


Lecture Notes in Mobility

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Sustainable Rail Transport 4

Innovate Rail Research and Education

 Springer

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ISSN 2196-5544

Lecture Notes in Mobility

ISBN 978-3-030-82094-7

<https://doi.org/10.1007/978-3-030-82095-4>

ISSN 2196-5552 (electronic)

ISBN 978-3-030-82095-4 (eBook)

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Foreword by Prof. Mark Robinson

I am honoured to provide this Foreword for *Sustainable Rail Transport 4*. The fact that we are now on volume 4 and the quality has been maintained and even improved is a testament to Dr. Marin Marinov's stamina and dedication. He is incredibly hard working and thorough in everything he does, and it is a pleasure working with him. It is also true that Marin's drive and personality help the authors honour their commitments to produce these fine articles.

The breadth of the papers is astonishing, and it is fair to say that the importance of rail as the backbone of an intermodal "Mobility as a Service" within cities and beyond, for both passengers and goods, meeting the needs of customers and society is absolutely supported by the articles. Inclusivity and accessibility are considered for all, from persons with reduced mobility to storing luggage.

The challenges of climate and environmental change are recognised with reference to energy saving, emission reduction and alternative zero carbon propulsion technologies. Due to climate change, more sustainable passenger and freight transport are in need. Rail is considered a more sustainable mode of transport compared to others such as road transport. Usage of rail lines that are currently under-utilised could help increase the sustainability of transport through enhanced utilisation of them. Aspects such as logistics are considered in terms of economic growth in relation to the world market, and comparisons are made that can support individual countries growth. Rail is demonstrated as the environmental situation in Europe if it was to be at the centre of sustainability-driven policies. In particular, it provides a relative picture of the CO₂ emissions generated by short-distance air passenger transportation in Europe which could have been transferred to high-speed rail and produce less CO₂. Russia is used as a case study sustainability of Russia's railway infrastructure, whose development faces innumerable challenges including its geography, demographic density and specific political considerations.

Rail is the safest form of travel, and these articles support this theme and develop it further by addressing issues such as level crossings where there is potential for cross-mode accidents. This volume has not shirked these issues and also addresses the aspect such as noise that can be generated by heavy haul, the different types

of noise that originate from railroads were identified, the squeal noise generated at curves, the impact noise generated at rail joints and the rolling noise stand out.

There are a number of factors addressed by these articles including opening up the rail passenger market to compete the ambition to achieve European technological leadership, increasing urbanisation and strategic autonomy and ensuring a sustainable and inclusive recovery from the COVID crisis requiring the convergence of dispersed research and innovation efforts within a shared vision of system transformation.

Addressing these issues needs long-term action plans, based on the Sustainable Development Goals of the United Nations. Rail and public transport are part of the solution, offering innovated services that provide mobility for passengers and delivery of goods and ensure sustainable socio-economic evolution. The volume identifies the importance of rail traffic flows from China and Europe and explores the potential of the railway network of the Republic of Kazakhstan as an effective and competitive transit transport route. There is also consideration of the TEN-T corridors.

I commend Dr. Marin Marinov in the production of *Sustainable Rail Transport 4*, as it highlights and builds on rail's existing credentials as the most environmentally friendly form of mass land transport and provides the latest discussions for consideration from the challenge of Hyperloop to the transportation of dangerous goods.

Newcastle upon Tyne, UK

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Foreword by Prof. Ed Sweeney

I am delighted to see that Volume 4 of *Sustainable Rail Transport* has been published. The fact that another volume has been developed is itself a testament to the quality of the earlier volumes and the contribution that they made to the ongoing discourse in this hugely important field. I am also honoured to again be invited to provide the Foreword to what is another volume of extremely high quality. This high quality suggests that it will become an indispensable work for experts in the fields, as well as a valuable source of fascinating insights for non-expert rail enthusiasts like myself. For rail specialists involved in research and scholarship, as well as for those in professional practice, this volume provides a wealth of information and knowledge about key developments and trends impacting the sector.

The railway industry is a dynamic and challenging one. The COVID-19 pandemic of 2020 has created a range of new challenges for the industry to grapple with. This is in addition to the challenges of operating in a market place has come more sophisticated, comprising customers with increasingly demanding value expectations. The wider business and regulatory environment is a complex one and subject to a high degree of change and unpredictability. Technology has continued to develop at a rapid rate, presenting rail professionals with an array of opportunities and threats. The anthropogenic impact of transport and logistics processes is now widely understood with climate change representing an existential threat. The rail industry is well positioned to support wider policy initiatives—including but not limited to modal shift—aimed at creating more environmentally sustainable passenger and freight transport systems. In this context, it is becoming clear that more integrated approaches are required, particularly in the context of transport system design with rail, and play a more critical role. The publication of this volume is very timely in this context.

It is important that rail policy-making is evidence-based and that innovation in the sector is based on the best available knowledge about operations, systems, technology and management. The high-quality research described in this volume is critical in this regard. As with previous volumes in this series, the research that has been undertaken is characterised by high levels of rigour in the research methodologies and approaches adopted by scholars. This is vital as the development of

deeper and richer insights into the complex phenomena under investigation needs to be based on research designs that are logical and systematic. However, this research excellence and academic rigour alone is not sufficient; it needs to be combined with a deep understanding of the evolving needs of the industry for the outputs to be truly valuable and impactful. I am delighted that this volume clearly demonstrates both academic excellence and practical relevance, with much of the work representing the fruits of effective academic/industry collaboration. The volume also demonstrates clearly that high-quality rail research requires truly interdisciplinary approaches. There is extensive use of multi-phase research approaches that adopt multiple methods of data collection and analysis. This presents challenges, but the material in this volume provides many excellent examples of good research practice in this regard. In tandem with this, there are illustrations of innovative practices from a range of different geographical settings. This is very welcome in the context of the increasingly international complexion of transportation and logistics systems, and the attendant needs to develop world-class levels of performance.

As I noted in my Foreword to volume 3, rich tomes of this kind require immense dedication and commitment on the part of a range of individuals—authors, editors, publishers and others. In this context, I would again like to commend my Aston University colleague, Dr. Marin Marinov, for his energy and enthusiasm in bringing this work to fruition. Marin is a passionate advocate of rail research and its critical role in developing a sustainable future for this strategically critical industry. Thanks to his work, as well as that of his collaborators, *Sustainable Rail Transport 4* will play an important role in our ongoing discourse and debate in this field.

December 2020

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Preface

Welcome to this important book, *Sustainable Rail Transport 4*, a collection of papers written by academics and students with a passion for rail transport. Since 2014, a core group of enthusiastic writers has presented works that have inspired others to explore some of the latest thinking, research and developments in rail transport. Led by Dr. Marin Marinov, the latest and fourth volume of Sustainable Rail Transport continues to inspire all who will read it. The call for global papers met with great interest and readers will not be disappointed by the contributions, so the opportunity to again be involved with the development of this vital piece of work has been an absolute pleasure.

The book comes at a time in history like no other. COVID-19 has upended our lives, causing rail companies to rethink how and when they offer services. New approaches to costing and service delivery have been vital in the ever-changing situation of the COVID-19 pandemic. Ensuring services remain viable while incorporating strict health and safety measures, unheard of even a year before 2020, has been a battle for many rail companies.

Amidst the need for social distancing, personal protective equipment and personal hygiene, the demand for rail passenger transport has declined for the time being. The industry has realised new ways of tracking customers who use rail services will be essential. As a result, innovations such as QR code scanning to track passengers have become a standard practice in some countries. Additionally, there has been a rise in opportunities for new types of jobs including the importance of once considered menial roles such as cleaning and disinfecting to ensure passengers remain safe—a positive outcome for millions of people working in unskilled roles in rail companies.

Freight transport has risen to the fore as an essential service delivering essential goods.

Other realisations lean towards new train designs to accommodate social distancing using materials that prevent viruses from living for long periods. While the pandemic is global, the rail industry will need to consider culturally and ethically appropriate practices for each country where they operate. All these realities highlight that the world in which we live cannot be controlled, and therefore, an open mind is needed to explore new ideas and break away from past mindsets. Recent

developments indicate the need for creativity and innovation for the rail sector to survive and “pivot” quickly.

The ideas offered by authors who have contributed to *Sustainable Rail Transport 4* embrace these new ways of looking at problems in a novel way.

Topics in this volume include alternative energy sources in urban guided transport systems and the effects of CO₂ production in high-speed rail. Regarding transport corridors, there are topics on the Scandria corridor, the hyperloop concept, Kazakh rail and the Bedford to Bletchley simulation.

Safety topics include investigating the need for multi-resource allocation to address safety issues at level crossings rather than looking at singular issues in isolation. Noise issues and dangerous goods feature in two chapters, while station boarding systems for people with reduced mobility and luggage on passenger trains are topics that look to the future of rail transport.

Economics of countries and their impacts on the rail industry are featured in chapters from Russia, the Slovak Republic and Brazil.

Thank you to all the authors and contributors who have made this volume possible. I commend this volume as a worthy contribution to new rail industry knowledge and trust you will benefit from the papers within *Sustainable Rail Transport 4*.

Port Lincoln, Australia

Dr. Janene Piip

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