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Shigeru Morichi
Surya Raj Acharya *Editors*

Transport Development in Asian Megacities

A New Perspective

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A New Perspective

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Preface

Besides rapid economic growth, Asia is also known for unprecedented growth of megacities. Despite new theoretical insights into the benefits of megacities, policy makers in developing countries are facing daunting challenges in improving the quality of life of the residents through sound planning and management of their megacities. Planning and management of transport infrastructure and services in developing megacities is one of the important agenda items that demands concerted efforts on the part of public authorities and other stakeholders. Various policy initiatives have been attempted, but the urban transport situation has not improved as anticipated and the quality of transport infrastructure and services in the majority of megacities continues to decline. The income growth to be accompanied by a concomitant growth of private vehicles in future, on the other hand, does not augur well for the urban transport system in developing countries.

The modern urban transport systems in developed megacities are indeed the result of various policy initiatives taken in the past. The systems evolved over time in response to travelers' needs, suppliers' motivation, and other practical requirements. Various policy strategies and measures have been developed and successfully applied in response to urban transport problems in developed megacities. These strategies and measures now constitute the core component of the existing knowledge base on urban transport. Despite a relatively long history of policy efforts, developed megacities are not free from transport problems. In fact, some of the policies which were once considered desirable and beneficial later turned out to be the cause of problems. The experience of developed megacities, therefore, can offer important policy lessons for developing countries.

However, a note of caution is in order here. The course of development of the Asian megacities is much different than that of their Western counterparts. Besides, Asian megacities have distinctive socioeconomic features which bring about a unique set of challenges as well as opportunities. A large-scale travel demand and its rapid growth have already overwhelmed the urban transport system of developing megacities in Asia. On the other hand, the urban form and structure in these megacities is yet to take a stable shape and, therefore, offers opportunities for developing a more integrated and sustainable form of urban transport. What is

important in this context is to adopt a new perspective that helps to design policy strategies and measures to address urban transport problems in a sustainable way while utilizing the best available options.

With this premise, an international collaborative research study titled "Sustainable Transport for East Asian Megacities" (STREAM) was undertaken. This book is a result of STREAM study. It was endorsed by the Eastern Asia Society for Transport Studies (EASTS) as one of the studies under the International Research Group (IRG). The study was conducted by a collaborative research team comprising leading academics and experts from the field. A series of international symposiums, research workshops, and special sessions during academic conferences were organized as a part of the study process. The Institute for Transport Policy Studies (ITPS), Tokyo, served as the secretariat of the study and provided administrative and logistics support.

The interim results of the research had been presented at the high-level government official meetings on various occasions. The feedback received from policy makers contributed much to focusing on policy-relevant issues. The study also included an extensive review of literature, policies, and practices for both theoretical insights and empirical evidences along with relevant cases from developed megacities from other regions. Although the study focuses on Asian megacities, the findings and conclusions may be equally relevant to the developing megacities in other regions.

We have received valuable cooperation and contribution from various individuals and organizations in the process of this research. We are thankful to Prof. Tony May, Dr. Takashi Yajima, Mr. Kiyoshi Terashima, and Mr. Naofumi Takeuchi for their insightful keynote lectures at different international events organized for this study. Thanks are also due to EASTS (Taiwan) and National Chiao Tung University for hosting the first international symposium in Taipei. We are also thankful to the Japanese Ministry of Land, Infrastructure, Transport and Tourism for providing us various forums to share our research outcomes with high-level officials from various Asian countries.

We are thankful to all the authors, who were also members of the international research team, for their valuable time and inputs to the study. We would like to acknowledge significant research inputs and feedback at different events by Prof. Primitivo Cal, Dr. Trinh Van Chinh, Dr. Gyeng-Chul Kim, and Prof. William H. K. Lam.

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Surya Raj Acharya

Contents

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Chapter 1
Introduction

Shigeru Morichi and Surya Raj Acharya

1.1 Growth of Megacities in Asia

In recent decades, the Asian region is known as the region of fastest economic growth. The region is also characterized by a concomitant trend of rapid urbanization with concentration of urban population in large cities. In fact, rapid urbanization simply reflects the aspiration of people for economic prosperity and better quality of life with modern urban services. On the other hand, urban conurbations serve as the engines of economic growth providing opportunities for investors, entrepreneurs, and both unskilled and skilled labors. In this sense, the urbanization trends as observed in Asian region is potentially a part of the virtuous cycle of growth and prosperity, which many developing countries in the region endeavor to trigger or sustain.

Despite the potentially positive aspects of the urbanization process, the nature and scale of urbanization in Asian countries have posed complex and difficult challenges for policymakers. In fact, the urbanization in the Asian region is characterized by the rapid growth of megacities, that is, urban population is concentrating in the country's one or few large cities. According to United Nations (2010), by 2010, out of 30 largest cities in the world, 17 cities were in Asia. Likewise, among the 55 world cities with population more than five million, 29 cities were in Asia. Some of them are already megacities (by the definition of 10 million or more population) and the rest are candidates for future megacities. The pattern is even more pronounced in developing Asian countries. On the other hand, the experience of managing rapidly growing big cities in developing world is not very encouraging. Traffic congestion, pollution, poor urban services, and increasing slum population have become some of

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the defining features of big cities in the developing world. Presence of range of externalities and associated costs of inefficiency, particularly in developing megacities, provides legitimate theoretical grounds to question the growth of megacities (Henderson 2002). There is a common perception among policymakers that the large population in a city increases complexities and magnifies the challenges, and hence is the primary cause of urban problems. The recent trend of accelerated growth in big cities turning many of them into megacities is a subject of utmost concern for policymakers.

Fresh policy insights have been drawn in recent years from the decades of theoretical advances in the field of economic geography, which may change the tenor of debate on merits and demerits of megacities. World Bank (2009) synthesized the implications of theoretical development along with empirical evidences mainly on the concept of agglomeration economies and yields many policy-relevant insights concerning megacities growth and management. The report argued that a large city size in itself is not a cause of problems. Rather, large size offers opportunities to cities for reaping scale and agglomeration economies and increases efficiency and productivity of urban activities. The problem with megacities is more about the spatial structure and provision of infrastructure.

Despite the seemingly powerful theoretical appeal and somewhat comforting policy implications of this new insight, policymakers in developing countries may still find the task of managing megacities full of daunting challenges. Given the limited institutional and resource capacity in most developing countries, meeting the precondition of appropriate spatial structure and adequate infrastructure provision is indeed a tall order.

1.2 Urgent Need to Improve Urban Transport in Asian Megacities

Among the different urban infrastructures, transport perhaps features as the most critical system in a megacity for various reasons. First, as a city grows, the scale of demand growth for transport services is much higher as compared with that of other urban services, such as electricity or water. Second, the demand is unevenly distributed by time, space, and direction of flow. Third, unlike other infrastructure, the transport network has to cater different kind of services, the demand of which depends on individual choices. This causes uncertainties in demand and quality of services. Fourth, transport infrastructure provides basic space for urban circulation, including right-of-way for other network infrastructure. Fifth, unlike other infrastructure for which private sector can provide services under market mechanism, transport system, because of its nature of strong publicness, seeks dominant role of public sector for capital investment and service operation. Finally, transport investment contributes greatly in shaping the urban structure and thereby determines spatial efficiency of a city.

The agglomeration benefits of megacities are basically due to higher density of economic activities. However, increase in economic density results in congestion. By improving transport system, the constraint imposed on reaping higher level of agglomeration benefits in megacities can be eased. Even though the question that what should be the optimal size of a city or if a given megacities is too big is yet to be fully settled theoretically (Fujita et al. 1999; Henderson 2005), the paramount role of transport system for a megacity is undisputable. The transport system in a megacity directly influences its competitiveness and also its contribution to local and global environmental problems. The urban transport policy, therefore, should be the corner stone of long-term development strategy of megacities.

However, it is a big irony that in developing Asian megacities, transport system is plagued with a range of problems. High economic growth along with rapid and large-scale urbanization is generating high demand for passenger mobility in Asian cities. But the infrastructure and services are severely lacking to respond the increasing demand for mobility. High modal share presently taken by public transport systems is likely to decline as the income level increases and private mode will be affordable to more people. The trend of urban expansion in the form of low-density sprawls in most Asian megacities further accelerates motorization since use of private mode is a compulsion rather than a choice for such an urban structure. However, the existing or even best possible expansion of road network in developing Asian megacities would be far inadequate in comparison with the ongoing trend of motorization. On the other hand, mass transit projects, particularly urban railways, require large capital investment mostly from public sources, which is not an easy proposition in the present era of fiscal tightening. In some developing megacities, policymakers have unreasonable expectation that low-cost and incremental solutions, such as introduction of bus rapid transit (BRT) in few routes, would be effective to solve the public transport problems. With such approach, there is a real risk of falling into a trap of low-cost, low-quality, and low-productivity transport system for these developing megacities. In a way, the potential virtuous cycle of urban growth, productivity, and prosperity is likely to be turned into a vicious cycle of worsening mobility, burdensome inefficiencies, and evolution of unsustainable spatial form. There are several factors driving this vicious cycle in most developing megacities, but inadequate and inappropriate transport system is the primary factor. This calls for improving transport system of developing megacities urgently.

The Asian megacities have taken various policy initiatives to improve the situation. Nevertheless, the improvement, particularly in developing megacities, is not to the desired extent. We may need to revisit the present policy approaches mainly from two viewpoints; first, given the rapid increase in transport demand, the urban transport problem is about a simple question of how to intensify the ongoing efforts "quantitatively"; alternatively, given the special context in Asian megacities, an equally important question is how to improve the efforts "qualitatively." Possible solutions lie on the combination of both, that is there is a need to intensify the efforts with new perspectives, the core premise of this book.

1.3 Learning from International Experiences

There are diverse patterns of urban transport system and associated performance indicators in megacities across the world. Patterns in some megacities seem to be more sustainable or desirable than in others. The resulting patterns are in fact outcomes of historical process, which is basically driven by immutable factors—such as geography and population—as well as factors controlled by public authorities through various policy measures. Deliberate policy decisions in the past certainly explain the resulting outcomes at the later stages. For example, cities in the world show different patterns of car ownership rate as the per capita city income rises. For a given level of income, American cities have the highest car ownership rate while developed Asian cities have lower rates (European cities fall in between). The car-dominated urban transport system with a small or negligible public transport modal share is now recognized as the main cause of mobility problems and other negative effects in American cities. On the other hand, large cities in developed Asia, such as Tokyo, Osaka, Hong Kong, and Seoul, boast higher modal share of public transport. These cities are primarily served by high-capacity rail network, which offers high-quality services and provide users a competitive alternative to cars, and thereby contribute to maintaining minimum or moderate level of car use. As extensively discussed in the literature (Goddard 1994; Jones 2008), domination of private car in American cities can be somehow linked with the past policy of the USA that treated motorization favorably as a desirable trend. It was because that car became affordable due to technological innovations, and contributed much to improving mobility with comfort, flexibility, and freedom. By the time motorization wave hit European and now developed Asian cities in the 1960s, early signs of the potential problems of automobile were visible and policy makes adopted cautious policy approach in accommodating the motorization trend in their urban transport system. Developing Asian megacities can learn great deal of lesson from the experience of their peers in the industrialized world.

In particular, experience of developing rail dominated public transport system in some megacities may offer useful lessons for other Asian megacities. A system of coordinating transport and land-use, and value capture (through real estate development around railway stations) made it possible for private sector railways, such as in Japan, to build and operate suburban railways without government subsidies. At the same time, vehicle-related taxes including limited parking space in the city core not only successfully restrained the car usage but also reflected true cost of private mode, making modal competition fairer and balanced. Fortunately, the key issue about the merits of automobile that confused policymakers for quite many decades is now more or less resolved. There is a broad consensus among academics as well as policymakers that unrestrained use of private automobile incurs huge social costs directly and indirectly. Most importantly, transport planners have now arrived at a conclusion that no matter how extensive an urban road network is, peak hour road congestion is an unavoidable phenomenon (Downs 2004).

Indeed, increase in car ownership rate, to some extent, is inevitable and should not necessarily be considered problematic, as most people give high value to the freedom and flexibility offered by car. What is important is to focus on the desirable level of car ownership and the kind of usage rather than absolute control of private mode despite the people's preference for it. Envisaging a pattern of reasonable rate of car ownership (say one car per family!) but lower level of car usage may provide a way to make it possible for both private and public transport mode to exist side by side (multimodal system). Examining the diverse patterns of car ownership and usages in megacities from the industrialized world and the underlying mechanisms (including policy intervention) responsible for these patterns can lead to important policy implications. Developing Asian megacities can draw valuable policy insights from these empirical evidences and theoretical advances, which have been well discussed in the existing literatures, such as WCTRS/ITPS (2004), Banister (2002), and Button and Hensher (2005).

1.4 Need to Explore Policy Strategies and Measures Considering the Asian Context

There is a broad realization that the task of achieving sustainable urban mobility in developing Asian megacities is difficult and complex. However, only few research studies were devoted to examine the specific characteristics of Asian megacities for the purpose generating new policy insights and perspectives. Much of the research effort at the international level focused on the case of developed cities. Limited researches were undertaken with specific focus on the transport problems in Asian megacities. In most of the cases, the research approach and problem structuring suffered from the adoption of inadequate framework and inappropriate perspective. There are indeed compelling reasons for this seemingly inconsistent research approach.

Firstly, the urban transport is relatively a young academic field and many of the theoretical concepts are yet to take deep roots. Most of the theoretical concepts and practical policy frameworks prominently featured in textbooks and academic publications are the results of research or practical policy efforts primary made in response to addressing transport problems at different stages of development in now developed cities of the western world. Despite the contrasting context of developing megacities, there is little effort toward working for more suitable theoretical and practical framework.

Secondly, international organizations including bilateral and multilateral donors have remained important actors in generating practical knowledge useful for solving development problems. For urban transport in developing cities, their engagement for research and practical studies is quite substantial and is able to exert significant influence in the policy process. Unfortunately, their efforts are short of addressing the core issues of the urban transport system. International organizations, by nature of their operation, primarily focus on issues identified for

their implications for global agenda such as environment and climate change. Though such issues are also legitimate agenda for developing countries' urban transport, they cannot address the core problems. Likewise, some major funding agencies, such as the World Bank, seem to face limitation in framing the problems since their operational principles place more emphasis on financial feasibility. This is perhaps the reason that the World Bank officially opposed the option of urban railways for developing cities (including megacities) until it softened the stands in recent years (World 1986, 2002). The World Bank's argument in opposition to urban rail investment in developing countries, however, lacked necessary analytical rigor and practical credence in the face of strong empirical evidence on the imperative of the urban rail system in developing megacities for its ability to serve large passenger volume and possible positive impacts on land use. However, the World Bank's view may have contributed to the delay in urban rail investment in many developing megacities.

Thirdly, the value-biased perspective, such as road versus rail, which is so common in urban mobility research, also limits the relevance of research results for practical policies in developing countries. Urban transport policy agenda involves huge capital investment and various business interests, which naturally generates political lobbying. The undulating evolution of different theoretical concepts in urban transport field and corresponding shifts in policy priority created different interest groups. The tradition of political wrangling over major transport agenda particularly in developed western countries have contributed much in dividing not only the interest groups but also academic and research communities over some critical urban transport agenda. Such value-biased perspective is simply out of context for Asian megacities. As mentioned before, over some of the key debatable issues, such as merits of automobiles and low-density urbanization, which created different set of values, there is a broad consensus now. The value-biased perspective is, therefore, not relevant for developing megacities.

What is therefore needed is a specific focus on the contexts of Asian megacities, particularly taking their characteristic features including practical constraints into account. The framework of analysis should also adopt appropriate policy perspectives considering long-term goals. Equally important is to focus on practically relevant issues and to present the analysis and research outputs in a format more accessible to policymakers. Policy experiences at the international level may provide important empirical basis for the research analysis, but the emphasis should be to generate useful policy insights from such experiences rather than making attempts to transfer directly the policy measures that were successful elsewhere. Most importantly, the potential for mutual learning by comparative case study of different Asian megacities should be fully utilized.

Indeed, we can see a trend of increased research interest in urban transport issues of developing countries. This has contributed many important references on the topic (such as Gakenheimer 1999; Vasconcellos 2001; Gwilliam 2003; Iles 2005). Some even focused on specific aspects such as mobility challenges in megacities (Moavenzadeh and Markow 2007) or problems and policy issues in the Asian context (Ieda 2010). These literatures have made important contributions to inform

policymakers in developing countries including Asia. However, there is still much scope to generate policy-relevant insights and lessons particularly for policymakers in Asian megacities through international collaborative research studies. This book is the outcome of such an effort. The contents of this book draw on the findings of the past researches as a starting point and then make attempts to contribute new insights and perspective considering the specialties of Asian megacities.

1.5 Context and Outline of the Book

Content of this book is based on the results of an international collaborative research on sustainable transport in Asian megacities. The above-discussed points provide the context and motivation for this collaborative study. The research adopted the approach of international comparative studies examining the cases of different megacities. The study had also been endorsed by Eastern Asia Society for Transport Studies (EASTS) as one of the studies under International Research Groups (IRG).

In this study, megacities are defined rather loosely as big or primate cities with the current metropolitan population more than 10 million and also as some rapidly growing cities with population less than 10 million but more than 5 million, which can be considered candidates for future megacities. For international comparative analysis, eight megacities from Asian region are chosen for case studies, namely, Tokyo, Seoul, Taipei, Shanghai, Bangkok, Metro Manila, Jakarta, and Ho Chi Minh City. The case study cities are selected to represent a broad spectrum of cities in order to examine empirical evidences related to different stages of development. The treatment to different candidate cities however varies as there is great variation in data availability.

The research analysis is primarily based on the case study reports completed on each candidate megacities. It also draws much on the existing literature for both theoretical insights and empirical evidences. Where relevant, reference is made also to the cases of other megacities (including those from developed western countries). Even though the study originally focused the case of Asian megacities, most of the conclusions may be equally relevant to other developing megacities as well.

In the following paragraphs, summaries of book chapters are presented.

Chapter 2 briefly reviews the concepts in the urban transport field. As the contemporary concepts came into being because of theoretical and practical efforts to respond urban transport problems mainly in now developed cities, the chapter looks into the history of evolution of transport systems and concepts in the developed world. This includes the evolution of mass transit since late nineteenth century, motorization since early twentieth century, and multimodal transport since late twentieth century. Different concepts emerged and gained prominence to address the emerging issues. The chapter then examines the transfer and diffusion of concept to Asian region through different routes such as colonization or higher education. Finally, common policy strategies and measures that are

grounded in the existing theoretical concepts are listed and a question is raised on if some adjustment is needed in these concepts, strategies, and policy measures in order to effectively address the urban transport problems and issues especially in Asian megacities. The chapter underscores the importance of examining the context of Asian megacities to answer this question.

In Chap. 3, we discuss specialties of Asian megacities on a range of themes that are related to urban transport, such as economic growth, urbanization, infrastructure development, public transport, and land use. The chapter examines the contexts of developing Asian megacities and compares them with the megacities from the western world in relation to major issues that have direct relevance to urban transport policies. Further, the chapter draws quite a few policy implications of such contrasting contexts for transport policies in developing Asian megacities. First, the urban form is just evolving and yet to be stabilized. There is good prospect of shaping urban structure to more desirable form. This may offer opportunities for synergistic policy measures as opposed to unavoidable trade-off so common in the developed cities. Second, the system should be developed to serve large travel demand (rather than an overemphasis on demand management) as increase in demand up to some level in developing megacities is something to be seen as a legitimate and desirable outcome of socioeconomic transformation. Third, demand for different kinds of infrastructure and services (for different user groups) needs to be provided simultaneously in an integrated way as the transformation is occurring in a relatively short span of time. Fourth, both hardware- and software-oriented solution approaches need to be adopted. Fifth, given the high population density and smaller road area ratio, some degree of road traffic congestion is unavoidable. Sixth, while considering different criteria for the choice of urban transport technology or modes, "space-efficiency" should be the main criteria as limited land area is the most binding constraint in Asian megacities. Seventh, where share of public modes is still high, policy focus should be on maintaining this high mode share rather than on the so-called modal shift. Eighth, as there is real possibility of running mass transit systems with high ridership, the common perception of public transport operation as loss-making services should be changed into potentially profit-making business. Ninth, innovative approach may be needed to manage motorcycles clearly defining their role for urban mobility. Tenth, new funding sources (in addition to financing mechanism) should be established for financial sustainability of the urban transport system. Finally, institutional evolution should be led by infrastructure development and service innovation. In conclusion, the chapter suggests that a new perspective may be needed to address the special context of Asian megacities and the resulting policy implications.

Chapter 4 focuses on urban transport dynamics to provide a relevant conceptual framework for subsequent chapters. The key premise in this chapter is that the system approach helps to understand the evolutionary process of urban transport system and then draw important policy insights. This approach is particularly relevant for developing Asian megacities since one of the key implications from Chap. 3 is about evolving system structure, which potentially offers many policy leverages. The chapter first reviews some theoretical concepts such as dynamic

efficiency and coordination failure and highlights their relevance for formulating long-term-oriented urban transport policies. We also explore principal domains of urban transport system, namely, transport subsystem, land-use subsystem, and behavioral subsystem, and examine how their dynamic interactions set different context for transport policy. System approach for urban transport dynamics is briefly reviewed, and a dynamic structure of urban transport system is presented utilizing feedback loop diagrams. Many positive feedback loops are identified in the urban transport system, which can result in either vicious or virtuous cycles. One of such vicious cycles is responsible for the declining mode share of public transport, which is identified as the core problem of urban transport. Applying the concept of feedback dynamics over the structure of urban transport system, implications are drawn for major policy strategies as relevant to developing Asian megacities. First, in the process of dynamic interaction among different system components, the physical structure has strong influence on the evolution of soft structure including human behavior. This suggests that achieving appropriate physical structure, such as infrastructure network and other built-up facilities, is the key to guide the evolutionary process of urban transport development toward sustainable direction. Second, the system comprising multiple positive feedback loops is vulnerable for locked-in leading to inefficient outcomes. That is the case where history matters or past (early) condition of the system determines the final outcomes. However, from practical viewpoints, implementing all policy measures at the early age may not be necessary or even feasible. This suggests a notion of appropriate timing for a policy measure to maximize its effectiveness. The chapter discusses an example of the timing of rail-based mass rapid transit (MRT) with some empirical evidence showing how the timing of investment matters. Finally, as different policy measures have to interact with the urban transport dynamics, there is possibility of synergy or conflicts among them. This indicates the importance of sequencing and packaging policy measures properly. In conclusion, the chapter underlines the importance of adopting these strategic insights while considering policy measures under different thematic topics to be discussed in subsequent chapters.

Chapter 5 deals with one of the core themes of urban transport that is urban road and motorization. The chapter starts with brief reviews on existing situation of road network, trends of motorization, and past policy initiatives in Asian megacities. Imperative of accommodating increasing motorization with inadequate road network is discussed as the key challenges for Asian megacities, for which strategy of decoupling income growth and motorization is emphasized. The chapter argues that the idea of responding motorization trend mainly through emission reduction strategies, a legitimate approach for developed cities, would, at best, result in a "clean congestion" in developing Asian megacities. On the other hand, given the relatively low level of vehicle ownership rate, there is an opportunity to stabilize vehicle ownership rate at a much lower level than in developed cities of the west if attractive alternatives are provided. Restraining motorization therefore can serve both emission and congestion problems. The chapter then discussed key policy issues that are relevant to Asian megacities, such as size of road network and types of road to be built, managing motorization, utilizing existing road infrastructure,

parking management and control, managing motorcycles, and possible impacts on urban freight. In order to address these policy issues, the chapter explores strategic options under different scenarios. It is pointed out that a limited road development mainly focusing on the development of essential basic road network is the likely scenario, which would demand for an effective restrain on motorization to better manage congestion under the road infrastructure constraints. The best policy option for this would be to implement package of policy measures comprising both regulatory and economic instruments. In case policymakers fail to implement such polices, the road traffic congestion would be managed through "self-regulation" (by the process of congestion itself). That is, the worsening congestion on the street would discourage people to drive and contribute to restraining vehicle ownership and usages. Though this option looks appealing, at least in the logic, it would be unbearably costly for the society due to severe congestion. The chapter concludes that the motorization can be restrained but not stopped. The road infrastructure is not likely to be adequate even for restrained motorization. Some degree of congestion is unavoidable, and ironically, it is the policy of improving public transport, which can save road traffic in Asian megacities from being gridlocked.

Chapter 6 looks into the issues, challenges, and policy options for another core topic, that is, public transport. This chapter follows structure similar to Chap. 5. The chapter begins with brief overview on the existing situation of public transport and past policy initiatives and lists challenges and opportunities facing Asian megacities. The list includes challenges of expanding capacity, improving service quality, attracting choice riders, and balancing affordability and profitability. Furthermore, the chapter argues that some specialties of Asian megacities offer many opportunities for public transport. In particular, high population density along with the evolving urban form at the metropolitan level provides most suitable condition to develop urban rail network, but some Asian megacities are already late for urban rail investment as measured by a timing indicator (IPN index). Lack of road infrastructure and resulting road traffic congestion, a daunting challenge for Asian megacities, can in fact be turned into an opportunity for maintaining the competitiveness of public transport modes in comparison with the private modes. The chapter then moves to discuss key strategic issues related to public transport, such as bus reform, managing paratransit, developing urban railways, and financial sustainability. Specific issues highlighted in the chapter include importance of continuous reform of bus services to suit the emerging market condition, need to adopt recently popularized mode of bus rapid transit (BRT) as a part of hierarchical transport system (as opposed to the substitution for urban rail), need to view the role of paratransit in a positive light and bring them to the formal domain, and the imperative of urban rail investment but need to ensure right timing and financially sustainable operation. The chapter concludes that improving public transport in terms of capacity, coverage, and quality is the only way out to serve burgeoning travel demand in Asian megacities. A hierarchically balanced public transport system with rail-based mass rapid transit (MRT) as a backbone should be planned and implemented with right timing of investment.

Chapter 7 examines the links between transport and spatial development at both national and metropolitan levels. The chapter is accordingly divided into two parts: one for transport and regional development and the other for transport and urban structure. The first part argues that the spatial development pattern at the national level is intricately related with policies on both intercity and urban transports and presents stylized facts of relatively higher regional disparity in Asian countries. Increasing concentration of population and economic activities in megacities is the most obvious manifestation of regional disparity. Explaining underlying reasons for the expansion of megacities, the chapter identifies the dynamics of agglomeration economy as the key factor but also points out that it is further reinforced by political forces and deliberate public policy measures. Subsequently, transport and non-transport-related policy options are discussed, and proposed to promote desirable form of transport and spatial development pattern at the national level. The second part of this chapter deals with the topic of transport and urban structure. It first reviews the case of Asian megacities and highlights the fact that the highly dense monocentric city structure is a distinctive feature of Asian megacities. However, at the metropolitan level, there is a visible trend of decentralization of population and economic activities to suburban areas. This raises critical issue on the possibility of low-density or even haphazard suburbanization, which would have serious implications for urban transport system. The chapter recalls that there is broad consensus among both academics and practitioners that for sustainability a compact city form should be promoted, but in case of megacities the "compactness" of multiple centers should be achieved as a single compact unit cannot accommodate the scale of a megacity. The approach of "decentralized concentration" could be effective for the purpose, which should be promoted in coordination with the development of rail transit. Such coordinated intervention can result in polycentric urban structure and public transport dominated mobility patterns. Suggested policy options to realize such an urban structure include master plans and urban containment strategies, and market-oriented strategies such as value capture and land adjustment schemes.

Chapter 8 discusses the adverse environmental impacts, namely, local pollution and CO_2 emissions from urban transport in Asian megacities. The chapter reviews the trend of emissions and common mitigation measures in Asian megacities, highlighting some successful examples, such as diesel retrofit and green tax programs in Tokyo. Further, comparison is made between mitigation measures in developing and developed countries and future challenges are identified. The chapter concludes with observations that despite the significant progress made mainly through regulatory measures, the CO_2 problem demands more fundamental solution at the structural level, such as the compact land-use pattern and mass transit technology with lower energy intensity. Paradoxically, these options, which are normally capital intensive, are more relevant in developing countries but face funding or institutional barriers. The point here is that in developing countries, there are good prospects of the policy measures that deliver CO_2 reduction as co-benefits (rather than primary benefits), provided that funding and other institutional barriers are overcome.

Chapter 9 is devoted to the topic of integrated urban transport system. It begins with a basic premise that practical policy measures essentially belong to different subsystems—such as urban roads, rail transit, or land use—of the urban transport system, but these policies should be conceived to address the long-term goal of achieving integrated transport system rather than to meet the immediate objective of addressing issues related to respective subsystems. A brief review on the concept of integrated urban transport as discussed in the existing literature revealed that the meaning of "integration" in recent years has been expanded in scope to achieve integration at different levels, such as facilities, operation, or institution. The seemingly broad concept of integrated transport is discussed mainly with a static perspective. That is, the integration of existing system elements for better outcomes rather than the integration in the long run. We therefore argue that the concept of integration should be expanded to incorporate dynamic perspectives to make it more relevant for Asian megacities. This means that an emphasis should be placed to achieve appropriate physical and institutional structure, which will then shape the evolutionary process to yield fully integrated system with minimum level of regulatory or other policy interventions. Under such framework, the chapter highlights several key issues and policy options. First, the importance of integration between private and public modes should be realized, as the special context of Asian megacities would not allow domination of private mode. For this, we need to change the prevailing mindset of car versus public transport while setting urban transport agenda. Integration at the system level demands that road modes (including car trips) be utilized for flexible accessibility but moderate mobility (speed) due to limited road network, while rail transit be utilized for limited destinations but with higher reliability and speed. The sequence of investment for road and rail infrastructures needs to be coordinated (first general roads, next railways, and finally expressways). Also important is to ensure level playing field for the road and rail modes by adjusting taxes, fees, and subsidies. Second, different public transport modes should be coordinated to develop hierarchical network of public transport in order to best use the advantage of each mode. While choosing public transport technology, not only capital cost but other factors that are important in the long run should also be considered, such as operation cost, competitive strength against cars, ability to handle crush loading during peak hours, and dynamic interaction with other components of urban transport system. This leads to a conclusion that the bus rapid transit (BRT), despite its successes in some Latin American cities, may have only limited role in Asian megacities. The role of BRT should be fit within the system of public transport hierarchy, and should not be exaggerated as a possible substitute for the heavy rail especially in Asian megacities. Third, integration between transport and spatial development should be accomplished mainly through transit-oriented development at the metropolitan level. Fourth, transport policies should also be integrated with environment and other social policies, where the context of Asian megacities offers good scope for win–win results.

Chapter 10 discusses the topic of institution, funding, and financing. All the strategic options and policy measures discussed under various thematic topics have to be supported by appropriate institutional, funding, and financing systems. The

chapter starts with a brief review of organizational types for urban transports that are common in developed cities. Institutional orientation in Asian megacities is then discussed including major barriers and possible options. The key point underscored here is that Asian megacities should adopt a market-oriented approach with strategic planning interventions to facilitate the utilization of the strength and creativity of the private sector. On funding and financing, the chapter reviews the funding and financing models that are common in Asian regions and argues that the existing sources of funding and financing cannot meet demand for investment for necessary transport facilities. Asian megacities should therefore make provisions of alternative sources to fill up the funding and financing gaps. Finally, the chapter argues that it is necessary to make distinction between funding and financing. Current debate is more focused on "financing" (such as private sector finance) rather than "funding," which is about taking the ultimate cost (both capital and operational) burden. The most important issue therefore is to secure adequate funding sources first and then only explore alternative financing instruments. This approach would also help to enhance the financial viability of the project and thereby create an environment for competitive bidding for a PPP scheme.

Chapter 11 presents conclusion in an attempt to synthesize the discussions on various issues in the previous chapters that converge into a few important insights. Consideration of special contexts of Asian megacities and examining the issues through the lenses of urban transport dynamics have allowed generation of new perspective. Elements of the new perspective include framing the core agenda of urban transport, learning from the mistakes of developed countries, drawing insights from urban transport dynamics, and adopting the framework of integrated transport. All the critical issues of urban transport in Asian megacities are filtered through this perspective and further examined against theoretical insights and empirical evidences, which led to the identification of appropriate strategies and policy measures. These include, among others, road investment with an emphasis to complete hierarchically balanced basic road network, restrain on motorization by regulatory and economic instruments, development of an hierarchical network of public transport with urban rail as the backbone, right timing and sequencing of different infrastructure (especially urban rail), integration of urban rail and land development and adoption of value capture schemes, choice of public transport technology for long-run cost efficiency, consideration for space efficiency (line capacity) and crush capacity to serve the much skewed distribution of demand during peak hours, ensuring level playing field for fair and efficient competition between private and public modes and between different public modes, establishment of funding model for commercial operation of public transport but partial capital subsidy (for urban rail), and so forth. A note of clarification is in order here. The list of strategies and policy measures is not intended to be an exhaustive one, neither the items mean to be "fit-for-all-size." Throughout the discussion in the book, the focus is on some underlying common threads that are defining feature of Asian megacities and the policy suggestions are intended to address the broader policy issues which are common in Asian megacities.

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Chapter 2
Evolving Concepts in Urban Transport

Surya Raj Acharya, Michelle Parumog-Pernia, and Shigeru Morichi

2.1 Introduction

Prevailing urban transport system in megacities is a combined result of dynamic interaction of institutions; the society's evolving need in mobility brought about by their changing physical, social, economic, and political environments; and the advancement in technology. The development of urban transport in cities involved a process of modernization and adaptation. European and American cities followed similar patterns of urban transport development up to the early twentieth century, and pursued quite different policy directions in the late twentieth century. Asian cities, on the other hand, followed a trend of adaptation in the past but gradually moved to locally adaptable systems.

This chapter discusses the evolution of urban transport concepts and the connections of these in the industrialized European and North American cities and East Asian cities. The chapter initially discusses some practical urban transport concepts in the USA and Europe after the dawn of the automobile in the late nineteenth century to the present. The discussions proceed to an overview of urban transport development in Asian cities. The last section attempts to draw broad policy implications and forward an argument that the special contexts of developing cities need to be carefully examined as the specialties may demand special policy measures rather than direct borrowing of concepts and lessons that evolved in the industrialized world.

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Why is it important to understand the evolution of urban transport policy concepts? There are two primary reasons that may explain the dynamics of transport policy development in cities. First, the basic time series characterization of urban transport policies in relation to the development of urban transport systems provides patterns that may potentially provide dynamic policy solutions for transport systems in Asian cities. Second, contextual understanding of the underpinnings of policies provides definitive cue points in introducing or reforming policies necessary for dynamic policy responses. The efficiency of solutions to urban transport challenges, measurable or qualitative, and policy responses to these problems can be evaluated through basic understanding of concepts. These policy lessons may provide useful insights for consequent policy development and decision-making practices in which the definitions of policy transitions are critical.

2.2 Development of Urban Transport System in the West

The development of urban transport policies has relatively been motivated by purposes that highly depend on the geopolitical characteristics of the cities and interest of the dominant political groups. Policies in the USA and Europe have set patterns on what transpired in the development of urban transport in the pacific region. From the start of the imperial regime in the sixteenth century, urban transport technologies from the west were actively applied in settlements in colonial countries. In an effort to create livable settlements at par to their country's standard, cities in Asia were built without ample considerations if it matched at all the local conditions at that time. This section provides a very brief trend in the concepts that influence urban transport policies in the USA and Europe to set context in understanding the development of urban transport in Asian cities.

2.2.1 Emergence of Street Cars and Rail Transits

Roadways have been integral part of even the earliest civilization. The progression of road-building led to construction of road networks to support city functions that had also transcended time from trade to empire building, industry development, and supporting hierarchic settlement functions. Before the dawn of motorization, urban road traffic consists mainly of horse-drawn vehicles, carriages, and coaches. The maintenance of roads was usually done locally, and roads were more extensive in inter-settlement links. The late eighteenth century showed forth the new trend, which is mobility through self-propelled vehicles. The mixed traffic of early automobile and slower transport modes caused conflict in the use of road space, and it was responded through signaling system and horns. Various types of automobile propulsion systems were developed in the nineteenth century up to the start