

I.1

Background and Objectives

Background

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional arm of the United Nations in the Asia and the Pacific region¹. It is located in Bangkok, Thailand.

ESCAP activities in the field of transport are guided by global United Nations mandates, such as the Millennium Development Declaration, as well as ESCAP's specific regional mandates, in particular, those contained in the Declaration of the Ministerial Conference on Infrastructure, held in Seoul from 16 to 17 November 2001.

The Ministerial Conference on Infrastructure adopted a Regional Action Programme² for 2002-2006, that, inter alia, recommended the promotion of an Asian Integrated Transport Network. In particular, point 1.3 of the Programme ("Integrated transport network and intermodal linkages") mandated the ESCAP Secretariat to produce two outputs in this regard³:

- (i) Conceptual plan for an *integrated regional transport network for Asia* covering all transport modes, including railway, roads, water transport, ports, freight terminals and airports.
- (ii) Recommendations for the development of intermodal transport facilities at the country, subregional and regional levels.

In this regard, the ESCAP Secretariat has taken preliminary steps through a series of subregional studies, the first of which focused on North-East Asia with the second one on Central Asia currently under preparation. The studies are carried out to collect data, identify bottlenecks and pinpoint potential routes for an Asian integrated transport network⁴.

1. <http://www.unescap.org/about/index.asp>

2. This is known as the "Regional Action Programme (2002-2006) of the New Delhi Action Plan on Infrastructure Development in Asia and the Pacific" as it is a continuation of an earlier regional action programme that was adopted in the earlier Ministerial Conference on Infrastructure in New Delhi in 1996.

3. See Annex 1 of ESCAP official document E/ESCAP/MCI(2)/Rep. of 6 December 2001.

4. ESCAP (2005). Integrated International Transport and Logistics System for North-East Asia, Draft for the Workshop (same title), 11-12 April 2005, Ulaanbaatar.

The current document is the first of a number of planned contributions to formulate a conceptual plan (“output 1”). The resulting choice of methodology, together with the route-specific information collected through the subregional studies will allow the definition of specific recommendations on the country, subregional and regional level (“output 2”) during the course of 2006.

The annual, legislative sessions of the Commission have elaborated these outputs further in the form of ESCAP’s biennial work programme 2004-2005. In particular, the current document was mandated to be entitled *Toward an Asian Integrated Transport Network*, and to be published under the *Monograph Series on Managing Globalisation*, due to the central role played by international integrated transport in the fragmented international production systems which are a main characteristic of the current wave of globalization of the past three decades, and especially so in Asia.

Finally, it should be noted that there are a number of related inter-continental activities that are going in parallel and in which the ESCAP Secretariat also plays a role. For example, the various activities that are promoting Euro-Asian Linkages are a case in point. In fact, the recent declaration of the Euro-Asian Conference on Transport held in St. Petersburg specifies elements of a strategy to develop an integrated Euro-Asian Transport network (the details of which are also described in this study).

Objective, Approach and Scope of the Study

Objective

The objective of this document is to carry out a comprehensive fact-finding and to lay out a broad vision of the Asian integrated transport network for consideration by the national policy-makers in Asia and the Pacific. It aims to:

- (a) define the scope of the integrated transport network and the possible paths towards its realization;
- (b) bring together in one document relevant information on the status of the Asian transport networks, relevant regional cooperation initiatives, policy environment, and related tools and guidelines;
- (c) provide preliminary guidance on necessary strategies, policies, programs and activities, including the role of governments in the process, investment needs and financing mechanisms.

Consequently, this monograph is designed to complement and provide the necessary broad background information for route-specific studies that are carried out in parallel on a subregional basis by the ESCAP Secretariat.

Approach

This study follows a pragmatic approach. In fact, it draws on policy-relevant work from various disciplines, including economics, social sciences, systems science, transport geography, economic geography, engineering, public policy, environmental science, and risk management. Anyone who has seen economists and engineers working with each other knows that drawing on concepts from all these disciplines in one document is a formidable challenge. This is due to a number of reasons, such as different terminologies and objectives. However, in essence, a purely “technical” or “engineering” solution to the challenge of developing an Asian integrated transport network does not appear sufficient from the national policy-makers’ point of view. Economic, business⁵, social, environmental and even geopolitical perspectives that can provide additional insight need to be taken into account and balanced against each other by policy makers.

However, it should be noted that the current document is addressed to national policy makers and their staff in national agencies that are working toward the realization of an Asian Integrated Transport Network. Developing such a network is an endeavour that will take many years, that requires significant financial commitments, and that is of salient interest to a wide range of stakeholders. That is why the study focuses on policy messages and takes an inter-disciplinary approach. We have tried to make the study as accessible as possible, by simplifying terminologies and by avoiding the use of quantitative and mathematical relationships.

We focus on concepts and selected issues that are illustrated through “stylized facts” and illustrative data. In this way, we provide a general picture of current trends and potential alternative future developments, both in transport infrastructure development and related regional cooperation in Asia and the Pacific. This approach is also least constrained by the significant data deficiencies for many ESCAP member countries.

While the focus is on regional issues, discussions of subregional and national specificities are also included. However, in contrast to the complementary subregional ESCAP studies mentioned earlier, this study is not a bottom-up study like many other United Nations reports that are essentially built on a compendium

5. For example, the economic perspective provides answers to the optimal extent of the use of market-based instruments as compared to a planning approach, whereas the business perspective would take into account metrics typically used by the private sector, such as risk and private returns on investment.

of country studies together with a regional synthesis. Instead, we will highlight some essentially regional, international elements of an Asian Integrated Transport Network that are well beyond a simple sum of national elements.

Necessarily, the selection of issues and concepts is somewhat subjective, but it has been guided by the authors' discussions with practitioners in transport cooperation in Asia over a number of years. In this regard, the authors are indebted to contributions from their colleagues in the Transport Division of ESCAP.

Finally, it should be noted that this study draws, inter alia, on the findings and material contained in the following earlier ESCAP reports or staff reports:

- (i) Working paper input of the Transport and Tourism Division for the ESCAP theme study for the Commission in April 2006 entitled *"Enhancing regional cooperation for infrastructure development, including that related to disaster management"*, November 2005.
- (ii) *Review of Developments in Transport in Asia and the Pacific 2005*, United Nations ESCAP, ST/ESCAP/2392, Dec. 2005⁶.
- (iii) Reports and studies from ESCAP projects, particularly on the Asian Highway and the Trans-Asian Railway⁷.
- (iv) Data contained in:
 - Statistical Abstract of Transport, 2005, and the related online transport database⁸.
 - ESCAP Transport and Tourism Division's GIS system (TTDIS)
 - Asian Highway database⁹.
 - Project information sheets of the World Bank¹⁰.

Scope

The geographical scope of the study is the "ESCAP region", which is defined as the area covered by the ESCAP member countries and associate members that are located in Asia and the Pacific (Figure 1). The ESCAP region stretches from Turkey in the West to French Polynesia in the East. 3.91 billion people or 62 % of the world population live in this region¹¹.

6. <http://www.unescap.org/ttdw/PubsDetail.asp?IDNO=178>

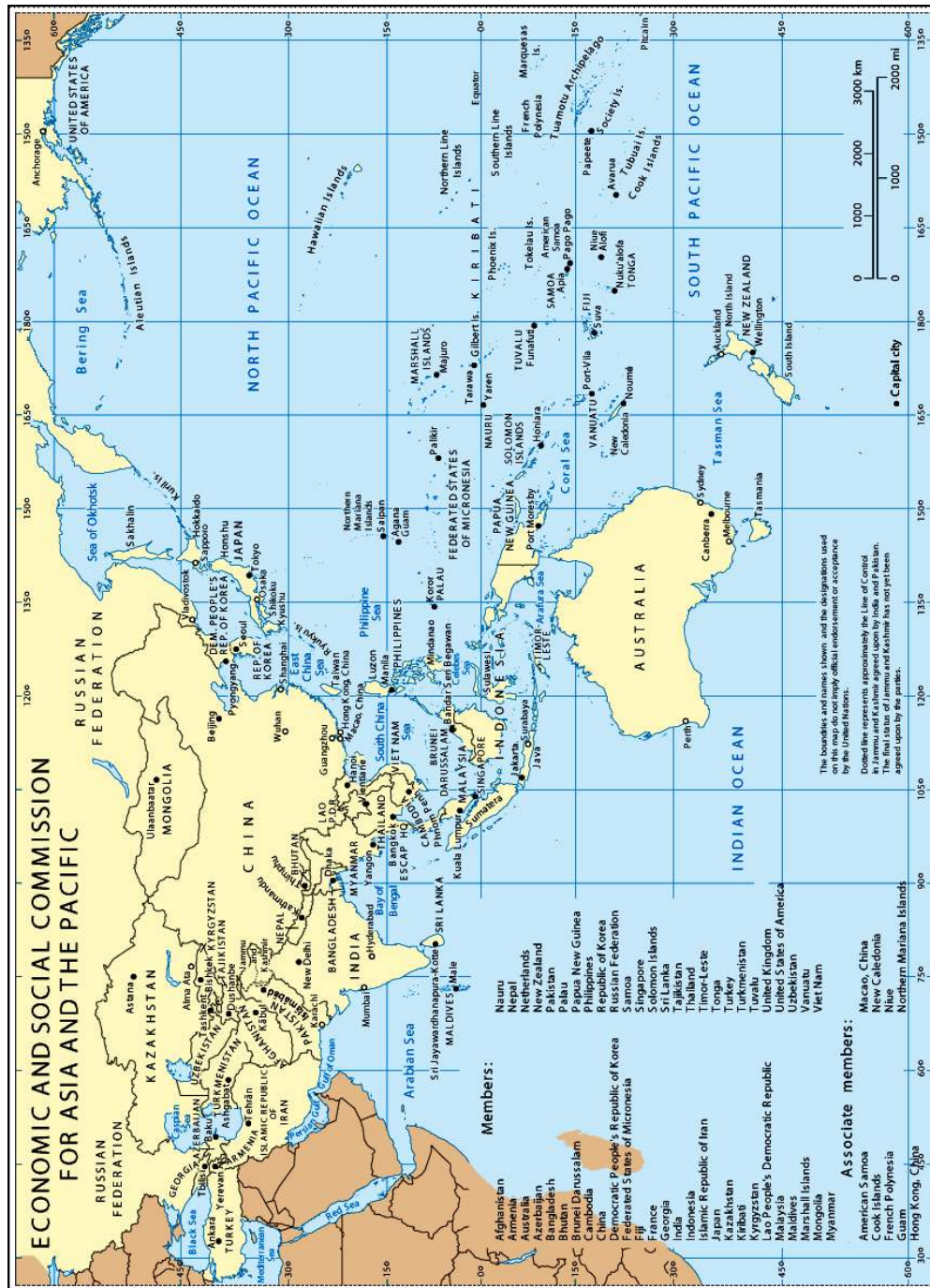
7. <http://www.unescap.org/ttdw/index.asp?MenuName=Publications>

8. www.unescap.org/ttdw/statabs/index2.asp

9. <http://www.unescap.org/ttdw/common/TIS/AH/Member%20countries.asp>

10. accessed in December 2005 through the World Bank's online project database: <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/0,,menuPK:41389~pagePK:95863~piPK:95983~targetDetMenuPK:228424~targetProjDetPK:73230~targetProjResPK:95917~targetResMenuPK:224076~theSitePK:40941,00.html>

Figure 1: Official map of the “ESCAP region”



The study's focus is on land transport, including road, rail, and dry ports, and their efficient linkages to ports and airports. Ports, shipping, airports and the airline industry are only discussed to a limited extent, as they essentially form part of a global integrated transport network, in contrast to land transport, in many parts of Asia.

While all types of transport networks and their inter-linkages are being taken into account, mainly international transport aspects are discussed. In particular, the international land transport backbone network is covered in more detail. This consists of the Trans-Asian Railway and the Asian Highway networks, complemented by the routes identified in the Euro-Asian linkages projects. Most discussions are on freight transport, but needs of the passenger transport are also taken into account. The presented vision of an Asian Integrated Transport Network includes both freight and passenger transportation. It also requires integration with other physical networks, particularly in communications, as well as with non-physical networks.

While the Pacific islands will form an integral part of a future Asian integrated transport network, their situation is special due to very long distances and low overall population densities in the Pacific. To do justice to the special needs of the Pacific island countries, a separate study should be undertaken. Essentially, the present study focuses on inland sites of Asia.

It should also be noted, that while the study acknowledges the importance of geopolitical issues related to international transport, these issues are not explored further. Similarly, the possible peace dividend of further regional integration through international transport integration is not the subject of the current study that focuses on technical, social and economic aspects¹².

Finally, the study explores possible developments over the next 25 years, i.e., the period from 2005 to 2030 with a mid-term point for benchmarking in 2015, the latter coinciding with the time-frame for the Millennium Development Goals of the United Nations.

11. ESCAP (2005). Review of Developments in Transport in Asia and the Pacific 2005, United Nations ESCAP, ST/ESCAP/2392, Dec. 2005.

12. A good UN reference paper on the issue is: ECE (2002). *The role of economic factors in conflicts in Europe: how can the multilateral security bodies addressing economic issues be more effective in conflict prevention?*, United Nations Economic Commission for Europe, Working party on international legal and commercial practise, ECE document no. TRADE/WP.5/2002/4, accessible through www.ods.un.org.

Outline of the Study

The remainder of this Chapter I introduces and defines the concept of network integration.

Chapter II illustrates the most relevant concepts and issues that need to be taken into account by policy makers working toward an Asian Integrated Transport Network. Section II.1 explains the two-way relationship between infrastructure and globalization, while Section II.2 summarizes the role of infrastructure in economic development and poverty reduction. Section II.3 introduces and illustrates the concept of networks as a tool to identify major issues related to international infrastructure cooperation and integration. Section II.4 relates the concept of networks to that of “regionalization” (i.e., private sector driven regional cooperation) and uses it to identify issues in developing inter-country infrastructure networks and barriers to effective cooperation and integration. Section II.5 discusses recent trends and issues in “regionalism” (i.e., state-driven regional cooperation) to improve connectivity in Asia. Section II.6 identifies major systemic risks related to increased regional cooperation and integration.

Chapter III provides selected international examples in intermodal infrastructure and services (Section III.1), as well as cross-border facilitation and transit for landlocked developing countries (Section III.2).

Chapter IV covers extension of international production networks to inland sites in Asia (Section IV.1), and related investment needs and financing options (Section IV.2).

Chapter V spells out policy recommendations and explores the way forward. Based on the analysis in the preceding chapters, Section V.1 suggests long-term policy strategies, programmes and selected activities for regional cooperation in the area of infrastructure in Asia and the Pacific, with the ultimate goal of supporting development and promoting greater equity through better connectivity. Section V.2 lists selected suggestions for future regional cooperation (*institutional* regional mechanisms) that could be promoted in Asia and the Pacific in the next 25 years.

The Annexes include more detailed information about current regional and subregional cooperation in transport infrastructure development.

I.2

Network Integration

Introduction

The story of globalization is essentially one of technological change coupled with the development and organization of interacting physical and non-physical networks designed to take advantage of the change. This fact is reflected in the terminologies currently used for various economic and social activities. Today, we talk about *fragmented international and regional production networks*, which, in turn, are facilitated by logistics systems that are designed to ensure the efficient flow of goods, services, and information through a network that starts at the point of origin of raw materials to the point of consumption of the final product and back again (in the case of repairs, recycling or disposal). Integral components of the logistics systems are the transport networks that ensure the physical movement of goods and the communications networks that ensure the timely flow of information.

To varying degrees, customers, commercial entities and public sector agencies are connected to communications networks for various purposes, including tracking of the movement of goods and the performance of various fiscal, regulatory and security functions. In addition, there are many formal and informal networks and clusters that interact with these networks and with each other. These include sales, banking, businessmen, small and medium sized enterprises (SMEs), researchers, labour unions, non-governmental organizations (NGOs), civil society and community-based organizations (CBOs). In fact, one of today's principal communications networks, the Internet, is providing the opportunity for interested parties to form any type of governmental, business or social network.

One of the keys to "success" of networks is their integration. This applies not only to interconnection and interoperability of physical networks in the same sector (for example, sea transport to land transport or rail transport to road transport) but also the interlinking of physical and non-physical networks (for example, international production networks and the information flows of logistics systems).

In other words, one might say that what is often termed as "globalization" is only the "tip of the iceberg" (Figure 2). Globalization itself is driven by the

integration of all kinds of networks, leading to seamless, fast and affordable connections and effectively an extended market size which allows for a higher level of international specialization.¹³ International production networks are the result of the integration of physical and non-physical networks.

Despite the popular use of the term “integrated networks” by national and international policy makers, experts and bureaucrats alike, there appears to be no generally accepted definition. This is particularly the case with the transport sector.¹⁴

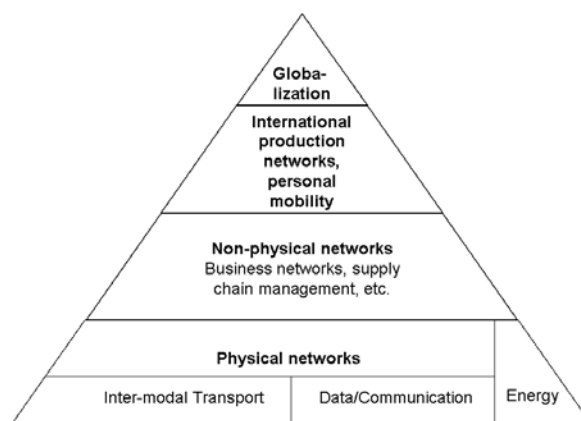
Integrated Transport Networks

The term “integrated transport” appears to have been developed separately in the freight transport community and the urban transport community. This Section discusses the various concepts related to integrated transport, the importance of integration to the development of “sustainable transport” and the significance of developing mechanisms to assist policy makers, managers of unimodal transport systems and integrated transport operators in ensuring the efficient operation of transport infrastructure and services. Having considered these concepts, the Section concludes by providing a working definition of an “integrated transport network” for the purpose of this study.

Integrated freight transport

In the context of freight transport, a number of related terms are used, that have a somewhat more restrictive meaning, namely, multimodal transport, intermodal transport and combined transport.

Figure 2: Below the tip of the “iceberg” of globalization



Source: ESCAP Secretariat

13. This relationship between efficiency, division of labour and market size has been famously documented already by Adam Smith (“That the Division of Labour is limited by the Extent of the Market”, Chapter 3 of “An Inquiry into the Nature and Causes of the Wealth of Nations”, 1776, <http://www.adamsmith.org/smith/won-b1-c3.htm>).

14. A search with Google on 29 November 2005 resulted in roughly 550,000 hits for “integrated transport network”. Yet, the retrieved documents only include vague indications of what is meant by the term. A comprehensive, satisfactory definition is lacking.

(a) *Multimodal transport*

A prominent definition of “*multimodal transport*” used by the United Nations Economic Commission for Europe (ECE), the European Conference of Ministers of Transport (ECMT), and the European Union’s European Commission (EC) is “*the carriage of goods by two or more modes of transport*”.

An early definition of “international multimodal transport” is contained in Article 1 of the United Nations Convention on International Multimodal Transport of Goods (1980): “*‘International multimodal transport’ means the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country.*”

(b) *Intermodal transport*

The concept of intermodal transport goes a step further than multimodal transport, in that it implies the use of a standardized loading unit, vehicle or “container”, that can be transferred from one mode of transport to another.

The United Nations Economic Commission for Europe (ECE), the European Conference of Ministers of Transport (ECMT), and the European Union’s European Commission (EC) define intermodal transport as follows¹⁵: “*The movement of goods in one and the same loading unit or road vehicle, which uses successively two or more modes of transport without handling the goods themselves in changing modes. By extension, the term ‘intermodality’ has been used to describe a system of transport whereby two or more modes of transport are used to transport the same loading unit or truck in an integrated manner, without loading or unloading, in a (door-to-door) transport chain*”.

In this sense, intermodal transport is hardly a new concept¹⁶. Modern intermodal transport was born with the emergence of railways. On the first railways in the 1830s, horse-drawn carriages were detached from their wheels and loaded onto flat wagons or attached to bogies, to save travellers the trouble of changing from carts to wagons. Unitization or “containerization” on railways was practised in France even before the first World War, where 2 x 2 x 2 metres wide wooden boxes were used which were called “cadres”. At the same time, an early road-rail-

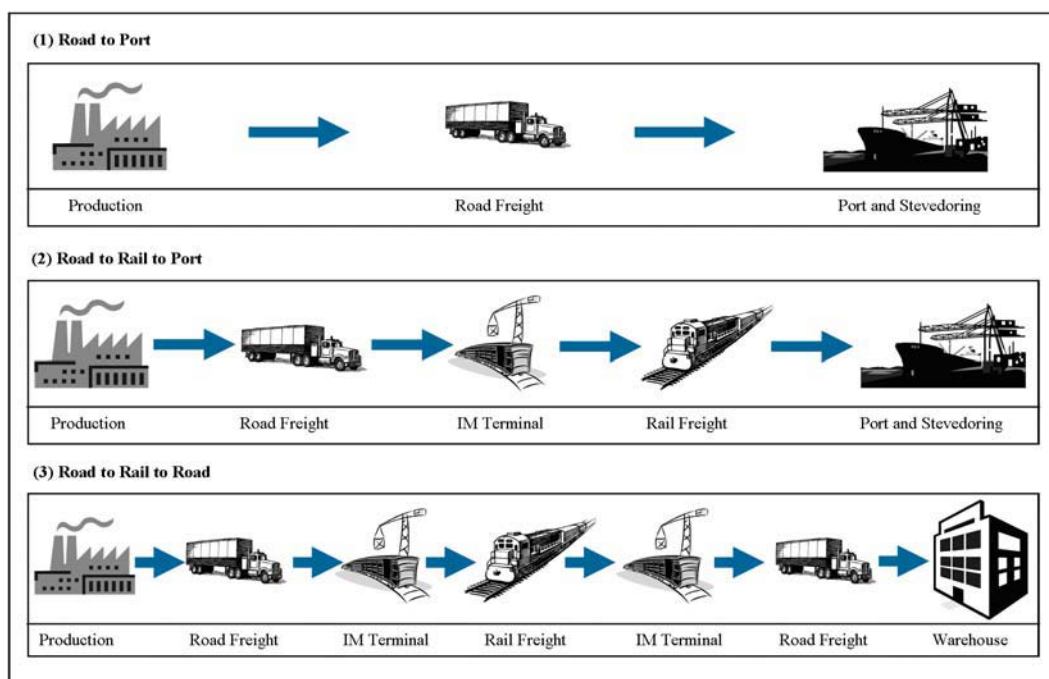
15. United Nations (2001). Terminology on Combined Transport (New York and Geneva).

16. For a brief overview of the history of multimodal and intermodal transport, see ESCAP (2004). *Manual on Modernization of Inland Water Transport for Integration within a Multimodal Transport System*, United Nations ESCAP, www.unescap.org/ttdw, ST/ESCAP/2285.

sea tri-modal transport service was operated between Paris and London through Calais and Dover. In 1933, these international ventures led to the establishment of the International Container Bureau. But, of course, “containerization” in the modern sense received its overarching importance only during the 1970s and 1980s, when the ISO standardized containers were finally used widely in international trade of manufactured goods.

The underlying principle of intermodal transport is that the seamless movement of freight occurs from one mode of transport to another during its delivery. Three types of intermodal land transport movements commonly found within the ESCAP region are illustrated in Figure 3, namely, road-to-port, road-to-rail-to-port and road-to-rail-to-road.

Figure 3: Three types of intermodal surface transport movements¹⁷



The Office of Intermodalism within the United States Department of Transportation defines intermodal transport from a business perspective and explicitly takes the network issues and competitive and environmental aspects into account¹⁸:

17. ESCAP (2005). *Review of Developments in Transport in Asia and the Pacific, 2005*. United Nations, ESCAP document number ST/ESCAP/2392. www.unescap.org/ttdw/PubsDetail.asp?IDNO=178

18. http://www.dot.gov/intermodal/about_us.html

“The concepts of ‘intermodalism’ have been applied by the freight industry for many years to provide the shippers with the most efficient movement of goods for the best value. The same concepts that work for freight have broad applications to all types of transportation. In its simplest terms, “intermodalism” covers all of the issues and activities which may affect or involve more than one mode of transportation. It has several aspects:

Connections: the convenient, rapid, efficient, and safe transfer of goods from one mode to another (including end-point pick-up and delivery) during a single journey to provide the highest quality and most comprehensive transportation service for its cost.

Choices: the provision of transportation options through the fair and healthy competition for transportation business between different modes, independently or in combination.

Coordination and Cooperation: collaboration among transportation organizations for the purpose of improving transportation services, quality, safety, and economy for all modes or combinations of modes in an environmentally sound manner.”

Due to economies of scale, the development of an intermodal transport network implies convergence of traffic at a number of “transshipment points”, such as ports, rail terminals, or dry ports, where loads are consolidated. As a result, higher load factors and higher transport frequency can be achieved, especially between terminals. Consequently, the efficiency of the emerging hub-and-spokes network mainly lies in the transshipment capabilities of the transport terminals, which explains the special focus of transport policy makers on the need for efficient intermodal “interfaces”, including ports, dry ports, inland container terminals, freight villages, etc.

(c) *Combined transport*

Another related term that is especially used in Europe is “combined transport”. This term is used by ECE, ECMT and the EC to include an environmental aspect into the concept of intermodalism. In essence, this boils down to the use of rail, inland waterway transport (IWT) and maritime transport for long distances, and road for the initial and/or final legs which are to be as short as possible.

In 1992, the EU officially defined “combined transport” as follows¹⁹: “.... ‘combined transport’ means the transport of goods between Member States where

19. European Union (1992). Council Directive 92/106/EEC on the establishment of common rules for certain types of combined transport of goods between Member States. Brussels.

the lorry, trailer, semi-trailer, with or without tractor unit, swap body or container for 20 feet or more uses the road on the initial or final leg of the journey and, on the other leg, rail or inland waterway or maritime services where the section exceeds 100 km as the crow flies and make the initial or final road transport leg of the journey:

- Between the point where the goods are loaded and the nearest suitable rail loading station for the initial leg, and between the nearest suitable rail unloading station and the point where the goods are unloaded for the final leg, or:
- Within a radius not exceeding 150 km as the crow flies from the inland waterway port or seaport of loading and unloading.”

In addition, the term “combined transport” has been used to also include social, economic and regional considerations, in addition to the environmental ones.

Integrated passenger transport

In the context of passenger transport, originally the concept of integrated transport was implemented mainly in urban areas, even though it has more recently been featured also on national and international scale. This Section illustrates the concept of integrated urban public transport.

A major direction of development in improving urban public transport is the integration of services provided by multiple operators often using different modes over a wide geographical area. Successful integration programmes can allow seamless travel between two points without the necessity of making separate payments for each segment of the trip and reduce the hassles of transfer at intermodal terminals or transfer points. Integration can make fare cost cheaper and journey time shorter for users as integration can improve the level of service considerably. Besides, an increase in public transport patronage can be expected following integration of public transport services.

Many cities in the region with advanced form of transportation, such as Singapore and Hong Kong, China, have successfully integrated their public transport services provided by multiple operators using different modes, such as the metro and bus systems. Introduction of smart card technologies for the collection of fare and capturing of real-time travel-related data, has made integration technically far more easier than in the past. It is understood that a number of cities in the region, which have introduced the smart card technology for their public transport systems, are now considering to apply the technology for city-wide integration of their public transport services.

Integration can occur at three levels: physical integration, operational integration, and institutional integration.

(a) Physical integration

Physical integration is the most basic and essential level of integration. It refers to the provision of jointly used facilities and equipment. Such facilities may include intermodal terminals, transfer points or stations, transit shelters, park-and-ride facilities, standardized identification symbols and display techniques used by all modes and services, etc. Comfort and safety of transfer passengers is vital to integration of public transport. Special passageways, escalators and moving sidewalks can greatly assist passengers in transferring between modes as well as accessing the public transport modes.

(b) Operational integration

Operational integration of services can be considered as the second higher level of integration. It allows matching of modes according to service requirements and rationalization/reorganization of existing services. Faster and high-capacity long-haul modes, such as metro and bus rapid transit (BRT) can be used for high-density travel corridors, while low-capacity modes, such as buses can be used as feeder to these high-capacity modes. Operational integration can also help eliminate wasteful duplication of service by competing modes and resources can be redeployed where they are better utilized. At this level, operational schedules of complementary modes are matched. Such matching of schedules can greatly reduce wait times at transfer points. Another important feature of operational integration is unification of the fare structure. A single area-wide fare structure can be established to permit users pay at the beginning of the trip and transfer freely between all modes or lines of service covered by the system.

(c) Institutional integration

Institutional integration refers to the creation of an organizational framework within which joint planning and operation of public transport services can be carried out by a number of independent transport operators. Such an organizational framework, however, can take different forms. There can be an organizational arrangement for working out a joint tariff and collection and distribution of jointly collected revenues. This type of arrangement works well where partners provide complementary services, do not compete but rather make end-to-end connections. The partners can go beyond this revenue collection and distribution by setting up a framework to coordinate routes and schedules. They can also establish a federated agency and delegate to it powers related to planning, joint facilities, tariffs, revenue

distribution and any other matter they consider appropriate. However, when multiple operators are to share common infrastructure facilities to run their services, such as BRT services over a dedicated corridor, a much stronger form of institutional integration, is necessary.

Integration and sustainability

Apart from facilitating global production and personal mobility, integrated transport networks support the concept of sustainable transport development – in other words, transport systems that are economically efficient, environmentally sound, safe, secure and socially inclusive.

Over the last around three decades, a number of forces have been set in motion that are directed towards sustainable transport. Global conferences have contributed towards increasing awareness and requiring action in the area of sustainable transport. It may also be pointed out that increased customer orientation, social responsibility, localization, including devolution, decentralization and urbanization, and awareness of the health and environmental impact of transport tend to be more of a consequence than a cause of globalization.

The following four features highlight the linkage between integrated transport networks and sustainable transport development.

Firstly, technological changes coupled with deregulation and liberalization in the transport and communications sectors have made a significant contribution towards a rapid growth in the movement of goods and people. This growth has, in turn, placed considerable pressures on unimodal transport infrastructure systems and their associated services as well as the modal interfaces between them. The clearest illustrations of these pressures are general road traffic congestion, congested road access to seaports and airports, ships waiting for berths outside seaports and air traffic congestion. To date, the solution to congestion problems has been to build more infrastructures by expanding existing unimodal systems, especially roads and highways. Given, however, limited land resources and financial constraints, as well as the health and environmental impacts of road transport, fundamental questions are being asked concerning “business-as-usual” unimodal transport policies. Integrated transport policies that draw upon the potential benefits of rail transport and mass transit schemes are being particularly considered.

Secondly, there has been a shift away from meeting output and production targets and towards meeting the needs of the customers. Addressing the needs of the customers, whether they be intermediate producers or final consumers, requires the provision of efficient and reliable transport services that provide value for

money. The search for increased efficiency, reliability and cost effectiveness demands not only improvements in existing systems, but also a search for alternative means of providing final outcomes to customers. These alternatives may include increased utilization of railways and inland container depots as part of an integrated freight transport system.

Thirdly, there has been an increased recognition of, and commitment to, social obligation with a specific focus on addressing the needs of the poor and marginalized communities. Physical access to economic and social opportunities is one of the contributions that transport can make towards this commitment: efficient, reliable and cost-effective integrated transport systems provide the means to fulfil this commitment.

Fourthly, there has been increased general awareness of the impact of economic activity on health and environment, and a more specific awareness of the significant contribution that transport is making to deteriorating health, including traffic accidents, non-renewable energy consumption, and various forms of pollution. Integrated transport offers the opportunity to considerably reduce these negative impacts of transport through, for example, the utilization of more energy-efficient and less polluting forms of transport.

Integration and efficiency

Unlike a good novel, a luxury cruise, amateur sailing or an “orient express”, transport is mainly concerned with “getting there”, not the journey. Stated alternatively, demand for transport is in general a derived demand: it is not required for its “our sake”. It is demanded because of the economic and social opportunities at each end of the trip.

Consequently, while *integrated transport* incorporates different transport modes, the transfer between modes and the integration with other physical and non-physical networks, there is a need to consider *transport outcomes* as distinct from specific modal outputs. This consideration is in line with the above observation that there has been a shift away from meeting output and production targets and towards meeting the needs of customers.

Transport and other associated networks add value by creating time and place utility.²⁰ In marketing terms, the essence of these two utilities is getting the “right

20. Broadly defined as being the satisfaction of needs and wants of consumers and producers.

21. Lambert, D.M., Stock, J.R., and Ellram, L.M. “Fundamentals of Logistics Management”, Irwin/McGraw-Hill, Singapore, 1998, p.11.

items” needed for consumption and production to the “right place”, at the “right time”, in the “right condition” at the “right cost”.²¹ In other words, producers are looking for transport services that are frequent, reliable, punctual, and secure and that offer tracking services, competitive transit times and costs, regardless of the mode of transport or route taken to move the goods between places. Passengers are also looking towards transport services with similar qualities as well as dimensions, such as comfort, ambience, and ease of transfer within and between modes.

The key element in these qualities is that it is a *transport service* that is being sought as an outcome, not a trip on a ship, train, boat or plane. The focus on transport services calls for optimization of the *efficiency* of the whole transport system, not just its individual components, such as roads or ports. It allows for choice between transport modes, service providers, their scheduled or other services and a policy choice taking into account environmental and social impacts.

Efficiency measures of an integrated transport network relate resource inputs to intermediate or final outputs. They measure system performance and progress in terms of network integration.

On the one hand, efficiency measures measure progress in the *performance* of the transport system which is, of course, the ultimate objective of an integrated transport network. In particular, network integration extends the “effective” market size and thereby provides new opportunities for division of labour taking advantage of economies of scale²². On the other hand, efficiency measures are actually good measures of transport network integration in its various dimensions.

Like other networks, transport networks consist of links and nodes. Therefore, in principle, any inefficiencies in, or missing links or nodes can affect the overall efficiency of the network (see Chapter II for a detailed discussion). Some important network effects need to be taken into account at that level when assessing the overall system efficiency and the risks of network “failure”. However, much of the dynamics of the system can be assessed by separately looking at efficiencies at higher, more aggregated levels (either for the national level or a particular subnetwork):

- *Physical transport network efficiency*: The efficiency of the physical transport network as a whole is determined by the efficiencies of the

22. Inframarginal economics, essentially a formalized resurrection Adam Smith’s concepts, see also footnote 13.

various individual transport modes, their intermodal integration and the modal choices actually available.

- *Service delivery efficiency*: The efficiency of service delivery through any given physical network system will depend on organizational and other factors.
- *Efficiencies in environmental and social terms*: Choices made at the physical infrastructure and the organizational levels lead to a range of environmental and social impacts. Transport system efficiency in environmental and social terms can be measured in various ways, including by the concepts of eco-efficiency and allocative efficiencies.

Total integrated transport network efficiency is a composite indicator determined by efficiencies at the three levels mentioned above.

To date, unimodal efficiencies are often expressed as technical efficiency (or technical productivity) which refers to the physical relation between resources inputs and transport outcomes.

However, technical efficiency cannot directly compare alternative interventions, where one intervention produces the same (or better) transport outcomes with less (or more) of one resource and more of another. Therefore, total physical transport network efficiency as well as service delivery efficiency is typically expressed in terms of productive efficiency (or economic productivity). Productive efficiency refers to the maximization of transport outcome for a given cost, or the minimisation of cost for a given outcome. The use of productive efficiency measures enables the assessment of the relative value for money of interventions with directly comparable outcomes²³.

Productive efficiency cannot address the impact of reallocating resources at a broader level, e.g., from urban to rural areas, because the transport outcomes are incommensurate. The concept of allocative efficiency also takes account of how the transport outcomes are distributed among beneficiaries. Allocative efficiency is achieved when resources are allocated so as to maximise the welfare of the “community”. The concept of allocative efficiency is used for measuring the achievement of environmental and social objectives as well as the total network efficiency from the perspective of various users (‘consumers’).

23. It should be noted, however, that, to date, economic productivity measures unfortunately only exist for few ESCAP member countries (see, in particular, the 60-Industry Database of the Groningen Growth and Development Centre).

As a result, a set of performance and efficiency indicators are needed for monitoring progress towards an Asian Integrated Transport Network. Yet, much of these data are not regularly collected by many ESCAP members and associate countries, and where they are collected they are not systematically shared among policy makers in the region. It is, therefore, of paramount importance to define a minimum set of efficiency indicators that should be shared and monitored by Asian policy makers.

Integrated transport

Integrated intermodal transport has been a major policy issue of concern to the governments in Europe and North America for the past two decades. More recently, this approach has also been adopted by an increasing number of countries in Asia and the Pacific region

A current definition of integrated transport used by a local government in the UK is: *“The planning, provision and operation of different modes of transport in such a way that journeys can be made as efficiently as possible and minimising the need to use the private car.”*²⁴. This is somewhat close to a combination of the definitions of intermodal transport and combined transport.

In the context of the transport system as a whole, including both freight and passenger transport, the UK Commission for Integrated Transport (CfIT) *“takes a broad view of integrated transport policy and its interface with wider government objectives for economic prosperity, environmental protection, health and social inclusion. Physical integration - the principle of ensuring transport modes operate in conjunction with one another, is just one vital element of the bigger transport picture.”*²⁵ This view of integrated transport policy by CfIT, an independent advisory body to the UK government, emphasizes an ambitious combination of the concepts of intermodal transport and combined transport both for freight and passenger transport.

Similarly, broad views of integrated transport networks have been formalized by other OECD governments. Examples include the European Union’s *Europe 2010 Vision*, as well as the *United States’ Intermodal Surface Transport Efficiency Act* of 1991 and its follow-up initiatives.

24. www.tewkesburybc.gov.uk/media/pdf/h/1/tblp_glossary.pdf

25. <http://www.cfit.gov.uk/>

26. Source: Ministry of Railways, China.

A number of developing countries in Asia and the Pacific have adopted similar approaches in recent years. A major difference is in (a) the stronger emphasis on promoting the adoption of new technologies, international standards and the building of national research and operations capacities; and (b) the promotion of market-oriented management methods.

For example, the Chinese *Tenth Five Year Plan and 2015 Long-term Programs of the Railway Scientific and Technological Development* ²⁶ specifies objectives and key tasks for the major role that Chinese railways are envisaged to play in the development of a national integrated transport system. It emphasizes the building of strategic research and development capacities in high-speed freight and passenger railways, including rolling stock (“technology self-reliance”). It covers the construction of new networks, improvement of efficiencies, development of IT and new management methods, achievement of social and safety objectives, as well as addressing the environmental protection issues.

The new approach suggested in the case of India explicitly mentions the aim of following the Chinese example and foresees the development and integration of dedicated rail corridors, provision of multimodal service and high-speed services for freight and passengers, integration with urban transport systems, and highlights the major environmental benefits from the pursuit of a national integrated transport system.²⁷

The concept of intermodal connectivity has been promoted in Asia and the Pacific, through ESCAP’s Asian Land Transport Infrastructure Development project since the early 1990s.

More recently, one of the outcomes of the “Seoul Declaration on Infrastructure Development in Asia and the Pacific” of November 2001 was the agreement by the Ministers that they considered it essential that “*Governments take a leading role in more effectively integrating the different forms of transport in order to develop sustainable intermodal transport systems that deliver efficient domestic transport services and at the same time provide access to international markets and wider hinterlands*”.

Following this line of thought, we suggest to adopt the following working definition of an “integrated transport network” for the purpose of this study:

27. Indian Ports Association. *Container Rail Corridors: An Approach Paper*, shipping.nic.in/approach paper.htm.

Working definition: An “*integrated transport network*” is a network:

- (a) where a coordinated transport service is provided through the network by multiple operators using one or multiple modes that allows efficient transfer between modes and charges a single tariff (i.e., the network shows physical, service, scheduling and tariff integration); and
- (b) that is designed to reflect a broad view of transport policy that also takes into account wider government objectives for economic prosperity, environmental protection, health and social inclusion (so-called “sustainability elements”).

The meaning and implications of an integrated transport network, as well as ways to achieve it in the ESCAP region are explored in the following chapters. In the international context, the availability of *choice* among alternative competing international transport routes is of key importance. Increased choice is a common consequence of network integration. Taking a perspective focussed on international routes, this leads to ESCAP’s “transport vision statement” of an integrated transport network in Asia and the Pacific²⁸.

Transport vision statement: “Integrated, intermodal international transport and transport logistics system that provides a *choice* of international alternative competing routes, thus reducing costs and improving quality of services. Such a system will have the capacity to change both the destination and the delivery path for goods already en-route.”

28. The authors are grateful to Vladimir N. Timofeev for the transport vision statement.