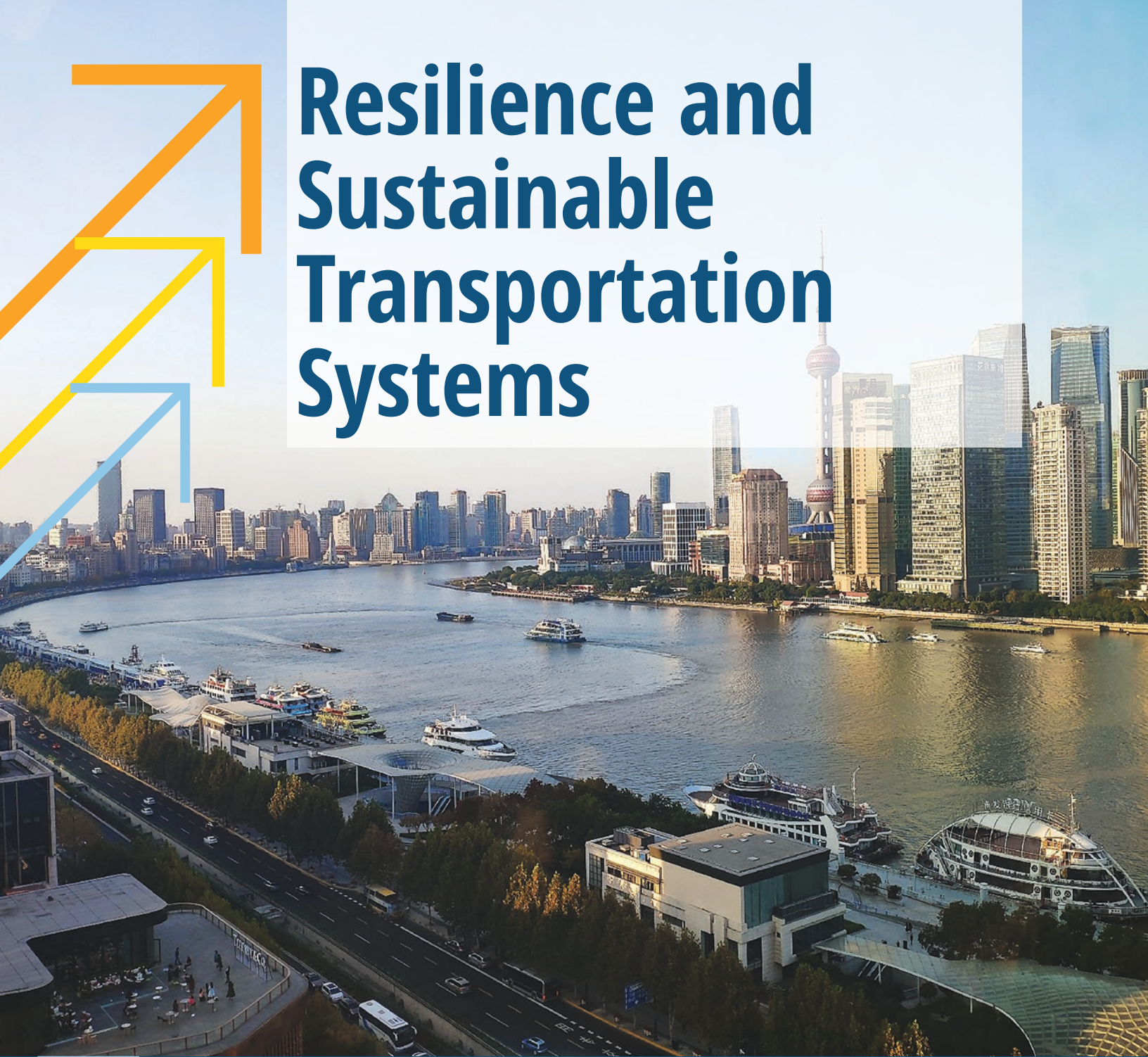




# Resilience and Sustainable Transportation Systems



Proceedings of the  
13th Asia Pacific Transportation Development Conference  
May 27–30, 2020 | Shanghai, China

**Edited by**

Fengxiang Qiao, Ph.D.; Yong Bai, Ph.D., P.E.;  
Pei-Sung Lin, Ph.D., P.E.; Steven I Jy Chien, Ph.D.;  
Yongning Zhang, Ph.D.; and Lin Zhu, Ph.D.

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# RESILIENCE AND SUSTAINABLE TRANSPORTATION SYSTEMS

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SELECTED PAPERS FROM THE 13TH ASIA PACIFIC  
TRANSPORTATION DEVELOPMENT CONFERENCE

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Shanghai, China  
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## Preface

Welcome to the 13<sup>th</sup> Asia Pacific Transportation Development Conference, organized by the International Chinese Transportation Professionals Association (ICTPA). The conference is hosted by the Shanghai University of Engineering Science (SUES). The sponsors of this conference include: the ICTPA, the SUES, and the Construction Institute (CI) of the American Society of Civil Engineers (ASCE). The theme of the conference is “Resilience and Sustainable Transportation Systems.”

Transportation professionals are facing continuous challenges, including endless traffic congestion, ever-worsening environmental impacts, rising energy costs, and deteriorating quality of life. To meet these challenges requires new innovations to develop sustainable transportation systems through planning, design, construction, management, and maintenance. This special publication, produced by ASCE, is one of several official proceedings of the conference. This publication includes 87 peer-reviewed papers addressing nine major areas: (1) Transportation Planning and System Development, (2) Transportation Infrastructure Design and Construction, (3) Transportation System Management and Maintenance, (4) Multi-Modal Transportation Systems, (5) Urban Railway Transportation Planning and Management, (6) Intelligent Maintenance Technologies for Rail Transit system, (7) Railway Noise and Vibration Control, (8) Transportation Sustainability, Environment, and Public Health, and (9) Autonomous and Connected Vehicles, and Advanced Technology Applications.

Recent advances in new strategies, new methods, and new technologies are presented to address topics of relating to funding, planning, design, construction, maintenance, and management of transportation facilities, including aviation, ports, harbors, highways, bridges, tunnels, rapid transit, and railroads.

The ICTPA, one of the conference organizers, started in Kansas City 33 years ago. Since then, it has organized conferences throughout North America and Asia, providing a unique platform for Chinese transportation professionals to discuss transportation development issues both in China and overseas. With the rapid growth in recent years, China has become one of the largest transportation infrastructure markets in the world. In this publication, many authors with extensive hands-on experience in China showcase new ideas and approaches that have emerged from some of the largest transportation projects in China, also in the world.

In addition, practitioners and scholars from the United States and other developed countries and regions present latest advances in transportation system management and maintenance. This unique combination presented by a distinguished group of internationally recognized practitioners and scholars provides a wide range of inspiration in solving global transportation problems.



We believe that these proceedings will be invaluable to transportation professionals in advancing their careers. We hope that you enjoy the conference and the City of Shanghai, catch up with old friends and colleagues, and make new ones.



Mengzhao Hu  
Conference Chair  
ICPTA President  
KOA Corporation, USA



Fengxiang Qiao, Ph.D.  
Technical Program Committee Chair  
ICTPA Co-Executive Director  
Texas Southern University, USA

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The organizers would also like to acknowledge many people whose names are not included above who have contributed their knowledge, time, and energy to make this conference successful.

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