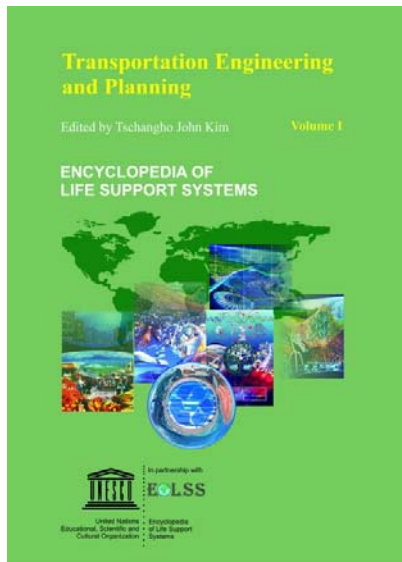


# CONTENTS

## TRANSPORTATION ENGINEERING AND PLANNING



### **Transportation Engineering and Planning - Volume 1**

**No. of Pages:** 450

**ISBN:** 978-1-905839-80-3 (eBook)

**ISBN:** 978-1-84826-980-4 (Print Volume)

### **Transportation Engineering and Planning - Volume 2**

**No. of Pages:** 292

**ISBN:** 978-1-905839-81-0 (eBook)

**ISBN:** 978-1-84826-981-1 (Print Volume)

For more information on e-book(s) and Print Volume(s) order, please [click here](#)

Or contact : [eolssunesco@gmail.com](mailto:eolssunesco@gmail.com)

## CONTENTS

### VOLUME I

**Transportation Engineering and Planning** **1**  
 Tschangho John Kim, *Department of Urban and Regional Planning, and Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, USA*

1. Introduction
  - 1.1. Transportation in Our Daily Lives
  - 1.2. Purpose and Organization of the Article
2. Historical Development of Transportation
  - 2.1. Life Cycles of Transportation Modes
  - 2.2. Transportation and Economic Activities
3. Transportation Problems
  - 3.1. Characteristics of Transportation
  - 3.2. Problems that Affect Transportation
    - 3.2.1. Increasing Demand
      - 3.2.1.1. Global Demand
      - 3.2.1.2. Urban Transportation
    - 3.2.2. Land-Use
    - 3.2.3. Pricing Policy
    - 3.2.4. Peak-Hour Demand
  - 3.3. Transportation Service Problems: Congestion
  - 3.4. Problems Caused by Transportation
    - 3.4.1. Air Pollution
    - 3.4.2. Safety
    - 3.4.3. Energy
    - 3.4.4. Equity
4. Mobility and Social, Technological, and Environmental Changes
  - 4.1. A New Paradigm
  - 4.2. Information Technology and Transportation Systems
    - 4.2.1. Telecommunications Substitution for Transportation
    - 4.2.2. GIS for Transportation (GIS-T)
    - 4.2.3. Intelligent Transport Systems (ITS)
  - 4.3. Enabling Technologies for the Information Society
    - 4.3.1. Teleports and Intelligent Buildings
    - 4.3.2. Location-Based Services: LBS
5. Can Transportation be Sustainable?
6. Conclusion

**Historical Transportation Development** **37**  
 William L. Garrison, *University of California, Berkeley, USA*

1. Introduction
  - 1.1. Early Transportation Developments
    - 1.1.1. Integration and Coupling
    - 1.1.2. Development or Revolution?
  - 1.2. Transportation and Other Life Support Systems
  - 1.3. Scope of this Discussion
2. Building Blocks for the Modern Systems
  - 2.1. Rivers and Canals
  - 2.2. Roads
    - 2.2.1. Toll Roads
  - 2.3. Tramways
  - 2.4. Maritime Transport and Ports

3. The First of the Modern Modes: Rail and Water
  - 3.1. Railroads
  - 3.2. Inland Waterways and Shipping
    - 3.2.1. Atlantic Steamships
    - 3.2.2. Riverboats and Ferries
4. Development Logistics
  - 4.1. Flexible and Robust Technology
    - 4.1.1. Use of Available Building Blocks
    - 4.1.2. Robust Structures
  - 4.2. Self Sufficiency
  - 4.3. Economic Demand for Systems
  - 4.4. Innovative People
5. Diffusion and Improvement of Rail and Marine Systems
  - 5.1. Diffusion of Services
    - 5.1.1. Maritime Services
    - 5.1.2. Rail Services
  - 5.2. Improvements
    - 5.2.1. Institutional Improvements
    - 5.2.2. Technological Improvements
    - 5.2.3. Diffusion Versus Concentration
6. Further Development of Modern Modes
  - 6.1. Urbanization
    - 6.1.1. Cities as Connections
    - 6.1.2. Intracity Demands
  - 6.2. Political Contexts and the Role of Governments
    - 6.2.1. France
    - 6.2.2. Comparisons
    - 6.2.3. Exceptions
7. The Latecomers: Planes, Trucks, Autos, and Others
  - 7.1. Air Transportation
    - 7.1.1. First Round of System Building
    - 7.1.2. Second Round of Development
  - 7.2. Highway-Based Transportation
    - 7.2.1. Many Beginnings and Diffusion
    - 7.2.2. Accessibility of Road Facilities
  - 7.3. Maritime and Railroad Adjustments
8. Transportation Systems as Life Support Systems

**Technological Changes and Transportation Development**  
 William L. Garrison, *University of California, Berkeley, USA*

79

1. Introduction
  - 1.1. Transportation Developments
  - 1.2. Plan for this Discussion
2. Transportation Technology and Innovation
  - 2.1. Technology Development Process
  - 2.2. Discussion of the Process
  - 2.3. Temporal and Spatial Realizations
  - 2.4. Winners and Losers
3. Structure, Behavior, and Performance
  - 3.1. Supplier, Service Provider, and User Technologies
  - 3.2. Innovator Roles
    - 3.2.1. Enhancing Performance
    - 3.2.2. Enabling Technologies
  - 3.3. Combining Technologies
    - 3.3.1. Disjoint Incrementalism
    - 3.3.2. Historic Path Dependence

- 3.4. Linking Perceptions and Roles
4. Service Providers as Innovators
  - 4.1. Innovations Combine Inputs
    - 4.1.1. Examples
    - 4.1.2. Variety and Qualitative Change
    - 4.1.3. How Variety Overcomes Historic Path Dependence
  - 4.2. Networks as Venues for Service Provision Innovations
    - 4.2.1. Technologies for Interfacing with Networks
    - 4.2.2. Changes in Networks
    - 4.2.3. Access and Accessibility
5. Innovations within User Systems
  - 5.1. Increased Demand Pulls Technological Change
  - 5.2. Further Consideration of User Innovations
    - 5.2.1. Fast and Slow Variables
    - 5.2.2. External Cost Paradigm
    - 5.2.3. More of the Same
6. Inputs to Service Providers
  - 6.1. Improved Inputs Improve Services
  - 6.2. Process Technology Improvements
  - 6.3. Market-Driven Improvements
  - 6.4. Economic Development-Driven Improvements
7. Transportation and Communication Synergies

### **Transportation Development and Institutional Change**

109

Gregory L. Thompson, *Department of Urban and Regional Planning, Florida State University, USA*

1. Introduction
2. US Transportation System Evolution before the Railroad
  - 2.1. Transportation Organizations in 1800
  - 2.2. The Blossoming of Transportation Organizations 1790–1840
    - 2.2.1. Packet Lines and Common Carrier Service
    - 2.2.2. Canals
    - 2.2.3. The Concept of Public Highways Open to Private Competitors
3. A New Consensus: The Railroad Era in the US
  - 3.1. The Rise of the Multidivision Corporation
  - 3.2. Urban Transportation Developments, Institutions, and Organizations
4. A Change in Consensus Again
  - 4.1. Railroad Regulation and Federal Control
  - 4.2. Government Promotion of Alternative Intercity Modes
    - 4.2.1. Revival of Domestic Water Transportation
    - 4.2.2. Road Revival
    - 4.2.3. Federal Involvement with Roads
    - 4.2.4. Car Ownership and Truck and Bus Appearance
    - 4.2.5. Bus, Truck, and Air Regulation
    - 4.2.6. Deregulation of the Intercity Transportation Industries
    - 4.2.7. Deregulation Consequences
    - 4.2.8. Western European Approaches Toward Intercity Transportation
  - 4.3. Urban Transportation in the United States
    - 4.3.1. Big City Government and Urban Transportation
    - 4.3.2. State Highways in Urban Regions: Urban Interstates
    - 4.3.3. The MPO Planning Process
    - 4.3.4. Public Transportation, UMTA, FTA, FHWA, and the Creation of the USDOT
    - 4.3.5. Large Capital Grants for Urban Mass Transit
  - 4.4. Modern Urban Transportation Organization Building in Western Europe
  - 4.5. Privatization and Deregulation of Urban Transport in the United Kingdom
  - 4.6. Alternatives to Privatization and Regional Public Monopolies
5. Conclusions

**History of Goods Transportation** **146**

James Nolan, *University of Saskatchewan, Saskatoon, Canada*

1. Introduction
2. Prehistory of Goods Transportation
3. The Middle Ages and the Development of Trade Economies in Europe
4. From 1500 to 1780: The Age of Sail, Worldwide Exploration, and Gains from Trade
5. The Impact of the Industrial Revolution on Goods Transportation, 1780–1870
6. Defining the Role of Modern Government: Goods Transportation from 1870 to the Present
7. Conclusion

**Transportation Systems** **160**

David Boyce, *Northwestern University, USA*

1. Definitions
2. Roles and Effects of Transportation Systems
3. Planning and Control of Future Systems

**Highways and Private Modes of Transportation** **165**

Maxwell G. Lay, *Royal Automobile Club of Victoria, Melbourne, Victoria, Australia*

1. Highways and Paths
2. Highway Law
3. Highway Planning
4. Highway Design
5. Highway Costs
6. Highway Funding
7. Highway Engineering
8. Drivers
9. Vehicles
10. Cars and Trucks
11. Traffic Behavior
12. Motorcycles
13. Bicycles
14. Pedestrians

**Urban Public Transportation Systems** **181**

Vukan R. Vuchic, *Professor, Department of Systems Engineering, University of Pennsylvania, Philadelphia, PA, USA*

1. Classification of Transit Systems
  - 1.1. Definition and Characteristics of Transit Modes
  - 1.2. Street Transit, Semirapid Transit and Rapid Transit
2. Bus Transit System
  - 2.1. Bus Vehicles
  - 2.2. Bus Travel Ways
  - 2.3. Bus Stops and Stations
  - 2.4. Express Bus
  - 2.5. Bus Semirapid Transit
3. Trolleybus System
4. Rail Transit Systems
  - 4.1. Characteristics of Rail Transit Modes
  - 4.2. Rail Transit Vehicles
  - 4.3. Tracks and Rights-of-Way
5. Tramway/Streetcar and Light Rail Transit – LRT

6. Rapid Transit or Metro
7. Automated Guided Transit Systems
8. Regional and Commuter Rail
9. Special Technology Transit Systems
10. Transit Line Scheduling
11. Transit Planning and Selection of Transit Modes
12. Present and Future Role of Urban Transit

**Paratransit Systems**

207

Roy E. Lave, *SYSTAN, Inc., Los Altos, California USA*  
 Rosemary G. Mathias, *Multisystems, Inc., Cambridge, Massachusetts USA*

1. Description of Paratransit Services
  - 1.1. What Is Paratransit?
  - 1.2. Types of Paratransit Service
  - 1.3. ADA Complementary Paratransit
  - 1.4. Paratransit Operating Functions
    - 1.4.1. Eligibility Determination
    - 1.4.2. Trip Reservations (Order-Taking)
    - 1.4.3. Service (Trip/Vehicle) Scheduling
    - 1.4.4. Vehicle Dispatching
    - 1.4.5. Vehicle Routing
    - 1.4.6. Management Reporting and Statistics
    - 1.4.7. Accounting/Invoicing
  - 1.5. Categorizing Paratransit Systems
    - 1.5.1. Introduction
    - 1.5.2. Vehicle Fleet Size
    - 1.5.3. Ridership
    - 1.5.4. Ridership Eligibility Requirements
    - 1.5.5. Immediate, Advanced, and Subscription Reservations
    - 1.5.6. Service Area Size
    - 1.5.7. Trip Patterns
  - 1.6. History of Paratransit
    - 1.6.1. Historical Overview
    - 1.6.2. History of Scheduling/Dispatching Innovations
  - 1.7. Relationships Between Paratransit, Fixed-Route Transit, and Taxi Services
  - 1.8. Size of the Paratransit Market and Paratransit Providers
  - 1.9. Paratransit Economics
2. Technology
  - 2.1. Radio Frequencies (RF)
  - 2.2. Mobile Data Terminals and Computers (MDT/MDC)
  - 2.3. Automatic Vehicle Location
  - 2.4. Mapping Software/Geographic Information Systems (GIS)
  - 2.5. Card-Based Data Storage and Transfer
  - 2.6. Telephone-Based Technologies
  - 2.7. State of the Art of Technology Use
  - 2.8. The Future of Paratransit Automation
3. Paratransit Issues
  - 3.1. Designing Paratransit Systems
  - 3.2. Management Options
    - 3.2.1. Contracting for Services
    - 3.2.2. Brokerage
    - 3.2.3. Research Needs
  - 3.3. Service Delivery Options
    - 3.3.1. Single vs. Multiple Operation Contractors, Single vs. Multiple Service Zones
    - 3.3.2. Rider Choice
    - 3.3.3. Dedicated vs. Undedicated Vehicle Service and the Distribution of Vehicles

- 3.3.4. Centralized vs. Decentralized Reservations and Scheduling
- 3.4. Labor Issues
- 3.5. Service Quality
- 3.6. Coordination of Service
- 3.7. Miscellaneous Service Policies and Practices
- 3.8. Monitoring
- 4. Conclusions

**Water Transport Systems and Port Developments** **246**  
 Mary R. Brooks, *Dalhousie University, Halifax, Canada*

- 1. Introduction
- 2. Alternative Propulsion Systems / Vessel Designs
- 3. Cargo-Handling Technologies and Port Development
- 4. Other Technologies
  - 4.1. Information Technology and Cargo Management
  - 4.2. Information Technology and Vessel Management
- 5. How Fast Will New Technologies Be Adopted?
- 6. Conclusions

**Railroad Transportation** **262**  
 Carl D. Martland, *Massachusetts Institute of Technology, Cambridge, Massachusetts, USA*

- 1. Introduction
- 2. Railroad Technology
  - 2.1. Route and Track Structure
  - 2.2. Locomotives
  - 2.3. Freight Equipment and Commodities
  - 2.4. Passenger Equipment and Markets
  - 2.5. Control Systems
- 3. Terminals
  - 3.1. Passenger Terminals
  - 3.2. Freight Terminals and Operations
  - 3.3. Intermodal Yards and Operations
- 4. Railroad Cost Structure
- 5. Decreasing Marginal Costs and Regulation
- 6. Operations and Service Planning
  - 6.1. Train Schedules
  - 6.2. Blocking Plans
  - 6.3. Terminal Operating Plans
  - 6.4. Car Scheduling
- 7. Conclusion

**Network Developments in Aviation** **287**  
 Eric Pels, *Free University, Amsterdam, The Netherlands*

- 1. Introduction
- 2. Deregulation of Aviation Markets
- 3. Airline Strategies
  - 3.1. Hub-and-Spoke Networks
    - 3.1.1. Cost Factors
    - 3.1.2. Demand Factors
    - 3.1.3. Entry Deterrence
  - 3.2. Alliances
- 4. Airport Strategies

5. Slot Allocation
6. Conclusion

<b>Airport Design and Development</b>	<b>305</b>
Yeong Heok Lee, <i>Hankuk Aviation University, Korea</i>	
Kwang Eui Yoo, <i>Hankuk Aviation University, Korea</i>	
Chang-Ho Park, <i>Seoul National University, Korea</i>	

1. Introduction
2. Planning for Airport Development
3. Financing Airport Projects
4. Economic Impacts and Economics of Airport Development
5. Impact of Aircraft Characteristics on Airport Design
  - 5.1. Design Concepts Related to Aircraft Operations
  - 5.2. Current Issues Regarding New Aircraft
6. Airside Design
  - 6.1. Runways and Taxiways
  - 6.2. Holding Bays and Terminal Aprons
  - 6.3. Relative Location of Terminal to Runways
  - 6.4. Current Issues Regarding Airside Design
7. Terminal Design
  - 7.1. Factors to Consider in Passenger Terminal Design
  - 7.2. Passenger Terminal Design Concepts
  - 7.3. Current Issues Regarding Passenger Terminal Design
  - 7.4. Design Concepts for Cargo Terminals
  - 7.5. Current Issues Regarding Cargo Terminal Design
8. Airport Design for Safety, Environmental Protection, and More
  - 8.1. Design Concepts for Safety and Security
  - 8.2. Current Issues Regarding Safety and Security
  - 8.3. Design Concepts Related to Environmental Protection
  - 8.4. Current Issues Regarding Airports and the Environment
9. Toward Better Concepts for Airport Design and Development
10. Conclusions

<b>Urban Travel</b>	<b>321</b>
David Boyce, <i>University of Illinois at Chicago, USA</i>	

1. Introduction
2. Travel Choices in Large Urban Areas
  - 2.1. Route Choice
  - 2.2. Mode Choice
  - 2.3. Origin–Destination Choice
  - 2.4. Time of Daily Travel
  - 2.5. Trip Frequency
  - 2.6. Combining the Choices
3. Equilibria of Travel Choices
4. Mobility and Vitality
5. Conclusions and Summary

<b>International and Interregional Transportation</b>	<b>331</b>
Hajime Inamura, <i>Graduate School of Information Sciences, Tohoku University, JAPAN</i>	

1. Introduction
2. Brief History of Interregional/ International Transportation
  - 2.1. Road Transportation



- 2.2. Rail Transportation
- 2.3. Air Transportation
- 2.4. Water Transportation
  - 2.4.1. Passenger Ferry Services
  - 2.4.2. Cargo Ships
  - 2.4.3. Bulk Cargo Transportation
  - 2.4.4. Container Cargo Transportation
  - 2.4.5. Canals
- 2.5. Pipeline Transportation
  - 2.5.1. Oil Pipelines
  - 2.5.2. Other Freight Pipelines
3. Role of International/ Interregional Transportation –Current Situation
  - 3.1. Dependence on Foreign Trade and Gross Domestic Products
  - 3.2. Trade of Agriculture Products
  - 3.3. Roles of Maritime Transport
  - 3.4. Role of the Automobile
  - 3.5. Role of Railway Transportation
  - 3.6. Role of Air Transportation
  - 3.7. Tourism and its Effects on the Economy
4. New Challenges in Interregional Transportation and Future Prospects
  - 4.1. High Speed Train and MAGLEV
  - 4.2. Ferry, Cargo Carrier, and Fifth Generation Container Vessel
  - 4.3. Supersonic Transport
  - 4.4. Intelligent Transportation System
    - 4.4.1. Area Covered by ITS
    - 4.4.2. ITS Development in Near Future
5. Conclusions

### Safety of Transportation

363

Rahim F. Benekohal, *University of Illinois at Urbana-Champaign, USA*

1. Transportation Safety Around the World
  - 1.1. Comparing Traffic Safety in Different Countries
2. Transportation in the United States
  - 2.1. Major Elements of the US Transportation System
  - 2.2. Transportation Crashes in the United States
    - 2.2.1. Cross-Modal Comparisons
    - 2.2.2. Hazardous Material Incidents and Accidents
  - 2.3. Highway Travel and Vehicle Registration Trends
    - 2.3.1. Roadway Mileage by Functional Class
    - 2.3.2. Vehicle Age and Its Role in Safety
    - 2.3.3. Fatality Rates by Population, Vehicle, and Licensed Drivers
    - 2.3.4. Fatalities and Injuries by Vehicle Type
  - 2.4. Roadway-Related Factors
    - 2.4.1. Location of Crashes and Numbers of Vehicles Involved
    - 2.4.2. Crashes by Number of Lanes and Traffic Flow
    - 2.4.3. Crash Relation to Intersections and Traffic Control Devices
    - 2.4.4. Safety and Horizontal Curves
  - 2.5. Driver-Related Factors
    - 2.5.1. Crashes by Driver Age
    - 2.5.2. Highway Crashes by Gender
    - 2.5.3. Crashes and Blood Alcohol Concentration Level
  - 2.6. Effects of Time and Environmental Conditions on Highway Crashes
    - 2.6.1. Crash Rates by Month
    - 2.6.2. Crash Rates by Day of Week and Hour of Day
    - 2.6.3. Environmental Conditions and Crashes
    - 2.6.4. Crashes by First Harmful Event

3. Conclusions

**Index** **385**

**About EOLSS** **391**

## VOLUME II

**Mobility and Social, Technological and Environmental Changes** **1**  
 Roger R. Stough, *George Mason University, Fairfax, VA, USA*

1. Introduction
2. Mobility and Accessibility
3. Social and Economic Change, and Technology
4. Sustaining and Improving Mobility
  - 4.1. Infrastructure Investment
  - 4.2. New Technology
    - 4.2.1. ITS
    - 4.2.2. Telecommunications, Telework, and Teleconferencing
  - 4.3. Behavioral and Institutional Change
  - 4.4. Environment and Energy
  - 4.5. Social Equity
5. Concluding Discussion

**Social Change and Demand for Mobility** **13**  
 Kenneth Button, *George Mason University, Fairfax, VA, USA*

1. Introduction
2. Economic Growth and Urbanization
3. Globalization and Internationalization
4. Household and Gender Issues
5. Leisure and Age Distribution
6. The Telecommunications Revolution
  - 6.1. Complements or Substitutes
  - 6.2. E-commerce
7. Environmental Awareness
8. Institutional Change
9. Conclusions

**Transportation and Air Quality** **36**  
 Veli Himanen, *JP-Transplan Ltd. and RelatePartnership, Finland*

1. Introduction
2. Exhaust Emissions
  - 2.1. Road Transportation
  - 2.2. Other Modes
3. Air Quality Standards
4. Historical Trends
5. Present Trends
  - 5.1. Exhaust Emissions
  - 5.2. Air Quality
6. Assessment Methods
  - 6.1. Assessment of Emissions

- 6.2. Assessment of Air Quality
- 7. Reducing Emissions
  - 7.1. Technological Development
  - 7.2. Control Actions
  - 7.3. Demand and Traffic Management
- 8. Conclusions

**Transport and Energy**

47

Peter Newman, *Institute for Sustainability and Technology Policy, Murdoch University, Australia*

- 1. The Problem
- 2. Patterns of Transport Energy Use
  - 2.1. Global Transport Trends
  - 2.2. Urban Transport Energy
  - 2.3. Fuel Types in Urban Transport
- 3. Explaining Transport Energy Use Variations
  - 3.1. Technology–Vehicle Efficiency
  - 3.2. Price and Income
  - 3.3. The Relative Provision of Infrastructure and Services for Transport Modes
    - 3.3.1. Modal Splits
    - 3.3.2. Road Supply and Parking
    - 3.3.3. Traffic and Transit Speeds and Travel Time
  - 3.4. Urban Form Characteristics of Global Cities
    - 3.4.1. Metropolitan Density
    - 3.4.2. Central City Density
    - 3.4.3. Inner City and Outer Area Density
    - 3.4.4. Land Use and Transport Links
- 4. Conclusions

**Intelligent Transportation Systems**

87

Roger R. Stough, *School of Public Policy, George Mason University, USA*  
 Guang Yang, *School of Public Policy, George Mason University, USA*

- 1. Introduction
  - 1.1. The Context: Transportation, Technology and Economic Development
  - 1.2. Defining Intelligent Transportation Systems (ITS)
  - 1.3. ITS and the Traditional Transportation Community
  - 1.4. Chapter Organization
- 2. The Technology and Related Services
- 3. Benefits
  - 3.1. Improved Mobility, Travel Time and Throughput
    - 3.1.1. Advanced Traveler Information Systems
    - 3.1.2. Advanced Traffic Management Systems
    - 3.1.3. Advanced Public Transportation Systems
    - 3.1.4. Commercial Vehicle Operations
  - 3.2. Cost Savings
    - 3.2.1. Advanced Traveler Information Systems
    - 3.2.2. Advanced Traffic Management Systems
    - 3.2.3. Advanced Public Transportation Systems
    - 3.2.4. Commercial Vehicle Operations
  - 3.3. Enhanced Safety
    - 3.3.1. Advanced Traveler Information Systems
    - 3.3.2. Advanced Traffic Management Systems
    - 3.3.3. Commercial Vehicle Operations
  - 3.4. Environment and Energy Benefits
  - 3.5. Special Social Groups

- 3.6. Competitiveness and Economic Development
- 3.7. Conclusions
- 4. Barriers to Deployment and Related Issues
  - 4.1. Dis-benefits?
  - 4.2. Regional Deployment
  - 4.3. Intergovernmental Relations
  - 4.4. Roles of the Public and Private Sectors
  - 4.5. Privacy
  - 4.6. Legal Liability
  - 4.7. Conclusions
- 5. General Conclusions

**Telecommunications Substitution for Transportation**

**109**

John S. Niles, *Global Telematics, Seattle, Washington, USA*

- 1. Introduction
- 2. Comparing Telecommunication and Transport
- 3. Comparing Remoteness and Proximity
- 4. How Telecommunication Influences Transportation Demand
- 5. The Linkage Between Trip Purposes and Telecommunication Applications
  - 5.1. Telecommunication and Travel Between Work and Home: Telecommuting
  - 5.2. Telecommunication and Consumption-Related Travel: Teleservices
  - 5.3. Telecommunication and Production-Related Travel: Telelogistics
- 6. Specific Telecommunication Applications Reduce Travel
- 7. Comparing Characteristics and Costs of Travel and Communication
- 8. Travel Telesubstitution and Traffic Dynamics
- 9. Travel Telesubstitution and Location Dynamics
- 10. The Challenge and Opportunity of Telecommunications for Location and Mobility

**Transportation in the 21st Century: Technological Innovation**

**132**

T.R. Lakshmanan, *Boston University, MA, USA*

William P. Anderson, *Boston University, MA, USA*

- 1. Introduction and Overview
- 2. Transport Innovation Process
  - 2.1. Institutional Innovations in Technology Evolution
  - 2.2. The Interplay of Technical and Institutional Innovations in Transport Evolution
- 3. Transportation in 2000: Past as Prologue to the Future
  - 3.1. Transportation in Developing Countries
- 4. Transportation in the Twenty-First Century
  - 4.1. Economy and Society in 2025
  - 4.2. Transport Technologies
  - 4.3. Transport in 2025
  - 4.4. Novel Arena for Transportation Services

**Perspectives on Sustainable Transport**

**164**

Peter Nijkamp, *Dept of Spatial Economics, Free University, Amsterdam, The Netherlands*

- 1. Praise for Mobility
- 2. Shadowsides of Mobility
- 3. The Future of a Mobile Society
- 4. Epilogue

**Sustainable Mobility** **173**

Peter Nijkamp, *Free University, Amsterdam, The Netherlands*

Erik Verhoef, *Free University, Amsterdam, The Netherlands*

Barry Ubbels, *Free University, Amsterdam, The Netherlands*

Caroline Rodenburg, *Free University, Amsterdam, The Netherlands*

1. Sustainable Transport: A Policy Challenge
2. Conceptual Issues
3. Transport and Environment
4. Spatial Aspects
5. Social and Behavioral Aspects
6. Technological Aspects
7. Dynamic Aspects
8. The Role of Policies in Creating Sustainable Transport
9. Conclusion

**Sustainable Transport and Public Policy** **192**

David Banister, *University College - London, UK*

1. Introduction
2. Global Perspectives on Public Policy
3. Local Perspectives on Public Policy
4. Barriers to Implementation
5. Conclusions

**Institutions for Sustainable Transportation Management: Principles and Evolution** **215**

Kingsley E. Haynes, *George Mason University, USA*

1. Introduction
2. Background
3. The Sustainability Concept in Institutional Decisions
4. Trade, Technology, and Institutional Arrangements in International Transportation
  - 4.1. Trade and Transport Logistics
  - 4.2. Cabotage
  - 4.3. The European Experience
  - 4.4. Mercosur Region Experience
  - 4.5. The NAFTA Experience
5. Recent Transportation Institutional Evolution in the United States

**Index** **229**

**About EOLSS** **233**