Llywodraeth Cymru
Welsh Government

Marine Planning Technical Statement: Marine Ecosystem Resilience, Restoration and Enhancement (Policy ENV_01)

September 2025

1. The Welsh National Marine Plan (WNMP, 2019) sets the Welsh Government's vision and objectives for the future of our seas. WNMP policies deliver upon the Plan's objectives and apply to all decisions made by public authorities with the potential to affect the Welsh marine plan area.

2. Marine Planning Technical Statements provide further detail and evidence for applicants, public authorities, and other users to ensure the effective and consistent implementation of WNMP policies. Technical Statements do not introduce any new requirements. This Technical Statement supports policy ENV_01 and should be read alongside the WNMP.

3. If there is uncertainty over the implementation or the requirements of any WNMP policies, decision makers should refer to the WNMP for the definitive policy wording and intent.

Marine Planning to Address the Nature Emergency – ENV_01, an Ecosystem Approach

4. WNMP General Policy, ENV_01 (Resilient Marine Ecosystems) contributes towards halting and reversing the decline of biodiversity.

ENV_01: Resilient Marine Ecosystems

Proposals should demonstrate how potential impacts on marine ecosystems have been taken into consideration and should, in order of preference:

a) avoid adverse impacts; and/or

b) minimise impacts where they cannot be avoided; and/or

c) mitigate impacts where they cannot be minimised.

If significant adverse impacts cannot be avoided, minimised, or mitigated, proposals must present a clear and convincing case for proceeding.

Proposals that contribute to the protection, restoration and/or enhancement of marine ecosystems are encouraged.

5. ENV_01 aims to ensure that the biological and geological components of ecosystems are maintained, restored where needed, and enhanced where possible (see paragraph 18 for definitions). This will help to increase the resilience of marine ecosystems to a wide range of pressures, protecting the benefits they provide for future generations.

6. As part of demonstrating compliance with ENV_01, proposals should highlight how they comply with the provisions of legislation that protects species, including in relation to European Protected Species. In addition, focus should be given to habitats and species of principal importance for the purpose of maintaining and enhancing biodiversity in Wales, listed under Section 7[1] of the Environment (Wales) Act 2016.

1 Habitats and species of principal importance are currently outlined in an **interim** Section 7 list, which replicates a previous list outlined by Section 42 of the Natural Environment and Rural Communities Act (2006). The Section 7 list is currently under review. Applicants should refer to the interim list until the finalised list is published.

Proposals should demonstrate how they maintain and enhance these habitats and species, including protecting them from potential impacts or promoting their restoration and/or enhancement.

7. Any enhancement conducted in relation to ENV_01 is separate from the applicant's statutory obligation to ensure that their proposal complies with the legislation and policies relevant to the management of Marine Protected Areas (MPAs, see WNMP policy, ENV_02). Enhancement measures conducted in relation to ENV_01 are separate from compensatory measures that may be required by The Conservation of Habitats and Species Regulations and equivalent offshore Regulations and/or the Marine and Coastal Access Act.

ENV_01: Avoiding Adverse Impacts

8. ENV_01 consists of two elements, which apply to all sectors.

9. Under the first element of ENV_01, applicants should avoid, minimise, and/or mitigate adverse impacts associated with development proposals that have the potential to negatively affect marine ecosystems. Applicants should avoid, minimise, and/or mitigate adverse impacts at each stage of their project's lifecycle, ensuring that they account for the sensitivities of marine ecosystems.

10. Avoiding adverse impacts through careful project design and implementing good practice (see paragraphs 41 to 48) is often the most effective approach to protecting marine ecosystems. Applicants and decision makers should always seek to avoid damage to marine ecosystems wherever possible, helping to halt biodiversity loss. To achieve this, a wide range of measures may be appropriate- for example, the siting, design, legacy planning, maintenance and/or timing of the applicant's development proposal. Considering marine ecosystems and the approaches to avoid adverse effects is most effective when undertaken from the early stages of project design.

11. Where avoidance of adverse impacts is not possible, applicants and decision makers should, in order of preference, implement measures that minimise and/or mitigate adverse impacts upon marine ecosystems.

12. The applicant's proposal should adequately evaluate the significance of identified impacts on marine ecosystems. Where significant adverse impacts cannot be avoided, minimised, and/or mitigated, applicants should submit a case for proceeding, as part of an application for consent, which sufficiently demonstrates the overriding benefits of doing so. Proposals should make every effort to avoid, minimise, and/or mitigate adverse impacts on marine ecosystems before considering a case for proceeding.

13. Decision makers may issue guidance on submitting a case for proceeding. However, it is the applicant's responsibility to provide a robust justification which sufficiently demonstrates the overriding benefits of proceeding. The case for proceeding should clearly demonstrate why the benefits of proceeding (or risks of not proceeding) outweigh any adverse impacts on marine ecosystems.

14. Submission of a supporting justification does not mean that the proposal will be approved; cases for proceeding will be assessed on an individual basis. Further information is provided in paragraphs 31 to 38 of the 'Welsh National Marine Plan Implementation Guidance' to assist with cases for proceeding.

15. Whilst seeking to protect marine ecosystems, policy ENV_01 must be applied in a proportionate way, taking a risk-based approach in line with WNMP policy GEN_02.

16. To help decision makers and applicants deliver upon these considerations, 'Welsh National Marine Plan Implementation Guidance' outlines further information in relation to ENV_01 (Section 2.4.1). This includes focus on European Protected Species and habitats and species of principal importance, listed under Section 7 of the Environment (Wales) Act.

Image supplied by Natural Resources Wales (2025)

Planning for our Future: Vibrant and Diverse Marine Ecosystems

17. Whilst the first aspect of ENV_01 focuses on managing potential adverse impacts upon marine ecosystems, the policy also highlights that applying established or new approaches to restore and enhance marine ecosystems can increase biodiversity and support ecosystem function. This distinctive approach recognises that development can accommodate, co-exist with, and provide support for the restoration and wider enhancement of marine ecosystems, helping to build ecosystem resilience.

Defining Enhancement and Restoration

18. Where decision makers and applicants are referring to ENV_01, the following definitions[2] apply:

Enhancement is an umbrella term we use to describe various activities that **aim to improve the quality or extent of a habitat or increase the population size or range of a species**. Enhancement may refer to the following types of action:

- **Nature positive measures** refer to an ambition and actions taken to reverse the decline in biodiversity and establish an improvement in the status of species and ecosystems. Nature positive measures (referred to throughout the Technical Statement and Annexes) is a term which encompasses **nature inclusive design** and **nature positive projects**:
  - **Nature inclusive design** involves approaches to, or features of, infrastructure design that can increase habitats or help support species.
  - **Nature positive projects** are proposals that specifically focus on intervention or action solely in support of marine restoration or enhancement and may be implemented at a different site to a development.
- **Nature recovery** refers to actions taken to enable a habitat or species to overcome damage, or other disturbance, and reach a better overall state rather than trying to "turn the clock back". This generally involves removing pressures and allowing the habitat to recover naturally.
- **Habitat creation** describes interventions to introduce a species or establish habitat. The fundamental difference between habitat restoration and habitat creation is that this term refers to instances where there has been no known historical presence of a habitat or species prior to the intervention.
- Initiatives that help to address our **evidence needs** relating to building marine ecosystem resilience and improving our collective understanding of the marine plan area.

These enhancement activities do not have to include, but could be progressed alongside or in addition to, **restoration**.

Restoration describes projects entailing a level of intervention. Restoration projects involve rebuilding a habitat or reintroducing a species where it has **historically** been found but is either functionally extinct now or where re-establishment could not occur without assistance. Restoration activities can be standalone projects promoting ecosystem resilience or may be coupled with wider enhancement activities.

2 Definitions reflect those published by Natural Resources Wales, within Terms Used in Wales for Marine and Coastal Enhancement.

19. 'Enhancement' – in the context of ENV_01- refers to a positive change in the state of an ecosystem as a result of an intervention. To determine whether enhancement has been achieved, ENV_01 encourages applicants and decision makers to measure[3] the scale of enhancement achieved. However, while such action is welcomed, ENV_01 **does not** require the provision of marine net benefit for biodiversity by a project, equivalent to the net benefit for biodiversity[4] requirement outlined within the terrestrial planning system's Planning Policy Wales. See paragraphs 72 to 83, under Annex 3, for examples of marine ecosystem enhancement in practice.

ENV_01: Restoring and Enhancing Marine Ecosystems to Reverse Biodiversity Loss

20. The second element of ENV_01 **encourages**[5] positive measures to protect, restore, and/or enhance marine ecosystems. This **voluntary** aspect promotes the application of good practice and taking proactive action to deliver positive benefits for marine ecosystems. Proposals delivering against this element of ENV_01 will be expected to demonstrate how they will integrate such measures.

21. This element of ENV_01 applies to a wide range of measures which can be taken to protect, restore, and enhance marine ecosystems. All activities and sectors operating in Welsh seas have a role to play in contributing towards supporting the resilience of Welsh marine ecosystems and are strongly encouraged to do so wherever feasible and appropriate.

22. Any interventions implemented under the 'enhancement' element of ENV_01 are **separate from and additional to** any nature positive measures taken to mitigate adverse impacts on marine ecosystems under the first element of the policy. However, in instances where developers deliver nature positive measures that go beyond the actions required to address adverse impacts on ecosystem resilience, this may be considered to align with the 'enhancement' element of ENV_01.

Key Considerations when Addressing the Nature Emergency – Act for Future Generations

23. Through protection, restoration, and enhancement initiatives, marine development can make a meaningful contribution towards combating the effects of the range of pressures acting upon our marine environment. Nature positive action from individuals, public bodies, and private companies will help to reduce the collective effects of these pressures and allow our ecosystems to function and continue to support future generations over the longer-term.

24. When designing nature positive measures, decision makers and applicants should consider how the pressures on marine ecosystems may evolve over time and how marine ecosystems may change in response. Incorporating this consideration into the design of measures will help to ensure that marine ecosystems are adaptable and resilient to future change.

3 Enhancement may be measured qualitatively or quantitatively.

4 Although ENV_01 **does not** require a marine net benefit for biodiversity, note that marine and terrestrial planning systems overlap between the mean low water spring tide and mean high water springs. Both Planning Policy Wales and the WNMP therefore apply to the intertidal zone. Developments sited in this overlapping area must deliver net benefit for biodiversity under Planning Policy Wales.

5 Please see section 1.8.5 or paragraphs 39 to 43 of the Welsh National Marine Plan Implementation Guidance for further information on 'encouraged' policy elements.

25. Enhancement may be progressed as an integral aspect of a development. For example, through the incorporation of enhancement features within infrastructure (nature inclusive design; see paragraphs 72 to 83, under Annex 3, for an example).

26. Equally, measures encouraged by ENV_01 also include those which are designed primarily as nature focussed projects- termed nature positive projects. Such initiatives are defined in this context as proposals that focus on intervention or action solely in support of marine restoration or enhancement.

27. Whether through small-scale or large-scale interventions, nature positive projects can help to deliver a range of biodiversity benefits, including helping to reverse biodiversity loss in Wales. Nature positive projects are strongly welcomed by the Welsh Government, and we will seek to enable them through marine planning and licensing[6].

28. Nature positive measures (a term which encompasses nature inclusive design and nature positive projects) can be applied in both inshore[7] and offshore[8] areas. However, while the inshore and offshore areas share many (often overlapping) features and activities, certain nature positive measures may be best suited to one of the two regions. Applicants should consider whether measures are best implemented:
    - On site, on infrastructure (nature inclusive design).
    - On site, near infrastructure (nature positive project).
    - Off-site, at an identified location in the inshore marine plan area (nature positive project).
    - Off-site, at an identified location in the offshore marine plan area (nature positive project).

29. Where developments have limited opportunity to make a meaningful contribution to nature recovery on-site, off-site nature positive projects may be preferable. Such projects could involve the protection, restoration, and/or enhancement of seagrass meadows, saltmarsh, maerl beds, and native oyster beds (see paragraphs 84 to 88, under Annex 3, for an example of native oyster restoration).

30. Welsh Government's goal is to see an increasing level of contribution from applicants towards our ambition to restore and enhance marine ecosystems. Marine sectors are strongly encouraged to work collaboratively to collectively contribute towards this ambition.

Understanding Opportunities to Enhance Marine Ecosystems

31. Natural Resources Wales (NRW), as the relevant Statutory Nature Conservation Body (SNCB), can advise on opportunities to deliver marine ecosystem enhancement and restoration in the inshore marine plan region. NRW has a key role in identifying priority areas and points of focus for ecosystem enhancement and restoration action.

32. NRW are progressing work to develop a suite of strategic mapping products that bring together relevant evidence and supporting information to highlight and prioritise the range of opportunities and actions required for enhancing the resilience of marine and coastal ecosystems in Wales (see Annex 1).

6 Please see paragraphs 42 and 43 of the Welsh National Marine Plan Implementation Guidance for further information on how Marine Planning and Licensing may enable nature positive projects.
7 Intertidal zone to 12 nautical miles.
8 12 nautical miles to continental shelf.

33. The purpose of the maps and supporting information is to communicate opportunities and target efforts in locations that have the greatest chance of delivering enhanced resilience of marine and coastal ecosystems. This includes where there are known opportunities to directly deliver enhancement and where evidence is required to inform the enhancement actions needed.

34. Applicants are strongly encouraged to consider this evidence when developing their proposals to maximise opportunities to enhance ecosystem resilience.

35. As stated above, enhancement and restoration measures may be co-located with or integral to a development (for example, on or next to infrastructure), or potentially sited at an alternative location.

36. Alongside NRW, the Joint Nature Conservation Committee (JNCC) serves as the relevant SNCB for the Welsh offshore region. Applicants who wish to deliver nature positive measures in the offshore region are encouraged to engage with JNCC to ensure that the most biologically appropriate measures are applied where they can make the greatest difference.

37. Initiatives that help to address evidence gaps relating to building marine ecosystem resilience in Wales and improve our collective understanding of the marine plan area (see Annex 2) are also important measures which can make a significant contribution towards the aims of ENV_01. Improving the evidence base will help us to better understand environmental challenges and approaches to reduce their effects on marine ecosystems.

38. Evidence gathered as a contribution towards the enhancement element of ENV_01 should be disseminated appropriately and made publicly available wherever possible. Applicants and decision makers are advised to refer to Natural Resources Wales's Marine and Coastal Evidence Programme to understand the key priority evidence needs associated with the Welsh marine plan area (see Annex 2).

39. When established, the MARINE Fund Cymru may serve as a further option for applicants to deliver marine ecosystem restoration and enhancement. Applicants will be able to donate to MARINE Fund Cymru, which will concentrate the funds and focus them upon schemes that enable, maintain, and enhance the resilience of marine ecosystems in the long-term. This will facilitate the delivery of wider benefits for individuals, communities, and businesses and will also promote healthy, resilient seas. NRW's strategic mapping of opportunities to enhance the resilience of marine and coastal ecosystems will be an important evidence base for MARINE Fund Cymru.

40. The Welsh Government is developing a Welsh Seabird Conservation Strategy, which will drive interventions to improve the prospects of seabird populations. The Strategy will produce up-to-date vulnerability assessments for the 29 designated seabird species in Wales, accounting for pressures they are facing. The Strategy will also identify where Welsh conservation efforts need to improve and set priorities for conservation work. The Seabird Conservation Strategy may become a key source of evidence for applicants who wish to build seabird resilience and help populations to thrive over coming years.

Good Practice

41. Applicants are strongly encouraged to adopt good practice when taking action to contribute to all aspects of ENV_01.

42. Good practice often refers to ways of working which have been proven to be effective in producing good results and are therefore recommended as a model. These ways of working may refer to the best available practice at the time of designing and implementing the applicant's proposal. Applicants may elect to solely adhere to these proven methods.

43. In the context of ENV_01, good practice also provides the opportunity to trial new and innovative approaches to deliver enhancement and restoration to sustain healthy marine ecosystems. Innovative approaches may be explored by adjusting proven methods or, alternatively, applicants may pioneer their approach to deliver restoration and enhancement. Any pioneer approach should be underpinned by risk-based decision making and sound evidence, which reflects the Welsh context wherever possible.

44. To promote good practice, applicants may elect to collaborate with external and/or internal partners to increase the efficiency and scale of nature positive measures. Collaboration may help to deliver on all aspects of ENV_01, helping applicants to identify interconnectivities (both within the marine environment and across the land-sea interface) by enabling the sharing of technical expertise and interdisciplinary knowledge.

45. Although approaches may vary, adherence to good practice principles will help to ensure that ecosystem restoration and enhancement measures maximise opportunity for recovery. Following good practice frameworks can help to shape and focus activities so that they deliver ecological benefits in the right place at the right time. Such frameworks are defined by the latest guidance and highlight how to best tailor interventions to the target area to bring about successful, long-lasting change.

46. The following resources may help to inform thinking about good practice as well as the design and delivery of specific actions.

Good Practice Resources

47. The inclusion of restoration and enhancement elements in a marine or coastal development proposal is a relatively new consideration for decision makers and applicants. As part of their advisory role, NRW have developed five core principles for including restoration or enhancement in a marine or coastal development proposal to provide a starting point for meaningful discussions with applicants. The principles sit within and support NRW's broader work to develop evidence, advice, and guidance to enable nature recovery and the resilience of Wales's marine and coastal ecosystems (see Annex 1 and 2).

48. Alongside NRW's five core principles, several resources can further inform the sustainable management of the marine environment by providing a good practice framework. The Marine Mammals Management Toolkit 'Good Practices', and the guidance outlined by CIEEM in their 'Good Practice Guidance for Ecological Restoration' report serve as strong examples of good practice frameworks. Likewise, the statutory requirements outlined by Subsection 2 and 5 under Section 6 of the Environment (Wales) Act can also inform good practice. Applicants and decision makers should refer to these resources when formulating actions aligned to the encouraged element of ENV_01.

ENV_01 Technical Annex 1: Key Evidence Sources

49. Listed below are examples of key evidence sources that relate to ENV_01. Amongst other sources, they will help decision makers and applicants to design measures to deliver upon the policy. Evidence sources may also be highlighted in the Welsh Marine Evidence Strategy.

50. The relevance of the following resource will vary on a case-by-case basis. For instance, some sources outline spatial opportunities to implement nature positive projects in Wales. These may be more suitable for applicants who are seeking additional guidance on where to locate restoration and enhancement. Other sources highlight species afforded legislative protection in Wales. These could enable applicants to tailor restoration and enhancement towards particular species.

    Sources of strategic mapping to assist with ecological considerations and support site selection for enhancement include:

    - Welsh Government Marine Planning Portal.
    - DataMapWales.
    - Welsh Government Sustainable Management of Marine Natural Resources: Mapping Natural Resources.
    - Welsh Government Sustainable Management of Marine Natural Resources: Ecological Constraints and Opportunities.
    - The Crown Estate's Marine Data Exchange.

    Resources supporting ecosystem restoration and enhancement (potential target species and past examples):

    - Cefas Marine Online Assessment Tool (MOAT).
    - Restoring Meadow, Marsh, and Reef (ReMeMaRe) Initiative.
    - Welsh Government Mitigation and Compensation Opportunity in Marine Consenting.
    - Marine Protected Area Network Management Framework for Wales (2018-2023) (target species are listed in Annex 1 of the document).
    - The Crown Estate's Offshore Wind Evidence and Change (OWEC) Programme.

51. This list will be updated from time to time. To note, The Crown Estate Whole of Seabed Programme, which is currently underway, is also developing relevant evidence. When it becomes more advanced and available for public use, it will likely become a key source of marine ecosystem related evidence which includes the identification of opportunities to support marine ecosystems.

52. To complement the upcoming Seabird Conservation Strategy, Welsh Government have produced Seabird Species Factsheets, which highlight the current impact status of designated species and their sensitivity to threats. The factsheets also map areas frequented by designated seabird species in Wales. The Seabird Species Factsheets may help applicants to avoid adverse impacts on populations by informing their project siting and design, helping to reduce development-related pressures on ecosystems.

53. The UK's Cetacean Conservation Strategy[9] aims to enable effective management to achieve and/or maintain favourable conservation status for eight of the most commonly found dolphin and porpoise species in UK waters (coast to continental shelf). The strategy seeks a joined-up approach to management, with both site-based conservation and wider activities working together to protect dolphin, porpoise and minke whale populations. It proposes a series of high-level actions to deliver these outcomes and discloses vulnerability and confidence assessments. The Cetacean Conservation Strategy may assist with ENV_01 considerations under both elements of the policy.

Organisations that Provide Data and Evidence

54. Organisations and networks that provide data and evidence related to ENV_01 include, but are not confined to:
    - Natural Resources Wales (NRW).
    - Joint Nature Conservation Committee (JNCC).
    - Centre for Environment, Fisheries, and Aquaculture Science (Cefas).
    - Marine Environmental Data and Information Network (MEDIN).
    - The Crown Estate.

Evidence Provided by NRW to Support ENV_01

55. Alongside the five core principles for including restoration or enhancement in a marine or coastal development proposal, NRW promote a number of additional products that will be integral in supporting initial considerations on embedding restoration and enhancement within a development proposal. Applicants are advised to use these products to inform their approach to restoration and enhancement. The products may also be helpful in addressing potential adverse impacts on ecosystems. This work includes:

1. Highlighting environmental considerations for marine planning.

56. NRW have produced a series of maps to support high level marine spatial planning. The maps may help users understand some of the relative differences in environmental considerations for a range of sectors operating across the Welsh marine area. The maps currently focus on renewable energy (wave, tidal range, tidal stream, offshore wind), aggregates, cabling, and aquaculture.

57. The outputs of the maps highlight consideration scores (data which concerns species/habitat presence, conservation importance, and potential impact of pressures specific to each sector) for birds, fish, marine mammals, and benthic marine habitats. The outputs are available on both the Welsh Government Marine Planning Portal and DataMapWales.

9 Formerly 'UK Dolphin and Porpoise Conservation Strategy'.

58. This mapping should be used alongside other evidence and guidance to support the Sustainable Management of Natural Resources and the consideration of nature in Welsh seas. The environmental considerations maps will be particularly helpful in supporting strategic considerations of the first element of ENV_01, on addressing adverse impacts. The maps may also be used as a basis for early site selection or pre-application discussions with NRW and relevant decision makers. However, it is important to note that the environmental considerations maps do not constitute an assessment of the suitability of any specific project development plans or proposals in any particular location.

2. Strategic mapping of opportunities to enhance marine and coastal ecosystem resilience in Wales.

59. NRW are also working to produce mapping that highlights opportunities for enhancing the resilience of marine and coastal ecosystems in Wales. The initial focus is on MPAs, given the extent of the MPA network in Wales and its central role in ecosystem resilience.

60. The first iteration of the strategic mapping is available on DataMapWales. It highlights sites where one or more MPA features are known to be in unfavourable condition. The mapping also identifies areas where action is needed to restore features, reduce pressures to enable their recovery, and/or gather evidence needed to support effective management.

61. Applicants and decision makers should consider these spatial layers as initial aides for identifying potential locations for restoration and enhancement opportunities. To reiterate, any enhancement undertaken under ENV_01 is separate from and additional to measures that are required by the Habitats Regulations and/or the Marine and Coastal Access Act, including delivery of compensation.

62. If an applicant chooses to locate a nature positive project within an area identified by NRW as a priority area of opportunity, they should follow NRW's advice when designing their measures to address the needs of that specific site. In doing so, applicants will follow a more targeted approach to help optimise positive outcomes for Welsh ecosystems.

3. Developing an understanding of the range of benefits derived from marine natural resources, which are underpinned by biodiversity and ecosystem resilience.

63. NRW are working to develop an understanding of the range of benefits that healthy and resilient marine ecosystems can provide. As part of this, NRW explored the benefits which may arise from restoring marine and coastal habitats in Wales. This work focussed on six marine habitats- saltmarshes, seagrass beds, honeycomb worm reefs, mudflats, oyster beds, and horse-mussel beds. The review showed that humans and nature gain substantial benefits from the six habitats. When healthy, prospering, and resilient, each of these ecosystems can improve water clarity, increase fish production, enhance biodiversity, promote cultural value, stabilise sediments, and remove excess nutrients. Under the restoration and enhancement element of ENV_01, applicants may focus any nature positive measures towards these habitats to improve the range of benefits we obtain from Welsh ecosystems, safeguarding them for future generations.

64. In 2020, NRW also identified the need to estimate the carbon sink potential of the Welsh marine environment to emphasise the role of Welsh marine ecosystems in offsetting carbon dioxide emissions. The evidence presented within the report indicates that a wide range of Welsh marine habitats sequester carbon, with subtidal muds, sands, and gravel storing the greatest volume. Intertidal flats and saltmarshes also contribute significantly. The report concluded that protecting these habitats from damaging activities is therefore important and that the restoration of degraded sites through nature positive projects could yield increased carbon sequestration in Welsh seas.

65. As part of considerations under ENV_01, surrounding avoiding adverse impacts on marine ecosystems, applicants may consider impacts upon blue carbon stores, such as those discussed within NRW's report. In line with the recommendations highlighted within the report, applicants could also contribute to improving the management of blue carbon habitats in the Welsh marine area through protection, restoration, and enhancement (including evidence-gathering, see Annex 2) measures under ENV_01. Applicants could elect to pursue established measures/ techniques which have proven effective in restoring blue carbon habitats- examples of which are highlighted in the report- or, alternatively, pioneer their approach.

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ENV_01 Technical Annex 2: Evidence Needs

66. There is a need for further evidence to support our understanding of the spatial opportunities to deliver ecosystem restoration and enhancement in Welsh seas.

Coming Together to Highlight Key Enhancement Opportunities

67. While Welsh Government, NRW, and associated organisations are taking proactive steps to address evidence needs, project applicants can also support the development of knowledge to help to support action under ENV_01. Applicants are strongly encouraged to develop measures that can address these existing evidence gaps and/or improve the evidence base. As highlighted within paragraphs 18 and 37, measures that contribute to addressing our evidence needs can be considered as supporting enhancement under ENV_01.

68. To qualify as a contribution to the enhancement element of ENV_01, evidence generated should be appropriately disseminated and/or shared (including with NRW). Prior to conducting evidence gathering initiatives, we recommend reviewing NRW's page, 'How researchers can work with us', to ensure that the standard of evidence complies with that required by NRW.

69. To assist applicants with meeting our evidence needs as part of their voluntary contribution to ENV_01, NRW promote a Marine and Coastal Evidence Programme. As part of this, NRW have produced two documents, which Marine Plan users can refer to. The first addresses high priority evidence needs, whilst the other highlights project ideas which would be particularly suitable for research collaboration.

Areas of Focus to Address the Nature Emergency

70. Related to NRW's Marine and Coastal Evidence Programme, Welsh Government has identified the following high-level evidence gaps that require addressing. Applicants are strongly encouraged to address these evidence needs as part of their voluntary measures. This list is not definitive, and our evidence needs will evolve over time. Our evidence needs will also be shaped as government policies and programmes progress. Our marine biodiversity evidence needs include:

- Improving our ability to monitor marine biodiversity to allow us to assess the condition and health of our marine ecosystems more effectively and efficiently.
- Improving our understanding of the effectiveness of current management approaches- including management of developed sites, management by regulators, and management by developers- in the Welsh marine environment.
- Developing a strategic understanding of spatial opportunities to deliver wider ecosystem restoration and enhancement, taking into account the environmental, social, and economic benefits.
- Developing methodologies for establishing baselines and/or calculating marine biodiversity benefits.
- Understanding how to monitor and capture benefits associated with marine ecosystem protection, restoration, and enhancement.
- Developing the design and efficacy of marine ecosystem enhancement approaches and/or specific enhancement actions.
- Developing our understanding of cumulative effects within marine ecosystems.

Image by Jake Davies (2019)

ENV_01 Technical Annex 3: Case Studies

71. Annex 3 highlights case studies that illustrate where measures relating to ENV_01 have proven successful. While nature positive measures are not confined to these activities or regions, they serve as strong examples of the approaches that applicants can pursue to enhance, restore, and protect marine ecosystems in Wales.

Good Practice in Ecosystem Enhancement: Improving the State of Habitats and Species

Case Study: Settlers of Porthcawl (Inshore Nature Inclusive Design)

72. Porthcawl is a seaside town in South Wales.

73. Following structural failures, strengthening measures were recently added to Porthcawl's coastal defence- the Western Breakwater- to better manage coastal risks in future[10]. To add biodiversity value to the project, repair, maintenance, and upgrade works upheld an eco-engineering approach, with the aim of fostering the colonisation of seaweed and shore fauna habitats.

74. Traditional elements were amalgamated with innovative technology to promote the holistic approach. Modular texture panels- varying between established commercial designs and new innovations- were installed horizontally along the edge of the Breakwater. These panels act as artificial reefs and rockpools with water-retaining features.

75. The panels were constructed with concrete mixtures, incorporating local crushes of cockle shells and ash to replicate the natural environment. The baseline survey conducted prior to intervention identified potential for the project to support thriving populations of honeycomb worm (*Sabellaria alveolata*) reefs, algal species such as *Ulva lactuca* and *Fucus serratus*, and Beadlet anemone (*Actinia equina*). Some of the new units therefore trialled honeycomb worm reef textures to attract new worm settlements and provide a home for associated species.

76. Updates provided in 2024 indicate that most of the structured panels are entirely or partially covered with the green algae *Ulva lactuca* and *Ulva intestinalis*. Small amounts of *Porphyra spp*. have developed amongst seaweed. Two generations of barnacles have also colonised the panels. Gastropods such as periwinkles, dogwhelks, and topshells are using panel sides and spaces for grazing and shelter. Recent monitoring highlighted that the horizontal panels have been significantly more successful in fostering species colonisation than the traditional Breakwater structure. Evidently, integrating good practice has encouraged biodiversity.

77. Should applicants wish to implement similar measures under ENV_01, we recommend careful consideration of existing environmental factors- such as the substrate type- as introducing new materials may result in the spread of invasive non-native species. As highlighted in paragraphs 15 and 43 of the Technical Statement, applicants should promote risk-based decision making when designing measures.

10 Commissioned as part of the Sandy Bay Coastal Scheme, the Breakwater repair was a collaborative effort between Bridgend County Borough Council, Welsh Government, CubeX, BlueCube, Swansea University, and Arup- who led the project.

Case Study: Ecowende, Netherlands (Offshore Nature Inclusive Design)

78. There are several ongoing evidence initiatives to explore how nature inclusive design can enhance ecosystems in the Welsh and wider UK offshore regions. Due to the novelty of the work, few examples of offshore enhancement in practice exist in a UK context.

79. However, in the Netherlands – 50 kilometres off the Dutch coast- the Ecowende wind farm exemplifies nature inclusive design and ecosystem enhancement measures in action.

80. When designing the 54 offshore wind turbines, a strong focus was placed on ecosystem enhancement to minimise any negative effect that construction and infrastructure legacy presented to the seabed.

81. Natural reef structures were installed on the seabed and in turbine foundations to foster biodiversity. To explore which form of reef is optimal for fostering enhancement, two differing designs were selected. Within one region of the windfarm, six reef **cubes** were attached to the turbine frame, consisting of hollow blocks made of recycled material, with round holes in the walls. Within another region, six reef **balls** were attached to a frame, also consisting of recycled material with round holes in the walls. Both designs were implemented in hope of fostering primary colonisation of coral and algae.

82. Implementation of nature inclusive design is ongoing, with tree reefs and oyster hubs being installed in 2026 and 2027 across three cable crossings.

83. Aside from enhancement, the Ecowende project outlined appropriate measures in line with the mitigation hierarchy, including increasing the space between each turbine to create a safe corridor for seabirds to fly through. This design consideration minimises the impact on seabird populations.

Promoting Ecosystem Restoration: Re-establishing Lost Ecosystems

Case Study: Natur am Byth Môr Project 1 (Inshore Nature Positive Project)

84. Funded by the National Heritage Lottery Fund and delivered by nine organisations, Natur am Byth is assisting the recovery of marine ecosystems across Wales.

85. As part of the project, the Marine Conservation Society are leading a scheme titled, 'Môr Project', which focuses on four key species/areas: seagrass, pink sea fan, oysters, and water quality. Recognising the decline of Native Oyster (*Ostrea edulis*) across Europe, initial focus has been placed on restoring oyster populations in the Cleddau Estuary, Pembrokeshire.

86. Native Oyster form complex habitats called biogenic reefs. Healthy biogenic reefs encourage an increase in biodiversity as they provide a habitat and refuge for other species- including juvenile fish, sponges, crabs, and sea snails. Through restoration initiatives like 'Môr Project', applicants can promote the sustainable management of Native Oyster and the biogenic reefs that they produce to safeguard this function.

87. The Marine Conservation Society are testing methodologies and techniques to scale up the restoration of Native Oyster beds in the Milford Haven waterway. To deliver upon this, the organisation is contributing to the 'Wales Native Oyster Restoration Project Investment' by providing broodstock (for natural spawning to address previous deficiencies) alongside containment systems to encourage growth.

88. The Marine Conservation Society are also promoting Native Oyster education and are actively monitoring populations to ensure that the restoration of reefs is a success. To further assist with restoration efforts, the Marine Conservation Society are creating opportunities for stakeholders, volunteers, community engagement, and citizen science to raise awareness and increase understanding. The outputs of the Marine Conservation Society's work will feed into a series of recommendations that will outline the feasibility, and likely approach, of wider-scale Native Oyster restoration in Wales.

Protecting Marine Ecosystems to Safeguard our Seas

Case Study: Natur am Byth Môr Project 2 (Inshore Nature Positive Project)

89. Another aspect of the Natur am Byth Môr Project is the Marine Conservation Society's work to protect Pink Sea Fan (*Eunicella verrucosa*) populations in Pembrokeshire. In recognition of Pink Sea Fan's status as a species of principal importance under Section 7 of the Environment (Wales) Act, as well as its current state of vulnerability, the Marine Conservation Society are actively monitoring populations to ensure that they are protected around Skomer.

90. Pink Sea Fan is a slow-growing coral, which sits at the extreme edge of their range in Pembrokeshire. Pink Sea Fan provides a habitat for marine species and aids in increasing biodiversity. However, in Wales, their numbers are declining due to anthropogenic seabed activities, changes in water quality, and- possibly- from extensive entanglement in biota. This carries negative implications for the marine species that are dependent on them.

91. To better protect Pink Sea Fan, the Marine Conservation Society are committed to long-term species monitoring. The monitoring assesses growth rates, damage, and the ability of Pink Sea Fan to recover following disturbance.

92. The Marine Conservation Society are also engaging with sea-users and communities to raise awareness of species vulnerability. The organisation is exploring the human impacts on Pink Sea Fan populations in Pembrokeshire and, informed by new knowledge, is identifying measures to support their conservation alongside improving public awareness. The Marine Conservation Society are assessing approaches to minimise all human-induced activities that threaten the species.

Developing Evidence to Turn the Tide on the Nature Emergency

Case Study: Shoresearch (Inshore)

93. The Wildlife Trust's 'Shoresearch- Intertidal Citizen Science Surveys' are employed across the UK. The Shoresearch surveys aim to address evidence needs associated with our local shores.

94. As part of Shoresearch, the North Wales Wildlife Trust provides volunteers with specialist training to identify and record wildlife found along Welsh shores, including species which serve as climate change indicators and those which are invasive non-native species (INNS).

95. Initially, the North Wales Wildlife Trust placed focus on adding to our understanding of given habitats that are situated along the coasts of Anglesey, Conwy County, and Pen Llŷn. Existing work has been conducted within the boundaries of Welsh MPAs.

96. Data collected by volunteers in these regions helps experts to monitor fragile marine life and allows us to develop greater knowledge of the effects of pressures such as climate change, pollution, and invasive species upon marine ecosystems in Wales. Data are generated through a range of methods, including quadrat biodiversity surveys, timed species searches, walkover surveys, and, increasingly, box corer biodiversity surveys. These approaches help the North Wales Wildlife Trust to identify in situ species as well as those which change in abundance according to the season.

97. Any data collected by volunteers through Shoresearch surveys are verified by the 'iRecord' system and are entered into the UK's National Biodiversity Network Atlas. This data then becomes available for general use.

98. The data regularly informs conservation decisions at local and national levels, allowing for shoreline changes to be monitored. For instance, raw data generated by Shoresearch surveys has been submitted to Natural Resources Wales regarding invasive non-native species, informing various reports. The Shoresearch surveys are also vital to our understanding of how we may counter potential threats to the marine and coastal environment.

Case Study: NICE Protection Project (Offshore)

99. Funded by a range of developers, the Nature Inclusive Cable Enhancement (NICE) Protection project aims to encourage the coexistence of marine life on offshore wind cabling materials. This is with the hope of supporting wildlife and delivering a biodiversity net gain in English[11] territorial waters.

100. To support this eventual outcome, ongoing research is building an extensive evidence base to highlight the potential ecological benefits of nature inclusive design technologies, which arise when integrated with offshore wind cable protection. The research is exploring how to best apply nature inclusive design to allow for significant nature positive contributions.

101. The evidence base will also include a comparison of existing cable protection methods with the new, proposed, nature inclusive cable protection. Where the latter is concerned, the evidence base will also disclose the benefits which arise through the incorporation of varying nature inclusive techniques, including basalt bags, ECO Mats, habitat pipes, reef cube filter bags, or mattresses. This will help to clarify positions on cable design, and the opportunities and risks associated with each new approach. The evidence base will also establish how nature inclusive infrastructure may be left in situ during decommissioning. This is with the intention to reduce post project decommissioning costs as well as environmental impact and emissions, helping to reduce our contribution to the climate and nature emergencies.

11 To reiterate, Wales does not require a marine net benefit for biodiversity in Welsh territorial waters under the Welsh National Marine Plan. Net benefit for biodiversity under Planning Policy Wales applies to the intertidal zone.