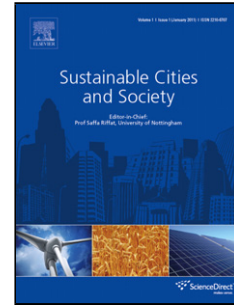


Accepted Manuscript

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PII: S2210-6707(16)30490-5
DOI: <http://dx.doi.org/10.1016/j.scs.2017.09.001>
Reference: SCS 755



To appear in:

Received date: 14-10-2016
Revised date: 31-3-2017
Accepted date: 1-9-2017

Please cite this article as: Cheng, Yuning., & Wang, Ruijun., A novel stormwater management system for urban roads in China based on local conditions. *Sustainable Cities and Society* <http://dx.doi.org/10.1016/j.scs.2017.09.001>

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A novel stormwater management system for urban roads in China based on local conditions

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Highlights

- we introduce a newly structured SWM system for urban roads.
- The special collecting method can effectively separate litter and debris.
- The storage facility has an extra function of irrigating without power input.
- Data analysis indicates the designed system performs well in retaining rainwater on site.
- A comparative analysis proves the irrigation method generally achieves its expected effect.

Abstract

This study introduces a novel design for stormwater management (SWM) for urban roads in China on basis of issues that have emerged in recent years. The designed system allows for the management of rainwater, from collection to reuse, in a way that is highly cost-effective and sustainable. Supported by the local government, a 600-m road section implementing the design was built and operated in Nanjing, China, in 2015. Data analysis supports the good evaluation of the current system performance, which is basically as expected. Specifically, about one-third to one-half of rainfall is captured during the rainy season. The system structure presents a continuous stability, even in rare heavy rain events. The irrigation function is realized using a slow-release method without any power input. The proposed design offers practical uses during rainless periods, thus has an ability to generally substitute for the conventional irrigation.

Keywords: urban roads; stormwater management; data monitoring and analysis; water conservation

1. Background

Stormwater management (SWM), an example of ecological infrastructure in urban areas, is implemented to address the runoff issues caused by incremental increase of impervious surface area. As a global concern, it is also known as Best Management Practices (BMPs), Low Impact Design (LID), Sustainable Urban Drainage Systems (SUDS), and Water Sensitive Urban Design (WSUD) (Coombes et al. 2000; Marsalek & Chocat 2002). The specific forms and materials for SWM are engineered depending on land setting and land-use types. A common classification is based on whether the location is a building, property, street/road, or open space, covering typical applications of SWM in urban areas. After these concepts and techniques were introduced in China, the application for urban roads was first used in various projects conducted by the government. Facilities similar to infiltration trenches, bioswales, curb extensions, and rain gardens, which are detailed in *Low Impact Development (LID): A Design Manual for Urban Areas* (UACDC, 2010), were installed in many pilot urban roads in recent years. Including other existing measures, the core concept of SWM is similar compared with the divers forms, which is to direct runoffs to sunken greenbelts where they are disposed directly or processed for further use. However, after one or several rainfall cycles, the SWM projects in China gradually manifested several problems, mainly due to the incongruity with the local conditions, including natural factors as well as social and cultural ones. The succeeding paragraphs summarize and analyze the primary issues of SWM to help to improve its design and construction in China.

1.1. Aesthetic preference

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