

Preface

Climate change caused by greenhouse gas is considered to be one of the most serious problems facing humankind. The transport sector contributes 20–30% of the carbon footprint of developed countries. Since a large part of transport emissions comes from urban transport, emission reduction policies have generally focused on this sub-sector of transport. However, globalisation of the economic system and growing inter-regional exchanges have recently been increasing intercity travel. As a result, climate change policies related to intercity transport now give serious consideration to controlling emissions from air transport, promoting investment in high-speed rail, introducing road pricing schemes, etc. Nevertheless, there has been only limited research on the theme of intercity transport and climate change.

Railways are generally considered to be a low-emission mode. In Japan, the railway share in intercity transport is as high as that in urban transport and is much higher than in the US and the EU countries, mainly because of the “Shinkansen” high-speed rail (HSR) network. As the next generation of HSR, the plan of the Superconducting Maglev (magnetic levitation system) has already been approved for the Tokyo-Osaka route, for which the travel time will be only 67 min for 438 km. GHG emissions per passenger-km from the Maglev will be much less than those from air transport, but a little more than the latest model of Shinkansen vehicle, the emission coefficient of which is almost half of the first generation Shinkansen vehicle.

Against this background, the Institute for Transport Policy Studies (ITPS), a Tokyo-based policy think-tank, decided to initiate an international research project in 2007 on the theme of intercity transport and climate change (chair: Shigeru Morichi). The research project was intended to examine broad patterns in transport emissions and policy responses in the US, the EU and Japan. Relevant theoretical concepts have been discussed and quantitative analyses have been conducted in order to gain useful insights for practical policies. In particular, the project evaluated the Maglev system from the viewpoint of the environment, and the findings of the research are expected to contribute to future decisions on HSR investment in the US and other countries, including developing countries.

We would like to gratefully acknowledge the valuable contributions of various organisations, experts and academics to the process of this research project.

The kick-off symposium for this research was organized in December 2007 in Tokyo, and was supported by the Government of Japan, the Embassy of Germany, the Embassy of the UK and Nanzan University. In the symposium, Lord Nicholas Stern, Professor of the London School of Economics, and former Chief Economist and Senior Vice President of the World Bank, delivered the keynote speech. The contribution of Lord Stern, an eminent scholar and global leader in the field of climate change policy, served as an important driving force for this research. Among other prominent scholars and experts who made important presentations in the symposium were Dr. Ottmar Edenhofer, Chief Economist, the Potsdam Institute for Climate Impact Research; Mr. Jack Short, Secretary General, the International Transport Forum; Mr. Norman Fujisaki, President, Metron Aviation, Inc.; Mr. Yoshiyuki Kasai, Chairman, Central Japan Railway Company; and Professor Takehiko Sugiyama, Hitotsubashi University (and current President of ITPS). All of these distinguished speakers presented on the current situation of GHG emissions and related transport policies in the EU, the US or Japan. Professor Kazuhiro Ueta from Kyoto University and Professor Takafumi Matsui from the University of Tokyo commented on the presentations, and floor discussions followed (all titles are in 2007).

After the symposium, an international research team was formed and a different theme was allocated to each team member. Since then, we have planned to publish the research output as an edited volume, and an editorial team was formed comprising us: Yoshitsugu Hayashi, Shigeru Morichi, Tae Hoon Oum and Werner Rothengatter.

In the course of this research, we needed detailed background information on the related institutions and policies in the US and the EU. This was provided by Dr. Dawn L. Rhoades and Dr. Michael J. Williams of Embry-Riddle Aeronautical University for the US, and by Professor Rothengatter for the EU.

After the completion of the first draft of the book, an international symposium entitled “Climate Change and Intercity Transport Strategy” was organized in 2010 by ITPS in Tokyo with support from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Ministry of Environment (MOE). The presentations in the symposium were based on the contents of each chapter of this book.

The drafts of the book chapters were reviewed by Professor Anthony May from the University of Leeds, Prof. David Banister from the University of Oxford, and Professor Lori Tayasszy from the Delft University of Technology. The reviewers’ comments and feedback contributed much to improving the contents of the draft chapters.

We sincerely appreciate the important contributions made by presenters and supporters of the two symposiums. We also thank all of the researchers who have been involved in the research work and preparation of the book manuscript for their hard work.

We hope that this book, which contains the outcome of our project, will assist policy makers and experts to take better policy decisions in relation to the transport and environment agenda and thereby contribute to lowering the carbon footprint.

Finally, we are deeply indebted to the Nippon Foundation for their support throughout this research project and ITPS activities.

Introduction: How this book is organised

Most studies on transport and the environment treat the transport sector comprehensively as a whole or focus on the problems of urban transport. Intercity passenger transport, which is in the focus of this book, is a less explored transport segment because it lacks a common statistical definition and plays a minor role in travel surveys because it includes only a small share of overall trip generation. But as the share of overall passenger transport performance is high—because of the longer distance per trip—and the climate relevance is even higher because of the dominance of car and air modes, there is enough motivation to place intercity transport into the focus of analysis. Chapter 1 is, therefore, to document the importance of intercity passenger transport in the overall transport segment and to underline its role for climate change. This analysis is placed into the framework of international climate policy and enriched by examples of Japanese transport policy to meet the future challenges.

In Chap. 2, international comparison is made concerning the situation and development of intercity passenger transport according to the national transport plans. Problems and tipping points of climate change generated by intercity transport are highlighted by referring to intercity transport policies and planning systems in Japan, Europe and the US, and at the same time by discussing the necessity of giving incentives to the private firms to foster technological innovation in this market. This is supplemented by a report on the rapid development of intercity transport systems in China.

In Chap. 3, we extend the dimension of analysis to the overall external costs stemming from intercity transport. In Sect. 3.1 the external costs of climate changes are positioned within the overall external costs of transport sector, which provides a basis for discussing the general options for a harmonised internalisation of externalities including climate change in a consistent way. In Sect. 3.2, life-cycle CO₂ emissions from HSR and air transport are calculated on a trial bases and the results are compared. This gives an impression on the magnitude of the reduction potential for external costs through fostering a modal shift towards the railways. Section 3.3 focuses on selected instruments for internalisation, in particular the impact of imposing a carbon tax on regional transport demand is calculated taking Japan as a case study.

Chapter 4 discusses approaches to assess intercity passenger transport policies on the base of spatial economic analysis. The first part of this chapter sets out the framework of analysis for measuring the regional distribution of economic impacts of high speed rail (HSR) investments by constructing spatial computable general equilibrium (SCGE) models. The second part of this chapter predicts the spatial distribution of the economic effects and the CO₂ emissions to be caused by the Japan's super-high speed Maglev rail project. The last part of this chapter computes the spatial economic impacts of the South Korea's KTX HSR investments and the Taiwan's HSR investments, and compares the results with those of Japan's Maglev investments.

Chapter 5 attempts to measure the ‘social’ economic efficiency of two major transport modes, aviation and railways, in Japan’s domestic intercity passenger travel market, by taking into account of the life cycle CO₂ emissions caused by carrier operations, construction and operation of infrastructure, and construction of aircraft/rolling stocks as well as the time spent by passengers to use these two intercity transport modes. We draw conclusions for the future development of intercity transport systems. Japan is chosen as an example to show that also in a country with a well-developed intercity and HSR system there are still options for major improvements.

Chapter 6 will summarise the results and give policy proposals (see Fig. 1).

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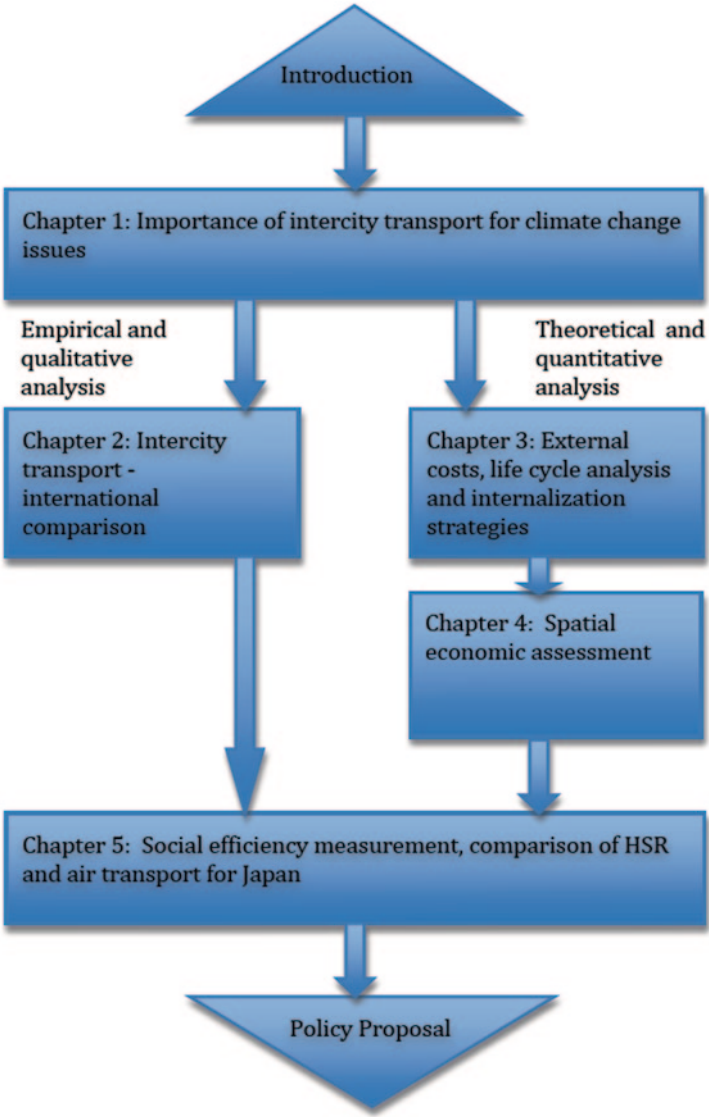


Fig. 1 Sequence of analysis in the book

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