods.

Practical application:

- Institutions should ensure modules provide practical experience of performing reviews of EIA and HRA of OWF, and providing technical guidance for the results.
- Field courses should provide opportunities for OWF relevant ecological investigation and assessments.
- Institutions should partner with SNCBs and private sector Environmental Consultancies active in the OWF sector (See Element 6).

Marine and environmental regulation:

- Modules should be up to date and include current legislation pertinent to Environmental Impact Assessment, Habitats Regulations, Marine Conservation Zones, Marine Plan Policy and the concepts of Net Gain.

Continued professional development (CPD) provision for environmental professionals

Pathways to Growth (OWIC, 2022) is a group comprising OWF industry, governmental and SNCB representatives that is in the process of developing e-modules to provide training for new starters. The training modules provide an overview of offshore wind industry in the UK, the intersection of the industry with climate change, and the lifecycle of a typical offshore windfarm. When complete, the training will be published on the Offshore Wind Industry Council website.

It is recommended that SNCBs develop CPD courses focussed specifically on the ecological and environmental effects of OWF in partnership with academic institutions that have significant experience in both marine environmental science and OWF. CPD courses typically last less than a week and would be certificated by the academic institution provider. Delivery of CPD courses could take two forms:

- Face-to-face teaching, which could be delivered at the SNCB and MMO offices or at academic institution providers location.
- Supported online delivery, with course tutor or mentor available to answer questions and provide further context or information as required.

Micro-credentials

A micro-credential is a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards (European Commission, 2021).

Across academia, there has been growth in the development of more flexible and adaptive frameworks for learning and academic credit accumulation. One approach has been the

provision of micro-credentials - courses that usually provide 10-15 academic credits, are focused on a specific area of disciplinary practice (e.g., 'Managing Public Money' at the University of Birmingham; 'Critical Immigration Migration Law' at the University of Kent), and are predominantly (but not always) delivered online. In many cases, micro-credentials are offered in partnership with a third-party organisation (e.g., FutureLearn). The Open University is an enthusiastic adopter of micro-credentials, and their website provides an example of how a portfolio of diverse resources can develop and be presented to potential learners (Open University, 2022).

From a policy perspective, micro-credentials align closely with the UK Government goals of ensuring that higher education provides opportunities for lifelong learning that are flexible and focused on development of skills linked to current or future employment.

Micro-credentials align closely with a competence-based approach to learning that aims to enhance employability and thus meet the needs of employers. Creating an employer led micro-credential portfolio offers a variety of options for development:

- Employers/sponsors who wish to support staff or other stakeholders to undertake learning in specific competences. This may include the development of directly-commissioned micro-credentials.
- Learners on 'standard' University programmes who wish to complete a supplementary, credited course to enhance learning and/or improve employability.
- Learners who wish to complete an individual micro-credential to develop expertise and knowledge in a specific area.
- Learners who wish to complete a set of micro-credentials that can be 'stacked' to receive a named award (this may be a combination of micro-credentials from a combination of universities and from other providers).
- Learners who wish to complete one or more micro-credentials to meet academic entry criteria for a named programme of study.

7. Element 5: academic institution participation

Task:

Open discussions with key providers to explore appetite to increase environmental content of courses of direct relevance to offshore wind in collaboration with SNCBs and MMO.

Method:

The 16 leading academic institutions identified in Element 3 were contacted to explore their appetite to incorporate content relating to offshore renewable energy developments within their marine environmental science courses, or the development of new specific courses and to explore potential solutions and options for delivery. The academics were contacted and informal Teams meetings held, based on a simple questionnaire to ensure consistency across all the discussions with the different institutions.

A summary of the main points gained from the conversations held with 11 of the 16 academic institutions identified in Element 3 which responded to the invitation for further discussion are set out below under two headings.

The opportunities:

- The leading academic institutions currently offer relevant and diverse marine environmental science modules in their programmes that align with the current general needs of the SNCBs and the MMO. The commonly taught modules covered research and analysis skills, environmental regulation and marine ecologies, as well as experience working on a project acting as an environmental consultancy professional.
- Generally, it would seem that universities are willing to discuss ways to build on their existing relevant subject matter to boost OWF environmental content in their respective programmes.
- The responding universities all stated that they would welcome greater involvement by SNCBs and the MMO as part of an on-going dialogue in the following ways:
    - Partnering with area teams and their local relevant academic institution;
    - SNCBs and the MMO providing guest lectures and leading seminars and workshops;
    - Creating dissertations, research and project work that are solving OWF relevant issues;
    - SNCBs and the MMO taking on supervisor roles for MSC and PHD students;
    - Promoting the opportunities within SNCBs and the MMO.
- Some of the institutions interviewed would consider developing part-time Masters and PhD programmes aligned to work that would support retention of people in the SNCBs and the MMO.

- The consensus of suggestions for closer working relationships were to establish applied learning options that offer students real work challenges which would include:.
    - Placements;
    - Year-in-Industry;
    - Apprenticeships;
    - Internships;
    - Scholarships.
- There was also the suggestion that recruitment and retention plans be shared with academia to help resource planning for programmes and courses.
- Consider industry body accreditation for courses.

The challenges:

- Between now and 2030 it is postulated that there will need to be an increase of 150 to 200 people in the SNCBs and the MMO to meet the growing OWF consenting challenge.
- To make it viable for universities to develop or adapt programmes there will need to be a co-ordinated annual recruitment cycle aligned to academia.
- It may take three years to develop and deliver new programmes for OWF knowledge, skills and behaviours given the duration of courses and the way that Higher Education institutions develop new courses.
- Identifying internal resources to support the development of academic programmes including CPD will be key and will need to be addressed.

What will it take?

- Develop a clear business case for greater collaboration with academia linked to the OWF challenge.
- Strong and committed leadership – clear ownership within the SNCBs and MMO.
- A project manager with a project plan.
- Clear governance & accountable roles.
- Capable line managers.
- A strong and committed team.
- Paced – it takes time.
- Proactive management - compelling communication & engagement.

8. Element 6: applied learning

Task:

Explore opportunities to increase applied learning through academic placements within SNCBs and MMO (e.g., year in industry), internships and apprenticeship programs.

Method:

The University of Hull used its experience in delivering marine environmental science and renewable energy Masters courses and offshore wind CPD courses to identify opportunities for applied learning.

The SNCBs existing internship programs were provided.

Applied learning options

The following list are methods that have been identified as opportunities for students to gain applied learning and experience.

- Workshops
- Placements
- Year in Industry
- Masters' dissertations
- PhD Scholarships
- Internships
- Apprenticeships

Academia

All of the leading institutions provide modules of field courses that include application of field research techniques, data collection and use of field equipment, some also provide experience working at sea.

Workshops led by external expert bodies are included within courses offered by all of the leading institutions.

Placements providing practical experience with professional environmental practitioners are included within courses provided by many institutions. The onus is on the student to select a practitioner to be approved by the institution. Practitioners could be SNCBs or private sector environmental consultants.

Year in Industry placements with professional environmental practitioners, are taken as part of a degree. Students on a placement year are completing a module and receive

academic credit for the year. These are available as an option for courses provided by the Universities of East Anglia and Exeter and Bangor University.

Masters Dissertations developed and conducted in partnership with SNCBs and/or environmental consultancies that are relevant to OWF ecological assessment (AuraCDT, 2022).

PhD Scholarship, industry led funded research focused on marine environmental sciences and policy (AuraCDT, 2022).

SNCBs and industry – internships

SNCBs and the MMO should consider partnering with academic institutions to provide internships and apprenticeships relevant to OWF consenting. An internship is a period of work experience, offered by an organisation, lasting for a fixed period of time anywhere between a week and 12 months. They are typically undertaken by students and graduates looking to gain relevant skills. Interns should receive at least the National Minimum Wage for their age if performing the role of a worker (Prospects, 2022b).

A Helpdesk report commissioned by the UK Department for International Development found that interns enhanced their technical and problem-solving skills through practical experience, as well as improving communication skills and team working (Ismail, 2018).

Example internships in the marine sector

Crown Estate:

The Crown Estate offers three marine internship programmes (Crown Estate, 2022). All three offer the opportunity to gain skills, knowledge and experience across the variety of marine sectors, helping to inform and shape future careers. Programmes are conducted in partnership with SNCBs, local councils, NGO and private sector environmental consultants.

- Coast Explorer Internship
- Marine Futures Internship
- Marine Research Internship

Natural England:

Natural England offered a Marine Futures North West internship program between 2019 and 2021 (Crown Estate, 2021). The scheme was a pilot initiative developed in partnership with the Crown Estate, Ørsted and the North West Wildlife Trust. The scheme was designed to provide an opportunity to gain experience across a range of organisations working in the marine sector, with a particular focus on conservation and renewable energy.

Example placements in the marine sector

NatureScot:

The NatureScot Programme for Youth Employment (NatureScot, 2022) offers opportunities to gain valuable skills and experience through a variety of different paid roles across the organisation. 2-year practical placements offering opportunities to work in a practical role

- Project Placement Scheme
- Practical Placement Scheme

SNCBs and industry – apprenticeships

NatureScot:

The Modern Apprenticeship combines working towards a qualification with on-the-job experience, providing practical experience and offering a qualification. The apprenticeship is a 2-year paid position available for anyone from age 16 upwards (NatureScot, 2022).

SNCBs and industry – volunteering, work experience and other placements

Further opportunities gain practical experience exist in the form of volunteering, work experience and research placements. Work Experience are practical placements offered to students aged above 14, and typically last between 1 to 6 weeks. Higher Education placements are available to students graduating from undergraduate or postgraduate courses, and last up to 18 months. Research placements are intended to provide an opportunity to complete a defined piece of research that could last up to a year. Volunteering provides an ongoing opportunity that is typically reviewed annually. Examples of such schemes are offered by Natural Resources Wales (NRW, 2022).

SNCBs and industry – additional opportunities

The following options were identified as opportunities for applied learning that could be developed and promoted by the SNCBs and MMO.

SNCBs and MMO should provide guest lectures at academic institutions regarding their role and function and opportunities for students to engage with projects.

SNCBs and MMO should consider developing workshops simulating their role in relation to OWF ecological effects. This could include analysing, performing and reviewing EIA and HRA. The workshops would be offered to academic institutions.

SNCBs and MMO could select relevant field data to offer academic institutions for analysis in projects or taught modules.

9. Element 7: recommendations

The University of Hull propose the following recommendations for academic institutions and SNCBs and MMO to improve the provision of OWF skills for future recruitment into DEFRA family roles.

Increase SNCB visibility within academia

Engagement between SNCBs and academic institutions of all levels (schools, colleges, universities and other education institutions) should be facilitated in a way that maximises the visibility of SNCBs and promotes OWF-related skills. Research suggests that employer engagement with schools and other education institutions is valuable in terms of directing students on to specific career paths. Action to increase visibility should begin in early education because the selection of GCSE and National qualifications determines options for further education. SNCBs should consider how they can promote the opportunities on offer to young people, and the extent to which they can facilitate the collaboration with academic institutions and student forums to maximise collaboration. A key aspect of this will be leveraging the SNCBs' reputations for excellence.
The following opportunities were identified to achieve this:

Short term:

- SNCB Area teams should partner with local relevant academic institutions to foster closer relationships.
- Encourage more papers to be written based on SNCB-commissioned reports, with academics and SNCB staff as co-authors.
- Link with Crown Estate to attend industry recruitment events to promote SNCBs' opportunities and contribution in combating the climate and biodiversity emergencies.
- Consider activities to promote the OWF industry to under-represented communities. Of all OWF-related higher degrees, Marine and Environmental Science had the highest female representations with 48% and 42% respectively (HESA, 2015). SNCBs should engage with networks, such as Women in STEM (WiS, 2022, STEM Women, 2022) and BBSTEM (BBSTEM, 2022), that are actively involved in developing and supporting student and professional groups.

Medium term:

- Establish internship programmes. Internships enhance the reputation and visibility of academic institutions and their potential for recruiting students (Ismail, 2018).
- SNCB participation in MSc courses, either as guest lecturers or to give seminars and workshops.
- Encouraging SNCB staff to take roles as supervisors of MSc and PhD students.

Long term:

- SNCB staff should be encouraged and supported to become honorary fellows and senior fellows at academic institutions. Fellowships would also provide admission to research seminars and other events as well as use of shared academic visitors' spaces. SNCB staff would apply to academic institutions for fellowships, this requires a statement of intent and a sponsor from within the academic institution that could advocate the value of hosting the SNCB colleague.

Many of these suggestions could also be used to improve practical application of skills within academic institutions. Implementing the proposals would require staff of SNCBs to be more proactive in activities that are non-core duties. Provision should be made to accommodate these activities within or among core-functions or career development plans.

SNCB and MMO roles

The job roles of SNCBs, as currently advertised, are not clear to those unfamiliar with the structure and operation of SNCBs or the Civil Service. The use of discipline and industry-specific language is customary in job roles, and suitable applicants would be expected to understand it. However, in-house terminology that is unique to organisations, or the Civil Service, should be clarified when advertising outside of the organisation.
No guidance is given as to which qualifications or experience are required. The onus is on candidates to provide qualifications and describe their experience so that SNCBs can assess on a case-by-case basis if it is relevant and sufficient. It is possible that this lack of clarity, when combined with SNCBs reputation for excellence, could deter suitable applicants.

The following recommendations were identified:

Short term:

- Describe the active and positive involvement of job roles and the SNCBs in achieving Net Zero and combating the climate and biodiversity emergencies.

Medium term:

- Opportunities and support provided for career development should be clearly established and promoted, e.g., support toward gaining membership of relevant professional institutions.
- SNCBs should ensure that there are clearly defined career paths.
  The competencies required to progress within current job roles and for further career progression need to be clearly defined.

New academic provision

There were two methods identified for institutions to supply new academic provision, making existing relevant modules more widely available and creating new modules. The following recommendations are highlighted and will be subject to further development with academic institutions invited to the discussion mentioned in Element 5.

Short term:

SNCBs and the MMO should engage with institutions to identify existing relevant modules, with the aim of promoting access to all marine environmental science courses.

- Academic institutions were found to have existing modules relevant to the skills required by SNCBs that are not currently available to marine environmental science courses (e.g., seafloor exploration and surveying included in oceanography). These modules could be included with relevant courses, or made available as optional modules.
- OWF and MRE Modules already included in marine environmental sciences courses should cover the ecological effects of the different technologies as well as the technologies themselves.

Long term:

SNCBs and the MMO should engage with academic institutions to develop new modules for marine environmental science courses that would fill the remaining skills gaps.

- Modules should be developed that teach the ecological effects of different OWF technologies at different stages of a typical OWF lifecycle.
- Awareness of the possible spatial extent of OWF arising from government targets should be included as part of marine environmental science modules.
- OWF focussed marine environment Masters courses should be developed that build upon the modules and further understanding of all relevant ecologies, regulations and assessment methods.

Improved applied learning

Opportunities to provide applied learning were identified that could be implemented by institutions and SNCBs.

SNCBs and the MMO should engage with institutions to:

Short term:

- Ensure modules provide practical experience of performing reviews of EIA and HRA OWF effects, and providing technical guidance for the results.

- Field courses should provide opportunities for OWF relevant ecological and habitat investigation and assessments.
- Provide material for inclusion in lectures on the role of SNCBs and case studies of issues in OWF permitting.

Medium term:

- Partner with Institutions to provide guest lectures and workshops.
  SNCBs could develop workshops pertaining to SNCBs function and their role in regard to OWF deployments and consenting.
  For institutions that host both marine environmental science and renewable energy courses, a workshop could be tailored to include students from both, with the renewable energy students proposing an OWF deployment and the marine environmental science students performing a review.
- Propose subjects for Masters dissertations, SNCB staff could also perform supervision.
- SNCB staff that become honorary fellows and senior fellows at academic institutions would be in a position to enable SNCBs to help ensure the quality and fit-for-purpose of relevant research within the academic institution.

Long term:

- Consider providing funded PhD Scholarships focussed on marine environmental sciences and policy.

Recommendations for actions within SNCBs were:

Medium term:

- Provide short placements and Year-in-Industry placements that would be taken as part of a marine environmental science degree.
- Establish internship programmes. The Crown Estate and NatureScot have existing internship programmes; this provision should be extended by all SNCBs.

Long term:

- Provide modern apprenticeships. An apprenticeship is more a long-term solution that combines education and practical application.

Further work

SNCBs could partner with an academic institution to perform a very-high-level review of potential effects of different OWF technologies in different marine ecosystems. The proposed study would be at the level of an MSc dissertation or a Sponsored PhD scholarship, not a full EIA. Alternatively, if a greater level of detail was preferred, individual MSc dissertations could be focussed on the individual different ecologies. The partner

institution or institutions would require significant expertise in marine environmental sciences, with informed input from academics experienced in marine renewable energy. The study or studies would provide opportunities to improve relevant skills and awareness of OWF effects in marine environmental sciences courses, while increasing the visibility of SNCBs within institutions. The outputs of the work could also be used to inform content for modules and courses provided by academic institutions, as well as workshops and guest lectures offered by SNCBs.

Concluding remarks

Speakers at an OWF industry skills workshop (Exeter, 2022) also recognised the lack of visibility of marine environmental sciences careers as an industry-wide barrier to recruitment, as well as the need to improve relevant skills provision from academic institutions. The environmental consultants from the private sector also anticipate the workload for OWF consenting to increase and discussed many of the same recommendations made in this report.

There are opportunities for Institutions and SNCBs individually and in partnership to improve OWF-relevant skills in marine environmental sciences. Partnership could operate at various levels, depending upon appetite for engagement. However, closer partnership is expected to provide the most opportunities and benefits for institutions, SNCBs and students. Many of the methods identified to improve applied learning would also improve SNCBs visibility and marine environmental science careers within institutions.

The combination of relevant skills provision from institutions, increased visibility of SNCBs and clear opportunities for personal development of SNCB staff is expected to improve recruitment of people with the right experience, aptitude and training to meet the sector's growing workforce needs and ensure that the sector proceeds in a sustainable way.

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Appendices

Appendix 1: SNCB and MMO Roles

Please refer to folder titled: NECR445 Appendix 1 - SNCB roles

Appendix 2: Master Table of Institutions

Please refer to document titled: NECR445 Appendix 2 - Master Table of Institutions.xlsx

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