

Assessing sustainability when data availability limits real-time estimates: using near-time indicators to extend sustainability metrics

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Abstract The goal of this paper is to highlight the problem of time lags in data releases that are necessary for calculating sustainability metrics and its effect on making informed management decisions. We produced a methodology to assess whether a regional system is on a sustainable path and tested it in south-central Colorado. We identified key components of the system and selected four sustainability metrics that measure those components. Metrics included: (1) ecological footprint (i.e., environmental burden), (2) green net regional product (GNRP) (i.e., economic well-being), (3) emergy (i.e., energy flows), and (4) Fisher information (i.e., dynamic order). Having calculated these metrics, we identified future research recommendations and limitations. One limitation was the delay between when an event occurred and when data on the event were released. Given, the recent push in government agencies for calculating sustainability metrics, finding solutions for the time lag will be important. To address this limitation, we explore the potential of using both sustainability metrics and indicators that are available near-time to provide decision makers with better decision support. For the pilot study in Colorado, the metric calculations were 3 years behind present. Using near-time indicators that are publicly available before the metrics can be calculated might help to predict the path of the metric. As an example, we examine if specific near-time indicators

are correlated with ecological balance (a component of ecological footprint) and GNRP. We use Spearman rank correlations and scatter plots to identify the relationship of the metrics and near-time indicators in an exploratory analysis. We offer research recommendations to consider.

Keywords Sustainability · Ecological footprint · Green net regional product · Data availability · Data release · Time lag · Ecological balance · Green accounting

Introduction

The United States Environmental Protection Agency (USEPA) is interested in developing integrated, system-based decision tools that focus on sustainability. We wanted a general methodology applicable at many spatial scales (e.g., city, country, state, region, etc.) with appropriate modification as data needs and availability change for the specific area under study. To test our general methodology, we initiated a pilot study in south-central Colorado, a region we refer to as the San Luis Basin (SLB). The research objectives of the pilot study were to: (1) determine the applicability of using existing datasets to estimate four metrics¹ of sustainability at a regional scale; (2) calculate metrics through time from 1980–2005; and (3)

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¹ For clarification, we distinguish between “metric” or “index,” and “indicator.” Mayer (2008) defines an indicator as measuring one characteristic or variable (e.g., CO₂ emissions), but an index combines many indicators or variables through aggregation (e.g., ecological footprint). Therefore, indices can provide a multidimensional view of sustainability and are capable of quantifying the condition of an entire system. For this paper, metric and index are synonymous.