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Editorial

The Value of Systematic Evidence Synthesis in Forestry, Land Use and Development to Improve Research, Decision-Making and Practice

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Despite well-established procedures for using systematic evidence-informed approaches to policy and practice in fields as diverse as medicine, crime and justice, education, and conservation, the uptake of these rigorous methods of synthesising relevant literature has been disappointingly slow in forestry and related fields. This may be due to: general lack of understanding of, or misconceptions about, systematic evidence synthesis; a belief that the method is inappropriate for the "messy" world of forestry and land-use; a dislike of the protocol-driven approach that underpins systematic evidence synthesis; the rigorous approach is beyond the resources of time and funding available for a given topic review; systematic reviews can only be undertaken by a narrow "elite"; or a combination of these. The current Special Issue of *Forests* brings together a range of papers that demonstrate that systematic evidence synthesis is appropriate for forestry and land-use policy and practice, and that the method is evolving to embrace new ideas that fit with the core tenets of comprehensiveness, transparency, and procedural objectivity.

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1. Introduction

Evidence-based initiatives have emerged in many subjects in recent years after 30 years of success in evidence-based medicine (EBM), also referred to as "evidence-informed medicine" [1]. Systematic evidence synthesis, particularly systematic review, became the cornerstone of EBM, with its emphasis on clear, repeatable methods to find, synthesise and assess large bodies of research of importance regarding critical questions in medicine and human health. The need for objectivity, repeatability and transparency in reaching conclusions from all available evidence is equally evident in many other areas of policy and practice, and systematic reviews were adopted in education, social policy, crime and justice, and international development. Systematic evidence syntheses were adopted in environmental management and conservation as recently as 2006 [2]. Adopting systematic reviews in forestry has been perhaps slower than expected, although the field has been more enthusiastic about the use of systematic maps.

2. What Are Systematic Evidence Syntheses?

Systematic evidence syntheses comprise reviews, maps, rapid reviews, and other types of evidence evaluation supported by detailed methods. Much has been written about the characteristics of systematic evidence syntheses, and there are guidelines for their conduct in diverse fields [3–6]. In brief, however, they follow a strict method for finding, selecting and analysing scientific research and differ from the majority of literature reviews in some important ways (Table 1).

Table 1. Differences between systematic maps, systematic reviews, and traditional, non-systematic literature reviews (adapted from Petrokofsky 2017 [7]).

Feature	Systematic Map	Systematic Review	Non-systematic Review
Purpose	Determining the evidence base and knowledge gaps	Determining the impact of management/environmental exposure	Variable
Question	Often broad in scope	Mostly a focused question	Often broad in scope
Sources and search	Comprehensive sources and explicit search strategy	Comprehensive sources and explicit search strategy	Not usually specified, potentially biased
Selection of articles	Criterion-based selection, uniformly applied	Criterion-based selection, uniformly applied	Not usually specified, potentially biased
Appraisal	Usually not applied owing to the purpose of systematic maps	Critical appraisal	Variable
Synthesis	Narrative synthesis	Quantitative summary (can be meta-analysis)	Often a qualitative summary

3. Why Is This Important?

Forestry and other forms of environmental management are filled with complex land use issues and conflicting interests. Many management activities will be controversial or expensive. To avoid unwanted or inefficient outcomes, it is important that actions be informed by the best available evidence, not by the assertions or beliefs of special interest groups, a literature search tailored to individual knowledge or to what is easily available, or even by ill-defined "experts". Furthermore, the rigorous approach to evidence inclusion in systematic evidence syntheses often reveals deficiencies in primary research, such as badly reported or missing methodological details that can highlight substantial gaps in the reliable knowledge available for decision-makers [8]. Consequently, "evidence" is a much-used, and misused, word in science and policy.

4. Why Are People Not Doing This All the Time?

Time and lack of resources are often mentioned as reasons for not engaging in rigorous evidence synthesis. However, from a societal point of view, the cost of not doing it is high and unjustifiable, especially when the purpose of the review is to support decision-making. Notwithstanding the plethora of information on what systematic evidence synthesis is and the many sources of guidance on how to conduct one, knowledge of the methods has been slow to diffuse to scientists and foresters outside of the circle of systematic review enthusiasts. One of the purposes of this Special Issue of *Forests* is to showcase the versatility of systematic evidence synthesis methods and encourage more people in forestry and related fields to engage in rigorous evidence synthesis work.

5. Papers in the Special Issue

This Special Issue focuses on systematic approaches to evidence synthesis in the broad area of land use and forest management. The papers selected covers a wide range of fields, from traditional land management to changes of terminology in time and space. These include forest management and conservation, ecology, economics, food security, bioenergy, soils, agroforestry, and land-use management. The papers cover different types of evidence syntheses, from protocols to systematic maps to mixed-methods.

Protocols

There are two protocols in this Special Issue that describe how the forthcoming evidence syntheses will be conducted. The systematic map protocol from Savilaakso et al. [9] focuses on how definitions of high-value forests are understood and described in the literature, where or from whom they come, and how salient they are. In their protocol, Sasmito et al. [10] outline a systematic review the literature on terrestrial and aquatic carbon dynamics in tropical peatlands, and using the evidence base, identify the influence of land-use change on carbon exchange.

Systematic maps

Kimanzu et al. [11] present a systematic map exploring the linkages between gender and access to forests for food security in low- and middle-income countries (LMICs). The assembled studies indicate strong gender specialisation in the use of, and access to, forests, but the authors point to limitations in the evidence base that prevent generalisations about the influence of gender on access to forests for food security. They also expose critical evidence gaps.

Petrokofsky et al. [12] also explore gender in their map on how the time saved in transitioning from wood or charcoal to modern energy systems is used, mainly by women, in LMICs. They find that research has done more than record the fact of time saved; very few studies have asked whether the it was spent on improving education or earning potential or reducing drudgery.

Zamkova et al. [13] map the literature on frost-tolerance measuring techniques in gymnosperms, focusing mainly on conifers. They document which techniques have been used and how, the technical constraints of measuring frost tolerance, and correlations among different techniques related to measurement performance. They conclude that many different techniques have been used for testing, and there has been little change in methodology since 2000. The gold standard remains the field observation study, which, due to its cost, is frequently substituted by other techniques.

Harvey et al. [14] introduce the first use of a systematic evidence synthesis in forest palaeo-environmental studies. The map records published palaeo-ecological proxies for regional environmental variables such as charcoal, diatoms, and phytoliths. The interactive evidence map makes available information about past land cover and land use for future research on palaeo-environmental science, and for land use policy where climate change, fire and drought are key challenges.

Torres et al. [15] explore the recent literature on the assessment of forest health by remote sensing techniques. Based on the synthesised literature, the number of published papers, mostly focused on North America and Europe, has increased over the last six years, especially since 2018. Although a variety of technologies has been applied to study forest health, satellite-borne multispectral sensors were the most common. Most of the studies attempted to quantify the damage caused by different biotic or abiotic factors on forest health, rather than on the development of early warning systems.

Jordan et al. [16] systematically map evidence on temperate agroforestry in ruminant livestock farming. The evidence base indicates that introducing agroforestry in sheep and cattle farming systems has the potential to sequester carbon, reduce soil erosion, and improve water quantity and quality regulation. Possible trade-offs and synergies between agroforestry system types and the delivery of environmental and productivity benefits are suggested for future research.

Mixed method paper

The paper by Casey et al. [17] is a novel mixed methods paper, with lessons on science–practice interaction in forest management. They examine how well literature reviews, gathered as a part of the systematic mapping of literature on bird–vegetation relationships, meet the information needs of forest managers. They identify two main areas where wildlife scientists could increase the relevance and applicability of their research: 1) aligning their research with metrics used by forest managers and 2) focusing on information to provide habitats for wildlife species that have varied habitat needs related to succession after harvest or natural disturbances. This research should be conducted over 1–2 decades, or even longer periods, of stand development.

Perspective paper

An innovative methodological approach to improving the search for, and analysis of, studies in systematic evidence synthesis is proposed by Murat et al. [18], which is intended to stimulate discussion in the systematic evidence synthesis community. They explore the possibility of using machine learning to combine specialist ontologies and crowd-sourced terminology, to improve the time required for systematic evidence syntheses,

which, they argue, is a major deterrent for their greater use in development projects and forestry generally.

6. Summary

The diversity of papers in this Special Issue demonstrates the applicability of a systematic evidence synthesis approach for the broad domain of forestry, comprising, as it does, fields from silviculture for production forestry, to forest ecology to current priorities, such as sustainable development, gender impacts, artificial intelligence in decision-making, and, of course, climate change. Robust, reliable evidence is needed for these and many other closely related fields of policy relevance. In addition, the papers show that there are significant gaps in scientific knowledge that can be targeted in future research to improve our understanding of different systems (ecological, socio-economic or both) and design better policy interventions where needed. As Casey et al. [17] show, there is room for improvement in bridging the science–practice gap, and surely a systematic evidence synthesis is the sine qua non of future evidence analysis for the critical questions of land management, social equality, and environmental health.

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