



Department
for Environment
Food & Rural Affairs

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Marine Programme Evidence Plan

Policy portfolio: Marine and Fisheries

**Policy area within portfolio: Marine environment,
marine biodiversity, marine and freshwater
fisheries**

Timeframe covered by Evidence Plan: 2013/14 – 2017/18

Date of Evidence Plan: March 2013

This evidence plan was correct at the time of publication (March 2013). However, Defra is currently undertaking a review of its policy priorities and in some areas the policy, and therefore evidence needs, will continue to develop and may change quite rapidly. If you have any queries about the evidence priorities covered in this plan, please contact StrategicEvidence@defra.gsi.gov.uk.

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1. Policy context

What are the key policy outcomes for the policy programme/area?

The overall vision for Defra's Marine Programme is to achieve clean, healthy, safe, productive and biologically diverse oceans and seas.

The marine environment makes a significant contribution to the UK economy, including through fisheries and aquaculture, maritime transport, leisure and recreation, energy (from oil and gas extraction and renewable energy), coastal tourism and naval defence.

Protecting and enhancing one of the UK's most important natural environments, while at the same time enabling marine industries to prosper, requires good evidence on the state of the environment and its sensitivity to various impacts. Defra's Marine Programme has an overarching outcome to promote more sustainable management and use of marine resources. This is a key Ministerial priority, which is supported by a specific priority to negotiate a reformed Common Fisheries Policy (CFP) to support sustainable fish stocks, a prosperous fishing industry, and a healthy marine environment. The programme also has responsibility for freshwater fisheries policy, including migratory fisheries.

Defra's Marine Programme undertakes policy development on behalf of the UK, where policy issues are UK-wide or non-devolved; working closely with devolved organisations to coordinate activity.

Our overarching outcome is supported by three high level outcomes:

1. **Achieving Good Environmental Status for our seas by 2020**

Our approach to achieving Good Environmental Status (GES) focuses on actions to protect and enhance biodiversity and to manage adverse impacts. This is informed by work to improve our understanding of the marine environment. Our approach is consistent with the UK's obligations under the European Union's Marine Strategy Framework Directive (MSFD) which is made up of the following elements:

- An initial assessment of the state of UK seas, and a set of detailed characteristics of what GES means for UK waters, including associated targets and indicators (by 2012);
- A coordinated monitoring programme for the ongoing assessment of GES for UK marine waters (by 2014), and;
- Implementation of a programme of measures (by 2016) for managing the marine environment and achieving GES by 2020.

The UK is already well placed to implement the MSFD – for example, through the publication of an assessment of the state of UK seas, Charting Progress 2, in 2010, as well as measures being put in place or planned. We submitted our initial assessment and proposals for GES characteristics, targets and indicators, to the European Commission in December 2012.

Establishing an ecologically coherent network of Marine Protected Areas (MPAs) in the North-East Atlantic is a key part of the UK's approach to protecting and enhancing its valuable and unique marine biodiversity. The European Habitats and Birds Directives set out requirements to establish MPAs to protect habitats and species of European importance while the UK Marine and Coastal Access Act 2009 sets out complementary requirements to establish Marine Conservation Zones (MCZs) for nationally important ones. Together with marine Sites of Special Scientific Interest (SSSIs) and Ramsar sites, these areas will be part of the ecologically coherent network of MPAs across the UK.

MPAs aim to provide an effective management tool for protecting threatened and/or representative species and habitats to help protect biodiversity, and maintain the health, structure and functioning of the wider marine ecosystem. Defra is responsible for designating and monitoring MPAs in English inshore and offshore and Welsh inshore waters and works closely with devolved organisations to ensure effective coordination to establish an ecologically coherent network of MPAs across the UK. MPAs will contribute to the programme of measures for achieving GES and to delivery of the England Biodiversity 2020 strategy, a key aim of which is to deliver a more integrated large-scale approach to conservation.

In terms of freshwater and migratory fisheries policy, a key driver is the need to achieve Good Ecological Status in freshwater and transitional waters, through protecting and enhancing biodiversity and limiting significant adverse impacts of human activities. The implementation of conservation measures for migratory fish is a key objective contributing to this aim.

The conservation of endangered freshwater and marine species is another key objective. For example, the UK's eel management plans and the UK Shark, Skate, and Ray Conservation Plan both set out measures necessary for recovery, protection, and management of populations.

The effective protection of the marine environment from the adverse effects of pollution (which comes from both land-based and marine sources) is also a key aim. This is achieved through implementation of various EU legislation (for example, the MSFD and the Water Framework Directive which covers coastal waters), and the requirements of the OSPAR Convention for the Protection of the North East Atlantic, and the London Convention, aimed at protecting the marine environment from pollution caused by dumping of wastes.

Building knowledge of the state of the marine environment and causes of change and variability, including the impacts of climate change, is important for understanding the effects of various pressures and putting in place effective measures to help achieve GES. For example, updated assessments of the impact of climate change in our seas are undertaken through the Marine Climate Change Impact Partnership (MCCIP) and

illustrated by Annual Report Cards. Defra's Marine Programme has a leading role in contributing to these assessments.

2. Secure, healthy food supplies delivered by a more sustainable fishing industry (supported by a specific priority to negotiate a reformed Common Fisheries Policy (CFP) to support sustainable fish stocks, a prosperous fishing industry, and a healthy marine environment)

Effective and sustainable management of fisheries helps provide a secure food source and economic livelihood for coastal communities whilst also protecting the habitats and species in our seas. Policy activities include reform of domestic fisheries management, ensuring an economically viable and sustainable shellfish industry, and negotiating a reformed CFP.

Reform of the EU CFP provides the opportunity to improve the conservation of fish stocks, reduce waste from fish discards, and support the long-term economic viability of the fishing industry. Policy priorities focus on negotiating and understanding the implications of CFP reform for the UK fishing industry and the marine environment, and implementing the agreed package of measures. Reforming domestic fisheries management (for example, improving the efficiency of quota management) will help deliver this objective.

Encouraging sustainable management of fish and shellfish stocks for both quota and non-quota species, ensuring that annual Total Allowable Catches balance long-term sustainability of stocks with profitability, and reducing the adverse environmental impacts of commercial fishing are also key policy goals underpinning these activities. Maintaining the diversity of freshwater and migratory fisheries and conserving their aquatic environment will also contribute to delivering a more sustainable fishing industry.

3. Sustainable growth in the wider marine economy

Good evidence is critical to enable proportionate decisions on sustainable use of the marine environment. For example, work on the Habitats and Birds Directives highlighted the need for improved evidence to support decisions on key marine infrastructure developments, such as renewable energy, and a specific evidence group has been set up to take this forward. More generally, the Marine and Coastal Access Act provides a framework for providing better protection for our marine environment and sustainable use of our marine resources.

Developing and implementing (through the Marine Management Organisation, MMO) an integrated marine planning system, combined with an effective marine licensing system, for managing our seas, coasts and estuaries is a key policy objective. Defra's marine evidence programme helps to support these functions: some evidence is specifically targeted at this area, but evidence from other areas of the Marine Programme, for example on environmental factors such as biodiversity, habitats, pollution and noise, is important for informing good decision making on development in the marine environment. The MMO also funds supporting evidence, including on marine planning and licensing, as set out in their Strategic Evidence Plan.

The policy outcomes supporting the Marine Programme's overall vision are interconnected and mutually dependent. For example, establishing MPAs and implementing CFP reform will contribute towards the programme of measures for achieving GES. As evidence needs for the programme are cross-cutting, evidence is managed as an integrated programme to recognise these links. This approach helps to identify gaps in the evidence base and where knowledge needs to be improved or uncertainty reduced to support better policy and management decisions. It also helps identify opportunities for achieving greater value for money from evidence activities that deliver to more than one policy outcome.

2. Current and near-term evidence objectives

What are the current and near-term objectives for evidence and how do they align to policy outcomes?

The Marine Programme manages the evidence budget for England and Wales on behalf of Defra and the Welsh Government. To manage the inter-dependencies between the programme's policy outcomes, evidence gathering and analysis is based around three themes:

- **Marine environment** - Understanding the state of the marine environment, including ecosystem dynamics, natural variability and features. Understanding the impacts of various pressures on the marine environment, such as climate change, fishing, and anthropogenic inputs i.e. hazardous substances, noise, litter. Identifying measures for sustainable marine management and informing marine licensing decisions.
- **Marine biodiversity** - Supporting development and implementation of Marine Protected Areas and marine planning, and protection of vulnerable or sensitive marine habitats and species.
- **Sustainable fisheries (including migratory and freshwater fisheries)** - Delivering commitments to the European Commissions' Data Collection Framework (DCF), which requires various economic and biological data on all aspects of fisheries management. Informing negotiation and implementation of CFP reform. Strengthening the evidence base and assessment approaches for non-quota species to support effective management of their exploitation. Understanding the biology of new, freshwater and migratory species, and the impacts of various pressures on migratory stocks.

In 2013, we will be reviewing and identifying future themes for the evidence programme, taking into account future policy and evidence challenges for marine and fisheries.

The programme is increasingly taking an ecosystems-based approach, i.e. taking account of the interactions between fisheries and the marine environment and considering the impacts of fisheries on food webs, habitats and biodiversity in management decisions. The UK's marine ecosystem, including its biodiversity, underpins major ecosystem services such as food production, regulation of carbon dioxide and oxygen balance, and a range of cultural values. It is impacted by traditional industries and new pressures from a

changing climate, new forms of energy production and novel organic pollutants and mixtures. Our goal is the sustainable use and management of the marine environment. Delivering this requires an improved understanding of the social, economic and environmental consequences of these pressures. This evidence, integrated across our sub-programmes, will inform implementation of effective management measures and support long-term delivery of services from marine ecosystems.

Evidence activities cover R&D across all evidence disciplines, and non-R&D. A significant proportion of our evidence investment is spent on monitoring activities or associated work in order to meet statutory requirements. The DCF sets out clear requirements for fisheries data and monitoring, and there are additional requirements for the MSFD, Habitats and Wild Birds Directives, OSPAR and the Marine and Coastal Access Act for monitoring contaminants, eutrophication and biodiversity. Some of these monitoring activities require use of a Cefas Research Vessel, also funded from our evidence budget, and Environment Agency and Inshore Fisheries Conservation Authorities vessels. Meeting our statutory obligations and maintaining access to Research Vessel capacity targeted to those needs is a key priority which influences the overall balance of the programme and decisions on relative priorities for our other evidence activities.

Across the programme, the highest priority evidence needs are for the following policy areas:

- I. Achieving GES, including further development of indicators for GES, establishing monitoring programmes (2014) and a programme of measures (2016).
- II. Designation and monitoring of MPAs.
- III. Implementation of CFP reform.
- IV. Freshwater and migratory fisheries.
- V. Economic and social impacts of policy measures.
- VI. Evidence to support sustainable growth.

Relative priorities for additional evidence needs are considered alongside these key policy areas. Current and near-term objectives for evidence have been aligned to our key policy outcomes and are summarised below.

1. Achieving Good Environmental Status for our seas by 2020

Evidence is needed to inform policies to improve and maintain the environmental state of UK seas, including protected areas and species, and to support decision-making on developments in the marine environment. Evidence is managed mainly through the marine environment and marine biodiversity sub-programmes.

Supporting the achievement of GES in our seas.	
High priority area	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Developing and implementing 	<ul style="list-style-type: none"> • Current monitoring and data collection

GES targets and indicators for the marine environment, exploring interdependencies between indicators, and alignment with indicators/thresholds identified by other drivers, e.g. Good Ecological Status and Favourable Conservation Status.

- Strengthening understanding of the value of goods and services provided by the marine ecosystem and how to make people aware of this value. Exploring the links between different sectors and ecosystem services, e.g. what impact does use of certain resources by one sector have on others? Understanding marginal valuation of changes in ecosystem services.
- Research supporting the design and implementation of the initial programme of measures for achieving GES, including evaluating the effectiveness of measures.
- Exploring implications for monitoring the state of the marine environment, indicators of GES, and the effectiveness of management measures over different sized areas and areas around the boundaries of territorial waters.
- Improving assessment of the costs and benefits of MSFD implementation and ensuring evidence gathering for evaluation.
- Improving understanding of natural variability and uncertainty in the marine environment and ecosystems.
- Developing understanding of carbon management, including the trade-offs between carbon valuation and carbon

supports UK commitments to monitor trends and status of marine environmental quality, as required under OSPAR and Habitats and Wild Birds Directives.

- Building on existing monitoring programmes, near-term objectives will include preparing for monitoring new components required under MSFD, including pelagic and sediment habitats, litter and noise in the marine environment.
- Developing data handling capacity and integrating MSFD needs into current reporting structures.
- Advice on human impacts, hazardous substances, eutrophication, marine litter, noise and microplastics

<p>sequestration.</p> <ul style="list-style-type: none"> • Exploring the impacts of non-native species, pathways of introduction, and the effectiveness of management measures. 	
<ul style="list-style-type: none"> • Developing and implementing an ecologically coherent network of Marine Protected Areas (MPAs): requires a sound evidence base to ensure adequate protection of vulnerable species and to understand the social, economic and environmental impacts of designated sites. High priority area 	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Improving data on biological and physical aspects in the marine environment to ensure data is current, proportionate and reasonable to inform site selection. Identifying thresholds of evidence for informing decision-making on designation. • Understanding how to better define and quantify favourable condition for features in MPAs. • Improving understanding of the social and economic benefits and impacts of MPAs, including on coastal communities and fishers. • Exploring how the impact of both individual and networks of MPAs can be evaluated (and ensuring sufficient evidence is in place for assessing effectiveness). 	<ul style="list-style-type: none"> • Mapping seabed and habitat coverage in recommended MCZ areas to support designation of MCZs and delivery of the MSFD. • Monitoring to improve understanding of pressures and impacts on the marine ecosystem, and potential resource conflicts, which may affect management of proposed protected areas (for example, assessing fishing activities and marine renewable infrastructure in proposed protected areas). • Monitoring feature condition in MPAs and developing monitoring programmes to evaluate whether conservation objectives are being met. • Data collection and monitoring to support Wild Birds Directive requirements to designate Special Protected Areas. • Monitoring to meet Marine Act, OSPAR and Biodiversity 2020 requirements and support protection of vulnerable marine species under the Habitats and Wild Birds Directives.
<p>Understanding the impacts of environmental change and implementing effective adaptation measures: Climate change and wider environmental changes and variability is a significant pressure in the marine environment, affecting acidity levels in the seas, natural uptake of carbon, habitat coverage and the distribution of marine species</p>	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Strengthening the robustness of 	<ul style="list-style-type: none"> • Advice on environmental change

<p>marine climate change projections and risk metrics.</p> <ul style="list-style-type: none"> • Improving evidence on the impacts of climate change on the marine environment, including the characteristics and processes that determine the physical condition of the UK's seas, pressures on ecosystems and implications for achieving GES. • Improving understanding of the economic and social implications of climate change • Identifying appropriate measures for climate change adaptation in the marine environment. • Quantifying risks and opportunities for different sectors regarding climate change and identifying the different adaptation measures being taken by different parts of the sector. 	<p>and variability, including impacts of changing pressures on ocean processes, ecosystems and the wider marine environment.</p>
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Delivering a coordinated response to marine emergencies - While the Maritime Coastguard Agency has overall responsibility for marine emergencies, the Marine Management Organisation (MMO) has important responsibilities in approving the use of pollutant dispersants. Organisations such as Cefas and the Environment Agency are also heavily involved in monitoring and assessing the effects of any major incidents. Defra's Marine Programme supports these functions through a number of evidence activities.

Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Understanding overall risk from pollution incidents and how risk levels might change. • Improving coordination and integration of approved best practice into national emergency plans to reduce risk and deal with any incidents effectively. • Exploring the use of pollutant dispersants in the marine environment, their impacts on marine ecosystems and identifying strategies for maximising effectiveness. 	<ul style="list-style-type: none"> • Strengthening evidence to monitor short-and long-term impacts of pollution events.

Effective protection of the marine environment from pollution is key to minimising and

reducing the impacts of chemical contaminants, e.g. diffuse pollution, atmospheric deposition, river and estuarine effluents, on the marine environment. Evidence helps identify effective measures for dealing with eutrophication and hazardous and radioactive substances and develop integrated environmental assessments.	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Developing methods for detecting new compounds and improving models for contaminants. • Exploring the effects of complex mixtures and hazardous substances and improving understanding of eutrophication, its causes and impacts. • Understanding how marine toxicity effects species populations and the health of aquatic organisms. 	<ul style="list-style-type: none"> • Monitoring and assessing the effects of contaminants on biological indicators, eutrophication, and the levels of hazardous substances in water, sediments and biota to meet statutory OSPAR and MSFD requirements. • Developing new techniques, such as remote sampling and novel technologies, to make monitoring more comprehensive, efficient and spatially relevant.
Protecting endangered and vulnerable species	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Understanding the impacts of changes under CFP reform on species populations. • Improving understanding of populations, distribution, pressures and status. • Developing existing research to avoid or reduce bycatch levels, including research into dolphin deterrent devices or pingers, as required under the Habitats Directive. • Species-specific requirements such as improving understanding of deep-sea shark species, causes of cetacean strandings, and the impacts of recreational angling. • Developing effective measures for minimising adverse impacts on specific species or populations. 	<ul style="list-style-type: none"> • Improving evidence on bycatch levels and survivability, (and for a greater range of species). • Monitoring to support implementation of conservation measures for endangered freshwater and marine species. • Integration with other monitoring and evidence activities supporting OSPAR, Biodiversity 2020 and Habitats and Wild Birds Directives requirements to protect vulnerable marine species.

2. Secure, healthy food supplies delivered by a more sustainable fishing industry.

Evidence supports Marine Programme policies aimed at securing the sustainable exploitation of international and nationally devolved UK fish and shellfish stocks, reducing commercial fishing's adverse environmental impacts, delivering sustainable fisheries for the long-term, and promoting the conservation and diversity of freshwater and migratory fisheries. Evidence is needed to inform negotiation and implementation of CFP reform,

including domestic fisheries reform, and provide robust information on which to make decisions on long-term management plans for fisheries. Evidence is managed mainly through the sustainable fisheries sub-programme.

International and domestic fisheries	
Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Understanding biological processes, including migration, spawning, growth rates, and influences of natural processes, as a component of stock recovery plans. • Investigating the effects of fishing on the environment, helping us adopt an ecosystem-based approach to fisheries management and develop effective mitigation measures, for example, through gear selectivity. • Evaluating alternative and more cost-effective ways of gathering data on stocks, such as remote sensing and self-sampling by fishermen. • Understanding the stability of stocks under a reformed CFP, the long-term effects of environmental factors (such as climate change) on fin- & shellfisheries, and developing effective stock management approaches. • Understanding the environmental, economic and social impacts of specific measures under CFP reform, including impacts on fishers' behaviour, impacts on fisheries infrastructure and capacity, and exploring opportunities for greater partnership working with the fishing industry. • Assessing the impacts of improving efficiency of domestic fisheries management. • Understanding the survival rates of different species of discarded commercial fish and identifying optimal approaches for managing mixed fisheries to achieve Maximum Sustainable Yield (MSY). • Assessing the impacts of and developing effective approaches to managing deep sea fishing activity in vulnerable marine ecosystems. 	<ul style="list-style-type: none"> • Meeting statutory requirements to monitor and assess commercial fish and shellfish stocks through surveys, biological sampling of landed catch, and monitoring discard rates. • Developing a modelling framework for data-limited stocks. • Modelling and evaluating alternative management scenarios (such as closing areas and gear restrictions) and their associated risks. • Developing monitoring systems to adopt a more strategic and regional approach to fisheries management, as required under a reformed CFP. • Evaluation of monitoring and survey designs.

- Understanding public perceptions, attitudes and behaviour regarding consumption of sustainable fish species.
- Developing cost-effective tools for assessing the risk of non-native species and developing appropriate management measures.
- Understanding the physiological and economic impacts of ocean acidification on key fin- and shellfish species.
- Strengthening evidence to underpin stock assessments for non-quota species.

Freshwater and migratory fisheries

Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none"> • Assessing the cumulative impacts of multiple small renewable energy developments on connectivity of habitats. • Understanding the impacts of changes in environmental conditions on estuarine habitats and fish stocks. Estuaries are an important transitional environment for migratory fish and we need to understand how changing conditions affect estuarine ecosystems and fish biology and behaviour. • Assessing the impacts of changes in habitat on eel populations, including the impacts of human factors, understanding mortality levels across environments and exploring implications for approaches to restocking. • Assessing the impacts of contaminants, temperature and diffuse pollution on freshwater and migratory fish, exploring their cumulative impacts and developing appropriate measures for managing ecosystems in a changing environment. • Understanding the biology and status of vulnerable conservation species, for example, shads, lampreys and sea trout and developing effective management approaches. • Understanding the social and economic impacts and benefits of freshwater fisheries and developing approaches to integrating these factors into 	<ul style="list-style-type: none"> • Developing effective methods for monitoring and assessing the status of freshwater and migratory fish. • Developing and delivering long-term management approaches for salmon and eel. • Evaluating management options and regulatory measures for freshwater and migratory fish stocks.

management decisions.

3. Sustainable growth in the wider marine economy

Supporting economic development, while protecting habitats and species, requires robust evidence to inform decisions on how the marine environment is used. The MMO is responsible for managing marine planning and licensing functions. Defra's Marine Programme (marine environment and biodiversity sub-programmes) invests in evidence supporting delivery of these functions, coordinating closely with the MMO who fund associated evidence activities as set out in their Strategic Evidence Plan. Evidence also informs further policy development, including evaluating the effectiveness of legislation and understanding the implications of new technologies and uses of the marine environment.

Research and analysis needs	Monitoring/surveillance and advice needs
<ul style="list-style-type: none">• Integrating economic development, social need and ecosystem management to formulate practical tools to inform decisions on marine planning.• Drawing on existing evidence to understand the impacts of geo-engineering and inform development of governance protocols for possible geo-engineering activities.• Exploring the impacts of oil, gas and renewable energy construction and operation on cetaceans, birds and ambient noise. Understanding requirements for monitoring conditions for offshore activities, including renewable and aggregates dredging.• Addressing evidence needs identified by the independent Habitats and Birds Directives Evidence Group to support decision making on developments.• Collating baseline information on the role and value of the marine economy, quantifying risks and opportunities for different sectors, and translating this to benefits and values.	<ul style="list-style-type: none">• Informing MMO licensing decisions and enforcement, including bringing together monitoring evidence, and understanding the conditions that should be attached to licences.• Helping ensure regulatory approaches are proportionate to the risk to the environment and navigational safety.

3. Future evidence needs

What are the longer-term evidence needs for the policy area/ programme?

A significant proportion of our data collection and monitoring activities will need to continue in order to meet statutory obligations (for example, as required by the MSFD and Data Collection Framework). In addition, there may be further monitoring requirements in the next three to five years (for example on marine litter and underwater noise), which will need to be built in to our programmes. We will continue to seek efficiencies in the way we access and draw together data, for fish stock monitoring in particular. A number of activities are already underway to identify opportunities for improving efficiencies in monitoring activity, for example through the UK Marine Monitoring and Assessment Strategy (UKMMAS). We will continue to explore options for improving the value and efficiency of monitoring, for example through the use of future monitoring technologies for remote methods of data collection, identifying options for more targeted risk-based monitoring, and improving interoperability between tools and reporting. In addition, we are engaging with a new call from the European Commission aimed at developing joint monitoring programmes between Member States that share a marine region, to improve integration of monitoring and assessment in the marine environment.

We will build on and strengthen our understanding of how to embed an ecosystems approach to sustainable use of our seas, including the range of goods and services the marine environment provides, and the trade-offs that need to be made. Marine food webs play a key role in regulating ecosystem services; we need to understand how impacts from environmental change and changes in biodiversity cascade through food webs and how scale-dependent these impacts are. Developing more realistic marine ecosystem models will provide important tools for testing potential management solutions. Social and economic research will become an increasing area of focus for the programme, quantifying the value of ecosystem services, exploring peoples understanding and decision-making with regard to the marine environment and identifying effective communication tools.

Strategic research will be needed to test our long-term perspective of pressures on the marine environment. For example, developing our understanding of cumulative and combined impacts on marine ecosystems, and the likely types and impacts of adaptation measures. This will also help inform the next round of the Climate Change Risk Assessment which will be due around 2017/18.

Strategic research will also need to consider ocean acidification and sea shelf biogeochemistry, how this might change over time as a result of environmental change and variability, and their impacts on ecosystem services. This will build on current strategic research funded through Natural Environment Research Council (NERC) Thematic Action Programmes. We need a better understanding of the potential threats and opportunities from changes in the way we use the marine environment (such as energy from marine algae) and what implications these have for achieving GES and for marine planning. We also need to draw on existing evidence to understand how assessments of predicted and actual impacts of large-scale developments compare.

Across all areas, we will continue to ensure effective alignment and integration of evidence with other partners. Together with other organisations in the Defra network, we will look to adopt a more systematic approach to identifying future evidence needs across the programme, including through horizon scanning.

Some specific long-term issues aligned to our policy outcomes are summarised below.

1. Achieving Good Environmental Status for our seas by 2020

Evidence will be needed to fill knowledge gaps on descriptors and indicators of GES and to identify opportunities for integrating and rationalising targets. We will continue to integrate evidence to determine how outputs from monitoring are meeting MSFD requirements and we will explore the effectiveness and impact of various measures (including MPAs) for achieving GES. This will include consideration of evidence needed for evaluation. Our assessment of the state of UK seas, GES characteristics, targets and indicators, as well as the monitoring programmes and programmes of measures, will need to be reviewed by 2018. Evidence will be needed to inform the UK's negotiation position around any changes to, or introduction of, new targets.

The Defra Natural Environment White Paper highlighted a gap in the international process for dealing with the conservation of high seas biodiversity. Building on our work to develop an ecologically coherent network of MPAs, we will need to explore the role of the UK in managing the conservation of marine biodiversity in the high seas. Evidence on the current and projected economic value of marine genetic resources to the UK economy may also be needed to support wider discussions on biodiversity in terms of access and benefit sharing for marine genetic resources.

We will need to explore options for extending biodiversity monitoring for habitats beyond designated sites into the wider marine environment. We will also need to improve evidence on the level, type and impact of noise in the marine environment and prepare for possible new monitoring requirements for noise. Opportunities will also need to be sought for joining-up monitoring programmes on bycatch of vulnerable species and cetacean strandings, and for strengthening monitoring of seabirds ahead of anticipated new DCF requirements for seabirds.

Greater understanding is also needed on non-native species, with regard to both pathways of introduction and potential impacts on native biota. Improving this evidence will assist the implementation of the EU strategy to combat invasive alien species. Pending advice from the Joint Nature Conservation Committee (JNCC) regarding evidence gaps on Habitats Directive and MSFD requirements, there may be a requirement to undertake the next cetacean population survey in collaboration with other Member States. Monitoring and surveillance to assess and improve understanding of the scale and distribution of marine mammals and the effects of climate change would need to be considered as part of this.

In terms of chemicals and emerging contaminants, we will need to continue to develop our understanding of systems biology to develop approaches for more targeted monitoring and analysis. We will also need to understand the impact of changing pressures, for example, from climate change and increasing antimicrobial resistance on chemicals and contaminants.

We will also need to develop our knowledge of human uses and pressures on the environment (including current and new uses/technologies), how these might change over time, and the potential opportunities, risks and impacts. For example, improving our understanding of the value of different uses, and where changes would most likely affect ecosystem services.

2. Secure, healthy food supplies delivered by a more sustainable fishing industry.

In the next three to five years, the agreed package of CFP reform will be in place. Evidence activities will focus on monitoring the impacts of CFP reform and identifying further opportunities for balancing environmentally, socially and economically sustainable fisheries in the marine environment. A key focus will be integrating methods of monitoring and assessment that meet the needs of both fisheries and environmental management to adopt a more ecosystems-based approach.

We will also need to continue to develop our understanding of the impacts of changing environmental pressures on non-native species and their impacts on fisheries and wider ecosystem services.

3. Sustainable growth in the wider marine economy

The UK Marine Policy Statement applies to all UK waters and is the framework for preparing Marine Plans and managing marine licensing, setting out the general environmental, social and economic considerations that need to be taken into account. The next Marine Policy Statement will be due in the next few years and evidence will be needed to inform and support the implementation of the next statement.

We will need to strengthen data on the social and economic impacts of marine plans and assessments of the cumulative impacts and interactions between current and potential new activities to underpin effective evaluation, ensuring effective coordination with the MMO. We will also continue to draw on evidence on the valuation of marine business and activities to improve our understanding of how the marine environment contributes to economic growth. In addition, we will need to develop our understanding of the cumulative impacts of various pressures in the marine environment on growth in the marine sector.

4. Meeting evidence needs

What approach(es) will be taken to meeting evidence needs?

In the past year a number of activities have, and will continue to, influence how we manage our evidence activities. In 2012, we undertook a fundamental review of our fisheries research programme for the period 2002-2012 to examine trends in previous research and identify future needs. We also undertook a review of our marine environment evidence. These activities have helped set the overall direction for our evidence programme. In July 2012, an independent review of Cefas, our main evidence provider, was carried out to assess the quality and relevance of Cefas' science. We will be working closely with Cefas to implement the recommendations from the review over the coming months.

Identifying and prioritising evidence needs

The Marine Programme has an annual process for identifying new and emerging evidence needs for policy and prioritising these across the programme's portfolio.

Policy teams across marine environment, marine biodiversity and marine and freshwater fisheries are consulted to identify new evidence needs, taking into account policy priorities, evidence gaps from recently completed projects and emerging evidence from other sources. Evidence requirements are also sought from the research community, other funders of marine research and the Marine Science Coordination Committee (MSCC). The Welsh Government and Defra teams with links to the programme are also consulted to ensure appropriate join-up across evidence activities. In September/October, Marine deputy directors analyse and challenge evidence needs across the programme and agree overall priorities for the following year. The programme continues to monitor and review priorities throughout the year and has the flexibility to refocus planned evidence spend if policy priorities change (consulting Defra's Chief Scientific Adviser for any significant changes).

Service Level Agreements (SLAs) with Cefas, through which the majority of our monitoring, surveillance and technical advice is delivered, specify the activities that Cefas undertake for Defra. Delivery of the SLAs is monitored through quarterly reports which help identify any risks or issues that need to be addressed. The overall balance and priority of activities within the SLAs are reviewed annually to ensure activities remain focussed on priority needs.

When assessing priorities, the following criteria are considered:

- Strategic alignment to policy outcomes
- Value for money; contribution to multiple objectives
- Contribution to meeting statutory obligations
- Timeliness
- Support for maintaining critical capabilities

Over the past few years, the programme has implemented a more integrated approach to identifying and prioritising evidence across the programme; we will continue to develop this approach to ensure value for money from evidence is maximised.

Determining method of evidence gathering

The Marine Programme uses a number of approaches for evidence gathering:

- The programme aims to keep up-to-date on existing and emerging evidence in a number of ways, such as via advisory groups and by drawing on advice and evidence from the Environment Agency, Natural England, JNCC, MMO, and Inshore Fisheries and Conservation Authorities (IFCAs). An area we are looking to strengthen is our approach to keeping updated on international evidence.
- Where appropriate, opportunities for internal analysis are sought. Currently, this is mainly economic analysis, but we will be looking into additional opportunities, such as operational research.
- Once evidence priorities have been agreed, the Marine Programme identifies R&D projects that are suitable for funding through the High Level Agreement with Cefas, who provide the core national capability for much of the expertise needed by the Marine Programme. Service Level Agreements with Cefas set out what monitoring and advice functions Cefas will provide on behalf of the Marine Programme.
- Where evidence needs cannot be met through these mechanisms, or where it is unknown who has the capability/expertise to meet the specific evidence need, expressions of interest, limited or open competition are used to test the market. Across the marine environment, marine biodiversity and fisheries sub-programmes, we are looking to ensure greater consistency in how open competition is used.

Internal partnerships

A number of other Defra teams invest in and draw on evidence that is relevant to the policy outcomes for the Marine Programme. To ensure appropriate join-up and maximise the value of evidence activities, the Marine Programme works with the following:

- Water quality, e.g. understanding the impact of contaminants in marine and freshwater environments.
- Adapting to climate change, e.g. understanding the effectiveness of measures for adapting to and mitigating climate change.
- Biodiversity and Ecosystems services, e.g. ecosystems approach to the marine environment; sharing information on approaches to assessing the value of natural capital and ecosystem services, and the impacts of non-indigenous species; coordination of evidence on freshwater, estuarine and coastal habitats.
- Atmosphere and Local Environment, e.g. air pollution in precipitation, marine litter.
- Chemicals and Nanotechnology, e.g. marketing and use aspects of chemicals.
- Data sharing, e.g. meeting Marine Programme commitments under the DCF.

We are also looking to strengthen links with Aquatic Animal Health, Sustainable Land and Soils, (e.g. impacts of diffuse pollution from agriculture on migratory and freshwater fisheries), and Food, (e.g. food traceability).

External partnerships

The Marine Programme works with a wide range of partners through diverse mechanisms to coordinate and deliver our evidence needs. The table below summarises some examples of the partners we work with.

Partnership	Activities
Defra network organisations	<ul style="list-style-type: none"> • Cefas, the Environment Agency, Natural England, JNCC and the MMO are key providers of evidence and advice. They also deliver a number of functions for which the Marine Programme provides underpinning evidence, for example, marine planning and licensing (MMO). • Through the network, we also link with country agencies such as the Countryside Council for Wales (CCW) and Scottish Natural Heritage (note that, from April 1st 2013, the functions of CCW and the Environment Agency Wales will be combined in a single body, Natural Resources Wales). • Successes include our long-standing collaborative programme with the Environment Agency on migratory and freshwater fisheries, which has helped to target evidence needs and avoid duplication of effort. • We are seeking to improve integration between Defra network bodies on marine evidence and will be exploring whether/how the Defra network might provide additional analytical support/advice on economics and other areas of specialist advice.
Advisory groups/committees	<ul style="list-style-type: none"> • Marine Science Coordination Committee (MSCC) - The MSCC brings together those involved in marine research, including the Defra network, Devolved Administrations, other Government Departments, The Crown Estate, NERC, and academic institutes, and aims to coordinate the work of major funders. Industry engagement is provided through a dedicated subgroup. Other work such as the UK Marine Monitoring and Assessment Strategy (UKMMAS), the Marine Environmental Data and Information Network (MEDIN) and groups on underwater sound and offshore renewable research also sit within the MSCC structure. • UKMMAS aims to coordinate and integrate marine monitoring and assessment. Government Departments, agencies, marine institutes, NERC and Devolved Administrations participate in various UKMMAS working groups, which are overseen by the Marine Assessment and Reporting Group (MARG). • MEDIN aims to improve access to marine data and provides advice and standards on data collection and metadata generation. It also provides storage and cataloguing, and discovery services. We are looking to review MEDIN to identify further opportunities to improve management of marine data.
Partnership schemes, industry, NGOs	<ul style="list-style-type: none"> • The Marine Climate Change Impacts Partnership (MCCIP), which coordinates and transfers evidence on the impacts of climate change in the marine environment to policy advisors and decision-makers. • The Marine Programme also engages with a number of other partnership schemes to ensure effective coordination of evidence and improve access to marine data, e.g. Marine Aggregates Sustainability Forum, Living With

	<p>Environmental Change programme, Fisheries Science Partnership, North Atlantic Salmon Conservation Organisation.</p> <ul style="list-style-type: none"> • We also have good examples of stakeholder involvement in priority setting where we have worked with the Rivers Trust, Atlantic Salmon Trust and others to ensure well-targeted evidence needs. • We work with a range of NGOs on specific issues and/or through specific R&D projects. • We have provided funding for the Fisheries Science Partnership, as part of our efforts to strengthen relationships between scientists and the fishing industry.
Research Councils, academia	<ul style="list-style-type: none"> • Collaboration with the Research Councils is sought through joint programming. Key links are with the Natural Environment Research Council (NERC); £5M investment from Defra's Marine Programme has leveraged approximately £25M from NERC. • These collaborations also help provide greater access to and strengthen links with universities and research institutes.
European partnerships	<ul style="list-style-type: none"> • Defra coordinated the MariFish European Research Area Network (ERA-Net) aimed at enhancing coordination on fisheries research, and is a partner in the follow-on ERA-Net COFASP "Cooperation in Fisheries, Aquaculture and Sea food processing" which brings together 26 national funding agencies across Europe. • Defra is also a partner in the SEAS ERA-Net, "Towards integrated European marine research strategy and programmes". • Defra is participating in the recently launched Joint Programming Initiative "JPI Oceans", in which we will take a lead with NERC in the 'Science to Policy' work area, with Cefas supporting MSFD aspects. • The Marine Programme is also an active participant in the International Council for the Exploration of the Seas (ICES) and OSPAR, and coordinates with EU Member States to develop MSFD monitoring programmes and programmes of measures.
Other Government Departments	<ul style="list-style-type: none"> • We work closely with Department of Energy and Climate Change (noise, offshore windfarms, carbon capture and storage and geoengineering), Department for Transport (impacts of shipping on noise and non-indigenous species, port development, emergency planning), Department for Communities and Local Government, Ministry of Defence, Department for Business, Innovation and Skills, Department for International Development, and the Foreign and Commonwealth Office. • We also work with other Government Departments on specific issues, for example we are contributing to a modelling review being led by HM Treasury.

We will be seeking opportunities to strengthen our external partnerships in a number of areas:

- Together with Cefas, we will commit to more systematic evaluation of Defra and Cefas links with academia to see where there is scope for stronger partnerships with universities and research institutes.
- We will identify opportunities to strengthen collaboration with industry.

- Building on our successes in accessing NERC funding, we will seek appropriate opportunities to strengthen links with other Research Councils, including the Economic and Social Research Council, the Engineering and Physical Sciences Research Council, and the Biotechnology and Biological Sciences Research Council.
- We will continue to promote links with Devolved Administrations to help coordinate monitoring and research at UK level. We will also build on existing mechanisms to improve access to and sharing of data.

These actions will also help address some of the conclusions of the recent Cefas science review.

Ensuring multi-disciplinary working

The Marine Programme draws on a range of skills from within Defra and externally. Within the programme, natural scientists manage the R&D programmes, and economists provide additional analysis/advice. For non-R&D, Cefas are a key source of advice on a range of issues, as set out in Service Level Agreements that are managed by policy teams. We also use a number of expert evaluators to assess project proposals and outputs.

A new cross-disciplinary evidence group covering Marine, Water and Floods programmes has recently been established. This will help identify opportunities for more multi-disciplinary working. We are increasingly looking at opportunities for integrating natural sciences with economics and social science and will be exploring the use of operational science for identifying efficiencies in our monitoring programmes.

External capabilities

The Marine Programme monitors availability of a number of key capabilities. A Cefas Research Vessel undertakes a significant amount of our monitoring work and a proportion of our R&D activities. We aim to monitor access to key areas of expertise, including modelling, regulatory advice, long-term datasets, and specialist capability for statutory monitoring and risk assessment. In terms of the Research Vessel, quarterly progress reports and discussions between Defra and Cefas provide opportunity to discuss any emerging risks and issues and agreeing appropriate mitigation actions. At annual reviews of evidence needs and priorities across the programme, access to and maintenance of key monitoring and R&D capacity is taken into consideration. This helps ensure we are aware of any risks to availability of these functions and can explore options for mitigating risks.

5. Evaluating value for money and impact

What approach(es) will be taken to maximise and evaluate value for money and impact from evidence?

A number of factors help achieve value for money from the programme's evidence activities:

- (i) Ensuring clear alignment of evidence with policy outcomes

- (ii) Using effective and appropriate methods for procuring evidence
- (iii) Identifying partnership opportunities and leveraging co-funding
- (iv) Undertaking robust evaluation of project proposals and outputs to ensure their quality and maximise their potential impact.

Quality assurance

The Marine evidence programme is reviewed periodically to assess the overall direction of the programme. For example, we recently reviewed our fisheries research programme over the past ten years, and the overall direction of our marine environment evidence. In 2013, we will be reviewing and identifying future themes for the evidence programme and will develop a timetable for future programme reviews to assess the robustness and relevance of our evidence.

For R&D activities, we also organise annual meetings with Cefas and key policy teams to evaluate progress with projects within our R&D programmes, identify key policy messages emerging, cross-linkages between projects and future issues to inform the programme's direction.

Other quality assurance measures include use of independent peer review for project proposals and selected final reports, and adherence to guidance within Defra's internal evidence handbook. Across the programme, we are looking to share good practice on the gathering and use of evidence to develop a more consistent approach across programme areas. Alongside Defra, Cefas, Natural England and MMO (key sources of evidence and advice for the programme) are signatories to the Joint Code of Practice for Research, providing added confidence in the robustness of evidence informing marine policy. Many of the analytical methods used to assess levels of contamination in the marine environment are also carried out to strict ISO standards.

The majority of our monitoring and advice activities are delivered through Service Level Agreements (SLAs) with Cefas. Delivery of evidence and advice within the SLAs is reviewed on a quarterly basis, assessing progress against activities, and identifying any risks/issues to delivery. We are looking to develop a more consistent approach to monitoring performance across all SLAs.

Defra also undertakes quinquennial science reviews of Cefas and its other laboratory agencies. These reviews are organised by Defra's Strategic Evidence and Analysis team and assess the quality and relevance of Cefas' science. This helps provide additional assurance on the evidence and advice feeding into Defra policy. The last review was carried out in July 2012; the next review will be due by summer 2017. In addition, we will also work with Defra's executive agencies team to review the science performance indicators for Cefas to ensure they are fit-for-purpose.

Impact of evidence

Effective policy engagement in marine evidence from the outset, and effective communication of emerging outcomes to policy teams helps maximise the value and

impact of evidence at all stages of the policy cycle. Clear alignment of evidence to policy outcomes helps ensure there is a clear policy 'owner' and a clear outcome against which to evaluate the impact of evidence.

Success measures

Success measures for evidence are both direct (for example, evidence underpins decisions on designation of MPAs), and indirect (for example, evidence reduces risks and uncertainties in decision-making on MSFD indicators). Success measures for the Marine Programme's evidence activities include:

- A comprehensive and robust evidence base provides Defra with a strong negotiating position, enabling Defra to effectively influence the European Commission and other Member States regarding emerging policies.
- Robust and timely data collection and monitoring ensures statutory obligations are met; monitoring activities contribute to multiple policy requirements.
- Timely policy decisions are informed, where appropriate, by robust impact assessments.
- Integrating modelling and monitoring activities and coordinating wider forms of evidence, supports an ecosystems-based approach to fisheries management.
- Evidence is used to identify opportunities for risk mitigation or avoidance, e.g. timely evidence informs decisions to change policy direction where appropriate.
- Evidence contributes to effective policy evaluation, helping deliver value for money.
- Evidence is communicated effectively internally and externally.

Programme reviews will include evaluation against relevant success measures. For individual projects, these are evaluated against the project specifications, including peer review where appropriate to ensure outputs are robust and relevant. Evaluation of individual policies will also include assessment of the impact of evidence on policy. We will also look to develop more specific success measures for certain areas of marine policy.

Communicating our evidence

Evidence outputs are communicated through a number of mechanisms to enhance the impact of evidence. Each year, the Marine Programme updates the Marine Yearbook; this provides an overview of marine and fisheries research carried out over the past year. Additional mechanisms for communicating outputs include the production of two-page summaries for all R&D projects both at the start and end of the project, and ad hoc science seminars which provide opportunity to discuss the outcomes and policy implications of specific areas of research.