Title

A standardized definition of Rapid Evidence Assessment for environmental applications

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Abstract

Evidence assessment—identifying, evaluating, and synthesizing data and findings from previous studies—is important to inform environmental decision-making but can be slow and resource intensive. Users seeking more efficient approaches have developed a wide range of definitions and methods for Rapid Evidence Assessment (REA), raising concerns about consistency and rigor. To improve consistency and confidence in REA, we convened an international group of evidence users and researchers to define REA for environmental applications. Our iteratively developed consensus

definition of REA highlights it as an efficient, structured process that is suitable for decisions with moderate to high risk profiles; transparent regarding the trade-offs required and potential bias; able to integrate multiple types of evidence; and reflective of the decision-making context. Having a standardized definition of REA, which improves transparency and facilitates decisions about the appropriate levels of required rigor, will be helpful to those who commission, carry out, and use REAs.

In a Nutshell

- Assessing evidence for environmental decision-making can be slow and resource intensive.
- Rapid Evidence Assessment (REA) is faster, but there are many competing definitions and methods.
- To improve consistency and confidence in REA, we developed a consensus definition of REA for environmental applications: an efficient, structured process that is suitable for decisions with moderate to high risk profiles; transparent regarding trade-offs required and potential bias; able to integrate multiple types of evidence; and reflective of the decision-making context.
- This standardized definition of REA can help those commissioning, conducting, and using REAs to make transparent decisions about how much rigor is needed.

Introduction

Evidence assessment— identifying, evaluating, and synthesizing data and findings from previous studies—is a critical part of informed environmental management and policy decision-making (Pullin et al. 2020, CEE 2022). Evidence assessment methods are wide-ranging and include evidence synthesis methods such as systematic reviews and maps. However, systematic review, the 'gold standard' for rigorous evidence synthesis, can be slow and expensive (Collins et al. 2015, Haddaway and Westgate 2019), making it impractical for many decision-making scenarios. For a variety of

reasons, including the time and effort required for rigorous evidence synthesis (Pullin et al. 2004), many environmental management and policy decisions are made without considering scientific evidence in an adequate, structured, and transparent manner (Cook et al. 2010).

In response, evidence synthesizers and users seeking quicker approaches have developed more rapid evidence synthesis approaches (e.g., Khangura et al. 2012, Sutherland and Wordley 2018, Garritty et al. 2021, CEE 2022), which we collectively refer to as Rapid Evidence Assessment (REA). These methods exist across diverse fields, including human health and environmental sciences (e.g., see Collins et al. 2015, Tricco et al. 2015, Speckemeier et al. 2022). The use of REA can provide a substantial increase in access to and use of evidence to inform management decisions in many cases.

Ideally, REA methods reduce the impact of biases on evidence interpretation and provide transparent and defensible evidence to decision-makers on appropriate management- and policy-relevant time scales (e.g., weeks to months). However, there is no agreement on how to define REA or standard guidance for decision-makers to consider types of assessments (including REA) appropriate to meet their needs. REA methods have often been developed for specific, discrete applications, resulting in varied and sometimes conflicting definitions and methods with a lack of underpinning, standardized principles (Harper et al. 2024). For example, Tricco et al. (2015) found 30 different definitions of rapid review and 50 different methods in the health sciences field alone, with only 16 methods used more than once. This inconsistency can make it difficult for evidence synthesizers and users to make informed decisions about whether REA methods are appropriate to meet their needs, and which specific REA methods would be best. In addition, confidence in the results of REAs—which can be a concern (e.g., Thomas-Walters et al. 2021)—can be increased by standardized methodological approaches.

To address the confusion caused by the diversity of REA definitions and methods, we convened an interdisciplinary group of experts to create a standard definition for environmentally focused REA

and discuss its implications for potential end users. By 'environmentally focused' we mean assessments related to species and ecosystem conservation; natural resource management; water, air, and soil quality; and agricultural practices. This diverse, international expert group included individuals who commission, conduct, or use evidence synthesis to address a broad range of environmental questions. Here, we provide the resulting definition of REA for environmental applications and detail the rigorous process used to develop it. We also discuss key considerations that can help decision-makers select REA approaches that meet their management needs to improve evidence-based decision-making.

Methods

From late 2021 to early 2022, 39 experts in environmental evidence assessment participated in a series of five workshops on Rapid Evidence Assessment Methods and Applications (REAMA). Participants included evidence synthesizers, users, and brokers (i.e., those who serve as knowledge bridges between synthesizers and users) associated with government agencies, non-governmental organizations, and academic institutions from the United States, Canada, the United Kingdom, Sweden, and Australia (see Appendix 1). All participants worked on issues related to environmental science and management that collectively, covered a range of specific topics, management options, and decision contexts.

The REAMA workshop series involved five half-day sessions conducted online via Zoom, with extensive use of the online workspace Mural (https://mural.co; see Appendix 2). All sessions had facilitators, and efforts were made to create a collegial atmosphere and encourage open sharing of ideas. Session 1 covered the motivation for developing a consensus-driven, shared definition of REA to help determine when REA could meet decision-making needs. This was followed by a survey on the critical concepts to include in a definition for REA. Survey results were used to draft an initial working definition of REA for discussion in Session 2, which was then refined over subsequent workshop sessions. During Session 3, participants identified parts of the definition to address in

small groups, eliminating parts of the definition that were unnecessary, and collaboratively editing the proposed language of the working definition for feedback from all participants.

The seven-member REAMA planning committee (see Appendix 1) considered comments provided by participants throughout workshop discussions, editing suggestions from the small group discussions, and polling results to draft iterations of the working definition. They also developed structured activities to help resolve outstanding differences through discussion with all participants in Sessions 4 and 5. These discussions provided participants with multiple opportunities to critically appraise and contribute to the working definition as it was iteratively revised. Differences of opinion among participants were resolved where possible; where consensus was not possible, differing perspectives were documented (see Appendix 3). At the conclusion of the REAMA workshop series and follow-up activities, we developed a concise, standardized definition of REA supported by all workshop participants, as well as more detailed language expanding on critical concepts in that definition.

Definition

Based on our deliberations, we define REA as follows:

> *REA is a structured review process that aims to maximize rigor and objectivity given assessment needs and resource constraints (e.g., time). REA aims to address requirements for timely and cost-efficient decision-making while maintaining confidence in conclusions. REA is typically more rigorous than less formalized practices such as traditional narrative literature reviews, but effort is reduced relative to comprehensive evidence assessment approaches such as systematic review. REA is transparent, well-documented, and the details of the specific methods used at each step are justified. Those who commission, conduct, and use REAs should be cognizant of the achievable levels of confidence in the conclusions that accompany the rapid application of different steps in the REA process.*

Critical Concepts

Workshop participants identified five interrelated concepts important when defining REA: structure, trade-offs and risks, bias, types and sources of evidence, and decision context. Here we expand on and discuss our REA definition in terms of each concept.

Structure

Like systematic review, REA is a structured, standardized process with several steps:

1. Planning/formulating the assessment question
2. Searching for potential evidence
3. Selecting relevant types and sources of evidence
4. Extracting information/data
5. Evaluating evidence quality/validity
6. Synthesizing evidence
7. Drawing and communicating conclusions

REA provides flexibility in how these methodological steps are implemented (e.g., see Speckemeier et al. 2022 for a list of methodological "shortcuts," or ways that different steps can be made faster) but requires clear documentation of implementation decisions at each step, the reasoning behind those decisions, and consideration of potential consequences and limitations (e.g., biases), including confidence in REA conclusions. The variety of methods that can be used at each step allows REAs to be tailored to specific questions and decision contexts (see Decision Context, below), while still providing a standardized and transparent assessment framework.

Given this flexibility, planning and formulating the assessment question (Step 1) is critical in REA. Designing an assessment that meets the needs of users may be challenging given time limitations. As a result, REA requires evidence synthesizers and users to negotiate and agree on what the REA will

produce given realistic constraints. Frequent communication and engagement with stakeholders, including evidence users, will facilitate such decisions.

Decision Context

The decision context is how evidence assessments (including confidence or uncertainty in their conclusions) are intended to be used to inform decisions. REA is a better fit for some decision contexts than others. For example, REA may be appropriate for addressing an urgent or acute evidence need, when a more comprehensive assessment would be too slow but an informal assessment would not provide enough confidence in assessment conclusions (Table 1; see Trade-offs and Risks, below). REA can also work well to inform the design of an adaptively managed program, where decisions are revisited based on monitoring and thus the potential risks of an initial decision may be reduced. Conversely, when the potential risk associated with a decision is significant and time is less constrained, then more comprehensive assessment approaches may be needed (Table 2). Finally, if there is little or no risk associated with the decision, then no evidence assessment may be needed, or a more informal approach may be a better use of resources.

Trade-offs and Risks

REA involves trade-offs relating to (1) whether to undertake a REA (versus another assessment type) and (2) the specific REA methods selected (including which steps to skip or abridge). These trade-offs may include the robustness and efficiency of methods used at any REA step, and link directly to the decision context (Figure 1). Trade-offs are tied to balancing different risks that influence the level of confidence in the conclusions. Different types of evidence assessment provide different levels of confidence in the conclusions (e.g., Dicks et al. 2017). Compromises in rigor required to increase the speed of REA may increase the risk of arriving at an incorrect conclusion. Conversely, slower and more systematic methods run the risk of failing to reach a conclusion before a management decision must be made or a policy window closes, or of diverting resources from management to evidence

assessment. The impact of those risks depends on the decision context (see Decision Context, above).

Consideration of these trade-offs and risks is crucial before undertaking a REA. REA attempts to balance the different sources of risk, as it is not possible to minimize all risks simultaneously. Evidence synthesizers should recognize that both the risk of incorrect assessment conclusions and the risk that assessments are too slow to be useful are important to decision-makers. The commissioners and users of assessments should be aware of how the choice of REA (versus other synthesis types) and REA design influence trade-offs between these two sources of risk.

Bias

REA must be 'bias aware'—that is, it must explicitly recognize potential sources and effects of bias in its findings—to provide users with confidence in both the assessment process and its conclusions. REA bias assessments are flexible depending on the nature of the question and associated risks, but the bias assessment and associated decisions (including the rationale if a bias assessment is not conducted or deemed necessary) should be transparently documented and explained to the end user. REA acknowledges potential biases stemming from: (1) the types and sources of evidence included and excluded; (2) the design and validity of individual studies included; (3) the limitations of the evidence base as a whole; (4) the specific synthesis approaches used; and (5) the REA conclusions. Potential bias should be both disclosed and minimized as much as possible. Explaining the types of evidence included in the REA, methods used at each REA step, reasons behind these methodological choices, and the resulting confidence in conclusions are essential to build trust in the completed REA.

Types and Sources of Evidence

Because evidence relevant to environmental management and policy decisions comes in many forms, REA must be able to accommodate a wide variety of evidence types and sources, including

qualitative and quantitative data from diverse study types and experimental designs (Game et al. 2018). The scope of relevant evidence types and sources of evidence should be discussed as part of planning and formulating the assessment questions (Step 1). Decisions about the evidence to include in or exclude from an assessment can introduce bias (Haddaway and Bayliss 2015, Nuñez and Amano 2021) and should be clearly documented and explained in the REA.

Sources of evidence that could be used in REA include:

- Published and other peer-reviewed research literature (e.g., externally reviewed government reports)
- Non-peer-reviewed research publications (e.g., pre-prints, internally reviewed reports and white papers, other reports and white papers not intended to be peer-reviewed)
- Traditional, Indigenous, local, or other expert knowledge
- Personal communications
- Legal records
- Published or unpublished data sets (e.g., from monitoring, experiments, surveys)

Conclusions and Next Steps

Given the inherent urgency in many environmental management decisions (McDonald-Madden et al. 2008), decision makers often must make environmental management and policy choices in short time frames with limited resources. REA provides a valuable and transparent approach for informing environmental decisions under these constraints. Although REA is often framed as being 'less than' assessments such as systematic review, it represents a 'more than' approach to how evidence is often incorporated into environmental decisions. Moreover, we contend that a well-conducted and documented REA can be more rigorous, and thus more useful to decision-makers, than a poorly conducted systematic review. Our REA definition is intended to help decision-makers consider the level of rigor appropriate for evidence synthesis given their decision context and needs, and then

select appropriate methods (whether REA or a more or less rigorous option). This definition should also help commissioners and conductors of evidence assessments understand trade-offs and determine what methods best meet their needs.

The balance between rigor, speed, and other resource constraints should be determined by the decision-making context and the need for evidence (Fisher et al. 2020), including tolerance for risk and decision-maker preferences. REA is particularly useful when a relatively rigorous assessment is needed to avoid making a significant error, but available decision time frames or resources do not allow for a full 'gold standard' systematic review. Ideally, REA allows decisions to be made with 'just enough' rigor and expenditure of time and resources. Our definition of REA upholds and acknowledges the value of rapidly assessing evidence in environmental decision contexts, while clearly recognizing how trade-offs, risks, and biases affect certainty and confidence in those results.

A consistent definition for REA also helps us to understand and document how specific REA methods affect assessment conclusions, particularly as REA becomes more widely used. Comparing processes and outcomes of different forms of REA and other assessment approaches should be a focus of future research. Increased collaboration and communication among evidence generators, synthesizers, users, and brokers could also facilitate the development and use of REA methods and applications. However, we acknowledge the need for future work on REA to be more inclusive of management perspectives from a wider array of countries, thereby ensuring the relevance of REA to the global environmental community. The newly formed REAMA Community of Practice (https://reamacop.wordpress.com/) offers a collaborative space, open to interested users, for these groups to share the challenges, needs, and opportunities related to training, applications, and innovations in using REA to address environmental questions.

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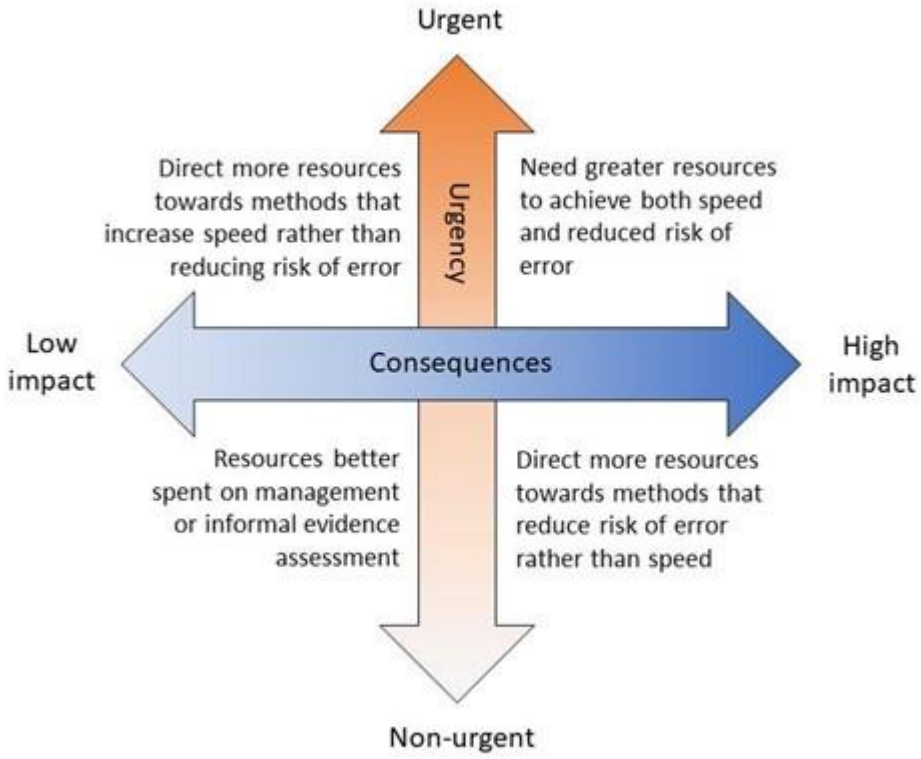
Figure

Figure 1. Ways in which the decision context influences choices about how to deploy resources across the stages of a Rapid Evidence Assessment.



Table

Table 1. Examples of factors to consider when determining whether a Rapid Evidence Assessment is the most appropriate assessment method given the decision context. Note that relative importance represents a continuum but is shown here as discrete categories to illustrate general principles.

FACTOR TO CONSIDER	RELATIVE IMPORTANCE		
Impact of wrong conclusion	Low	Moderate	Moderate to high
Impact of delayed conclusion	High	Moderate	Low to moderate
Resources available	Low	Moderate	High
Tolerance for risk	High	Low to moderate	Low
Sources/types of evidence to be assessed	Variable	Broad (including unpublished/unreviewed)	Narrow (primarily published/reviewed)
APPROPRIATE EVIDENCE ASSESSMENT METHOD	**Quick or Informal Review**	**Rapid Evidence Assessment**	**Systematic Review**