International Journal of Sustainable Built Environment (2016) xxx, xxx–xxx

HOSTED BY

ELSEVIER

Gulf Organisation for Research and Development

International Journal of Sustainable Built Environment

ScienceDirect
www.sciencedirect.com

Review Article

A review of studies on ecosystem services in Africa

Peter Wangai [a,b,*], Benjamin Burkhard [a,c], Felix Mueller [a]

[a] University of Kiel, Institute for Natural Resource Conservation, Olshausenstr. 40, 24098 Kiel, Germany
[b] Kenyatta University, Department of Environmental Studies & Community Development, P.O. Box 43844-00100, Nairobi, Kenya
[c] Leibniz Centre for Agricultural Landscape Research ZALF, Eberswalder Str. 84, 15374 Müncheberg, Germany

Received 21 October 2015; accepted 30 August 2016

Abstract

Assessments of ecosystem services (ES) are vital for Africa's sustainability. ES supply and demand take place in distinctive patterns in Africa due to the continent's characteristic spatial heterogeneity, rich biodiversity, demographic developments, resource endowment, resource management conflicts, and fragile political landscapes, along with current industrialization and urbanization processes. Ignorance of the dynamism of these parameters could diminish the capacity of the different ecosystem service providing units (SPU) to satisfy the demands in the ecosystem service benefiting areas (SBA) in Africa. The main aim of this review article is to assess the extent to which ES studies have been conducted and applied in Africa. This review analyzes those articles accessible online via the ISI Web of Science and open access journals. The online search yielded 52 ES-related studies, which were used for the review. Results indicate that most studies were conducted in South Africa, Kenya and Tanzania, and focused on services provided by watersheds and catchment ecosystems. Crucially, most of the studies focused on more than one ES category. Provisioning ES dominated across all the ES categories. However, ES tradeoffs and synergies were barely addressed. Economic valuation of ES and ES mapping comprised more than three-quarters of all the studies, and a quarter referred to biophysical quantification or qualification of ES. There are emerging alternative, non-monetary valuation methods for ES, which could pave a new way of capturing value of non-monetized ES in Africa. Moreover, there is an urgent need to extend ES studies to the entire continent, in order to capture spatial and socio-economic uniqueness of various countries and focus more on local-scale assessments of multiple ES, as a means for addressing ES tradeoffs, synergies and SPU-SBA relations in Africa.

Keywords: Ecosystem services; Scale; Quantification; Mapping; Valuation

Contents

* Corresponding author at: University of Kiel, Institute for Natural Resource Conservation, Olshausenstr. 40, 24098 Kiel, Germany.
E-mail address: peterwangai@gmail.com (P. Wangai).
Peer review under responsibility of The Gulf Organisation for Research and Development.

http://dx.doi.org/10.1016/j.ijsbe.2016.08.005

1. Introduction

Africa hosts an estimated population of 1.1 billion people, with an annual population growth rate of 2.3% (UNFPA, 2011). This population, like any other, depends on a continuous supply and flow of ecosystem services (ES) from nature to society. However, ES providing units (SPU) and benefitting areas (SBA) are relatively unevenly distributed across Africa (Serna-Chavez et al., 2014). For example, the Africa Environment Outlook[1] (2013) stipulated that 66% of Africa's total surface area is deserts and arid lands, and that only 26.9% of the total area is viable arable land (Cotula et al., 2009). However, large parts of Africa are rich in natural resources such as tropical forests, freshwater lakes, rivers, oil, minerals and biodiversity (Elbra, 2013; Holland et al., 2012; Green et al., 2013). These resources are vital SPUs that hold significant amounts of natural capital, or deliver abiotic outputs from natural systems, such as oil and minerals. The spatial mismatch between SPU and SBA is further exacerbated by frequent resource management conflicts, political instability (Miguel and Gugerty, 2005), ecosystem degradation (Masese et al., 2013; Jalloh et al., 2012; Green et al., 2013), droughts, diseases, poverty, and inadequate knowledge on human-environmental system dynamics and interrelations (Basedau and Pierskalla, 2014). The latter is vital for methodological development, assessment and analysis of ES potentials, flows and demands across Africa. As Costanza and Kubiszewski (2012) have shown, there were only eight authors from Africa that have published more than five papers on ES. However, since the turn of the second millennium, ES have increasingly become a topical issue for research and discussion in scientific forums (MA, 2005; TEEB, 2010; Müller and Burkhard, 2012), not only at global level, but also in Africa (Egoh et al., 2012).

1.1. Ecosystem services

The concept of '*ecosystem services*' is a relatively recent development, tracing back to the middle of 1960s and beginning of 1970s (De Groot et al., 2010; Braat and De Groot, 2012; Hernández-Morcillo et al., 2013). The Millennium Ecosystem Assessment (MA) (2005) defines ecosystem services as "the benefits that humans obtain from ecosystems". Costanza et al. (1997) postulate that ecosystem services comprise of "flows of materials, energy, and information" from the natural environment to the society. Wu (2014) defines ecosystem services as "benefits that people derive from biodiversity and ecosystem functions". Other definitions focus on a range of services including: ecosystem benefits to human well-being, ecosystem goods and services to humans, value derivation by humans from ecosystems, direct/indirect positive contribution of ecosystems to human well-being, and utility from ecosystems (Ericksen et al., 2012; Fisher et al., 2009; Müller and Burkhard, 2012; Sagie et al., 2013; Costanza et al., 1997). It is noted that some authors use either an ecological or economic perspective in defining ecosystem services (Jax, 2010). However, distinguishing these two perspectives is not within the focus of this review.

The interest in ecosystem services has greatly increased after the publication of the Millennium Ecosystem Assessment (MA, 2005; Haines-Young and Potschin, 2010).

[1] http://www.unep.org/pdf/aeo3.pdf.

Please cite this article in press as: Wangai, P. et al. A review of studies on ecosystem services in Africa. International Journal of Sustainable Built Environment (2016), http://dx.doi.org/10.1016/j.ijsbe.2016.08.005