

Preface

The International Conference on Civil Engineering, Architecture and Sustainable Infrastructure (ICCEASI2012) was held on September 22-24, 2012 in Zhengzhou, China. As the rising requirement of environmental and natural resources protection to achieve sustainable development, it brings more opportunities to the activities of civil engineering, architecture, hydraulic engineering and sustainable infrastructure. The aim of ICCEASI2012 is to provide a showcase for recent developments and advancements in these areas, and offer a forum for researchers and engineers in the world to discuss and debate future directions.

This book is a collection of the selected, peer-reviewed papers. All these accepted papers were subjected to strict peer-reviewed at least by 2 expert referees. This book aims to collect the latest development and applications of advanced and sustainable materials, the innovation in civil and hydraulic engineering, the innovation in architecture and building construction, and the innovation in bridge and underground engineering.

This issue was the product of the hard work and dedication of the authors. We would like to express our sincere appreciations to all the authors. We are indebted to all the referees for their constructive comments, time and effort. Thanks are also given to Trans Tech Publications for producing this volume.

Prof. Shunbo Zhao

North China University of Water Resources and Electric Power, China

Prof. Yi Min Xie

RMIT University, Australia

2012 International Conference on Civil Engineering, Architecture and Sustainable Infrastructure (ICCEASI2012)

Organized by

North China University of Water Resources and Electric Power, China
RMIT University, Australia

Co-organized by

Zhengzhou University, China
Wuhan University, China
Dalian University of Technology, China
Changsha University of Science and Technology, China
Fiber Concrete Committee, China Civil Engineering Society
Concrete Specialist Committee, China Association for Engineering Construction Standardization
Henan Civil Engineering and Architecture Society, China
Henan Highway and Transportation Society, China

Conference Organization

Co-chairman

Prof. Dakao Yan, North China University of Water Resources and Electric Power, China
Prof. Jianxin Xu, North China University of Water Resources and Electric Power, China
Prof. Yi Min Xie, RMIT University, Australia
Prof. Shunbo Zhao, North China University of Water Resources and Electric Power, China

International Scientific and Technical Committee

Prof. Chun Qing Li, RMIT University, Australia
Prof. Danying Gao, Zhengzhou University, China
Prof. Dakao Yan, North China University of Water Resources and Electric Power, China
Dr. David W. Law, RMIT University, Australia
Prof. Fengjun Zhou, Chinese Academy of Engineering, China
Prof. Guangqian Wang, Chinese Academy of Science, Tsinghua University, China
Dr. Guo Min Zhang, RMIT University, Australia
Prof. Handong Liu, North China University of Water Resources and Electric Power, China
Prof. Hao Wang, Chinese Academy of Engineering, China
Prof. Huai Chen, Zhengzhou University, China
Dr. Indubhushan Patnaikuni, RMIT University, Australia
Prof. Jianhua Rong, Changsha University of Science and Technology, China

Prof. Jianxin Xu, North China University of Water Resources and Electric Power, China
Prof. Jitao Yao, Xi'an University of Architecture and Technology, China
Prof. Jinxin Gong, Dalian University of Technology, China
Prof. Qingbin Li, Tsinghua University, China
Prof. Qinghuai Liang, Beijing Jiaotong University, China
Dr. Rebecca Gravina, RMIT University, Australia
Prof. Renda Zhao, Southwest Jiaotong University, China
Prof. Shunbo Zhao, North China University of Water Resources and Electric Power, China
Prof. Songtao Ba, Henan Research Institute of Building Science, China
A/Prof. Sujeeva Setunge, RMIT University, Australia
A/Prof. Thomas Molyneaux, RMIT University, Australia
Prof. Wei Sun, Chinese Academy of Engineering, Southeast University, China
Prof. Weichen Xue, Tongji University, China
Prof. Weiliang Jin, Zhejiang University, China
Prof. Xiangtian Nie, North China University of Water Resources and Electric Power, China
A/Prof. Xueqing Zhang, Hong Kong University of Technology, China
Prof. Yi Min Xie, RMIT University, Australia
Prof. Yiyang Lu, Wuhan University, China
Prof. Yining Ding, Dalian University of Technology, China
Prof. Yongjian Liu, Chang'an University, China
Prof. Zhenmin Zhou, North China University of Water Resources and Electric Power, China
Prof. Zhimin Wu, Dalian University of Technology, China
Prof. Zhiquan Huang, North China University of Water Resources and Electric Power, China
Prof. Zongcai Deng, Beijing University of Technology, China

Organizing Committee

Co-chairs

Prof. Shunbo Zhao, North China University of Water Resources and Electric Power, China
Prof. Yi Min Xie, RMIT University, Australia

Secretary

Prof. Fenglan Li, North China University of Water Resources and Electric Power, China
A/Prof. Fule Han, North China University of Water Resources and Electric Power, China
A/Prof. Changyong Li, North China University of Water Resources and Electric Power, China
A/Prof. Yuping Tong, North China University of Water Resources and Electric Power, China
A/Prof. Fulai Qu, North China University of Water Resources and Electric Power, China
Ms. Xiaoyan Zhang, North China University of Water Resources and Electric Power, China
Ms. Xinxin Ding, North China University of Water Resources and Electric Power, China
Mr. Lixin Liu, North China University of Water Resources and Electric Power, China
Mr. Coffey ML Zhao, RMIT University, Australia

Member

Prof. Mingquan Sun, North China University of Water Resources and Electric Power, China

Prof. Yingbin Kang, North China University of Water Resources and Electric Power, China

Prof. Xiaoke Li, North China University of Water Resources and Electric Power, China

A/Prof. Jianwei Zhang, North China University of Water Resources and Electric Power, China

Dr. Jihao Chen, North China University of Water Resources and Electric Power, China

Dr. Junfeng Guan, North China University of Water Resources and Electric Power, China

Dr. Zhen Chen, North China University of Water Resources and Electric Power, China

Dr. Zhihao Wang, North China University of Water Resources and Electric Power, China

Dr. Xiaodong Huang, RMIT University, Australia

Dr. Shiwei Zhou, RMIT University, Australia

Dr. Zhihao Zuo, RMIT University, Australia