ROUTLEDGE ADVANCES IN RISK MANAGEMENT

Green Transportation and Energy Consumption in China

Jian Chai, Ying Yang, Quanying Lu, Limin Xing, Ting Liang, Kin Keung Lai and Shouyang Wang

ROUTLEDGE

Green Transportation and Energy Consumption in China

This book provides insights into China's energy consumption and pollution as well as its energy saving policies. It explores energy saving ways and argues for an energy consumption revolution, which includes technologies to improve transportation resource efficiency, modification of existing transportation infrastructure and structure.

This book uses various analytical models to study the relationships within the transportation system. It also includes comparative analysis of China, Japan, the US and developing countries on traffic demand and transportation energy consumption. This book highlights the urgent need to review China's current transportation policies in order to secure a breakthrough in energy saving and emissions reduction.

Jian Chai is Professor at the School of Economics and Management, Xidian University, Xi'an, China.

Ying Yang is a PhD candidate at the School of Management, Xi'an Jiaotong University, Xi'an, China.

Quanying Lu is currently pursuing a master's degree at the International Business School of Shaanxi Normal University, Xi'an, China.

Limin Xing is currently pursuing a master's degree at the International Business School of Shaanxi Normal University, Xi'an, China.

Ting Liang is currently pursuing a master's degree at the International Business School of Shaanxi Normal University, Xi'an, China.

Kin Keung Lai is currently Professor at the International Business School of Shaanxi Normal University, Xi'an, China.

Shouyang Wang is currently a Professor and Dean at the College of Economics and Management, University of Chinese Academy of Sciences, Beijing, China. He is also the Director of Forecasting Science Research Center at the Chinese Academy of Sciences, Beijing, China.

Routledge Advances in Risk Management
Edited by Kin Keung Lai and Shouyang Wang

For a full list of titles in this series, please visit www.routledge.com/Routledge-Advances-in-Risk-Management/book-series/RM001

2 **China's Financial Markets**
Issues and opportunities
Ming Wang, Jerome Yen and Kin Keung Lai

3 **Managing Risk of Supply Chain Disruptions**
Tong Shu, Shou Chen, Shouyang Wang, Kin Keung Lai and Xizheng Zhang

4 **Information Spillover Effect and Autoregressive Conditional Duration Models**
Xiangli Liu, Yanhui Liu, Yongmiao Hong and Shouyang Wang

5 **Emerging Financial Derivatives**
Understanding exotic options and structured products
Jerome Yen and Kin Keung Lai

6 **Operational Risk Management in Container Terminals**
Eric Su, Edward Tang, Kin Keung Lai, Yan Pui Lee

7 **Managing Currency Options in Financial Institutions**
Vanna-Volga method
Yat-Fai Lam and Kin Keung Lai

8 **Gold and International Finance**
The gold market under the internationalization of RMB in Hong Kong
Haywood Cheung

9 **Green Transportation and Energy Consumption in China**
Jian Chai, Ying Yang, Quanying Lu, Limin Xing, Ting Liang, Kin Keung Lai and Shouyang Wang

Green Transportation and Energy Consumption in China

Jian Chai, Ying Yang, Quanying Lu,
Limin Xing, Ting Liang, Kin Keung
Lai and Shouyang Wang

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2017
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book has been requested

ISBN: 978-1-138-03733-5 (hbk)
ISBN: 978-1-315-17796-0 (ebk)

Typeset in Galliard
by Apex CoVantage, LLC

Contents

Figures

Tables

1 China's transportation energy consumption

An overview

Transportation energy conservation and emissions reduction are global concerns. Whether in developed or developing countries, motor traffic is the main source of outdoor air pollution in cities. Every year, over 2 million people worldwide die from excessively inhaling small particles from the air. Among all the continents, the air pollution in Asia is the worst. Among the 15 cities with the worst particulate pollution in the world, 12 are located in Asia, and transportation has become one of the main sources of air pollution in these cities, with traffic pollution being the source of much fossil fuel consumption. According to a research report from the Center for International Climate and Environmental Research – Oslo (CICERO), issued with the National Academy of Sciences (www.cicero.uio.no/en/about), currently, exhaust emissions from motor vehicles, ships, airplanes and trains are main factors in global warming. Over the past ten years, CO_2 emissions have increased by 13 per cent worldwide; however, the increase rate of carbon emissions from transportation reaches 25 per cent. While other industrial sectors are formulating emissions reduction objectives, traffic pollution remains hard to curb because the transportation sector is controlled by hundreds of millions of people. For example, the EU successfully reduced emissions in most industrial sectors, except for transportation, and carbon emissions from the transportation sector in the EU has increased by 21 per cent over the past ten years. Obviously, transportation energy conservation and emissions reduction have become significant challenges for most countries in the world. As for China, a major developing country, with the acceleration of industrialization and urbanization, issues of transportation energy conservation and emissions reduction have become more and more important.

1.1 The current situation and structure change in China's transportation

1.1.1 Passenger transportation development

From 1990 to 2012, Chinese passenger turnover maintained sustained and rapid growth. As shown in Figure 1.1, passenger turnover increased to 3.39 trillion passengers/km in 2012 from 562.84 billion passengers/km in 1990, while the

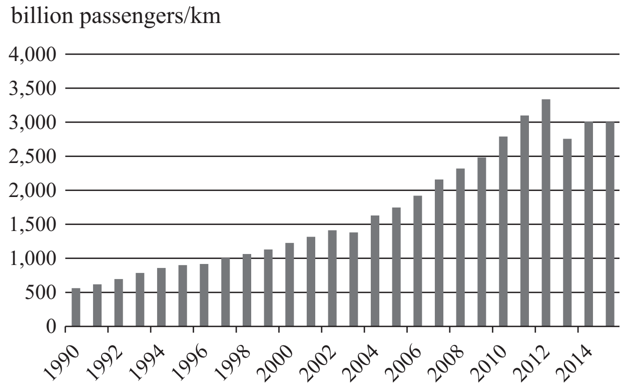

Figure 1.1 Chinese passenger traffic turnover from 1990 to 2015

Source: China National Bureau of Statistics, *China Statistical Yearbook* (2016).

Note: Road passenger turnover includes the number of operating passenger cars but does not include (electric) busses or taxis on city roads. Similarly, rail does not include urban rail transit (subways), and civil aviation does not include international routes. However, domestic civil aviation routes include routes between China and Hong Kong after 1997 as well as routes with Macao after 1999.

average annual growth was 8.5 per cent. Although passenger turnover fell sharply to 2.76 trillion passengers/km in 2013, the level of reduction was 17.41 per cent compared with 2012. The experience of developed countries has shown that both productive passenger demand and consumer demand have been showing rapid growth during urbanization, and productive passenger demand growth will slow in the middle and later periods. Today, China is in a stage of rapid urbanization, as whole society mobility increases passenger turnover growth.

On the one hand, with the rapid expansion of urban populations and with improvement in living standards, the growth potential of passenger transportation demand is huge. On the other hand, unbalanced regional development has led to the increasing flow of regional personnel. By 2020, passenger turnover will continue rapid growth momentum (Zhang, Xiong and Kang, 2015). In recent years, the prosperity of the tourism market also led to increased traffic passenger turnover. In 2015, the number of Chinese domestic tourist trips increased to 4 billion from 784 million in 2001, enjoying a compound growth rate of 12.34 per cent. Tourism revenue grew from 3.52 billion RMB in 2001 to 34.2 billion RMB of 2015, enjoying a compound growth rate of 17.63 per cent. But from the perspective of the residential travel rate, the average travel frequency per person every year, which was 2.98 in 2015, there are still large gaps compared to developed countries, which has a per capita travel rate 8 times greater.

In recent years, the passenger market structure has also undergone great change. Before 2012, road passenger turnover occupied a dominant position in all types of transportation modes, 55.32 per cent of road passenger turnover in all types of transportation in 2012 (Figure 1.2), and rail passenger turnover accounts