

# **International Low Impact Development Technology Conference China 2016**

## **LID Applications in Sponge City Projects**

Proceedings of the International Low Impact  
Development Conference China 2016

Beijing, China  
26 – 29 June 2016

### **Editors:**

**Haifeng Jia  
Shaw L. Yu  
Robert Traver**

**Huapeng Qin  
Junqi Li  
Mike Clar**

ISBN: 978-1-5108-5585-4

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by American Society of Civil Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact American Society of Civil Engineers  
at the address below.

American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191  
USA

Phone: (800) 548-2723  
Fax: (703) 295-6333

[www.asce.org](http://www.asce.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Contents

## *Urban Hydrology and Water Systems*

<b>Temporal and Spatial Variations of Extreme Precipitation and Flood Thresholds in Qinghe Basin in Beijing, China .....</b>	<b>1</b>
Li Lu, Xuebiao Pan, Lizhen Zhang, and Xingyao Pan	
<b>The Effects of Low Impact Development Practices on Urban Stormwater Management .....</b>	<b>12</b>
Na Li, Qian Yu, Jing Wang, and Xiaohe Du	
<b>The Impact of Focused Recharge with LID Devices on Groundwater Dynamics and Water Quality under Natural Rainfall Conditions .....</b>	<b>21</b>
Zhonghua Jia, Qing Xu, Wan Luo, and Shuangcheng Tang	
<b>Assessment of Stormwater Management and Storage Capacity for Urban Green Space in Shanghai City .....</b>	<b>27</b>
Bingqin Yu, Shengquan Che, and Jiankang Guo	
<b>Index System of Urban Rainwater Collection and Utilization in Beijing City under Low Impact Development.....</b>	<b>37</b>
Anping Shu, Xing Zhou, Donglian Kong, Lu Tian, and Li Huang	
<b>Verification of the Effectiveness of BMP Techniques in a Long Time Period Using Trend Analysis .....</b>	<b>45</b>
Zijing Liu and Yuntao Guan	
<b>Application of LID Attribute Index Evaluation Method in the Design of Urban Stormwater Control .....</b>	<b>57</b>
Jiangyun Li, Wang Sheng, Qing Chang, and Yi Zhou	
<b>Comparative Analysis of Different Evapotranspiration Estimation Methods Used in a Raingarden in Auckland, New Zealand .....</b>	<b>66</b>
Tingting Hao, Asaad Shamseldin, Keith Adams, and Bruce Melville	
<b>Concurrent Potential for Flooding Risk Reduction of Decentralized Rainwater Management System.....</b>	<b>76</b>
Donggeun Kwak, Minju Lee, Soyoung Baek, and Mooyoung Han	

## *Urban Runoff Simulation and Analysis*

<b>Modeling of Streamflow in an Underdrain System of Vegetated Dry Swales .....</b>	<b>85</b>
Sidian Chen, Huapeng Qin, and Shuxiao Li	

<b>Stochastic Long Time Series Rainfall Generation Method .....</b>	<b>92</b>
Yi Zhou, Yu Shang, Jiangyun Li, and Qiufeng Tang	
<b>Effects of Low Impact Development Practices on the Mitigation of Nutrient Pollution in Deep Bay, China .....</b>	<b>100</b>
Sidian Chen, Mingfeng Zheng, Huapeng Qin, and Xueran Li	
<b>Modeling of Bioretention Systems' Hydrologic Performance: A Case Study in Beijing.....</b>	<b>108</b>
Meishui Li, Xiaohua Yang, Lei Chen, and Zhenyao Shen	
<b>Estimating Water Quality Capture Volume for LID Designs Using a Mechanical Wash-Off Model .....</b>	<b>118</b>
Qi Zhang, Fang Yang, and Zhijie Zhao	
<b>Distribution Analysis for Non-Point Source Pollution Control Programs Using Multivariate Statistical Analysis Methods .....</b>	<b>126</b>
Zijing Liu and Yuntao Guan	
<b>Study on Spatial Characteristics and Load of Urban Non-Point Source Pollution Based on Geostatistical Model.....</b>	<b>137</b>
Sheng Xie, Kai Yang, Yong Peng Lyu, Chen Zhang, Yue Che, and Lei Ding	
<b>Rainfall-Storage-Pump-Discharge (RSPD) Model for Sustainable and Resilient Flood Mitigation .....</b>	<b>152</b>
Duc Canh Nguyen and Moo Young Han	
<b>Runoff Characteristics on LID Combination Type in the New Development Site Using XPSWMM.....</b>	<b>162</b>
Donggeun Kwak, Hyunwoo Kim, and Mooyoung Han	
<i>Runoff LID Control Technology</i>	
<b>Isolation and Characterization of a PYR-Degrading Bacterial Consortium for Bioaugmentation in Bioretention Systems .....</b>	<b>172</b>
Dongqi Wang, Zhangjie Yang, Jiaqi Shan, Enyu Liu, Guodong Chai, Chan Li, Xiaohua Lin, Wen Dong, Huaien Li, and Jiake Li	
<b>Evaluation of the Effects of Low Impact Development on Base Flow in an Urbanized Watershed Using HSPF .....</b>	<b>179</b>
Qi Zhang, Zhijie Zhao, and Huapeng Qin	
<b>Groundwater Replenishment Analysis of Rainfall Collected via an Ecological Detention Facility .....</b>	<b>186</b>
Fengqing Guo, Yuntao Guan, and Tanaka Hiroaki	

<b>Reinvent of a New Public Toilet Wastewater Treatment System Using Forward Osmosis as the Key Unit: A Resources Close-Loop Model in Urban LID .....</b>	<b>194</b>
Yangyu Xu, Lu Zhou, and Qibo Jia	

<b>LID-Based Ecological Planting Groove for Road Runoff Purification Research.....</b>	<b>204</b>
Xuexin Liu, Xueping Chen, Shaoyong Lu, Xinzhu Xiong, Shuohan Gao, and Yaping Kong	

### *Green Building and Green Roofs*

<b>How to Construct Green Roofs on the Tops of Existing Buildings: A Case Study in Shanghai .....</b>	<b>214</b>
Tianqing Luo, Yining Su, and Libin Chen	

<b>Behavior of Soil Moisture in a Retentive Green Roof System .....</b>	<b>223</b>
Saerom Yoon, Juyoung Lee, and Mooyoung Han	

<b>Impact Study of Thermal Environment on Integration of Extensive Green Roof Techniques in Northwestern Arid Regions of China.....</b>	<b>231</b>
Yajun Wang, Rajendra Prasad Singh, Dafang Fu, and Junyu Zhang	

### *Sponge Cities and Landscapes*

<b>Traditional Pattern of Mountain-Water-City and Its Contemporary Enlightenment: Changshou District of Chongqing as a Case.....</b>	<b>241</b>
Lu Guo	

<b>Landscape-Scale Simulation Analysis of Waterlogging and Sponge City Planning for a Central Urban Area in Fuzhou City, China .....</b>	<b>251</b>
Shaoqing Dai, Jiajia Li, Shudi Zuo, Yin Ren, and Huixian Jiang	

<b>Adaptation to Water: A Study on Bamboo Landscape System with Low Impact Development .....</b>	<b>261</b>
Renwu Wu, Jun Zheng, Yan Shi, Fan Yang, and Zhiyi Bao	

<b>A Balance of Landscape Architectural Planning and Design among Antiterrorism Concern with Nature, Cultural, or Socio-Economic Ecosystem Services.....</b>	<b>267</b>
Kaitai Lin	

### *Case Studies*

<b>Optimization Study of Urban Stormwater Runoff Control BMPs Scheme Based on SUSTAIN.....</b>	<b>278</b>
Yifan Zeng, Xiaodong Long, Zimu Jia, Weihua Zeng, and Jianbin Shi	

<b>Comparison of Stormwater Management in the Community Park between China and Singapore: A Case Study of Hillside Eco Park and Crescent and Pioneer Hall .....</b>	<b>289</b>
Mo Wang, Dong Qing Zhang, Ya Wang, Jin Su, Jian Wen Dong, and Soon Keat Tan	
<b>Effects of Land Use and Rainfall Characteristics on River Pollutions: A Case Study of Xili Reservoir Watershed in Shenzhen, China .....</b>	<b>304</b>
Lixun Zhang, Bo Zhao, and Yuntao Guan	
<b>Low Impact Stormwater Management Development at Rutgers University .....</b>	<b>318</b>
Seth Richter, Christian Roche, and Qizhong Guo	
<i>Sponge City Construction and Management Strategies</i>	
<b>Low Impact Thinking of the Spongy City Construction in Built-Up Areas from the Perspective of Sustainable Urban Design .....</b>	<b>328</b>
Xili Han, Wenqiang Zhao, Linus Zhang, and Peter Siostrom	
<b>Challenges and Future Improvements to China’s Sponge City Construction .....</b>	<b>339</b>
Hong Wang, Xiaotao Cheng, Li Man, Na Li, Jing Wang, and Qian Yu	
<b>A CFD-Based Level Sensor Location Optimization Method for Overflow Discharge Estimation in CSOs.....</b>	<b>352</b>
Hexiang Yan, Kangqian Zhao, Gislain Lipeme Kouyi, Tao Tao, Kunlun Xin, and Shuping Li	
<b>Value and Rational Use of Landform Resources in Low Impact Development .....</b>	<b>363</b>
Dehua Mao, Wen Liu, and Min Yang	
<b>The Application of Adaptive Design Strategies in Urban Green Stormwater Infrastructure Development .....</b>	<b>372</b>
Wei Zhang, Jack Ahern, and Xiaoming Liu	
<b>Hydrologic Design and Economic Benefit Analysis of Rainwater Harvesting Systems in Shanghai, China .....</b>	<b>381</b>
Shouhong Zhang and Xueer Jing	
<b>A New Approach to Urban Water Environment Protection: Leasing Mode and Its Risk Management of Urban Rivers and Lakes Pollution Control Projects under Public-Private Partnership Model .....</b>	<b>390</b>
Zhixuan Wu, Lu Zhou, Yi Zhou, and You Zhou	