1. Introduction

**Genserik L. L. Reniers, Dawna L. Rhoades,
Joseph S. Szyliowicz and Luca Zamparini**

Recent decades have witnessed the emergence and implementation of a new vision of transportation across the globe. That vision, known as intermodalism or multimodal transport grew out of technological innovations and a realization that the traditional modal approach to moving people and goods by road, rail, water or air no longer sufficed. This modal approach, whereby each mode is administered and operated in isolation from the other modes, had created a situation characterized by numerous problems including urban congestion, environmental pollution and bottlenecks that prevented the smooth flow of goods and people thus imposing ever-heavier costs upon communities and governments everywhere. Accordingly, it became increasingly obvious that it was essential to view transportation in a new way, one that recognized transportation as a system, that the modes, though possessing individual characteristics, were interrelated. Technological changes in transportation and communication have been a powerful driver that unleashed these forces. Indeed it has been argued that intermodalism emerged from a box in 1956 when a ship called the *Ideal X* sailed from New Jersey to Texas carrying freight packed in containers. Until then, ships were loaded and offloaded much as they had been for centuries; now goods could be shipped across the globe at greatly reduced costs since the freight needed to be packed only once. Thus ships could be loaded and unloaded more quickly. Malcom McLean had created a new technology that transformed international trade and investment patterns.

Since the container could easily be transported not only by sea but by road or rail, those modes also began to change to accommodate the new technology, and imaginative entrepreneurs who recognized the economic advantages of shipping freight in an integrated way through different modes were able to seize market opportunities. Concomitantly, important technological innovations, such as double stack trains, further spurred the revolution whereby air, ship, rail and truck became intertwined so that intermodal systems began to be created.

Passenger traffic was also transformed since populations were growing everywhere and increasing numbers of people were traveling domestically and internationally. To meet this ever-growing demand for faster, reliable, convenient travel services, linkages among passenger road, air and rail services began to be created, a process that continues to the present. This is particularly important in the case of international and/or intercontinental trips that rely on air transport in order to reach virtually every possible destination in a reasonable amount of time. It is then evident that the air transport network has to be connected with the networks/infrastructures of the other transport modes. Moreover, as people everywhere became increasingly concerned with issues such as congestion, air, water and noise pollution and climate change, the social costs of existing transportation systems became increasingly apparent and the need to view transportation not merely in traditional economic terms but in terms of its sustainability became ever more apparent.

Thus, as the 20th century came to a close, it became increasingly obvious that the traditional modal approaches no longer sufficed and that new policies and practices were required to deal with the new demands and challenges. In the US, for example, Congress enacted, in 1991, the landmark Intermodal Surface Transportation Efficiency Act (ISTEA) that moved policy away from the age old emphasis on specific modes, notably the highways, towards intermodalism. For the first time, federal legislation recognized the constraints and negative consequences imposed by traditional modal policies and the need for a new approach that emphasized flexibility, innovation and greater public involvement. One of the most notable effects of this new approach and of concurrent technological innovations (i.e. containers, intermodal hubs and so on) has been a drastic contraction of overall transportation costs. This rationalization of costs has been one of the main determinants of the large increases in international trade.

Though the concept of an integrated transportation network quickly gained widespread acceptance among transportation professionals, it has proven difficult to define. Indeed many – including contributors to this volume – continue to prefer the term ‘multimodal’. In our view, however the term ‘multimodal’ which is widely used throughout the world is not adequate because it can be used to refer simply to the obvious fact that goods and people may use more than one mode of transportation from origin to destination. This term ignores the obvious fact that people have traveled and shipped goods in this way since the earliest days of human existence and, more importantly, fails to capture the critical integrative element that distinguishes the new approach. Adding to the confusion, however, is the fact that though the term ‘intermodalism’ captures the essence of the process, it does not take into account all elements involved

(i.e. security, sustainability). This is evident if we consider some of the ways in which the term has been defined.

For example, consider the following popular definition: ‘the coordinated passage of goods and people by way of two or more of the primary modes of transport (sea, air, rail, road) from origin to destination as defined by the passenger or the shipper and consignee, with a single travel directive bill of lading or ticket and a single price covering the entire trip’ (Alt et al., 1997, p. 36ff). This definition captures the integration dimension well but it fails to include other critical elements – choice and inclusiveness – that many consider to be integral dimensions. Thus, intermodalism has also been defined more broadly as: ‘a system that is both safe and efficient and productive and flexible in responding to the needs for good movements and . . . offer(s) people choices and flexibility in their personal movements. This system must also be “international, intelligent and inclusive”’ (Jeff, 1998, p. 13). Yet many would argue that even this definition is inadequate because it does not recognize explicitly the externalities of a transportation system. It is obviously possible to develop an integrated system that is safe, efficient, flexible, intelligent, international and inclusive but which continues to pollute the environment and waste energy. Nor does it consider the critical elements of safety and security, elements that are essential in today’s world.

Accordingly, it is necessary to expand the definition to include such factors as safety, security, efficiency, cost-effectiveness and long-term sustainability. Thus, we suggest the following definition: An intermodal system is one in which the individual modes are linked, governed and managed in a manner that creates a seamless and sustainable transportation system. Such a system should be economically efficient, environmentally sound, safe and secure, and ethically based.

Implicit in such a perspective is the idea that each mode should be utilized for the purpose for which it is best suited in terms of these considerations. Thus, as many containers as possible should move by rail and not by road and the aviation mode should be used only for high-value long-distance and trans-oceanic trips. Furthermore, every effort should be made to minimize the negative impacts that are inherent in each mode. Such a system maximizes efficiency, offers more choices for personal and freight mobility and minimizes environmental impacts and the use of energy – a critical point given transportation’s heavy reliance on petroleum and its contribution to global warming.

Powerful forces created the need for this new approach to transportation. Most obviously, the process of globalization has impacted transportation in many ways. New economic units such as the EU and NAFTA were established and competition between countries and regions intensified,

creating increased demand for transport – the role of which became more and more critical at the same time that the existing patterns were demonstrating major weaknesses. These structural changes in the global economy were accompanied and intensified by the emergence of new consumption patterns which created new pressures to distribute goods to global markets. As a result, new patterns of international trade emerged, creating opportunities for innovation and change. Production patterns were also affected as firms everywhere sought to minimize costs and eliminate inefficiencies in various ways. Such concerns led to the introduction of ‘just in time’ production, an approach that reduced costs by eliminating much of the need for warehousing and storage. As a result of these changes, national development now requires not only sound domestic economic policies but the ability to export and import products rapidly and efficiently to numerous foreign markets. This can only be achieved through integrated global supply chains.

1. INTERMODAL SECURITY

However defined, the new complex transportation infrastructure which has emerged creates difficult new security challenges that are a major concern for governments everywhere. No mode – land, sea, water and air – has been immune as subway systems, airports, buses, ships, railroad stations and airplanes in many countries have been targeted, often with devastating consequences in terms of human lives and in economic terms. Attempting to ensure that people can continue to avail themselves of various mobility options and that trade can continue to flow smoothly and economically has become an international priority because intermodal transportation networks are a major sector in any economy and a significant contributor to national growth.

Thus, new security measures have been implemented everywhere and these have enhanced the security of various modes to varying degrees. However, transportation security requires going beyond safeguarding the individual modes to ensuring the security of the intermodal terminals, the nodes that link and integrate passenger and freight flows. Their importance has continued to grow as globalization and technological developments have accelerated in recent years, particularly in the fields of transportation and communications. These trends have made the world a smaller place. As technological progress has continued to shrink distance and time, an ever-expanding flow of people and goods across national frontiers further accelerates the process of economic and financial integration. Today companies produce in many countries, ship components from one subsidiary to

another, distribute finished goods to markets in many countries and use the transportation system as a warehousing system. To accommodate the growing demands these developments place on the transportation system, new intermodal facilities have been built everywhere. Airports have proliferated throughout Asia, new road and rail links have been established through the Channel and the Trans-European Network, and many countries are modernizing and expanding their port facilities. Such projects facilitate and enhance interdependence and interconnectedness, but at the same time present new and attractive targets for terrorists who have become increasingly sophisticated in recent decades, understand the inner workings of transportation systems and are developing new weapons and capabilities.

Intermodal terminals are very attractive targets because of their economic and social significance and the difficulties that are involved in safeguarding them. Traditional security challenges are multiplied by numerous new problems of coordination and integration, such as clearly defining the roles of the many different types of personnel working in these terminals, and ensuring that they understand their proper roles in the security program and can manage them effectively. For example, the new emphasis on direct rail connections to airports means that security practices for the railways and those for aviation modes need to be harmonized. Of course, ensuring that all rail passengers are subject to rigorous aviation screening standards is no simple matter. Thus, intermodalism greatly complicates security procedures, particularly when there is a continuing tendency to think of security purely in intramodal terms within one mode at a time.

Modal thinking is reinforced by the tendency of virtually all governmental agencies (even those which have overarching responsibilities across modes of transportation) to function in a reactive manner by responding to particular threats, rather than taking a more holistic view of the situation. For example, the airline hijackings and the problem of bombs aboard airplanes that emerged in the late 1950s and 1960s resulted in government-mandated, stepped-up security measures by the airlines and at airports. By contrast, little focus was given at the time to security measures in road, rail or sea-going modes.

The global freight system which is vulnerable at many points is of particular concern because of the devastating economic consequences, nationally and internationally, that would follow from a successful attack. As Robert Bonner, the Commissioner of the US Customs Service has noted: 'If terrorists used a sea container to conceal a weapon of mass destruction and detonated it on arrival at a port, the impact on global trade and the global economy could be immediate and devastating – all nations would be affected. No container ships would be allowed to unload at U.S. ports after such an event.'¹ Consequently, the economies of all countries would

receive a major shock as international trade would not return to its normal state for months. In the meantime, economic growth throughout the globe would slow, imposing a heavy burden on all states, especially upon those least able to bear it.

Another factor of concern lies in the awareness that terrorists have adopted new tactics and now seek to inflict as many casualties as possible. Intermodal nodes such as train stations, airports and metros which are often crowded with people are therefore attractive targets. The March 2004 attacks on the Madrid train stations in which over 170 people were killed and many more injured, and the July 2005 attacks on London's underground system which killed 56 people, including the four suicide bombers, and injured about 700 other people, provide vivid and tragic proof of the appeal of these targets. These attacks only involved a tragic human toll but a series of such attacks could produce significant changes in mobility patterns and hence on the quality of life as well as on economic activity.

Transportation facilities are often national and international icons and the demolition of a famous bridge or tunnel would possess great symbolic significance. Transportation security is thus an essential counter-terrorism tool. Terrorists have to travel to their targets with their weapons or to a place where they can obtain them. A secure intermodal system can obviously limit the mobility of terrorists, an issue of growing concern to law enforcement agencies everywhere. It can also increase the security of vehicles which can be, and often have been, used as weapons. The tragedy of 9/11 was the result of airplanes that were transformed into missiles. Most common are truck bombs which have been launched against intermodal terminals, bridges and tunnels, vessels in ports, trains and buses. Terrorists are also exploring the potential of other weapons including nuclear materials. The acquisition of 50 kg of Highly Enriched Uranium (HEU), would permit terrorists to assemble a nuclear weapon, albeit an inefficient one. However, building a bomb is a difficult task, even with the necessary materials and the technical know-how. More likely is a radiological attack using a 'dirty bomb' or other radiological dispersal device (RDD) that explodes and disseminates radioactive materials in transportation facilities or disperses such materials in powdered form, perhaps from a plane.

Even more likely are chemical and biological attacks. Terrorists may be able to acquire numerous agents that cause such diseases as plague, botulism and smallpox. The deployment of a few grams of these microbes in a passenger intermodal hub would suffice to cause death and create panic. Many other virulent toxins can be identified, some of which such as sarin gas and anthrax have actually been used. Each of these substances poses unique challenges that require particular countermeasures and responses that also depend on the nature of contexts and resources.

Cyber-attacks, which are commonplace, also pose an ever-growing threat. These can take many forms. A specific database of a transportation owner/operator can be attacked in order to gain information, or an attacker can seek out a weakly defended pathway for access to a network in order to shut down service or to introduce harmful instructions. Attacks can be launched against train control centers and air traffic control systems, ports, power and telecommunications systems, and railroad signals. A successful attack would have devastating consequences.

Since attacks against transportation systems can take many forms and involve a variety of weapons, safeguarding transportation systems is a challenging but essential task. Safeguarding this system is no easy matter for several reasons. First, its sheer size creates difficulties. Shipping freight in containers has proven to be a reliable and inexpensive way of sending goods from one corner of the world to another and container freight has grown exponentially in the few decades since its introduction. Today, about 90 percent of the world's cargo movements involve containers. Almost 50 million full containers are shipped between the world's major ports each year, six million of these arrive in the US each year (Szyliowicz, 2009). Another ten million arrive by road or rail.

Second, the economic and technological integration that has been achieved has not been matched by an equal degree of political coordination and cooperation. There is a growing discrepancy between traditional political borders and economic boundaries that continue to expand outward as a result of various international trade agreements. As a result, new questions have emerged to complicate the already complex and difficult issue of border security. There is an obvious trade-off between efficient trade flows and enhanced security risks.

Thus, the problem of safeguarding intermodal transportation systems is further complicated because it is an international as well as a national issue. But world politics continues to be largely characterized by the interactions of independent international states with varying degrees of power and influence. Thus, national and international security concerns require a strong measure of cooperation, reaching agreements, often a difficult and challenging task when attempting to create a new regime.

Since the system is characterized by a lack of agreement on responsibility and overlapping claims to jurisdictional authority, policy makers in national governments confront substantial challenges in such areas as port and aviation security since numerous national agencies and actors are involved as well as private sector firms and other non-governmental organizations and international organizations such as the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO). Coordinating all these international, transnational

and domestic actors and stakeholders is extremely difficult. Globalization, thus, poses difficult challenges for transportation security. It has created a system whose disruption can have catastrophic consequences for the entire world economy.

Still, international, and transnational, actors have attempted to enhance transportation security. Asia Pacific Economic Cooperation (APEC), for example, has adopted various measures to enhance transportation security among its member states. These include the establishment of the Secure Trade in the APEC Region (STAR) initiative by which member economies are to take action to screen people and cargo better, as well as to protect ships, planes, airports and seaports better more generally. To achieve these goals, a Counter Terrorism Task Force has been established along with a Transportation Security Experts Group with task groups for such areas as cyber, maritime and aviation security. Although helpful, the full impact of these activities remains to be seen. Nor should one overlook the policies that have been adopted by the two key international organizations whose areas of responsibility include shipping – the IMO – and aviation – the ICAO.

Though their activities involve the security of intermodal nodes, the traditional concern with enhancing the security of individual modes, especially aviation, continues to be the principal area of concern. Prior to 9/11, the other modes received what might be considered, at best, limited consideration. Today, governments recognize that attention must be paid to the intermodal dimension but transportation systems everywhere are still largely organized by modes and the key private and public actors continue to think and act along modal lines, often nationally. Such an orientation does not facilitate the development and implementation of appropriate policies to safeguard intermodal transportation systems. It is now essential to view transportation security from an intermodal or systems perspective and to be sensitive to the global reach of a transportation system. But, like globalization, its very characteristics – such as the increased number of stakeholders, the functioning of terminals, and the increasing reliance of information technology – further complicate the task of dealing with terrorism. Of particular significance are the great problems of coordination since different modes have different security practices and involve large numbers of private and public stakeholders.

Essentially, intermodal transportation can be divided into two obvious categories: passenger systems and freight systems. Though they are interrelated, they must be considered separately for each has distinct and separate features that present particular security problems.

2. INTERMODAL PASSENGER SYSTEMS

By their very nature, intermodal passenger systems are especially vulnerable. They are complex, large in terms of both the areas they cover and the number of people who utilize them, and they are designed to be easily accessible. As a result, it is difficult, if not impossible, to screen passengers and their luggage as is done at airports everywhere. Moreover, any attempt to enhance security is likely to conflict with the ease of access that all intermodal terminals are designed to provide to large numbers of users. Thus, there is always a tension between security and convenience. A report by Horowitz and Thompson (1994) ranked the maximization of security as the second most desirable goal (in a list of 70) for the evaluation of the quality of an intermodal passenger transport facility.

All new passenger transport hubs should then be built with a very clear security focus both in terms of design and construction and in terms of operations and response. With respect to the former, all available technologies should be used in order to maximize the screening capability of the infrastructure. Operations and response should, on the other hand, be aimed at minimizing the probability of occurrence of (a lack of) security related episodes and, given the virtual impossibility to reduce this probability to zero, the minimization of casualties, damages and disruption involved in such episodes. The training of intermodal hubs personnel is a very important factor if this objective is to be achieved. For very large intermodal hubs (i.e. airports and ports) devoted to international transport, the coordination among country systems and strategies plays a pivotal role in increasing the effectiveness of security systems. In this respect, the best practices adopted in one country and for a specific transportation mode should be extended and, where necessary, adapted to the other countries and transport modes. The main components of a security plan for intermodal passenger systems should include a clear identification of goals, assets and choke points, where security should be maximized and conceived as the primary goal of the system. This goal can be reached by a flexible and efficient security scheme that takes into account the evolution of transport systems and works to enhance security standards continuously. The dissemination of information and the involvement of private stakeholders is very important in this respect along with public awareness campaigns that target the overall society (Tarr et al., 2005).

3. INTERMODAL FREIGHT SYSTEMS

The intermodal freight systems which, as noted above, are a critical infrastructure that undergirds national economies, present perhaps even more daunting security challenges. Ensuring the security of ports is particularly difficult. Ports are a critical element in the modern supply chain, handling thousands if not millions of containers a year. Like all other elements of the transportation system they also possess inherent characteristics that make them vulnerable and attractive targets. They are accessible by both land and water, have large numbers of workers and visitors, are in crowded metropolitan centers, cover large land areas that often contain (petro) chemical and other hazardous facilities, and are intermodal nodes that link shipping to rail and road nodes and thus provide ready access to other locations. The flow of trade enhances all these vulnerabilities.

Ports are not the only highly vulnerable nodes. Air freight is an enormous business that is handled not only in specialized airports but in regular airports as well. In fact, there is a significant volume of freight carried in the belly of passenger aircraft. This so-called belly freight poses serious potential risk to air passengers and any explosion at altitude would result in maximum fatalities. And, once cargo has arrived at a port, the container continues its journey by road or rail creating additional opportunities for a terrorist attack. Given the volume involved, checking each container or even a statistically significant percentage at a large port is an impossible task, since it would bring commerce to a standstill. Consequently, it is important to devise contingency plans aimed at minimizing the effects of security related attacks. These should take into account all measures that are both efficient and effective, such as the decision of which transport corridors to shut, how to divert traffic to other similar infrastructures, the downstream effects to the attack on an intermodal transport hub, and so on. As in the case of passenger transport, the coordination among all economic stakeholders involved is vital in order for a security system and/or a contingency plan to function smoothly. In this respect, a proper regime of incentives (i.e. conditional facilitation of procedures) and sanctions (i.e. slow lanes of custom clearance procedures for non-complying firms) should be promoted. Moreover, security protocols should not be based on the response to single episodes but they should rather rely on a strategic vision that integrates security as one of the most important elements in the supply chain. Finally, the efficient exchange of information among stakeholders should be fostered and facilitated.

4. STRUCTURE OF THE VOLUME

Clearly the emergence of multimodalism/intermodalism has created dangerous new security challenges. This volume is designed to provide an overview of these issues and the ways in which different countries have defined and dealt with them. Given that there are some homogeneities but also significant differences between the freight and passenger sectors, we consider each separately. The theoretical parts of the book (Part I devoted to freight transport and Part III to passenger transport) discuss the relevant issues in each sector. The empirical and country policy related parts of the book (Part II for freight transport and Part IV for passenger transport) comprise various case studies that cover Africa, Asia, Europe, North America and South America. By presenting the context, policies and strategies from a diverse range of cases we seek to develop, both at the theoretical level and with respect to specific countries, information about commonalities and peculiarities in approaches, procedures and strategies that can provide a basis for the development of sound, effective and efficient intermodal transport security policies.

Part I of the book begins with Chapter 2 where Gerrit Nieuwenhuis provides a general overview of the challenges confronting multimodal freight transport. Following a discussion of the various definitions for multimodal and intermodal transport, he emphasizes standardization as a necessary condition for the efficient and seamless transportation of goods at both the continental and intercontinental scale. He then discusses the large number of economic and transport firms and agents that are involved in multimodal transport on the demand side and on the supply side of the market, one of the main factors complicating efforts at securing any supply chain. The chapter also discusses how the container, the most important innovation that has allowed a large diffusion of intercontinental maritime transport and the consequent globalization of trade, creates its own problems. Although several loading units can alternatively be used (i.e. trailers, swap bodies) for continental multimodal transport, these too pose security challenges. The chapter then considers all possible categories of security related events that can pose a risk to the supply chain and considers cargo thefts, acts of terrorism and piracy as the most relevant ones. Finally, the chapter presents the EU regulations that seek to increase the degree of security with the least possible cost in terms of seamless transport flows and concludes by discussing the trends and innovations in the sector.

In Chapter 3, 'Economic issues in multimodal freight transport security', Luca Zamparini proposes an economic analysis of several topics related to multimodal freight transport security. The chapter first provides an economic analysis of the various container security measures that have

been implemented in the last decades, especially after 9/11. This is followed by a detailed discussion of the important economic issues related to the main national and international initiatives that have been implemented since 2002 in an effort to increase the degree of multimodal transport security. Moreover, the economic impact of some private multimodal transport security programs is considered and is critically analyzed.

Chapter 4, 'Assessing vulnerability in multimodal supply chains' by Jyri Vilko, Lauri Lättälä and Jukka Hallikas, begins by proposing a clearly defined distinction between risk and vulnerability in the context of the supply chain and then discusses the main differences between these two concepts. It then clarifies that risk analysis and vulnerability are conceptually different and highlights the various steps that are necessary in a vulnerability analysis study (definition of scope, description of context, selection of methodology, scenario/model development, analysis and prioritization, interpretation of results and limitations, and selection of proper actions). The chapter then provides a taxonomy of possible risks in the various phases of a supply chain and posits the need to consider the quality and the amount of available data if a proper method of vulnerability analysis is to be selected. The second part of the chapter illustrates how this should be done by presenting and discussing a hypothetical case of vulnerability analysis in intercontinental multimodal transport. It discusses all possible causes of risk along the supply chain, their probability, and the implied costs in terms of delay to the shipment. Finally, the chapter concludes by considering the necessity of optimizing the supply chain management in order to minimize the connected risks and vulnerabilities.

Part I concludes with Chapter 5 on insurance issues. Eric Depré, Genserik L. L. Reniers and Luca Zamparini begin by defining insurance and partitioning it into two categories – indemnity insurance and fixed sum insurance. They then provide a taxonomy of all the possible types that can be related to a supply chain and all the related physical infrastructures. Moreover, the chapter considers the most relevant topics that are connected to single mode transport modes by discussing the peculiarities of each mode. The chapter concludes with a consideration of the themes and issues related to the insurance of the multimodal transport option, emphasizing that each single mode involved in a multimodal chain has its peculiar risks and that these have to be carefully considered. Finally, it highlights the most important elements that have to be taken into account when insuring a multimodal shipment.

Part II of the book is devoted to national policies that deal with multimodal/intermodal freight security. Chapter 6 by Brent Shapiro considers how the US seeks to ensure that imported freight does not pose a security threat, especially during its inland stages. For many years that

responsibility has lain with the Customs and Border Patrol (formerly the US Customs Service). The chapter describes the various security initiatives that have been implemented by the US administration since 9/11. These include the Customs-Trade Partnership Against Terrorism, the Container Security Initiative and the 24 Hour Advance Manifest Rule, and the Importer Security Filing and Additional Carrier Requirements (commonly known as the 10+2 Rule). Moreover, the chapter analyzes the procedures and protocols that are related to security once a cargo enters the US. These measures relate to both hubs (such as ports) and to the other legs of the transportation shipment, including the electronic data interchange for the clearance of shipments bound at ports. The importance of tracking goods during their final stages is explained in detail.

Chapter 7 provides an analysis and discussion of Italy's policy. Luca Talarico and Luca Zamparini first describe the evolution of the multimodal freight transportation system in Italy by highlighting the modal split and the difference between domestic and international multimodal freight transport. They then consider the existing logistic infrastructure network which can be integrated under the multimodal perspective, describing both the main multimodal hubs and the road network with its high traffic and medium traffic routes as well as the main multimodal firms. The criticalities for a consistent development of multimodal transport in Italy are then discussed. The second part of the chapter is devoted to the analysis of the security aspects in the multimodal freight transportation. The critical principles, legislations and rules which impact the Italian logistic system are then presented. Moreover the multimodal freight transportation security related events that occurred in 2013 are also reviewed and analyzed. Lastly, the chapter suggests that a discussion be held about the many best practices and innovative technical solutions which have been proposed in Italy, since doing so would help guarantee both the efficiency of the multimodal logistic nodes and the security of the overall logistic supply chain.

In Chapter 8 Olli-Pekka Hilmola describes the security improvement potential of Rail Baltica investment. The chapter begins with an analysis of the transportation sector's development including the evolution of fatalities and its downward trend in the last two decades in the Baltic States and Poland. After discussing the dependency of these countries on energy (mainly oil imports) and the consequent importance of fostering multimodal transport, the chapter discusses the existing security and safety controls in the rail sector. This mode has failed to adequately implement a common signaling and traffic control system (the European Rail Traffic Management System [ERTMS]), though doing so would ease interoperability and facilitate rail transport. The factors for this delay are then accounted for. The chapter then analyzes and discusses the most important

threat to the mode, the growth in crime. It concludes with a consideration of the potential future growth of road transport due to increasing private car and truck traffic as well as the readiness of the railway sector to take care of south-north general cargo transports.

Chapter 9 by Evaristus Irandu deals with the situation in Kenya. The chapter begins by analyzing the development of its transport network over time and the problems faced by multimodal transport in sub-Saharan Africa. It then highlights the importance of multimodal freight transport within Kenya, and along the relevant regional transport corridors, as a means of reducing the high transport costs in the country and improving its economic competitiveness. The various challenges for the improvement of multimodal transport (an inadequate legal framework, institutional capacity and investments, lack of capacity at the port of Mombasa and in the railway network itself) are then discussed. The chapter then considers the security of the freight transport system, the factors that are threatening it and the policies and strategies that have been implemented in order to increase security along with the legal framework that has been issued over time for each transport mode. Finally, the chapter considers the role of ICT in multimodal freight transport security in Kenya.

Chapter 10 by Chunyan Yu and Yihong Ru discusses the Chinese situation. It begins by describing the current status of the transport sector in China with respect to both transport flows and the degree of infrastructural development for all transport modes, including the rail links with neighboring countries. The second part of the chapter discusses the main security issues for all transport modes, including a series of examples and a detailed description of the relevant security regulations and agencies. The last part of the chapter describes the security measures (prevention activities and optimal response strategies) that have been put in place in the main multimodal hubs and assesses their strengths and weaknesses. The chapter concludes by assessing the main similarities and heterogeneities of the various security measures across modes.

Part II closes with Chapter 11 by Michael J. Williams on the Brazilian case. Following some general data about Brazil the author turns to the development of its transport network in the last decades, including road, water, rail, pipeline and aviation. It then considers the government's initiatives to improve the conditions of transport infrastructures and the efficiency of freight movements. The challenges conditioning such policies and their degree of success and effectiveness are discussed. The second part of the chapter looks closely at the factors affecting freight security and emphasizes cargo thefts as the most relevant and recurrent issue. The last part of the chapter is devoted to a discussion of the initiatives and measures that have been implemented in order to increase the system's security.

Part III of the book begins with Chapter 12 on the ‘Challenges for multimodal passenger transport’ by Monika Bak and Jan Burnewicz. They start by clarifying the different concepts of multimodal and intermodal passenger transport and conclude that multimodality is more developed for freight while it is evolving in the context of passenger transport. They then consider all the important themes involved in meeting the infrastructure and technology needs for the efficient development of multimodal passenger transport. The relevance of transferability of good practices is also considered. In the second part of the chapter, the links between multimodality and sustainability of transport are explored, with particular emphasis on the need to reduce the environmental impacts. The increase in regional accessibility due to efficient multimodal transport solutions is also considered. The last part of the chapter discusses the policies and legal frameworks that facilitate intermodal cooperation including a comparative viewpoint on the actions and strategies adopted by the EU, the US, Japan, China and Russia.

Chapter 13 by Luca Zamparini concludes Part III and considers the economic and policy issues related to multimodal passenger transport security. It first stresses the homogeneities and, above all, the differences with respect to freight transport security and notes that relatively fewer analyses have been devoted to passenger transport security. It then discusses the economic issues in multimodal passenger transport security, two specific initiatives that have been developed by the International Road Transport Union and by the Transit Cooperative Research Program of the Transportation Research Board, and the multimodal passenger security policies of the EU and of Australia. The aim of this chapter is to highlight some relevant issues that will be thoroughly discussed in the country-specific chapters that constitute the next part of the book.

Part IV of the book – which is devoted to multimodal passenger transport security policies – begins with Chapter 14 by Joseph S. Szyliowicz which discusses the US case. The chapter begins with a description of how its transport network developed along unimodal lines and the attempts to adopt a holistic and multimodal perspective over the last 25 years. It then discusses the current state of multimodality, noting that it is more developed for rail transport than for air transport. The chapter then discusses the most vulnerable parts of the multimodal transport networks – the intermodal hubs – a vulnerability exacerbated by the wide array of weapons that terrorists can employ to attack such facilities. Another criticality is represented by the fact that security protocols need to mediate among different organizational cultures, structures and operating procedures. The second part of the chapter discusses the policies that have been adopted by the agencies created by the US administration, over time, to

secure the multimodal hubs. Both airports and surface transport terminals are considered in a historical perspective.

Chapter 15 by Coen van Gulijk, Megan Anderson and Genserik L. L. Reniers considers the Dutch situation. It first describes the structure of the transport network in the Netherlands with a particular emphasis on the two main hubs – the port of Rotterdam and Schiphol Amsterdam Airport – and the general transport networks that serve them. In the second part, the management of transport security is described and analyzed, including the major role played by the ‘national coordinator for anti-terrorism and safety’ agency of the Ministry of Security and Justice. Moreover, the prioritization of strategies according to the national risk assessment multi-criteria strategy is considered in detail. After a description of the main security related episodes in the Netherlands, the security arrangements in the Port of Rotterdam and in Schiphol Amsterdam Airport are described and the mixed results of the national risk assessment strategy are thoroughly discussed.

Chapter 16 by Yair Wiseman and Yahel Giat considers the situation in Israel. The chapter begins with a description of the Israeli transport networks, the critical infrastructures pertaining to each mode and the agencies and authorities responsible for transport security. It discusses how policies evolved more as a consequence of security episodes than as a planned strategy. The most relevant cases of security related episodes in the various transport modes (air transport, rail and bus transport) and the policies adopted to decrease their probability and to reduce their impact are then discussed in detail. Various security challenges including road blockages, shooting from cars, and the use of ambulances as terrorists’ tools are considered. The chapter then describes security in multimodal hubs and considers the occurrence of terror attacks and of missile strikes from a historical perspective.

The Indian case is analyzed in Chapter 17 by Jay B. Kshirsagar and Pawan Kumar. They note that passenger security in multimodal transport is a very relevant issue in India given that it has 53 cities with more than one million inhabitants. They specify that the software and hardware of the entire transport system are key elements in security. Particularly important, in this respect, is the planning strategy for the different infrastructures. The chapter then describes the current practices for the enhancement of security in public transport (where particular care is reserved for women travelers) and in its multimodal options. In the second part of the chapter, the main issues related to passenger security are discussed. These involve all phases of the transport chain and all possible means of transport. Lastly, the role of public campaigns to increase public awareness and to influence travel behavior is discussed.

Part IV closes with Chapter 18 on the Brazilian case by Dawna L. Rhoades. Following an overview of the country's general economic and geographical data she provides a precise description of the transport sector, particularly its air, inland waterways, road, rail and public transport. The regulatory and policy framework is then considered. The second part of the chapter starts with a discussion of the main bodies and agencies responsible for security in Brazil, at the national, state and local levels, and then considers the security challenges Brazil faces in terms of both border and interior security and crime and infrastructure.

The concluding chapter of the book provides a comparative analysis of the freight and passenger transport sections and highlights homogeneities and heterogeneities among the many countries that have been discussed. Moreover, it integrates the various case studies by comparing their regulations, policies and strategies and presents the best practices. It ends with proposals for possible future directions of research that will further our understanding of the factors that shape multimodal/intermodal freight and passenger security and the kinds of measures and policies that can further enhance their security.

NOTE

1. Remarks by Commissioner Robert Bonner, Council on Foreign Relations, January 11, 2005.

REFERENCES

- Alt, R., P. Forster and J. King (1997), 'The great reversal: information and transportation infrastructure in the intermodal vision', in National Conference on Intermodal Transportation Research Framework, Washington, DC: Transportation Research Board.
- Horowitz, A. J. and N. A. Thompson (1994), *Evaluation of Intermodal Passenger Transfer Facilities*, Washington, DC: US Department of Transportation.
- Jeff, G. (1998), 'Welcoming remarks', in *Intermodal Education and Training*, Washington, DC: National Academy Press.
- Szyliowicz, J. (2009), 'Terrorism, mobility and transportation security', in *Transportation Security against Terrorism. Proceedings of the NATO Advanced Research Workshop on Transportation Security Measures to Counter Terrorism*, Amsterdam: IOS Press.
- Tarr, R. W., V. McGurk and C. Jones (2005), 'Intermodal transportation safety and security issues: training against terrorism', *Journal of Public Transportation*, **8** (4), 87–102.