Policies and Procedures

JNCC Evidence Quality Assurance (EQA) Policy

2018/19
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https://jncc.gov.uk/about-jncc/corporate-information/evidence-quality-assurance/

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Summary

This Evidence Quality Assurance (EQA) policy provides a standard for JNCC staff to follow to help ensure that the quality of JNCC scientific advice and evidence is fit for purpose. The policy presents principles that must be adhered to by all staff when providing scientific advice and evidence. Evidence is defined here as a general term for expert opinion or advice, data, methodology, results from data analysis, interpretation of data analysis, and collations and interpretations of scientific information (including meta-analyses).

The Appendices provide additional information, practical guidance and tools to help staff make good choices about quality assurance; they are not intended to prescribe activities.

The policy is in line with *The Government Chief Scientific Adviser's Guidelines on the Use of Scientific and Engineering Advice in Policy Making* (2010) and *The Defra Joint Code of Practice for Research* (2012).

Compliance with this JNCC policy will be discussed at the Science Management Board which reports to the Executive Leadership Team and Joint Committee. Monitoring will be carried out as an element of JNCC governance.

The Science Management Board will review this policy every three years as part of internal JNCC governance, and, if necessary, update it.

1 What is evidence?

Evidence is a general term for expert opinion or advice, data (and the methodology used to obtain the data), results from data analysis, interpretation of data analysis, and collations and interpretations of scientific information (including meta-analyses).

JNCC generates evidence through its own activities, in partnership with others and through commissioned survey and research. Evidence from external sources also plays an important role in allowing JNCC to provide its scientific advice.

The work that we undertake and commission must follow good scientific practice:

- data are collected using repeatable systematic observation, measurement, and experiment;
- hypotheses are formulated and tested (and modified);
- data are stored securely;
- results are analysed;
- inferences are drawn regarding the meaning, importance and reliability of analyses;
- the work is published appropriately.

Evidence – quantitative and qualitative – is obtained from a variety of sources of which independently peer-reviewed and published studies are of particular value. There are numerous other sources including 'grey literature' like technical reports, systematic reviews, commissioned studies and case studies, as well as expert knowledge and opinion.

2 What is quality assurance?

Quality assurance (QA) signifies the various processes that ensure work abides by and meets specific quality standards. Monitoring and auditing are essential parts of the QA process.

Two principles included in QA are: "fit for purpose" i.e., the product should be suitable for the intended purpose; and "right first time", i.e. mistakes should be eliminated as far as possible.

This policy defines the QA process in JNCC. Guidance notes in the Appendices are provided here to help staff understand and implement the process but are not intended to be prescriptive.

3 Why is evidence quality assurance important?

3.1 Purpose

It is essential that good evidence (i.e. fit for purpose in scope and quality) is available to underpin decision-making, particularly in supporting policy and programme decisions made by government. Such evidence, when it is generated from assured scientific practice in research, is required to form judgements and deliberate response options and thereby make effective decisions. As a public body, JNCC must be able to assure the quality of its evidence and advice. This means that we are:

- able to understand the quality, assumptions and limitations of the data we collect or use (this may include collation/processing or interpretation);
- clear about the certainty and risks associated with our evidence and advice;

- able to document and trace the processes that provide evidence;
- honest, open and transparent about those processes.

3.2 Transparency

Transparency means being open about the scientific evidence and analysis underpinning our decisions, including confidence, uncertainties, data and knowledge gaps, assumptions, and how we have used scientific evidence and analysis, and any other factors, in our advice.

Government has set out the need for greater transparency across its operations to enable the public to trust in government services and hold public bodies and politicians to account.

3.3 Government guidelines on scientific advice

The Government Chief Scientific Adviser's Guidelines on the Use of Scientific and Engineering Advice in Policy Making (GCSA Guidelines, 2010) require the adoption of an open and transparent approach to the scientific advisory process. Evidence and analysis are published as soon as possible, alongside any public explanation of the reasons for policy decisions.

The JNCC Evidence Quality Policy is compliant with the GCSA Guidelines (2010).

Scientific advice is only one type of advice that may be taken into account by government decision-makers. Other types might involve social, political, economic, or ethical concerns.

Openness and transparency of the scientific advisory process are vital to ensure that all relevant streams of evidence are considered, so that the process has the confidence of experts and the public. The evidence for a particular policy should be published as early as possible, unless there are over-riding reasons for not doing so, for example, national security, or requirements to protect personal or commercial confidentiality. The evidence should be published in a way that is meaningful to the non-expert, using plain English and avoiding overly technical descriptions and jargon. The analysis and assumptions that went into its creation, and any important gaps in the data, should be clearly identified.

Defra's Aqua Book (Defra Aqua Book 2015) is a detailed guidance document on producing quality analysis for government. The section on analysing uncertainty (Chapter 8, page 49) may be especially useful for high risk analyses undertaken by JNCC.

3.4 Access to evidence and information

JNCC is committed to providing open access to the data and information we hold, publishing via our website.

The Freedom of Information Act 2000 (FOI) gives the public a right of access to information held by all public authorities in the UK. The Environmental Information Regulations 2004 (EIR) deal with environmental information held by public authorities in England, Northern Ireland and Wales. The Information Commissioner's Office[1] is an independent authority promoting openness by public bodies. Scotland has its own Scottish Environmental Information Regulations and the Freedom of Information (Scotland) Act 2002. These are regulated by the Scottish Information Commissioner.

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[1] http://www.ico.org.uk/for_the_public/official_information

The purpose of the legislation is to make public bodies, such as JNCC, more transparent and accountable. The right to information is subject to certain exemptions and exceptions which are considered on a case by case basis.

There are exceptional cases where JNCC will withhold access to some information and exemptions are listed under both pieces of legislation to allow this. All such decisions are based on a public interest test, which weighs up the balance of the interest to the public in releasing the data or information against the potential risk of damage if access were allowed.

For the types of data that we hold there are two exceptions (under the Environmental Information Regulations) that are particularly relevant:

   i.   Protecting the interest of the data provider (especially in relation to data which has been voluntarily provided);
   ii. Protection of the environment to which the information relates (where the release of data or information could lead to environmental harm).

Guidance on both FOI and EIR requirements is available on the JNCC website under the heading Freedom of Information[2]. Good QA practices can both help avoid the need for the public to make requests and enable more efficient responses to FOI or EIR requests.

4 Who is responsible for evidence quality assurance?

4.1 Internal responsibilities

JNCC employs specialists in a wide range of scientific disciplines across biological sciences, economics, geographic information and spatial analysis, statistics and data management. All these staff are responsible for evidence quality assurance, along with administrative staff who contribute to project management and evidence delivery.

Project managers have a particularly important role in implementing the EQA policy, with support from team leaders; both groups should have a good working knowledge of the policy and be able to provide leadership and guidance for other staff involved in evidence and advice delivery.

Groups working on evidence delivery within or for JNCC also have a role in supporting implementation of the EQA policy, for example, by providing peer review for major projects, monitoring implementation of the policy and suggesting policy improvements.

The Science Management Board (SMB) and Audit and Risk Assurance Committee (ARAC) both have responsibility for ensuring that the EQA policy works and is implemented to a satisfactory standard. ELT, as advised by SMB, has overall organizational responsibility for budgets, making decisions over evidence spend including reviewing business cases for projects which are relevant to EQA in determining the evidence being funded. ELT and SMB are also responsible for ensuring that JNCC has the capabilities and capacity to deliver required EQA standards, via recruitment of staff with appropriate skills and provision of the appropriate training and professional development.

The Joint Committee is ultimately responsible for evidence standards and QA processes within JNCC. Members discuss strategic nature conservation and organisational issues as

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[2] https://jncc.gov.uk/about-jncc/corporate-information/access-to-information/

well as making high-level advice, strategy, funding and planning decisions. In setting strategic direction, the Committee helps determine the scope of evidence and advisory work undertaken, and through its scientific oversight provides scientific leadership, including challenge, scrutiny (including peer review) and support.

4.2 Working with others

JNCC staff have a responsibility to ensure partners and contractors employed to deliver evidence work understand our EQA standards and procedures and what we expect from them to support achievement of good practice.

In working jointly with partner organisations agreement must be reached, and the agreement recorded, concerning standards that will be adopted for any given project at the start of that project; the JNCC policy should be followed as closely as possible. Guidance is available for understanding the EQA practices of the government environment departments, the SNCBs and EU projects in Appendix 6.

Contractors will need to comply with standards set out in this policy.

5 Which advice or evidence should be quality assured?

5.1 Overview

Quality Assurance should be proportionate to the intended use of the advice or evidence.

Staff in JNCC produce different types of scientific advice and evidence ranging from short, rapidly produced advice notes to major data and evidence products delivered through contracts and partnerships. The QA approach for each of these products is necessarily very different, but all forms of scientific advice and evidence should undergo some level of QA.

Deciding on a suitable QA procedure should be based on a simple assessment of risk associated with use of the evidence; see the EQA flow chart (Figure 1).

JNCC EVIDENCE QUALITY ASSURANCE

GETTING STARTED WITH EQA
Evidence is a general term for expert opinion or advice, data, methodology, results from data analysis, interpretation of data analysis, and collations and interpretations of scientific information. Before you start you should read the EQA Policy, then decide on the appropriate level of EQA for your project using the decision tree below. Ensure our EQA Policy has been shared with external partners and contractors.
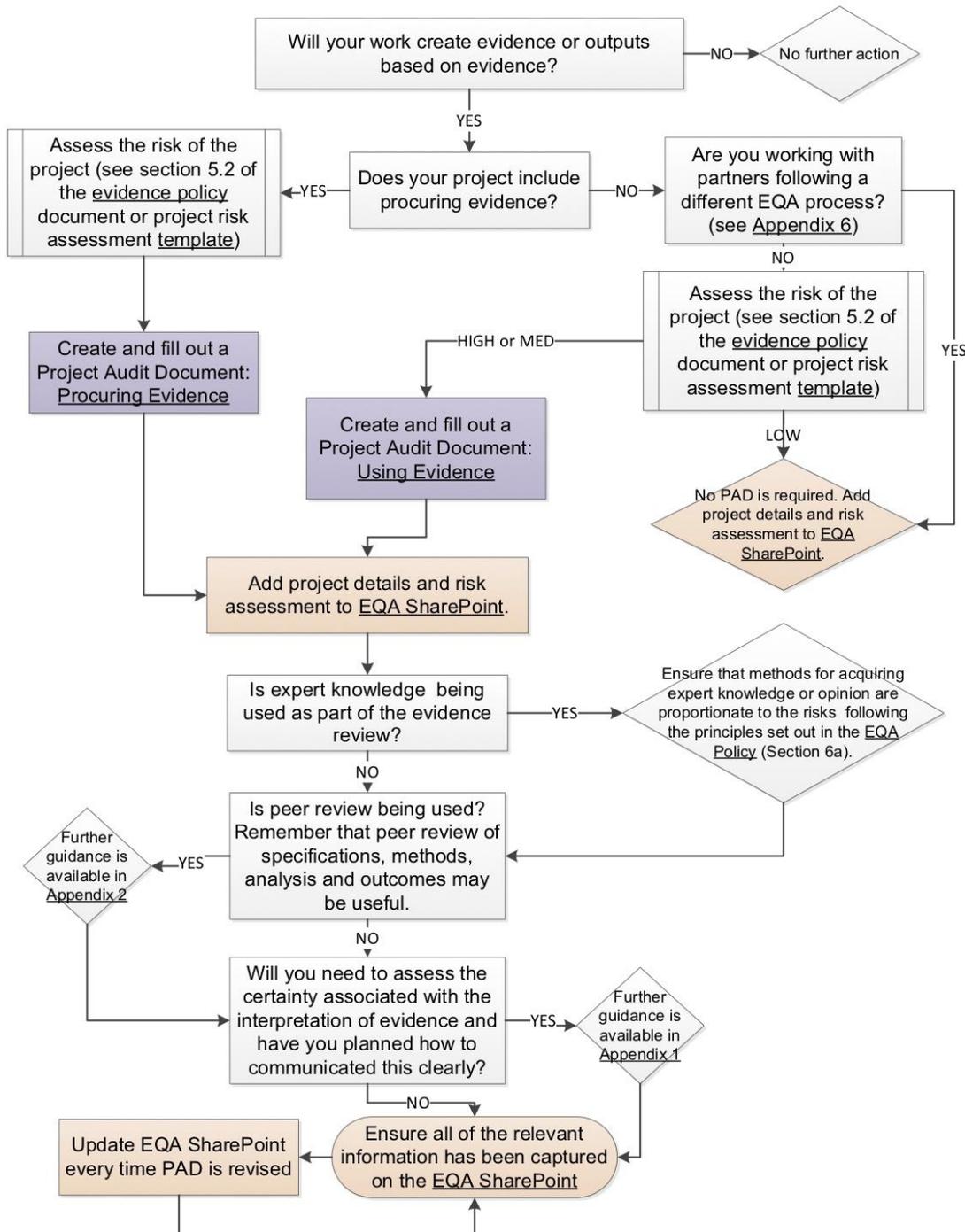
Figure 1. EQA Flowchart: decision tree for making EQA choices and recording them

5.2 Assessing risks associated with the use of advisory and evidence products

Risk can be defined and categorised in many ways. Risk is typically measured as 'size of impact multiplied by likelihood of occurrence of an event'. For an advisory or evidence product this can be defined as:

Impact = use of the evidence, i.e. significance of potential decision or policy application, and scale of change that is likely to result from this use;

Likelihood = contribution of the evidence to the use, i.e. how significant is the evidence likely to be as a driver of the decision or policy change, including as part of a larger evidence-driven process.

In order to assign to a High, Medium or Low category, multiply impact and likelihood then use the matrix below to categorise risk. The examples below the matrix demonstrate the levels of risks for different types of product.

Risk scoring matrix

Likelihood of use of the evidence in making significant decisions		Impact: significance of potential decision or policy application, and scale of change that is likely to result from this use	
1	Small chance	1	Small impact
2	Realistic possibility	2	Moderate short-term impact
3	Likely to happen over the longer term	3	Moderate longer-term impact
4	Likely in the short term	4	Major impact
5	Likely and imminent	5	Extremely significant

Risk scores assigned to low, medium or high risk categories

5 LOW	10 MED	15 MED	20 HIGH	25 HIGH
4 LOW	8 LOW	12 MED	16 MED	20 HIGH
3 LOW	6 LOW	9 MED	12 MED	15 MED
2 LOW	4 LOW	6 LOW	8 LOW	10 MED
1 LOW	2 LOW	3 LOW	4 LOW	5 LOW

Likelihood (vertical axis) — *Impact* (horizontal axis)

Impact

Risk assessment is rarely precise, and a general rule is that as risk increases the QA of the advice and evidence should be more rigorous. There will be exceptions to this rule, usually as a result of the time available to provide advice or evidence (see below). Risk can also change during the life of a project and in this situation should be re-assessed and QA adapted accordingly.

Special cases relating to 'contribution to decision' also exist in which the advice is the sole basis for decision-making, for example evidence-based protocols and criteria. In such cases, the risk of using poor evidence and/or creating poor protocols will always be moderate to high, varying only in relation to scale of use, and so both the underlying evidence and the protocols themselves should be subject to sufficiently rigorous QA.

Examples of high-risk applications might include: designation of European protected sites; national and official statistics; advisory options for supporting development of EU law; evidence in support of government response to EU legal challenges.

Moderate risk applications might include: technical advice to support UK negotiations in international agreements (although these might be high risk in some circumstances); conservation advice packages for protected areas; strategy development; operational policy development.

Lower risk applications might include: scoping exercises to specify additional evidence gathering needs; expert inputs to workshops; responses to Parliamentary Questions.

Project managers should make risk assessments at the start of the project process and, if necessary, check risk assessments with colleagues, including team leaders. Evaluation of the risk should be recorded in the EQA SharePoint database and also in the PAD when the risk assessment indicates use of a PAD.

Staff should also be aware that risks relevant to users of our advice and evidence include reputational risk and risk of legal challenge, that may need to be taken into consideration when deciding on the best evidence quality assurance procedures. Precautionary approaches to EQA may also be helpful in situations where risks are very hard to assess.

5.3 Time-limited responsive advice

Where JNCC advice is sought on tight timescales, such as license consents under the Convention on International Trade in Endangered Species (CITES) and advice on regulated activities (OIA) in offshore marine waters, a more strategic approach (at programme or project level) to QA is necessary. This approach relies on competency of staff and quality control is achieved through effective systems, training, within-team checks (including peer review), and use of advice from non-team experts (usually specialists in JNCC or the SNCBs, or suitable external experts). Systems have been set up under the guidance of our internal auditors to review and spot-check a proportion of the decisions made in CITES and OIA over stipulated time periods. The EQA standard in place must be based on the principles set out for use of expert knowledge or opinion (see 6.2), and must include a monitoring plan to allow quality audits.

6 General principles for evidence quality assurance

6.1 Introduction

The following sections provide a set of principles associated with different forms of evidence production, from expert knowledge to procured evidence: these principles must be adhered to by all staff providing, or involved in the provision of, scientific advice and evidence.

To help staff implement the actions required to meet these principles, various Appendices are provided here for guidance. They are not prescriptive but include tools and forms for staff to use.

6.2 Expert knowledge and opinion

Expert knowledge and opinion are important and frequently used for providing advice, supporting development of response options, and checking quality of evidence (through peer review). Martin et al. (2012)[3] provide an introduction to and evaluation of expert consultation.

Expert knowledge or opinion should not be relied upon as a sole source of evidence when there is relevant evidence of suitable quality to support advice, unless there are good and demonstrable reasons why published evidence cannot be reviewed (for example, short deadlines imposed by others or as part of a function-specific strategic EQA standard; see 5.3).

Assessing the quality of expert knowledge and opinion can be difficult, although maintenance of expertise through training and professional development and selection of experts are key controls (see Appendix 2 on peer review). Some principles should be followed to increase confidence in use of expert knowledge and opinion, both when used to complement evidence reviews and when used without supporting evidence. These principles are based partly on Barnard & Boyes (2013), JNCC Report 490.[4]

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[3] Martin, T.G., Burgman, M.A., Fidler, F., Kuhnert, P.M., Low-Choy, S., McBride, M. & Mengersen, K. (2012). Eliciting expert knowledge in conservation science. *Conservation Biology*, **26**: 29-38. http://caestuaries.opennrm.org/assets/25c6ecae38d70f4c1075fee788e0155b/application/pdf/0611_M arti n_etal.pdf

[4] Barnard, S. & Boyes, S.J. (2013). Review of case studies and recommendations for the inclusion of expert judgement in marine biodiversity status assessments. JNCC Report 490, ISBN 0963 8091.

6.3 Principles for using expert knowledge and opinion

JNCC staff when using in-house expert knowledge or opinion to provide rapid advice will:

- Ensure quality assurance of expert advice is proportionate to the use and likely impact of the advice;
- Comply with any function-specific strategic QA procedures, or:
- Check advice or opinion with a suitably qualified colleague within JNCC, or if appropriate a colleague in an SNCB or partner organisation;
- Support advice or opinion with review of relevant peer-reviewed or trusted evidence (evidence based on peer-reviewed and published methods), citing evidence sources;
- Ensure that potential users are made aware that the advice is based on expert knowledge or opinion.

JNCC staff when using externally sourced expert knowledge or opinion to provide advice will:

- Ensure quality assurance of expert advice is proportionate to the use and likely impact of the advice;
- Obtain opinions from two or more experts;
- Select experts with an appropriately wide range of views and expertise, involving generalists as well as specialists;
- As best practice, typically involve non-government experts from academic, NGO and/or business communities, but when this is not acceptable for reasons of confidentiality then document decisions;
- Ensure that experts involved in an exercise do not have relevant conflicts of interest;
- Define key terms and concepts ahead of an information-gathering exercise to help clarify what is being asked for and reduce uncertainty and 'noise' in experts' responses;
- When appropriate, use training or familiarisation of experts on the issues to be addressed in order to help reduce uncertainty and improve the quality of information provided;
- Use different methods to check consistency, for example well-designed questionnaires paired with workshops, iterative consensus development methods, Delphi method;
- Use a transparent and structured process to evaluate expert opinion, documenting methods used and decisions taken;
- When appropriate, weight opinions from different experts in accordance with the experts' self-assessments of their degree of expertise;
- Give experts opportunities to reflect on and refine their opinions in the light of information from the other experts.

Both internal and external expert opinion may be sought simultaneously and guidance to help staff fully understand and meet all of these principles is provided in Appendix 3.

6.4 Reviews and assessments: using multiple sources of evidence

6.4.1 Introduction

Review of evidence from multiple sources, including that produced by JNCC and externally, is an important method for analysing evidence and providing advice. This section focuses on using results and conclusions from existing evidence sources.

Meta-analysis of multiple data sets, or re-analysis of data, to create new evidence products (in-house research) should follow good scientific practice and the principles included in Section 7 below on procurement of evidence must be followed.

The interpretation of evidence collations can be biased by a number of factors, including for example:

- lack of evidence and/or poor transferability of evidence;
- selective choice of evidence to underpin advice;
- dismissal of evidence that conflicts with other evidence;
- inclusion of evidence that is not relevant for the intended use;
- failure to account for the quality of evidence included and its associated uncertainty;
- poor choice of meta-analysis methods;
- poor information management underpinning meta-analyses;
- combining evidence and expert opinion.

In order to reduce bias in evidence reviews and meta-analyses the following set of principles must be followed.

6.4.2 Principles for undertaking evidence reviews and assessments

JNCC staff when undertaking in-house reviews or assessments of evidence will:

- Make reasonable attempts to collate all relevant evidence of good or high quality to include in an assessment, documenting search methods used;
- Include any relevant evidence of suitable quality that conflicts with other evidence in the assessment, but clearly describe the effect of this evidence on the overall certainty of the assessment;
- Correctly and consistently cite all evidence sources so that users are clear about origin and would be able to find the evidence if it is published or request it if not;
- Select fit for purpose meta-analysis methods, testing this through peer review (see Appendix 2) and document the reasons for the methods chosen;
- Follow existing JNCC/programme-level data management approaches, ensuring other users are able to understand the data and would be able to use the data to obtain repeatable results;
- Assess expert opinions used for an assessment (see Appendix 3), documenting the methods used and outcomes to ensure transparency;
- Provide assessments of certainty in the overall conclusions drawn from the evidence and associated likely risks for any response options provided, using the terminology given in Appendix 1;
- Peer review products according to the risk-based approach (Section 5) and Appendix 2, documenting methods chosen, reviewers involved and storing reviews in original form.

See Appendix 1 for guidance to help staff more fully understand and meet these principles.

Systematic review can reduce bias but is costly and time-consuming. Guidance on systematic reviews and other knowledge synthesis methods is available from various sources, e.g. the Centre for Evidence-Based Conservation[5] and the Eklipse project which reviews 21 different knowledge synthesis methods[6].

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[5] http://www.cebc.bangor.ac.uk/index.php
[6] http://www.eklipse-mechanism.eu/eklipse_outputs_reports

7 EQA in procurement

7.1 Procurement practice and evidence quality

The JNCC procurement process includes steps to help project managers ensure that the quality of commissioned work is fit for purpose. It provides guidance on creating a project specification, choosing contractors and defining required products.

The procurement process needs to consider evidence quality (see Project Audit Document Procuring Evidence; PAD2). The project specification (known as the Annex A) is central to the process. It is used to establish the scope of the work (framing the questions to be addressed) and is a key document for establishing quality assurance requirements.

To help embed good evidence quality assurance practice in procurement we recommend the following documents are created:

i. An Annex A – for internal use only (not published), to include information to help us test and understand the requirement (including through peer review) and provide context for tender evaluation. Annex A is the vehicle for providing information about how the tender will be evaluated and will include EQA specifications as appropriate;

ii. Invitation to Tender (ITT) specification – derived from the Annex A, to set out the problem and any specific requirements (published);

iii. Contract specification – derived from the Annex A and successful tender documents, agreed with the contractor, and for contract use only (not published).

A standard Annex A form available from Finance (via the JNCC intranet) embeds EQA requirements. Additional information on how to assess and describe the specific EQA for a project in an Annex A is provided below in Table 1, along with guidance on how this could then be translated into an invitation to tender (ITT). These are based on the following additional principles to ensure that the evidence we procure is of fit-for-purpose quality, and hence value for money.

7.2 Additional principles and standards for ensuring that procured evidence is of 'fit-for-purpose' quality

JNCC will ensure that the following requirements are met when procuring evidence:

- Research/survey methods will be fit for purpose, and when innovative and novel methods are used, or developed, adequate risk management, including peer review processes, will be implemented;
- Interpretation of new data and other evidence is based on best scientific practice, and analytical methods and sources of other evidence are cited clearly;
- Evidence quality and the uncertainty associated with its interpretation are clearly communicated in reports and other relevant products;
- Internal peer review is used in the procurement process, including during development of the specification, multiple independent evaluations to determine the best contractor to achieve value for money, and in ensuring that reports and other products are of the required quality (see Appendix 2);
- Procurement decisions and contract management processes are documented in a way that allows monitoring and evaluation of compliance with the JNCC EQA Policy.

JNCC will procure evidence only from contractors who satisfactorily demonstrate that they have the required:

- Capacity, capability and credibility – the staff resources available, including sub-contractors, the competency of those actually doing the work and track record of the contractor will be assessed for suitability to deliver the specified work;
- Quality management systems, either accredited or self-designed, in place and in use;
- Data management capability and relevant and adequate data access policies in place for the specified work.

Project managers are required to comply with these principles and use the guidance in Table 1 for creating a project specification (an Annex A) and invitation to tender. Contract documents must reflect the agreed approach to EQA, including addressing these principles.

7.3 Elements for inclusion in an Annex A and invitation to tender document

To help staff ensure consistency in approach to evidence quality assurance key elements of an Annex A, ITT and contract are described in the table below (Table 1).

Table 1: Guidance on effective inclusion of EQA in procurement documentation

Matching section in Annex A	Specification (the Annex A)	Invitation to tender
(5) Project objectives: detailed tasks - research/survey methods	Annex A should cite the required and/or desired methods, if known, for delivering the project objectives; this will help in tender evaluation. Peer review of methods may be appropriate (see EQA Policy Appendix 2); in cases where peer review of methods is undertaken a description should be provided in Annex A.	The specification used for inviting tenders should avoid being prescriptive of the methods that are required so as to ensure effective competition, unless conformity is required. The applicant must state what research and/or survey methods will be used and whether these are already peer reviewed (published sources should be cited). They must state why the chosen methods are fit for purpose. When methods are not published or a non-published variation of a method is being proposed, the possible risks to quality of evidence associated with the innovative methods should be described and a contingency plan for managing these risks provided.
(5) Project objectives: detailed tasks - peer review	Choice of peer review approaches should be based on risk assessment (section 5). The Annex A should describe the desired approach, based on EQA Policy Appendix 2, and reasons for this decision. Any requirements deemed mandatory, including the need for a steering or advisory group, should be clearly described and included in the invitation to tender.	Plans for peer review of the specification (if required) and of project progress and outputs should be described and accounted for in the delivery timetable. Approaches to any specified mandatory peer review must be clearly described and timetabled. If JNCC intends to undertake an independent review outside of the project then this should be mentioned.
(13) Instructions for tender submission - capacity, capability and credibility	Annex A should include a basic estimate of staff resource and the competency requirements to meet the objectives. This is not for inclusion in the invitation to tender,	The applicant is required to propose a breakdown of staff resources and how these will be met, including any subcontracting. The competencies and experience of those actually doing the work must be provided (for example,

Matching section in Annex A	Specification (the Annex A)	Invitation to tender
	but to help clarify likely costs and in tender evaluation.	short CVs, publication records) and must be relevant to the specified work. Examples of previous relevant work completed by the applicant and any sub-contractors should also be provided.
(13) Instructions for tender submission - Quality Management (QM) systems	Any requirements for the contractor to have an accredited QM system in place must be specified. Requirements for compliance with recognised codes of practice should also be given, for example Code of Practice for Official Statistics[7].	Any recognised QM systems in use by the applicant should be specified and current certification demonstrated. If not accredited, the applicant must provide evidence that they have a QM system in place (documentation should be provided) and in use or provide a quality assurance plan. The QM system or plan must include adequate monitoring and audit practices.
(7) Outputs - data management and access	Set out management and storage requirements related to the data generated from the project and the relevant policy for data access.	The applicant is required to describe the approach that they will take to data management and storage and demonstrate that they have the required capability. They must indicate that they can comply with any specified data access requirements.
(14) Evaluation criteria	A short list of evaluation criteria and the ways in which they will be scored must be included in the Annex A, based on the standard criteria. They must include criteria relevant to the other headings in this table.	The tender evaluation criteria, plus scoring approach (weightings), must be specified in invitations to tender.

8 Publishing evidence and communicating evidence quality

JNCC publishes evidence and scientific advice in many forms, including through the JNCC Report Series, books, papers, data sets, code and geographic information. Quality assurance of products prior to publication is important, especially through peer review.

Peer review should be proportionate to the kind of evidence being published. Staff should assess the need for peer review, conduct the required review and respond to it, and document the process and outcomes (Appendix 2). Evidence products likely to have a major role in significant decision-making (i.e. high risk) should undergo independent peer review. The peer review process should be transparent and the names of reviewers cited in publications when appropriate and permitted (see Appendix 2 for more information).

Evidence that is of sufficient scope and/or novelty should be considered for submission to a scientific journal for publication, although this should not delay use of the evidence for decision-making. Realistic time and resources will need to be allocated, ideally during initial project planning and certainly if the evidence is gained through procurement. If seeking to publish procured evidence in a scientific journal, JNCC staff should assess their contributions to the paper and seek co-authorship if this is appropriate. A simple set of rules for determining authorship is available in Annex 4 of Appendix 5.

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[7] http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html

Reports published as part of the JNCC Report Series and major papers must include a short statement on the evidence quality assurance process undertaken during the project and in refining the report (the Communications Team will advise on how best to do this for a particular type of report).

Whatever the form in which evidence is published, it is critical that the way in which a product has been quality assured is communicated clearly. In addition, staff must provide some assessment of certainty of the findings, using the terminology in Appendix 1.

9 Public consultation on JNCC evidence

JNCC undertakes public consultations on a range of evidence products, especially in relation to European and international reporting. Consultation can provide a valuable additional peer review opportunity, but is not necessarily relevant to all of our evidence work. However, it should not replace peer review; it typically follows once expert peer review of evidence is completed.

Decisions on if, when and how long to consult the public on evidence should be made at the beginning of any project and adequately planned. The requirement to consult is often pre-determined by government, and JNCC might not always be responsible for running consultations, but when we do lead a consultation then project managers should consult with programme leaders or project steering groups on the appropriateness of public consultation. Evidence products likely to have a major role in significant decision-making (i.e. related to high environmental risk) would usually undergo public consultation either alone or more typically as part of that decision-making process.

10 Record keeping, monitoring, auditing and reporting

Adequate records of decisions and actions must be kept for purposes of monitoring, assessment (audit) and reporting of compliance with this EQA policy. All projects where EQA is relevant should have an initial risk assessment recorded (see Figure 1, EQA Flowchart).

1. To determine whether a Project Audit Document (PAD) is required, see the Flowchart, which determines which of the following PAD templates should be used: PAD1– Using Evidence or PAD2 – Procuring Evidence (see also Appendix 5). When required the PAD must be created at the beginning of the work and used through to completion. The PAD should set out clearly who is responsible for tracking and recording the agreed evidence quality assurance process for the project. Where a function-specific strategic QA standard is in use this must specify record-keeping requirements.

Project documentation should be managed and retained in accordance with the guidance set out in Appendix 5. PADs should be recorded in the EQA SharePoint database, which will be checked twice annually by the JNCC Governance Manager.

JNCC will monitor the quality of its evidence and advice on a regular basis and implement changes necessary to address any identified shortfall in compliance with this policy or the adequacy of the policy. Monitoring will include twice-annual updates for central reporting and quality audits. The approach to any additional monitoring will be defined by the Science Management Board at the start of each business year. Information on evidence quality management, including methods and outcomes, will be audited and reported to ELT and Joint Committee (annually), and summary information published.

Appendix 1. Bias, conflicting evidence and uncertainty[8]

1. Bias in interpretation of evidence

1.1. The interpretation of evidence can be biased by a number of factors, including for example:

- lack of evidence and/or poor transferability of evidence;
- selective choice of evidence to underpin conclusions and advice;
- dismissal of evidence that conflicts with other evidence;
- failure to account for the quality of evidence included and its associated uncertainty;
- poor choice of additional analytical (meta-analysis) methods;
- poor data management underpinning meta-analyses;
- poor data analysis (i.e. incorrect use of statistics)
- combining evidence and expert opinion without a suitable audit trail demonstrating how differing types of evidence have been combined;
- poorly designed methods for obtaining expert opinion.

The JNCC Evidence Quality Policy is designed to help reduce bias in the interpretation of evidence so that advice and response options are as robust as available good quality evidence allows. The following guidelines should help staff in meeting the principles set out in the policy.

1.2 Searching for, collating and reviewing third party evidence

Third party evidence includes all information that is gathered from sources outside JNCC.

Searching and sourcing:
JNCC staff have access to Scopus, which enables searches of published research literature using specific search terms. In addition, some internet search engines are specifically designed to find scientific literature, including 'grey' literature (reports) (e.g. Science Direct, Google Scholar). Scopus searches can be filtered to show only open access results. Most of the literature can be obtained through OpenAthens logins supplied by the Defra librarians, who also provide a service supplying electronic interlibrary loans for the standard fee using project budgets. Papers can also be obtained by email request to the main author and/or through Researchgate. Although there is increasing open access availability of important literature and more funders are demanding open access publication of work they fund, relying on open access journals and grey literature may result in bias and JNCC staff should remain aware of this when searching for evidence.

JNCC uses the free reference managing software Zotero, which should be available at team level to assist with managing information on relevant literature and generating reference lists. Decisions on which papers to acquire and review take much more time and this time needs to be estimated when planning a project and setting deadlines.

Conservation Evidence (https://www.conservationevidence.com/) provides a fully referenced summary of the evidence concerning a wide range of conservation actions based on a database of over 5,000 papers.

Collation and review:

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[8] This appendix is an edited version of EQGN 1, written in 2013-14 by Helen Baker and edited by Richard Ferris and Matt Smith

It is important to ascertain what constitutes reasonable effort in collating and reviewing relevant evidence. There is a trade-off between reducing bias in our assessments of evidence and the use (or impact) of the evidence product. Therefore, the effort spent reducing bias needs to be proportionate to the expected use (or impact) of the evidence product. A basic risk assessment can help in making a decision on how much effort to invest in searching, collating and reviewing published evidence (see the Evidence Quality Policy section 5.2). All categories of knowledge synthesis methods have been analysed by the EU-funded Eklipse project (http://www.eklipse-mechanism.eu/expert_group_on_methods), with their costs and benefits, strengths and weaknesses, to help select the most appropriate method for each task. The 21 methods analysed include:

    Systematic reviews
    Meta-analysis
    Multiple expert consultation with Delphi
    Non-systematic literature review
    Bayesian Belief Networks

http://www.eklipse-mechanism.eu/apps/Eklipse_data/website/EKLIPSE_D3-1-Report_FINAL_WithCovers_V6.pdf [9]

1.3 What is good or high quality evidence?

Adopting good scientific practice in evaluating evidence will help in judging the quality of evidence. Key questions to consider include:

- Are the data gathering methods fit for purpose and scientifically sound?
- Given the type and amount of data, are the analytical methods appropriate?
- Do the conclusions fit the results derived from the analytical methods?
- Is the work peer reviewed?

Not all good or high quality evidence is published in scientific journals and it should not be automatically rejected from consideration simply because it has not been published. If the authors have undertaken some form of peer review of the published material this might increase confidence in the quality of the evidence. In addition, other parties may afford a greater confidence to JNCC's evidence if published material has been subject to a peer review process. Conversely, peer review does not necessarily guarantee quality of information and JNCC staff should remain open-minded and inquiring about the evidence being drawn upon.

Valuable sources of evidence exist that will not have gone through any formal peer review process (e.g. industry activity data, site reports from SNCBs, EIA casework, data from trade associations etc.) and in some cases it may not be clear whether peer review has been undertaken. Review and inclusion of these kinds of evidence will require some assessment of quality, which will take more time.

1.4 Judging relevance of third party evidence

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[9] Dicks, L.V., Haddaway, N., Hernández-Morcillo, M., Mattsson, B., Randall, N., Failler, P., Ferretti, J., Livoreil, B., Saarikoski, H., Santamaria, L., Rodela, R., Velizarova, E., and Wittmer, H. (2017). Knowledge synthesis for environmental decisions: an evaluation of existing methods, and guidance for their selection, use and development – a report from the EKLIPSE project.

When assessing the relevance of evidence that has been collected by individuals or organisations outside JNCC the key points that should be considered are:

- Are your work or project objectives clear and correct? In some cases, it might be decided that objectives require peer review to ensure that they will deliver evidence that is fit for purpose.
- Do the hypotheses or objectives of third-party reports match some or all of the project's objectives? Evidence that is only marginally relevant would normally be excluded and records should be kept of the decision to exclude certain evidence.
- When was the evidence gathered? Evidence gathered some time ago might be less valuable than recently collected evidence due to the dynamic nature of natural systems, the policy landscape and other variable factors that may affect validity of historical evidence. However, historic data should not be automatically discounted and staff will need to make a judgement as to whether the evidence is still reliable and relevant.

It is important not to reject evidence solely because it conflicts with other evidence; this is not a valid way to judge relevance.

1.5 Using third-party evidence for assessments

Scoring and ranking quality and relevance can help determine how to use the evidence in an assessment or review. For example, lower quality evidence might be given less weight in an assessment if there is better quality very similar evidence available (see Table 1 for example rankings, on a scale of 1-5, with 5 being highest ranked). An attempt should be made to collate all relevant evidence of good or high quality to include in an assessment. Evidence of more marginal relevance that is included in an assessment might be weighted as less important for the findings than evidence more closely matching the project's objectives.

Table 1: An example of how to rank or score third party evidence

Relevance ↑			
	High relevance Low quality Rank 2	High relevance Medium quality Rank 4	High relevance High quality Rank 5
	Medium relevance Low quality Rank 2	Medium relevance Medium quality Rank 3	Medium relevance High quality Rank 4
	Low relevance Low quality Rank 1	Low relevance Medium quality Rank 2	Low relevance High quality Rank 2

Quality →

A scored/ranked approach to using evidence will be important for assessment of certainty in the overall findings from a review (also see tables in Section 3 'Assessing Certainty'). It will be up to project managers to decide when, and if, evidence should be discounted based upon ranking or scoring. Under some circumstances it may be the case that all available evidence is of low quality; this limitation must be clearly communicated in the final product or advice provided.

1.6 Meta-analysis of third-party evidence

Data sourced from other studies can be re-analysed statistically, including when combined with data generated by JNCC. This type of analysis should follow good scientific practice, including an assessment of the quality of the external data prior to use, and the resulting JNCC outputs.

Whichever methods of meta-analysis are chosen, it is useful to test that they are appropriate for your objectives through peer review, and have the findings peer reviewed (see Appendix 2).

1.7 Documenting the search and selection process

When undertaking the search and selection process it is recommended that the following steps are followed to enable an audit of the evidence selection process to be undertaken if necessary:

- Produce a simple plan for searching, collation and review of third-party evidence;
- Record the methods that have been utilised during this process;
- Keep a list of literature returned from specified search terms or the combination of terms and their different permutations;
- Record the risk assessment undertaken to judge the effort needed in collating and reviewing evidence;
- Assess the quality and relevance of collated evidence and record reasons for rejecting specified evidence, including material meeting quality and relevance judgements;
- If using a scoring method for assessing quality and relevance of evidence then a record should be kept of the method applied and outcomes;
- Record any peer review methods and outcomes for determining meta-analysis approaches and testing outcomes of analyses undertaken;
- Correctly cite all evidence used in an assessment; staff should refer to the JNCC Design Identity Manual for guidance on correct citation style.

1.8 Expert opinion and judgement

See Appendix 3.

2. Dealing with conflicting evidence

Systematic reviews of evidence typically demonstrate that divergent conclusions emerge from different studies of similar ecological processes or the effects of the same, or similar, interventions. There is a risk that in undertaking selective reviews of evidence conflicting evidence will be missed from an evaluation and not included in final conclusions (findings). This may result in assessments of certainty and response options being erroneous.

As best practice, the assessment of relevance and quality should be applied to all evidence, irrespective of whether there are conflicting findings. In practice this can be difficult, as literature searches may not include grey literature and fail to pick up on evidence that is deemed 'un-publishable' for various reasons.

There may be occasions when JNCC staff are faced with a situation where evidence sources give conflicting conclusions and will have to judge which evidence is the most reliable. If there is a case where 2 or 3 high quality evidence sources conflict with numerous

low quality evidence sources it will be imperative that staff judge the reliability of the sources and it would be likely that the high quality evidence would take precedence over low quality evidence.

The weighting of evidence, if used, should be applied consistently to ensure that the outcome of an assessment of findings is repeatable and that the certainty of the overall finding can be qualified. To enable this, JNCC staff are required to document the decision-making processes that have been used to select what is deemed to be the highest quality evidence.

3. Assessing certainty

Uncertainty can arise from lack of evidence or disagreement about what evidence conveys. Evidence types can vary and may be measured (quantifiable) or descriptive (qualitative).

Assigning certainty terms to findings from the review or assessment of multiple sources of evidence can be done using the UK National Ecosystem Assessment (UK NEA) 4-box model and likelihood scale (Appendix 3.1, page 61, of the Technical Report), which is modelled on the Intergovernmental Panel on Climate Change (IPCC) approach.

The IPCC approach uses two ways of communicating certainty in findings:

- **Confidence in the validity of a finding** based on type, amount, quality and consistency of evidence and the degree of agreement. Confidence is expressed qualitatively;
- **Quantified measures of uncertainty** in a finding expressed probabilistically (as likelihood).

Findings or conclusions can be assigned a standard term using criteria:

Confidence	Standard term	Criteria
High	Well established	High agreement between evidence and plenty of good to high quality relevant evidence available
Medium	Established but incomplete evidence	High agreement but limited evidence
Low	Competing explanations	Low agreement albeit with plenty of evidence
Very low	Speculative	Low agreement based on limited evidence

Or assigned with a level of likelihood using the scale:

Likelihood terminology	Probability of occurrence
Virtually certain	>99%
Very likely	>90%
Likely	>66%
About as likely as not	33-66%
Unlikely	<33%
Very unlikely	<10%
Exceptionally unlikely	<1%

Examples of how this is used can be found in the UK NEA:

> *"Agri-environment schemes are critical to maintain and enhance the biodiversity of ecosystem service of semi-natural grassland. Maintenance of the biodiversity and cultural value of semi-natural grassland requires low intensity management related to traditional farming (**well established**) ... protected and restored semi-natural grasslands also have potential to provide recreational and tourism services, and pollinator and pest control services for adjacent intensive farmland (**likely**)."* (Key findings, Chapter 6 of Technical Report, page 163):

In this example, the statement about low intensity management is derived from a mixture of quantitative and qualitative evidence; hence a qualitative assessment of confidence has been made. The statement on pollinator and pest control services is based on quantitative evidence only.

> *"**Marine microbial organisms play a key role in cycling nutrients that are essential for other marine organisms and the services and benefits they provide** (**well established** and **virtually certain**). Microbial processing of nutrients in the sediment depends on invertebrates disturbing and irrigating the sediment (**established but incomplete evidence**). Without this recycling, most nutrients would be lost from the ecosystem to the seabed as they would sink from the water column and then be buried (**virtually certain**). In open water, planktonic coccolithophores make a major contribution to the global carbon sink (**virtually certain**). Climate change may affect internal nutrient cycling by changing nutrient exchange processes between the open waters and the open ocean and altering water stratification, but the likely direction and extent of these changes is still poorly understood (**likely**)."* (Key finding, Chapter 12 of Technical Report, page 461)

In this example, the statement that microbial organisms play a key role in nutrient cycling is derived from well established, peer reviewed, quantitative evidence. Therefore, a quantitative assessment of confidence has been applied. The statement on the effect of climate change on internal nutrient cycling was derived from interdisciplinary reviews of evidence that was emerging in 2006/07. Due to the limited amount of established evidence a lower confidence has been applied.

It is important to note that there is a marked difference between confidence assigned from statistical analysis and certainty assessments based on the conclusions from multiple sources of evidence. This should be kept in mind and clearly communicated in the final evidence outputs.

Appendix 2. Peer review in JNCC evidence and advice provision[10]

1. Introduction

Peer review is the expert assessment of concepts, methods and outcomes in evidence gathering and advisory processes; it can be a powerful tool in evidence quality assurance (EQA). Evidence provided by JNCC should be subject to a level of assessment proportionate to the proposed use (potential impact) of the evidence and its likely contribution to that use. Peer reviews can be conducted during the planning phase (development of a specification), whilst research is being undertaken, when the work is being finalised and when the end product is produced. Expert opinions and knowledge can also be peer reviewed.

Peer review can be formal or informal and conducted using a range of methods including: consultations; peer review panels; working groups; steering committees; scientific advisory committees; and expert consultations. Reviewers can come from within JNCC, Statutory Nature Conservation Bodies (SNCBs), partner groups, or be fully external and independent of government organisations. The selection of reviewers will depend on the scope and use of the evidence.

Peer review is helpful in assuring that data collection is fit for purpose, of suitable quality, and that the resulting evidence is interpreted appropriately by audiences. Independent expert scrutiny can be particularly important in cases where evidence is complex and likely to have a significant impact on decision-making and policy development. Peer reviewing provides an opportunity to ensure transparency in the evidence-gathering process.

2. When is peer review required?

It is the responsibility of advisors and project managers to quality assure evidence and advice and, as part of this process, to decide on any need for, and type of, peer review that will be required to meet Quality Assurance (QA) standards.

If required, peer review should be planned as part of project delivery, and sufficient time and resources built into project plans to ensure that the chosen peer review methods can be undertaken satisfactorily. External reviewers might need to be paid for their time and their travel and subsistence for taking part in meetings. Plans for peer review should be included in any project initiation documents, including the business case, and the project audit document (PAD).

Peer review is not always appropriate or possible, particularly if advice is time-constrained. A general risk assessment approach can help in deciding whether peer review is needed, at what stages in a project or advisory work it should be used, and which method would be most effective.

Refer to the risk ratings in the Evidence Quality Policy, section 5.2.

In applying the risk-based approach, the following considerations might be useful:

- The degree of potential political, environmental, economic and social impact.
- Likelihood of establishing a precedent.

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[10] This appendix is an edited version of EQGN 2, written in 2013-14 by Helen Baker and edited by Richard Ferris and Matt Smith

- How contentious the advice or decision is likely to be.
- The novelty of the issue being explored.
- Complexity of the issue and the existing evidence base.
- Difficulty of the analysis required.
- Timescale available for delivering advice.

Projects and advisory work with medium- or high-risk assessments are likely to demand peer review at some stage, whilst many low-risk activities are likely to require minimal or no peer review. Once a risk assessment has been made the level of peer review should be assessed for each stage of the project.

3. Levels of peer review

Listed in the table below is an indication of the types of advice that JNCC provides, the likely sources of information, and an indication of the proposed level of peer review staff could consider applying to these types of evidence products. Explanations of the different levels of peer review are presented in section 3 of this document.

Type of product	Source of evidence	Level of review
Quick advice	Expert knowledge ± limited review	1
Limited (shallow) reviews	Expert knowledge + limited review	1/2A
Moderate reviews	Expert knowledge + moderate review	2A/2B
Substantial (deep) reviews	Thorough review of evidence ± expert knowledge	2B-3B
Systematic reviews	Fully systematic review of evidence ± expert knowledge	2B-4
Survey products (including GIS)	Data collection, analysis and interpretation	3B-4
Methodologies (tools and models)	Thorough review of evidence collection methods and interpretation	3B-4

The table above presents a generic guide and there will be varying needs for the differing types of advice that JNCC produces. When deciding the level of review required, staff will need to take account of the risk model (EQA policy section 5.2), time constraints, and resource availability. Peer review within JNCC is likely to be a two-way process, with staff required to act as reviewers and experts. This will be necessary for the peer review system to be streamlined and sustainable.

Level 1: Self assessment

This level of QA is likely to be acceptable only for particular time-constrained low-risk and some medium-risk evidence and advisory activities. The level of expertise of the staff member is an important factor in judging use for medium-risk projects.

For advice that is time-constrained, self-assessment might be the only option available, but for many medium-risk and high-risk projects it would be best practice to seek the view of another expert (usually a suitably knowledgeable colleague within JNCC).

When undertaking a self-assessment review it is important to ensure the consistency of the advice and evidence being provided. It is important that staff continually work at developing skills necessary to conduct effective reviews and self-assessments.

Level 2A: Internal peer review

This level of peer review follows on from self-assessment and involves peer review by one or more people from within JNCC who possess relevant expertise. Low- and medium-risk work would typically be subject to internal peer review only, but in some cases this might be acceptable or necessary for high-risk work, especially if time-constrained or confidential.

An internal peer reviewer must possess relevant expertise. Reviewers may be:
- A JNCC staff member
- Line managers
- Programme leaders
- Directors

Level 2B: Peer review involving the SNCBs and relevant agencies

A similar approach to 2A can be applied, but also involving relevant staff from the SNCBs and other relevant agencies (e.g. SEPA, EA, CEFAS). Projects and advice that fall within UK coordination are typical candidates for peer review support from the SNCBs, for example collating evidence for national reporting or making changes to UK guidelines.

Level 3A: High level internal peer review

This next level of internal peer review should be carried out in cases where a high level of transparency is necessary due to the potential high risk or impact of the advice or resultant decision, or where there is a high degree of data complexity, novelty, technical difficulty, or financial value. Depending on the project or work, this level of peer review should be carried out by:
- An appropriate Director
- Science Management Board

Level 3B: High level peer review involving the SNCBs and relevant agencies

A similar approach to 3A can be applied, but also involving relevant staff or governance groups from the SNCBs and other relevant agencies. The Chief Scientists' Group (CSG) and relevant senior task and finish groups established by the CSG are likely to have a role. Independent members of the Joint Committee might also be involved in certain areas of work.

Level 3B: High level peer review involving non-governmental partners

In addition to other level 3 approaches, peer review of work with non-governmental partners is often used for long-term contracts or partnerships. Working or steering groups are often in place and will involve partners and usually staff from SNCBs. These groups act like 'internal' review bodies.

Level 4: External independent peer review

This level of peer review applies to instances where an independent review from outside JNCC, the SNCBs and government departments is required. This level should be applied to all high-risk work where time permits, especially when the work is considered controversial

and/or highly challenging, or where JNCC lacks specific skills. This level of peer review should be undertaken by an appropriate external or independent body, such as:

- A qualified and independent expert, or panel of experts, from outside government.
- Relevant partner organisation(s).
- An accredited professional review body external to government.

The following procedures should be followed when conducting an external peer review:

- A clear set of objectives needs to be identified and agreed upon.
- A list of experts with relevant expertise should be drawn up.
- Invitation to undertake the review should be sent to chosen experts (normally those who are available and have been judged to possess the highest level of expertise).
- Declaration of any conflicts of interest should be requested.
- An explanation of the purpose of the review, a proposed timetable for completion and terms of reference should accompany the invitation.
- Confirmation from the reviewer should be obtained, stating that he/she is willing to undertake the commission based upon the proposed terms. A contract will need to be drawn up if reviewers are being paid or travel and subsistence is likely to be provided for meetings.
- A minimum of two reviewers should be appointed (in cases where the topic is highly specialised it may only be possible to identify one suitable expert). However, using more than two reviewers will minimise the risk of late submission or failure to submit by the reviewer and may provide a more even-handed perspective on the topic.
- Reviewers should be made aware of particular contentious or technically challenging aspects of the work.
- A standard review form could be provided, which could include a request for the reviewer to self-assess their expertise (as the Research Councils do).
- Once the review has been undertaken and has been received, all suggested changes should be compiled. It may be necessary to contact the reviewer for further clarification.
- Each suggested amendment must be considered and changes should be made when considered appropriate.
- An accurate record of all proposed changes (both rejected and accepted) must be kept. The record should state how comments were dealt with.
- In some cases it may be deemed appropriate to obtain additional external independent opinion on subjects where reviewers are in disagreement.
- Draft documents, reviews, accounts of how suggestions were handled, and the subsequently amended text should be retained.
- Reviewers should be acknowledged in all publications unless they have requested anonymity.

Appendix 3. Quality Assurance of Expert Knowledge and Opinion[11]

1. What is expert knowledge and opinion and why is it needed?

The advice that JNCC provides is strongly based on direct evidence, which is obtained from many sources, including the *knowledge* of experts. However, there are occasions when expert *opinion* is also required to generate evidence. Expert opinion is an informed judgement, based on the experience and knowledge of the expert(s) concerned. It can be presented as a form of scientific evidence, as opposed to a value judgement. It contrasts with evidence derived from direct empirical observation, or extrapolation of empirical evidence.

Techniques for eliciting expert opinion are used in many fields, for example engineering, medicine and hazard prediction. The techniques aim to synthesise opinions of experts where there is uncertainty, for example, in the case where there is a lack of data.

Collating expert opinion in order to address a particular problem is widely used in the science and practice of conservation because of the complexity of ecosystem interactions, relative lack of data, and the imminent nature of many conservation decisions and their far-reaching effects. It may also be favoured in situations where there are constraints on time and costs or staff skill restrictions associated with collecting, analysing and extrapolating data. The EKLIPSE project (http://www.eklipse-mechanism.eu/expert_group_on_methods) provides an analysis of the evidence synthesis methods "Expert consultation" and "Multiple expert consultation with formal consensus method such as Delphi".

JNCC report 490, published in 2013[12], examined the potential use of 'expert judgement' as a tool, or approach, within marine biodiversity status assessments, and also extensively evaluated and explored several scientific disciplines. Report 490, pp. 86-87 provides recommendations for how expert elicitation processes should be carried out.

2. Confidence in expert opinion

2.1 Impartiality

Experts are not necessarily objective observers free from bias, whether subconsciously or purposefully. Expert opinion reflects, for the most past, personal experience which, by its very nature, will have its limits. The bias may be particularly true in conservation, where in many cases the people providing the expert advice are generally the same as those involved in implementing decisions informed by that advice. Scientists tend to have specialisms or preferences, for a particular habitat, species, or even a particular strategy, and that will be reflected in their opinions and advice.

It is important that an expert is asked if they would prefer one outcome over another, to guard against the assumption that the opinion is neutral. It is important to remain aware that the selection of experts will affect the nature of opinions received and thus the outcome of the advice given. The selection and management of the elicitation of expert advice should

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[11] This is an edited version of Evidence Quality Guidance Note 3 (EQGN 3), written by Richard Ferris in 2013 and edited by Matt Smith and Helen Baker.
[12] Barnard, S. & Boyes, S.J. (2013). Review of case studies and recommendations for the inclusion of expert judgement in marine biodiversity status assessments. JNCC Report 490, ISBN 0963 8091.

maximise impartiality and obtain a balanced view as far as possible in order to increase assurance in the quality of the opinion.

2.2 Challenge

A key principle of using expert opinion (and often a legal requirement) is that it must be open to challenge by anyone with a stake in the outcome. Although it is not JNCC's intention to suppress critical questioning of its use of expert opinion, information has sometimes been presented in the past in a format that makes challenge and/or questioning difficult. It is important that challenge to expert opinion is facilitated (see the openness and transparency principles outlined in the EQA Policy section 3.2).

3. Risks and mitigation measures

3.1 Proportionality

Applying a 'risk model approach' (see the Evidence Quality Policy section 5.2), it is possible to make logical decisions about the nature and degree of quality assurance that will be required for the processes of elicitation of expert opinion. For example, if the advice is given in response to statutory obligations (e.g. reporting under the Habitats and Wild Birds Directives) or is likely to affect important, high-profile decisions (e.g. designation of protected areas, such as Marine Conservation Zones) then it may be justifiable to invest more time in checking the quality and reliability of that expert opinion. In contrast, advice relating to lower impact issues, or where JNCC input is limited (in comparison to other bodies) does not require such a high level of time investment.

3.2 Transparency

The process used to evaluate expert opinion needs to be open and transparent and structured to follow a clear set of recorded steps to enable the process to be clearly traced and monitored (see Appendix 5). The record should include the methods used, decisions taken, and attribution of judgements to named individuals (unless anonymity is required; where this is the case the reason for anonymity should be recorded).

3.3 Defining requirements

Ahead of seeking input from experts, steps that can increase clarity and reduce uncertainty in their responses include deciding what information is needed, how it will be used, and defining the important terms and concepts involved. This will inform choices of which experts are consulted and help to ensure that they are familiar with requirements in advance.

In some circumstances, it may be appropriate to increase familiarisation of experts on the issues to be addressed (without introducing bias) to help streamline the quality of information that is provided.

3.4 Selecting experts

In order to minimise bias, opinions from two or preferably more experts (see section 3.5, below) should be sought, in order to 'normalise' potentially extreme views. By eliciting multiple opinions from experts with a wide range of views and expertise, greater stakeholder confidence in the advice will be established.

To ensure a wide range of views are captured, it is good practice to involve non-government experts from academic, NGO and/or business communities. However, there are situations when the need for confidentiality means that seeking the views of a wide range of experts is undesirable. Such decisions should be clearly justified and recorded in sufficient detail to stand up to the scrutiny of auditors.

It is recommended that the identity of experts consulted is made clear, so that emanating advice is attributable, unless there is a genuine reason for anonymity, for example to reduce pressure from external sources to present a particular viewpoint that is not their own, or for reasons of personal security. Any such reasons should be clearly identified.

Although every effort should be made to recruit the most appropriate experts for the issues under study, they are not always going to offer (on further evaluation and analysis) good opinions. Their knowledge can be out of date (e.g. unfamiliar with the most recent research), or overconfident in their abilities. Experts, particularly scientists, are often asked to predict something based on their knowledge of a subject. The consequences of poor predictions can be dramatic and have profound implications. An assessment of the skill level of the experts engaged should be recorded (e.g. as a mini 'biopic').

3.5 Multiple opinions

Using groups of experts helps overcome limitations of employing a single expert, and the variability in expert knowledge. Taking an appropriate statistical average value or assimilated and synthesised standpoint from a larger group is likely to result in a more balanced opinion than from a small group or individual expert. Guidance on appropriate group size can be found at (JNCC report 490).

In eliciting the opinions from a selected group of individuals, the *Delphi Method* can be a useful tool (see JNCC report 490, the Eklipse project (http://www.eklipse-mechanism.eu/eklipse_outputs_tools) and Mukherjee et al. (2015)[13]). It aims to improve on use of a single individual's opinion by asking each group member to offer a response to the question at hand, then bringing the individual responses back to the whole group, discuss the views, and then make a second, potentially revised view individually, which again is then brought back to the group. The *Delphi Method* is an iterative process that is repeated until a group average is achieved (details of the process and its strengths and weaknesses are examined in JNCC report 490 and the Eklipse project at http://www.eklipse-mechanism.eu/eklipse_outputs_tools).

Sometimes it is advisable to 'calibrate' responses by asking some questions to which the answer is already known, to evaluate the level of expertise in individual experts. From this, it is possible to weight individual's opinions based on the particular levels of expertise in each expert.

3.6 Summary

The aim of the process of seeking expert opinion is to make it as robust as possible, that is to minimise bias and improve accuracy and hopefully get closer to the best possible answer, whilst recognising constraints of time and knowledge.

To this end, it is essential to provide:

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[13] *Methods in Ecology and Evolution*, 6: 1097-1109.

- An indication of the level of expertise held by those providing the advice, and a measure of the applicability of the advice to the issue involved;
- A judgement by the expert involved as to whether they are **reasonably certain** or **reasonably uncertain** that the advice is of high quality (reliability assessment);
- An indication of which elements of the advice are based upon a review of the evidence and information available, and which are based on the judgement of the expert.

Appendix 4. Communicating evidence quality[14]

1. General principles

The effective management and dissemination of scientific evidence are essential to JNCC's work. No less important, however, is communicating information about the *quality* of the evidence and advice provided. Information about parameters that define the quality of evidence used is essential to validate, corroborate and support the advice that JNCC provides.

When communicating evidence, it is important to devise in advance a communications strategy for each project that includes measures to record the quality of the evidence supplied in order to help support any scientific conclusions and decisions that are made on the basis of that evidence. The quality evaluations should be made available alongside the evidence that is supplied at the end of the investigative research.

During the initial work planning process it is important to make provisions for communications activity, including communicating evidence quality. JNCC's Communications Team can offer guidance on devising communications strategies and how best to communicate quality assurance measures. For example, it may be that the evidence quality information is not directly communicated to a target audience, but is simply made available through references in a document or via the JNCC website. However, the greater the uncertainty in quality of evidence used, the greater the need to openly communicate reservations.

2. Evidence quality in communications planning

Beyond an overarching communications strategy (the justification and reasoning for communications activity to achieve the desired results – the 'why'), a communications plan (the 'what', 'where', 'how' and 'who') is needed for each piece of evidence work. The plan will need to reflect the decisions taken on the type of communication method to be used, the definition and location of the target audience(s), and how the work will be communicated to those audiences.

The plan itself will also need to encompass how the evidence and its quality assurance is to be presented. Any final advice provided by JNCC should have at least a summary of potential variables affecting evidence quality. Examples of this may include: differing geographical scales used in aggregated datasets; complex accumulation methodologies applied to data of different ages and collected from various sources; or whether different methods for aggregating expert opinion have been applied (see Appendix 3 on expert opinion).

The communications plan will need to be reviewed periodically and may require revision as work progresses, including any revisions to information about evidence quality. Not all communications activity will necessarily occur at the end of the work so where time allows, reviews of opportunities for additional communications activity may be explored.

Evidence – and information about the quality of that evidence - should be presented in a format most appropriate to the activity and be accessible to the target audience(s). Examples of appropriate media may include: email, press releases, newsletters, JNCC web

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[14] This appendix is an edited version of EQGN 4, written in 2013-14 by Richard Ferris and edited by Helen Baker and Matt Smith

pages, reference lists, external websites, printed media or direct engagement in conference or meeting settings.

Technical publications are suitable for many types of evidence, from research reports to publishing results of monitoring activities. Publication in the scientific literature may be a suitable option – one where the quality of evidence will always be independently peer reviewed, and which increases external confidence in the advice being provided. Other types of evidence will be suited to dissemination by other means, such as geographic databases (spatial datasets and analysis outputs) and maps, all of which require accompanying information about data quality.

3. Communicating uncertainty

It is important to realise that being open in describing the uncertainty in how we understand a problem means that the strengths and weaknesses of the science underpinning the advice become clearer. Communicating uncertainty can also reassure users of the reliability and applicability of the evidence provided.

Levels of uncertainty in the interpretation of evidence should be identified explicitly and communicated directly in plain language. The approach to assessing uncertainty described in Appendix 1 (Bias, conflicting evidence and uncertainty) is taken from the UK NEA and IPCC approaches; this terminology should be used. It is important to state clearly what precautionary approaches are being taken in response to any uncertainties that have been identified throughout the course of the project.

There will inevitably be occasions where advice is required at short notice. In such cases, decision makers should be made aware of the period of notice which specialists have had to prepare evidence. The level of confidence in the quality of the data, and appropriate cautions, should be stated; this is particularly important where analysis and evidence have been time-constrained.

4. Openness and transparency

4.1. Restrictions

When beginning any evidence advice work it is necessary to decide if there is a justifiable reason for restricting access to evidence or to the assessment of certainty regarding accuracy and quality (e.g. if it was 'commercial in confidence'). In cases where access needs to be restricted, the reasons for doing so must be recorded clearly. Advice on data restriction policy should be sought from JNCC Communications Team.

4.2. The benefits of open communication

In the majority of cases, it is essential to adopt an open and transparent approach to communicating scientific advice and ensure that the processes undertaken to acquire and assess the evidence are clearly presented. The qualification of the level of accuracy or uncertainty, whether in statistical or descriptive terms, is an important part of evidence provision. This openness is vital to ensure that all relevant streams of evidence are considered and that stakeholders are fully aware of these. Openness also increases the confidence of experts and the public in JNCC's advice work.

5. Who should communicate the evidence and who should communicate information about its quality?

Selecting effective communicators to relay the message(s) and convey the evidence quality activities that were involved in the work is a key consideration. This may depend upon the intended audience (stakeholder group) for each message and identification of the most appropriate methods for interacting with the different stakeholders, whether disseminating information, seeking consultation, or deliberating. The main communicator of the evidence itself may not necessarily be the person who conveys technical information, including quality, about the evidence. The evidence quality communicator may feel that the job is a subsidiary activity to the main message, but without it, the evidence itself could be called into question or even dismissed.

The methods of analysis and judgement that went into gathering evidence, and any important gaps in the data, should be clearly identified and presented in communication products. See EQA Policy Appendix 3 (QA of expert knowledge and opinion).

Levels of confidence may be expressed mathematically for numerical data, but whatever statistical method is applied to present evidence, the derivation of error margins needs to be expressly shown. Activities that have been carried out to verify and corroborate evidence supplied are important in order to demonstrate that the evidence used has a quality of surety associated with it.

6. Dealing with challenge

6.1. A suitable process

Given the wide range of stakeholders with an interest in the evidence JNCC supplies, it is inevitable that there will be challenges to the way in which evidence has been acquired and the level of reliability of the evidence, which, if the challenge were correct, would undermine conclusions. It is important to have an agreed, open and transparent process of describing confidence and quality assurance of evidence in order to fully understand and deal with potential challenges to evidence and advice.

When responding to stakeholder concerns over emerging findings, it is important to:
• State clearly the level of quality assurance and peer review which has been carried out;
• Identify all the margins of error in variables and parameters, as well as any limitations of the methods used to aggregate data, particularly where diverse datasets have been drawn on;
• Identify geographical scale and age of data used;
• Acknowledge the qualifications and experience of experts consulted and the breadth or the limitations of expert consultation (if time was a limiting factor);
• State whether the work will be subjected to any further assessment or peer review; and,
• State when the outputs of the work are likely to be made available.

6.2. Additional evidence

Where external challenge involves the submission of additional evidence to which JNCC has not yet had access, this should be considered carefully. Depending on JNCC's evaluation of the validity and appropriateness of new information, it may be used to update the evidence base, and revise conclusions. However, the 'audit trail' of how any new evidence, evidence quality, and modifications of conclusions came about should be carefully recorded. All such additional evidence or data being considered for inclusion or exclusion in revised advice

must be documented, including assessments of the accuracy and appropriateness of new data, along with the reliability of data gathering methods. The rationale for excluding any datasets from the assessment process needs to be published alongside the advice and evidence that is being communicated.

JNCC operates a complaints procedure. This should be followed in cases where resolution of a challenge to our evidence provision is not possible. Further information on this procedure can be found on the JNCC website at https://jncc.gov.uk/about-jncc/corporate-information/complaints/.

Appendix 5. Monitoring and auditing [15]

1. Record keeping for monitoring compliance with the JNCC EQA Policy

1.1 General principles

In order to comply with the core principles in the JNCC EQA Policy, staff need to keep adequate records of the decisions, actions and outcomes associated with providing evidence and advice.

1.2 Project audit document (PAD)

As set out in the EQA Policy, section 10, the EQA flowchart (Figure 1) permits staff to determine when a project audit document (PAD) should be used. When appropriate, a PAD must be created and maintained throughout the life of a substantial piece of work (e.g. an in-house evidence review) or project so that monitoring could be undertaken easily and any external requests for information (e.g. FOI requests) can be managed as efficiently as possible.   The EQA questionnaire on the SharePoint site must be used to record use of the PAD and the decisions taken if a PAD is not used. The SharePoint site will be monitored as part of the JNCC governance process (see EQA Policy document).

Forms in Annex 1 are to help staff ensure that they have captured relevant information; more detail can be recorded if this is helpful in managing a project or piece of advisory work (an example list of documentation is included in Annex 2, derived from Defra's (2015) Joint Code of Practice for Research (JCoPR), which might be useful for some survey projects).

The PAD should specify roles and responsibility of staff involved in the project with respect to document management and record keeping, including product sign-off processes. If the document contains personal information its management must be compliant with Data Protection Act requirements. Any confidential information should be clearly identified and controls for its management specified so that all staff involved in a project are able to judge when information can be shared externally (see 1.3, below)

The audit document should be fully completed at the end of the project to facilitate monitoring and should include a concluding statement on success of the quality assurance process used and any thoughts on improvements.

1.3 Confidentiality

Deciding whether information is confidential is very difficult, but there should always be a presumption that at some stage nearly all documented information that we deal with in procuring and reviewing evidence and in giving advice will go into the public domain. Judging what information to proactively publish and when to publish is important; it is fundamental to open and transparent government.

The Freedom of Information Act (FOI) and the Environmental Information Regulations (EIR) recognise that there will be valid reasons why some kinds of information may be withheld, such as if its release would prejudice national security or damage commercial interests. A list of exemptions is available (a good source of guidance is The Information Commissioner's Office), which includes publication, commercial confidence, damage to the environment (under EIR), personal information, etc. The Data Protection Act sets out information that

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[15] This appendix is an edited version of EQGN 4, written in 2013-14 by Richard Ferris and edited by Helen Baker and Matt Smith

would be exempt from public disclosure in relation to personal information; staff must comply with the Act (training and guidance are available on the Civil Service Learning Portal).

If there is any doubt about whether information used to procure evidence or provide advice is confidential then staff should seek help from the Finance and Planning Team for issues related to procurement and the Communications Team for other issues. External experts, including peer reviewers, should be made aware of the limits to confidentiality in dealing with their personal information and the evidence that they provide before they participate in any evidence and advisory activity.

1.4 Proportionality

As with all approaches to EQA the effort made in documenting actions should be proportionate to the risks associated with the evidence (see 3EQA Policy 5.2). However, we recommend that even small, simple evidence and advice communications have some record of QA associated with them, for example, expert opinion given without the provider having checked and cited evidence could be described as such in an advisory communication.

1.5. Document management

To support effective QA actions, the following principles should be followed:

- All documentation must be managed in a designated space on a general access server unless there are genuine reasons for maintaining confidentiality and limited access.

- Folder structure and file-naming conventions should be agreed at the start of a project to help with management and version control, searching and accessibility to others.

- The use of a document tracking form is required for version control of any single document (see Annex 3 for examples). A circulation or distribution list can be a useful addition. Both of these can be removed from final products before publication, but should be kept for record.

- Document sharing and management software particularly SharePoint may be helpful for version control.

- All reports or papers should provide a formal citation for others to use, and include the date of publication. The general JNCC Communications email address can also be included to provide a future-proof way for users to contact staff about a specific publication.

- Document retention must follow current JNCC Policy. All physical and electronic information should be reviewed in accordance with the JNCC Retention and Disposal Protocol, Annex A, revised in 2018.

2. Monitoring of evidence quality within individual projects and across JNCC business

2.1 General principles

JNCC will monitor the quality of its evidence and advice on a regular basis and implement changes necessary to address any serious shortfall in compliance with its EQA Policy or the adequacy of that policy.

2.2 Monitoring approaches

Monitoring methods will include twice-annual checks through the SharePoint EQA site and using the PAD documents. The approach in any business year will be defined by the Executive Leadership Team (ELT).

The Joint Committee with guidance from ELT and the Audit and Risk Committee (ARAC) has responsibility for assessing how well JNCC is performing on evidence quality management; an annual report will be provided to ELT and the Committee.

2.3 Roles and responsibilities of others in monitoring evidence quality in JNCC

The Science Management Board (SMB) has an important role in quality assurance of evidence products. Processes and grant-in-aid projects are reviewed by the Statutory Nature Conservation Bodies (SNCBs), represented by the Chief Scientists' Group (CSG). This can be regarded as an important element of peer review (see earlier section).

Inter-agency (IA) groups (established by the CSG) and project steering groups can also play a role in supporting monitoring of EQA processes. Such roles should be agreed and incorporated in the terms of reference of any task or project, and included in a PAD.

In our longer-term evidence partnerships it may be beneficial to have partners involved in active monitoring of quality. Each project should consider how this might work in meeting the requirements set out by ELT for monitoring and reporting on evidence quality.

2.4 Reporting

Information on evidence quality management, including methods and outcomes, will be reported to the Joint Committee and published annually as part of our usual business reporting process.

ANNEX 1

FORMS FOR RECORDING EQA ACTIONS

FORM A – FOR USE WHEN PROCURING EVIDENCE

Note that this form can be adapted for a specific application.

Project stage	What to record	Comments
Initiation	Staff involved in the project and roles and responsibilities, including management authority	A Project Initiation Document (PID) is a useful tool for defining project governance
Specification development	Any peer review undertaken to refine the project specification, including who was involved (including position and organisation of external personnel)	Use EQA Policy Appendix 2 to help decide on scope of any peer review at this stage
Invitation to tender	Minimum quality controls are specified	See EQA Policy Table 1 for minimum requirements in procurement documentation to support the procurement of evidence that is 'fit for purpose' quality.
Tender evaluation	Panel membership and evaluation method (virtual or meeting). Criteria used and scores, and that capability test has been met	
Contract	Contractor CVs are on file	
	Methods are fit-for-purpose	
	Risk assessment associated with innovative methods is available and adequate mitigation planning is included	
	Peer review plans are specified and adequate	Use EQA Policy Appendix 2 to help decide on appropriate scope of peer review
	Contractor quality management system is adequate and in use	See list of recognised systems below. It is good practice to request a QA report from a contractor linked to specific milestones or deliverables
	Data management approaches are adequate	Check compliance with JNCC Data Management Policy and any additional requirements
	Contractor understands what is required in terms of communicating uncertainty	Use EQA Policy Appendix 1 as a guide to inform the contractor

Project stage	What to record	Comments
Checks and completion	Any changes to the project that might impact on evidence quality and the agreed methods for ensuring that quality management is maintained	
	Contractor has satisfactorily completed the project in accordance with the contract specification and demonstrated that quality management has been carried out as required	
	Any peer review undertaken outside of the contractual process, e.g. independent peer review of reports, including who was involved (including position and organisation of external personnel)	Peer review activities should typically be included as part of the project process, but there might be cases where JNCC undertakes additional independent review. See Appendix 2 for further details on the peer review process
	Any changes to project documents as a result of peer review outside of the contractual process	Use standard document version tracking

The table below shows examples of internationally recognised quality management systems.

ISO Standard	Purpose of Standard
ISO 9000 - Quality management	ISO 9000 addresses aspects of quality management standards. The standards provide tools and guidance on how to ensure that products and services meet clients' requirements and that quality is consistently improved.
ISO 14000 - Environmental management	Addresses various aspects of environmental management by providing tools for organisations seeking to identify and manage their environmental impact and improve environmental performance. The other standards in this category focus on specific environmental aspects such as life cycle analysis, communication and auditing.
ISO 26000 - Social responsibility	Provides guidance on how organisations can ensure their operations are ethical and transparent and conducted in a socially responsible manner.
ISO 31000 - Risk management	Provides guidance for managing risk and assists organisations to increase the likelihood of achieving objectives, identify opportunities and threats, effectively manage and treat risk, and ensure sound corporate governance.
ISO/IEC 27001 - Information security management	ISO 27000 standards help organisations keep secure assets such as financial information, intellectual property, employee details or information entrusted by third parties.
ISO 80000 - Quantities and units	Provides information about mathematical signs and symbols, their meanings, verbal equivalents and applications. The recommendations are intended mainly for use in the natural sciences and technology, but also apply to other areas where mathematics is applied.
ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories	Specifies requirements for the competence to carry out tests, calibrations, and sampling; covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods.

Further information on quality management systems can be found on the International Organisation for Standards website: http://www.iso.org/iso/home.htm

FORM B – FOR USE WHEN REVIEWING EVIDENCE AND GIVING ADVICE

Note that this form can be adapted for a specific application.

Activity	What to record	Comments
Objectives setting	• Any peer review methods used at this stage and names of reviewers (including position and organisation of external personnel)	Keep any peer reviewers' comments in original format
Selection of evidence	• Search method used, including any risk assessment made to determine search effort; • lists of search results for each specific search term; • criteria for assessing the relevance and quality of evidence; • list of evidence sources considered relevant but rejected and the reasons for rejection	Contractors should be requested during project initiation phase to keep a record of these
Use of evidence	• Any weighting of evidence used (method of weighting and results); • methods used for selecting any meta-analysis techniques and reasons for choosing those used; • methods for acquiring expert opinion and any validation methods, including reasons for excluding any expert opinions; • methods used for combining quantitative and qualitative evidence, including how and why these methods were chosen; • checks undertaken to ensure that all evidence that has been used is fully cited using the correct format (see p.25-27 in the JNCC Design Identity Guidance)	Keep all experts' comments in original format if using expert opinion as a source of evidence
Summary conclusions	• Check that they accurately reflect the evidence actually used; • ensure that any estimates of certainty have been described consistently; • peer review methods used, including selection, and reviewers names (and positions if external)	Keep all peer reviewers' comments in original format
Response options (advice)	• Any risk assessment methods used and reason for choosing them; • peer review methods used and reviewers names (and positions if external)	Keep all peer reviewers' comments in original format

ANNEX 2

JOINT CODE OF PRACTICE FOR RESEARCH (JCOPR) Defra (2015)

EXAMPLES OF DOCUMENTARY EVIDENCE

QUALITY ISSUE	EVIDENCE REQUIRED
1. Responsibilities	• Organisation structure showing line management responsibilities (organogram) • Updated and maintained list of personnel involved with the project (including sub-contractors) • Documented agreement with sub-contractors to adhere to JCoPR and evidence of rationale for appointment • Documented roles and responsibilities for all project staff (including subcontractors)
2. Personnel competence	• Consistent collation of CVs of all personnel associated with the project (including sub-contractors) • Maintenance of relevant, up-to-date training records for all project staff (including evidence showing awareness of obligation to comply with the JCoPR provisions)
3. Project planning	• Risk assessment (where appropriate) • Records of regular reviews of project timetables and plans • Up-to-date approved project plan with milestones and deliverables • Statistical validation of experimental plans and procedures for analysis of data • Documented approved procedures for sampling materials • Ethical approval documentation and project licences (where appropriate)
4. Quality Control	• Documented internal 'fit-for-purpose' review procedures • Records of consistently applied internal audits, findings and corrective actions taken • Approved publication policy with authorisation procedures
5. Health and safety	• Documentation to demonstrate both training and compliance. • Documentation on specific measures as appropriate
6. Handling of samples and materials	• Consistent application of a standardised system for controlling, labelling and tracking samples • Documented procedures for handling samples & materials • Up-to-date storage logbooks
7. Facilities and equipment	• Documented maintenance and calibration records of project equipment (as appropriate) • Records of regular maintenance of special facilities (e.g. refrigeration units) (as appropriate) • Documented standard operating procedures for project critical equipment, including emergency procedures
8. Documentation of procedures and methods	• Robust process for document and version control in all key project documentation • Validated Standard Operating Procedures

9. Research / work records	• Where facilities exist, research / work records should be stored consistently in both hard copy and electronic format (e.g. counter-signed laboratory notebooks or indexed computer data files) • Consistent and documented archiving procedures
10. Field-based research	• Documented risk assessment for field-based research, showing proactive steps taken to counter any risks identified

ANNEX 3

STANDARD DOCUMENT TRACKING FORM

This is a basic form for inclusion at the beginning of a document, which can be adapted to suit user needs. A standard form for recording circulation history of documents can also be included. See examples in use by marine teams below.

DOCUMENT VERSION TRACKING			
Author	**Document Name (and version)**	**Description (incl. revision details)**	**Date**

EXAMPLES OF DOCUMENT TRACKING FORMS USED BY MARINE TEAMS

(A) FOR USE IN A WORD DOCUMENT

BUILD STATUS:

Version	Date	Author	Reason/Comments

DISTRIBUTION:

Copy	Version	Issue Date	Issued To
Electronic/ Paper/Link			

(B) FOR USE IN A SPREADSHEET

Workbook Summary

Worksheet	Comments
Sheet1	

Annex: Version Control

Build status:

Date	Version	Author	Reason/Comments

Amendments in this release:

Worksheet	Amendment Summary

Distribution:

Copy	Version	Issue Date	Issued To
Paper/Electronic	0		A, B, C
	0		

ANNEX 4

AUTHORSHIP PROCEDURE

The determination of authorship of papers shall be in accordance with the following procedure based upon a simple points table. The maximum score possible is 100 points. Each potential author is awarded the highest realistic score in each category; whoever achieves a total of 25 points is offered joint authorship in rank order of total score. In the event of ties, near-misses are considered; if none exists, alphabetical order is used.

Co-authorship scoring system:

Intellectual input (planning/designing/interpreting)	Points
No contribution	0
One detailed discussion	5
Several detailed discussions	10
Correspondence or longer meetings	15
Substantial liaisons	20
Closest possible involvement	25
Practical input: data-capture (setting-up/observing/recording/abstracting)	
No contribution	0
Small contribution	5
Moderate indirect contribution	10
Moderate direct contribution	15
Major indirect contribution	20
Major direct contribution	25
Practical input: beyond data-capture (data processing/organising)	
No contribution	0
Minor or brief assistance	5
Substantial or prolonged assistance	10
Specialist input from related fields	
No contribution	0
Brief or routine advice	5
Specially-tailored assistance	10
Whole basis of approach	15
Literary input (contribution to first complete draft of manuscript)	
No contribution	0
Edited others' material	5
Contributed small sections	10
Contributed moderate proportion	15
Contributed majority	20
Contributed virtually all	25

Appendix 6. Working with the Statutory Nature Conservation Bodies, Departments and EU consortia on joint projects[16]

1. Background

When working jointly with other government bodies or in EU projects, JNCC may not always be able to control evidence quality. When working in partnership, adding interpretation to evidence collations or aggregating evidence there is a need to seek assurances from other organisations on the quality of the evidence that they are supplying. This guidance note provides some suggestions on how to do that.

Specialists within the Statutory Nature Conservation Bodies (SNCBs), with whom JNCC staff often work closely, have a responsibility to support good evidence quality assurance (EQA) practices in joint work. This responsibility also applies to other partners, both in government and the NGO sector, and any contractors employed to deliver evidence products. In these cases, JNCC staff will need to help others understand our EQA standards and procedures and what we expect from them to support achievement of good practice.

In working jointly with partner organisations agreement must be reached and recorded on standards that will be adopted for any given project at the start of that project; the JNCC policy should be followed as closely as possible.

The challenge is to ensure that the JNCC EQA principles are met when working jointly and when other EQA policies or standards need to be considered or are absent. The overarching EQA approach in a project may already be established in a MoA or MoU with one of the SNCBs or Departments, but even in these circumstances the EQA approach for any individual project, task or piece of work may need to be agreed before work starts.

2. The SNCBs and EQA Policy

Natural England – Evidence Standards[17]. NESTND024 is the standard that covers the way Natural England uses and analyses data, research findings and other information to develop its evidence base. NE may also use standards from other organisations, for example they have adopted Production of Quick Scoping Reviews and Rapid Evidence Assessments (NERC, 2015)[18].

Natural Resources Wales – Good Evidence: Our Evidence Management Strategy and Delivery Plan 2014-2017[19] . This plan sets out key principles, but evidence standards are currently being developed. NRW has assessed the JNCC EQA Policy and guidance notes (EQGNs) during development of its own standards.

Scottish Natural Heritage – SNH Instruction Notice No. 417 sets out QA standards for acquisition, commissioning and managing data. SNH Instruction Notice No. 429 sets out QA steps for completion and publication of research reports. It includes requirements for peer review and the involvement of the SNH Scientific Advisory Committee (SAC). The SAC comprises a chairman and nine independent scientists and specialists, and fulfils three key roles in the quality assurance process. The Committee reviews the annual bidding round for research projects, and individual members advise on the detail of research proposals

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[16] This Appendix is an edited version of EQGN 6
[17] http://publications.naturalengland.org.uk/category/3769710
[18] https://connect.innovateuk.org/documents/3058188/3918930/JWEG%20HtG%20Dec2015v2
[19] https://naturalresources.wales/our-evidence-and-reports/our-evidence/?lang=en

associated with their specialist skills and experience. Individual members provide independent peer-review of key and critical Commissioned Research Reports and other publications. The Committee also reviews the SNH research programme areas on a five-yearly cycle, through which the members assess and advise on the quality and application of the recently-completed work, as well as providing guidance on future directions for the research programme.

3. Departmental and Agency EQA Policy

Defra (and Welsh Government) – the Aqua Book[20]: Guidance on Producing Quality Analysis for Government sets out detailed best practice on quality assurance of evidence. JNCC has used the Aqua Book to inform its EQA Policy and guidance, which sometimes uses different terminology, but is compliant with the principles established in the Aqua Book.

Scottish Government – Main Research Providers[21]. SG uses six MRPs to acquire evidence on the environment and each MRP is responsible for quality standards; most follow international (ISO) standards. Of most relevance to JNCC are The James Hutton Institute and Royal Botanic Garden Edinburgh. See also Code of Practice for Official Statistics.

Cefas[22] follows a range of international standards (ISO) and other accreditations to support high-quality evidence production.

Marine Management Organisation: the MMO Evidence Strategy 2015-2020 Part 1[23] sets out its approach to quality assurance (section 7.1), making reference to a group of EQA policy documents. MMO both assessed the JNCC EQA Policy and consulted JNCC during the development of these policies and the two are consistent on general EQA principles and some practices.

The Code of Practice for Official Statistics[24] (UK Statistics Authority) sets standards for quality assurance of data and evidence. Compliance with the Code is a statutory requirement on all UK bodies that produce statistics that are designated as National Statistics through the Authority's Assessment process. JNCC used the Code to inform its own EQA Policy to ensure consistency.

The Joint Code of Practice for Research[25] (JCoPR) sets standards for research practice, and hence evidence quality, providing a generic framework of principles to apply through the research process. JNCC has not endorsed the JCoPR, but the JNCC EQA Policy is compliant with the code and goes further in specifying best practice.

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[20] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416478/aqua_book_final_web.pdf

[21] http://www.gov.scot/Topics/Research/About/EBAR/research-providers

[22] https://www.cefas.co.uk/about-us/quality/

[23] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/445083/MMO_Evidence_Strategy_2015-2020_-_Part_1.pdf

[24] https://www.statisticsauthority.gov.uk/wp-content/uploads/2018/02/Code-of-Practice-for-Statistics.pdf

[25] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/413154/pb13725-research-code-practice.pdf

4. How do EQA standards in the SNCBs, agencies and Departments compare to the JNCC approach?

Much of the current policy and guidance was developed at around the same time and JNCC was involved in Defra, NE, NRW, and MMO review processes, as well as convening an interagency evidence quality Task & Finish group. In addition, by publishing the JNCC EQA Policy on our website it has been available for others to use.

The outcome of this period of reflection, refinement and development of operational standards has meant that the general principles are consistent across policies and guidance. In addition, much of the more detailed practice is consistent between different organisations. However, there are some differences that could influence the scope of EQA approaches agreed in joint working.

Important differences to be aware of:

Risk-based decisions on which EQA practices to apply: Risk assessment should only ever be used as a guide to decisions about EQA practices, but if JNCC staff are concerned about agreement on the level of EQA required in a joint project because of the risk assessment then guidance from more senior staff may be required. Once the EQA approach is agreed then it is important to be transparent about what this means for the quality of the evidence produced. JNCC staff should be aware that wider risk considerations may mean different peer review and sign-off procedures are required, and will need to consider the resource, timetabling and cost implications.

Governance and delegations: partners may have different governance processes and formal sign-off procedures from JNCC. Joint projects will need to accommodate these and plan time to ensure that this does not impact on the EQA practices required; this should be clarified at the start of a joint project and agreement reached on each organisation's needs.

Records: EQA records kept by other organisations may not be the same as those required by the JNCC Policy. JNCC forms can be adapted for joint working to help support project management (see below), but staff should not seek to impose the same documentation standards on others. However, the JNCC project staff should seek assurances from the partner organisation(s) that EQA records are being kept.

EQA statements in publications: Other organisations may not include a summary statement of the EQA practices adopted for a project. This is a simple approach to improve transparency and should be maintained in publications co-produced by JNCC.

5. Working in EU consortia

Involvement in delivering evidence within an EU consortium is likely to be under a contractual agreement with defined responsibilities for specific work packages or tasks. EQA procedures may not be defined in the contract documentation or overarching description of work (project specification).

JNCC project officers should seek to establish a general EQA approach in the contract document prior to signing. If this is not feasible, then as part of the project governance process this should be established and JNCC should promote the adoption of an EQA approach.

Ways of working and responsibility for EQA:

- Any work packages or tasks that JNCC has lead responsibility for delivering should include an EQA approach based on our policy and work planning should include sufficient time to ensure that this can be followed.
- Any tasks within a work package being led by JNCC, but delivered by another partner, should include an agreed approach to EQA that the task leader agrees to take responsibility for; JNCC should seek assurances from the partner(s) that an EQA process is in place and being followed.
- Work packages or tasks that JNCC has no specific role in delivering would be covered by a general approach to EQA agreed by all partners, but in cases where evidence from these are then aggregated with those from JNCC work or jointly interpreted by JNCC will require assurances on quality from other partners.

JNCC project staff have responsibility for ensuring that partners are aware of the importance of having defined EQA approaches and that JNCC will expect all partners to have EQA practices in place and that assurances will be required.

6. Agreeing and recording an EQA approach in joint working

It is important to raise the issue of evidence quality and assurance approaches at the start of any joint project and agree responsibilities for producing an EQA plan, decision making and accountability, and recording practice. The principles in the JNCC EQA Policy should be followed as closely as possible; the Annexes documentation (including the peer review template) can be used to help put a joint EQA plan into practice and adapt it as necessary.

Key documents:

PID (project initiation document): Optional, may be helpful to support project planning and agree governance for large or complex projects. An EQA plan can be incorporated into a PID, especially to establish governance, but records of EQA decisions should be captured in a PAD or alternative record.

PAD (project audit document):
- if JNCC is leading a joint project or has responsibility for delivering an evidence task within a project then a PAD should be used if relevant (see EQA Policy, EQA flowchart for when a PAD is required);
- if JNCC has no lead role then the project officer may wish to keep their own records in the form of a PAD or reduced PAD to support effective engagement with the project partners. However, the project leader should maintain an audit of EQA decisions and actions and the PAD can be shared and adapted to meet this need if the project leader does not have a standard approach.

Alternative records: If JNCC is not leading on a project or a PAD is deemed unnecessary then an alternative record of the joint decisions on risk and EQA plan must be recorded in the SharePoint EQA database.

An assurance statement: JNCC does not have a template for recording and communicating evidence quality assurance for other partners, but project staff should be willing to supply short statements to partners if requested (see below for some suggested inclusions).

7. Gaining Assurances on Evidence Quality from Partners

In cases where JNCC relies on evidence produced by partners and is involved in aggregating data or interpreting evidence then an assurance statement on QA must be sought from the partner(s).

The statement should include:
- Confirmation that the evidence has been produced in accordance with the originating organisation's own EQA policies, and has been signed-off by the responsible officer (who should be named);
- Statement of the EQA standards that have been applied and met (policy document names, including any national codes and international standards);
- A record of any peer review process that has been applied (see EQGN#2 in relation to anonymity of reviewers);
- Additional information that JNCC staff might think necessary to provide assurance for a specific type of evidence, such as record of field methods applied, statistical approaches used, an assessment of certainty associated with interpreted information, etc.