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TRANSPOSITION OF THE MARINE STRATEGY FRAMEWORK DIRECTIVE

Final Impact Assessment

June 2010

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Title:	Impact Assessment (IA)
Transposition of the Marine Strategy Framework Directive - Final Stage IA	**IA No:** 1004
Lead department or agency:	**Date:** 7th May 2010
Defra	**Stage:** Development/Options
Other departments or agencies:	**Source of intervention:** EU
Scottish Executive Welsh Assembly Government Dept of Environment Northern Ireland	**Type of measure:** Secondary legislation
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Summary: Intervention and Options

What is the problem under consideration? Why is government intervention necessary?

Human activity has caused adverse changes to marine eco-systems. Those changes pose a threat to the balance and integrity of marine ecosystems and their ability to deliver economic and other benefits (ecosystems goods and services). This results in an inefficient allocation of resources and the loss of some of the UK's environmental assets. Government intervention is necessary to ensure environmental quality is properly valued and managed to ensure the sustainable use of the UK's seas. Since marine pollution and other impacts are often trans-boundary, national action needs to be supported by a common framework to ensure action is taken across the EU with other Member States playing their role.. EU Member States must transpose this Directive by 15th July 2010.

What are the policy objectives and the intended effects?

The EC's Marine Strategy Framework Directive (MSFD) requires Member States to put in place measures to achieve or maintain Good Environmental Status (GES) in their waters by 2020. Member States must produce a Marine Strategy for their waters, in collaboration with other Member States in their marine region. The strategy should consist of: an assessment of environmental status and a determination of what GES means for those waters; targets, indicators and a monitoring programme to measure progress; and a programme of measures to achieve or maintain GES. This Impact Assessment (IA) focuses on the transposition of the MSFD. Future IAs will also look in more detail at the impacts of its implementation.

What policy options have been considered? Please justify preferred option (further details in Evidence Base)

Option 1 describes the status quo (i.e. if the Directive is not transposed into UK law). This is not a viable option and is included as the counterfactual baseline against which options 2 and 3 are assessed.

Option 2 is for Defra and each Devolved Administration to transpose the Directive separately. This option has not been pursued following responses to the public consultation.

Option 3 (the preferred option) is to transpose the Directive using a single UK-wide legislative instrument. This would considerably reduce the risk of infraction (relative to the Option 1 baseline) and in the future will result in costs and benefits associated with implementing the Directive. These will be explored in future

When will the policy be reviewed to establish its impact and the extent to which the policy objectives have been achieved?	It will be reviewed 07/2018
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

SELECT SIGNATORY Sign-off For consultation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:..... Date:.....

Summary: Analysis and Evidence Policy Option 3

Description:

Transpose the Marine Strategy Framework Directive using a single UK-wide legislative instrument

Price Base Year	PV Base Year	Time Period	Net Benefit (Present Value (PV)) (£m)		
			Low: 0	**High:** 0	**Best Estimate: 0**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant	Total Cost (Present Value)
Low	0		0	**0**
High	0		0	**0**
Best Estimate	0		0	**0**

Description and scale of key monetised costs by 'main affected groups'

No costs are expected to business or the environment as a result of choosing a single transposition instrument for the UK. Government activity in support of the transposition of the Directive is considered to be 'routine business of government' and consequently no incremental costs are anticipated. See paras 3.10-3.15.

Other key non-monetised costs by 'main affected groups'

In the future the implementation of the Directive is anticipated to result in costs and benefits. These will be explored and consulted upon in future Impact Assessments.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant	Total Benefit (Present Value)
Low	0		0	**0**
High	0		0	**0**
Best Estimate	0		0	**0**

Description and scale of key monetised benefits by 'main affected groups'

No benefits are expected to business or the environment as a result of choosing a single transposition instrument for the UK. Government activity in support of the transposition of the Directive is considered to be 'routine business of government' and consequently no incremental benefits are anticipated. See paras 3.16-3.19.

Other key non-monetised benefits by 'main affected groups'

In the future the implementation of the Directive is anticipated to result in costs and benefits. These will be explored and consulted upon in future Impact Assessments. A key benefit of EU-coordinated action to improve the marine environment will be to ensure that measures taken in the UK do not erode competitiveness of UK businesses.

Key assumptions/sensitivities/risks **Discount rate** 3.5%

Key risks:

1. The key difference between the baseline (Option 1) and the preferred option (Option 3) is that under the baseline the UK is at risk of infraction if the MSFD is not transposed by 15th July 2010. Under the preferred option it is assumed that by transposing the Directive this risk is considerably reduced.
2. The future implementation of the Directive is anticipated to result in (potentially considerable) costs and benefits. This will be explored in future Impact Assessments once there is more clarity regarding the precise requirements of the Directive

Impact on admin burden (AB) (£m):			Impact on policy cost savings	In scope
New AB: N/A	**AB savings:** N/A	**Net:** N/A	**Policy cost savings:** N/A	No

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			United Kingdom		
From what date will the policy be implemented?			15/07/2010		
Which organisation(s) will enforce the policy?			EU		
What is the annual change in enforcement cost (£m)?			N/A		
Does enforcement comply with Hampton principles?			Yes		
Does implementation go beyond minimum EU requirements?			No		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** 0	**Non-traded:** 0	
Does the proposal have an impact on competition?			No		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:** N/A	**Benefits:** N/A	
Annual cost (£m) per organisation (excl. Transition) (Constant Price)	**Micro** 0	**< 20** 0	**Small** 0	**Mediu m**	**Large** 0
Are any of these organisations exempt?	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Specific Impact Tests: Checklist

Set out in the table below where information on any SITs undertaken as part of the analysis of the policy options can be found in the evidence base. For guidance on how to complete each test, double-click on the link for the guidance provided by the relevant department.

Please note this checklist is not intended to list each and every statutory consideration that departments should take into account when deciding which policy option to follow. It is the responsibility of departments to make sure that their duties are complied with.

Does your policy option/proposal have an impact on…?	**Impact**	**Page ref within IA**
Statutory equality duties[1] Statutory Equality Duties Impact Test guidance	No	N/A
Economic impacts		
Competition Competition Assessment Impact Test guidance	No	N/A
Small firms Small Firms Impact Test guidance	No	N/A
Environmental impacts		
Greenhouse gas assessment	No	N/A
Wider environmental issues Wider Environmental Issues Impact Test guidance	No	N/A
Social impacts		
Health and well-being Health and Well-being Impact Test guidance	No	N/A
Human rights Human Rights Impact Test guidance	No	N/A
Justice system Justice Impact Test guidance	No	N/A
Rural proofing Rural Proofing Impact Test guidance	No	N/A
Sustainable development Sustainable Development Impact Test guidance	No	N/A

[1] Race, disability and gender Impact assessments are statutory requirements for relevant policies. Equality statutory requirements will be expanded 2011, once the Equality Bill comes into force. Statutory equality duties part of the Equality Bill apply to GB only. The Toolkit provides advice on statutory equality duties for public authorities with a remit in Northern Ireland.

Evidence Base (for summary sheets) – Notes

Use this space to set out the relevant references, evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Please fill in **References** section.

References

Include the links to relevant legislation and publications, such as public impact assessment of earlier stages (e.g. Consultation, Final, Enactment).

No.	Legislation or publication
1	ABPmer (2009) "An Introduction to Socio-economic Assessment within a Marine Strategy Framework". Available at http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16663&FromSearch=Y&Publisher=1&SearchText=me5101&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
2	R. K. Turner, D. Hadley, T. Luisetti, V. W. Y. Lam and W. W. L. Cheung (2010), "An Introduction to Socio-economic Assessment within a Marine Strategy Framework", CSERGE, University of East Anglia. Available at http://www.defra.gov.uk/environment/marine/documents/legislation/msf-socioeconomic.pdf
3	
4	

+ Add another row

Evidence Base

Ensure that the information in this section provides clear evidence of the information provided in the summary pages of this form (recommended maximum of 30 pages). Complete the **Annual profile of monetised costs and benefits** (transition and recurring) below over the life of the preferred policy (use the spreadsheet attached if the period is longer than 10 years).

The spreadsheet also contains an emission changes table that you will need to fill in if your measure has an impact on greenhouse gas emissions.

Annual profile of monetised costs and benefits* - (£m) constant prices

	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Transition costs	0	0	0	0	0	0	0	0	0	0
Annual recurring cost	0	0	0	0	0	0	0	0	0	0
Total annual costs	0	0	0	0	0	0	0	0	0	0
Transition benefits	0	0	0	0	0	0	0	0	0	0
Annual recurring	0	0	0	0	0	0	0	0	0	0
Total annual benefits	0	0	0	0	0	0	0	0	0	0

* For non-monetised benefits please see summary pages and main evidence base section

Microsoft Office Excel Worksheet

Evidence Base (for summary sheets)

There is discretion for departments and regulators as to how to set out the evidence base. However, it is desirable that the following points are covered:

- Problem under consideration;
- Rationale for intervention;
- Policy objective;
- Description of options considered (including do nothing);
- Costs and benefits of each option;
- Risks and assumptions;
- Administrative burden and policy savings calculations;
- Wider impacts;
- Summary and preferred option with description of implementation plan.

Inserting text for this section:

Select the notes here and either type section text, or use **Paste Without Format** toolbar button to paste in the standard EBBodyPara Style. Format text by applying EB styles from the toolbar.

1. INTRODUCTION

1.1 This Impact Assessment considers the options for transposing the EU Marine Strategy Framework Directive (2008/56/EC) into UK law. The UK-wide costs and benefits of transposing the Directive (Option 3) are compared to the counterfactual baseline of not transposing the Directive (Option 1).

1.2 The impacts of transposition itself are relatively small. This is because the Marine Strategy Framework Directive (MSFD) is a framework directive and its transposition involves establishing a high-level legal framework in the UK. Details of what actions will be needed for implementation will be decided at later stages. This document should therefore be seen as a first step in the Impact Assessment process for the eventual implementation of the Directive.

1.3 This Impact Assessment (IA) does however outline current thinking on how we might approach the implementation process including the determination of GES, the monitoring arrangements and programmes of measures necessary to deliver GES by 2020 [see section 4] which will be examined in more detail in future Impact Assessments. The intention is to lay the foundation for further IAs, and we will continue to work with experts and stakeholders to develop an evidence-based approach towards implementation.

1.4 The evidence base is structured as follows:

Section1: Introduction

Section 2: Policy rationale and objectives

- Policy rationale
- Policy objectives: an overview of the Directive
- Policy objectives for the initial transposition

Section 3: Policy options for the initial transposition (by July 2010)

- Option 1: Do not transpose the Marine Strategy Framework Directive (the ‘status quo’)
- Option 2: Separate transposing regulations in England and each of the Devolved Administrations
- Option 3: Transpose the Marine Strategy Framework Directive using a single UK-wide legislative instrument (the preferred option)

Section 4: Towards implementation of the Directive

- Overview
- Analytical approach to assessing the costs and benefits of implementing the Directive
- UK approach to taking forward implementation of the Directive

Section 5: Specific impact tests

Annex A: Summary of the scientific evidence for the Descriptors of GES

2. POLICY RATIONALE AND OBJECTIVES

Policy rationale

2.1 The marine environment is subject to a range of changes as a result of human activity. These changes can include the loss or degradation of biodiversity and changes in its structure, loss of habitats, contamination by dangerous substances and nutrients, and the possible future effects of climate change.

2.2 The UK Government and Devolved Administrations recognise the need for enhanced intervention in order to achieve the Directive's aim of maintaining biodiversity and providing diverse and dynamic oceans and seas which are clean, healthy, safe and productive. This is why we are committed to putting in place better systems for managing the marine and coastal environment through the UK Marine and Coastal Access Act 2009, the Marine (Scotland) Act 2010 and the proposed Marine Bill in Northern Ireland. Nevertheless, marine pollution can be trans-boundary in nature and national measures are not necessarily sufficient to achieve our objectives for our seas where these are influenced by the actions of other countries.

2.3 The EU Marine Strategy Framework Directive requires all Member States to take the coherent and collaborative action necessary to protect Europe's seas. It aims to promote sustainable use of the seas and conserve marine ecosystems, covering many human activities that have an impact on the marine environment by putting in place a transparent and coherent common legislative framework for action across the EU.

2.4 Along with other Member States, the UK must transpose the Directive by 15 July 2010 or we will be liable to infraction proceedings.

Policy objectives: an overview of the Directive's requirements

2.5 The key requirement of the Directive is for Member States to put in place measures to achieve or maintain Good Environmental Status (GES) in their marine waters by 2020. Achievement of GES will be assessed against the following eleven descriptors set out in Annex 1 of the Directive:

1: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions ("Descriptor 1" or "D1").

2: Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems ("Descriptor 2" or "D2").

3: Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock ("Descriptor 3" or "D3").

4: All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity ("Descriptor 4" or "D4").

5: Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae

blooms and oxygen deficiency in bottom waters (“Descriptor 5” or “D5”).

6: Sea floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected (“Descriptor 6” or “D6”).

7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems (“Descriptor 7” or “D7”).

8: Concentrations of contaminants are at levels not giving rise to pollution effects (“Descriptor 8” or “D8”).

9: Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards (“Descriptor 9” or “D9”).

10: Properties and quantities of marine litter do not cause harm to the coastal and marine environment (“Descriptor 10” or “D10”).

11: Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (“Descriptor 11” or “D11”).

2.6 The Directive anticipates Member States using an ecosystem-based approach to the management of the marine environment. The precise requirements of an ecosystem-based approach is the subject of academic debate but it broadly involves integrating and managing the range of demands on the natural environment in such a way that it can indefinitely support essential services and provide benefits for all.

2.7 Achieving such an integrated approach to marine management will involve close coordination between each of the UK administrations, as well as with other Member States in the North East Atlantic marine region. For this reason the Government and the Devolved Administrations are taking a closely coordinated approach to the implementation of this Directive and this Impact Assessment has been carried out jointly by the UK Government, the Scottish Government, the Welsh Assembly Government and the Department of the Environment in Northern Ireland. This IA assesses the costs and benefits of transposing the Directive.

2.8 In order to deliver GES by 2020 the Directive requires that Member States must produce a Marine Strategy for their waters, in collaboration with other Member States in their marine region. A Marine Strategy is broken down into the following elements:

- An initial assessment of the current environmental status of a Member State’s marine waters (to be completed by July 2012);
- A determination of what GES means for those waters (to be completed by July 2012);
- Establishment of targets and indicators designed to show whether a Member State is achieving GES (to be established by July 2012);
- Establishment of monitoring programmes to measure progress towards GES (to be established by July 2014);

- Establishment of programmes of measures designed to achieve or maintain GES (to be developed by 2015 and made operational by 2016)
- The Directive also requires Member States to submit an interim review of the Programme of Measures in July 2018 and to review the initial assessment of marine waters, the determination of GES and associated targets and indicators by the same date[2].

2.9 Each of these steps in implementing the Directive will involve the development of further impact assessments, as the detailed requirements of each step become clearer. In particular the concept of GES is critical to the implementation stages. While the Directive does set out 11 high-level descriptors of GES, it leaves it to the Member State concerned (in coordination with other neighbouring countries) to determine detailed targets and indicators for GES, following pan-European criteria and methodologies which the European Commission hopes to agree by the end of July 2010. This level of uncertainty makes it impossible to say at this stage exactly what achieving GES will involve and what its impact will be, both on marine ecosystems and on businesses and other users operating in the marine environment.

Policy objectives for the initial transposition

2.10 This Impact Assessment focuses on the regulations to transpose the Directive. The regulations cover all the UK's marine waters, including territorial waters in Wales, Scotland and Northern Ireland. The purpose of the regulations is to transpose the Directive by establishing a high-level legal framework that ensures that each obligation which it places on the UK is assigned to a competent authority, and those competent authorities are given the necessary powers to carry out their roles. The regulations transpose the Directive and, in particular, set out:

- the geographical scope of the legislation - the area over which the UK Marine Strategy will apply;
- the bodies that will be responsible for implementing the Directive in different parts of the UK's marine waters (i.e. which bodies will act as competent authorities for the Directive) and put duties on those bodies to deliver each of the Directive's requirements to the required timetable;
- an appropriate legal framework to ensure that the UK Government and each of the Devolved Administrations work together effectively to implement the Directive in a consistent and co-ordinated way across the UK;
- appropriate provisions to ensure that all public authorities which take decisions or carry out activities affecting the marine environment will be required to play an appropriate role in ensuring that the requirements of this Directive are delivered;

2.11 Draft Regulations were consulted on between October 2009 and January 2010. The consultation set out the requirements of the Directive and made

[2] We anticipate that these reviews will also include an assessment of the costs and benefits of implementing the Directive.

proposals on how these should be transposed into UK legislation. The majority of respondents to the consultation supported the proposals, in particular the suggested legal framework for ensuring that the Government and Devolved Administrations coordinate effectively with each other when implementing the Directive across the UK. The summary of responses to that consultation, along with the Government response can be found on the Defra website (http://www.defra.gov.uk)

2.12 The draft regulations do not set out:

- *the detail of what GES means for UK seas* – the UK determination of GES and the associated targets and indicators cannot be developed until appropriate EU-wide criteria and methodologies for GES have been agreed – these are expected to be finalised by the end of July 2010.
- *the UK monitoring programmes for GES* – monitoring programmes for GES are required by 2014 and will be developed once it is clear what achieving GES means for UK waters.
- *the UK programmes of measures for achieving GES* - programmes of measures for GES are required by 2015. Again, at this stage it is too early to set out what measures will be needed to achieve GES, other than spatial protection measures which are specifically mentioned in the Directive.

3 POLICY OPTIONS FOR THE INITIAL TRANSPOSITION

3.1 The options at this stage are limited. It is a requirement of EU law that the Directive must be transposed by 15 July 2010. The status quo option of not transposing the Directive is outlined in this Impact Assessment and should be considered to be the hypothetical baseline against which option 3 (to transpose with a single, UK-wide legislative instrument) is assessed. In practice, the choice of legislative instrument will have little 'real world' impact as the UK has already committed to the Marine Strategy Framework Directive and the principle of delivering Good Environmental Status in UK waters. The legislative background against which the choice of a UK-wide transposition instrument will be assessed is set out in para 3.3[3].

Option 1: Do not transpose the Marine Strategy Framework Directive (the status quo)

3.2 This section describes the hypothetical scenario in which the UK does not transpose the MSFD. This is not considered a viable option as the UK is legally committed to transposing the Directive and would face the risk of substantial infraction fines if the regulations are not transposed by 15 July 2010. The costs of transposition (as opposed to implementation) are low compared to the possible level of fines for non-transposition. This option is therefore included solely for the purpose of providing a baseline for comparison.

3.3 By definition, continuing under the status quo would result in no additional costs or benefits from the MSFD. However, even under this option it is anticipated that between now and 2020 marine resources will be used in a more strategic way than they have been in the past. This will be due largely to the Marine and Coastal Access Act 2009, the Marine (Scotland) Act 2010 and the proposed Marine Bill in Northern Ireland which introduce a number of measures including new systems of marine planning, streamlined regulatory processes, the creation of strategic delivery bodies in the marine environment, and the commitment to create a network of Marine Conservation Zones/Marine Protected Areas. In addition, a Marine Policy Statement is being consulted on in 2010 and is due for publication in 2011. It is intended that this will set out in one document the UK Government and Devolved Administrations' policies for the sustainable development of the UK marine area and will provide clarity for stakeholders with an interest in the use of the seas. This clarity will benefit businesses and enable marine users to plan for the future with more certainty[4]. Other policies anticipated to impact upon marine environmental policy include the EU Birds and Habitats Directives which aim to conserve marine biodiversity, and reform of the Common Fisheries Policy which aims to improve the sustainability of the European fishing industry and secure a stable source of income for European fishers. The Water Framework Directive which requires Member States to achieve Good Ecological Status in their terrestrial water bodies is also expected to deliver environmental improvements in

[3] The baseline environmental quality and economic activity against which the implementation of the Directive will be considered is described in paras 4.4-4.13.

[4] For more detail see http://www.defra.gov.uk/environment/marine/documents/legislation/marinebill-ia.pdf for the UK Bill and http://www.scotland.gov.uk/Publications/2009/04/29130759/0 for the Scottish Bill.

coastal areas[5]. The combined impact of existing legislation and other international commitments is anticipated to deliver a baseline of improving environmental quality in UK marine waters (relative to the counterfactuals set out in the Impact Assessments for those policies) and it is against this legislative baseline that any measures to be introduced under the Marine Strategy Framework Directive should be considered. A report produced for Defra by ABPmer to provide evidence for this Impact Assessment sets out this legislative baseline in more detail and can be found at : http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16663&FromSearch=Y&Publisher=1&SearchText=me5101&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

3.4 It is a requirement of EU law to transpose Directives by the relevant deadline. The key risk associated with option 1 is that the UK would be liable to infraction proceedings being brought by the European Commission as a result of not transposing the Directive. Failure to meet our obligations could eventually result in a fine being imposed on the UK. Whether to impose a fine – and if so, the level of fine - would be determined by the European Court of Justice. This could involve both a lump sum and a periodic payment. The magnitude would be likely to depend on: the seriousness of the breach, including the importance of the Community rule infringed and the effects of the infringement; the duration of the breach; and the Member State's ability to pay and the weighting of its votes in Council (intended to ensure the penalty has a deterrent effect). For example, in a recent French case (on EU fisheries policy), a lump sum of 20 million Euros was imposed, together with a penalty of over 57 million Euros for each six-month period that France failed to implement the law (although that case – involving repeated non-compliance with fisheries conservation - may not be directly comparable to the straightforward non-transposition considered here). However, the European Court of Justice would consider each case on its individual merits.

Option 2: Separate transposition of the Marine Strategy Framework Directive in England and each of the Devolved Administrations.

3.5 At consultation stage we explored the option of the UK and each of the Devolved Administrations for Scotland, Wales and Northern Ireland transposing the MSFD independently for their areas of jurisdiction, entailing four separate sets of transposing regulations.[6] It should be noted that the choice of a single set or four sets of transposing regulations would not have affected how the Directive is implemented. We decided not to pursue this option as it would not have had a real world impact that was different from Option 3, but may have increased the costs to stakeholders of engaging in the transposition process and may have increased the risk of infraction proceedings.

[5] For more detail see http://www.defra.gov.uk/environment/quality/water/wfd/documents/pdf-ria-draft/ria-wfd-annex1.pdf , and for Scotland: http://www.scotland.gov.uk/Topics/Environment/Water/WFD/WEWSAct

[6] Although Welsh Ministers do not currently have a general designation which would enable them to make regulations transposing the MSFD in Wales either alone, or on a composite basis, they could apply for a specific designation to do so.

Option 3: Transpose the Marine Strategy Framework Directive using a single UK-wide legislative instrument (the preferred option)

3.6 This section explores the implications of using a single UK-wide legislative instrument to transpose the Marine Strategy Framework Directive. It should be noted that the choice of a single or four sets of transposing regulations does not affect how the Directive will be implemented. Paras 4.1-4.37 articulate current thinking on the implementation of the Directive. However, this is not the focus of this IA and will be explored in detail in future IAs looking at options for implementation.

3.7 Under option 3 there would be a single set of regulations covering transposition for the whole of the UK. The regulations will assign relevant duties and powers to each of the UK Government and the Devolved Administrations.

3.8 The principle advantage of this option is that it would create a clear transparent transposing instrument. This should help improve clarity for businesses which operate across the whole of the UK and significantly reduce the risk of infraction compared to the baseline (Option 1).

3.9 Option 3 is the preferred option of the UK government and the Devolved Administrations and the Regulations have been prepared on that basis.

COSTS

Costs to the environment

3.10 No environmental costs associated with transposition of the Directive have been identified.

Costs to Government (central and wider)

3.11 Transposing through a single set of regulations would involve the UK Government and Devolved Administrations in preparing regulations, a consultation document and an Impact Assessment. These costs fall within the routine business of government and do not result in any incremental costs.

Costs to business and other stakeholders

3.12 The impact of the transposition of the Directive on businesses will be small, although further down the line the implementation of the Directive is likely to result in both costs and benefits to businesses (see section 4).

3.13 The key cost that has been identified arising from the transposition process is the cost to businesses of engaging with the consultation. An informal straw poll of stakeholders suggests that they will devote between 10 and 2,600 hours responding to and influencing the MSFD's public consultation on transposition. The range reflects the differential effort between small local interest groups and industry bodies representing multiple private companies[7]. However it has not been possible to estimate fully how much time businesses are likely to spend on this. It should be noted that now the consultation is closed no additional costs to business are expected.

3.14 Some marine stakeholders may choose to undertake research and build upon the evidence base available for the eventual implementation of the Directive.

[7] The representative industry body devoting 2,600 hours to the transposition process represents more than ten organisations which is approximately equal to 200 hours per organisation devoted to the process

Approximately a third of stakeholders indicated that they may undertake such research in the informal poll undertaken by Defra and the Devolved Administrations. Stakeholders estimated that this research would cost between £2,500 and £25,000 with the anticipated cost to most organisations falling at the lower end of this spectrum. This research does not relate directly to the transposition of the Directive and the extent to which this research would have been undertaken anyway, rather than being commissioned specifically to develop thinking on the MSFD is not clear.

3.15 There may also be some additional uncertainty generated for businesses in the time before the programmes of measures are announced and before any other implications of the Directive are clarified. To minimise this risk the government will adopt a transparent approach to policymaking and will proactively engage with stakeholders (see section 4 for more details).

BENEFITS

Benefits to the environment

3.16 No environmental benefits associated with transposition of the Directive have been identified at this stage, although further down the line the implementation of the Directive is likely to result in significant benefits to the environment (see section 4).

Benefits to Government (central and wider)

3.17 By transposing the Directive to the agreed timetable the government will have optimally managed the risk profile associated with the Directive.

Benefits to business and other stakeholders

3.18 The impact of the transposition of the Directive on businesses will be negligible. The choice of transposition instruments is unlikely to have a material impact on businesses or other stakeholders.

3.19 Transposition of the Directive by the UK and other Member States will result in a stronger legal framework for coordinated action to improve the marine environment within Europe than exists at present. This could yield benefits to business by levelling the playing field compared to the status quo, under which consistent management of marine waters across Europe is not achievable.

4 TOWARDS IMPLEMENTATION OF THE MSFD

Overview

4.1 As a framework directive the MSFD articulates broad principles and actions. The timetable for these to be agreed and carried out is set out in para 2.8 and it is a requirement of EU law that the Directive must be implemented by Member States according to this timetable. The Directive requires Member States (in coordination with the other countries in their marine region) to determine detailed targets and indicators for GES. To inform this process the European Commission will publish pan-European criteria which are expected to be finalised by the end July 2010.

4.2 This section aims to give further information on the UK Government and Devolved Administrations current thinking in relation to the implementation of the Directive and to set out how we intend to develop our evidence base to support that process. While this section does not relate to the transposition of the Directive directly, this information is provided for the sake of transparency and to encourage the early engagement of stakeholders to help inform this approach.

4.3 Implementation will involve consideration of more substantive options for each stage of the Directive including more detailed consideration of the associated costs and benefits. Further Impact Assessments will be developed to inform each stage of implementation.

Analytical approach to assessing the costs and benefits of implementing the Directive

4.4 There remains significant uncertainty as to the precise requirements for achieving GESand what this will mean for the UK. The European Commission is currently working to develop a set of pan-European criteria and methodologies for GES (see para 4.9 and Commission Webpage http://ec.europa.eu/environment/water/marine/index_en.htm) which will need to be applied by Member States in close coordination with other Member States in their marine region (i.e. through regional seas conventions such as the Oslo and Paris Convention (OSPAR) for the North East Atlantic). The analytical milestones of the Directive are described in para 2.8.The UK's analytical approach for assessing the impacts of implementing the Directive is to identify:

a. How the quality of the marine environment may evolve between now and 2020;
b. What the targets for GES may be;
c. The types of measures that may need to be introduced for each of the GES descriptors; and
d. What the associated benefits and costs may be and to ensure that these are proportionate

This basic approach was explored in a scoping study carried out by ABPmer (see Box 1).

Identifying the baseline

4.5 The UK has already introduced a number of policies that are anticipated to improve marine environmental quality (see para 3.3). However there is uncertainty as to the scale of any improvements in environmental quality that will be achieved between now and 2020. The key sources of uncertainty are imperfect understanding of:

- The interaction between human activities and ecosystem function and resilience;
- The interaction between policy interventions and ecosystem function and resilience;
- The very long timescales over which improvements in environmental quality may be expected to be observed in the sea following a particular policy intervention or other human impact;
- The interaction between a combination of policy or other human interventions. For example multiple interventions in a particular area could lead to smaller or larger than anticipated impacts on ecosystem function and resilience or on business and other interests in the area;
- Large natural variations and trends in observed environmental outcomes over time; and
- Imperfect understanding of the impacts of climate change and human and ecosystem responses to these changes.

Box 1 – ABPmer's scoping study on the MSFD evidence base

Defra commissioned a three month desk-based scoping study to explore options for the UK's analytical approach to the MSFD and to flag priority areas for further research. This is available at http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=16663&FromSearch=Y&Publisher=1&SearchText=me5101&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
Given the high degree of uncertainty surrounding both the environmental trends between now and 2020 and the precise requirements of the Directive, the focus of the study was on identifying an analytical framework for future research rather than to attempt to accurately predict the costs and benefits of the Directive.

The study proposes identifying a range of environmental baselines that describe how environmental quality may evolve in the absence of the Directive and a range of scenarios that describe a world in which GES has been achieved (see tables 1 and 2 respectively). The study identifies the descriptors for which expected trends in environmental quality combined with existing legislative and policy commitments may be expected to deliver GES by 2020 and those descriptors for which additional effort may be required.

Based on the illustrative scenarios identified in the study, ABPmer suggest that the UK may already be making good progress with respect to some of the descriptors. They identify that robust legislation is already in place to support the descriptors on eutrophication (D5), contaminants (D8) and contaminants in seafood (D9). For other descriptors the authors suggest that existing legislation may not be sufficient to deliver GES by 2020. These include the descriptors on biological diversity (D1), non-indigenous species (D2), fish stocks (D3), food webs (D4), sea floor integrity (D6) and potentially for marine litter (D10) where there is significant uncertainty regarding what might be required. The authors note that fishing activity is relevant to the delivery of D1, D3, D4 and D6 and that the principal tool for managing fisheries will remain the Common Fisheries Policy.

For the descriptors which may require additional measures the authors provided 'quick and dirty' estimates of the potential scale of costs and benefits involved.

Source: ABPmer (2009)
Note: the report solely reflects the views of the authors and does not necessarily represent Defra policy

4.6 To account for this uncertainty we will consider a range of plausible baseline scenarios: a 'best estimate' using a combination of latest available information and expert judgement, a 'pessimistic' estimate that plausibly describes a scenario where environmental quality is worse than anticipated and a 'optimistic' estimate that plausibly describes a scenario where environmental quality is better than currently anticipated. Illustrative baseline scenarios for each of the descriptors of GES are presented in Table 1.

Table 1: Illustrative scenarios of the evolution of environmental quality under the baseline, between now and 2020

GES descriptor	Illustrative baseline		
	Pessimistic	Best estimate	Optimistic
Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions (D1)	Biodiversity loss is reduced but not fully halted	Biodiversity loss is halted	Biodiversity loss is halted and there is recovery of impacted areas and mobile species
Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems (D2)	New introductions of non-indigenous species are reduced but some ecosystem impacts remain at national scale	Introductions of non-indigenous species are significantly reduced to limit ecosystem impacts at a national scale	Introduction of new species is minimised and existing non-indigenous species managed to avoid ecosystem damage at a national scale.
Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock (D3)	Fish stocks remain lower than safe biological limits but decline in stock levels is halted. Species abundance maintained to recent historic levels and fish sizes remain low	Populations of all commercially exploited fish and shellfish within safe biological limits but size and age class structure adversely affected when populations are assessed at the level of the whole of the UK's marine area	Populations of all commercially exploited fish and shellfish are at maximum sustainable yield, within safe biological limits with no significant distortion of size and age class structure when populations are assessed at the level of the whole of the UK's marine area.
All elements of the marine food webs, to the extent that they are known, occur at normal abundances and diversity levels capable of ensuring the long-term	Marine food webs affected by human activity. In particular, fishing still affecting top predators and evidence of 'fishing down the food chain' remains	Maintenance of food webs but minor impacts to top predators from fishing activity still evident. No loss of key functional groups	Structure and function (biomass within different trophic levels) of marine foodwebs being maintained across the UK Continental Shelf when assessed at the level of

abundance of the species and the retention of their full reproductive capacity (D4)			the whole of the UK's marine area.
Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters (D5)	Risk from point source discharges sufficiently low but diffuse pollution will remain a significant source of nitrate and phosphate	Point and non-point source nutrient inputs into the estuarine and marine environments minimised to the extent that eutrophication does not occur at a Regional Sea scale	No significant adverse effects on biodiversity or the marine ecosystem which can be attributed to human induced eutrophication when assessed at the level of the whole of the UK's marine area
Sea floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected (D6)	Benthic ecosystem structure and function shift into an alternative steady state with adverse effects on benthic structure and function as a whole.	Bed disturbing activities (all forms of dredging including fisheries) are subject to spatial management, matching the disturbance potential of each activity with the resistance/resilience of target substrate. Loss of the most sensitive habitats is halted; damage to the most important habitats (ie. key to maintaining ecosystem function) is reduced. Measures introduced for all UK waters, including coastal, shelf (to 200m depth) and deep sea (>200m depth)	Sea floor integrity is adequately protected when assessed at a national scale. Management paradigm shifts from the concept of 'Protected Areas within an exploited environment' to 'Exploited areas within a Protected Environment'
Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems (D7)	Adverse impacts on marine ecosystems from permanent alteration of hydrographic conditions within 1 and 3nm are prevented (with the exception of some heavily modified water bodies) unless for reasons of over-riding public interest	No permanent alteration of hydrographical conditions which results in significant effect on marine ecosystems	No permanent alteration of hydrographical conditions which results in significant effect on marine ecosystems
Concentrations of contaminants are at levels not giving rise to	Contaminants persist within marine environments; including	Concentrations of contaminants are at levels not causing pollution in	Concentrations of contaminants at levels not causing pollution in

pollution effects (D8)	offshore	sensitive areas	any component of the marine environment when assessed at the level of the whole of the UK's marine area.
Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards (D9)	Exceedence of contaminant levels set by community legislation continues in some shellfish harvesting areas and fish farms (inadequate microbiological quality of waters)	Contaminant levels not exceeding community legislation	Contaminant levels not exceeding community legislation
Properties and quantities of marine litter do not cause harm to the coastal and marine environment (D10)	Marine litter levels stay the same or increase. Adverse impacts in marine and coastal environment continue	Marine litter levels are reduced and adverse impacts in marine and coastal environment decline	Marine litter is reduced to levels that does not have adverse impacts in the marine and coastal environment
Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (D11)	Noisy development activities and introduction of other forms of energy (including electromagnetic fields) continue at current trend	Noisy development activities and introduction of other forms of energy (including electromagnetic fields) are controlled at a national level to reduce the harm to cetaceans and key fish species	All sources of energy introduction are adequately controlled resulting in minimised impacts on cetaceans and key fish species

Source: ABPmer (2009)
Note: these scenarios are for illustrative purposes only

This information will feed into the UK's initial assessment (see paras 4.16-4.25 for more information.

Identifying the targets for GES

4.7 At this stage we are not yet in a position to define what the UK's targets for GES will be. The Directive leaves it to Member States, in co-ordination with other neighbouring countries, to determine what GES means in more detail for their waters and to set clear targets and indicators to support it (by 2012). However in practice, the UK Government will not have total freedom to determine GES. The European Commission is currently working to develop a set of pan-European criteria and methodologies which will underpin the descriptors of Good Environmental Status and set clear parameters which will need to be applied by Member States.

4.8 In 2009 the Commission asked the Joint Research Centre (JRC) and the International Council for the Exploration of the Sea (ICES) to lead a series of scientific task groups to review the current research associated with each of the descriptors of GES and make recommendations on possible criteria and methodologies to support Member States in setting targets and developing

monitoring programmes for GES. The reports produced by these task groups were finalised earlier this year and have been circulated widely to UK stakeholders. A summary of the evidence provided in these reports is given at Annex A to this document.

4.9 The Commission has used the evidence provided in the task group reports to develop draft proposals for pan-European criteria and methodologies on GES. It is expected that these will be finalised by the end of July 2010. Once the final set of criteria are available the process of determining GES will begin in the UK, in coordination with neighbouring Member States who share the same regional waters.

4.10 Once the targets for GES have been determined we will be in a position to consider the costs and benefits associated with achieving GES in more detail. In the ABPmer scoping study (see Box 1) the authors identified a range of illustrative scenarios that they believe describe the status of the marine environment when GES has been achieved (see Table 2). The 'best estimate' used a combination of latest available information and expert judgement of what may be required, the 'lower ambition' estimate describes a scenario where the level of ambition is lower than the best estimate and the 'higher ambition' estimate describes a scenario where the level of ambition is higher than that currently anticipated.

Table 2: Illustrative scenarios of environmental quality outcomes that may be required under the Marine Strategy Framework Directive, 2020

GES descriptor	Illustrative outcome		
	Lower ambition	Best estimate	Higher ambition
Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions (D1)	Biodiversity loss of important (i.e. listed) species and habitats is halted, with some recovery within protected areas.	Biodiversity loss is halted and significant recovery to favourable status of important (i.e. listed) species and habitats in UK waters	Biodiversity loss is halted and recovery to favourable status for all species and habitats in UK waters
Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems (D2)	New introductions are minimised and new and existing non-indigenous species are managed to limit the most significant ecosystem impacts	New introductions of non-indigenous species are significantly reduced and existing non-indigenous species are managed to avoid ecosystem damage	New introductions of non-indigenous species are significantly reduced and existing non-indigenous species reduced to a level which does not significantly impact the natural ecosystem structure
Populations of all commercially exploited fish and shellfish are within safe biological	Populations of all commercially exploited fish and shellfish are within safe biological	Populations of all commercially exploited fish and shellfish are consistently within safe	Populations within safe biological limits consistently and stock production optimum;

limits, exhibiting a population age and size distribution that is indicative of a healthy stock (D3)	limits for the majority of the time but variability results in frequent returns to outside of the limits	biological limits but stock production below optimum, age and size structure impaired.	age and size structure appropriate.
All elements of the marine food webs, to the extent that they are known, occur at normal abundances and diversity levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity (D4)	Structure and function indicators (biomass and productivity within different trophic levels) of marine foodwebs show no evidence of major imbalance	Structure and function (biomass within different trophic levels) of marine foodwebs maintained across UK waters	Restore populations of large top- predators (mammals and fish) to within fully sustainable thresholds
Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters (D5)	Human induced eutrophication does not lead to significant adverse effects on biodiversity or ecosystems	Human induced eutrophication is minimised in all areas.	Nutrient inputs are controlled to the extent that eutrophication does not occur.
Sea floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected (D6)	Pressures that lead to habitat loss and damage are minimised within areas containing the most sensitive (as distinct from important) habitats leading to some restoration of seafloor integrity within those sites	Human induced benthic impacts are prevented within areas containing the most sensitive habitats (within protected areas only) and a proportion of representative habitats to support benthic ecosystem function at a national level.	Pressures causing habitat loss and damage are minimised across UK waters and benthic habitats restored where practicable.
Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems (D7)	Alteration of hydrographic conditions does not cause significannt adverse effects within the marine ecosystem outside of areas where they support sustainable human use activities	Alteration of hydrographical conditions does not cause significant adverse effects within the marine ecosystem outside of highly modified water bodies	Alteration of hydrographical conditions does not cause significant adverse effects within the marine ecosystem
Concentrations of contaminants are at levels not giving rise to	Inputs of contaminants into the marine environment are reduced;	Concentrations of contaminants at levels not causing pollution in	Concentrations of contaminants are at levels not causing

pollution effects (D8)	areas where contaminant threshold limits are exceeded continue to fall	any component of the marine environment when assessed at a Regional Seas scale	pollution in any component of the marine environment at a national level
Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards (D9)	Contaminants in fish and other seafood do not affect human health	Contaminants in fish and other seafood for human consumption are not sufficiently high to lead to bed closures; closures due to harmful algal blooms are reduced.	Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
Properties and quantities of marine litter do not cause harm to the coastal and marine environment (D10)	No significant increase in the quantities or detrimental effects of marine litter	Overall reduction in the quantities or detrimental effects resulting from litter in the marine environment	Litter reduced to levels deemed not to cause detrimental effects to the coastal and marine environment
Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment (D11)	Existing levels of noise are maintained, unless shown to cause significant adverse impacts on cetaceans and key fish species	Levels of noise are reduced to a level that significantly reduces the risk of adverse impacts to cetaceans and key fish species	Noise throughout the marine environment is reduced to a level which does not have a significant adverse effect

Source: ABPmer (2009)
Note: these scenarios are for illustrative purposes only

This information may feed into the UK's determination of GES and associated targets and indicators (see para 4.26-4.30 for more information).

Identifying programmes of measures

4.11 By comparing the outcome scenarios (see Table 2) to the baseline scenarios (see Table 1) a hypothetical gap analysis can be undertaken to assess where existing efforts may not be sufficient to deliver Good Environmental Status by 2020. The types of policy interventions (programmes of measures in the language of the Directive) which may be required to close the gap could be derived by comparing the outcome (target) scenario for each descriptor with the range of plausible baseline scenarios. Comparison against the high estimate baseline scenarios will identify the minimum that may need to be done, comparison with the low estimate baseline scenario will identify the maximum that may need to be done and comparison with the best estimate baseline scenarios could provide a best guess of the types of measures that may be necessary to deliver the requirements of the Directive.

Identifying costs and benefits

4.12 It may be expected that the costs and benefits associated with achieving GES will be inversely related to the current level of environmental quality. It should be noted however that estimation of the costs and benefits will not be straightforward as, for example, some programmes of measures will contribute to the achievement of multiple objectives. Given the significant uncertainty about current and future environmental status and the environmental effects of different

measures, it may be helpful to describe potential measures in terms of the probability of achieving (or risk of failing) Good Environmental Status. For example a risk-based approach to the Directive could be used to reduce the expected risk of failing to take measures to deliver Good Environmental Status by 2020 to an acceptable level.

4.13 Any potential programmes of measures identified for the MSFD would be subject to rigorous analysis to ensure that the benefits of any intervention exceeded the costs and to ensure that similar outcomes could not be achieved more effectively through the pursuit of alternative policies. A range of techniques are available to identify how best to assess the economic impacts of proposed measures. Cost benefit analysis can be used to identify the optimal level of investment (i.e. where net benefits are maximised) whilst techniques such as cost effectiveness analysis and multi criteria analysis can be used to identify the least cost ways of achieving predetermined objectives or targets[8] It should be noted that since many of the challenges to marine environmental quality are trans-boundary in nature the Europe-wide implementation of the Directive may provide some additional benefits to the UK. For example if the UK were to introduce programmes of measures in isolation UK businesses could experience an erosion in their competitive position. By acting at the same time as other European countries this risk will be minimised.

UK approach to taking forward the implementation of the Directive

4.14 This section outlines in more detail the Government and Devolved Administration's plans for taking forward the implementation of each stage of the Directive.

Competent Authorities

4.15 The intention is that the competent authorities for implementing the Directive will be as follows:

- The Secretary of State should act as competent authority for the Directive in English waters and in the UK offshore area (with the exception of the Scottish offshore region);
- Scottish Ministers should act as competent authority for the Directive in Scottish territorial waters and in the Scottish offshore region;
- Welsh Ministers should act as competent authority for the Directive in Welsh territorial waters;
- The Department of the Environment in Northern Ireland should act as competent authority for the Directive in Northern Ireland's territorial waters.

Initial Assessment (due by July 2012, with consultation expected by July 2011)

4.16 The Directive requires an assessment of marine waters in respect of each marine region or sub-region. The evidence for the UK's initial assessment will be substantially delivered through Charting Progress 2, the second integrated assessment of the state of UK seas, which is due to be published later in 2010.

[8] See Turner et al (2010) for more information on cost benefits analysis, cost effectiveness analysis and multi criteria analysis

Led by the UK Marine Monitoring and Assessment Strategy (UKMMAS), [9] it will provide extensive information on developments since the first report (Charting Progress) in 2005, the pressures and impacts on the marine environment and will place the work within the wider political, social, economic and environmental context. UKMMAS and Charting Progress 2 meet the statutory evidence requirements of a range of existing legislation, taking an integrated and coordinated approach that prevents duplication and ensures cost-effectiveness. Charting Progress 2 will be a key tool for policymakers in developing measures aimed at protecting the marine environment. Charting Progress 2 promotes the ecosystem approach which provides a more holistic framework for protecting the environment than considering component factors and their impact separately.

4.17 Defra has invested more than £3 million so far in the production of Charting Progress 2 and the associated evidence base. In total, Defra spends close to £20million per annum on essential marine monitoring activities (including activities in Northern Ireland and Wales). There is also a large amount of in-kind contribution from members of the UKMMAS community who have provided their time and resources without cost to government. Board members may give several weeks of their time per year to attend meetings which drive the UKMMAS process forward, review key documents and provide policy direction.

4.18 For 2008/2009, the costs of monitoring of Scottish seas undertaken by Marine Scotland Science, Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH), Scottish Association for Marine Science (SAMS) and Sea Mammal Research Unit (SMRU) was a total of about £7.86 million. The Scottish Government, through Marine Scotland, is also planning to publish a State of Scotland's Seas report in 2010. This will analyse the data from Charting Progress 2 and emphasise in more detail the situation in the Scottish seas, and will provide a baseline as Scottish marine policy develops. It will be more detailed than the work required for the MSFD initial assessment although will give background to the initial assessment from a Scottish perspective. The costs of the work will be in the range of £50,000 to £100,000. Fisheries Research Services (FRS, now Marine Scotland Science) have also undertaken some initial investigation of the various GES descriptors for Scottish Government. Their reports were published in early 2009.[10]

4.19 A Northern Ireland State of the Seas report which will analyse data collected for Charting Progress 2 will be published in 2010. The report will present monitoring data using the Driving Force, Pressures, State, Impact and Response (DPSIR) framework[11] to describe the interactions between society and the environment. The report will contain chapters on each of the 11 descriptors and will also present information on issues like maritime archaeology, shipping movements and ports, and bathing water quality as well as highlighting Northern Ireland specific issues.

4.20 Through the evidence provided in Charting Progress 2, the State of Scotland's Seas and the Northern Ireland State of the Seas Report, the UK's initial

[9] See: http://www.defra.gov.uk/environment/marine/science/ukmmas/index.htm

[10] See: http://www.frs-scotland.gov.uk/Delivery/Information_resources/information_resources_view_documents.aspx?resourceId=31136&parentId=37&parentName=Reports

[11] See Turner et al (2010) for an overview of DPSIR

assessment will provide a clear environmental baseline for the future implementation of the Directive. It will describe the current state of the UK's marine environment and the future trends against which the impact of the measures we take to implement the Directive can be assessed.

4.21 Although it is anticipated that Charting Progress 2 will provide the vast majority of the environmental evidence for the Initial Assessment, one area where more work will be necessary is in developing the socio-economic assessment required by the Directive. Charting Progress 2 will include some information on the economic and social use of the UK's marine waters, but further consideration is needed on the inclusion of ecosystem services (to capture the value of marginal changes in environmental quality) and on how to meet the requirement to analyse the cost of degradation of the marine environment. The UK and Scottish Governments are taking forward further work on this, both at National and EU-level. This work will be based on the framework described in paras 4.4-4.13 (see Box 2 for more information).

Box 2 – The UK's international research to support of MSFD implementation

The UK published an overview of existing projects and available methodologies for economic and social analysis of the use of marine waters (as defined in the Directive), on the cost of degradation, and on options for progressing work on economic and social assessment of the north-east Atlantic. This report was produced as part of the UK's work under the OSPAR Environmental Impact of Human Activities Working Group, working with Sweden as a first step to help OSPAR parties take forward the economic and social analysis of marine waters required under Article 8(1)(c), and to assess the social and economic impacts of the programme of measures to be developed. The report, *An Introduction to Socio-economic Assessment Within a Marine Strategy Framework* (also referred to as Turner et al (2010) elsewhere in this IA), was published in March 2010, and is available at http://www.defra.gov.uk/environment/marine/documents/legislation/msf-socioeconomic.pdf

Defra commissioned a study in April 2010 to assess current and expected data availability, tools and methodologies, to assist OSPAR parties in appraising the feasibility of strategic options for regional socioeconomic analysis under the Directive, and develop a detailed specification for a regional scale economic and social analysis to contribute towards the initial assessment under the Directive. The final report is due in early 2011.

The UK and Sweden are co-chairing a Working Group on Economic and Social Assessment for the wider EU (i.e. not just the OSPAR region), to facilitate a common understanding of the economic and social assessment requirements under the Directive, to identify methodologies and approaches and to promote cooperation. There will be a number of products delivered

Costs/benefits to government:

4.22 It is not possible at this point to estimate the additional costs of the initial assessment for the MSFD, but these are likely to be small as the majority of the work has already been carried out for the development of Charting Progress 2. It will involve: a) time from policy makers and other UKMMAS organisations to re-profile the Charting Progress 2 evidence into whatever format the Commission requires for the initial assessment; b) time from policy makers and experts to develop the socio-economic elements of the Initial Assessment. It is anticipated that the majority of these activities would be classified as routine costs of government business.

Costs/benefits to business and other stakeholders:

4.23 There will be costs to businesses and stakeholders of engaging with and influencing the implementation process. Information will be sought, for example, as evidence for inclusion in a socioeconomic analysis, and where stakeholders choose to provide this information there is likely to be a cost involved for them (see para 3.14). The initial assessment could potentially provide benefits to the private sector by improving the quality of the marine environment evidence base on which they make business related decisions. This is particularly true where Charting Progress 2 is highlighting future trends within the marine environment. Businesses can plan better if they are aware of current and likely future state of the seas.

Costs/benefits to environment:

4.24 There are unlikely to be any significant costs to the environment of carrying out additional assessment. However, as above, this work should lead to a greater understanding of the marine environment and ecosystem service provision and potentially support the development of more effective techniques for environmental management.

4.25 Further assessment of the costs and benefits of carrying out the initial assessment will be carried out in future Impact Assessments.

Determination of GES and associated targets and indicators (by July 2012, with consultation expected by July 2011)

4.26 The Directive requires the UK to determine what GES means for UK waters, using the 11 descriptors in the Directive, and – as part of this - to develop an associated set of targets and indicators to guide progress towards achieving it. Linked to this is EU-level work, which is already underway, to develop common criteria and methodologies to ensure a level playing field across Europe. Most of the costs of this work will fall on government. Both UK and EU aspects of this work will require the involvement of a number of officials and scientists, as well other stakeholders.

Costs/benefits to government:

4.27 The main costs associated with this stage in the implementation process will fall to government. They include: a) Costs to policymakers and delivery bodies of engaging in the EU-level process of identifying EU wide parameters for GES; b) Costs to policymakers and delivery bodies of taking forward a process to develop UK determination of GES and associated targets and indicators – between 2010

and 2012; and c) Commissioning research to support this process. In addition a research project by CEFAS will look at possible targets and indicators and the effects these could have, both on the marine environment and in socioeconomic terms. Government will benefit from a clear framework within which clear environmental targets and indicators can be established, leading to better targeting of policies, as well as the potential to exploit synergies between policy areas to achieve environmental benefits.

Costs/benefits to business:

4.28 The way in which GES is determined will have significant implications for businesses and organisations that operate in the marine environment, but there will be no significant costs to business at this stage, other than costs involved in engaging with the process of developing targets and indicators for GES. These include: a) UK stakeholders' time in engaging in the EU-level work to develop parameters for GES, both through their EU-umbrella organisations, and through engagement with the UK government. This is not quantified at this stage and, as describe in para 3.14, may include undertaking additional research if this is what businesses decide to do; and b) Engaging with UK government process to develop GES targets and indicators for the UK over 2010-2012. Benefits to business would derive from the longer-term certainty that clear targets and indicators for GES would provide, as well as a level-playing field involved in EU-wide efforts to achieve it.

Costs/benefits to the environment:

4.29 There are unlikely to be any significant costs to the environment of developing targets and indicators for GES. However this work should lead to development of a more effective framework for environmental management.

4.30 Further assessment of the costs and benefits of developing the targets and indicators for GES will be carried out in future Impact Assessments.

Establishment of a monitoring programme (by July 2014, with consultation expected by July 2013)

4.31 The UK Marine Monitoring and Assessment Strategy (UKMMAS), informed by the results of Charting Progress 2, will play a key role in establishing a monitoring programme to assess progress towards GES. The UKMMAS evidence collection groups will be tasked with developing or amending monitoring programmes in response to the recommendations from Charting Progress 2 and in the light of the pan-European criteria and methodologies for GES developed by the Commission. The higher level UKMMAS group, Marine Assessment Reporting Group (MARG) overseeing the Marine Assessment Policy Committee (MAPC) will review the proposed programmes and ensure they will help the UK to meet the requirements of the Directive. As the UK already carries out significant monitoring and assessment of the marine environment, it is anticipated that this will very much be about filling gaps in existing programmes and adding to them where necessary.

4.32 It is not yet clear whether current monitoring activities will be sufficient to inform the programme of work outlined in para 2.8 or whether additional arrangements may be required. Although much of the work of UKMMAS consists of in-kind contributions, the main costs of both developing and implementing any

additional monitoring programmes needed for the Directive are likely to fall to the UK Government, the Devolved Administrations and delivery bodies. There may be costs to business from engagement in the development of the monitoring programmes. Government is also keen to consider how we can make better use of the monitoring data and information which businesses collect themselves (i.e. are there ways we could encourage them to share it with Government). Business will probably benefit from any additional monitoring info which Government publishes. There are no obvious costs to the environment of implementing the monitoring programme for GES. Benefits include improving the evidence base for marine management. Further assessment of costs and benefits associated with the monitoring requirements of the Directive will be carried out in future Impact Assessments.

Development (by 2015) and entry into operation (by 2016) of the programmes of measures

4.33 The final stage of implementation of this Directive is the design and delivery of programmes of measures for achieving Good Environmental Status. Member States are required to develop programmes of measures by the end of 2015 and have put these in place by the end of 2016. The development of the programmes of measures is expected to build on all the previous stages of implementation, using the information gathered from the initial assessment and enabling Member States to meet the targets and indicators they have set for GES. Member States are also required to carry out a full analysis of the costs and benefits of the programmes of measures they propose.

4.34 It is important to note that the Directive specifically calls on Member States to ensure that measures are cost-effective and technically feasible, and shall carry out impact assessments prior to the introduction of any new measure (see UK proposed approach to this outlined in para 4.4). The UK Government and the Devolved Administrations will ensure that this applies in all cases. The Directive also lists exceptional circumstances under which GES cannot be achieved within the timetable. These would include action where the UK is not responsible, natural causes, and alterations to the physical characteristics of the marine waters brought about by actions taken for reasons of overriding public interest which outweigh negative impacts on the environment. Where Member States identify that one of these exceptional circumstances applies to their marine waters, they must still take appropriate ad hoc measures aimed at preventing further deterioration and mitigating adverse impacts at the level of the marine region concerned. The use of these exceptions will be taken into consideration by the UK Government and the Devolved Administrations in their development of programmes of measures for the UK.

4.35 At this point, before the earlier stages of implementation have been carried out, and because of the uncertainties highlighted in section 4.5, it is not possible to give a clear indication of what the programmes of measures for GES might look like. Due to the broad-ranging nature of the Directive the measures are likely to be varied and potentially impact on a wide range of activities which affect the marine environment. The only types of measure specifically required by the Directive are spatial protection measures such as marine protected areas. The UK Government and Devolved Administrations are committed to creating a UK-wide

network of MPAs as a key element of wider work to recover and protect the richness of our marine environment and wildlife and promote ecosystem resilience. The Marine and Coastal Access Act 2009, the Marine (Scotland) Act 2010 and the proposed Northern Ireland Marine Bill will directly support the implementation of the Directive by giving the UK Government and Devolved Administrations new tools for achieving this.

4.36 It is also too early to provide a credible estimate of the costs of the measures which may be required as part of the UK's programmes of measures since GES is itself a highly uncertain concept at this stage. Paras 4.4-4.13 and Boxes 1 and 4 describe the UK's broad approach to assessing the requirements of the Directive and the associated costs and benefits. Any programmes of measures identified would be subject to rigorous analysis to ensure that the benefits of any intervention exceeded the costs and to ensure that similar outcomes could not be achieved more effectively through the pursuit of alternative policies. The UK Government and Devolved Administrations will assess each individual measure for cost effectiveness, costs and benefits, and consider the need to use the provisions for exceptions within the Directive where this is appropriate. The UK Government and Devolved Administrations will be in a much stronger position to determine the costs and benefits of specific measures by the time they are required in 2015.

4.37 In addition, it is too early to say which organisations will have the most significant role in implementing the programmes of measures, or which businesses operating in the marine environment will be most affected. It is probably reasonable to assume, however, that all organisations which are currently involved in managing activities which can affect the marine environment will have some kind of role to play.

Annexes

Annex 1 should be used to set out the Post Implementation Review Plan as detailed below. Further annexes may be added to provide further information about non-monetary costs and benefits from Specific Impact Tests, if relevant to an overall understanding of policy options.

Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

Basis of the review: [The basis of the review could be statutory (forming part of the legislation), it could be to review existing policy or there could be a political commitment to review]; A first review (of the implementation rather than the transposition of the Directive) will be carried out by the end of 2018. However more information on the costs and benefits of implementation will accompany each further step in implementation, and in particular the design and establishment of programmes of measures in 2015-16.
Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?] According to Art 18 of the Directive, the aims of the review include (but are not confined) to describing progress in the implementation of the programme of measures. Art 17 of the Directive also requires a further assessment in 2018 of the status of the marine environment. As above, it should be noted that the review will focus on the implementation, not the transposition of the Directive.
Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach] More clarity will be provided on this by the European Commission in due course.
Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured] The baseline against which the implementation will be reviewed will be set out in more detail in future IAs. The regulatory baseline against which the transposition could be reviewed is described in ABPmer (2009).
Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives] More clarity will be provided on this by the European Commission in due course.
Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection systematic collection of monitoring information for future policy review] The UK's extensive monitoring arrangements are described in paras 4.18-4.20.
Reasons for not planning a PIR: [If there is no plan to do a PIR please provide reasons here] N/A

ANNEX A: IMPACT ASSESSMENT DESCRIPTOR SUMMARIES

BACKGROUND

1.1 Under Article 9(3) of the MSFD the European Commission are obliged to develop a set of criteria and methodological standards for GES by 15th July 2010. In support of the development of these criteria and methodological standards, the Commission tasked the International Council for the Exploration of the Sea (ICES) and Joint Research Centre (JRC) to lead a series of scientific task groups to produce reports on each GES Descriptor. They summarise the scientific knowledge associated with each Descriptor and suggest a range of attributes, criteria and indicators which could be used to make an assessment of GES operational. This annex provides a summary of the key attributes, criteria and indicators which the task group reports recommended should be considered for each of the Descriptors of GES. The Commission has used the content of these reports to inform the development for a Commission Decision on criteria and methodological standards for GES which is likely to be finalised in July this year.

1.2 The summary tables set out below have been taken directly from the ICES/JRC Management Group Report, *Scientific Support to the European Commission on the Marine Strategy Framework Directive*. This overarching report summarises the work of the 10 task groups[12] and can be found at:

http://publications.jrc.ec.europa.eu/repository/handle/111111111/13626

1.3 The individual task group reports can be found at:

http://publications.jrc.ec.europa.eu/repository/simple-search?query=MSFD

1.4 The Commission Decision on criteria and methodological standards should be finalised in July 2010 and it will then be available on the Commission website at:

http://ec.europa.eu/environment/water/marine/index_en.htm

Descriptor 1- Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions

ATTRIBUTE	CRITERIA	INDICATOR	
Species state (includes sub-species and populations where	Species distribution	Distributional range	During the preparatory phases of the assessment and monitoring process, the
		Distributional pattern	
	Population	Population biomass	

[12] ICES and JRC were not asked to produce a report for Descriptor 7 – Hydrographical conditions

they need to be assessed separately; apply criteria to each recognised sub-species/population)	size	Population abundance (number)	region/subregion should be characterised in terms of its biodiversity and the human activities and their associated pressures. Accordingly, the biodiversity components and locations which are potentially at risk are identified. All four attributes and their criteria need to be considered. Those assessed as being at risk of not meeting targets for GES should be identified and an appropriate selection of indicators should be made to form the basis of a monitoring programme. This table outlines the main classes of indicator for the criteria. Within each indicator class, specific indicators appropriate to the assessment area, biodiversity component and pressures need to be selected. Standardised methodology should be used when applying the indicators.
	Population condition	Population demography	
		Population genetic structure	
		Population health (sub-lethal condition, e.g. disease prevalence; parasite loading; pollutant contamination.)	
		Inter and intra-specific relationships (e.g. competition, predator/prey relationships.)	
	Habitat condition	Habitat distributional range	
		Habitat distributional pattern	
		Habitat extent	
		Physical condition	
		Hydrological condition	
		Chemical condition	
Habitat/Community State	Habitat distribution	Habitat distributional range	Certain criteria (e.g. population, community condition and habitat condition) can be applied to assess the local state of a species, habitat/community or landscape type against target conditions, whilst other criteria (e.g.
		Habitat distributional pattern	
	Habitat	Areal extent of	

	extent	habitat	habitat distribution, habitat extent) are applied at the scale of the assessment area. Guidance on these issues of quality and quantity is given in TG1 report Section 4.8 (defining targets). Consistency with the Habitats and birds directive is recommended. See also considerations under Landscapes.
		Habitat volume	
	Habitat condition	Physical condition (structure and associated physical characteristics, incl. structuring species)	
		Hydrological condition (incl. water movement, temperature, salinity, clarity)	
		Chemical condition (incl. oxygen, nutrient and organic levels)	
	Community condition	Species composition	
		Relative population abundance	
		Community biomass	
		Functional traits	
Landscape State	Landscape distribution and extent	Landscape distributional range	The areal extent and distributional range of marine landscapes may not change much. If so, this criterion may not need a formal monitoring programme. However, the condition of the habitats and species in the landscape may change. For species, especially those which are mobile (associated with multiple habitats), and of functional importance (e.g. pelagic-benthic coupling, structuring) should be considered.
		Areal extent of landscape	
	Landscape structure	Habitat composition and relative proportions	
	Landscape condition	As for habitat condition and community condition, as appropriate	

			See also considerations under Habitats.
Ecosystem State	Ecosystem structure	Composition and relative proportions of the ecosystem components	Assessments of species, habitat/community and landscape state should provide the basis for assessment of ecosystem structure, and ecosystem functions and processes. Aspects of ecosystem functioning and processes are provided by other Descriptors (e.g. D4: food-webs). Further research may be needed to develop suitable indicators/metrics.
	Ecosystem processes and functions	Interactions between the structural components of the ecosystem	
		Services provided by biological diversity within ecosystems	

Descriptor 2- Non-indigenous species introduced by human activities are at levels that not adversely alter the ecosystem

ATTRIBUTE	CRITERIA	INDICATOR	
Number of NIS recorded in an area	Reduced risk of new NIS introductions	CBD, "Trends in invasive alien species", EEA - Streamlining European 2010 Biodiversity Indicators (SEBI) Ratio between NIS and native species	Areas with elevated numbers of NIS are at greater risk of exposure to future invasions. GES direction is to reduce the number of new NIS introductions. Basic information on NIS (inventories) is available for all coastal MS. Such inventories, which preferably include also cryptogenic species, should be constantly updated by MS. The ratio between NIS and native species should be established at least in well

			studied taxonomic groups, as a measure of change in species composition.
Abundance and distribution range of NIS	Prevention of establishment and spread of NIS	Abundance of NIS Distribution of NIS	The degradation gradient in relation to NIS is a function of their relative abundances and distribution ranges, which may vary from low abundances in one given locality with no measurable adverse effects up to occurrence in high numbers in many localities (causing massive impact on native communities, habitats and ecosystem functioning). The same measurement units of abundance (numbers per area, biomass or percentage of coverage) should be used for the NIS and native species. This attribute is a prerequisite for assessment of the magnitude of the NIS impacts; therefore at least most impacting NIS should be assessed.
Environmental impacts of IAS*	Absence or minimal level of IAS impacts adversely affecting environmental quality	Biopollution index based on ranking of the abundance and distribution range of IAS and the magnitude of their impacts on: • communities (structural shifts) – possible link to TG1, • habitats (alteration, fragmentation and/or loss) – possible link to TG6, • ecosystem (shifts in trophic nets and alteration of	Sufficient data on abundance and distribution of impacting IAS present in the area and, at least, basic knowledge on local native biodiversity and environmental impacts of IAS is required. Both, the effects of newly established IAS and changes in environmental impacts due to previously established IAS should be taken into account.

		energy flow and organic material cycling), see also TG4	

Descriptor 3 - Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock

ATTRIBUTE	CRITERIA	INDICATOR	
Sustainability of Exploitation	Are exploited sustainably consistent with high long-term yield	Based on analytical stock assessments: Fishing mortality (F)	Fishing mortality (including the F at maximum sustainable yield level, FMSY reference level) is the preferred indicator. The aim should be to have this information available for as many stocks as possible, covering a large enough proportion of the commercial catches or revenue.
		Based on monitoring programmes: Ratio catch/biomass	The ratio catch/biomass indicator can be considered a fall-back option to be used for those stocks for which F is not available and to increase representativity. This indicator (without a reference level) is, however, considerably less sensitive than F, and this may

			hamper the GES assessment. The sensitivity can be improved if a reference level for the indicator is known. Otherwise, only the lack of a degradation gradient can be applied to assess whether GES is achieved. Reference direction to achieve GES is a decrease of both indicators .
Reproductive Capacity	Reproductive capacity should not be compromised	Based on analytical stock assessments: Spawning Stock Biomass (SSB)	SSB is the preferred indicator and two reference levels are available: SSBpa and/or SSBMSY). The SSBpa reference level should be enough to ascertain that reproductive capacity is not being compromised and should apply to 100% of the stocks. SSBpa, however, should not be considered a target but a limit and a certain proportion of the stocks should also achieve SSB>SSBMSY. A higher proportion reflects better

			ecological status. Instead of trying to establish what this proportion should be it could also be left to emerge by applying F< FMSY consistently and on all stocks which eventually should result in the appropriate proportion of stocks for which SSB>SSBMSY applies.
		Based on monitoring programmes: Log(abundance)	Log-transformed abundance together with 95% percentile of the population length dis-tribution (see next attribute) should be an appropriate proxy for SSB. Alternatively a threshold size equal to the size at maturity could be used to select mature fish only if it turns out to be a better indicator and thus improve the GES assessment. The sensitivity can be improved if a reference level for the indicator is known. Otherwise, only the lack of a degradation gradient can be applied to

			assess whether GES is achieved. Reference direction to achieve GES is an increase of both indicators
Age and Size Distribution	Enough older/larger fish to ensure the stocks resilience	Based on monitoring programmes: 95% percentile of the population length distribution	The sensitivity can be improved if a reference level for the indicator is known. Otherwise, only the lack of a degradation gradient can be applied to assess whether GES is achieved. Reference direction to achieve GES is an increase of the indicator. Applying FMSY consistently should drive the indicator to this reference direction but it will not necessarily result in what can be considered a ‚healthy age and size distribution.

Descriptor 4 - All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity

ATTRIBUTE	CRITERIA	INDICATOR	
Energy flows in food webs	Production or biomass ratios that secure the long term viability of all	One region-specific ratio based on one of the following: • Ratio pelagic/ demersal fish	One region-specific ratio should be selected depending on food web structure. Broad scale datasets for e.g.

	components	production • Ratio macrobenthos / demersal fish production • Ratio zooplankton produc. requirement of landing/ zooplankton production	plankton, fish and fisheries would be suitable. The spatial extent of the ratio indicator should be broad rather than regionally restricted. There has been some discussion of reference levels in the literature, but no fixed reference levels or directions are available. These should be based on assessment of recent trends.
	Predator performance reflects long-term viability of components	E.g.OSPAR EcoQOs for seal population size and pup production, and seabird breeding population size and breeding success in the North Sea.	The performance of key species should be monitored using their production per unit biomass (productivity), to summarise the main predator-prey processes in the part of the food web that they inhabit. Methods developed by OSPAR can be applied in other regional seas. Guidance on setting reference levels has been provided by OSPAR.
	Trophic relationships that secure the long-term viability of components	Trophic Levels (Functional feeding groups)	Diet composition of a species or group of species describes the relative abundance of prey in a food web. Stomach contents indicate trophic level at which species feeds, and can be diagnostic of food web changes. Data should be collected at

			routine intervals, from sampling or stranding monitoring programmes. Analytical methods, including the use of Marine Trophic Index, should be further developed. No fixed reference levels or directions are available but should be based on assessment of recent trends.
Structure of food webs (size and abundance)	Proportion of large fish maintained within an acceptable range	Proportion of large fish OSPAR has selected the large fish indicator (proportion by weight) to achieve its ecological quality objective (EcoQO) for the demersal fish assemblage in the North Sea (ICES, 2007;OSPAR, 2008).	Monitoring the rate of change in abundance of functionally important species will highlight important changes in food web structure. This indicator can be made operational using data from fish monitoring surveys, on an annual basis, and at the scale of a regional sea. Guidance on setting reference levels has been provided by OSPAR.
	Abundance /distribution maintained within an acceptable range	Indicators of abundance & spatial distribution, based on one or more of: a) groups/species with **fast turnover rates**, useful as early warning indicators (e.g. phytoplankton,	Assessment of this attribute should occur at regular intervals and account for seasonal changes. Indicators should be regionspecific, and developed at an appropriate scale, taking account of their importance to local and regional food webs. At

		bacterioplankton, microzooplankton, mesozooplankton, jellyfish, short-living pelagic fish) b) groups/species that are **targeted by fisheries**, responding to fishing impact (e.g. pelagic and demersal fish), and plankton-feeding pelagic fish c) **habitat-defining** groups/species (e.g. benthic fauna) d) groups/species at the **top of the food web** and charismatic indicator species (e.g. tuna, sharks, marine mammals, seabirds and turtles) e) groups/species that are **tightly linked** (via food web linkage) to other trophic levels	least one of the categories a) to e) should be selected and an indicator developed, using an assessment of risk within regional seas. Indicators in this criterion will also be developed by TG1, TG2 and TG6, at least. No fixed reference levels or directions are available but should be based on assessment of recent trends.

Descriptor 5- Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters

ATTRIBUTE	CRITERIA	INDICATOR	
Nutrient	Increase in the water column	*Pressure/causative factor* Nutrient load Nutrient concentration	From riverine and direct inputs adjusted to the inflow, industrial and urban water treatment plant loads.

			OSPAR RID Programme and HELCOM Pollution Load Compilations (PLCs) could be used for guidance. Use as directed (one/all/combination) by one of the appropriate tools*2
Nutrient Stochiometry	Deviate from normal proportions (e.g. Si is reduced in relation to other nutrients)	*Causative factor* Nutrient ratios (Si:N:P)	
Water Clarity	Decrease due to increase in suspended algae	*Primary symptom/direct effects* Water transparency	
Primary Production	Increase due to increased nutrient availability	*Primary symptoms/direct effects* Chlorophyll	Use chlorophyll and other algal components as a proxy or use remote sensing plus modelling as appropriate and as resources allow. 90th percentile concentration, spatial area of high concentrations. Temporally appropriate datasets, which may (i) favour seasonal datasets (e.g. the productive period and/or winter nutrients); or (ii) an annual cycle, which may be more adequate for marine areas with less well defined seasonality.
Phytoplankton Biomass	Increase (e.g. can form blankets over the natural flora and suffocate benthic animals)	*Primary symptoms/direct effects* Opportunistic macroalgae	Blooms that cause detriment to living resources, duration of blooms, approximate spatial coverage of blooms. Use as directed (one/all/combination) by one of the appropriate

			tools*2
Organic Decomposition	Decrease due to increased organic decomposition	*Secondary symptoms/indirect effects* Dissolved oxygen	Monthly, or more frequent as appropriate and as possible especially for dynamic areas 10th percentile concentration, spatial area of low concentrations.
Algal Community Structure	Species shifts (e.g. diatom: flagellate ratio, benthic to pelagic shifts, indicator species, HAB)	*Secondary symptoms/indirect effects* Floristic composition	Annual Bloom events, changes in balance of diatoms/flagellates/ cyanobacteria. HAB: annual to multi-year changes in frequency and/or duration of blooms
Benthic Flora	Decrease (e.g. fucoids and wracks, eelgrass and Neptune grass, that are adversely impacted by decreases in water transparency	*Secondary symptoms/indirect effects* Perennial seaweeds and seagrasses	Annual to multi-year changes from perennials, fucoids/kelp to opportunistic green/brown algae. Guidance on approaches (region-specific) exists, e.g. total algal cover ,cumulative algal cover and number of perennial algal species.

Descriptor 6- Sea-floor integrity is at a level that ensures that the structure and function of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected

ATTRIBUTE	CRITERIA	INDICATOR	
Substrate	Change in natural 3-dimensional structure Degree of alteration of original substrate composition/type	Spatial extent of benthic habitats % area with benthic invertebrates known to be associated with particular substrates	ON SELECTION AND USE OF INDICATORS Spatial extent of habitats is valuable to inventory but costly to monitor change directly, and often insensitive to pressures impacting functions served by the habitats.

	s Size of area exposed to pressures known to alter substrate Changes in ecological functions provided by substrate features	Biomass/production above a given % of undisturbed areas % of area exposed to pressure X above level Y, where X and Y are location specific an take account of different backgrounds	Impacts of pressures on substrates are likely to be more sensitively assessed through Species Composition, Size Composition, and Life History Traits Attributes. Pressure indicators are likely to be more cost effective and sensitive than many direct indicators of substrate features. Where there are multiple human-induced pressures on substrate, cumulative effects should be evaluated. ON REFERENCE LEVELS Reference levels for extent of substrate types and abundance of species associated with specific substrates need to be evaluated relative to local historical baselines, which are often not quantified
Bio-engineers	Change in number and/or spatial extent of bio-engineers Change in availability of functions served by bioengineers Size of area exposed to pressures known to alter substrate	Abundance of bio-engineer species Extent of habitats used by or provided by bio-engineers % of area exposed to pressure X above level Y, where X and Y are location specific an take account of different backgrounds	ON SELECTION AND USE OF INDICATORS Some types of bio-engineers are difficult to monitor directly. However, monitoring their functions through species-, size-, and life history indicators may be more cost-effective and sensitive to impacts on bio-engineers. Assessments of bio-engineers must be local. Intervals between

	or harm bio-engineers directly		assessments depend on the type of bio-engineer.Where there are multiple human-induced pressures on bioengineers, cumulative effects should be evaluated. ON REFERENCE LEVELS Reference levels for abundance of bio-engineers and extent of habitats associated with them need to be evaluated relative to local historical baselines, which are often not quantified
Oxygen	Changing oxygen concentration of bottom water and/or upper sediment layer	Extent of area with spatial and temporal hypoxia Ratios of oxygen / hydrogen sulphide concentrations Presence of benthic communities associated with low oxygen conditions	ON SELECTION AND USE OF INDICATORS Instruments make direct measurements of oxygen and hydrogen sulphide feasible, but seasonal monitoring may be challenging. Thus, benthic community data may give time-integrated picture of past hypoxia. Assessments should be done in critical areas, and annually at critical times of year (often late summer and autumn). Guidance on Eutrophication (TG 5) is relevant here as well ON REFERENCE LEVELS Standards for setting reference levels are in TG 5
Contaminants	See TG 8 Accumulation of contaminants in sediment and biota	See TG 8	ON SELECTION AND USE OF INDICATORS Evaluations of Contaminants in marine ecosystem should always

			consider benthos. Substrates might be reservoirs for contaminants and should be part of assessments of contaminants in marine systems. ON REFERENCE LEVELS See TG 8
Species composition of benthos	The number of species in the benthic community The relative abundances of species in the benthic community The presence of species know to be particularly sensitive or particularly tolerant to various pressures or to general disturbance regimes	Diversity and richness indices taking in account also species/area relationships Shape of cumulative abundance curves of numbers of individuals by species Position of samples in multivariate representations community composition Presence of diagnostic species	ON SELECTION AND USE OF INDICATORS Selection of diagnostic species requires good knowledge of communities in area being assessed, but can be effective when a specific pressure is a major concern. Many indices of richness and diversity, and methods of community ordination have been advocated for use. Expert guidance on choice is needed – see TG 1 – Biodiversity. Assessment of this attribute should occur at regular intervals, and be standardized for seasonality ON REFERENCE LEVELS Reference levels for all species composition indicators need to be evaluated relative to local historical baselines, which are often not quantified. Knowledge from benthic habitats of similar depth, latitude, substrate type etc, can provide starting points for setting reference levels.

Size-composition of benthos	Changing proportion of the community comprised of small and large individuals	Proportion of number or biomass above some specified length Biomass size spectrum Shape of cumulative abundance curves of numbers of individuals by size group	ON SELECTION AND USE OF INDICATORS This Attribute often uses the same information as for species composition, but required less sample processing. Assessment of this attribute should occur at regular intervals, and be standardized for seasonality. ON REFERENCE LEVELS Reference levels for all size composition indicators need to be evaluated relative to local historical baselines, which are often not quantified. Knowledge from benthic habitats of similar depth, latitude, substrate type etc, can provide starting points for setting reference levels.
Trophodynamics	Rates of Nutrient supply, mobilisation, regeneration in the benthos and sediments Levels of secondary production in the benthos Changes in carrying capacity	See TG4	ON SELECTION AND USE OF INDICATORS TG 4 does not address indicators for secondary production and carrying capacity. However sensitive and cost effective direct indicators of these properties of tropho-dynamics are not available at this time. Indirect indicators of secondary production and carrying capacity are already covered under Species Composition; Size composition, and Life History traits. ON REFERENCE LEVELS

			No guidance because there are presently no suitable indicators
Life-history traits	Changes in functional diversity Changes in relative abundance of traits associated with opportunistic and sensitive species	Opportunistic-sensitive species proportion (e.g. AMBI) Biological traits analysis Conceptually possible to apply for changing life history traits within a species / population over time.	ON SELECTION OF INDICATORS All Indicators for this Attribute use the same information as for species composition, but require more knowledge of life history traits of the species. Many proposed Indicators use discrete community stages, but continuous Indicators (e.g. ordinations) are also possible Assessment of this attribute should occur at regular intervals, and be standardized for seasonality ON REFERENCE LEVELS Reference levels for all life history trait indicators need to be evaluated relative to local historical baselines, which are often not quantified. Knowledge from benthic habitats of similar depth, latitude, substrate type etc, can provide starting points for setting reference levels

Descriptor 8 - Concentrations of contaminants are at levels not giving rise to pollution effects

ATTRIBUTE	CRITERIA	INDICATOR	

Presence of contaminants at concentrations which may adversely impact organisms, populations, communities and ecosystems	Concentrations of contaminants in water, sediment and/or biota, as appropriate, are below threshold values identified on the basis of toxicological data. Concentrations of contaminants should not be increasing.	Contaminant concentrations and their trends in water, sediment and/or biota as appropriate. (Note that relevant contaminants should be identified at EU, regional or subregional level and existing regulatory provisions should be respected.)	Not all relevant contaminants are being monitored; validated and quality controlled methods and assessment criteria may not be available.
Presence of pollution effects at organism, population, community and ecosystem level	Levels of pollution effects are below thresholds representing harm at organism, population, community and ecosystem level. The occurrence and severity of pollution effects should not be increasing.	Levels of pollution effects and their trends measured using appropriate methodologies. (Note that relevant biological effects should be identified at EU, regional or subregional level and existing regulatory provisions should be respected.)	A limited number of biological effects techniques are currently validated, quality controlled, and have assessment criteria, and so are available for use. Others are under development.

Descriptor 9- Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards

Attribute	Criteria	Indicators	
Levels of	Compliance of	• Actual levels	Levels of

contaminants (individual substances or groups of substances) in fish and other seafood for human consumption	levels of contaminants with regulatory provisions.	detected; • Frequency that levels exceed regulatory levels (see below out of the table); • Number of contaminants for which exceeding levels have been detected in parallel;	contaminants (individual substances or groups of substances) in fish and other seafood for human consumption.

Descriptor 10- Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

ATTRIBUTE	CRITERIA	INDICATOR	
Marine litter in the marine environment	Inputs, impacts on aesthetic values, the potential presence of toxic compounds and socio-economical damage. Litter dynamics, accumulation areas	Amount, composition and source of litter washed ashore and/or deposited on coastlines	Provide organised and systematic collection of relevant data/information for setting up a pan-EU data base. An expert group needs to be established to undertake this. Introduce standardised and automated methods to monitor indicators and integrate methodologies which allow origin evaluation of marine litter. This will lead to common and comparable monitoring approaches, recommendations and guidelines to assess GES on a regional/European scale
		Amount, composition and source of litter floating at sea, in	Assess temporal trends, regional differences, Identify accumulation and representative areas

		the water column and on the sea floor	to prioritise sites to be monitored. It will also include specific evaluations in special areas (discarded fishing gear in fishing areas, litter in convergence zones , important sources etc.).
Impacts of litter on marine life	Time-trends and spatial variation in inputs and impacts on marine life	Amount and composition of litter ingested by marine animals	Evaluate the amounts and categories of litter ingested by representative species of wildlife, expressed in units of mass: The Fulmar EcoQO to assess temporal trends and regional differences for acceptable ecological quality in the North Sea area can be applied in other areas and similar species with ad-justed targets. This will need flexibility to adapt protocols. Entanglement monitoring might be possible at hotspots (breeding colonies).
Degradation of litter at sea	Degradation of marine litter and potential sources of contaminants	Amount, composition and source of microparticles (mainly microplastics)	Examine the presence of microparticles in various types of sediments/ depths/ locations/ water masses. This will provide a baseline for future temporal and geographical comparisons and evaluation of risks. The various sources of microparticles in the proximity of industrial

			locations should also be investigated, together with sampling of sewage outfalls.

Descriptor 11- Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment

ATTRIBUTE	CRITERIA	INDICATOR	
Underwater noise - Low and mid-frequency impulsive sound	High amplitude impulsive anthropogenic sound within a frequency band between 10Hz and 10 kHz, assessed using either sound energy over time (Sound Exposure Level SEL) or peak sound level of the sound source. Sound thresholds set following review of received levels likely to cause effects on dolphins; these levels unlikely to be appropriate for all marine biota. The indicator addresses time and spatial extent of these sounds.	The proportion of days within a calendar year, over areas of 15'N x 15'E/W in which anthropogenic sound sources exceed either of two levels, 183 dB re $1\mu Pa^2.s$ (i.e. measured as Sound Exposure Level, SEL) or 224 dB re $1\mu Pa_{peak}$ (i.e. measured as peak sound pressure level) when extrapolated to one metre, measured over the frequency band 10 Hz to 10 kHz.	Direction to GES: A decrease in proportion of days (could set a % decrease target) starting in [Year] Measurement: Administrative recording of activities
Underwater noise – High frequency impulsive sounds	Sounds from sonar sources below 200 KHz that potentially have adverse effects, mostly on marine mammals, appears to be increasing. This indicator would	The total number of vessels that are equipped with sonar systems generating sonar pulses below 200 kHz	Direction to GES: A decrease in total number of vessels (could set a % decrease target) start-ing in [Year] Measurement:

	enable trends to be followed.		Administrative registration
Underwater noise – low frequency continuous sound	Background noise without distinguishable sources can lead to masking of biological relevant signals, alter communication signals of marine mammals, and through chronic exposure, may permanently impair important biological functions. Anthropogenic input to this background noise has been increasing. This indicator requires a set of sound observatories and would enable trends in anthropogenic background noise to be followed.	The ambient noise level measured by a statistical representative sets of observation stations in Regional Seas where noise within the 1/3 octave bands 63 and 125 Hz (centre frequency) should not exceed the baseline values of year [2012] or 100 dB (re 1µPa rms; average noise level in these octave bands over a year).	Direction to GES: A decrease in ambient noise level [or maintaining ambient noise level against an increasing trend in ship traffic] Measurement: Needs development of [regional sea] specific networks of representative underwater noise observatories. Some are there already. Needs also technical standards (see TNO work).