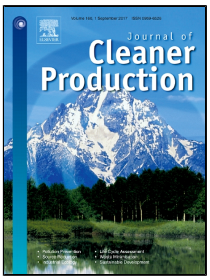
Accepted Manuscript



The ecosystem service value as a new eco-efficiency indicator for industrial parks

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PII:	S0959-6526(17)31357-4
DOI:	10.1016/j.jclepro.2017.06.187
Reference:	JCLP 9937
To appear in:	*Journal of Cleaner Production*
Received Date:	26 October 2016
Revised Date:	20 June 2017
Accepted Date:	21 June 2017

Please cite this article as: Yao Shi, Jingru Liu, Han Shi, Huiquan Li, Qiang Li, The ecosystem service value as a new eco-efficiency indicator for industrial parks, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.06.187

The ecosystem service value as a new eco-efficiency indicator for industrial parks

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Abstract

The ecologicalization of industrial parks and the construction of eco-industrial parks (EIPs) are new trends within industrial clusters. However, land use changes and the related losses of ecosystem services are often neglected in ecological evaluations of industrial parks. This negligence is particularly significant in developing countries such as China, where the economic outputs of land use have significantly improved, but a considerable number of farms and forests have been exposed to industrial land, which greatly reduces the regional natural capital. This article proposes a set of eco-efficiency indicators for evaluating the ecological performance of an industrial park from the perspective of the ecosystem services or natural capital reflected by such services. A corresponding efficiency evaluation model and index system was constructed and used in a case study of Ningguo Gangkou industrial park in eastern China. Based on a comparative analysis of the eco-efficiency of the Gangkou industrial park in 2007 and 2015, we found that although the total ecosystem service value (ESV) of Gangkou in 2015 had increased by 27% compared with that of 2007, the maintenance of the ecological regulating and supporting services of the park had declined, and the indirect economic value of these services had decreased by 14%. Because of the development of the park over the last 10 years, the different ecosystems and the relevant ecosystem services had undergone different degrees of change. The main task of this study was to establish an ESV-based eco-efficiency evaluation index system that can be used by decision makers for sustainable landscape planning and development.

Key Words: industrial park, eco-efficiency, ecosystem services, land use

1. Introduction

In China, the development of eco-industrial parks (EIPs) reflects the government's attempt to implement the circular economy that focuses on resource shortages and environmental pollution issues related to regional economic development (Shi et al., 2010; Shi et al., 2003a, b; Shi et al., 2012a, b). Over the past two decades of methodological and practical development of EIPs, most of the focus have been on the exchanges of by-products and waste , their influence on the environment, and the metabolism of natural resources and energy (Côté, 1998; Lowe, 1997). With the rapid development and extension of EIPs in recent years (Bai et al., 2014; Panyathanakun et al., 2013; Shi et al., 2010; Shi et al., 2011; Yu et al., 2014a;

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