Information Quality Guidance for the National Climate Assessment

The National Climate Assessment (NCA) is required by law to meet the highest information quality standards set by the Federal Government. Because NOAA is the administrative agency for NCA5, its agency guidelines under these federal standards serve as the guiding principles for the Assessment. NOAA's information quality manager for the NCA is responsible for ensuring all requirements are met.

Main points for authors

1. The NCA adheres to multiple **Federal Guidelines** and laws, including the Information Quality Act and the Evidence Act.
2. Information cited within the report must meet federal **Information Quality Standards** for utility, transparency, objectivity, integrity, and reasonable reproducibility.
3. Conclusions must be backed by **Supporting Evidence** from a diversity of information sources and source types. It is not acceptable to have a conclusion (i.e., Key Message) based on just one cited source, no matter the type.
4. Source materials can fall into four types. Each type has an associated **Information Quality Decision Pathway** and survey to help you understand if a source meets federal standards for inclusion in the NCA (see pages 5–9 below).

1. Federal Guidelines

Specific information quality requirements are set out by the Information Quality Act (IQA), the Office of Management and Budget (OMB) Final Information Quality Bulletin for Peer Review for highly influential scientific assessments (HISA), and the Foundations for Evidence-Based Policymaking Act (EBPA, or Evidence Act).

> The **IQA** ensures that the Assessment data and information are of a sufficient quality by meeting standards of *objectivity*, *utility*, and *integrity*. This includes the requirement for information in the Assessment to demonstrate a capability of being reasonably *reproduced*. For analytic data, reproducibility means that independent analysis of the original or supporting data using identical methods would generate similar analytic results to an acceptable degree of imprecision.
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> The **OMB Final Information Quality Bulletin for Peer Review** establishes guidance to enhance the practice of peer review of government science documents in order to increase the quality and credibility of scientific information generated across the Federal Government. The Bulletin sets the minimum peer-review requirements for documents with the HISA designation, such as the National Climate Assessment.

The **Evidence Act** expands on prior Open Government policy initiatives and public access to agency data assets. It requires that all federal data assets and supporting information be open by default, distributed under an open license, and published as machine-readable—subject to legal exemptions for privacy sensitivities and/or intellectual property rights.

2. Information Quality Standards

Each source should be evaluated based on the following attributes, which are described in detail specific to source material type in Section 4 below:

- **Applicability and Utility***:* The source is important, relevant, and useful for its intended audience (not only from the author's perspective but also from the public's).
- **Transparency and Traceability**: The source material, the methods supporting conclusions, and evaluation of the source are documented and clear.
- **Objectivity***:* The purpose, methods used to create the source material, presentation, substance, and interpretation of conclusions are clear, accurate, reliable, and unbiased.
- **Integrity and Security***:* The source material will remain reasonably protected and intact over time, and both the information and the owners of the information are respected.
- **Reproducibility:** Procedures surrounding source materials are documented such that they can be reproduced, with checks for robustness on non-reproducible data.

3. Supporting Evidence

Conclusions made in the NCA (i.e., Key Messages) must be backed by supporting evidence. In developing Assessment findings, authors should evaluate evidence from multiple sources, consider a diversity of source types, and focus on new information or advancements made since previous Assessments. Where relevant, authors should strive to present defensible quantitative findings. Conclusions should not be based on only one cited source, no matter the type. While an author's own research may be cited, it must be considered among a wide array of available sources.

Each Key Message's Traceable Account identifies just the key sources referenced in the chapter that are essential in supporting the given message. Key sources, which form the foundational basis of support for a Key Message, exhibit all the Information Quality Standards (see Sections 2 and 4), and especially the attributes below:

- **Value**: The source is useful and professionally relevant; it makes a contribution to the field in terms of the practitioners' understanding or decision-making on the topic.
- **Focus**: The source not only addresses the area of inquiry under consideration but also contributes to its understanding.
- **Rigor**: The source is important, meaningful, and non-trivial relative to the field and exhibits sufficient depth of intellect rather than superficial or simplistic reasoning.

- **Credibility**: The source is credible within the context of the wider body of knowledge, or if not, the new or varying information is documented within the work.

4. Information Quality Decision Pathways

Source materials

Sources (or **source materials**) broadly include all information used in the NCA. Authors must consider information quality when deciding whether or not to use a given source in their chapter. Information quality standards must be met any time a source is associated with the NCA, including incorporating the source into the chapter, citing the source, or linking to the source. If only part of a document or set of data is being used, authors need to consider information quality for only the portion used. See Data and Metadata on ACE for additional guidance on maintaining information quality for non-literature-based sources, such as datasets and figures.

There are four main categories of sources for which authors are responsible for ensuring information quality standards:

Peer-Reviewed Literature: A publication that is subjected to independent scrutiny, evaluation, deliberation, and validation by other experts in the same scientific field (peers) to ensure the quality of information meets scientific and technical standards, often published in a refereed scientific journal.

Other Literature: Often called "gray literature," information from documented sources produced without independent peer review, including government reports, white papers or working papers, workshop summaries, online resources, websites, digital documents, etc.

Indigenous Knowledge (IK): A body of dynamic and experiential knowledge gained over time by Indigenous peoples, often associated with a specific place. IK includes observations, oral and written knowledge, innovations, practices, rituals, and beliefs; some IK is considered sacred and secret to a group or individuals. IK is inherently heterogeneous due to the cultural and geographic contexts from which it is derived. Also known as Native Science, Traditional Ecological Knowledge, or Indigenous Ways of Knowing. [Federal OSTP/CEQ guidance on the use of IK]

Other Expert and Local Knowledge: Other sources of knowledge from local experts (e.g., multigeneration farmers) or people who have direct, lived experience of the subject being described; this information might not be in written form, nor published, or documented beyond personal communication.

A fifth type of information that may be used in the NCA is climate data processed and prepared for authors by NOAA's Technical Support Unit (TSU). In previous Assessments, this source type has included historical or projected climate datasets and derived climate variables (see Climate Data on ACE for a list of more than 40 derived climate variables available to authors). The TSU is responsible for ensuring information quality standards for global and regional climate data

provided to authors. This involves meeting all the standards in the Peer-Reviewed Literature or Other Literature decision pathways below, as well as considerations for location, variables, and scenarios:

- **Location**: The information, particularly downscaled data, has been evaluated or previously applied within the United States, including territories or affiliated islands.
- **Scenarios**: For future projection information, there is available information from two or more climate scenarios to represent a range of potential future outcomes.
- **Variables**: The climate variables included in the dataset are applicable and relevant to the subject matter scope, and clear methods for detection and attribution are applied.

How to use the decision pathways

While development of an NCA chapter often involves a comprehensive literature review, not every source evaluated in the report development process will be cited in the NCA chapters. An important responsibility of the authors is to determine which sources are most useful to include in the Assessment. References cited in the Assessment are those that are highly relevant and critical to the understanding of the intended users or audience of the Assessment, which includes the general public (see Section 3). The utility of the source is thus assessed not only by the use or applicability of the source to the author (e.g., Is this source or analysis relevant and useful in supporting my conclusion?) but also from the perspective of the reader (e.g., Is this source or analysis relevant and useful to the public's understanding, and does it inform the critical decisions readers are currently facing?).

Utility is further demonstrated by meeting the requirements of transparency and traceability, objectivity, integrity and security, and reproducibility. If the author believes that a source is applicable and useful, they may then use the Information Quality Decision Pathways below to determine whether the source meets these standards and may be cited in the NCA.

Step 1: Determine the information source type. Using the definitions provided above and on page 5, determine which of the four source categories is most appropriate.

Step 2: Answer the questions in the appropriate survey. Each of the four source types has its own Information Quality Survey. Use the survey (pages 6–9) appropriate for the source type.

Step 3: Make a determination about the use of the source. Upon completing the survey, return to page 5 for instructions on whether and how to use the information source. If authors can answer "yes" to every item on the appropriate information quality survey, then they may use the information source.

If the authors answer "no" to any item on the survey, then in most cases, the information source may not be used. Exceptions to this rule must be approved by the Assessment's Information Quality Act manager and properly documented. For example, if the author of the information source can provide additional clarification, or if the source material can be sufficiently qualified or conditioned for use in some more limited or generalized manner, then

the NCA author should document their justification, provide a short explanation of how the source provides essential content, and submit this for approval by the report's IQA manager. Please see author guidance on References for how to cite different information source types.

National Climate Assessment Information Quality Decision Pathway

Step 1: Determine the information source type

Peer-Reviewed Literature	Other Literature	Indigenous Knowledge	Other Expert & Local Knowledge
A publication that is subjected to independent scrutiny, evaluation, deliberation, and validation by other experts in the same scientific field (peers) to ensure the quality of information meets scientific and technical standards, often published in a refereed scientific journal	Often called "gray literature," information from documented sources produced without independent peer review, including government reports, white papers or working papers, workshop summaries, online resources, websites, digital documents, etc.	A body of knowledge gained over time by Indigenous peoples, including observations, oral and written knowledge, innovations, practices, and beliefs; also known as Native Science, Traditional Knowledge, Traditional Ecological Knowledge, or Indigenous Ways of Knowing	Other sources of knowledge from local or traditional experts (e.g., multigeneration farmers) or people who have direct, lived experience of the subject being described; this information might not be in written form, nor published, or documented beyond personal communication

Step 2: Answer the questions in the appropriate survey

See **Peer Reviewed Literature – IQA Survey** on page 6	See **Other Literature – IQA Survey** on page 7	See **Indigenous Knowledge – IQA Survey** on page 8	See **Other Expert and Local Knowledge – IQA Survey** on page 9

Step 3: Make a determination about the use of the source

If you answered **Yes** to the questions in this survey, you have demonstrated applicability and utility; transparency and traceability; objectivity; integrity and security; and reproducibility of the source and it may be used in the NCA If you answered **No** to any of the questions in this survey, go to the next page and complete the **Other Literature – IQA Survey**	If you answered **No** to any of the questions, the source material should not be used in most cases. If the source author can provide clarification or the use of the source materials could be sufficiently qualified or conditioned for use in some more limited manner, then authors should document their justification, provide a short explanation of how the source provides essential content, and submit this for approval by the report's IQA manager.	If you answered **Yes** to the questions in this survey, you have demonstrated applicability and utility; transparency and traceability; objectivity; integrity and security; and reproducibility of the source and it may be used in the NCA If you answered **No** to any of the questions in this survey, go to the next page and complete the **Other Expert and Local Knowledge – IQA Survey**	If you answered **No** to any of the questions, the source material should not be used in most cases. If the source author can provide clarification or the use of the source materials could be sufficiently qualified or conditioned for use in some more limited manner, then authors should document their justification, provide a short explanation of how the source provides essential content, and submit this for approval by the report's IQA manager.

Peer-Reviewed Literature – IQA Survey

Transparency & Traceability

Independence

- The peer-review process was conducted in an open and rigorous manner and completed by experts who are detached from the information or analysis and have disclosed any potential conflicts of interest.

Transparency

- The peer review includes clear documentation of the review process, including data and methods.

Objectivity

Soundness

- The peer review includes evaluation of the reasonable application of procedures, measures, methods, or models employed to generate or develop the information and conclusions.
- Assumptions are stated clearly, applied in a tractable manner, and justified with technical reasoning.
- Sound scientific principles, practices, and approaches are used.
- Conclusions are internally consistent with the data and results and presented in an accurate, clear, complete manner with adequate context provided.

Uncertainty

- Appropriate techniques have been employed to evaluate variability and uncertainty, with any impact on the conclusions clearly identified.
- Datasets have been validated and potential sources of error explained.

Bias

- Any potential bias in the source material is acknowledged and other sources are used in the NCA to balance potential bias.

Integrity & Security

Access

- The underlying data or information that supports the relevant conclusions drawn in the source materials is publicly available.

  Note: Publicly available data are strongly preferred, but if the data are protected as non-public under the Evidence Act, they must be documented as such in the metadata survey along with document access instructions, if applicable.

Integrity

- The original source material is permanently safeguarded from improper access, modification, or destruction ("secured") and will remain reasonably protected and intact, even if the information is altered for use in the chapter.

Reproducibility

Validation

- Data, assumptions, methods, and procedures are documented such that they could be reasonably reproduced, and checks for robustness on non-reproducible data have been conducted.

Reproducibility

- Independent review, evaluation, verification, or validation of the study method has been performed and documented, showing results consistent with the conclusions and with results of other-peer reviewed studies using similar methods.

Other Literature – IQA Survey

Transparency & Traceability

Evaluation

- Independent verification or validation has been conducted of the study method and results, with conclusions of independent reviews considered. If several independent evaluation efforts were completed, they resulted in consistent conclusions.
- Results of the study are consistent with other uses of the same procedure, method, or model in similar studies, including peer-reviewed studies. If not, differences are clearly documented with an explanation of the study's setup.

Clarity

- Theories, scope, approach, methods, and context are clearly described. Any differences in outcomes from other approaches are discussed, including assumptions and limitations.

Objectivity

Soundness

- The application of procedures, measures, methods, or models employed to generate or develop the information and conclusions is reasonable for, and consistent with, the intended application.
- Assumptions are stated clearly, applied in a tractable manner, and justified with technical reasoning.
- Sound scientific principles, practices, and approaches are used.
- Conclusions are internally consistent with the data and results and presented in an accurate, clear, complete manner with adequate context provided.

Uncertainty

- Appropriate techniques have been employed to evaluate variability and uncertainty, with any impact on the conclusions clearly identified.
- Datasets have been validated and potential sources of error explained.

Bias

- Any potential bias in the source material is acknowledged, and other sources are used in the NCA to balance potential bias.

Integrity & Security

Access

- The underlying data or information that supports the relevant conclusions drawn in the source materials is publicly available.

  Note: Publicly available data are strongly preferred, but if the data are protected as non-public under the Evidence Act, they must be documented as such in the metadata survey along with document access instructions, if applicable.

Integrity

- The original source material is permanently safeguarded from improper access, modification, or destruction ("secured") and will remain reasonably protected and intact, even if the information is altered for use in the chapter.

Reproducibility

Validation

- Data, assumptions, methods, and procedures are documented such that they could be reasonably reproduced, and checks for robustness on non-reproducible data have been conducted.

Reproducibility

- Independent review, evaluation, verification, or validation of the study method has been performed and documented, showing results consistent with the conclusions and with results of other peer-reviewed studies using similar methods.

Indigenous Knowledge – IQA Survey

Transparency & Traceability

Relationality

- The knowledge is part of a relationship or kinship of people across generations interconnected to social, spiritual, cultural, and natural environmental or ecological systems.
- The knowledge is tied to a specific location or a specific type of habitat, environmental medium, or biological species.

Clarity

- Theories, scope, approach, methods, and context are clearly described, and any differences in outcomes from those developed using other approaches are discussed, including assumptions and limitations.

Objectivity

Context

- The knowledge is understood and applied in a way that is respectful to and consistent with the cultural, spiritual, and environmental context of the knowledge holders.
- The knowledge is used or applied in the Assessment in an accurate, clear, complete, and unbiased manner.
- There was meaningful engagement, communication, collaboration, or co-production between the Assessment author and the knowledge holders.

Valuation

- The inherent use and value of the knowledge and expertise of the knowledge holders, including lived experience, are retained and respected.
- Language and names, in which Indigenous Knowledge and values may be nested, are preserved.
- The knowledge is considered through an Indigenous lens, voice, or style and woven together with other forms of evidence without converting or forcing the knowledge into non-Indigenous frameworks.

Purpose

- The original purpose for creation of this knowledge is understood, considered, and respected when used in the Assessment.

Integrity & Security

Consent

- Knowledge holders granted free, prior, informed consent for including this knowledge in the Assessment and maintain control over collection, ownership, and use of data derived from sources.
- Reference in the Assessment is free of any culturally sensitive information that the knowledge holders do not want made public, including consideration of how documentation may be subject to or released under the Freedom of Information Act and other legal authorities.

Respect

- The author made clear how the knowledge will be protected to prevent against unauthorized use, cultural misappropriation, or inadvertent disclosure, including how data governance is being respected and not disclosed in contexts outside the Assessment.

Reproducibility

Continuity

- The knowledge consists of repeated observations or understandings built and maintained over time and shared or passed down through generations while maintaining continuous formats (e.g., oral, written, song, dance, visual formats, etc.).

Validation

- Practices for ensuring quality control and validation are appropriate to the nature of the source knowledge, as determined by the knowledge holders from which the information comes, such as through iterative, equitable dialogue on the interpretation of findings by community members, co-researchers, or collective knowledge systems.

Other Expert and Local Knowledge – IQA Survey

Transparency & Traceability

Experience

- The information stems from direct lived experience, traditional or professional expertise, or a relationship to natural environmental or ecological systems.
- The information is tied to a specific location, event, profession, or a specific type of biological or environmental habitat, medium, or species.

Clarity

- Theories, scope, approach, methods, and context are clearly described, and any differences in outcomes from those developed using other approaches are discussed, including assumptions and limitations.

Objectivity

Context

- The information is understood and applied in a way that is respectful to and consistent with the expertise of the information owners, including their lived experience.
- The knowledge is used or applied in the Assessment in an accurate, clear, complete, and unbiased manner.
- There was meaningful engagement, communication, collaboration, or co-production between the Assessment author and the knowledge holders.

Soundness

- The application of any methods employed to generate or document the information and conclusions is reasonable for, and consistent with, the intended application.
- Assumptions are identified, characterized, and justified.
- Conclusions are internally consistent and presented in an accurate, clear, complete manner with adequate context provided.

Bias

- Any potential bias in the source material is acknowledged, and other sources are used in the NCA to balance potential bias.

Integrity & Security

Consent

- Information owners granted free, prior, informed consent and maintain control over collection, ownership, and use of data derived from sources.
- Reference in the Assessment is free of any personal or sensitive information that the information owners do not want made public, including consideration of how documentation may be subject to or released under the Freedom of Information Act.

Respect

- The author made clear how the information will be protected to prevent against unauthorized use, cultural misappropriation, or inadvertent disclosure, including how data and knowledge sovereignty and governance are being respected and not disclosed in contexts outside the Assessment.

Reproducibility

Validation

- Practices for ensuring quality control and validation are appropriate to the nature of the source information.
- The information consists of direct, immediate experience and/or repeated observations over time that result in conclusions consistent with other experiences or observations, as determined by independent evaluation, verification, or validation.