



Evaluation of Environmental Purification Service for Urban Green Space in Nanjing

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ABSTRACT

Urban environmental pollution intensifies with the acceleration of industrialization and urbanization. Urban green space plays an important role in improving the quality of urban environment. Statistical reports from 2002 to 2013 were analysed to estimate the environmental purification value of urban green space in Nanjing by using the production cost method and substituted expenses method. Results showed that the environmental purification value of urban green space from 2002 to 2013 increased from 0.212 billion to 0.354 billion RMB, showing an increase of 0.142 billion RMB and an annual average growth rate of 14% in the past 12 years. Carbon fixation and oxygen release of urban green space ecosystems are transferable in regional space; hence, these services can be performed by the natural ecosystems beyond the city. However, harmful gas absorption, dust detention and noise reduction of urban green space is not transferable in space and thus must be performed by the urban ecosystem. Therefore, aside from innovating technologies for pollution-reducing and pollution-controlling, increasing green space coverage, optimizing green plant distribution structure, and enhancing urban green space management must be executed to improve the urban ecological environment.

INTRODUCTION

Urbanization and industrialization inevitably result in the production of wastewater, exhaust gas and waste residues. These wastes will not cause serious problems in the urban environment when produced within the tolerance of the urban ecosystem; otherwise, the urban ecosystem will be destroyed. Urban green space, an important component of urban ecosystems, plays an indispensable role in maintaining carbon-oxygen balance and improving the conditions of the urban environment. In addition to innovating technologies for pollution-reducing and pollution-controlling, strengthening the construction and increasing the ecological benefits of urban green space are important means to improve the urban environment, as well as effectively facilitate a sustainable urban development (Chiesura 2004).

The relationship between urban green space and urban thermal environment is currently a major research topic. For example, on the basis of the quantitative analysis of Landsat6 remote sensing data, surface temperature drops with the increase in the normalized differential vegetation index, as shown by studying the zone of rapid development in south Guang-zhou (Ke et al. 2010). This phenomenon is manifested in the differences in the mean surface temperature of

various land use types. The mean surface temperature in decreasing order is as follows: industrial land > land for roads > commercial land > residential land > commonality construction land > other land > land for public facilities > green space > water area (Zhang et al. 2008), although the difference in surface temperature is not very obvious at night (Yan et al. 2015). Changes in green space area influence directly the range of urban heat island effect (Zhou et al. 2014). Using remote sensing and geographic information technologies, most urban green space plaques in the main urban area of Beijing can cool the surrounding buildings within approximately 100 meters. However, no significant correlation existed among the perimeter, area, and shape of green space plaque, as well as plant coverage and cooling amplitude of the surrounding buildings (Luan et al. 2014). Given that relieving the heat island effect is an effective measure to improve the urban ecological environment, urban green space plays an important role in improving the quality of life in the urban environment.

The ecosystem service value assessment, which is an effective method to measure the environmental benefit of urban green space, started from Costanza's quantitative evaluation of global ecosystem service value in 1997 and has become a major research topic in ecology, ecological