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Conceptualizing and operationalizing human wellbeing for ecosystem assessment and management

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ABSTRACT

There is growing interest in assessing the effects of changing environmental conditions and management actions on human wellbeing. A challenge is to translate social science expertise regarding these relationships into terms usable by environmental scientists, policymakers, and managers. Here, we present a comprehensive, structured, and transparent conceptual framework of human wellbeing designed to guide the development of indicators and a complementary social science research agenda for ecosystem-based management. Our framework grew out of an effort to develop social indicators for an integrated ecosystem assessment (IEA) of the California Current large marine ecosystem. Drawing from scholarship in international development, anthropology, geography, and political science, we define human wellbeing as *a state of being with others and the environment, which arises when human needs are met, when individuals and communities can act meaningfully to pursue their goals, and when individuals and communities enjoy a satisfactory quality of life*. We propose four major social science-based constituents of wellbeing: connections, capabilities, conditions, and cross-cutting domains. The latter includes the domains of equity and justice, security, resilience, and sustainability, which may be assessed through cross-cutting analyses of other constituents. We outline a process for identifying policy-relevant attributes of wellbeing that can guide ecosystem assessments. To operationalize the framework, we provide a detailed table of attributes and a large database of available indicators, which may be used to develop measures suited to a variety of management needs and social goals. Finally, we discuss four guidelines for operationalizing human wellbeing measures in ecosystem assessments, including considerations for context, feasibility, indicators and research, and social difference. Developed for the U.S. west coast, the framework may be adapted for other regions, management needs, and scales with appropriate modifications.

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1. Introduction

The concept of *human wellbeing* is attracting increasing attention in environmental science, policy, and management, most recently at the global scale and in marine contexts (Adger et al., 2005; Cope et al., 2013; Díaz et al., 2015; Mace, 2014; McLeod et al., 2005; Millennium Ecosystem Assessment, 2005a). In part, this is due to the inclusion of people and human societies in definitions of “ecosystem” (Mace, 2014; McLeod et al., 2005), the rise of the paradigm of ecosystem services (Díaz et al., 2015; Millennium Ecosystem Assessment, 2005a), and a renewed appreciation for human wellbeing as a better measure of social progress than conventional economic measures such as gross domestic product (GDP) (Cobb and Rixford, 1998; Gough and McGregor, 2007; Stiglitz and Sen, 2009). Social scientists, in fields such as fisheries anthropology, social forestry, health, and international development have produced a rich literature on human wellbeing as it pertains to the environment at individual, community, and societal scales, using a range of approaches (Chan et al., 2012; Charnley et al., 2012, 2008; Coulthard, 2012; Donatuto et al., 2014; García-Quijano, 2015; Pollnac et al., 2006; Pollnac and Poggie, 2006; Satterfield et al., 2013; Stephanson and Mascia, 2014). The challenge is to translate these diverse insights from the social sciences into a cohesive framework for assessing human wellbeing that is specifically designed for the current demands of environmental science, policy, and management (Breslow, 2015; Castree et al., 2014; Fish 2011; Hicks et al., 2016; Levin et al., 2014; Samhuri et al., 2014; Satterfield et al., 2013).

Ecosystem-based management (EBM) represents a shift from a single-species, extraction-oriented focus in resource management toward a more holistic philosophy that strives to balance the multiple interrelated dimensions of ecological integrity and human wellbeing (McLeod and Leslie, 2012; Millennium Ecosystem Assessment, 2005a). Integrated Ecosystem Assessments (IEAs) were formalized as an approach for implementing EBM in marine ecosystems (Levin et al., 2009), and seek to answer three primary questions: 1) What constitutes a “healthy” ecosystem?; 2) Is the ecosystem being assessed currently healthy?; and, 3) What management strategies can maintain or improve ecosystem health? IEAs use indicators to help answer these questions. Indicators represent features of the social or biophysical system that can be easily measured and tracked over time in order to understand how the system is changing, what interventions may be necessary, and whether these interventions are effective (Mascia et al., 2014). To date, IEAs have largely employed biophysical indicators to assess ecological conditions (Samhuri et al., 2014). However, because IEAs promise to consider the full social-ecological system (Levin et al., *in press*), they must explicitly include human wellbeing in the assessment, and thus must confront the challenge of operationalizing the concept of human wellbeing.

Human wellbeing evokes, variably, quality of life, happiness, and the social and economic conditions of individuals, communities and societies. Here we define human wellbeing as “a state of being with others and the environment, which arises when human needs are met, when individuals and communities can act meaningfully to pursue their goals, and when individuals and communities enjoy a satisfactory quality of life.” We build on the definition developed by the Wellbeing in Developing Countries research group (WeD) (Coulthard et al., 2011; McGregor, 2008), and adapt it for EBM by emphasizing a dynamic set of conditions whereby the major dimensions of wellbeing operate at multiple social scales within a social-ecological context.

Global assessments of human wellbeing use comparable, objective, quantitative indicators to measure tangible qualities of the economy, the environment, human health, and education

(United Nations, 2008; United Nations, Department of Economic and Social Affairs, 2007; United Nations Human Development Programme, 2014). These global efforts leave less tangible, yet important dimensions of wellbeing unassessed, such as social relationships, and cultural and spiritual values (Satterfield et al., 2013; Turner et al., 2008). National and regional assessments use more diverse measures than these global assessments, yet human connections to the environment remain underrepresented (e.g. Michalos et al., 2011; OECD, 2013a; Office for National Statistics, 2015) or limited due to lack of indicators and data (Australian Bureau of Statistics, 2013; see also the review by Smith et al., 2013). In cases where measures of wellbeing have been designed specifically for environmental management, they are typically assessed at scales and resolutions that are too coarse to definitively track the social effects of acute environmental events, such as an oil spill, or specific management actions, such as catch shares and boat buy-back programs (Dillard et al., 2013; Dunn, 2013; Leisher et al., 2013; Summers et al., 2014). Others are very specific, focused, for example, on fishing communities (e.g. Colburn and Jepson, 2012; Pollnac and Poggie, 2006), marine protected areas (Mascia et al., 2010) or forest ecosystems (Edwards, 2011), and therefore may not translate effectively to other social and ecological contexts. Additionally, ecosystem services frameworks (e.g. Millennium Ecosystem Assessment, 2005a) primarily attend to the one-way delivery of benefits from the natural environment to humans, without fully accounting for the interdependencies between social and ecological systems, and how management might directly affect wellbeing (Breslow, 2015; Fish, 2011; Satz et al., 2013).

Here we develop a comprehensive framework of human wellbeing as it relates to environmental conditions and management actions. Our effort was initiated by the U.S. National Oceanic and Atmospheric Administration (NOAA) to inform the IEA of the California Current, the large marine ecosystem that stretches from Vancouver Island, Canada, through the U.S. West Coast, to Baja California, Mexico (<http://www.noaa.gov/iea/regions/california-current-region/index.html>). We combine an analysis of U.S. marine and environmental management priorities with a synthesis of existing wellbeing concepts to advance a framework of human wellbeing that is expressly designed for EBM. Below, we propose four major constituents of wellbeing, outline a process for identifying policy-relevant attributes of wellbeing, and recommend guidelines for using the framework to select indicators and scope complementary social science research for ecosystem assessments. While our focus is on U.S. marine management, our approach is designed to be adaptable to other regions, management needs, and scales, with appropriate modifications.

2. A conceptual framework of human wellbeing

We developed a detailed conceptual framework of human wellbeing to guide the selection and analysis of social indicators for an IEA, and scope complementary social science research. In developing the framework, we strove to serve the needs of resource managers, while improving social science literacy and awareness of the multidimensionality of human wellbeing. Our framework is distinguished from several well-known examples in its very pragmatic emphasis on management needs. While other frameworks begin with theoretical principles (e.g. Meadows, 1998), empirical observations (Millennium Ecosystem Assessment, 2005b), or a review of existing domains and indicators (Smith et al., 2013), ours is built on an analysis of managers' responsibilities vis a vis human wellbeing as articulated in management and policy documents. These are then augmented and organized according to social science principles. In this way, the framework focuses attention on aspects of human wellbeing for which managers and decision-makers may be held accountable (Cobb and Rixford, 1998;

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