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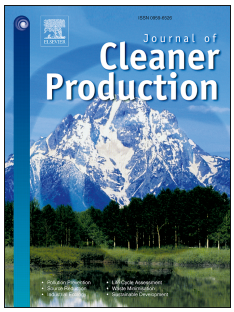

Associations of multiple ecosystem services and disservices of urban park ecological infrastructure and the linkages with socioeconomic factors

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Associations of multiple ecosystem services and disservices of urban park ecological infrastructure and the linkages with socioeconomic factors

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Abstract

Urban ecological infrastructures (UEIs; e.g., parks, beaches, rivers, forests, and woodlands) provide important ecosystem services (ESes) to urban ecosystems. Understanding the covariance of multiple ESes and disservices and their associations with social economic factors is a precondition of ecosystem management. Previous studies have mainly focused on ESes and tradeoffs among multiple ESes, whereas disservices and their associations with ESes have seldom been addressed. In this study, we took public urban parks, an important component of UEIs as well as the basic unit for management, as a case study and explored the ESes and disservices of different types of parks and the delivery of ESes to different social economic strata based on 187 plot inventory data. The results showed that the actual dominant ESes of four types of parks differed from both the expectations of planners and the demands of residents. Positive correlations existed among ESes and disservices (e.g. bio-emissions and air pollution reduction). Population density was positively related with several ESes; Distance to urban center was negatively associated with C storage, bio-emissions, and aggregative ES indicators; Wealthy areas had better performance in terms of C storage and aggregative ES indicators. Major challenges for the four types of parks and measures to coordinate ESes and disservices are discussed. Multiple stakeholder involvement, ES provision for low income populations, and the protection of parks in peri-urban and central urban areas are suggested.

Keywords: urban ecological infrastructure, ecosystem service, green space, disservice

1 Introduction

The world is experiencing rapid urbanization. Between 1950 and 2005, the level of urbanization increased from 29% to 49%, while global carbon (C) emissions from fossil-fuel burning increased by almost 500% (UN-Habitat 2016). Urban ecosystems account for more than 75% of the global resource consumption and contribute to 80% of the C emissions (UN, 2012). In addition, the large-scale land use conversion from peri-urban forests, farmlands, and wetlands to built-up areas has resulted in a critical loss of ecosystem services (ESes) at the local to global scales (Breuste et al., 2015; Li et al., 2016; Seto et al., 2012). The concept of urban ecological infrastructures (UEIs) has been developed within the last three decades and commonly refers to the connective matrices of green space, wetlands, rivers, pervious surfaces, and traditional gray infrastructures (Breuste et al., 2015; Li et al., 2016). UEIs are the main carrier of ecosystem services in urban ecosystems and are closely related to the quality of life of urban residents (Breuste et al., 2015). UEIs include a comprehensive set of functions: water supply and recycling, soil fertility and biodiversity maintenance, materials decomposition and waste regeneration, and