Paper Summary

<!--META_START-->

Title: What Is “Actionable” Science for Climate and Environment?

Authors: Ziheng Sun

DOI: 10.1007/978-3-031-41758-0_1

Year: 2023

Publication Type: Book Chapter

Discipline/Domain: Environmental Science / Climate Science

Subdomain/Topic: Actionable science; climate change adaptation and mitigation; environmental decision

Eligibility: Eligible

Overall Relevance Score: 95

Operationalization Score: 95

Contains Definition of Actionability: Yes

Contains Systematic Features/Dimensions: Yes

Contains Explainability: Yes

Contains Interpretability: Partial

Contains Framework/Model: Yes

Operationalization Present: Yes

Primary Methodology: Conceptual with quantitative framework proposal

Study Context: Climate and environmental science research, with focus on science-to-action translation

Geographic/Institutional Context: Global, with examples from the USA (California), coastal resilience, and

Target Users/Stakeholders: Policymakers, engineers, scientists, local communities, funding agencies, inc

Primary Contribution Type: Conceptual framework and evaluation model

CL: Yes

CR: Yes

FE: Yes

TI: Partial

EX: Yes

GA: Yes

Reason if Not Eligible: N/A

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What Is “Actionable” Science for Climate and Environment?

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Discipline/Domain:

Environmental Science / Climate Science

Subdomain/Topic:

Actionable science; climate change adaptation and mitigation; environmental decision support

Contextual Background:

This chapter addresses the concept, necessity, and evaluation of “actionable” science within climate and

Geographic/Institutional Context:

Global scope, with examples including California climate adaptation, NOAA coastal resilience programs,

Target Users/Stakeholders:

Decision-makers, scientists, engineers, industry stakeholders, local communities, and funding agencies.

Primary Methodology:

Conceptual framework development, supported by illustrative case studies and proposed quantitative for

Primary Contribution Type:

Conceptual definition and operationalization model for actionability.

General Summary of the Paper

The chapter defines “actionable science” as research explicitly designed to produce knowledge, recomm

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Eligibility

Eligible for inclusion: **Yes**

How Actionability is Understood

Actionable science is “oriented towards answering inquiries such as ‘What actions should we take in this

> “Actionable science requires a meticulous examination of ideas within the confines of practical constrai

> “An actionable science endeavor should not run counter to the overarching consensus goals shared by

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What Makes Something Actionable

- Alignment with real-world challenges and operational application goals.
- Practical application potential for significant societal challenges.
- Consideration of “what-if” engineering questions and operational uncertainties.
- Feasibility within resource, scalability, political, and economic constraints.
- Public understanding through clarity and transparency.
- Measurable societal, environmental, economic, and cultural impacts.
- Practicality from the operators’ perspective.
- High engagement with stakeholders and end users.

How Actionability is Achieved / Operationalized

- **Framework/Approach Name(s):** Quantitative actionability assessment model.
- **Methods/Levers:** Six-factor model: Relevance, Feasibility, Public Understanding, Societal Impact, Pr
- **Operational Steps / Workflow:**
  1. Define project objectives and societal alignment.
  2. Assess each factor using quantitative/qualitative indicators.
  3. Identify barriers (e.g., policy, economics) and design mitigation strategies.
  4. Engage stakeholders early and iteratively.
  5. Use feedback to refine applicability and implementation readiness.
- **Data & Measures:** Accessibility scores, scalability indices, impact metrics (economic, environmental,
- **Implementation Context:** Climate and environmental projects at local, regional, and global scales.

> “If the answer is ‘yes’ to all three questions, the research falls within the high basket of actionable scien

> “The overarching goal is to provide decision-makers with the tools and information they need to make w

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Dimensions and Attributes of Actionability (Authors’ Perspective)

- **CL (Clarity):** Yes – Explicitly tied to public understanding and communication effectiveness.

> “Effective communication is essential for promoting public understanding and support.” (p. 14)

- **CR (Contextual Relevance):** Yes – Research must align with specific societal and operational needs

> “Aligned with real-world challenges and part of a broader community effort.” (p. 7)

- **FE (Feasibility):** Yes – Multi-factor feasibility assessment provided.

> “Another important factor for actionable research is the feasibility of implementing the results into real-w

- **TI (Timeliness):** Partial – Timeliness is implied via real-time science discussion but not formalized as

- **EX (Explainability):** Yes – Linked to transparency, clarity, and addressing “what-if” questions.

- **GA (Goal Alignment):** Yes – Must not run counter to shared societal/scientific goals.

- **Other Dimensions Named by Authors:** Stakeholder engagement, practicality by operators, societal in

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Theoretical or Conceptual Foundations

- Knowledge transfer frameworks (Chai et al., 2003; Agrawal, 2001).

- Co-production of knowledge (Beier et al., 2017).

- Climate information usability literature (Kirchhoff et al., 2013).

- Life cycle and environmental impact assessment methods.

Indicators or Metrics for Actionability

- Quantitative scores for relevance, feasibility, public understanding, societal impact, practicality, and eng

- Sub-metrics: accessibility, scalability, reproducibility, political/economic feasibility, clarity, transparency,

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Barriers and Enablers to Actionability

- **Barriers:** Funding constraints, policy misalignment, technological immaturity, public misunderstandin

- **Enablers:** Early stakeholder engagement, clear communication, alignment with policy goals, interdis

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Relation to Existing Literature

Positions itself as integrating and extending prior definitions of actionable knowledge by proposing a com

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Summary

This chapter provides one of the most comprehensive conceptualizations and operational frameworks for

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Scores

- **Overall Relevance Score:** 95 – Highly explicit definition, detailed attributes, and strong conceptual cl

- **Operationalization Score:** 95 – Provides structured, measurable framework with concrete metrics, ex

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Supporting Quotes from the Paper

- “Actionable science requires a meticulous examination of ideas within the confines of practical constrain
- “An actionable science endeavor should not run counter to the overarching consensus goals shared by
- “If the answer is ‘yes’ to all three questions, the research falls within the high basket of actionable scienc
- “Effective communication is essential for promoting public understanding and support.” (p. 14)

Actionability References to Other Papers

- Beier et al. (2017) – Co-production of actionable science.
- Kirchhoff et al. (2013) – Actionable knowledge usability.
- Meinke et al. (2006) – Actionable climate knowledge.
- Chai et al. (2003); Agrawal (2001) – Knowledge sharing/transfer.
- Lemos et al. (2012) – Climate information usability gap.