REVIEW OF DEVELOPMENTS IN TRANSPORT IN ASIA AND THE PACIFIC 2007

Data and Trends

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

ESCAP is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. ESCAP provides the strategic link between global and country-level programmes and issues. It supports Governments of the region in consolidating regional positions and advocates regional approaches to meeting the region's unique socio-economic challenges in a globalizing world. The ESCAP office is located in Bangkok, Thailand. Please visit our website at www.unescap.org for further information.

The shaded areas of the map represent ESCAP members and associate members.

REVIEW OF DEVELOPMENTS IN TRANSPORT IN ASIA AND THE PACIFIC 2007

Data and Trends

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

New York, 2007

REVIEW OF DEVELOPMENTS IN TRANSPORT IN ASIA AND THE PACIFIC 2007

Data and Trends

United Nations publication
Sales No. E.08.II.F.4
Copyright © United Nations 2009
Second revised edition, May 2008
All rights reserved
Manufactured in Thailand
ISBN: 978-92-1-120534-3
ST/ESCAP/2485

ESCAP WORKS TOWARDS REDUCING POVERTY AND MANAGING GLOBALIZATION

Acknowledgements: This document was prepared by the Transport Policy and Tourism Section with inputs from across the Transport and Tourism Division of ESCAP. Project data was graciously provided by Thomson Project Finance International and Thomson SDC Platinum. Data inputs were contracted from Meyrick and Associates Pty., Limited. The chapter on air transport was graciously provided by the International Civil Aviation Organization.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Mention of firm names and commercial products does not imply the endorsement of the United Nations.

The term "ESCAP region" is used in the present document to include Afghanistan; American Samoa; Armenia; Australia; Azerbaijan; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; Cook Islands; Democratic People's Republic of Korea; Fiji; French Polynesia; Georgia; Guam; Hong Kong, China; India; Indonesia; Islamic Republic of Iran; Japan; Kazakhstan; Kiribati; Kyrgyzstan; Lao People's Democratic Republic; Macao, China; Malaysia; Maldives; Marshall Islands; Micronesia (Federated States of); Mongolia; Myanmar; Nauru; Nepal; New Caledonia; New Zealand; Niue; Northern Mariana Islands; Pakistan; Palau; Papua New Guinea; Philippines; Republic of Korea; Russian Federation; Samoa; Singapore; Solomon Islands; Sri Lanka; Tajikistan; Thailand; Timor-Leste; Tonga; Turkey; Turkmenistan; Tuvalu; Uzbekistan; Vanuatu; and Viet Nam. The term "developing ESCAP region" excludes Australia, Japan and New Zealand. The term "Central Asia" in this publication refers to Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

On 1 July 1997, Hong Kong became Hong Kong, China. Mention of "Hong Kong" in the text refers to a date prior to 1 July 1997.

On 20 December 1999, Macau became Macao, China. Mention of "Macau" in the text refers to a date prior to 20 December 1999.

The term "billion" signifies a thousand million.

Unless otherwise stated, current United States dollars have been used throughout.

This publication has been issued without formal editing.

CONTENTS

Page

ABBREVIATIONS xi

EXECUTIVE SUMMARY 1

PART ONE: THE CHALLENGE FOR TRANSPORT 15

I. MEETING THE NEEDS OF ECONOMIC GROWTH AND TRADE 17

A. Economic growth 17
B. Intraregional and interregional trends in merchandise trade 22

II. MEETING THE NEED FOR PERSONAL MOBILITY 35

A. World and regional population growth and distribution 35
B. Trends in urbanization 37
C. Growth of mega-cities 38
D. Demographic change 40

III. MEETING THE NEEDS OF THE ENVIRONMENT 45

A. Global environmental considerations 45
B. Local environmental considerations 46
C. Air pollution abatement strategies: policies and initiatives 48

IV. MEETING THE NEED FOR SAFE ROADS 55

A. Introduction 55
B. Ministerial Declaration on Improving Road Safety in Asia and the Pacific 55
C. Data and trends in road crashes in the ESCAP region 56
D. Main causes of road crashes 61
E. National road safety targets 63
F. Examples of road safety initiatives in China, the Republic of Korea, Malaysia and Viet Nam 66

V. MEETING THE NEEDS OF THE POOR 69

A. Transport and poverty reduction 70
B. Rural poverty and transport 70
C. Urban poverty and transport 72
D. Infrastructure and “Inclusive Development” 74

PART TWO: DEVELOPMENTS IN INFRASTRUCTURE 77

VI. CHANGING DELIVERY MECHANISMS 79

A. Background and infrastructure investment needs 79
B. Private sector financing of transport infrastructure 79
C. Institutions to facilitate private sector investment 88

VII. ROADS AND ROAD TRANSPORT 97

A. Asian Highway Network 97
B. Road networks in Asia and the Pacific 104
C. Selected road and highway investment projects 111

CONTENTS *(continued)*

Page

VIII. RAILWAY TRANSPORT 117

A. Trends in railway traffic 117
B. Rail systems growth 123
C. The Trans-Asian Railway Network 130
D. Selected railway infrastructure projects 135

IX. SHIPPING 141

A. Registered merchant fleet capacities 141
B. Vessels by country of domicile 143
C. Shipbuilding 144
D. Trends in container slot capacity and ship size 144
E. Trends in bulk shipping fleet capacities 146
F. Trends in the average age of merchant fleets 147
G. Productivity trends in the world merchant shipping fleet 148
H. Supply-side developments in world container shipping 149

X. PORTS 151

A. Trends in container port throughput 151
B. Selected port infrastructure projects 155

XI. URBAN TRANSPORT 161

A. Introduction 161
B. Motorization and its consequences for cities 161
C. Public transport 164
D. Para-transit 168
E. Non-motorized transport 169
F. Transport in Dhaka, Hanoi and Bangkok 170

XII. AIR TRANSPORT 173

A. Airlines 173
B. Airports and air navigation services 186
C. Aviation Safety and Security 191
D. Medical issues related to aviation 193
E. Aviation Environmental Protection 194

PART THREE: TRADE AGREEMENTS, TRANSPORT REGIONALISM AND INTERMODAL TRANSPORT 197

XIII. TRADE AGREEMENTS 199

A. GATT/WTO system 199
B. General Agreement on Trade in Services (GATS) 199
C. Bilateral and regional trade agreements in the ESCAP region 201
D. Case studies: ASEAN+3, BIMP-EAGA, SCO 207

XIV. TRANSPORT REGIONALISM 211

A. Overview of regional cooperation for transport in Asia 211
B. Examples of regional cooperation agreements 215

CONTENTS *(continued)*

Page

XV. INTERMODAL TRANSPORT 223

A. Busan Ministerial Declaration 223
B. Different types of transport logistics and distribution centres 224
C. Dry ports in Asia and the Pacific 225
D. Logistics Centres and Distriparks in the ESCAP Region 227
E. Free Trade Zones 230
F. Intermodal systems development in selected ESCAP countries 231

ANNEX: STATISTICAL NOTES 237

A. Aggregation 237
B. Growth rates 238

LIST OF TABLES

I-1 Annual GDP growth rates for the world and selected regions and countries, 2001-2008 17
I-2 GDP growth rates for selected ESCAP regions, 2000-2008 18
I-3 GDP growth rates for East and North-East Asia, 2000-2008 18
I-4 GDP growth rates for South and South-West Asia, 2000-2008 19
I-5 GDP growth rates for North and Central Asia, 2000-2008 20
I-6 GDP growth rates for South-East Asia, 2000-2008 21
I-7 GDP growth rates for the Pacific island developing economies, 2000-2008 21
I-8 GDP growth rates for developed economies in the ESCAP region, 2000-2008 21
I-9 Merchandise exports by region in value terms and at current prices, 1980-2005 23
I-10 Merchandise exports in value terms and at current prices, North and Central Asia, 1980-2005 24
I-11 Merchandise exports in value terms and at current prices, South and South-West Asia, 1980-2005 25
I-12 Merchandise exports in value terms and at current prices, South-East Asia, 1980-2005 25
I-13 Merchandise exports in value terms and at current prices, North and North-East Asia, 1980-2005 26
I-14 Merchandise exports in value terms and at current prices, Australia and New Zealand, 1980-2005 27
I-15 Merchandise exports in value terms and at current prices in *million* US$, Pacific island developing countries, 1980-2005 27
I-16 Exports of ESCAP developing economies and subregions to importing economies as a share of their total exports, 1995 and 2005 30

II-1 Estimates of population 2000-2025, and population growth 1980-2025: world and ESCAP region 35
II-2 Population indicators in the Asia-Pacific region, 2006 36
II-3 Estimates of urban population, level of urbanization and rate of growth of the urban population in selected economies of the ESCAP region, 1960-2025 38
II-4 Actual and expected population between 1975-2015, and growth rate over 2005-2015 of urban agglomerations with more than 10 million inhabitants 39
II-5 Selected dominant urban agglomerations and their proportion of the national population, 1970- 2015 40
II-6 Size of age groups and gender ratio among senior citizens in the ESCAP region, 2007 41

III-1 Air Quality Data from 2000-2003 compared with 1990-1999 47

CONTENTS *(continued)*

Page

LIST OF TABLES *(continued)*

IV-1 Road safety indicators in selected ESCAP countries 58
IV-2 Road fatality and injury rates for selected ESCAP countries, 1997-2006 60
IV-3 Road safety targets of selected ESCAP countries or groupings 65

VI-1 Estimates of average annual investment needs in the transport sector, 2005-2015 79
VI-2 Number and value of PPI projects in the transport sector of ESCAP developing countries, by investment type, 1990-2006 82
VI-3 Sample of PPP projects in ESCAP member countries, 2000-2007 84

VII-1 Status of the Asian Highway in Member States in 2006. Kilometres of road of each Asian Highway Class (a quality standard) 100
VII-2 Current investments in the Asian Highway Network (2004/2005 data) 101
VII-3 Priority investment requirements in the Asian Highway Network (2004/2005 data) 102
VII-4 National road length, road length per capita and road length per land area in selected ESCAP economies in 2005 106
VII-5 Selected road and highway investment projects in the ESCAP region 111

VIII-1 Trend in railway freight tonnage in the ESCAP region, 1997-2006 117
VIII-2 Trends in railway freight traffic task in the ESCAP region, 1997-2006 118
VIII-3 Average freight haul distance in selected ESCAP member countries, 1997-2006 119
VIII-4 Efficiency measures of the rail network in selected ESCAP countries 121
VIII-5 Passenger kms per passenger wagon in selected ESCAP member countries 122
VIII-6 Railway employment in selected ESCAP countries, 1997-2006 126
VIII-7 Participating countries in the Trans-Asian Railway Network 131
VIII-8 Break-of-gauge along the Trans-Asian Railway 132
VIII-9 Selected inter-country missing links in the Trans-Asian Railway Network (2007) 133
VIII-10 Selected railway infrastructure development projects in the ESCAP region 135

IX-1 Capacity of merchant fleets registered in the ESCAP region, 1980-2006 142
IX-2 Registered and domiciled vessels for selected ship owning economies in the ESCAP region 2000-2006 (million dwt) 143
IX-3 World shipbuilding production; total ships delivered in 2006 in selected ESCAP member countries 144
IX-4 Containership fleets of ESCAP economies [1,000 gt], 2000-2006 146
IX-5 Oil tankers and bulk carriers controlled by ESCAP economies 2000-2006 (1,000 gt) 147
IX-6 Average age of the world fleet 1999-2006 148

X-1 Port container throughput in selected ESCAP economies and ports, 1995-2006 152
X-2 Selected port infrastructure projects in the ESCAP region (status as of 2007) 155

XI-1 Motorization in UNESCAP region 162
XI-2 Selected rail-based mass transit systems in the ESCAP region (Status: 2007) 165
XI-3 Selected investment projects in Bus Rapid Transit (BRT) in the ESCAP region 167

XII-1 Scheduled air passenger traffic (measured in pkm) by world region, 1996, 2006 and forecasts for 2007, 2008 and 2009 175
XII-2 ICAO passenger traffic trends, World and Asia-Pacific – 1985 to 2005 and 2005 to 2025 176

CONTENTS *(continued)*

Page

LIST OF TABLES *(continued)*

XII-3 Scheduled air passenger traffic in pkm for international route-groups involving Asia and the Pacific, 1985, 2005 and forecast for 2025 177
XII-4 Global scheduled air freight services (measured in ton-kilometres) and those in Asia and the Pacific, 1985 to 2005 and forecasts for 2005 to 2025 179
XII-5 Airline alliances, as of end 2007 184
XII-6 Top 25 airports in the world in terms of total passenger traffic in 2006 186
XII-7 Top 25 airports in terms of international passenger traffic in 2006 187
XII-8 Major airport projects in Asia and the Pacific 188
XII-9. Airports in Asia and the Pacific that are publicly traded at stock exchanges 190

XIII-1 Selected bilateral and regional trade agreements that include ESCAP countries 202

XIV-1 Examples of substantive content of national vs. regional activities for transport development 212
XIV-2 Matrix of subregional and regional agreements/organizations with a transport or communications component, versus its member countries in Asia 214

XV-1 Selected distriparks and logistics centres in the ESCAP region 228
XV-2 Selected Free Trade Zones in the ESCAP region 230
XV-3 The Parkes facility in Australia 232
XV-4 Intermodal transport capability of selected facilities in China 233
XV-5 Inland container handling facilities in the Republic of Korea 235
XV-6 Facilities and operations at four inland ports in Malaysia 235

A-1 Groupings of countries and regions used throughout the present publication, except in Chapter I on merchandise trade, where groupings were made strictly according to geographical criteria 237

LIST OF FIGURES

I-1 ESCAP exports as a share of world exports, 1980-2005 24
I-2 Intra-ASEAN share of total merchandise exports from ASEAN 31
I-3 Intra-SAARC share of total merchandise exports from SAARC 32
I-4 Intra-Central Asian Republics (CAR) share of total merchandise exports from CAR's 33

II-1 Population shares of ESCAP subregions, 2006 and 2025 37
II-2 Location of mega-cities within the ESCAP region in 2005 39
II-3 Life Expectancy and Fertility Rate in Asia, Oceania and the World, 1950-2050. 41
II-4 China and World population by age bracket by sex 2005-2050 43

III-1 Anthropogenic greenhouse gas emissions 46
III-2 Status of Air Quality in Asia: Average annual ambient AQ levels of selected Asian Cities, 1993-2005 47
III-3 Ambient versus Roadside Air Quality 48
III-4 Components of the CAI-Asia Initiative 50
III-5 Efforts to Reduce Sulphur Levels 51
III-6 Transport CO_2 emissions in programme cities by city and mode, 2006 52
III-7 Proportion of cities in China meeting national air quality standards 2004-2005 52

CONTENTS *(continued)*

Page

LIST OF FIGURES *(continued)*

IV-1 Number of road fatalities per 10,000 vehicles in 2006 (or the most recent year for which data was available) in selected ESCAP countries 57

V-1 Progress toward halving the number of people living on less than US$ 1 per day in selected ESCAP countries 69

VI-1 Annual number of infrastructure projects with private participation in ESCAP developing countries, 1990-2006 80
VI-2 Value of PPI projects in ESCAP developing countries, in million US$, 1990-2006 81
VI-3 Geographic location of transport sector PPI projects in developing ESCAP member countries (share of the 435 projects from 1990 to 2006) 83
VI-4 PPI transport sector investment, PPI investment for all infrastructure sectors, and gross domestic investment for selected ESCAP member countries in 2006 84

VII-1 Asian Highway Route Map (2007) 97
VII-2 Asian Highway Network classes in 2006 99
VII-3 Annual average growth in road length in selected ESCAP countries, 1993-2005 105
VII-4 Proportion of paved road in selected ESCAP countries, in per cent 107
VII-5 Average annual growth in the number of road vehicles, 1993-2005 108
VII-6 Vehicle density in selected ESCAP economies, 2006 109
VII-7 Motorization rates in selected economies of the ESCAP region, 2002-2004 110

VIII-1 Rail freight tons moved per capita in selected countries 120
VIII-2 Rail passengers moved per capita in selected countries 123
VIII-3 Railway route length in selected ESCAP countries, 1996-2006 124
VIII-4 Proportion of electrified railway routes in selected ESCAP countries, 1997-2006 125
VIII-5 Number of locomotives in selected ESCAP countries, 1997-2006 127
VIII-6 Number of freight wagons in selected ESCAP countries, 1997-2006 128
VIII-7 Number of rail passenger coaches in selected ESCAP countries, 1997-2006 129
VIII-8 Map of the Trans-Asian Railway Network, 2006 131

IX-1 Largest container ships in service, 1975-2007 145
IX-2 Developments in the numbers of container vessel numbers and their average size, 1988-2010 145
IX-3 Various indices for the productivity of the world merchant fleet, 1990-2006 148
IX-4 Current fleet and vessels on order for the top 20 cellular shipping lines, Nov. 2007 150

XII-1 Average annual growth in scheduled air passenger traffic (measured in pkm) by world region from 1996 to 2006 174
XII-2 Shares of each world region in international scheduled air passenger traffic (measured in pkm) in 2006 174
XII-3 Average annual growth of scheduled air passenger traffic (measured in pkm) worldwide and in Asia and the Pacific region, 1996 to 2006 and forecast for 2007 to 2009 175
XII-4 Scheduled air passenger traffic (measured in pkm) by world region, 2006 and forecast for 2007 to 2009 175
XII-5 Scheduled passenger services (measured in pkm) by airlines registered in Asia and the Pacific, 1985 to 2005 and forecast for 2005 to 2025 176
XII-6 Global scheduled passenger services (measured in pkm) by air, 1985 to 2005 and forecast for 2005 to 2025 177

CONTENTS *(continued)*

Page

LIST OF FIGURES *(continued)*

XII-7 Growth in international scheduled air freight (in tkm) for each world region in 2006 178
XII-8 Shares of international scheduled air freight traffic (in tkm) by world region in 2006 178
XII-9 Global scheduled air freight traffic (measured in ton-kilometres), 1985 to 2005 and forecast for 2005 to 2025 179
XII-10 Scheduled air freight services (measured in tkm) in Asia and the Pacific, 1985 to 2005 and forecast for 2005 to 2025 179
XII-11 Scheduled airlines' operating revenues and expenses in Asia and the Pacific, 1996 to 2006 180
XII-12 Scheduled airlines' operating results as share of revenues in Asia and the Pacific, 1995 to 2005 180
XII-13 World commercial aircraft fleet by type of propulsion, 1960 to 2005 (only aircraft of at least 9 t MTOM are included) 181
XII-14 International air transport services conducted under liberal agreements, 1995 to 2007 181
XII-15 Ownership structures of airlines by region 183
XII-16 NO_x stringencies by ICAO CAEP cycles 195
XII-17 CO_2 emission from domestic air transport in Japan 195

XV-1 Potential key intermodal facilities of international importance in Asia and the Pacific 224
XV-2 Potential expansion of functions at an inland intermodal facility 224
XV-3 ESCAP estimates of major dry port requirements for Asia in 2015 227
XV-4 Container throughput at ICDs operated by CONCOR 1995-2007 234

ABBREVIATIONS

ACI	Airports Council International
ADB	Asian Development Bank
ADS	Automatic dependent surveillance systems
AFTA	ASEAN Free Trade Area
AH	Asian Highway
AIT	Asian Institute of Technology
ALTID	Asian Land Transport Infrastructure Development
APEC	Asia-Pacific Economic Cooperation
APMA	Air Pollution in the Megacities of Asia
ARF	ASEAN Regional Forum
ASEAN	Association of Southeast Asian Nations
ASYCUDA	Automated System for Customs Data
AusCID	Australian Council for Infrastructure Development
BIWTA	Bangladesh Inland Water Transport Authority
BMA	Bangkok Metropolitan Administration
BMTA	Bangkok Mass Transit Authority
BOOT	build-own-operate-transfer (scheme)
BOT	build-operate-transfer (scheme)
BT	Build Transfer
CAGR	Compound average growth rate
CAI-Asia	Clean Air Initiative for Asian Cities
CDCD	State Committee on Demonopolization and Competition Development (Uzbekistan)
CFCs	chlorofluorocarbons
cgt	compensated gross tonnage
c.i.f.	cost, insurance, freight
CNG	compressed natural gas
CNS/ATM	Computerized Navigation System/Air Traffic Management
CO	Carbon monoxide
CO_2	Carbon dioxide
CPDLC	Controller-pilot data link communications
CSI	Container Security Initiative
dB	decibels
dBA	Measurements made on the A scale are expressed as dBA
DBF	Design Build Finance
DBFO	Design Build Finance Operate
dwt	deadweight tonnage
ECE	Economic Commission for Europe
ECO	Economic Cooperation Organization
EDI	electronic data interchange
EIA	environmental impact assessment
EPA	Environmental Protection Agency
ESIA	environmental and social impact assessment
ETC	Electronic Toll Collection
EU	European Union
FDA	United States Food and Drug Administration
FDI	foreign direct investment
f.o.b.	free on board
FTAs	Free Trade Agreements

GASAG	Global Aviation Security Action Group
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GEO	Global Environment Outlook
GIDB	Gujarat Infrastructure Development Board
GPS	Global Positioning System
gt	Gross tonnage
ha	hectare
HFCs	hydrofluorocarbons
HS	harmonized system (trade classification)
IACA	International Air Carrier Association
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICC	International Chamber of Commerce
ICD	inland container depot/inland clearance depot
IEE	initial environmental examination
IFALPA	International Federation of Air Line Pilots' Associations
IIFC	Infrastructure Investment Facilitation Centre (Bangladesh)
ILO	International Labour Organization
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ISL	Institute of Shipping Economics and Logistics
ISPS	International Ship and Port Facility Security Code
IT	information technology
ITF	International Transport Workers' Federation
ITS	Intelligent Transportation Systems
IWAI	Inland Waterways Authority of India
IWT	inland waterway transport
JICT	Jakarta International Container Terminal
JNR	Japanese National Railways
KHRC	Korea High Speed Rail Construction Authority
km	kilometre
KNR	Korean National Railway
LPG	liquefied petroleum gas
LRT	Light Rail Transit
LSE	Lloyds Shipping Economist
m	metre
CH_4	methane
MMURTRIP	Metro Manila Urban Transport Integration Project
MRTD	machine-readable travel document
NAAQS	National Ambient Air Quality Standards
NGO	non-governmental organization
NGV	natural gas vehicle
NHAI	National Highways Authority of India
NIES	National Institute Environmental Studies (Japan)
NMT	non-motorized transport
NMTTFP	Nepal Multimodal Transport and Trade Facilitation Project
N_2O	nitrous oxide
NTTFC	National Trade and Transport Facilitation Committee (Nepal)

OECD	Organisation for Economic Co-operation and Development
OSE	Office of State Enterprise and Government Securities (Thailand)
OSJD	Organization for Railways Cooperation
passenger-km	kilometre
PAT	Port Authority of Thailand
PFCs	perfluorocarbons
PFI	Private Finance Initiative (Japan)
PFP	privately financed projects
PIASA	Pacific Islands Air Services Agreement
PICKO	Private Infrastructure Investment Center of Korea
PPI	Private Participation in Infrastructure Act 1999 (Republic of Korea)
ppm	parts per million
PPP	public-private partnership
RITES	Rail India Technical and Economic Services
RNP	Required Navigation Performance
ROO	rules of origin
ROW	rest of the world (not part of any other country groupings)
RTAs	Regional Trade Agreements
RTG	rubber tyred gantry
RVSM	Reduced Vertical Separation Minimum
RZD	Russian Railways
SAARC	South Asian Association for Regional Cooperation
SAPTA	SAARC Preferential Trading Arrangement
SARPs	Standards and Recommended Practices
SDRC	State Development and Reform Commission (Beijing, China)
SITC	Standard International Trade Classification
SF_6	sulphur hexafluoride
SOLAS	1974 Safety of Life at Sea Convention
SPM	suspended particulate matter
STAR	Secure Trade in the APEC Region
TAR	Trans-Asian Railway
TEU	twenty-foot equivalent unit (container)
TRACECA	Transport Corridor Europe Caucasus Asia
TSA	Transpacific Stabilization Agreement
UIC	International Union of Railways
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VMS	Variable Message Sign
WHO	World Health Organization
WTO	World Tourism Organization
WTO	World Trade Organization

PART ONE:

THE CHALLENGE FOR TRANSPORT

I. MEETING THE NEEDS OF ECONOMIC GROWTH AND TRADE

Trade has a major impact on transport development and vice versa. Rapid increases in trade, and changes in the geographic and commodity structure of trade, require expansion and adaptation of transport infrastructure facilities and services. Conversely, inadequate transport infrastructure capacity, or poor service levels, may well hinder further socio-economic development. This chapter provides a general background on the recent developments and trends in economic and trade growth of the world and the ESCAP region, which has driven developments in transport over the recent years.

The present document interchangeably uses the terms "*Asia and the Pacific*" and "*ESCAP region*". Essentially it covers those 59 members and associate members of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) that are located in the Asia and the Pacific region[6]. It excludes the three ESCAP members (USA, UK, and Netherlands) most of which territory is located outside the Asia and the Pacific region.

A. Economic growth

1. World GDP

From 2001 to 2004, the growth of world gross domestic product (world GDP) accelerated from a low of 1.6 per cent to a record 4.1 per cent which was the fastest annual growth rate in almost three decades.[7] This change closely mirrored the growth trends of the economies of the United States and developing economies, which confirmed the structural change and increased global interdependencies as the key engines of growth of the world economy. Contributors to the peak in 2004 were also the economy recovery in the European Union and Japan since 2003 (Table I-1).

The rate of growth of world GDP declined somewhat in 2005 to 3.4 per cent, but it bounced back to an estimated 4.0 per cent in 2006. The growth in world GDP is forecast to decline somewhat to 3.4 to 3.6 per cent in 2007 and 2008 (Table I-1).

Table I-1. Annual GDP growth rates for the world and selected regions and countries, 2001-2008

Annual growth in GDP (per cent)	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[b]
World	1.6	1.9	2.7	4.1	3.4	4.0	3.4	3.6
Developed economies	1.2	1.3	1.9	3.1	2.4	3.0	2.3	2.5
Japan	0.2	0.3	1.4	2.7	1.9	2.2	2.1	1.9
United States of America	0.8	1.6	2.5	3.9	3.2	3.3	2.1	2.8
European Union	2.0	1.2	1.3	2.4	1.6	3.0	2.7	2.5
Developing economies	2.7	3.9	5.2	7.1	6.5	6.9	6.4	6.2
Economies in transition	5.8	5.1	7.2	7.6	6.6	7.5	7.1	6.7
China	8.3	9.1	10.0	10.1	10.2	10.7	10.1	9.5[c]
India	5.0	4.0	7.1	8.5	8.5	9.0	8.4	8.5[c]

Sources: United Nations ESCAP, Economic and Social Survey of Asia and the Pacific (various years); and United Nations, World Economic Situation and Prospects 2007.

[a] Partly estimated [b] Forecast [c] LINK Global Economic Outlook 2007

[6] Afghanistan; American Samoa; Armenia; Australia; Azerbaijan; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China; Cook Islands; Democratic People's Republic of Korea; Fiji; French Polynesia; Georgia; Guam; Hong Kong, China; India; Indonesia; Islamic Republic of Iran; Japan; Kazakhstan; Kiribati; Kyrgyzstan; Lao People's Democratic Republic; Macao, China; Malaysia; Maldives; Marshall Islands; Micronesia (Federated States of); Mongolia; Myanmar; Nauru; Nepal; New Caledonia; New Zealand; Niue; Northern Mariana Islands; Pakistan; Palau; Papua New Guinea; Philippines; Republic of Korea; Russian Federation; Samoa; Singapore; Solomon Islands; Sri Lanka; Tajikistan; Thailand; Timor-Leste; Tonga; Turkey; Turkmenistan; Tuvalu; Uzbekistan; Vanuatu; and Viet Nam.

[7] ESCAP, *Economic and Social Survey of Asia and the Pacific 2005,* United Nations Publication, Sales No. E.05.II.F.10.

2. ESCAP region

Table I-2 provides an overview of regional trends in economic growth from 2000 to 2006 and forecasts for 2007 and 2008. Table I-3 to Table I-8 present the underlying national data.

a) Overview

Consistent with the trends of the US economy and that of other developing countries, average annual economic growth in developing countries of the ESCAP region ("developing ESCAP region") accelerated from a low of 4.4 per cent in 2001 to a peak of 7.8 per cent in 2004. Thereafter, GDP of the developing ESCAP region expanded by some 7.6 per cent in 2005 and an estimated 7.9 per cent in 2006. The rate of growth is forecast to slow somewhat to 7.4 per cent in 2007 (Table I-2). These high growth rates were sustainable especially due to the economic expansions of the emerging economies India and China, which have made noteworthy contributions to global growth since 2000.[8]

Table I-2. GDP growth rates for selected ESCAP regions (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
Developing ESCAP region	7.4	4.4	6.4	7.0	7.8	7.6	7.9	7.4	–
South and South-West Asia	5.2	2.3	5.2	7.2	7.4	8.0	7.8	7.4	–
South-East Asia	6.2	2.4	4.6	5.1	6.5	5.6	5.9	5.6	7.2
East and North-East Asia	8.2	5.6	7.6	7.3	8.4	8.1	8.5	7.8	–
Pacific island developing	-1.3	1.7	0.7	3.0	3.8	2.7	3.8	3.7	–
North and Central Asia				7.6	7.5	7.1	7.5	7.5	
Developed ESCAP region	2.5	0.6	0.5	1.9	2.8	2.0	2.2	2.0	–

Sources (2000-2007): ESCAP, *Economic and Social Survey of Asia and the Pacific 2007,* United Nations Publication, Sales No. E.07.II.F.4.

[a] Estimate; [b] Forecast; [c] United Nations *LINK Global Economic Outlook,* viewed on website of United Nations Economic and Social Development, 25 September 2007, http://www.un.org/esa/analysis/link/geospring06.pdf

(b) East and North-East Asia

In recent years, the East and North-East Asian economies have been, on average, the fastest growing in the ESCAP region. The region's average GDP growth rate reached 8.5 per cent in 2006, up from 5.6 per cent in 2001. The GDP growth rate is predicted to decline in 2007 to an estimated 7.8 per cent (Table I-3).

Table I-3. GDP growth rates for East and North-East Asia (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
East and North-East Asia	8.2	5.6	7.6	7.3	8.4	8.1	8.5	7.8	–
China	8.4	8.3	9.1	10.0	10.1	10.4	10.7	9.9	9.5
Hong Kong, China	10.0	0.6	1.8	3.2	8.6	7.3	6.2	5.7	4.6
Mongolia	1.1	1.0	4.0	5.6	10.6	6.2	7.5	6.0	–
Republic of Korea	8.5	3.8	7.0	3.1	4.7	4.0	5.2	4.8	4.8
Taiwan Province of China	5.8[e]	-2.2[e]	3.9[e]	3.3[e]	5.7[e]	4.0	4.2	4.1	4.6

Sources (2000-2007): ESCAP, *Economic and Social Survey of Asia and the Pacific 2007,* United Nations Publication, Sales No. E.07.II.F.4; [d] *Source:* Asian Development Bank, *Asian Development Outlook 2007: Growth amid change,* Oxford University Press, Hong Kong, China, 2005; [e] *Source:* United Nations ESCAP, *Economic and Social Survey of Asia and the Pacific 2006*,United Nations Publication Sales No. E.06.II.F.10.

[a] Estimate; [b] Forecast; [c] United Nations *LINK Global Economic Outlook,* viewed on website of United Nations Economic and Social Development, 25 September 2007, http://www.un.org/esa/analysis/link/geospring06.pdf

[8] ESCAP, 2007, *Economic and Social Survey of Asia and the Pacific 2007,* United Nations Publication, Sales No. E.07.II.F.4.

A strong Chinese economy has been the primary driver of economic growth of East and North-East Asia. Despite government efforts to slow this economic growth in China, it reached 10.4 per cent in 2005 and an estimated 10.7 per cent in 2006. According to forecasts, Chinese economic growth is expected to slow somewhat in 2007 and 2008. Mongolia recently registered phenomenal economic growth that reached a peak of 10.6 per cent in 2004. The economies of Republic of Korea and Hong Kong, China have also continued to grow rapidly, but growth rates since 2001 have not regained the previous record levels (Table I-3).

c) South and South-West Asia

Economic growth in South and South-West Asia has shown a marked increase since 2001 to levels much higher in the previous decade. The region's economic growth rate reached 8 per cent in 2005 similar to the growth performance of East and North-East Asia. Consistent with global economic trends, the economies of the South and South-West Asia are expected to slow in the short term (Table I-4).

India's economy has performed increasingly strongly and reached more than 9 per cent in 2005, 2006 and 2007. Economic growth of other countries in South and South-West Asia has been less consistent. For example, Turkey's annual economic growth rates between 2001 and 2007 have ranged from -7.5 to 8.9 per cent. Due to continued political unrest, Nepal has shown the weakest economic growth performance in South and South-West Asia. Pakistan experienced an average growth rate of approximately 7.5 per cent over the past three years despite a decline in GDP from 8.6 to 6.6 per cent in 2006, where the slowdown reflects increased oil prices and the devastation caused by the October 2005 earthquake.[9] Despite the December 2004 tsunami, economic growth in Sri Lanka increased from 5.4 to 7.0 per cent between 2004 and 2006 fuelled by expansionary macroeconomic policies[10], and it is expected to be lower in the coming years given the civil conflict and the slow pace of structural reforms.[11] The December 2004 tsunami had significant impact on the economy of the Maldives which contracted by 5 per cent in 2005 following growth of 9 per cent in 2004, but rebounded with double digit growth in 2006 and 2007 (Table I-4).

Table I-4. GDP growth rates for South and South-West Asia (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
South and South-West Asia	5.2	2.3	5.2	7.2	7.4	8.0	7.8	7.4	–
Bangladesh	5.9	5.3	4.4	5.3	6.3	6.0	6.7	6.0	6.0
Bhutan	9.9	7.5	8.5	7.1	7.5	6.1	–	18.0[d]	–
India	4.4	5.8	3.8	8.5	7.5	9.0	9.2	9.0	8.5
Iran (Islamic Republic of)	5.1	3.3	7.5	6.7	4.8	5.4	6.1	6.0	4.1
Maldives	4.8	3.5	6.5	8.5	9.5	-4.5	18.7	12.1[d]	–
Nepal	6.1	5.6	-0.6	3.3	3.8	2.7	1.9	4.3	3.3
Pakistan	3.9	1.8	3.1	4.7	7.5	8.6	6.6	7.0	5.9
Sri Lanka	6.0	-1.5	4.0	6.0	5.4	6.0	7.0	6.5	6.1
Turkey	7.4	-7.5	7.9	5.8	8.9	7.4	6.0	5.0	5.7

Notes and footnotes: refer to Table I-3.

d) North and Central Asia

Economic growth in North and Central Asia has been strong at rates higher than 7 per cent since 2003 (Table I-5). Some countries in the region have experienced phenomenal economic growth in this decade which has followed very weak economic performance in the previous decade. In fact, as most

[9] ESCAP, *Economic and Social Survey of Asia and the Pacific 2007,* United Nations Publication, Sales No. E.07.II.F.4.

[10] *Asian Development Outlook 2007: Growth amid change,* Asian Development Bank, Oxford University Press, Hong Kong, China, 2007.

[11] *Asian Development Outlook 2007: Growth amid change,* Asian Development Bank, Oxford University Press, Hong Kong, China, 2007.

countries in the region are commodity exporters, their economies have been benefiting strongly from the current boom in global commodity prices. At the same time, such strong dependence on commodity prices poses significant risks for the subregion in the longer future.

Economic growth in Armenia, Azerbaijan, Kazakhstan and Turkmenistan has been, on average, faster than in China from 2000 to 2007. Oil and gas-rich Azerbaijan has experienced double-digit growth in all but one year since 2000, with a record 35 per cent growth in 2006 (Table I-5). The outlook remains strong for the oil and gas-exporting subregion, even though easing oil prices and softening non-oil commodity prices may take the wind out of the sails in the future.

Table I-5. GDP growth rates for North and Central Asia (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
North and Central Asia				7.6	7.5	7.1	7.5	7.1	
Armenia	4.0	---	---	13.9	10.5	13.9	13.4	8.0	7.0
Azerbaijan	11.1[b]	9.9[b]	10.6[b]	11.2	10.2	26.4	34.5	30.0	22.0
Georgia	-0.2[a]	---	---	11.1	5.9	9.3	7.0	5.0	7.0
Kazakhstan	13.5	13.5	9.5	9.2	9.6	9.5	10.5	10.0	8.3
Kyrgyzstan	5.1	5.3[b]	-0.5[b]	6.7	7.0	-0.6	2.7	6.0	5.5
Russian Federation	7.6	5.0	3.9	7.3	7.2	6.4	6.7	6.4	6.2
Tajikistan	8.3	10.2[b]	9.1[b]	11.0	10.6	6.7	7.0	7.0	7.5
Turkmenistan	17.6	20.5[b]	8.6[b]	17.0	9.0	6.0	14.0	7.0	10.0
Uzbekistan	5.0	4.5	3.0	4.4	7.7	7.0	7.3	6.5	7.3

Notes and footnotes: refer to Table I-3.

e) South-East Asia

South-East Asia has continued to be heavily dependent on export-led economic growth and thus vulnerable to a downturn in the global economy. Economic growth has increased from a low 2.4 per cent in 2001 to 5.9 per cent in 2006 due to increased external demand, thus tracking the US economic growth trend (Table I-6).[12]

Emerging South-East Asian economies that were growing rapidly in the 1990s up to the Asian crisis of 1997 (such as Indonesia, Malaysia, Singapore and Thailand), had regained pace in 2000, but were hit hard by the bursting of the dot-com bubble in 2001. Thereafter, economic growth increased again until 2004, but did not reach the level of record growth rates of the 1990s, with the exception of Singapore (e.g., 8.7 per cent growth in 2004 and 7.6 per cent in 2006). In particular, the Thai economy, which was one of the "tiger economies" of the 1990s, has lost much of its dynamism as it is undergoing a time of political uncertainty[13] (Table I-6).

The economy of Viet Nam has show strong, consistent and accelerating economic growth since 2000, similar to the earlier Chinese experience. Economic growth has reached 8 per cent by 2004 and is expected to remain at least at that level in the coming years (Table I-6). Viet Nam shows increasing signs of an emerging economy.

The least developed countries (Cambodia, Lao People's Democratic Republic, and Myanmar) experienced relatively rapid growth. Their combined economic growth reached and an average 10.7 per cent between 2005 and 2006. However, growth perspectives for Myanmar in 2007 and 2008 have become more modest. Great hopes have been raised in Cambodia following the discovery of sizable offshore oil reserves. The growth experience of Lao People's Democratic Republic has been most stable in this group with consistent growth in the range of 6 to 7 per cent since 2000 (Table I-6).

[12] *Asian Development Outlook 2007: Growth amid change,* Asian Development Bank, Oxford University Press, Hong Kong, China, 2007.

[13] Demonstrations and military coup in 2006.

Table I-6. GDP growth rates for South-East Asia (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
South-East Asia	6.2	2.4	4.6	5.1	6.5	5.6	5.9	5.6	7.2
Cambodia	8.4	5.5	5.2	8.6	10.0	13.4	8.0	7.0	–
Indonesia	4.9	3.8	4.4	4.7	5.1	5.6	5.5	6.2	6.3
Lao People's Democratic Republic	5.7	5.8	5.9	5.8	6.9	7.2	7.5	7.6	–
Malaysia	8.5	0.3	4.4	5.4	7.1	5.3	5.6	5.7	5.9
Myanmar	13.7	11.3	10.0	13.8	5.0	4.5	7.0[e]	5.5[e]	4.0
Philippines	4.4	4.5	4.4	4.5	6.0	5.0	5.5	5.6	6.0
Singapore	9.6	-2.0	3.2	2.9	8.7	6.4	7.6	4.7	5.3
Thailand	4.8	2.2	5.3	7.0	6.2	4.5	5.0	4.7	4.6
Viet Nam	6.8	6.9	7.1	7.3	7.8	8.4	8.2	8.3	8.5

Notes and footnotes: refer to Table I-3.

f) Pacific island developing countries

Economic growth in the Pacific island developing countries has continued to low compared to Asian economies and quite volatile. Overall economic growth of the region has been in the range of roughly 3 per cent since 2003. Fiji, Kiribati, Papua New Guinea, the Solomon Islands and Vanuatu have experienced severe recessions around 2000-2002 (Table I-7).

Table I-7. GDP growth rates for the Pacific island developing economies (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
Pacific island developing countries	-1.3	1.7	0.7	3.0	3.8	2.7	3.8	3.7	–
Cook Islands	13.9	4.9	2.6	8.2	4.3	0.1	1.8	3.5	–
Fiji	-2.8	2.7	4.3	1.0	5.3	0.7	3.6	2.0	–
Kiribati	-0.7	2.9	-1.2	5.6	-3.1	4.5	–	–	–
Papua New Guinea	-1.2	1.8	-1.0	2.2	2.7	3.3	3.7	4.5	3.7
Samoa	6.1	7.0	1.0	3.5	3.7	5.1	3.5	4.7	–
Solomon Islands	-14.3	-8.7	-2.1	6.4	8.0	5.0	6.2	5.0	–
Tonga	5.4	2.6	3.0	3.2	1.4	2.3	1.9	0.9	–
Tuvalu	13.4	5.9	1.2	4.0	4.0	2.0	–	2.5[d]	–
Vanuatu	2.7	-2.7	-4.9	2.9	5.5	6.8	7.0	7.0	–

Notes and footnotes: refer to Table I-3.

g) Developed ESCAP region

Economic growth of the developed economies in the ESCAP region was in the range of 2 per cent since 2003. The economies of New Zealand and especially Australia have benefited greatly from the high commodity prices and strong demand from China particularly since 2002. Consistent with global and regional economic trends however, growth rates in Japan, Australia and New Zealand are predicted to slow in 2007 (Table I-8).

Table I-8. GDP growth rates for developed economies in the ESCAP region (annual average), 2000-2008

Annual growth in GDP (per cent)	2000	2001	2002	2003	2004	2005	2006[a]	2007[b]	2008[c]
Developed ESCAP region	2.5	0.6	0.5	1.9	2.8	2.0	2.2	2.0	-
Australia	3.2	2.5	4.1	3.1	3.6	2.7	2.5	3.0	3.5
Japan	2.9	0.2	0.3	1.4	2.7	1.9	2.2	1.9	1.9
New Zealand	3.8	2.5	4.7	3.7	4.2	2.1	1.9	1.8	2.7

Notes and footnotes: refer to Table I-3.

B. Intraregional and interregional trends in merchandise trade

There are positive feedbacks between economic growth, trade and transport development. Thus, current trends in trade volumes, the nature and direction of trade are important pieces of information for transport planners. While the focus is on trade in goods, trade in services (including transport services) is becoming increasingly important.

This section provides an overview of the trends in trade between Asia and the Pacific countries ("intraregional") and with the rest of the world ("interregional"). Section 1 describes global and regional trends in merchandise trade. Section 2 describes the changing nature of trade due to global production sharing. And section 3 analyzes trade flows in terms of trade by origin and destination and by type of goods.

1. Value of trade

For transport planners and policy makers, information on trade in terms of volume (e.g., in tons or TEU) is most interesting such data are quite inconsistent or unavailable for many countries in the Asia and Pacific region. For that reason, the much more reliable data of value of trade are presented here first.

a) World exports

In terms of value, merchandise exports increased at an annual average of 10.1 per cent per year from 2000 to 2005, which was considerably faster than in the previous two decades, when they increased 5.4 per cent in the 1980s and 6.4 per cent in the 1990s (Table I-9). In view of the importance of the weakening demand for Asian goods from the US economy since 2006 and continuing concerns about the subprime lending crisis this year, current speculation is that there will be a short-term negative impact on world trade in 2008 and 2009. However, others predict that the US economy will begin to gain momentum at some point in 2008.[14]

Increases in oil prices have been the focal point of recent analyses of global trade. The average price of crude oil more than tripled between 1999 and 2006, parking at a (then) record level of US$ 78.30 per barrel in August 2006[15], before commencing a decline that helped to sustain consumer spending. After almost a year of prices at around US$ 60 to 65 per barrel, sharp rises in the September quarter of 2007 saw prices reaches new highs, and by mid-October 2007 oil was trading at US$ 84/barrel[16] and crossed the US$ 100 line by the end of 2007.

Non-fuel commodity prices also increased rapidly in recent years. For example, non-fuel commodity prices were up 10.3 per cent in 2005 from the previous year, followed by a further 28.4 per cent increase in 2006[17]. The change in prices is forecast to slow significantly in 2007 and subsequent years.[18]

---

[14] *World Economic Outlook April 2007: Spillovers and Cycles in the Global Economy,* International Monetary Fund, Washington, 2007.

[15] N. Krichene, *IMF Working Paper: Recent Dynamics of Crude Oil Prices,* WP/06/299, International Monetary Fund, 2006 viewed September 2006, http://www.imf.org/external/pubs/ft/wp/2006/wp06299.pdf

[16] Historical data from Economagic website, viewed 15 October 2007, http://www.economic. Prices as at 15 October 2007 from Bloomberg website, viewed 15 October 2007, http://www.bloomberg.com.

[17] *World Economic Outlook April 2007: Spillovers and Cycles in the Global Economy,* International Monetary Fund, Washington, 2007.

[18] *World Economic Outlook April 2007: Spillovers and Cycles in the Global Economy,* International Monetary Fund, Washington, 2007.

b) Asia and Pacific exports

(i) ESCAP overview

Merchandise exports of ESCAP economies grew at an average 11 per cent per year from 2000 to 2005, only slightly faster than the world exports (Table I-9). This average rate masks a decline in the value of merchandise exports in 2001 and a recovery from 2002 onwards. From 2003-2005 the average growth of merchandise exports of ESCAP economies was 18 per cent per year. Intraregional exports within the ESCAP region, though, grew faster than the world average (see Table I-10 to Table I-15).

ESCAP exports roughly accounted for one quarter of world exports since 1993 (Figure I-1). The ESCAP region increased its share of world exports slightly from 24.2 per cent in 2000, to 25.1 per cent in 2005.

Table I-9. Merchandise exports (f.o.b.) by region in value terms and at current prices, 1980-2005

Subregion/Country/ Territory	National sum of value of merchandise exports (US$ billion])								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990 - 2000	2000 - 2005
North and North-East Asia	202	515	1,076	966	1,054	1,278	1,622	1,665	9.8	7.6	9.1
Central Asia	–	0.0	18.6	18.6	19.6	25.2	35.0	45.3	n/a	11.3[b]	19.5
Australia and New Zealand	27.4	49.1	77.1	77.1	79.3	88.1	106.9	127.6	6.0	4.6	10.6
Russian Federation	–	–	105.6	103.6	106.9	135.9	183.2	243.6	n/a	7.7[b]	18.2
Pacific island developing countries	2.4	2.8	4.2	3.7	3.3	4.3	4.8	5.1	1.6	4.0	4.4
South Asia	13.1	27.5	64.2	64.4	71.1	82.1	100.9	127.9	7.7	8.9	14.8
South-West Asia	15.9	32.5	56.0	55.4	57.7	81.3	105.7	130.2	7.4	5.6	18.4
South-East Asia	65.2	126.2	368.4	326.0	342.7	456.8	549.7	547.8	6.8	11.3	8.3
ESCAP region (Sum)	**326**	**753**	**1,770**	**1,615**	**1,735**	**2,151**	**2,708**	**2,997**	**8.7**	**8.9**	**11.1**
North America	294	522	1,224	1,149	1,107	1,163	1,330	1,478	5.9	8.9	3.8
Latin America	110	147	361	349	352	212	272	355	3.0	9.4	-0.3
Western Europe[b]	897	1,685	2,635	2,655	2,836	3,382	4,024	5,329	6.5	4.6	15.1
CIS[c]	n/a	59	146	146	153	195	263	340	n/a	9.5	18.4
Africa	122	106	147	138	139	175	228	298	-1.4	3.3	15.2
Middle East	213	139	259	240	236	301	379	538	-4.1	6.4	15.7
World	**2,034**	**3,449**	**6,447**	**6,186**	**6,424**	**7,546**	**9,124**	**10,431**	**5.4**	**6.5**	**10.1**

Data Source (1980-2002): World Merchandise Trade by Region and Selected Economy, viewed WTO website, September 2007, *http://www.wto.org/english/res_e/statis_e.htm#wtr2003*

Data Source (2003-2004): World Trade Statistics Database, viewed on WTO website September 2007 *http://stat.wto.org/Home/WSDBHome.aspx?Language*. (Data valid at 14 April 2005)

Source (2005): World Trade and Statistics Database, viewed on WTO website September 2007, http://www.wto.org/english/res_e/statis_e/its2006_e/its06_toc_e.htm

[a] Excludes re-exports

[b] Includes new EU(25) and several countries formerly classified as Economies in Transition

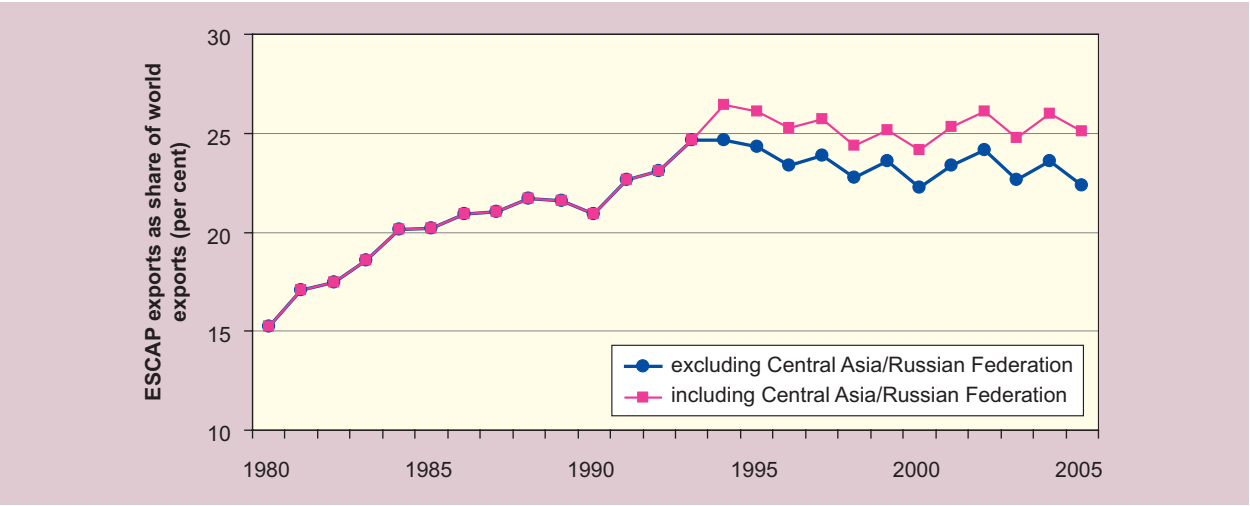
[c] CIS data replaces former Central and Eastern Europe/Baltic States/CIS classification used in Review of Developments in Transport in the ESCAP region 2003

– no data

… negligible amount

[a] Excludes re-exports. [b] 1994 to 2000.

Figure I-1. ESCAP exports as a share of world exports (by value), 1980-2005



Source: Based on data in WTO, *World Merchandise Trade by Region and Selected Economy.*

(ii) North and Central Asia

Merchandise exports of Central Asian economies and the Russian Federation have more than doubled (in value terms) from 2000 to 2005, with growth rates of almost 20 per cent per year, i.e., much faster than in the 1990s. From 200 to 2005, exports of Armenia and Kazakhstan have increased by 26 and 25 per cent, respectively (Table I-10). Exports of the Russian Federation alone (US$ 244 billion in 2005) are now twice the value of exports of Australia and New Zealand combined. Such export booms has helped keeping the share of ESCAP exports in world exports constant (Figure I-1).

Table I-10. Merchandise exports (f.o.b.) in value terms and at current prices, North and Central Asia, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ billion)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
Central Asia	**–**	**0.0**	**18.6**	**18.6**	**19.6**	**25.2**	**35.0**	**45.3**	**–**	**11.3[b]**	**19.5**
Armenia	–	–	0.294	0.343	0.508	0.678	715	950	n/a	5.4[b]	26.4
Azerbaijan	–	–	1.7	2.3	2.0	2.6	3.6	4.3	n/a	17.7[b]	20.0
Georgia	–	–	0.33	0.32	0.32	0.47	0.65	0.87	n/a	13.4[b]	21.3
Kazakhstan	–	–	9.1	8.6	9.6	13.2	20.3	27.8	n/a	18.9[b]	25.0
Kyrgyzstan	–	–	0.50	0.46	0.46	0.58	0.72	0.67	n/a	6.8[b]	5.9
Tajikistan	–	–	0.79	0.65	0.72	0.80	0.92	0.91	n/a	8.2[b]	3.0
Turkmenistan	–	–	2.5	2.7	3.1	3.6	3.9	4.9	n/a	2.6[b]	14.5
Uzbekistan	–	–	3.3	3.1	2.9	3.3	4.2	4.7	n/a	4.2[b]	7.8
Russian Federation	**–**	**–**	**105.6**	**103.6**	**106.9**	**135.9**	**183.2**	**243.6**	**–**	**7.7[b]**	**18.2**

Notes and footnotes: refer to Table I-9.

(iii) South and South-West Asia

Merchandize exports of South Asia and South-West Asian economies have also increased much more rapidly from 2000 to 2005 than in the 1980s and 1990s, with average growth rates of 15 and 18 per cent per year. Both subregions, South Asia and South-West Asia now export roughly US$ 130 billion each, which is comparable to the value of exports from Australia and New Zealand combined (Table I-11).

The greater part of the increase of exports of South and South-West Asia from 2000 to 2005 is due to export booms of India, Pakistan, Turkey, and the Islamic Republic of Iran with increase of 18, 12, 21 and 15 per cent per year, respectively.

Table I-11. Merchandise exports (f.o.b.) in value terms and at current prices, South and South-West Asia, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ billion)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
South Asia Total	**13.1**	**27.5**	**64.2**	**64.4**	**71.1**	**82.1**	**100.9**	**127.9**	**7.7**	**8.9**	**14.8**
Bangladesh	0.76	1.7	6.4	6.1	5.7	7.0	8.2	9.3	8.2	14.4	7.8
Bhutan	0.02	0.07	0.12	0.12	0.11	0.13	0.16	0.25	15.2	5.2	16.6
India	8.6	18.0	42.4	43.3	50.0	57.1	72.5	95.1	7.7	9.0	17.5
Maldives	0.008	0.052	0.076	0.076	0.088	0.15	0.17	0.16	20.6	3.9	16.3
Nepal	0.08	0.20	0.80	0.74	0.65	0.66	0.76	0.85	9.8	14.7	1.1
Pakistan	2,6	5.6	9.0	9.2	9.9	11.9	13.3	15.9	7.9	4.9	12.0
Sri Lanka	1.1	1.9	5.4	4.8	4.7	5.125	5.8	6.3	6.0	11.0	3.2
South-West Asia Total	**15.9**	**32.5**	**56.0**	**55.4**	**57.7**	**81.3**	**105.7**	**130.2**	**7.4**	**5.6**	**18.4**
Afghanistan	0.67	0.24	0.20	0.11	0.08	0.25	0.45	0.56	-9.9	-2.3	24.7
Islamic Republic of Iran	12.3	19.3	28.3	23.9	22.9	33.8	42.5	56.3	4.6	3.9	14.7
Turkey	2.9	13.0	27.5	31.3	34.8	47.2	62.8	73.4	16.1	7.8	21.7

Notes and footnotes: refer to Table I-9.

(iv) South-East Asia

Merchandize exports of South-East Asian economies have increased some 8 per cent per year (in value terms) from 2000 to 2005, which is slower than in the 1990s, but faster than in the 1980s. In 2005, South-East Asia exported roughly US$ 550 billion, which is comparable to the value of Japanese exports in the same year, or four times the value of exports from Australia and New Zealand (Table I-12).

Table I-12. Merchandise exports (f.o.b.) in value terms and at current prices, South-East Asia, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ billion)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
South-East Asia	**65.2**	**126.2**	**368.4**	**326.0**	**342.7**	**456.8**	**549.7**	**547.8**	**6.8**	**11.3**	**8.3**
Brunei Darussalam	4.6	2.2	2.9	2.8	2.7	4.1	4.6	6.6	-7.0	2.6	18.2
Cambodia	0.02	0.09	1.3	1.4	1.4	2.0	2.4	3.1	18.3	30.8	19.7
Indonesia	21.9	25.7	62.1	52.1	52.0	61.1	69.7	86.2	1.6	9.2	6.8
Lao People's Democratic Republic	0.03	0.08	0.33	0.33	0.33	0.38	0.46	0.51	10.9	15.4	9.1
Malaysia	13.0	29.5	98.2	88.0	95.7	105.0	126.5	140.9	8.6	12.8	7.5
Myanmar	0.47	0.33	1.6	2.4	2.8	2.5	3.0	3.0	-3.7	17.4	12.5
Philippines	5.7	8.1	39.8	32.7	35.6	37.0	39.6	41.3	3.5	17.2	0.7
Singapore[a]	12.7	34.8	78.7	66.2	67.0	79.8	98.5	124.5	10.7	8.5	9.6
Thailand	6.5	23.1	69.1	65.1	68.6	80.3	97.7	110.1	13.5	11.6	9.8
Viet Nam	0.34	2.4	14.4	15.1	16.5	20.2	26.3	31.6	21.7	19.6	17.0

Notes and footnotes: refer to Table I-9.

Export growth in South-East Asia was uneven, though. The poorer economies, such as Cambodia, Lao People's Democratic Republic, Myanmar, and Viet Nam, almost all experienced double-digit merchandise export growth from 2000 to 2005. Richer Brunei Darussalam also experienced rapid export growth in terms of value, due to higher oil prices. From 2000 to 2005, merchandise exports grew at a slower rate in the Indonesia, the Philippines and Thailand than in the 1990s. Of the formerly mighty "tiger economies", only Singapore experienced an accelerated increase in exports. However, Malaysia, Singapore and Thailand continue to be (in that order) the largest exporters of the region by a large margin.

(v) North and North-East Asia

Merchandize exports of North and North-East Asian economies have increased on average by 9 per cent per year (in value terms) from 2000 to 2005, which is somewhat less than the world average. In 2005, North and North-East Asian economies exports were valued at roughly US$ 1.7 trillion, of which China exported US$ 762 billion, Japan US$ 595 billion and the Republic of Korea US$ 284 billion (Table I-13). In other words, in 2005, Chinese merchandise exports were valued at slightly more than one seventh of European merchandise exports.

From 2000 to 2005, exports of China expanded massively at an average rate of 25 per cent per year, much faster than the expansion at 15 per cent per year in the 1990s. As a result, since 2004, the value of merchandise exports of China has been larger than that of all South-East Asian economies combined, and one third larger than those of Japan.

In contrast, merchandise exports of Hong Kong, China and Macao, China actually decreased in absolute terms from 2000 to 2005 (when re-exports are excluded). This is in a large part due to a rapidly shifting economic base in these economies toward services and a continued moving of manufacturing into mainland China.

From 2000 to 2005, exports of Japan grew at 4.4 per cent per year, considerably slower than in the 1980s and 1990s. IMF forecasts indicate that the rate of growth in exports from Japan will further decline over the next few years, in part due to the increasing price of oil and Japan's dependence on energy imports.[19]

Table I-13. Merchandise exports (f.o.b.) in value terms and at current prices, North and North-East Asia, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ billion)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
North and North-East Asia	**201.5**	**515.0**	**1,075.8**	**966.5**	**1,054.5**	**1,278.1**	**1,622.1**	**1,664.9**	**9.8**	**7.6**	**9.1**
China	18.2	62.1	249.2	266.1	325.6	438.4	593.4	762.0	13.1	14.9	25.0
Hong Kong, China[a]	13.7	29.0	23.5	20.3	16.7	19.6	22.6	20.1	7.8	-2.1	-3.2
Japan	130.4	287.6	479.2	403.5	416.0	471.8	565.5	594.9	8.2	5.2	4.4
Republic of Korea	17.5	65.0	172.3	150.4	162.4	193.8	253.9	284.4	14.0	10.2	10.5
Macao, China	0.6	1.7	2.5	2.3	2.3	2.6	2.8	2.4	10.7	4.1	-0.5
Mongolia	0.4	0.7	0.5	0.5	0.5	0.6	0.9	1.1	4.7	-2.1	14.5
Taiwan Province of China	19.8	67.1	147.8	122.5	130.3	150.3	181.4	–	13.0	8.2	4.2

Notes and footnotes: refer to Table I-9.

(vi) Australia and New Zealand

Exports from Australia and New Zealand expanded in line with global trends at 10 per cent per year from 2000 to 2005 (Table I-14). However, this masks very high export growth in 2004 and 2005, when the average growth rate reached 19 per cent per year, due to higher commodity prices. In 2005, combined exports of Australia and New Zealand reached US$ 128 billion, similar in the size to Singaporean exports.

[19] *World Economic Outlook April 2005: Globalization and External Imbalances,* International Monetary Fund, Washington, 2005.

Table I-14. Merchandise exports (f.o.b.) in value terms and at current prices, Australia and New Zealand, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ billion)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
Australia and New Zealand	**27.4**	**49.1**	**77,142**	**77,110**	**79,337**	**88,051**	**106.9**	**127.6**	**6.0**	**4.6**	**10.6**
Australia	21.9	39.8	63.9	63.4	65.0	71.5	86.6	105.8	6.1	4.9	10.6
New Zealand	5.4	9.4	13.3	13.7	14.4	16.5	20.4	21.7	5.7	3.5	10.4

Notes and footnotes: refer to Table I-9.

(vii) Pacific island developing countries

Merchandize exports of Pacific island developing economies have increased on average by 4 per cent per year (in value terms) from 2000 to 2005, which is less than half the world or Asian average. In 2005, combined exports of these economies amounted US$ 5.1 billion, which was similar to the value of exports of Turkmenistan in that year.

The greater part of the increase in exports of the subregion from 2000 to 2005 is due to increased exports from New Caledonia and Papua New Guinea which increased by 11 and 8 per cent per year, respectively. Many economies actually experienced a decrease of merchandise exports in absolute terms, including for example American Samoa, Cook Islands, French Polynesia, Kiribati, Nauru, and Samoa. While there are multiple reasons for this performance, it is partly due a challenging transport situation.

Table I-15. Merchandise exports (f.o.b.) in value terms and at current prices in *million* US$, Pacific island developing countries, 1980-2005

Subregion/Country/ Territory	Value of merchandise exports (US$ million)								Average annual growth (per cent)		
	1980	1990	2000	2001	2002	2003	2004	2005	1980-1990	1990-2000	2000-2005
Pacific island developing countries	**2,405**	**2,810**	**4,150**	**3,685**	**3,361**	**4,296**	**4,809**	**5,142**	**1.6**	**4.0**	**4.4**
American Samoa	127	311	346	383	376	250	280	–	9.4	1.1	-4.1
Cook Islands	4	5	20	16	16	8	11	–	2.3	14.9	-11.3
Fiji	470	497	584	538	497	679	695	702	0.6	1.6	3.7
French Polynesia	30	111	222	195	184	156	125	–	14.0	7.2	-10.9
Guam	61	82	74	61	37	76	50	–	3.0	-1.0	-7.5
Kiribati	26	3	17	28	24	3	25	1	-19.4	18.9	-43.3
Nauru	105	66	28	13	17	---	---	–	-4.5	-8.2	-9.5
New Caledonia	418	449	635	501	424	785	975	1,085	0.7	3.5	11.3
Papua New Guinea	1,031	1,177	2,096	1,813	1,646	2,174	2,460	3,192	1.3	5.9	8.8
Samoa	17	9	14	16	12	15	16	12	-6.2	4.5	-3.0
Solomon Islands	74	70	69	47	52	74	110	102	-0.6	-0.1	8.1
Tonga	7	11	9	13	18	16	14	10	4.6	-2.0	2.1
Vanuatu	35	19	26	22	48	27	40	38	-5.9	3.2	7.9

Notes and footnotes: refer to Table I-9.

2. Integration of local production and supply chains in Asia

Not only the value, but the nature of trade has changed significantly in recent years which is very much linked to transport developments. Globalization involves the increasing integration of economies, markets and production chains around the world. The greatest impact of globalization in Asia has been the integration of local production and supply chains with others in Asia, or indeed with others in the rest of the world. This integration involves the sharing of production among manufacturing plants located in two or

more countries, in order to realize technical and/or cost advantages offered by individual countries for the manufacture of specific components.[20] Examples of globalized manufacturing ventures which have been established in the region are:

- Manufacturing, under license to companies based in Europe or North America, of brand name garments and footwear in Bangladesh, Cambodia, China, Indonesia, Lao People's Democratic Republic, Nepal, Sri Lanka, and Thailand, using raw materials and components (e.g. raw cotton, textiles, and shoe soles or uppers) supplied mostly from other countries in the region;
- Manufacturing of micro-chip and other computer parts in China, India, Malaysia, Philippines, Singapore and Thailand (among others), under license to principal manufacturers based in Japan, the Republic of Korea, Taiwan Province of China and the United States of America;
- Component production and assembly in several countries of Asia (notably India, Indonesia, Malaysia and Thailand) of motor vehicles of globally standardized design, mostly under license to principals based in Japan and the Republic of Korea[21];
- Supply of aircraft components by factories in China and the Republic of Korea to aircraft manufacturers under fleet purchase off-set arrangements.

The success of globally distributed manufacturing depends critically upon the operation of efficient logistics or supply chain management systems which will move components and finished products where and as they are needed in the production process, but at the right cost.

3. Direction of trade

And finally, the geography of trade has changed significantly in recent years, due to, on the one hand, successful development of some economies and, on the other hand, transport and supply chain management developments. Section a) provides an overview picture of the changing geography of exports of ESCAP developing countries. Section b) specifically compares recent trends in intraregional and subregional trade in the ESCAP region.

a) Overview of changing export geography of ESCAP developing countries

This section provides an overview picture of the changing export geography ESCAP *developing* countries. As the data presented has been collected by the Asian Development Bank (ADB), reference is made to its Developing Member Countries (DMCs). It should be noted that ADB has less comprehensive membership in Asia and the Pacific than ESCAP.

(i) Regional overview

ESCAP developing countries continue to send roughly half of their exports to China, other ESCAP developing countries and Japan (Table I-16). The share of these exports in their total exports has hardly changed from its 49.5 per cent in 1995 to 50.2 per cent in 2005. In fact, this is due to the offsetting effect of an increase in the share of exports to China by three percentage points with a similar decrease in the share of exports destined to Japan. In essence, this is due to changing roles of these two major economies in the evolving Asian production networks. Roughly the same share of 16-17 per cent of ESCAP developing economies' exports go to three groups of countries: the United States of America (USA), the European Union (EU) and other developing countries (Table I-16).

Historically, Japan has been a major importer of merchandise produced by the developing countries of Asia. Over the late 1990s to early 2003 however, the share of exports to China overtook those to Japan. Between 1995 and 2005, the share of DMC exports headed for China increased from 8 per cent to 13 per

[20] UNESCAP, *Agenda Item 5(a): Globalization and integration of transport,* Ministerial Meeting on Infrastructure, Seoul, Republic of Korea, November 2001.

[21] The same principle applies in the case of components for cars of Japanese or Korean design manufactured/assembled in Europe and North America.

cent; the share of exports destined for Japan decreased from 12 per cent to 9 per cent respectively. These trends underline the emergence of China as an engine for subregional and intraregional trade.[22]

The increasing share of ESCAP exports to the EU from 1995 to 2005 was offset by a decreasing share heading to the USA. Nevertheless, the USA has remained the greatest importer outside the region of ESCAP DMC exports.

(ii) North and North-East Asia

Exports from East Asian economies destined for other DMCs makes up 40 per cent of the subregion's total exports, up from 38 per cent in 1995. This has been entirely due to an increase in the share of exports headed for China. In 1995, 12 per cent of East Asian exports headed to China. By 2005, this had increased to 15 per cent.

While a greater proportion of DMC exports are being absorbed by the Chinese economy, a decreasing share of China's exports has been absorbed within the region. Instead, an increasing proportion of Chinese exports now head to the European Union and the United States. The share of Chinese exports that were destined for the EU increased from 14 to 18 per cent in the period 1995-2005. The share of Chinese exports that were destined for the USA increased from 17 to 21 per cent in the period 1995-2005 (Table I-16).

(iii) South-East Asia

The share of exports of South-East Asian economies to DMCs other than China increased from 36 to 40 per cent from 1995 to 2005. This share increased for all South-East Asain economies except for Viet Nam, the Lao People's Democratic Republic and Cambodia (Table I-16).

Cambodian exports have seen an especially large change in direction. In 1995, 74 per cent of Cambodian exports headed to other ESCAP DMCs, by 2005, only 27.2 per cent did. Instead, in 2005, nearly half of all Cambodian exports were destined for the United States, up from a mere one per cent in 1995. This redirection has coincided with a rapid increase in Cambodian exports.

(iv) South Asia

The share of exports of South Asian economies that have been destined to ESCAP DMCs has increased from 1995 to 2005. For example, the share of South Asian exports to China increased from 1 to 5 per cent over this period (Table I-16).

There have also been significant changes in the direction of exports from some South Asian economies. Over the same period, the share of exports of Afghanistan to China decreased from 9 to 0.6 per cent, while that to the USA increased from 3 to 26 per cent, due to the changed political situation. On the other hand, the share of exports of Nepal to other ESCAP DMCs has increased from 10 to 56 per cent, while that to the EU has decreased from 53 to 17 per cent. The share of exports from the Maldives to the EU and especially to the USA declined, whereas it increased to ESCAP DMCs. A similar change in export geography has been experienced by Sri Lanka. In part, these changes have been due to the growing importance of India in the trade of its neighbours.

(v) Central Asia

In 2005, 41 per cent of exports of Central Asian economies were headed to the Russian Federation and to some extent the developing countries in Africa, Latin America and the Middle-East. The share of exports headed for the EU increased the most and reached 37 per cent in 2005, up from 28 per cent in 1995. The share of exports headed to China increased from 3 to 8 per cent over the same period, whereas that destined for other ESCAP DMCs decreased. Japan and the US continue to play a minor role as export markets of Central Asian economies.

[22] Asian Development Bank, *Asian Development Outlook 2005,* Oxford University Press, Hong Kong, China, 2005.

Table I-16. Exports of ESCAP developing economies and subregions (listed in the left column) to importing economies (listed on the top) as a share of their total exports (per cent), 1995 and 2005

Exporters	Importers											
	China		Other DMC		Japan		US		EU		Others	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
East Asia	**11.9**	**15.3**	**26.4**	**24.9**	**12.3**	**9.0**	**20.0**	**18.4**	**13.9**	**16.5**	**15.5**	**15.8**
China	–	–	37.6	31.1	19.1	11.0	16.6	21.4	13.6	18.9	13.0	17.6
Hong Kong, China	33.3	45.0	9.6	9.4	6.1	5.3	21.8	16.1	15.3	14.5	13.9	9.8
Republic of Korea	7.0	21.8	23.9	17.6	13.0	8.5	18.5	14.6	13.3	15.4	24.3	22.2
Mongolia	16.4	48.1	22.4	7.7	9.9	0.5	5.5	14.2	15.0	12.5	30.9	16.9
Taiwan Province of China	0.3	21.8	40.4	35.0	11.8	7.7	23.7	15.2	12.7	11.7	11.0	8.5
South-East Asia	**2.7**	**8.4**	**35.7**	**40.3**	**13.9**	**11.3**	**18.7**	**14.8**	**14.7**	**13.2**	**14.2**	**12.0**
Cambodia	1.5	0.6	74.0	27.2	1.9	3.5	1.4	48.6	14.5	14.3	6.7	5.8
Indonesia	3.8	7.8	25.9	33.5	27.1	21.1	13.9	11.5	15.2	12.0	14.0	14.1
Lao People's Dem. Rep.	2.8	3.3	55.0	44.1	1.7	1.1	1.7	0.6	10.9	19.7	27.9	31.1
Malaysia	2.6	6.6	37.8	39.1	12.5	9.3	20.8	19.7	14.4	11.7	12.0	13.5
Myanmar	11.3	6.7	51.1	67.9	7.1	5.0	6.6	–	6.1	8.5	17.7	11.9
Philippines	1.2	9.9	21.1	29.2	15.8	17.5	35.8	18.0	17.7	17.0	8.4	8.4
Singapore	2.3	9.5	43.5	53.1	7.8	6.0	18.3	11.5	13.9	13.3	14.3	6.5
Thailand	2.9	8.3	29.2	32.2	16.6	13.6	17.6	15.4	16.1	13.5	17.7	17.0
Viet Nam	6.4	9.0	28.8	20.1	26.0	13.6	3.0	18.3	12.6	16.9	23.2	22.1
South Asia	**1.0**	**5.4**	**18.4**	**20.1**	**6.5**	**2.1**	**19.5**	**18.9**	**29.9**	**24.8**	**24.8**	**28.8**
Afghanistan	9.2	0.6	55.9	45.6	0.6	1.1	3.2	25.8	20.6	12.6	10.5	14.4
Bangladesh	0.6	0.5	8.2	5.2	3.3	0.8	31.9	23.6	44.8	46.8	11.2	23.0
India	0.9	6.6	20.2	21.7	7.0	2.4	17.4	16.7	27.5	22.3	27.0	30.3
Maldives	0.0	0.0	31.4	49.1	5.7	22.8	19.2	0.8	38.4	24.5	5.3	2.8
Nepal	0.1	1.2	9.8	55.5	0.5	1.5	30.5	17.4	53.3	17.0	5.8	7.4
Pakistan	1.5	2.7	19.6	18.5	6.8	0.9	15.1	24.8	31.0	26.5	26.1	26.6
Sri Lanka	0.1	0.5	8.9	14.2	5.3	2.3	35.6	31.1	32.4	30.9	17.7	21.0
Central Asia	**3.2**	**8.3**	**16.9**	**8.7**	**1.3**	**1.1**	**0.9**	**3.6**	**28.1**	**37.3**	**49.7**	**41.0**
Azerbaijan	0.3	2.3	6.7	12.1	0.0	0.0	0.2	1.0	19.0	46.7	73.8	38.0
Kazakhstan	5.7	11.2	9.4	5.2	0.9	1.3	0.8	4.5	26.6	43.7	56.7	34.2
Kyrgyzstan	0.6	13.4	47.3	22.1	0.0	0.0	0.5	0.7	16.3	2.6	35.2	61.1
Tajikistan	0.8	0.6	20.7	11.8	1.1	0.0	2.0	0.0	53.5	54.7	22.0	32.9
Turkmenistan	0.4	0.3	23.2	10.8	0.0	0.0	1.7	2.3	26.7	15.8	48.0	70.8
Uzbekistan	2.4	11.9	22.2	23.9	3.7	3.3	0.5	2.6	29.8	17.3	41.6	41.0
The Pacific	**1.9**	**5.4**	**14.0**	**11.0**	**19.8**	**7.9**	**3.2**	**3.7**	**17.1**	**9.4**	**44.1**	**62.5**
Fiji	1.0	0.2	13.7	13.5	5.8	5.4	11.5	19.7	24.5	13.4	43.4	47.7
Kiribati	0.0	0.0	44.5	7.2	17.0	29.2	10.5	9.1	25.9	51.9	2.1	2.6
Nauru	0.0	0.0	15.3	17.5	1.5	7.2	0.0	0.0	2.2	28.8	81.0	46.5
Papua New Guinea	2.3	5.4	12.9	7.9	21.2	8.6	1.6	1.1	16.3	8.7	45.7	68.4
Samoa	0.0	0.0	1.5	1.2	1.8	0.4	0.9	6.5	2.1	0.2	93.7	91.7
Solomon Islands	0.4	41.6	35.5	31.8	46.6	6.4	2.4	0.9	10.3	8.5	4.8	10.8
Tonga	0.0	0.0	1.6	8.1	47.8	41.8	25.8	33.4	0.0	3.0	24.7	13.7
Tuvalu	0.0	0.0	17.4	14.4	0.3	0.0	0.0	0.0	22.6	82.0	59.6	3.6
Vanuatu	0.0	0.2	8.3	62.9	25.1	6.9	0.0	1.1	37.9	14.5	28.7	14.5
DMC (sum of the above)	**8.1**	**12.7**	**29.0**	**28.4**	**12.4**	**9.1**	**19.3**	**17.2**	**15.1**	**16.4**	**16.1**	**16.1**

Source: Asian Development Bank, *Asian Development Outlook 2007: Growth amid change*, Oxford University Press, Hong Kong, 2005.

"DMC" = Selected ESCAP developing countries that are also ADB member countries.

The share of exports from Kazakhstan to the EU increased significantly from 27 per cent to 44 per cent over the ten year period. At the same time, the share of exports from Kyrgyzstan to other DMCs dropped by over half in the period, from 47 per cent to 22 per cent. During this time, the direction of exports from Azerbaijan to the EU increased considerably, more than doubling between 1995 and 2005, from 19 per cent to 47 per cent respectively.

(vi) Pacific island developing economies

The Pacific island developing economies continued to depend upon trade with developed ESCAP economies as the mainstay of their export trade. Since 1995, growth in the percentage of Pacific exports destined for China and the United States has also formed part of this story. Other developments within the subregion include a sharp fall in the share of exports from Kiribati to other DMCs in favour of an increase in the share of those headed for Japan and the EU. In contrast, there has been a sizeable reduction of the proportion of exports from Vanuatu in the direction of the EU in favour of a major increase of exports heading to other DMCs. Similarly, the direction of exports from the Solomon Islands to other DMCs also increased considerably after 1995, accounting for slightly more than 50 per cent of exports to other DMCs in 1995.

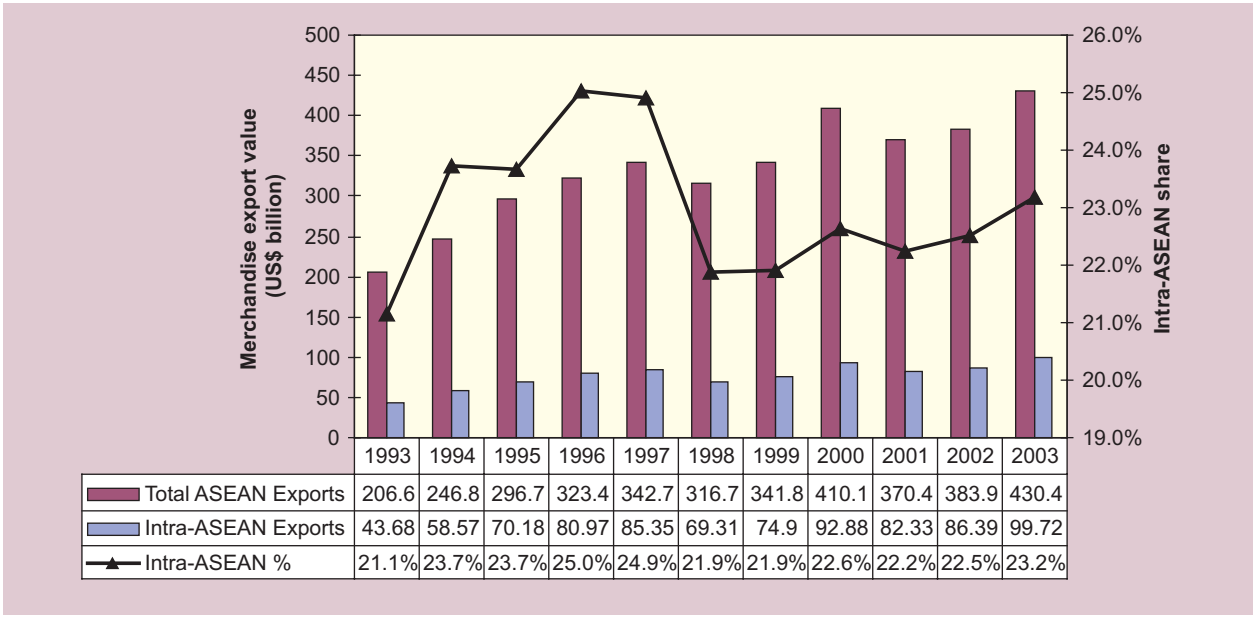
b) Intraregional and subregional trade patterns in the ESCAP region

The growth in intra-regional trade (i.e. trade within the subregions themselves) outpaced the growth in subregional trade with the rest of the world. Despite rapid growth of exports from countries in Asia and the Pacific, the intra-regional share of the overall trade of most subregions remains very low.[23]

(i) South-East Asia

For example, intra-ASEAN export trade currently accounts for little more than 20 per cent of the value of that bloc's overall merchandise export trade, and there has been little change in this share over the past decade, as may be seen from Figure I-2.

Figure I-2. Intra-ASEAN share of total merchandise exports from ASEAN



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total ASEAN Exports	206.6	246.8	296.7	323.4	342.7	316.7	341.8	410.1	370.4	383.9	430.4
Intra-ASEAN Exports	43.68	58.57	70.18	80.97	85.35	69.31	74.9	92.88	82.33	86.39	99.72
Intra-ASEAN %	21.1%	23.7%	23.7%	25.0%	24.9%	21.9%	21.9%	22.6%	22.2%	22.5%	23.2%

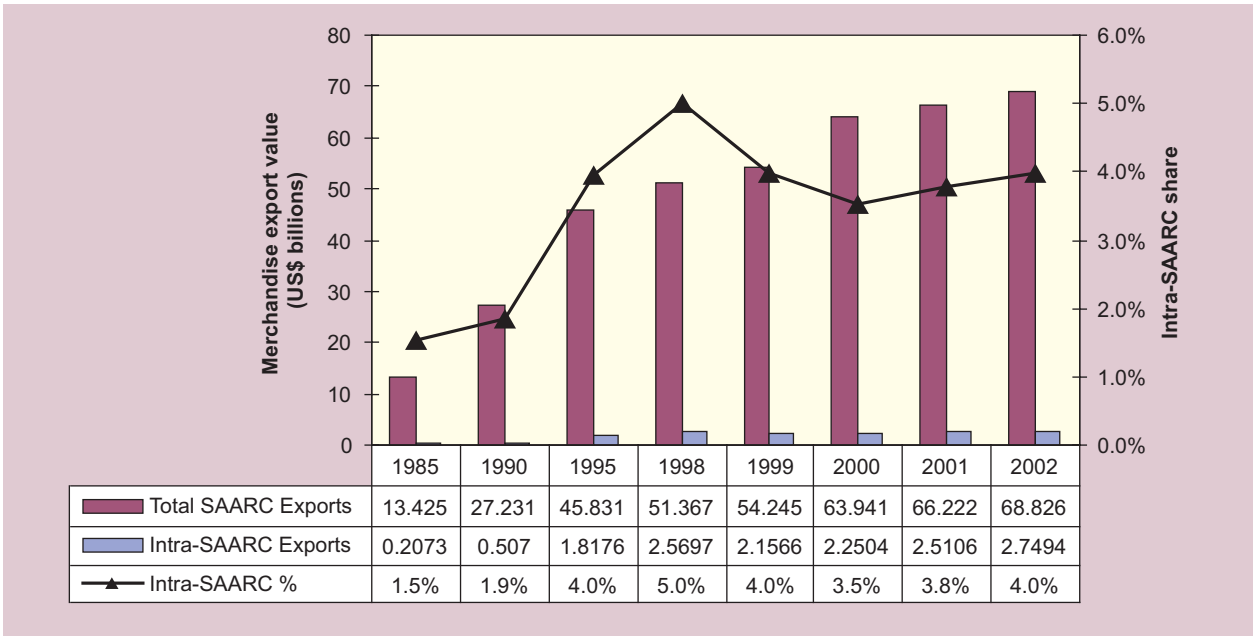
Source: ASEAN Statistical Yearbook 2004, Chapter 5: *Merchandise Trade*.

[23] This section is based on: UNESCAP (2006). *Study on National Coordination Mechanisms for Trade and Transport Facilitation in the UNESCAP Region*.

(ii) South Asia

In the case of the SAARC group, there was a five-fold growth in total export trade during the period 1985-2002, while intra-SAARC export trade grew by 13 fold over the same period. However, as may be seen from Figure I-3, the share of intra-regional exports in the overall value of merchandise exports was only 4 per cent in 2002, having risen modestly from 1.5 per cent in 1985.

Figure I-3. Intra-SAARC share of total merchandise exports from SAARC



	1985	1990	1995	1998	1999	2000	2001	2002
Total SAARC Exports	13.425	27.231	45.831	51.367	54.245	63.941	66.222	68.826
Intra-SAARC Exports	0.2073	0.507	1.8176	2.5697	2.1566	2.2504	2.5106	2.7494
Intra-SAARC %	1.5%	1.9%	4.0%	5.0%	4.0%	3.5%	3.8%	4.0%

Source: ADB/SAARC Regional Transport Connectivity Review, 2004.

(iii) Central Asia

In the case of the Central Asian Republics (CAR's), while the value of the total export trade of the subregion expanded by two and a half times during the period 1993-2001, the value of internal export trade (i.e. export trade within the subregion) increased by only nine per cent over the same period, as may be seen from Figure 2.3. As a result, the share of internal trade in the subregion's total export trade fell by more than half, from 39.8 per cent in 1993 to 16.3 per cent in 2001.

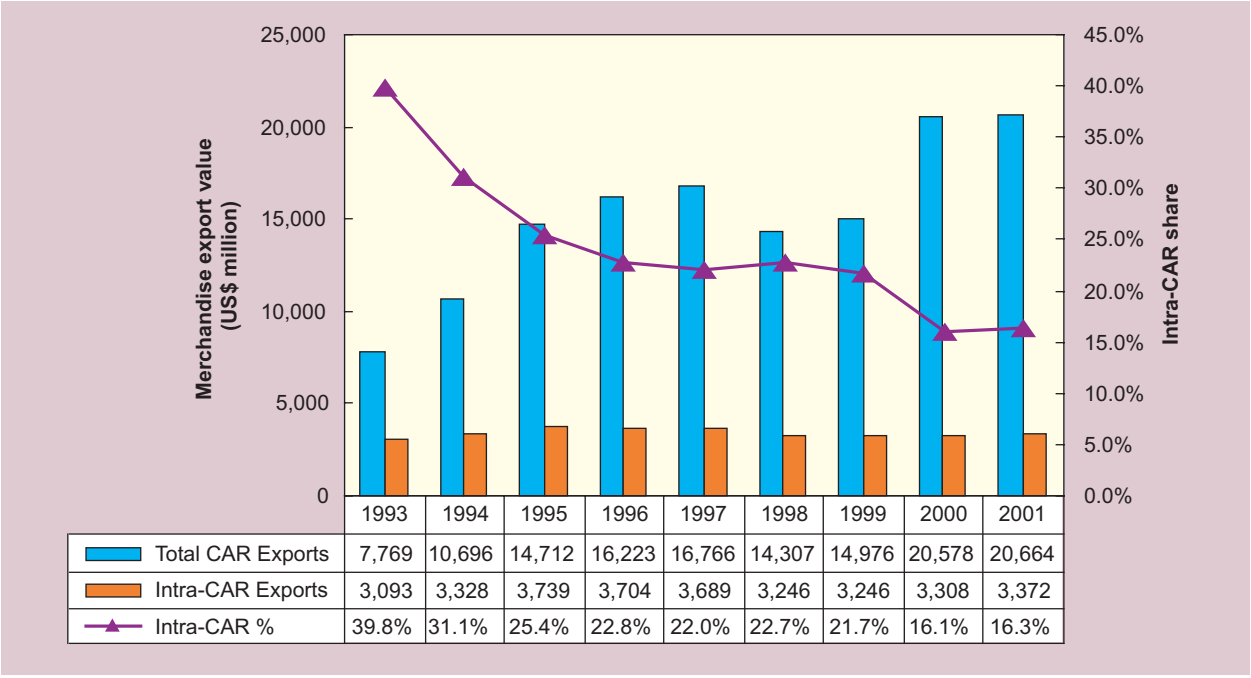
(iv) Reasons for low intra-regional trade shares

There are three major reasons for the very low shares of intra-regional trade in the total merchandise trade of the subregions.

- The first is that the industrial bases of member countries are in some cases not sufficiently diversified from one another to allow trade complementarity with one another. Often, they tend to compete on the same external export markets with essentially the same types of trade commodities. However, there is evidence of emerging potential for complementarity in the intra-regional trade of some commodities. For example, exports of finished garments from Bangladesh to the rest of the world are supported by imports of cotton and other textile feedstock from India.
- The second is that while substantial efforts have been made to lower the tariff barriers to trade with the rest of the world[24], internal trade still confronts major obstacles, if not through high tariff barriers, then through the application of other types of trade restraint measures, such as

[24] Examples are to be found in the recent negotiation of free trade agreements between some ASEAN member countries and China, Japan and the United States.

Figure I-4. Intra-Central Asian Republics (CAR) share of total merchandise exports from CAR's



	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total CAR Exports	7,769	10,696	14,712	16,223	16,766	14,307	14,976	20,578	20,664
Intra-CAR Exports	3,093	3,328	3,739	3,704	3,689	3,246	3,246	3,308	3,372
Intra-CAR %	39.8%	31.1%	25.4%	22.8%	22.0%	22.7%	21.7%	16.1%	16.3%

Source: Statistical Yearbook for Asia and the Pacific 2003, United Nations, New York, 2003.

licenses, quantitative restrictions and quotas, as well as inefficient application of border Customs controls.

- Third, internal trade is often vulnerable to the imposition of restrictions on cross-border transport and to operational delays occurring at borders, which can compound delays resulting from inefficient application of border Customs controls.

Notwithstanding the non-physical barriers confronting intra-regional trade, the rapid growth of this trade from a very low base, as shown in the above examples, provides one indication that it is currently well below its potential.

Another indication is to be found in the extraordinarily high level of unofficial, or informal, trade between neighbouring countries in certain subregions of the UNESCAP region. Among the SAARC group of countries, for example, it has been estimated that the values of unofficial and official export trade from India to Bangladesh are approximately equal.[25] Similarly, unofficial trade between India and Pakistan has been estimated at anywhere between US$ 1 billion and US$ 2 billion per annum, or 5-10 times the value of the official trade between the two countries.[26] It is highly probable that similar trends may be observed in other subregions, which adhere to restrictive trade policies. The rapid growth of unofficial trade is, after all, almost wholly a reflection of the imposition of high barriers to official trade. To the extent that the unofficial trade consists of commodities which would otherwise be legal, a lowering of these barriers would remove the incentive for smuggling and hence have the potential for a substantial reduction in the delivered cost of trade consignments.

It seems desirable, therefore, that priority be given to liberalizing the conditions for intra-regional trade and for transit trade to/from the landlocked countries of the region, along the lines of measures already taken in respect of global trade – from which the development of globalized manufacturing industry in the region is now benefiting.

[25] Lakshmanan et al., Integration of Transport and Trade Facilitation – Selected Regional Case Studies, World Bank, Washington, DC, January 2001, page 87.

[26] ADB, SAARC Regional Transport Connectivity Review (2004), page 39.

II. MEETING THE NEED FOR PERSONAL MOBILITY

This chapter examines the changes in population and urbanization in the Asia and the Pacific region and the rest of the world. Section A analyses past and prospective changes to world and regional population growth and distribution since 1980, section B looks at urbanization, section C at the growth of mega-cities, and section D considers demographic trends in the region.

A. World and regional population growth and distribution

Table II-1 below compares the estimated and forecast population size and its growth rates of the ESCAP region (i.e., Asia and the Pacific) with that of the rest of the world over the period 1980-2025.

The world population was estimated at 6.5 billion in 2006. Average annual population growth was 1.5 per cent in the 1990s (which was 0.3 percentage points less than in the 1980s) and 1.2 per cent in the present decade. World population is expected to continue to grow in the coming years to 8.0 billion in 2025, but it is forecast to grow slower than in the past, eventually falling below 1 per cent in the 2020s.

In 2006, the population of the ESCAP region was 4.0 billion which was 62 per cent of the world population. The ESCAP population is expected to increase to 4.7 billion by 2025. While the population growth rate of the ESCAP region was still identical with the average rate for the world in the 1980s (i.e., 1.8 per cent per year), it is now as low as 1.1 per cent per year and below the global average, and it is expected to fall to 0.6 per cent per year during 2020-2025. As a result, the ESCAP region is expected to comprise 59 per cent of the world's population in 2025 (Table II-1).

Table II-1. Estimates of population 2000-2025, and population growth 1980-2025: world and ESCAP region

Region	Population (millions)		Annual compound growth rate (percentage)				
	2006	2025	1980-1990	1990-2000	2000-2010	2010-2020	2020-2025
ESCAP	3,992	4,704	1.8	1.4	1.1	0.9	0.6
World	6,465	8,011	1.8	1.5	1.2	1.1	0.9
ESCAP (percentage of world total)	62%	59%	–	–	–	–	–

Source: ESCAP Population Data Sheet 2006, viewed on United Nations Emerging Social Issues Division, Population and Social Integration Section website, 16 September 2007, http://www.unescap.org

South and South-West Asia is the ESCAP subregion with the fastest growing population which increased by 1.6 per cent per year in 2006 (Table II-2). South and South-West Asia accounts for 41.2 per cent of the total ESCAP population and is the most populous ESCAP subregion. The population share of this region is expected to reach 45 per cent by 2025 (Figure II-1). However, these aggregate data disguise significant differences in population growth rates among countries. For example, the populations of Afghanistan, Sri Lanka and the Islamic Republic of Iran are growing at 3.9, 1.1 and 1.2 per cent per year, respectively (Table II-2). It should also be noted that the region's population growth rate is to a large extent determined by the size and growth rate of India's population.

East and North-East Asia is the second most populous ESCAP subregion, is expected to continue to be so in the future, despite a relatively slow current population growth of 0.6 per cent. This is primarily due to the large population of the Republic of China which still remains the most populous ESCAP country (Table II-2).

The shares of population of South-East Asian, North and Central Asian, and the Pacific subregions as a proportion of ESCAP population is not expected to change significantly over the next twenty years. The Pacific island countries are forecast to remain the least populous in the region despite their relatively fast annual average growth rate of 1.4 per cent. North and Central Asia's population has been growing at a very low rate, and South-East Asia's population has been increasing at a rate of 1.3 per cent (Figure II-1).

Table II-2. Population indicators in the Asia-Pacific region, 2006

Country and subregion	Mid-2006 Population Thousands	Annual Growth[a] Rate Percentage
ESCAP Region	**3,991,516**	**1.1**
East and North-East Asia	**1,532,761**	**0.6**
China	1,323,636	0.6
Democratic People's Republic of Korea	22,583	0.4
Hong Kong, China	6,940	0.8
Japan	127,741	0.1
Macao, China	473	1.1
Mongolia	2,679	1.2
Republic of Korea	48,710	0.5
South-East Asia	**563,787**	**1.3**
Brunei Darussalam	382	2.1
Cambodia	14,081	2.0
Indonesia	225,465	1.2
Lao People's Democratic Republic	6,058	2.2
Malaysia	26,605	1.8
Myanmar	51,009	1.0
Philippines	86,954	2.0
Singapore	4,363	1.3
Thailand	62,520	0.5
Timor-Leste	1,007	5.4
Viet Nam	85,344	1.3
South and South-West Asia	**1,644,217**	**1.6**
Afghanistan	31,082	3.9
Bangladesh	144,437	1.8
Bhutan	2,211	2.2
India	1,119,538	1.4
Iran (Islamic Republic of)	70,324	1.2
Maldives	302	1.9
Nepal	25,887	2.2
Pakistan	156,580	2.1
Sri Lanka	19,682	1.1
Turkey	74,175	1.3
North and Central Asia	**217,057**	**0.0**
Armenia	3,007	-0.3
Azerbaijan	8,471	0.7
Georgia	4,434	-0.9
Kazakhstan	14,812	-0.1
Kyrgyzstan	5,325	1.2
Russian Federation	142,537	-0.5
Tajikistan	6,591	1.3
Turkmenistan	4,899	1.4
Uzbekistan	26,980	1.4
The Pacific	**33,693**	**1.4**
American Samoa	67	2.0
Australia	20,574	1.2
Cook Islands	17	-1.3
Fiji	851	0.8
French Polynesia	260	1.4
Guam	172	1.5
Kiribati	97	2.3
Marshall Islands	60	2.3
Micronesia (Federated States of)	115	1.2

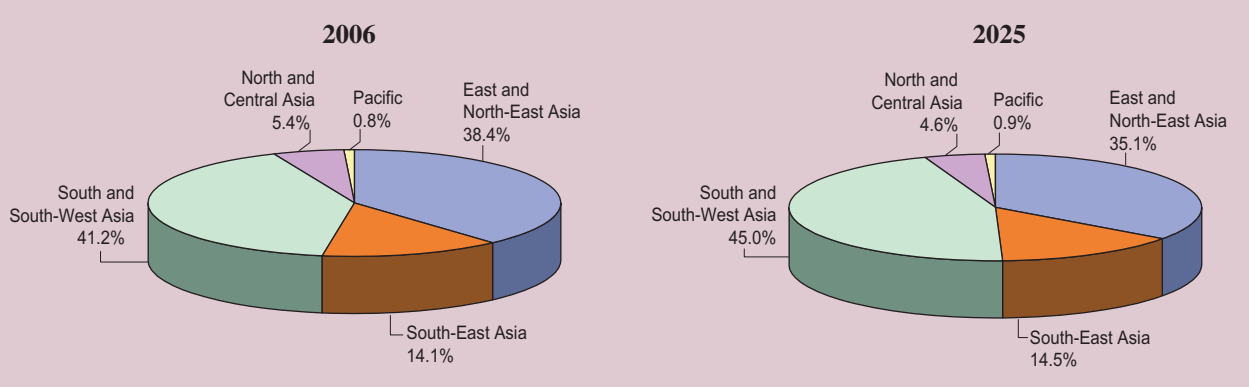
Table II-2. *(continued)*

Country and subregion	Mid-2006 Population Thousands	Annual Growth[a] Rate Percentage
Nauru	10	1.0
New Caledonia	246	1.9
New Zealand	4,113	1.2
Niue	2	-1.5
Northern Mariana Islands	82	2.5
Palau	21	1.3
Papua New Guinea	6,001	1.9
Samoa	186	0.9
Solomon Islands	490	2.4
Tonga	103	0.3
Tuvalu	10	0.4
Vanuatu	215	1.9

Source: 2006 ESCAP Population Data Sheet.

[a] Compound annual growth rate. The rate takes into account international migration, and thus may not equal the rate of natural increase.

Figure II-1. Population shares of ESCAP subregions, 2006 and 2025



Source: 2006 ESCAP Population Data Sheet.

B. Trends in urbanization

Both developed and developing countries are becoming increasingly urbanized. However, the rate of urbanization in developed economies is slow as there is already a large majority of people living in cities and urban areas.

2007 marked the first year in human history when half the world's population lived in cities. By 2025, this share is expected to increase to 58 per cent of the world population. World urban population is forecast to increase at a rate of 1.9 per cent over the period 2000 to 2025, which is almost twice the rate of world population growth. In fact, almost all future population growth will be absorbed by urban areas. Consequently, future urban agglomerations will have to sustain over 4.6 billion people over the next two decades.

With the rate of urban population growth close to double that of total population growth, urbanization patterns in the ESCAP region are quite similar to trends in the rest of the world. The number of city dwellers in the ESCAP region is expected to increase by one billion people in the next 20 years. But it is the developing countries of the region that are expected to experience the most rapid processes of urbanization in the foreseeable future. As a result, by 2025, the average urbanization ratio of South, South-West and South-East Asia should be almost 50 per cent (up from 43 per cent in 2000). The region's developed economies are already on average around 81 per cent urbanized and is expected to only slightly increase.

Table II-3. Estimates of urban population, level of urbanization and rate of growth of the urban population in selected economies of the ESCAP region, 1960-2025

Region	Urban Population			Level of Urbanization				Annual average growth of urban population	
	Millions			*Per cent*				*Per cent*	
	1980	2000	2025	1960	1980	2000	2025	1980-2000	2000-2025
East and North-East Asia Total	233	514	893	50	63	72	79	4.0	2.2
North and Central Asia	123	140	139	43	51	49	54	0.6	0.0
Pacific Island States	1.1	1.9	3.6	34	46	52	60	2.7	2.5
South and South-West Asia	240	467	883	15	23	30	41	3.4	2.6
South-East Asia	92	206	402	27	34	43	57	4.1	2.7
Developed Economies	85	103	114	67	76	79	84	1.0	0.4
ESCAP	774	1,432	2,434	39	49	54	63	3.1	2.1
WORLD	1,741	2,860	4,606	33	39	47	58	2.5	1.9

Source: World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2005 Revision, viewed on Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat website, September 10, 2007, http://esa.un.org/unpp.

Table II-3 highlights the varying levels of urbanization that exist in ESCAP subregions. For example, the average urbanization ratio of South and South-West Asia was 30 per cent in 2000, whereas it was 72 per cent in East and North-East Asia. Yet these subregional averages conceal further national differences. For example, Turkey and Bhutan both belong to the same subregion, yet the former is 65 per cent urbanized, while the latter only 8 per cent.

In general, caution ought to be exercised when comparing urbanization levels across countries, as the definition of what is "urban" often varies considerably. Furthermore, a narrow focus on urban areas may also deflect attention away from important changes taking place just outside these areas. Distinctions between urban and peri-urban areas can also be contentious. In China, it is forecast that the urban population will have increased at a rate of 2.4 per cent between 2000 and 2025, from 454 million to 822 million persons. One of the greatest population changes foreseen for China, however, is in the peri-urban population, which is expected to grow by 250 million people in the next 25 years.[27]

Another key urbanization trend in East and South-East Asia is the connecting of cities which leads to the formation of large urban clusters, such as Bangkok's Eastern Seaboard, China's coastal zone and the Philippines' National Capital Region.[28] This development is expanded upon in the next section: the growth of mega-cities.

C. Growth of mega-cities

In 1950 there were only two mega-cities[29] in the world: Tokyo and Mexico City. In 1975 there were three, and by 2005 there were twenty mega-cities twelve of which are located in the ESCAP region (Figure II-2 and Table II-4).

By 2015, the number of mega-cities is expected to increase to twenty-two, seventeen of which will be in developing countries. As Table II-4 shows, Istanbul and Guangzhou are expected to become mega-cities by 2015, thus increasing to 14 the number of mega-cities in the UNESCAP region.

[27] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, *Connecting East Asia: A New Framework for Infrastructure,* ADB, Philippines, 2005.

[28] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, *Connecting East Asia: A New Framework for Infrastructure,* ADB, Philippines, 2005.

[29] A mega-city is defined as a city with 10 million inhabitants or more.

Figure II-2. Location of mega-cities within the ESCAP region in 2005

Table II-4. Actual and expected population between 1975-2015, and growth rate over 2005-2015 of urban agglomerations with more than 10 million inhabitants

Agglomeration	Population (millions)			Average annual rate of change (per cent)		Population residing in agglomeration, 2005, as share of:	
	1975	2005	2015	2000-2005	2010-2015	National population	National urban population
Tokyo	26.6	35.2	35.5	0.4	0.0	27.5	41.8
Ciudad de México (Mexico City)	10.7	19.4	21.6	1.4	0.8	18.1	23.9
New York[1]	15.9	18.7	19.9	1.0	0.5	6.3	7.8
São Paulo	9.6	18.3	20.5	1.4	1.0	9.8	11.7
Mumbai (Bombay)	7.1	18.2	21.9	2.5	1.8	1.6	5.7
Delhi	4.4	15.0	18.6	3.8	1.8	1.4	4.7
Shanghai	7.3	14.5	17.2	1.8	1.7	1.1	2.7
Kolkata (Calcutta)	7.9	14.3	17.0	1.8	1.8	1.3	4.5
Jakarta	4.8	13.2	16.8	3.6	2.0	5.9	12.3
Buenos Aires	8.7	12.6	13.4	1.2	0.5	32.4	36.0
Dhaka	2.2	12.4	16.8	4.0	2.8	8.8	35.0
Los Angeles [2]	8.9	12.3	13.1	0.8	0.6	4.1	5.1
Karachi	4.0	11.6	15.2	2.9	2.7	7.3	21.1
Rio de Janeiro	7.6	11.5	12.8	1.2	1.0	6.2	7.3
Osaka-Kobe	9.8	11.3	11.3	0.2	0.0	8.8	13.4
Al-Qahirah (Cairo)	6.4	11.1	13.1	1.4	1.7	15.0	35.1
Lagos	1.9	10.9	16.1	5.1	3.3	8.3	17.2
Beijing	6.0	10.7	12.9	1.8	1.8	0.8	2.0
Manila	5.0	10.7	12.9	1.4	1.8	12.9	20.5
Istanbul	3.6	9.7	11.2	2.1	1.2	13.3	19.7
Guangzhou	2.7	8.3	10.4	2.6	2.0	0.6	1.6
Moskva (Moscow)	7.6	10.7	11.0	1.1	0.1	7.4	10.2

Source: World Urbanization Prospects: *The 2005 Revision*, New York, United Nations, Department of Economic and Social Affairs, Population Division, 2006.

[1] Refers to the New York-Newark urbanized area.

[2] Refers to the Los Angeles-Long Beach-Santa Ana urbanized area.

Non UNESCAP Countries

UNESCAP Countries

For some time, Tokyo has remained the largest urban agglomeration in the world and is expected to remain so into the foreseeable future, despite a slow growth rate. Over the last quarter of a century, South and Central Asian mega-cities have been the fastest growing. For example, Dhaka's population, which totalled 12.4 million in 2005, has grown at an average annual rate of about 5 per cent since 1975, growing fastest between 1980 and 1995. While it is predicted that this growth will slow somewhat over the coming decade, Dhaka is expected to remain the fastest growing mega-city in the region and the second fastest in the world (behind Lagos). Karachi is expected to be the region's second fastest growing mega-city. Delhi's population has also grown rapidly, maintaining an average annual growth rate above 4 per cent since 1975.

The population living in the mega-cities of the ESCAP region has increased not only in absolute terms, but also, in many instances, as a proportion of the corresponding national total. As Table II-5 illustrates, Dhaka and Tokyo have undergone the most dramatic increase of the proportionate share of national population in the region. Consequently, by 2015, almost 10 per cent of the population of Bangladesh is forecast to reside in Dhaka, and Tokyo will have 28 per cent of Japan's population.

Table II-5. Selected dominant urban agglomerations and their proportion of the national population, 1970-2015

Name	Population in thousands (percentage of national population)					
	1970	1980	2000	2005	2010	2015
Tokyo, Japan	23,298	28,549	34,450	35,197	35,467	35,494
	(22.3)	(24.4)	(27.1)	(27.5)	(27.8)	(28.0)
Mumbai (Bombay), India	5,811	8,658	16,086	18,196	20,036	21,869
	(1.1)	(1.3)	(1.5)	(1.6)	(1.6)	(1.7)
Delhi, India	3,531	5,558	12,441	15,048	16,983	18,604
	(0.6)	(0.8)	(1.2)	(1.3)	(1.4)	(1.4)
Shanghai, China	7,055	7,608	13,243	14,503	15,790	17,225
	(0.8)	(0.8)	(1.0)	(1.1)	(1.2)	(1.2)
Jakarta, Indonesia	3,915	5,984	11,065	13,215	15,206	16,822
	(3.2)	(4.0)	(5.2)	(5.8)	(6.3)	(6.7)
Dhaka, Bangladesh	1,474	3,257	10,159	12,430	14,625	16,842
	(2.1)	(3.7)	(7.3)	(8.1)	(8.8)	(9.4)
Karachi, Pakistan	3,119	5,048	10,020	11,608	13,252	15,155
	(5.2)	(6.4)	(6.9)	(7.3)	(7.6)	(7.9)
Manila, Philippines	3,534	5,955	9,950	10,686	11,799	12,917
	(9.7)	(12.4)	(13.1)	(12.6)	(12.7)	(12.8)

Source: World Population Prospects: The 2004 Revision, and *World Urbanization Prospects: The 2005 Revision,* viewed on Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat website, 12 September 2007, http://esa.un.org/unup.

D. Demographic change

Older adults make up an increasing proportion of the population. A result of the combination of decreased fertility rates and increased life expectancy, population ageing is one of the most significant demographic changes occurring in the ESCAP region and around the world.[30] In mid-2007, on average, 29 per cent or more of the total ESCAP population was aged 0-14 years, 62 per cent was 15-64 years and 9 per cent were 65 years or older (Table II-6).

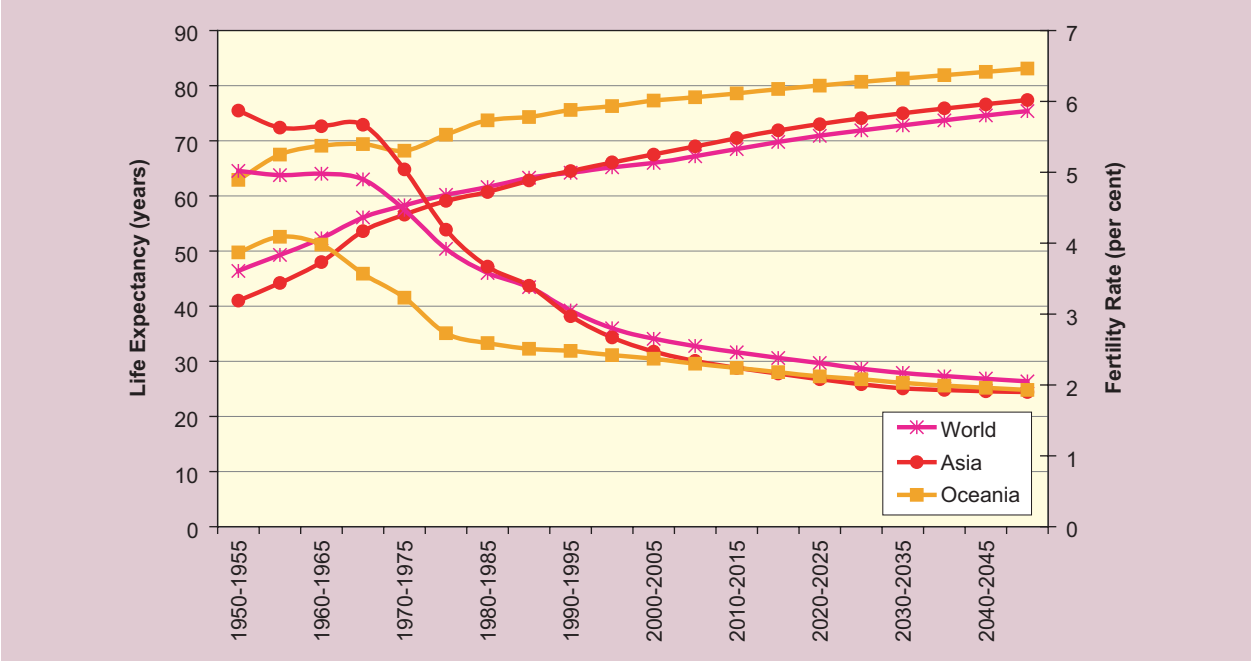
Within the region, however, there are significant differences between countries with respect to population ageing. As Table II-6 shows, North and Central Asia, East and North-East Asian, and Pacific countries already experienced substantial population ageing, with 14, 13 and 15 per cent of the population over 65 years of age respectively. Figure II-4 below shows the current and forecast distribution of age by sex in the world and China's population: it illustrates the ageing pattern is a global phenomenon and that China is expected to have an even greater ageing phenomenon than the world average.

[30] *Economic and Social Survey of Asia and the Pacific 2005,* ESCAP, United Nations Publication, Sales No. E.05.II.F.10.

In contrast, population ageing has been considerably slower in countries such as Bangladesh and some South-East Asian countries (Cambodia, Indonesia, and East Timor).

Differences also exist with respect to the gender ratio of the ageing population, (the number of males per 100 females over the age of 65 years). In the significant majority of countries however, aged females outnumber aged males (Table II-6).

Figure II-3. Life Expectancy and Fertility Rate in Asia, Oceania and the World, 1950-2050



Source: World Population Prospects: The 2006 Revision and *World Urbanization Prospects: The 2005 Revision,* viewed on Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat website, 12 September 2007, http://esa.un.org/unup

Table II-6. Size of age groups and gender ratio among senior citizens in the ESCAP region, 2007

Country or area and region	Gender ratio of population 65+ (males per 100 females)	Relative size of age group in total population (per cent)		
		0-14	15-64	60+
ESCAP Region	**89**	**27**	**63**	**10**
East and North-East Asia	**93**	**20**	**67**	**13**
China	96	21	67	12
Democratic People's Republic of Korea	67	23	63	14
Hong Kong, China	91	14	70	16
Japan	78	14	58	28
Macao, China	85	15	75	10
Mongolia	80	27	67	6
Republic of Korea	74	18	68	14
South-East Asia	**81**	**29**	**63**	**8**
Brunei Darussalam	122	29	66	5
Cambodia	59	36	59	5
Indonesia	82	28	63	9
Lao People's Democratic Republic	81	38	57	5
Malaysia	93	30	63	7
Myanmar	84	26	66	8
Philippines	85	35	59	6
Singapore	89	18	68	14
Thailand	79	22	67	11
Timor-Leste	92	45	50	5
Viet Nam	72	29	62	9

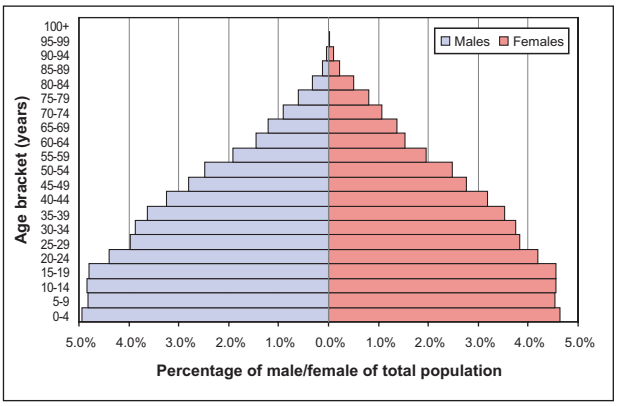
Table II-6. *(continued)*

Country or area and region	Gender ratio of population 65+ (males per 100 females)	Relative size of age group in total population (per cent)		
		0-14	15-64	60+
South and South-West Asia	**93**	**32**	**61**	**7**
Afghanistan	98	47	49	4
Bangladesh	94	34	60	6
Bhutan	105	31	62	7
India	93	32	60	8
Iran (Islamic Republic of)	93	27	66	7
Maldives	120	31	62	7
Nepal	102	38	56	6
Pakistan	97	36	58	6
Sri Lanka	86	23	66	11
Turkey	83	27	65	8
North and Central Asia	**58**	**20**	**66**	**14**
Armenia	67	20	65	15
Azerbaijan	71	24	67	9
Georgia	67	18	64	18
Kazakhstan	56	24	66	10
Kyrgyzstan	69	30	63	7
Russian Federation	51	15	68	17
Tajikistan	85	38	57	5
Turkmenistan	70	30	64	6
Uzbekistan	77	32	62	6
The Pacific	**89**	**24**	**61**	**15**
American Samoa	99	37	57	6
Australia	87	19	62	19
Cook Islands	97	31	57	12
Fiji	81	32	61	7
French Polynesia	96	27	65	8
Guam	93	29	61	10
Kiribati	71	36	59	5
Marshall Islands	99	38	58	4
Micronesia (Federated States of)	76	38	56	6
Nauru	109	39	58	3
New Caledonia	88	26	63	11
New Zealand	85	21	62	17
Niue	93	26	58	16
Northern Mariana Islands	121	19	78	3
Palau	96	26	66	8
Papua New Guinea	96	40	56	4
Samoa	84	41	52	7
Solomon Islands	100	40	55	5
Tonga	91	37	54	9
Tuvalu	74	34	58	8
Vanuatu	119	39	56	5

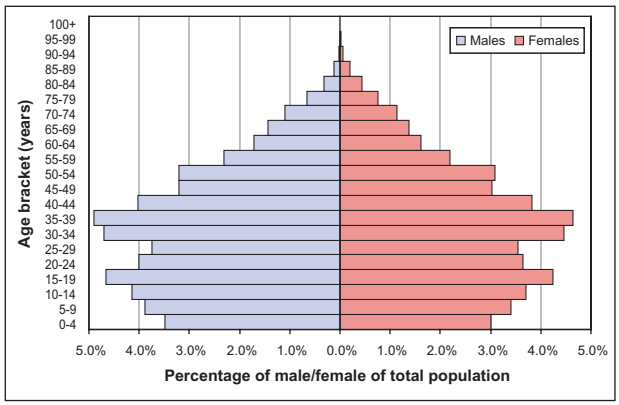
Source: Population and Development Indicators for Asia and the Pacific, United Nations, 2007.

Figure II-4. China and World population by age bracket by sex 2005-2050

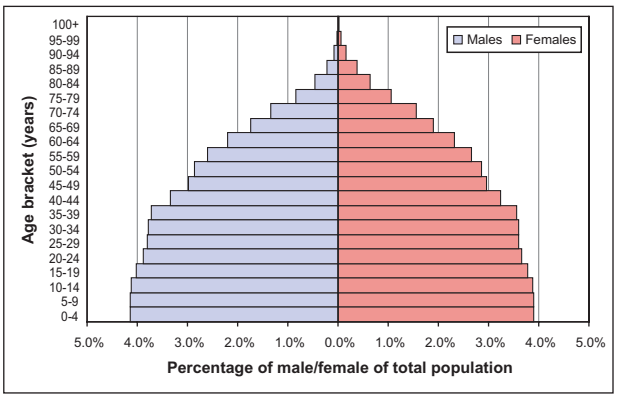
World population 2005 by age by sex



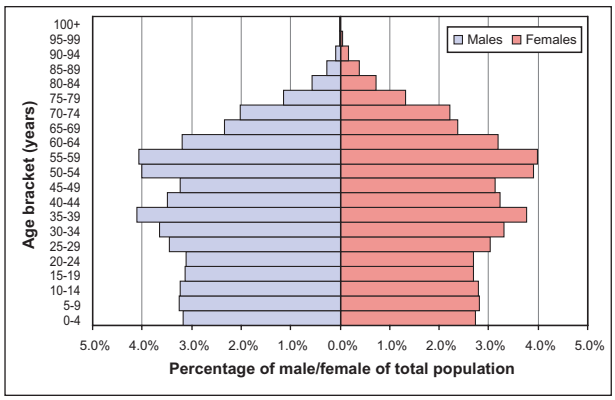
China's population 2005 by age by sex



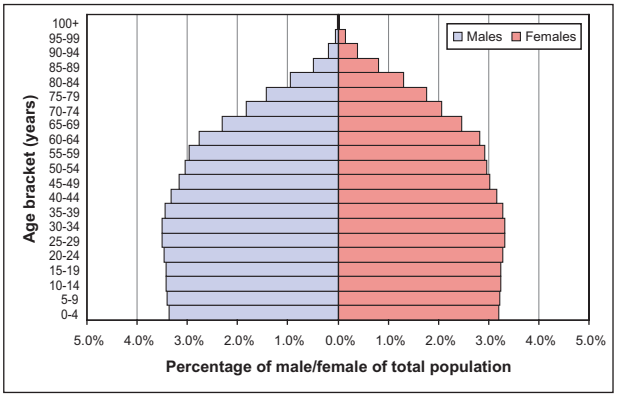
World population 2025 by age by sex



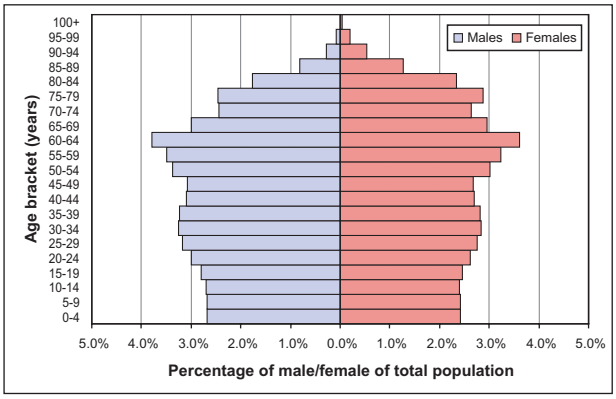
China's population 2025 by age by sex



World population 2050 by age by sex



China's population 2050 by age by sex



Source: World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2005 Revision, viewed on website of Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 12 September 2007, http://esa.un.org/unpp.

III. MEETING THE NEEDS OF THE ENVIRONMENT

While transport systems provide the mobility that is essential to support large scale population growth, urbanization and economic growth, they are also major contributors to air pollution and greenhouse gases. In the ESCAP region (as elsewhere) there has been a growing awareness that the provision of transport infrastructure and services needs to be undertaken in a way that protects and preserves the natural resources upon which the survival of human life ultimately depends; that is, in a manner which promotes the sustainable development of society.

This chapter examines the impacts that transport systems have on the environment and human health (both in a global and local sense). It also provides an overview of selected environmental and air pollution abatement policies and programmes within the ESCAP region.

A. Global environmental considerations

Human activities are increasingly changing the composition of the earth's atmosphere and its properties. For example, carbon dioxide (CO_2) concentrations in the atmosphere have increased by approximately one-third since the pre-industrialized era.[31] There has also been a rise in the atmospheric concentration of the other five controlled greenhouse gases: methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). These gases build up in the earth's atmosphere, and it is generally accepted that this build up has led, and will continue to lead, to global warming and climate change.

These issues of global warming, climate change and resultant sea level change are posing a particular threat to the oceanic states in the ESCAP region, but also have very significant implications for countries, such as Bangladesh, which have extensive low-lying fluvial areas.[32]

As illustrated in **Figure III-1** below, in 2005, approximately 65 per cent of anthropogenic greenhouse gas emissions were due to energy consumption (including building, power, industry and transport-related emissions).[33] Transport-related emissions account for 22 per cent of energy-related CO_2 emissions. Transport also contributes to global N_2O and CH_4 emissions and motor vehicle air conditioners are major contributors of HFCs. In total, transport activity produces approximately 14 per cent of total anthropogenic greenhouse gas emissions.

In the ESCAP region, as elsewhere, emissions from road transport vehicles are the major source of concern: Road transport accounts for three-quarters of transport-related greenhouse gas emissions. Aviation accounts for approximately one-eighth, and the rest is emitted by rail and shipping.[34] The total CO_2 emissions from transport are forecast to more than double by 2050.[35]

CO_2 emissions per ton-kilometre of air transport are high compared with other modes of transport. On average, they are roughly 10 times higher than those of the most inefficient of all other non-bulk freight modes, and up to 60 times higher than those of the most efficient of these modes.[36] It should also be noted,

---

[31] Stern, Nicholas, 2006, *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, viewed on website of HM Treasury, 10 October 2007, http://www.hm-treasury.gov.uk/

[32] Hook, Walter, 2001, *Implementing the Kyoto Protocol in the Transport Sector,* Institute for Transportation and Development Policy, viewed on website of Institute for Transportation and Development Policy, http://www.itdp.org/pub.html

[33] Stern, Nicholas, 2006, *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, viewed on website of HM Treasury, 10 October 2007, http://www.hm-treasury.gov.uk/

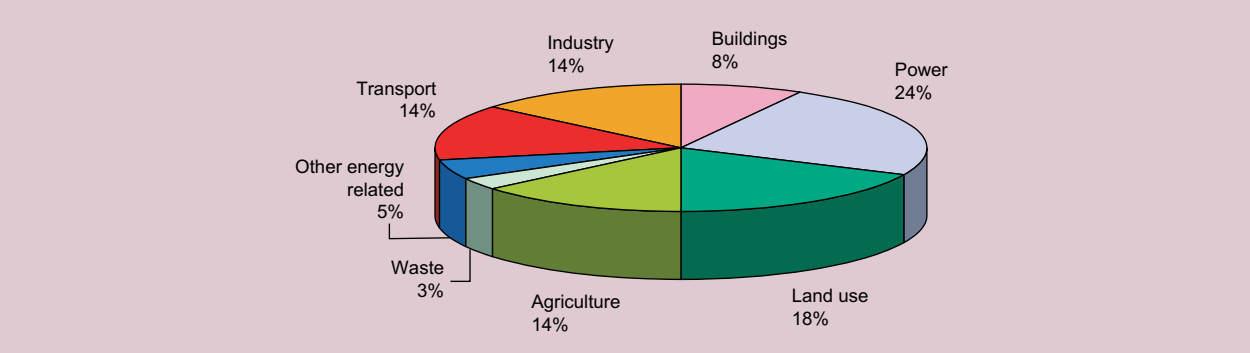
[34] Stern, Nicholas, 2006, *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, viewed on website of HM Treasury, 10 October 2007, http://www.hm-treasury.gov.uk/

[35] Stern, Nicholas, 2006, *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, viewed on website of HM Treasury, 10 October 2007, http://www.hm-treasury.gov.uk/

[36] Van Essen, H, Bello, O, Dings, J and van den Brink, R, 2003, *To shift or not to shift. That's the question. The environmental performance of the principal modes of freight and passenger transport in the policy making context,* CE Delft, The Netherlands.

though, that the range of actual CO_2 emissions per ton-kilometre also depends on other factors such as the length of trips and ranges can be very large and usually overlap across transport modes (e.g., emission factors are not always higher for truck transport than for rail transport).

Figure III-1. Anthropogenic greenhouse gas emissions



Source: Stern, Nicholas, 2006, *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, viewed on website of HM Treasury, 10 October 2007, http://www.hm-treasury.gov.uk/

In addition to greenhouse gas emissions, aircraft fuel combustion is a major contributor of N_2O which is particularly problematic at high altitudes. This can cause stratospheric ozone reduction, leading to increased surface ultraviolet radiation regional pollution and changes in tropospheric chemistry for tens to hundreds of kilometres.[37]

B. Local environmental considerations

1. Urban air pollution and its impacts on human health

Among the different environmental pollution problems, urban air pollution causes the greatest damage to health and loss of welfare from environmental causes in Asian countries. Developments in terms of air quality in selected Asian cities over the period 1993-2005 is summarized in Figure III-2.

Studies conducted by the Clean Air Initiative for Asian Cities (CAI-Asia) have revealed that although there is vast variation, most Asian countries have more lenient air quality standards than those prescribed by WHO and USEPA. And ambient air quality in Asia is often worse than the WHO guidelines. For example, particulate (PM_{10}) concentrations in Jakarta and Beijing ranged between 110 and 140 $\mu g/m^3$ in 2002-2003 (WHO and USEPA guidance is for a maximum level 50-70 $\mu g/m^3$ in any 24 hour period).[38].

Whilst the local air quality in some Asian cities continues to cause significant concern, improvements in air quality have been experienced by a number of Asia's urban centres in the last decade (Table III-1).

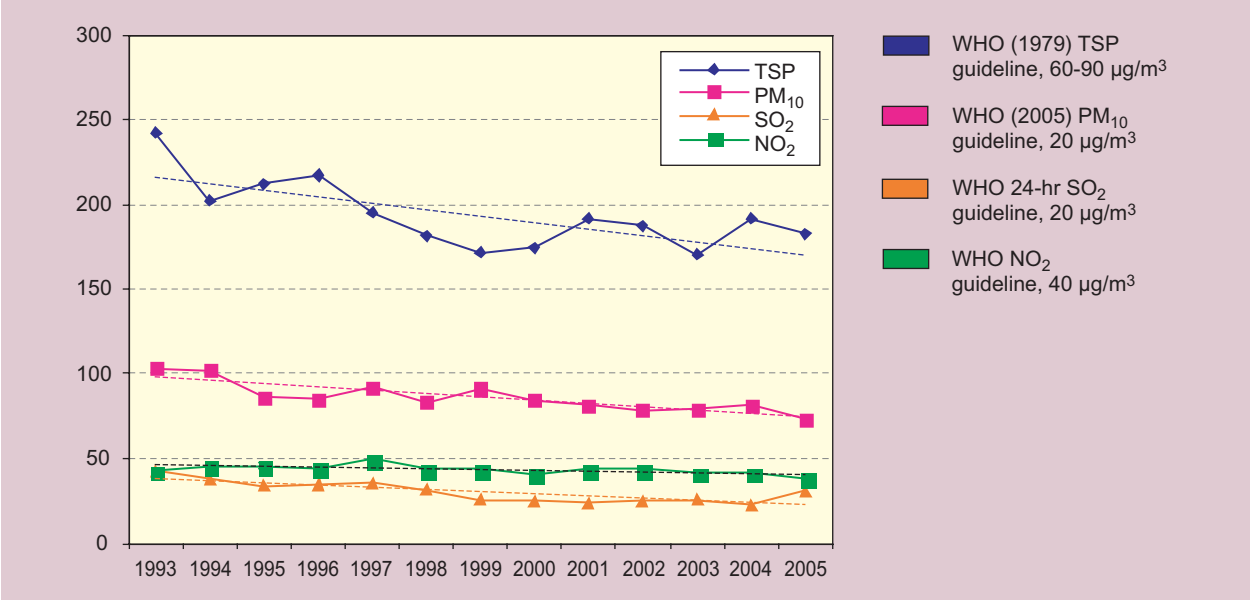
The data in the above table indicates that of the Asian cities selected, most have reduced levels of SO_2 and NO_2, and almost all the selected cities have reduced levels of SPM and PM_{10} compared to the level during the 1990s. However, NO_2 and PM_{10} levels remain above the WHO guidelines except for the most developed cities.

This is a serious concern to most major cities in the region: although people spend most of their time indoors, outdoor air pollution is one of the main determinants of indoor air quality. Outdoor air pollution (particularly due to transport emissions) therefore has the potential to significantly affect human

[37] Royal Commission on Environmental Pollution, *The Environmental Effects of Civil Aircraft in Flight,* viewed on the website of Royal Commission on Environmental Pollution, 2002, http://www.rcep.org.uk/

[38] World Health Organization, 2006, *Fact sheet No. 313,* viewed on the website of the World Health Organization, 15 October 2007, http://www.who.int

Figure III-2. Status of Air Quality in Asia: Average annual ambient AQ levels of selected Asian Cities, 1993-2005



TSP = total suspended particulates; PM_{10} = particulate matter with diameter of not more than 10 microns; SO_2 = Sulfur dioxide; NO_2 = Nitrogen dioxide; WHO = World Health Organization

Sources: CAI-Asia (2007), Partnership Strategy 2007-2010, viewed on the website of Clean Air Initiative for Asian Cities (CAI-Asia), http://www.cleanairnet.org/caiasia; and *World Health Organization (WHO), Air Information Database,* presented in *Air Quality Monitoring in the Asian Region,* Murray, Huizenga, Ajero and Fabia, for the Clean Air Initiative for Asian Cities, August 2005.

Note: Cities included are the following: Bangkok, Beijing, Busan, Colombo, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, China, Jakarta, Kathmandu, Kolkata, Metro Manila, Mumbai, New Delhi, Seoul, Shanghai, Singapore, Surabaya, Taipei and Tokyo.

Table III-1. Air Quality Data from 2000-2003 compared with 1990-1999

City	SO_2	NO_2	SPM	PM_{10}
Bangkok	≥	>	<	<
Beijing	<	?	?	<
Busan	<	>	?	≥
Colombo	>	<	?	≤
Hong Kong, China	>	<	<	<
Kolkata	<	>	<	<
Manila	?	?	<	?
Mumbai	<	<	<	<
New Delhi	<	<	<	<
Seoul	<	>	<	<
Shanghai	<	<	<	?
Taipei	<	<	?	>
Tokyo	<	≤	?	<

Source: Clean Air Initiative-Asia Research 2004, presented by Murray, Huisenga, Ajero and Fabian, for the Clean Air Initiative for Asian Cities, August 2005.

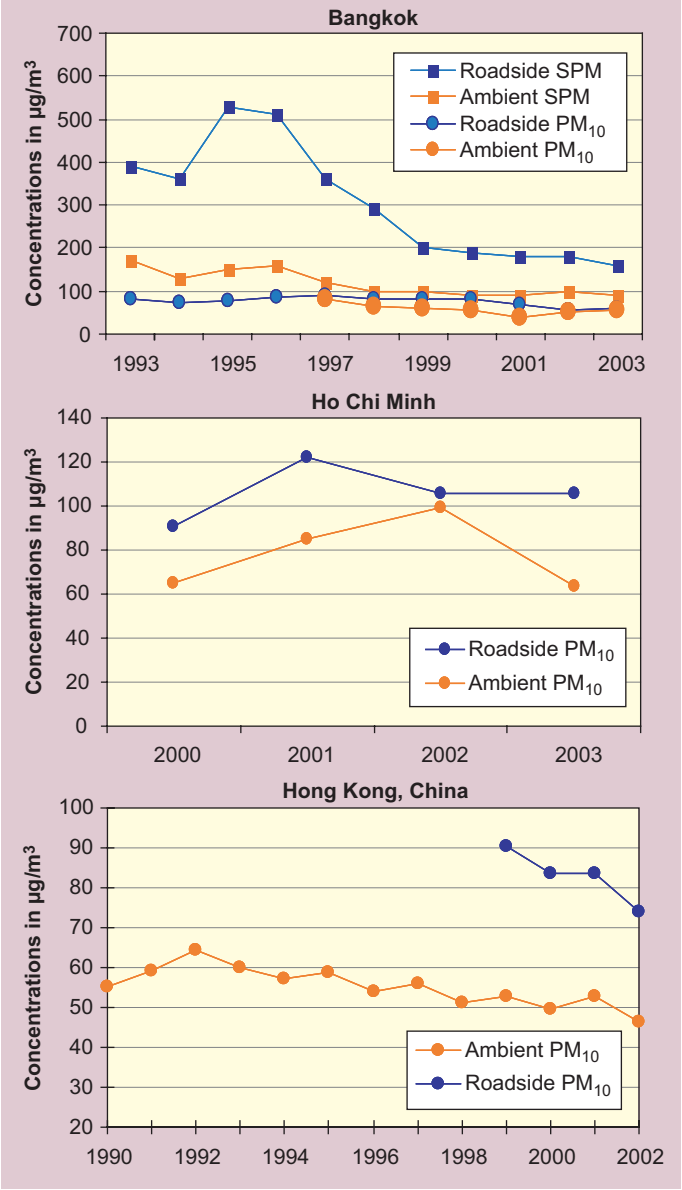
Notes: ≥ = about 5% increase; ≤ = about 5% decrease; ? = data not available

health and mortality. The WHO has estimated that the annual number of premature deaths caused by urban air pollution is approximately 530,000 and that 6.4 million years of healthy life are lost due to long-term exposure to ambient particulate matter.[39, 40]

[39] World Health Organization, 2004, *Comparative Quantification of Health Risks, Chapter 17,* viewed on website of World Health Organization, 15 October 2007, http://www. who.int/

[40] Krzyzanowski, Michal, *Why we need better air quality?,* The keynote presentation delivered during the opening session of the Better Air Quality Workshop 2006, 13-15 December 2006, Yogyakarta, Indonesia.

Figure III-3. Ambient versus Roadside Air Quality



Source: Air Quality Monitoring in the Asian Region, presented by Murray, Huisenga, Ajero and Fabian, for the Clean Air Initiative for Asian Cities, August 2005.

Note: SPM ambient annual standards = 100 µg/m^3
PM_{10} ambient annual standards = 50 µg/m^3

2. The relationship between transport and local air pollution

Transport emissions comprise the most significant source of airborne air pollution in urban air. There are over 4,000 compounds (including CO_2, SO_2, NO_2 and hydrocarbons) emitted from motor vehicle exhausts in gaseous, vapour and particle forms.[41] Many of these emissions are hazardous and have a detrimental effect on the environment and public health.

Figure III-3 shows, a general relationship between roadside and ambient air qualities. The figure shows that the roadside particulate levels in three cities (Bangkok, Hong Kong, China and Ho Chi Minh) are always higher than the ambient levels. Each of these cities has been affected by the introduction of national policies within the last decade regarding improved fuel quality, stricter emission standards and improvements to emission testing, more consistent enforcement of emission standards and changes to vehicle design standards.

C. Air pollution abatement strategies: policies and initiatives

The contribution that transport makes towards greenhouse gas emissions and other forms of pollutants will continue to pose significant challenges for policy makers in the future. The level and composition of pollution in urban air resulting from transport depends not only on the number of vehicles, but also vehicle age, engine type, size and condition, and fuel quality and type. A significant gain has been that leaded fuel has now been phased out in many countries in the region. However, poorly maintained diesel vehicles and two-stroke motorcycles continue to be major contributors to poor air quality in the region.[42]

In order to meet the needs of the environment, policy makers have taken a combination of measures, including the development of new transport technologies, increased reliance on renewable energy sources, changes in economic geography and urban form, and new and more sophisticated forms of demand management. An optimal mix of policies will include a combination of command-and-control measures and market-based instruments (such as pollution permits).

This section provides an overview of selected air pollution abatement policies and measures at the region-wide, national and local levels.

[41] Morawska, L, *Urban Air Quality: an introduction,* Air Pollution & Transport: Short Course, Transport Futures Institute, Queensland, Australia, 2007.

[42] Asian Clean Fuels Association, 26 September 2005.

1. Regional-wide Initiatives to Improve Air Quality

Although there are not yet any regional or subregional level agreements in place in the ESCAP region to address air pollution, governments, non-governmental organizations (NGOs) and regional and international development agencies have been working towards regional cooperation on air quality. Two notable examples are the Kitakyushu Initiative for a Clean Environment and the Clean Air Initiative for Asian Cities (CAI-Asia).

a) Kitakyushu Initiative for a Clean Environment

This initiative was adopted by the fourth Ministerial Conference on Environment and Development in Asia and the Pacific (held in Kitakyushu, Japan, from 30 August to 5 September 2000). At its core, the Kitakyushu Initiative is a permanent forum of cooperation between the Institute for Global Environmental Strategies, the City of Kitakyushu, the Ministry of Foreign Affairs of Japan, the Ministry of the Environment of Japan and the Government of Japan.

The primary aim of this initiative during its First Cycle (2000-2005) was to draw lessons from the city's experiences for other cities in the ESCAP region about ways of improving air quality by focusing on enhanced integrated urban planning strategies, water quality improvements, waste management improvements and capacity building and awareness raising initiatives.

The initiative, now in its second cycle (2006-2010), has four overall objectives:

1. To garner commitments by cities to conduct projects and disseminate their experiences to other cities facing similar challenges. The realization of commitments throughout the second cycle will be recognized by 2010.
2. To collect successful practices and policies.
3. To identify models of innovative win-win policies and practices by focusing on how specific problems were overcome. Particular focus will be paid to environmental, social and economic benefits.
4. To discuss future intercity collaborative mechanisms of enhancing the capacity of local governments in their approaches to urban environmental management and socio-economic development.[43]

b) Clean Air Initiative for Asian Cities (CAI-Asia)

The CAI-Asia project has brought together government, private sector and civil society stakeholders to improve understanding and acceptance of policies and programmes that promote improved air quality by reducing pollution from mobile sources, stationary sources and area sources. The project was launched in 2001 after a meeting at UNESCAP in Bangkok, and it is being financed by the Asian Development Bank, World Bank, and the US Agency for International Development/US-Asia Environmental Partnership. Essentially, the project adopts a multisector approach that focuses on cities in South Asia, South-East Asia and East Asia which have significant air quality problems. It comprised of several components (Figure III-4).

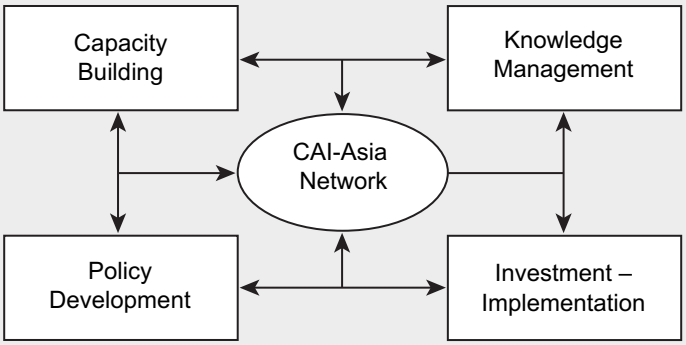
CAI-Asia encourages cooperation with existing networks such as APMA and projects supported by UNEP, WHO, the Stockholm Environment Institute and the Korea Environment Institute.[44]

---

[43] Viewed on website of Kitakyushu Initiative for a Clean Environment, 10 October 2007, http://www.iges.or.jp/kitakyushu

[44] Viewed on website of Clean Air Initiative for Asian Cities (CAI-Asia), 10 October 2007, http://www.cleanairnet.org/caiasia

Figure III-4. Components of the CAI-Asia Initiative



Source: CAI-Asia (2007), *Partnership Strategy 2007-2010*, viewed on the website of Clean Air Initiative for Asian Cities (CAI-Asia) on 10 October 2007, http://www.cleanairnet.org/caiasia

c) Other initiatives

There are many other inter-regional air pollution abatement initiatives. A significant number of these have specifically focused on increasing the use of cleaner transport fuels. Some of these initiatives include:

- The Air Pollution in the Megacities of Asia (APMA) project. The project aims to strengthen air quality management in major Asian cities by establishing an information network for city authorities.
- The Asian Clean Fuels Association (ACFA) was established in Singapore in 2000. To promote and advance the interests of stakeholders in the use of clean fuels that benefit the environment through leveraging their economic, technical and environmental attributes in Asia.
- The ASEAN – METI (Japan) Economic and Industrial Cooperation Committee (AMEICC) are in the process of discussing a roadmap to move to Euro 4 by 2010.
- The ASEAN Council on Petroleum (ASCOPE) in its internal planning has also assumed Euro 4 by 2010 as a benchmark.
- The Asian Clean Fuels Association (ACFA) undertook stakeholder consultations with the aim to develop fuel quality roadmaps in Asia. Stakeholders were brought together in November 2005 to develop a consensus on a roadmap for cleaner fuels in Asia (in conjunction with ASCOPE 2005).
- The International Council for Clean Transportation (ICCT) actively promotes leapfrogging to ULSD and Euro 4 emission standards for Asian countries with poor air quality.

2. National Initiatives

Institutional capacity for air quality management is limited in many countries of the ESCAP region.[45] However, recently, there has been an emerging trend for high and middle-income countries in the ESCAP region to formulate air pollution abatement strategies at the national level.

a) Improving fuel quality

Increasing the use of cleaner transport fuels has been a challenging goal for many ESCAP countries. Many refineries in Asia are not well equipped to produce clean fuels, but significant capital investment to upgrade production quantity is underway in several countries. Also, almost all Asian

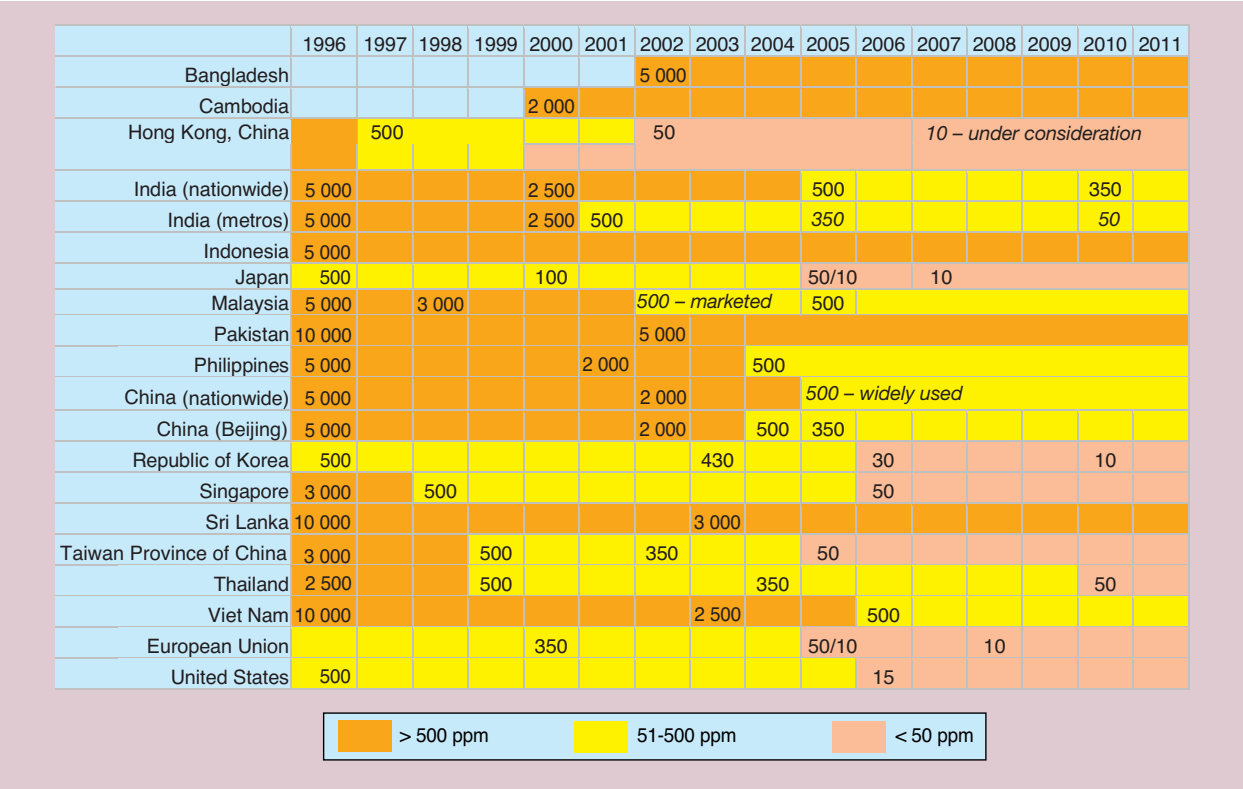
[45] CAI-Asia, 2007, *Partnership Strategy 2007-2010,* viewed on the website of Clean Air Initiative for Asian Cities (CAI-Asia) on 10 October 2007, http://www.cleanairnet.org/caiasia

countries have banned the use of leaded petrol and put into place cleaner fuel standards.[46] A number of countries in the ESCAP region have adopted one or a combination of incentives to achieve the desired uptake of cleaner fuels:[47]

- Tax and pricing differentials for cleaner fuels
- Direct subsidies and incentives
- Vehicle incentives

Almost all the countries listed in **Figure III-5** have set national goals to reduce sulphur levels to 500 ppm or below which has been actively encouraged by the Partnership for Clean Fuels and Vehicles (PCFV). The Figure also compares these efforts with those of the European Union and the United States.

Figure III-5. Efforts to Reduce Sulphur Levels



Source: An Emerging Consensus on Cleaner Fuels for Asia, Huizenga, Fabian, Boyle, Courtis and Walsh, for the 3rd Asian Petroleum Technology Symposium, 2-4 March 2005, http://www.cleanairnet.org/caiasia/1412/article-59891.html

b) Case study: The improvement of air quality in China

The Urban Transport Development Strategy and Demonstration Programme, has the primary objective of implementing the national Chinese urban transport strategy and strengthen its institutional capacity. The programme is being carried out in 14 cities[48]. The project aims to increase the modal share of public transport, and the implementation of new transport technologies and traffic management systems – all of which are targeted towards reducing greenhouse gas emissions.[49] Passenger vehicles are the major source of CO_2 emissions in each of the 14 cities cited by the Urban Transport Development Strategy and Demonstration Programme (Figure III-6).

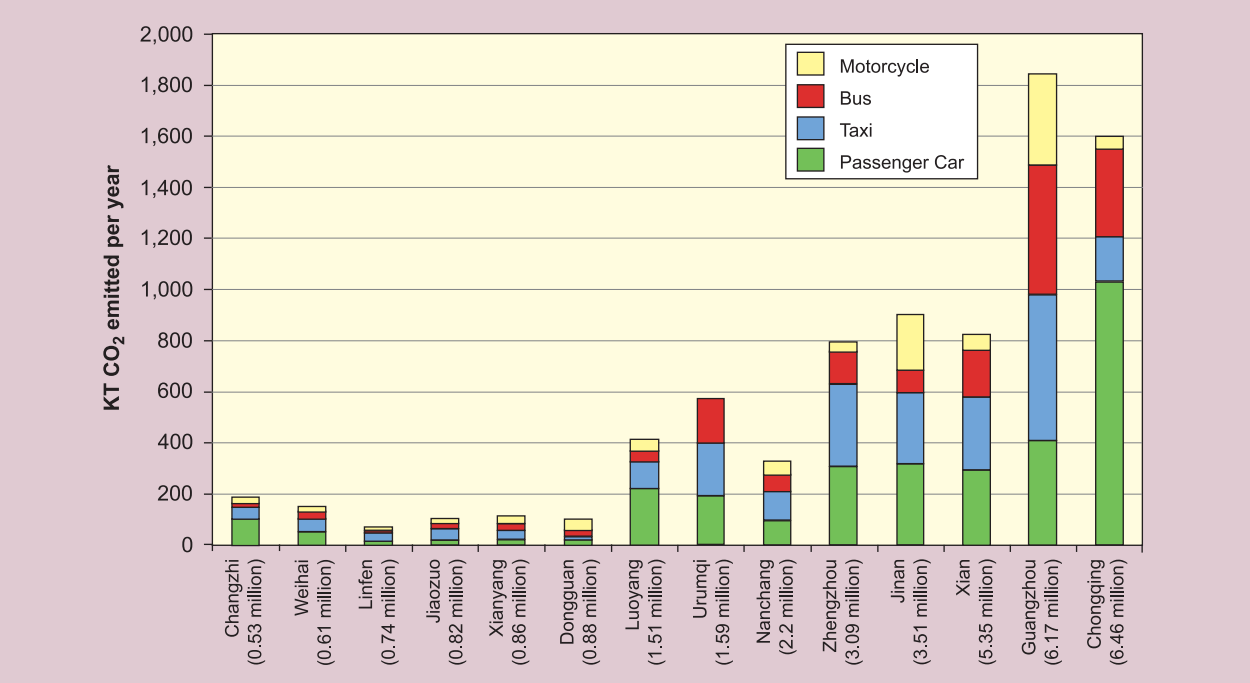
[46] CAI-Asia, 2007, *Partnership Strategy 2007-2010,* viewed on the website of Clean Air Initiative for Asian Cities (CAI-Asia), http://www.cleanairnet.org/caiasia

[47] Cleaner Fuels in Asia: *The Role of Pricing, Taxation and Incentives,* presented by Boyle & Huizenga for the Better Air Quality Symposium, December 6-8, 2004.

[48] The 14 cities are: Changzhi, Weihai, Linfen, Jiaozuo, Xianyang, Dongguan, Luoyang, Urumqi, Nanchang, Zhengzhou, Jinan, Xian, Guangzhou, Chongqing

[49] World Bank, 2004, *China Urban Transport Development Strategy Partnership and Demonstration Programme: Request for Pipeline Entry and PDF B Block Proposal,* Washington, DC.

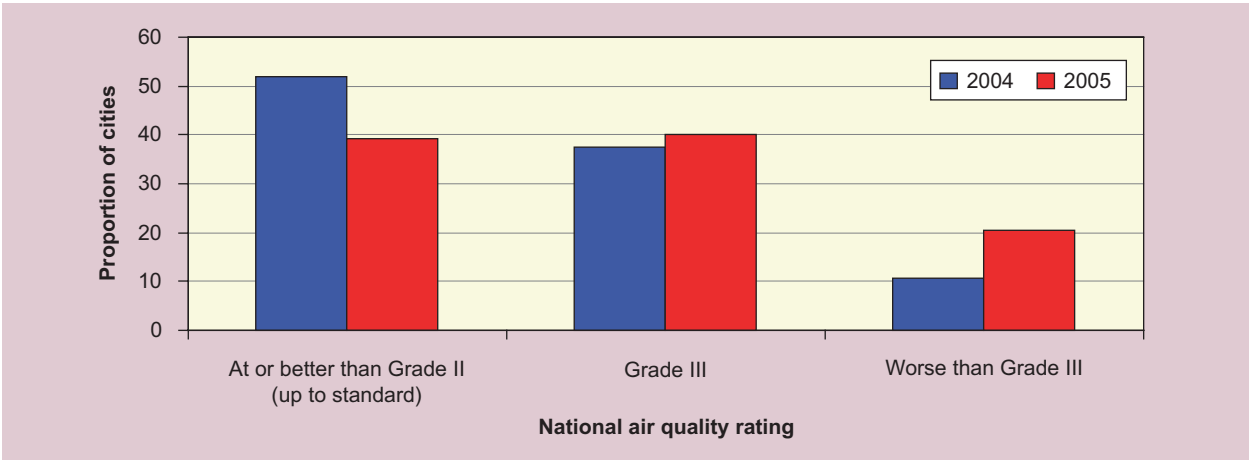
Figure III-6. Transport CO_2 emissions in programme cities by city and mode, 2006



Source: Mehndiratta, Shomik, 2007, *China – GEF – World Bank Urban Transport Partnership Programme: Clean transport in development countries transport forum*, viewed on the website of World Bank, 17 October 2007, http://siteresources.worldbank.org/INTTRANSPORT/Resources/336291-1171658979314/3465102-1175712029532/Shomik_Mehndiratta_Transport_Forum_2007.pdf

The air quality in the main 522 cities in China has improved substantially over the past few years. This improvement has been the result of numerous national and local initiatives that have sought to directly influence the level of air pollution. In 2004, approximately 40 per cent of the 522 monitored Chinese cities were at least at Grade II national air quality standards[50]; this improved substantially by 2005: 22 of the 522 monitored cities in China met Grade I national air quality standards (4.2 per cent of cities); and 293 met the Grade II standard (56 per cent). This also led to a reduction in the number of cities falling into the category of Grade III over the period 2004-2005: in 2004, approximately 22 per cent of cities failed to meet Grade III; whereas, in 2005, 10.6 per cent failed meet Grade III (10.6%). See Figure III-7 for more details.

Figure III-7. Proportion of cities in China meeting national air quality standards 2004-2005[51]



Data source: State Environmental Protection Administration, 2005, *Report on the State of the Environment in China,* viewed on the website of the State Environmental Protection Administration, 13 October 2007, http://english.sepa.gov.cn

[50] Grade II is classified as meeting the national standard, or 'up-to standard'.

[51] State Environmental Protection Administration, 2005, *Report on the State of the Environment in China,* viewed on the website of the State Environmental Protection Administration, 13 October 2007, http://english.sepa.gov.cn

This improvement in air quality has come at a time when the number of passenger motor vehicles has been increasingly rapidly. Vehicle numbers increased from one million to ten million during the period 1992-2002, and then to 22 million in 2006.[52]

3. Local Initiatives

At the urban (or local level), air pollution abatement strategies vary significantly between countries and cities in terms of the focus of attention on the different types of pollutants, and their source. This is primarily due to the need to target specific pollutants and emissions whilst working within the framework of local, national and regional policy frameworks. However, with respect to transport-related air pollution abatement strategies, there has been a trend of targeting three main areas:

- Vehicle standards and compliance
- Vehicle inspection and maintenance
- Urban redesign

a) Vehicle compliance

During 2005, the City of Shenzhen began to issue fines of 300 Yuan (US$ 36.30) to drivers that violate emissions standards. As part of a six-month grace period and public information campaign, police began putting labels on vehicles which fail to meet the Euro I or Euro II standards for petrol and diesel powered engines. Almost half of the 600,000 labelled vehicles in Shenzhen bear the yellow label and will face increasing travel restrictions. The Shenzhen police are also implementing a system that includes an odd and even number license plate schedule to reduce congestion and give priority to high capacity passenger vehicles at key nodes in the city's road network, such as railway stations.

b) Vehicle inspection and maintenance

In Chongqing the State Environmental Protection Administration (SEPA) is focusing on strengthening vehicle inspection and maintenance (IM). For many years, Chongqing's main air pollution problem was caused by sulfur dioxide (SO_2), primarily from coal burning. However, air quality monitoring data revealed that average nitrogen oxide (NO_2) concentrations have doubled in the past five years, an indication that vehicle emissions have increased rapidly during this period.

c) Urban redesign

Seoul, Republic of Korea, was the Institute for Transportation and Development Policy (ITDP), Sustainable Transport Award Recipient for 2005.[53] Seoul's ongoing paradigm change from a car-oriented city to one favouring transit, walking and cycling was achieved via the restoration of the Cheonggyecheon River. The dismantling of a six kilometre elevated highway and its replacement with the original stream, lined by high quality walkways and public spaces, holds many lessons for other cities about sustainable modernization. Twenty bridges cross the stream – five of which are exclusively for pedestrians and bicycles. Seoul now has more than 80 kilometres of median bus lanes that provide on-street priority.

TransJakarta has succeeded in building the first full Bus Rapid Transit system in Asia. It is currently moving some 65,000 passengers per day, and attracting some 14 per cent of these passengers from private cars, 6 per cent from motorcycles, and 5 per cent from taxis. Shifting these 16,250 daily trips to bus trips has helped to reduce traffic congestion and air pollution in the TransJakarta corridor, and it has cut travel time for the majority of its passengers by a significant margin. The new sidewalks along JI, Thamrin

[52] Figures for 1992 and 2002 from Mehndiratta, Shomik, 2007, *China – GEF – World Bank Urban Transport Partnership Programme: Clean transport in development countries transport forum,* viewed on the website of World Bank, 17 October, 2007, http://www.worldbank.org.

[53] Sustainable Transport, Winter 2005, pages 6-7.

and improved pedestrian bridges in the corridor have converted a lot of short distance taxi and motor vehicle trips to walking trips, also reducing air pollution and congestion in the corridor.[54]

d) Case study: Beijing

The City of Beijing has implemented numerous air pollution abatement policies in the past few years. In 2005, Beijing City implemented the 11th stage of its air pollution prevention and control strategy. The strategy is aimed at, amongst other things, reducing the level of CO_2 emissions from transport and energy production. Previous stages have focuses on strengthening monitoring and enforcement and accelerating the conversion to cleaner fuels (for example lower-sulfur coal and natural gas).

Some of the key outcomes of the policy include: in July 2005, the city began to supply fuels complying with the National Phase III Motor Vehicle Emission Standards; it also phased out 28,000 outdated taxis and 3,900 diesel-powered buses – the replacement vehicles all complied with the National Phase III Motor Vehicle Emission Standards[55]. Nowadays, approximately 90 per cent of Beijing's 18,000 buses and 70 per cent of its taxis are using some form of clean energy (such as natural gas or a retrofitting of diesel buses).

[54] *Making TransJakarta a World Class BRT System,* Final Recommendations of the Institute of Transportation and Development Policy, June 30, 2005.

[55] State Environmental Protection Administration, 2005, *Report on the State of the Environment in China,* viewed on the website of the State Environmental Protection Administration, 13 October 2007, http://english.sepa.gov.cn

IV. MEETING THE NEED FOR SAFE ROADS

In addition to the negative externalities of transport in terms of pollution and resource depletion, negative externalities of transport in terms of safety have been increasingly high on the agenda. In particular, a continuing reason for concern has been the large number of lives lost and injuries incurred on Asian roads.

This chapter examines status and initiatives in the area of road safety in Asia and the Pacific. It reports on the recent *ESCAP Ministerial Declaration on Improving Road Safety in Asia and the Pacific* (Section B), the status of road in the region (Section C), causal factors for road crashes in selected countries (Section D), national road safety targets in the region (Section E), as well as some information on road safety initiatives in China, Republic of Korea, Malaysia and Viet Nam.

A. Introduction

While transportation is an essential element of the global economy, road crashes and the associated deaths and injuries are a serious public health issue and affect the welfare of millions in the ESCAP region each year. In fact, the scale of the problem is such that it negatively affects national economies and constrains their development. According to the often cited *World Report on Road Traffic Injury*, road crashes worldwide kill some 1.2 people and injure roughly 50 million people each year.[56] Direct and indirect costs of road crashes are typically as large as one to three per cent of gross domestic product of developing countries. Direct costs include medical costs, costs for vehicle repairs and administrative costs; indirect costs include items such as the loss of quality of life (including pain, grief and suffering) and the loss of productivity.

The number of road traffic fatalities per capita is especially high in middle-income and newly industrialized economies. High fatality rates per unit of population are also linked to higher vehicle densities. It has been predicted that over the next 20 years the number of people killed and injured in road crashes worldwide will increase by as much as 65 per cent. It has been estimated that the number of road fatalities in Asia and the Pacific will almost double from 2000 to 2020, unless significant measures are taken to improve road safety. Already today, road traffic injuries are one of the largest contributors to the global burden of disease.[56] Since road crashes over-proportionally affect the poor, they in effect raise poverty levels in developing countries.

Given the significant costs associated with road traffic crashes, ESCAP countries have acknowledged the importance of creating and sustaining political commitment for improving road safety. The *ESCAP Ministerial Declaration on Improving Road Safety in Asia and the Pacific* which was adopted on 11 November 2006, *recognized* "that road safety is a public policy issue of major concern that requires a strong political commitment and effective interventions if road traffic fatalities, injuries and related human suffering are to be reduced significantly."[57]

The ESCAP secretariat has worked on road safety issues since 1992. It has supported the creation of Global Road Safety Partnership (GRSP) and is a member of the United Nations Road Safety Collaboration (UNRSC).

B. Ministerial Declaration on Improving Road Safety in Asia and the Pacific

The Ministerial Conference on Transport was organized by the ESCAP secretariat and hosted by the Government of the Republic of Korea in Busan from 6 to 11 November 2006. It was attended by 264 representatives, including 39 ministerial-level officials from 40 member and associate members of ESCAP, and 16 representatives from relevant organizations within and outside the United Nations system, including

[56] WHO, (2004). *World Report on Road Traffic Injury Prevention*. World Health Organization (WHO). Geneva.

[57] http://www.unescap.org/ttdw/roadsafety/files/BusanRoadsafetydeclaration_Nov06.pdf

the private sector. Road safety issues were featured high on the agenda, culminating in the adoption of the *Ministerial Declaration on Improving Road Safety in Asia and the Pacific* on 11 November 2006.

The Ministerial Declaration builds on the Asian Highway agreement and essentially extends key elements of the ASEAN road safety framework to the whole ESCAP region up to 2015. In particular, the Ministerial Declaration sets an overall goal to "*save 600,000 lives and prevent a commensurate number of serious injuries on the roads of Asia and the Pacific over the period 2007 to 2015*". It invites the members and associate members of the Commission to address road safety in the following areas:

- "Making road safety a policy priority;
- Making roads safer for vulnerable road users, including children, senior citizens, pedestrians, non-motorized vehicle users, motorcyclists, and persons with disabilities;
- Making roads safer and reducing the severity of accidents (building "forgiving roads");
- Making vehicles safer and encourage responsible vehicle advertising;
- Improving national and regional road safety systems, management and enforcement;
- Improving cooperation and fostering partnerships;
- Developing the Asian Highway as a model of road safety;
- Providing effective education on road safety awareness to the public, young people and drivers."

The Ministerial Declaration requests the development of "*a set of goals, targets and indicators, to be achieved by 2015, in order to assess and evaluate road safety progress*". The Senior Government officials meeting in preparation for the ESCAP Ministerial Conference on Transport agreed to a set of eight road safety goals (in line with priority areas), 24 targets and 45 indicators as a basis for future work. It should be noted that the set includes four measurable targets that specifically pertain to the 140,000 kilometres of Asian Highway, thus contributing to the road safety commitments under the Intergovernmental Agreement on the Asian Highway Network.

Subsequently, the Commission adopted *Resolution 63/9 on Implementation of the Busan Declaration on Transport Development in Asia and the Pacific and the Regional Action Programme for Transport Development in Asia and the Pacific, phase I (2007-2011)* in Almaty, Kazakhstan in May 2007. The Commission Resolution encourages "*members and associate members to continue to act upon the recommendations contained in the Ministerial Declaration on Improving Road Safety in Asia and the Pacific*".

C. Data and trends in road crashes in the ESCAP region

This section provides an overview of data on the current status (Section 1) and trends in recent years (Section 2) in terms of road crashes in ESCAP member countries.

1. Current status

In recent decades, the number of people killed in road crashes the ESCAP region has increased rapidly, which to a large extent has been due to rapid motorization. In the year 2005, an estimated 440,000 people were killed and as many as 20-30 million people were injured in road crashes in the ESCAP region. All developing countries in the ESCAP region have higher fatality rates than OECD countries. While only one in five of the world's motor vehicles are registered in the ESCAP region, more than half of the world's traffic fatalities occur in the region. China and India account for approximately half of these in the region. By 2020, roughly two thirds of the world's road fatalities will be occur in the ESCAP region, if not more decisive action is being taken.

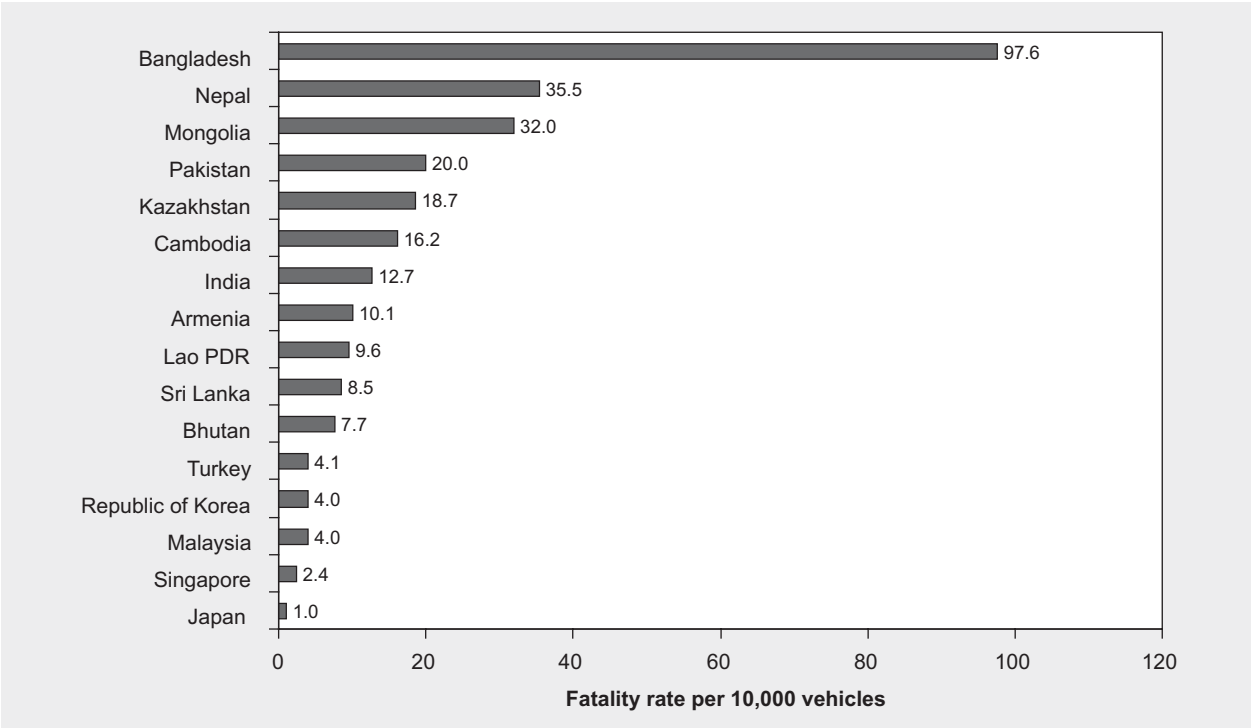
The nature of road safety issues in the region varies between developing and developed countries. The majority of people killed from road accidents in Asia are pedestrians and motorcyclists. According to

a Special Issue on road safety of the ESCAP Transport and Communications Bulletin, "(deaths as a result of) motorcycle (accidents) may be as high as 90 per cent (of road crash fatalities) in some Asian countries."[58]

In South Asian countries, more than 50 per cent of road fatalities are pedestrians. In East and South-East Asian countries, more than two thirds of the victims are motorcyclists. But in North and Central Asia the mix of casualties by road user type is more similar to that of OECD countries.

Figure IV-1 compares the number of road fatalities per vehicle in 2006 (or the most recent year for which data was available). This fatality rate is particularly high in Bangladesh, where almost 100 fatalities per 10,000 vehicles were reported. Very high fatality rates were also reported in Nepal, Mongolia, Pakistan, Kazakhstan and Cambodia. Most likely these rates are much higher due to underreporting which is typically as high as 80 per cent (!) in many ESCAP countries, according to estimates based on hospital records. Therefore, care should be taken in terms of comparing fatality rates across countries, as a lower rate may simply be due to less comprehensive reporting. On the other side of the spectrum are Singapore and Japan which do have good reporting systems and registered only 2.4 and 1.0 road fatalities per 10,000 vehicles, respectively.

Figure IV-1. Number of road fatalities per 10,000 vehicles in 2006 (or the most recent year for which data was available) in selected ESCAP countries



Source: UNESCAP Country Data, December 2007, http://www.unescap.org/ttdw/roadsafety/countrydata.html

Table IV-1 provides an overview of recent road safety indicators for selected ESCAP countries. The indicators are based on *reported* data, and thus the same word of caution applies in particular in terms of cross-country comparisons due to the high levels of underreporting. In the remainder of this Section 1, the road safety indicators are discussed country by country.

In Armenia, 1,309 road crashes that led to 1,771 serious injuries and 304 fatalities were registered in 2005. 43 of the road fatalities were pedestrians. Thus, the road fatality rate was 10 fatalities per 10,000 vehicles and 1.1 pedestrian deaths per 10,000 vehicles.

[58] Economic and Social Commission for Asia and the Pacific (2005) *Transport and Communications Bulletin for Asia and the Pacific,* Special Issue on Road Safety, No. 74, New York, 2005, www.unescap.org/ttdw/review/bulletin.html

Table IV-1. Road safety indicators in selected ESCAP countries

Country	Year	Number of motorized vehicles (1,000)	Number of road fatalities	Fatalities per 10,000 motorized vehicles	Number of serious road injuries	Serious injuries per 10,000 motorized vehicles
Armenia	2005	300,000	304	10.1	1,771	59.0
Bangladesh	2005	–	2,960	97.6	2,570	–
Bhutan	2005	29,914	23	7.7	247	82.6
Cambodia	2006	714,463	1,157	16.2	3,967	55.5
India	2004	72,718,000	92,618	12.7	464,521	63.9
Japan	2004	85,797,060	8,492	1.0	72,777	8.5
Kazakhstan	2005	1,807,737	3,374	18.7	17,422	96.4
Republic of Korea	2004	18,420,000	6,563	4.0	346,987	188.4
Lao PDR	2005	430,406	414	9.6	–	–
Malaysia	2006	15,790,732	6,287	4.0	9,253	5.9
Mongolia	2004	120,418	385	32.0	1,119	92.9
Nepal	2006	–	617	35.5	4,390	–
Pakistan	2004	–	10,275	20.0		–
Singapore	2006	–	190	2.4	104	1.3
Sri Lanka	2005	2,141	8	8.5	4,968	19.7
Turkey	2005	11,145,826	4,525	4.1	154,094	138.3

Source: UNESCAP Country Data, December 2007, http://www.unescap.org/ttdw/roadsafety/countrydata.html

In Bhutan, 1,038 road crashes that involved motorized vehicles were registered in 2005. 22 of the crashes were fatal leading to 23 deaths. In addition, 247 serious injuries and 77 hit-and-run cases were recorded. The comparable rates were 7.7 fatalities and 83 injuries per 10,000 vehicles.

In Cambodia, while there are laws for seat-belt and helmet wearing, compliance with these laws is not particularly strong. Similarly, road safety education is not part of the school curriculum and drink driving is currently not prosecuted. In Cambodia road accidents are the second largest cause of death and loss of livelihood after AIDS. The ADB has estimated that road accidents cost the Cambodian economy $ 116 million per year. In 2006 there were 16.2 fatalities per 10,000 registered vehicles, which was an increase of 15 per cent compared to previous year. In 2006, there were 905 pedestrian deaths in Cambodia, 1.805 pedestrian deaths per 10,000 vehicles. During the same year there were 807 motorcyclist deaths.[59] In Cambodia, 92 per cent of road accidents are caused by road users who violate the traffic law, including drunk and careless driving, and speeding.

In India, the most vulnerable road users include pedestrians and users of two-wheelers. In 2004, 8,405 pedestrians and 15,963 users of two-wheelers were killed in road crashes. India's fatality rate was reported to be 13 fatalities per 10,000 vehicles and 64 injuries per 10,000 motor vehicles. Due to underreporting, it is likely that in the same year there were 1.1 pedestrian deaths per 10,000 vehicles and 2.9 two-wheeler rider deaths per 10,000 two-wheelers.[60]

In Japan, there 952,191 road crashes reported in 2004. These crashes led to 8,492 road fatalities and 72,777 serious injuries. Thus, there were roughly 1.0 fatalities and 8.5 injuries per 10,000 motor vehicles. Enforcement was strong, too. For example, the rate of seatbelt usage was 88 per cent according to surveys.

In Kazakhstan, 14,517 road crashes led to a reported 3,374 fatalities and 17,422 injuries. This is equivalent to 19 fatalities per 10,000 vehicles.

[59] Status Paper on Financing and Improving Road Safety: Cambodia (2006), www.unescap.org/ttdw/roadsafety/countrypapers.html

[60] India Country Status Paper (2006) Expert Group Meeting on the Development of the Asian Highway Network, 8-10th May 2006, Bangkok, www.unescap.org/ttdw/roadsafety/countryreports.html

In the Republic of Korea, 213,754 road crashes, 6,327 fatalities and 340,229 serious injuries were reported in 2006. While the fatality rate declined in recent years, it has remained in the range of 3 to 4 fatalities per 10,000 vehicles since 2004. Road safety education in the Republic of Korea is part of the school curriculum. It is also mandatory to use helmets and seat belts. Seat-belt usage stood at 89.2 per cent, according to survey conducted in 2005.[61]

In Malaysia, 4 fatalities per 10,000 vehicles were reported in 2006. "Motorcycle casualties constitute more than two thirds of all crash casualties in Malaysia."[62]

In Nepal, 617 people were killed and more than 4,000 people were injured in road crashes in 2005/2006. There were a reported 36 fatalities per 10,000 motor vehicles. Pedestrians are the largest group of victims in road crashes in Nepal. In cities and urban areas, which have inadequate and narrow roads, there are a large number of crashes that involve two-wheelers, while on rural roads trucks and buses have high crash rates. Crashes that involve buses (mainly those for long-distance travel) account for 39 per cent of people killed and 60 per cent of people seriously injured.

In Pakistan, 10,275 road fatalities were reported in 2006, which amounts to 20 fatalities per 10,000 motor vehicles. The poor are affected the most by road crashes. Most of the victims are pedestrians, cyclist, motorcyclists or passengers of public transport. Most are between the ages of 15 and 44, with young people being particularly more vulnerable.[63]

In Singapore, 190 road fatalities (including 42 pedestrians) and 104 serious injuries were reported in 2006. There were 2.4 fatalities (0.5 pedestrians) and 1.3 injuries per 10,000 motor vehicles. There were also 102 motorcyclist deaths (including pillion deaths) which implies a toll of 7.2 motorcyclist deaths per 10,000 motorcycles. The Land Transport Authority is responsible to provide adequately designed roads and facilities for road users, as well as to ensure processes to check the road-worthiness of vehicles. The task of the Traffic Police is to enforce traffic regulations and to oversee road safety the education and awareness raising.[64]

In Turkey, 621,183 road crashes led to 4,525 fatalities and 154,094 injuries in 2005. This is equivalent to 4 fatalities per 10,000 vehicles.

In Viet Nam, urban road safety in Viet Nam is a significant issue. There are approximately 900 road fatalities per year in Ho Chi Minh City alone, and roughly 500 road fatalities per year in Hanoi of which 70 per cent are cyclists and motorcyclists.[65]

2. Trends over time

In recent years, several ESCAP countries have achieved remarkable results in improving road safety. Most ESCAP countries also have a road safety strategy and/or a road safety policy, programme and action plan.[66] However, in many countries there is still significant potential for further progress and improvement.

---

[61] Ministry of Construction and Transportation (2006) Status Paper on Road Financing and Improving Road Safety, Republic of Korea, April 2006, www.unescap.org/ttdw/roadsafety/countrypapers.html

[62] Economic and Social Commission for Asia and the Pacific (2005) Transport and Communications Bulletin for Asia and the Pacific, Road Safety, No. 74, New York, 2005, www.unescap.org/ttdw/review/bulletin.html

[63] Ahmed, A. (2007) Road Safety in Pakistan, National Road Safety Secretariat, Ministry of Communications, Government of Pakistan, June 21, 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[64] Status Paper on Road Financing in Singapore (2006) Expert Group Meeting on the Development of the Asian Highway Network: Regional Experiences and Lessons in Financing Highway Infrastructure and Improving Road Safety, 8-10 May 2006, Bangkok, www.unescap.org/ttdw/roadsafety/countrypapers.html

[65] World Bank (2007) Transport in Viet Nam, February 2007, viewed December 2007, www.worldbank.org

[66] Economic and Social Commission for Asia and the Pacific (2006) Road Safety in Asia and the Pacific, Meeting of Senior Government Officials in Preparation for the Ministerial Conference on Transport, 6-8 November 2006, Busan, Republic of Korea, viewed December 2007, www.unescap.org

Some governments have also developed long-term safety visions. For example, Hong Kong, China; is trying to achieve "zero deaths on the road", and Japan adopted the vision to have the "safest roads in the world."

Table IV-2 displays shows the road fatality and injury rates for selected ESCAP countries for each year from 1997 to 2006. While many countries have reported falling road fatality and injury rates (e.g., measured as the number of road fatalities per 10,000 motor vehicles), these nevertheless implied increasing absolute numbers of fatalities and injuries in most ESCAP countries due to rapid motorization. In view of high levels of underreporting (e.g., estimated to be at least 80 per cent for road fatalities in South-East Asia, and even more for injuries), care need to be taken particularly in cross-country comparisons and with the injury data.

Table IV-2. Road fatality and injury rates for selected ESCAP countries, 1997-2006

Country	Road fatality and injury rates	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Bangladesh	Fatalities/10,000 motor vehicles	–	137.4	143.1	142.6	123.2	126.2	116.1	102.9	97.6	–
	Injuries/10,000 motor vehicles	–	–	–	–	–	–	–	–	–	–
Bhutan	Fatalities/10,000 motor vehicles	–	–	–	29.9	22.8	23.5	22.4	27.4	7.7	–
	Injuries/10,000 motor vehicles				135.4	101.0	136.6	128.0	141.2	82.6	–
Cambodia	Fatalities/10,000 motor vehicles	3.5	3.8	6.6	12.1	12.0	13.1	18.4	21.5	15.7	16.2
	Injuries/10,000 motor vehicles	5.6	4.7	10.4	60.2	46.1	51.5	60.7	65.6	55.4	55.5
India	Fatalities/10,000 motor vehicles	–	–	18.3	16.2	14.7	14.4	12.8	12.7	–	–
	Injuries/10,000 motor vehicles				81.7	73.7	69.4	64.9	63.9		–
Lao PDR	Fatalities/10,000 motor vehicles	–	–	–	17.9	16.9	15.3	16.7	11.4	9.6	–
	Injuries/10,000 motor vehicles	–	–	–	–	–	–	–	–	–	–
Malaysia	Fatalities/10,000 motor vehicles	7.4	6.3	5.8	5.7	5.2	4.9	4.9	4.5	4.1	4.0
	Injuries/10,000 motor vehicles	66.2	60.9	53.3	47.4	44.7	7.0	7.1	6.7	6.3	5.9
Mongolia	Fatalities/10,000 motor vehicles	–	–	–	41.4	36.0	31.5	36.4	32.0	–	–
	Injuries/10,000 motor vehicles				197.8	194.7	157.6	114.1	92.9		–
Nepal	Fatalities/10,000 motor vehicles	42.1	42.8	25.5	22.8	61.9	45.4	71.9	73.5	42.0	35.5
	Injuries/10,000 motor vehicles	–	–	–	–	–	–	–	–	–	–
Republic of Korea	Fatalities/10,000 motor vehicles	7.0	8.0	8.0	8.0	6.0	5.0	4.0	4.0	–	1.3
	Injuries/10,000 motor vehicles	–	–	–	–	–	–	–	–	–	–
Singapore	Fatalities/10,000 motor vehicles	3.8	3.2	2.9	3.1	2.7	2.8	3.0	2.7	2.3	2.4
	Injuries/10,000 motor vehicles	4.2	4.6	5.8	5.8	4.8	2.5	2.0	1.1	1.2	1.3
Turkey	Fatalities/10,000 motor vehicles	–	–	–	–	5.1	4.8	4.5	4.3	4.1	3.8
	Injuries/10,000 motor vehicles	–	–	–	–	136.4	134.1	131.7	133.1	138.3	–
Sri Lanka	Fatalities/10,000 motor vehicles	–	–	–	11.6	11.0	10.8	9.4	9.2	8.5	–
	Injuries/10,000 motor vehicles	–	–	–	13.4	19.1	17.4	18.9	19.8	19.7	–

Source: UNESCAP Country Data, December 2007, http://www.unescap.org/ttdw/roadsafety/countrydata.html

Bangladesh reported the highest the road fatality rate per motor vehicle in the ESCAP region. This is despite a significant decrease in the number of road fatalities per 10,000 motor vehicles from 137 fatalities in 1998 to 98 in 2005.

Bhutan reported a reduction in the number of road fatalities per 10,000 motor vehicles from 29.9 in 2000 to 7.7 in 2005. Similarly, the number of injuries per 10,000 motor vehicles has declined 135 in 2000 to 83 in 2005.

Cambodia reported an increase in the number of road fatalities per 10,000 motor vehicles from 3.5 in 1997 to 16 in 2006. Similarly, the injury rate increased from 5.6 to 56 injuries per 10,000 motor vehicles from 1997 to 2006. It is likely that this is partly due to an improved road crash reporting system. Yet, 'road traffic accidents, casualties and fatalities continued to increase more proportionally than road

traffic and population.'[67] From 2003 to 2007, the number of road crashes in Cambodia increased by 50 per cent and the number of fatalities more than doubled, whereas the population increased by 12 per cent and the number of registered motor vehicles expanded by approximately 70 per cent.

Indonesia reported an increase in the number of road crashes from 17,732 in 2004 to 20,623 in 2005. The number of road crashes that were fatal increased by 3.6 per cent, while those resulting in serious or minor injuries increased by 10 and 2 per cent, respectively. Reasons for the large number of fatalities include speeding of many bus and truck drivers, poor medical treatment, the poor road conditions on many intercity routes, and insufficient vehicle maintenance.

Japan achieved a reduction in the absolute number of road fatalities from 16,765 in 1970 to 6,871 in 2005, despite increasing motorization.[68] This is largely due to the success of a series of five-year traffic safety programmes since 1971 that included quantitative targets. From 1994 to 2004, the number of fatal crashes due to drinking-and-driving halved from 1,458 to 710 due to a number of measures including tougher enforcement.[69]

Malaysia reported a halving of the number of fatalities per 10,000 motor vehicles from 7.4 to 4 from 1997 to 2006.

Mongolia reported a decrease in the road fatality rate from 41 road fatalities per 10,000 motor vehicles in 2000 and to 32 in 2004. Road crashes in Ulaanbaatar, the capital of Mongolia, account for 74 per cent of the national total. In 2004, there were 3,557 road crashes in Ulaanbaatar which killed 385 people and injured 2,312. Vulnerable groups of society, including small children and the disabled, were most prone to become road victims.[70]

Nepal reported large differences in the number of fatalities in recent years. There were 74 fatalities per 10,000 motor vehicles in 2004, compared to 36 in 2006.

The Republic of Korea reported a rapid reduction from 7.0 road fatalities per 10,000 motor vehicles in 1997 to 1.3 in 2006. Decisive action has also led to a reduction in the absolute number of road fatalities from 13,429 in 2003 to 6,327 in 2006. The introduction of speed cameras sine 1997 is said to have reduced the number of speed-related fatalities by 70 per cent. Other important government measures include road safety improvements for children and road safety awareness campaigns since 1992.

Singapore, Turkey, Sri Lanka and India reported a declining fatality rate in recent years. For example, in Singapore the number of fatalities per 10,000 motor vehicles declined from 3.8 in 1997 to 2.4 in 2006. Singapore and India also reported a declining injury rate. For example, in India the number of injuries per 10,000 motor vehicles declined from 82 in 2000 to 64 in 2005.

D. Main causes of road crashes

Rapid motorization due to successful economic development has led to an increased number of road crashes in many ESCAP countries and especially in large urban areas.

Generally, a combination of factors, including geometric features, vehicle design, road users' behaviour, driver, traffic and pavement characteristics, and environmental aspects, interact to cause road crashes as a result of improper interaction between vehicles and other road users (or roadway characteristics).[71] The most important reasons for road crashes do not only vary from country to country but

[67] Ung Chun Hour, H.E. (2007) Country Report on Road Safety in Cambodia, Royal Government of Cambodia, Ministry of Public Works and Transport, 22 June 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[68] Economic and Social Commission for Asia and the Pacific (2006) Road Safety in Asia and the Pacific, Meeting of Senior Government Officials in Preparation for the Ministerial Conference on Transport, 6-8 November 2006, Busan, Republic of Korea.

[39] Japan status paper, 2006, www.unescap.org/ttdw/roadsafety/countrypapers.html

[70] ESCAP (2007) Studies of the Motor Vehicle Distribution, its Increase and Traffic Accidents in Ulaanbaatar, www.unescap.org/ttdw/roadsafety/

[71] Chakraborty, S., and Roy, S.K. (2005) Traffic Accident Characteristics of Kolkata, Transport and Communications Bulletin for Asia and the Pacific, No. 74, 2005.

tend to depend on the type of location (type of road, urban/rural, terrain, etc.), and will also change over time. Road user behaviour is often cited to be the main "cause" of road crashes, but in many cases it is only one of several factors at a time. Indeed, other factors such as poor road conditions make incorrect road user behaviour more likely. A number of typical reasons for road crashes are listed in the following for selected ESCAP countries.

In Myanmar, four fifths of all motor vehicles have their steering wheel on the "wrong side" of the road. Most vehicles are imported from Japan and Thailand which drive on the left-hand side of the road, whereas there is right-hand side traffic in Myanmar. According to the government of Myanmar, the country may consider banning vehicles with steering wheels on the "wrong side" before the expected rapid increase in the number of motor vehicles over the next few decades.[72]

In Cambodia, poor road infrastructure conditions are major causes for road crashes besides behavioural aspects. In particular, road and bridge infrastructure does not meet appropriate road safety standards. Also, many vehicles are poorly maintained and cause crashes when brakes and steering wheels fail, tires burst or headlights fail to work.[73]

In China, overloading and speeding were the main causes of road crashes in recent years and contributed to as many as 70 per cent of all reported road crashes. This situation has most recently triggered decisive action by the authorities (see next section).

In India, traffic conditions vary widely. Means of road transport range from pedestrians to animal-drawn carts, non-motorized traffic, two-wheelers, cars, buses and trucks all of which share the same road space. Nearly four fifths of all road crashes are at least partly due to the behaviour of drivers, in contrast to 1.3, 1.8 and 1.2 per cent of crashes that are due to the behaviour of pedestrians and passengers, mechanical defects in vehicles, and bad roads, respectively. In 2000, the estimated cost of road crashes were as large as 3 per cent of GDP.

Kolkata Metropolitan Area (KMA) is a major urban centre and port in the Eastern part of India. A recent road safety study of KMA found that traffic accidents occur for a combination of reasons, including reckless driving of buses, minibuses and auto-rickshaws; inefficient traffic control at intersections; poor road geometrics; lack of public awareness; road user indiscipline and inefficient movement; and undefined bus stops. Most roads in Kolkata are narrow with bad geometrics and surface conditions. The lack of lane discipline contributes to confusion on the roads in addition to closely spaced and poorly designed intersections. Furthermore, the same road space is shared by vehicles of varying size, shape and maneuverability. Recent measures include the introduction of a one-way road system on major arterials, the construction of flyovers, improvement of geometrics of the intersections, and greater attention to road markings and signage. As a result, average travel speeds of vehicles have increased. The number of road crashes in KMA increased from 8,895 in 1995 to 11,036 in the year 2000, and decreased to 8,610 in 2002. The number of road fatalities was reported as 480 in 1995, 452 in 2000 and 457 in the year 2002. The number of injuries has increased by 11 per cent from 1995 to a peak in 2000, and declined thereafter by 42 until 2002.[74]

In Nepal, poor road user behaviour, including bad driving skills, drinking and driving, careless crossing by pedestrians and road side parking, is a key factor in most road crashes. In urban areas, crash clusters are found to occur predominately at road intersections while on highways, where there are plenty of steep grades and sharp bends, road crashes occur at bridge approaches, built-up road side areas and intersections. According to the Ministry of Physical Planning and Works, other areas affecting road safety which need to be addressed include the large amount of traffic during peak hours, the lack of essential infrastructure (including flyovers and subways, bypasses, parking spaces and traffic lights), poor vehicle

[72] Ministry of Construction (2006) National Road Safety, Government of the Union of Myanmar, Expert Group Meeting Development of the Asian Highway Network, www.unescap.org/ttdw/roadsafety/countrypapers.html

[73] Ung Chun Hour, H.E. (2007) Country Report on Road Safety in Cambodia, Royal Government of Cambodia, Ministry of Public Works and Transport, 22 June 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[74] Chakraborty, S. and Roy, S.K. (2005) Traffic accident characteristics of Kolkata, Transport and Communications Bulletin, No. 74, pp. 75-86, 2005.

conditions, the lack of lane separators, insufficient coordination among the agencies responsible for road safety issues, and above all a lack of sufficient funds for improving road safety conditions.[75]

In China the main issues regarding road safety include safety consciousness, vehicle safety performance, hidden trouble on highways, and traffic safety management. Many vehicles are in bad condition and have poor safety characteristics. There are too many vehicle models, rapid growth of auto population and overloading.

In Pakistan, major road safety issues include road user behaviour, public transportation, road infrastructure and vehicle safety issues.

- With regard to road user behaviour, lack of safety awareness on the part of unaccompanied children walking to schools and j-walking by pedestrians are frequent causes of road crashes. Motorcyclists' compliance with compulsory helmet wearing is low. The majority of motorists do not wear seat belts, which is partly due to the many old vehicles that do not have seat belts, and partly due to the fact that there is no legislation that makes seat-belts mandatory. Other issues include the increased use of cell-phones while driving and the lack of adoption of road safety into the curriculum at government schools.
- Public transportation is another road safety issue in Pakistan. A number of operating buses are at least 20 years old, and public transport vehicles are often overloaded. There are a large number of small transportation companies offering public transport services which have proved difficult to regulate.
- There are also a number of road infrastructure issues. Work zones are often poorly designed, while safety design standards have not been established creating significant road side hazards. Also, parking spaces are not available in large cities, which creates congestion and causes crashes as a result of illegal parking.
- Finally, vehicle safety is another area of concern in Pakistan. Trucks are often overloaded which can cause significant damage to roads and also leads to road crashes. Visual safety inspections are limited to vehicles used in public transportation. Vehicle lights are an area of concern due to the use of illegal high-intensity lights as well as the in appropriate use of fog lights.[76]

E. National road safety targets

This section provides a brief overview of existing national road safety targets and the ASEAN road safety framework

Most ESCAP member countries have a road safety strategy, vision, and/or a road safety policy, programme and action plan, including objectives and/or targets for the reduction of road accidents and their consequences. Some of these are summarized in Table IV-3. The examples of Japan, China, Indonesia and Singapore are explained in somewhat more detail in the following.

Japan has carried out a series of successful five-year *Fundamental Traffic Programmes* which set various national targets for fatalities and injuries. These programmes have helped reducing the number of road traffic fatalities from 16,765 in 1971 to 6,871 fatalities in 2005. Through its most recent programme, the 8th Fundamental Traffic Safety Programme (2006-2010), Japan aims to make its roads the "safest in the world" by reducing the annual number of victims who die within 24 hours of a road crash to less than 5,500 by 2010 and by reducing the total number of fatalities and injuries to less than 1 million.[77]

---

[75] Sharma, K.K. (2007) Country Status Paper on Road Safety in Nepal, Ministry of Physical Planning and Works Nepal for the Expert Group Meeting on Improving Road Safety on the Asian Highway, May 2007, viewed December 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[76] Ahmed, A. (2007) Road Safety in Pakistan, National Road Safety Secretariat, Ministry of Communications, Government of Pakistan, June 21, 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[77] Japan status paper, www.unescap.org/ttdw/roadsafety/countrypapers.html

Table IV-3. Road safety targets of selected ESCAP countries or groupings

ESCAP members and associate members and ASEAN	Overall targets
Armenia	Decrease the number of accidents.
Australia	2001-2010: "The target of the strategy is to reduce the annual number of road fatalities per 100,000 population by 40 per cent, from 9.3 in 1999 to no more than 5.6 in 2010."
Bhutan	Focus on education, awareness, habits and enforcement.
Brunei Darussalam	Save more than 56 lives in the five-year period of the action plan (for 2008) [Reduction of 45 lives and 2028 injuries (2005-2010)].
Cambodia	"Eliminate number of road fatality by educating peoples through illustrating posters, TV spots and radio broadcasting on road safety programme"; ASEAN target of saving 1,800 lives and prevent 36,000 injuries during 2005-2010.
France	Halve the number of road fatalities from 1997 to 2002.
India	Various targets of state Governments.
Indonesia	For 2005-2010: save 20,411 lives, 3.4 per cent deaths per 10,000 vehicles, increase seat-belt and helmet use to 90 per cent; ASEAN target of saving 12,000 lives and preventing 996,000 injuries during 2005-2010.
Japan	2006-2010: a) "Safest roads in the world" (<5,500 deaths); b) Less than 1 million injuries and deaths.
Kazakhstan	Reduce the number and severity of accidents.
Lao People's Democratic Republic	Save 917 lives and 21,000 injuries by the year 2010 by halving the anticipated increase in deaths and injuries; increase helmet wearing to 90 per cent.
Malaysia	By 2010, reduce the fatality rate to 2 per 10,000 vehicles, 10 per 100,000 people and 10 per billion vehicle-km; ASEAN target of saving 3,000 lives and preventing 21,900 injuries during 2005-2010.
Myanmar	ASEAN target of saving 940 lives and preventing 32,900 injuries during 2005-2010.
Nepal	Halve the number of road casualties in ten years.
Netherlands	Reduce the number of road deaths by 25 per cent during 1985-2000 and by 50 per cent during 1986-2010.
New Zealand	Reduce the road toll to no more than 300 deaths and fewer than 4,500 hospitalizations per year by 2010 (from 404 fatalities in 6,670 hospitalizations in 2002).
Philippines	ASEAN target of saving 3,000 lives and prevent 258,000 injuries during 2005-2010.
Republic of Korea	"Prevent road accidents and advance transport culture"; reduction of 62 per cent between 2000 and 2006.
Russian Federation	Local target in Krasnoyarsk region "to decrease the accident rate by 10-15 per cent and the number of victims of road accidents by 10-12 per cent every year".
Singapore	Reduce fatalities by 100 between 2004 and 2008. ASEAN target of saving 100 lives and prevent 4,300 injuries during 2005-2010.
Thailand	ASEAN target of saving 13,000 lives and prevent 1,508,000 injuries during 2005-2010.
Turkey	Reduce fatalities and injuries on highways by 40 per cent within 5 years.
United Kingdom	Reduce the number of road deaths and serious injuries by 40 per cent during 1998-2010.
United States of America	Reduce the number of all road deaths by 20 per cent during 1996-2008, and to reduce the number of road deaths involving large trucks by 50 per cent during 1998-2010.
Viet Nam	ASEAN target of saving 7,000 lives and prevent 16,100 injuries during 2005-2010.
ASEAN	Reduce the number of projected road deaths and injuries by 12 per cent during 2005-2010.

Sources: Country papers and status notes on road safety, submitted to the ESCAP secretariat by government officials in 2006 and 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html; and OECD, Safety on Roads: What's the Vision? (Paris, OECD, 2002).

Note: Information refers primarily to a sample from Fiji and 22 Asian Highway network countries which is representative of the whole ESCAP region, covering the vast majority of the population (roughly 3.3 of 3.8 billion).

China's *Law on Road Transport Safety* aims to improve road safety, strengthen institutional capacities and to raise public awareness of road safety issues.[78] As overloading and speeding were the main causes of 70 per cent of road crashes in recent years, the Chinese government has taken effective action in terms of enforcement of traffic laws, standardization of vehicle manufacturing, labeling of vehicle tonnage, and road safety education and campaigns.

Indonesia's current *Safety Strategy and Programme 2012* is directed at reducing the number of road fatalities by 20 per cent between 2002 and 2012, i.e., from 14.1 to 11.3 road deaths per 100,000 people. The Programme also aims to reduce the number of injuries caused by road crashes by 15 per cent from 207 to 187 injuries per 100,000 people. The plan is to achieve these targets through strengthening of institutional coordination, awareness raising, education, evidence-based road safety management, and increasing "orderliness" of traffic.[79]

Myanmar developed a national road safety plan as a contribution to the recent ASEAN Road Safety Framework Project. The action plan includes a set of measures that focus on the safety of vulnerable road users, particularly motorcyclists and pedestrians. An overall target of the action plan is to save 940 lives and prevent 32,900 injuries during 2005-2010. The action plan implies a halving of the annual increase in road fatalities from 6.4 per cent in 2006 to 3.2 per cent in 2011 and a reduction in the number of road fatalities per 10,000 motor vehicles from 27 in the year 2003 to 20 in 2008. Another target is to achieve a 90 per cent helmet wearing rate for motorcyclists and a 70 per cent seatbelt-wearing rate in motor vehicles.[80]

Singapore aims to reduce the fatalities by 100 fatalities between 2004 and 2008 through the country's National Road Safety Action Plan. On 21 April 2007, LTA, TP and National Safety Council jointly launched the first "Global Road Safety Week" alongside the First United Nations Global Road Safety Week (23-29 April 2007). The campaign aims to raise awareness of road safety. A Road Safety Conference was held with the theme "towards better road safety for all". "The event included Shell road safety games for children, driving schools and motorcar service centers."

As mentioned in section B, the ESCAP *Ministerial Declaration on Improving Road Safety in Asia and the Pacific* (see Section B) essentially extended the overall ASEAN road safety targets to the whole ESCAP region and updated its time frame to 2015. In fact, the ASEAN road safety project and the resulting framework, which was earlier funded by ADB, has been catalytic in terms of increasing the awareness of the scale and costs of the road safety issue to decision makers. Since road crash data in South-East Asia are often incomplete and inadequate, the project "was aimed at quantifying the scale and characteristics of the problem, assisting individual ASEAN member countries and the region to develop appropriate road safety strategies and action plans, developing a safety research capability in each country and commencing the establishment of an internet based ASEAN Safety Network to enable Safety professionals across ASEAN to collaborate and discuss/share best practices."[81] "In order to boost economic integration in the ASEAN region, all country members have agreed to set up targets to reduce road accidents": less than 10 fatalities per 10,000 vehicles by 2004; 7 fatalities per 10,000 vehicles by 2010; and 2 fatalities per 10,000 vehicles by 2020.

[78] Status paper submitted to ESCAP in 2006, www.unescap.org/ttdw/roadsafety/countrypapers.html

[79] Directorate of Road Transport Safety (2007) The Development of Road Transport Safety in Indonesia, 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

[80] Ministry of Construction (2006) National Road Safety, Government of the Union of Myanmar, Expert Group Meeting Development of the Asian Highway Network, www.unescap.org/ttdw/roadsafety/countrypapers.html

[81] Ross, A. and Melhuish, C. (2005) Road Safety in ASEAN: Introducing a Regional Approach, Transport and Communications Bulletin for Asia and the Pacific, No. 74, Economic and Social Commission for Asia and the Pacific, pages 2-3, www.unescap.org

F. Examples of road safety initiatives in China, the Republic of Korea, Malaysia and Viet Nam

This section provides a more detailed overview of road safety initiatives in China, the Republic of Korea, Malaysia and Viet Nam.

1. China

In China, approximately 100,000 people are killed in road crashes every year and some 5 million people are injured. Road crashes in China are often due to under-developed-roads, poorly maintained vehicles, and insufficient road safety awareness. The economic cost of road crashes in China are estimated at 3 to 6 per cent of gross domestic product.

The Chinese government undertook a number of road safety initiatives in recent years. For example, in 2004 the issue of overloading was addressed by the Ministry of Communications, the Ministry of Public Security and six other ministries, and the occurrence of overloading is said to have been reduced from 80 to 10 per cent.

Road infrastructure has been made safer through the elimination of hidden dangers on roads and the improvement of sharp turns, steep grades, sections with poor sight distance and dangerous roadside conditions on highways. An estimated 210,000 dangerous spots were improved and 61,000 kilometres of road reconstructed through China's *Road Safety Guarantee Project*. The project was launched by the Ministry of Communications in an effort to eliminate hidden dangers and save lives. So far, the project has resulted in a reduction in the number of road crashes by 90,000 and the number of fatalities by 5,000 between 2004 and 2005. Road safety components have also been increasingly included in the current large-scale expressway projects which may have a long-lasting impact on improved safety.

The Chinese government also wants to strengthen the administration within the transportation industry and transport enterprises, launch transportation safety inspections and special rectifying movements toward dangerous freight transportation as well as strengthen the training and operation administration of drivers.

China still accepts assistance from the World Bank. For example, in 2007, a grant (US$ 500,000) was received from Global Road Safety Facility to finance the Hubei Provincial Road Safety Training Center which will raise road safety awareness, improve the quality of facilities and establish a network of road safety practitioners.

2. Republic of Korea

The Republic of Korea's *National Transport Safety Strategy (2007-2011)* aims to reduce the number of road fatalities by 30 per cent between 2006 and 2011, from 6,317 in 2006 to 4,350 in 2011. In 2007, the Republic of Korea also introduced a *National Transportation Action Plan* and allocated an estimated US$ 1.6 billion.

Infrastructure: The government aims to create safer roads through a number of measures. It will carry out road safety audits and inspections, and reduce the number of hazards from roadside obstacles (such as trees and poles) in addition to the creation of black spot and hazardous locations improvement programmes. It also aims to improve road safety in rural areas using, for example, with rumble strips. New signs and safety fences will be installed on road curves and highways will be regularly monitored and maintained. There will be campaign periods for improved road maintenance and safety to improve and repair safety facilities and infrastructure. Road infrastructure will be improved to make it safer for vulnerable road users, e.g., improved pedestrian, adoption of Silver Zone for old people and an improved school zone programme.[82]

[82] The Ministry of Construction and Transportation (2007) Reporting about Korean National Road Safety, the Republic of Korea, June 2007, www.unescap.org/ttdw/roadsafety/countrypapers.html

Road user behaviour and enforcement: The road safety plan targets road user behaviour through national campaigns and enforcement. The plan includes measures to improve enforcement of wearing of helmets, seat-belts, and child restraints, as well as compliance with speed limits (e.g., through an increased number of speed cameras). Awareness of road safety issues will be raised through better education for young and learner drivers, driving schools for commercial vehicles' drivers, and school education road safety programmes, nation-wide media campaigns.

Vehicle safety: The road safety plan also aims to make vehicles safer through the development of new ITS-based technologies, an integrated vehicle registration and information system, and a strengthened recall system and regular inspection for vehicle defects.

Emergency services: Finally, the plan also foresees improvements in the emergency medical service, including shorter response times and better medical training and equipment.

3. Malaysia

Malaysia's road safety policy follows a comprehensive "4E-approach" that includes initiatives in the areas of **e**ducation, **e**ngineering, **e**nforcement and **e**nvironment. The Ministry of Transportation of Malaysia drafted and the government accepted the "Road Safety Plan 2006-2010". The Plan details guidelines, strategies and road safety initiatives. The national road safety targets of Malaysia aim to achieve by 2010 less than 10 road fatalities per 100,000 population, 2 fatalities per 10,000 registered vehicles, and less than 10 fatalities per billion vehicles kilometres traveled.

In 2007, the government introduced a new road safety curriculum for all primary schools in Malaysia. The decision was based on a pilot testing of the curriculum and its effects that was implemented by the Road Safety Council (of the Ministry of Transport) in Pasir Mas, Kelatan, from 2004 to 2005.

Most fatal road crashes in Malaysia involve motorcyclists. Motorcycles also represent more than two thirds of the Malaysian vehicle fleet. Malaysian government has mandated the use of running motorcycle headlights during the day. It has also made good experience with separate exclusive motorcycle lanes even on roads between cities.

In 2007, the Malaysian Institute of Road Safety (MIROS) was created for research, evaluation and development. It also evaluates and the road safety standard design and audit, the use of road safety devices, the creation of a safe vehicle database and a review on motorcycle lanes. A hazardous locations improvement initiative has also been implemented in Malaysia.[83]

4. Viet Nam

In Viet Nam, approximately 30 people per day are killed in road crashes and approximately 60 people are injured. As the economy and motorization in Viet Nam continue to grow, so too does the countries road fatality rate which is causing serious economic and social consequences for the country. But "appropriate transport policies and infrastructure development can help cope with [Viet Nam's] surge in traffic, but more is needed."[84]

In 2005, Viet Nam received a US$ 31.7 million loan from the World Bank for a dedicated road safety project. The project aims to improve the management of road safety in Viet Nam through institutional capacity building and road improvements. It also aims to improve the enforcement of road safety laws, raise awareness, and improve emergency medical services as well as facilities for vehicles and driver testing. The worst safety record in terms of road fatality and injury rates occur on three main sections of Viet Nam's national roads. Therefore, the project also aims to introduce 'safe highway' demonstration corridors. The overall target is to reduce the fatality rate on the project's 'safe highway' roads by half and injury rates by two thirds after 5 years.

---

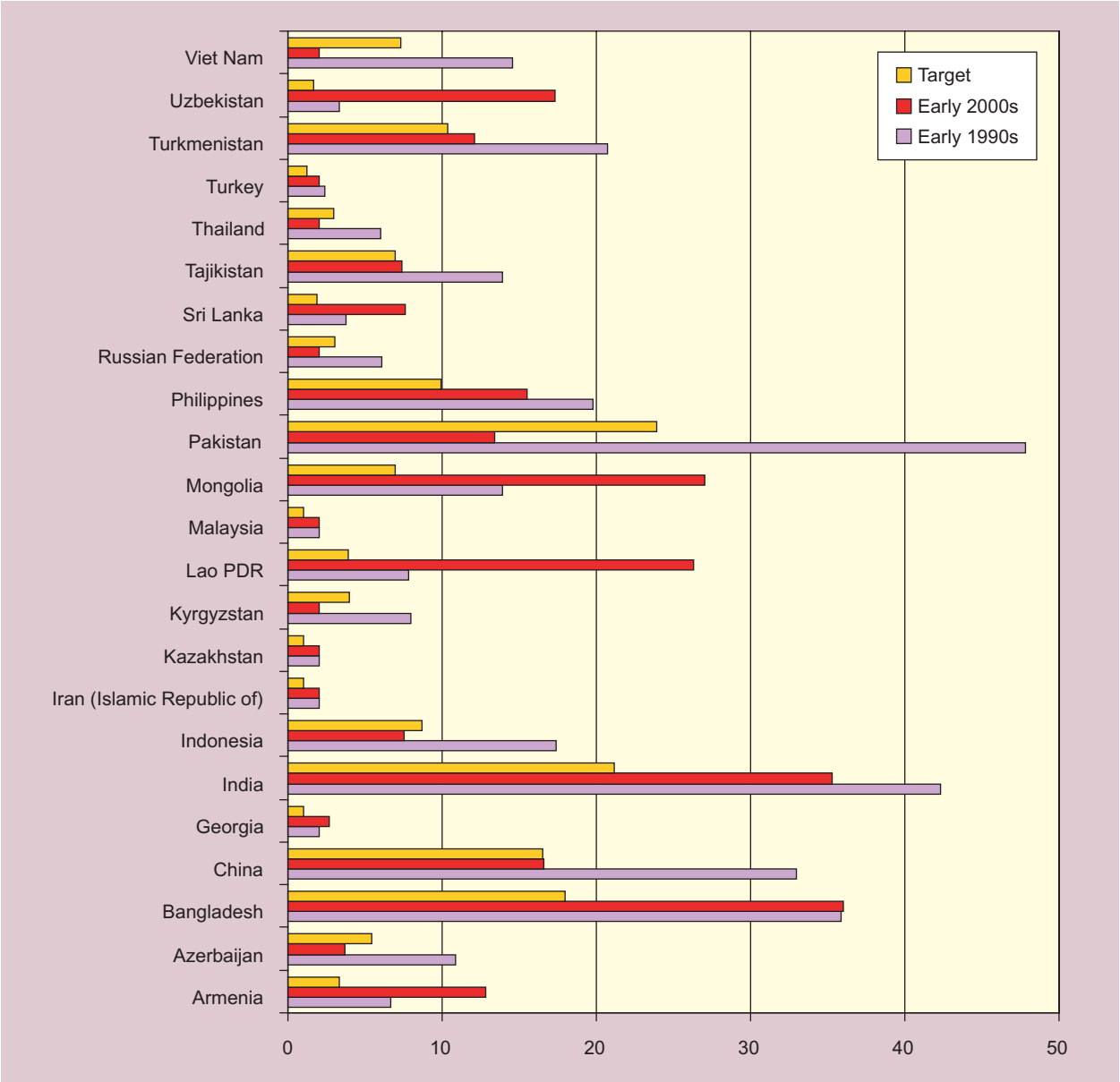
[83] Status Paper on Road Safety in Malaysia (2007), www.unescap.org/ttdw/roadsafety/countrypapers.html

[84] World Bank, viewed December 2007, www.worldbank.org

V. MEETING THE NEEDS OF THE POOR

Close to 800 million people in the ESCAP region (accounting for two-thirds of the world's poor) live on less than one dollar per day. In recent years however, significant steps have been made towards reducing poverty in the region. In fact, the overall incidence of income poverty has been reduced from 31 to 20 per cent between 1990 and 2001.[85]

Figure V-1. Progress toward halving the number of people living on less than US$ 1 per day in selected ESCAP countries. Population shares of these poor people in the early 1990s, 2000s, and MDG target.



Source: ESCAP, A future within reach: Reshaping institutions in a region of disparities to meet the Millennium Development Goals in Asia and the Pacific, United Nations Publication Sales No.E.05.II.F.27, 2005

[85] ESCAP, *A future within reach: Reshaping institutions in a region of disparities to meet the Millennium Development Goals in Asia and the Pacific*, United Nations Publication Sales No. E.05.II.F.27, 2005.

According to a United Nations ESCAP report on the Millennium Development Goals[86], this is remarkable progress and ESCAP countries are therefore on track to achieve the Millennium Development Goal (MDG) of halving, between 1990 and 2015, the proportion of people who live on an income of less than US$ 1 per day.[87]

The reduction of poverty in Asia and the Pacific is expected to be strongly influenced by achievements in China and India. These two countries are currently on track to reach their 2015 poverty targets. In China, the proportion of people living in poverty declined from 33 to 16 per cent between 1990 and 2001, while in India the proportion declined from 42 to 35 per cent (Figure V-1).

However, the progress of poverty reduction has been uneven for countries in Asia and the Pacific. Figure V-1 shows that North and Central Asian countries have had great success in achieving their MDG targets; these include Kyrgyzstan, the Russian Federation, Tajikistan and Turkmenistan, which have reduced their poverty levels by more than half since the early 1990s. Similarly, a number of countries in South-East Asia (especially Indonesia, Thailand and Viet Nam) are also reaching their poverty-reduction goals. Progress in South and South-West Asia has been positive for India, Pakistan and Turkey. Overall there are 17 countries in Asia and the Pacific that are either currently on track or have already reached their 2015 poverty target.

In spite of this progress, there are countries that are deviating from their poverty reduction targets – including Armenia, Bangladesh, Sri Lanka, Lao People's Democratic Republic, Mongolia and Uzbekistan.

A. Transport and poverty reduction

The United Nations Millennium Development Goals (MDG) are now "common currency" in the development world, used to benchmark progress towards poverty reduction. For example, the Asian Development Bank (ADB) uses the MDGs as a framework for its Poverty Reduction Strategy (PRS).[88]

While poverty can be broadly defined as the inability to meet basic needs, the MDGs highlight the diverse aspects and manifestations of poverty. In short, a poverty of income or expenditure is one, but not the sole, indicator and form of poverty. Equally, the poor are not a monolithic, homogenous category: people living in poverty have diverse needs, transport-related or otherwise, between and within regions, subregions and countries. This section therefore uses rural and urban poverty as broad categories, and does not and cannot present an exhaustive list of the dimensions of poverty in the region.

The MDG's make an explicit connection between the provision of transport infrastructure and services and poverty reduction.[89] The connection is also widely recognized amongst major international organizations, such as United Nations, the Asian Development Bank and the World Bank. At the same time, it is also widely accepted that developments in transport can potentially have an adverse impact on the poor, who tend to be more vulnerable to bad policy and investment decisions.

B. Rural poverty and transport

According to the ADB, approximately half the total population within Asia and the Pacific reside in rural areas, and currently 85 per cent of this number still live on less than a US dollar a day. By 2015 it is predicted that Asia will still be home to half of the world's poor with three-quarters of the world's poor still living in rural areas.[90]

---

[86] ESCAP, *A future within reach: Reshaping institutions in a region of disparities to meet the Millennium Development Goals in Asia and the Pacific,* United Nations Publication Sales No. E.05.II.F.27, 2005.

[87] *The Millennium Development Goals: Progress in Asia and the Pacific 2006,* viewed on website of Millennium Development Goals, September 2007, http://www.mdgasiapacific.org/

[88] *Asian Development Bank, Enhancing the Fight Against Poverty in Asia and the Pacific: The Poverty Reduction Strategy of the Asian Development Bank,* ADB, Philippines, 2004.

[89] See for example Estache, Antonio and Pinglo, Maria Elena, *Emerging Infrastructure Policy Issues in Developing Countries: A Survey of the Recent Economic Literature,* The World Bank, Washington D.C. 2004, Background paper for the October Berlin meeting of the POVNET Infrastructure Working Group.

[90] Von Braun, J. and Islam, N., *Agriculture and Rural Development for Reducing Poverty and Hunger in Asia: Past performance and priorities for the future,* viewed on website of ADB, October 2007, http://www.adb.org/

Transport is an important infrastructure sector as it helps encourage economic growth, boost incomes and assists in the reduction of poverty levels.[91] Transport also facilitates access to economic and social services critical to achieving the millennium development goals. In particular, transport infrastructure enhances the production and trade capability of local, national and regional economies.[92]

It is possible to generalize a number of broad characteristics of rural poverty, and the concomitant transport needs of the rural poor, in the ESCAP region. For instance, the rural poor often lack access to the most basic services, such as health and education and economic opportunities. At an economic level, access to markets is required in order to sell and buy goods or produce consumables in particular. The rural poor may require transportation to find non-farm employment.

When referring to the infrastructure needs of people in these areas, roads and also inland waterways (particularly in South-East Asia) are of particular importance. For example, if main or secondary roads are not sealed and are vulnerable to heavy rains, or if bridges or piers are unusable, the ability of rural children to attend school can be limited. Likewise, it may be difficult for the sick to reach medical services, and conversely, for medical supplies or services to reach the sick. Access to transport infrastructure and services is rarely available year-round often leaving people isolated for extended periods. Lack of reliable transportation also increases production and transportation costs and leaves the rural poor particularly vulnerable to economic and natural crises, such as drought. The lack of reliable, basic transport infrastructure can impede relief efforts, exacerbating existing conditions.

Effective transport infrastructure and services can assist poverty reduction in a number of ways. Most importantly, they link people with economic opportunities and basic services: for instance, they may link rural people with markets to sell their goods, and provide access to schools and hospitals.

Investment in transport targeting rural populations can also have an indirect effect on poverty alleviation. The development of roads for example, can reduce the costs associated with servicing rural areas, by lowering transport costs and improving market access.[93] Moreover, one study on road development and poverty reduction in Lao PDR found that approximately 13 per cent of a decline in rural poverty between 1997-1998 and 2002-2003 could be attributed to improved road access alone.[94]

In 2006 the ADB published a special evaluation study concerning pathways out of rural poverty. The study involved an Operations Evaluation Mission which visited three countries (Viet Nam, the People's Republic of China and Malaysia) to gain an in-depth understanding of how rural households climb out of poverty. After a visit to the Chinese province of Yunnan, ADB found that upgrading roads in areas with a high potential for commercial agriculture, sufficient land and favourable conditions was worthwhile and contributed considerably to poverty reduction.[95]

Rural infrastructure has a high unit cost however, due to the relatively low population levels compared with urban areas. Unfortunately, this is often a disincentive for investment in much needed resources, particularly where funding is limited.

---

[91] World Bank, *Promoting Global Economic Priorities in the Urban Transport Sector: Experience from World Bank Group,* Global Environment Facility Projects, Environment Department, 2006, viewed on website of ADB, October 2007, http://www.adb.org/

[92] OECD, *Promoting pro-poor growth: Infrastructure,* Report, 2006, viewed on website of OECD, October 2007, http://www.oecd.org/

[93] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, *Connecting East Asia: A New Framework for Infrastructure,* ADB, Philippines, 2005.

[94] Warr, P., *Road Development and Poverty Reduction: The Case of Lao PDR,* ADB Institute Discussion Paper No. 25, Asian Development Bank, February 2005.

[92] Asian Development Bank, *Pathways out of rural poverty and the effectiveness of poverty targeting, special evaluation study,* Operations Evaluation Department, May 2006.

C. Urban poverty and transport

The ESCAP region has the world's fastest growing urban population and is currently transforming from a rural, agriculture-dominated region to an increasingly urban region dominated by industrial and service sectors. At the same time, it is estimated that between 240 and 260 million of the poor in Asia live in urban areas, with the majority living in China, India, Bangladesh, Indonesia and Pakistan.[96]

By 2025, the developing economies of the ESCAP region are expected to be, on average, 58.9 per cent urbanized. While it is anticipated that poverty levels will remain highest in rural areas, the poor living in urban areas are projected to average 40 per cent of the region's total. This marks a dramatic increase from 25 per cent in 1998.[97] In other words, increased urban poverty is expected to be an unfortunate feature of increased urbanization which is already evident by the aggregate number of people in urban areas living in poverty.[98]

In April 2005, ADB, World Bank and the Japan Bank for International Cooperation (JBIC) released a report detailing the findings of research into East Asia's Infrastructure needs, in terms of transport, water, sanitation, power and telecommunications. In turn, the report provides a framework for investment in infrastructure which stresses a direct correlation between increased urbanization and rising national income levels. Moreover, it points to the rapid growth of cities in the Region as having driven economic growth and transformed national economic structures.[99]

However, according to the OECD, "urban areas in particular may suffer if their rapidly growing demand for transport is not met."[100] Few urban transport systems currently integrate social concerns and certain needs of vulnerable groups effectively, causing these systems to be ineffective pertaining to the reduction of poverty.

The urban poor suffer, as do the rural poor, from inadequate access to economic opportunities. Yet they lack adequate access to employment and labour markets, rather than to product markets. Transportation issues are central to this story of urban poverty in the Region. While the implementation of efficient transport systems in urban societies has been found to contribute to the reduction of poverty through increased economic growth, current systems inadequately incorporate all the specific needs of the poor. This has resulted in increased difficulty for the poor to make the journey to work or access required services.

As rapid urbanization continues to contribute to the escalation of the numbers of urban poor, vast increases in the number of vehicles on the road, and consequently increased congestion, are generating significant problems for this group. The three main problems include ill-health from pollution, inadequate access to affordable transport systems and concerns for road safety. Firstly, the poor are more vulnerable to the risks associated with transport externalities and therefore lack the means to avoid exposure to polluted air. In terms of affordability, as cities grow the poor are forced to live either in slums in the city or on distant city peripheries, which creates time-consuming, costly journeys to work. Thirdly, the poor in developing countries are faced with higher risks when traveling than the wealthy due to the lack of safety provisions for cyclists and pedestrians at street crossings and the inefficient enforcement of pedestrian crossings.[101]

---

[96] Asian Development Bank, *Special evaluation study on urban sector strategy and operations,* Urban Sector Strategy and Operations, Reference No. sst:reg 2006-03, ADB Operations Evaluation Department, June 2006.

[97] World Bank, *Urban Poverty in East Asia: a review of Indonesia, the Philippines, and Viet Nam,* East Asia Urban Working Paper Series, No. 11, East Asia Infrastructure Department Urban Sector Development Unit, September 2003.

[98] Asian Development Bank, *Urbanization and Sustainability in Asia: Case studies of good practice,* edited by Brian Roberts and Trevor Kanaley, 2006, viewed on website of ADB, 10 October 2007, http://www.adb.org/

[99] Asian Development Bank, *Connecting East Asia: A New Framework for Infrastructure,* ADB Japan Bank for International Cooperation and the World Bank, Philippines, 2005.

[100] OECD, *Promoting pro-poor growth: Infrastructure,* Report, 2006, viewed on website of OECD, October 2007, http://www.oecd.org/

[101] Asian Development Bank, *Sustainable Urban Transport,* Technical Assistance Report, Project Number: 39335, ADB, October 2006.

Across urban populations, whether low or high income, there tends to be some physical distance between where people live and work. Transport infrastructure and services therefore form an important intermediary role in connecting people's homes and workplaces, enabling them to earn the income needed to provide for their needs.

The difference between poor urban dwellers and their more affluent neighbours is that the urban poor tend to live in informal settlements, largely out of reach of public transport networks. When motorized transport is available, its cost tends to be high relative to their low income. A slight increase in bus fares may therefore preclude a person from using this mode of transport, and subsequently to attain or maintain employment. As a result, the urban poor depend entirely on non-motorized transport (NMT), such as bicycle or walking, as their means of transportation. The high cost of transport is both a cause and symptom of urban poverty, as is recognized by the World Bank in their Poverty Reduction Strategy (PRS).[102]

In 2007, ESCAP published a special issue on of its *Transport Bulletin for Asia and the Pacific* on the topic of "transport and gender" which includes a number of case studies from the region on these issues.[103] It notes: "travel and transport needs of women are different from those of men and women face different constraints. As such, access to transport technologies and services is gendered. However, traditional transport planning and policy interventions and project designs often fail to recognize the gender difference in travel and transport needs. The economic and social benefits of improving women's access to travel and transport could be very high." The World Bank PRS also notes the disproportionate transport burdens faced by poor urban and rural women.

Transport can be a means of urban poverty alleviation. In simplest terms, access to affordable transportation can provide economic opportunities and facilitate access to services. Effective investment in transport infrastructure and services assists poverty alleviation by facilitating the economic growth essential to poverty reduction.

CASE STUDY

Urban Poverty and Transport: The Case of Mumbai

A survey was conducted between August 2003 and February 2004 to assess the case of urban poverty and transport in Mumbai, India.

Mumbai is one of the most densely populated cities in the world. In 2001, the city had an urban population of 18 million in 2001 with approximately 50 per cent of the population living in slums.

The poor in developing countries are faced with numerous challenges concerning job access and social services. Lack of access in urban areas can be associated with a sluggish economy, inequality in the provision of services and inadequate or unaffordable connections to facilitate mobility. This can contribute to low standards of living, problems of social exclusion and social fragmentation.

The aim of the study was to enhance the understanding of demand for transport services by the poor, the factors influencing demand and the relationship between transport decisions and other critical decisions, such as where to live and work. Overall this study was conducted to facilitate the planning of future transport policies.

A large proportion of Mumbai's poor live in the city's eastern suburbs, characterized by a lack of public transport and fewer jobs. The poor typically travel shorter distances than wealthier households, live further away from train stations, make less trips and walk more as opposed to depending on motorized transit.

On average, the poor travel shorter distances than wealthier households due to the comparatively higher time and money costs of commuting. The main earner in poor households spends 19 per cent of their income to commute by bus and 17 per cent to commute by train. The poor also live further away from train stations than the non-poor as a result of higher land prices near rail lines. This increases the time taken up to access train stations. Consequently, 50 per cent of poor workers commute less than 2 kilometres for work.

[102] World Bank, *Poverty Reduction Strategy: Transport,* viewed on World Bank website, 2007, www.worldbank.org

[103] United Nations ESCAP (2007). *Transport and Communications Bulletin for Asia and the Pacific,* No. 76, ST/ESCAP/SER.E/76, http://www.unescap.org/ttdw/PubsDetail.asp?IDNO=193

It was found that 44 per cent of all commuters in Mumbai walk to work, 23 per cent rely on rail as their main method of transportation and 16 per cent rely on the bus. In comparison, the transportation methods used by the *poor* in Mumbai comprises 61 per cent who walk to work, 15 per cent who take the bus and 6 per cent who ride to work. The survey found that while the poor rely on walking as their main method of commuting, they use the bus for intermediate distance (3 to 10 kilometres) and the train for long distances (5 kilometres or more).

Compared to the poor who live further away from the city, the poor in central Mumbai live closer to higher-paying jobs for unskilled workers. As a result they typically commute short distances, 3 kilometres or less. In contrast, the suburbs of Mumbai are characterized by higher unemployment rates for poor males, lower costs for slum housing and lower wages for skilled and unskilled labour. Approximately 37 per cent of Mumbai's poor live in the suburbs. A higher proportion of the poor who live in the suburbs leave the area for work compared to the poor living closer to the city. There are therefore higher commuting distances for poor workers in the suburbs.

Overall it was found that as household income goes up, the proportion of the population taking the bus and the train increases for short to medium distances and the proportion of the population commuting by foot declines. While 25 per cent of higher income groups (Rs. 7,500-20,000 per month) use rail as the main method of transport, the main mode of transport for those earning Rs. 20,000 or more are cars and motorcycles where only 15 per cent of commute by foot. Since a large proportion of commuters have chosen to live close to work, particularly to poor people living in Mumbai who have a higher preference to commute by foot, this would suggest that in the short term there is likely to be much benefit from improvements in bus and rail transit.

(*Source:* Baker, J., Basu R., Cropper M., Lall, S., Takeuchi, A., *Urban Poverty and Transport: The Case of Mumbai*, World Bank Policy Research Working Paper 3693, September 2005)

D. Infrastructure and "Inclusive Development"

According to the World Bank, "Transport policies and strategies need to pursue a combination of interventions to meet national poverty-reduction goals."[104] The facilitation of bicycle transport in urban areas, an improved management of road agencies and sustainable financing of maintenance are considered to promote poverty alleviation through increased access and employment opportunities.

In particular, most cities in Asia "urgently need to establish a strategic development framework that will link urban transport, effective environmental management, and inclusive social development and poverty reduction." [105]

The ADB has recently instigated a number of field studies for selected cities in Asia with an aim to facilitate the development of blueprints for sustainable urban transport systems in the region. The project will be conducted in Sri Lanka, Pakistan, Nepal, China and Bangladesh, and is due to be completed by April 2008.[106] This technical assistance programme will encourage sustainable urban development for developing countries. It will address a number of issues concerning urban transport, for instance efficient and sustainable urban transport, traffic management, public transport and road networks.[107]

Several organizations such as United Nations ESCAP, World Bank, JBIC and ADB have proposed "inclusive development" models as a framework for pro-poor investment in infrastructure. Inclusive development ensures that the benefits of economic growth are used to reduce poverty. Investments in infrastructure play a key role in this framework, as they are seen to have the potential to draw "poverty reduction, service provision and growth into a reinforcing cycle."[108]

---

[104] Word Bank, *Transport, 2007*, viewed on website of World Bank, 10 October 2007, http://go.worldbank.org/

[105] Asian Development Bank, *Sustainable Urban Transport,* ADB, Technical Assistance Report, Project Number 39335, October 2006.

[106] Asian Development Bank, *ADB Funding Study of Sustainable Urban Transport in Asia,* news release, 5 January 2007, viewed on website of ADB, September 2007, http://www.adb.org/media/Articles/2007/11285-asian-urban-transport-studies/

[107] Asian Development Bank, *Sustainable Urban Transport,* ADB, Technical Assistance Report, Project Number 39335, October 2006.

[108] Asian Development Bank, *Connecting East Asia: A New Framework for Infrastructure,* ADB Japan Bank for International Cooperation and the World Bank, Philippines, 2005.

Precisely because transport infrastructure and services fulfill intermediary “connecting” roles, many variables influence the efficacy of investments in transport infrastructure in poverty alleviation. As outlined, one of these is the different experiences of poverty between and within urban and rural areas in the region. Likewise, the social, economic and political situations of poor populations affect their transport needs. Increasing the possibility for all stakeholders to participate in transport investment issues is therefore a cornerstone of strategies for inclusive development. However, by their very nature, investments in infrastructure of any kind, tend to be “lumpy” rather than incremental, thus requiring centralized administration. Consequently, they also tend to be the product of top-down decision-making and vulnerable to poor governance. As such, there can be a tension between the need for participation and the nature of infrastructure investment.

PART TWO:

DEVELOPMENTS IN INFRASTRUCTURE

VI. CHANGING DELIVERY MECHANISMS

A. Background and infrastructure investment needs

Lack of physical infrastructure is one of the main barriers to poverty reduction and ensuring equitable access to basic services in ESCAP member countries. Consequently, infrastructure development and investment has a significant role to play in stimulating economic growth, reducing the incidence of poverty and increasing access to basic services.

In many cases, investment in infrastructure delivers high economic and social returns. For example, economic returns on some road-related investment projects average over 200 per cent. Furthermore, the returns are much higher in low-income countries than in middle-income and high-income countries.

According to ESCAP estimates, developing Asia and Pacific countries will need to spend more than a trillion US dollars over the period 2005-2015 on roads, water, communications, power and other infrastructure to meet the strong growth in populations and economies or US$ 224 billion per year (Table VI-1). US$ 262 billion is per year is required for developed and developing countries in the ESCAP region. Approximately 65 per cent of this amount will take the form of new investments, with the remaining 35 per cent used towards the maintenance of existing infrastructure assets – which can be an equally, and sometimes more, cost-effective way of meeting the increased needs as a result of economic and population growth.[109]

Table VI-1. Estimates of average annual investment needs in the transport sector, 2005-2015
(billions of 2004 United States dollars)

Transport subsector	Developing Asian and Pacific countries		ESCAP region	
	2005-2010	2010-2015	2005-2010	2010-2015
Roads	161	206	185	231
Railways	7.7	8	8.8	9.3
Airports	8.7	11	14.6	18.5
Container ports	2.3	3	2.5	3.6
Urban mass transit	15.6	24	20.4	29.8
Total	195	253	231	292
Annual average (2005-2015)	224		262	
All infrastructure	609		n/a	

Source: ESCAP, *Enhancing Regional Cooperation in Infrastructure Development Including that Related to Disaster Management,* United Nations Publication, Sales No. E.06.II.F.13, pp. 38 and 140.

Note: Estimates are based on investment needs derived from sectoral studies by ESCAP. More recent data on railway investment needs in China show that the annual average might be even larger than previously expected.

However, these investment needs outweigh the capacity of public resources in a significant number of developing, as well as developed nations. Thus, governments in the region have been looking for alternative models of financing, in particular the participation of the private sector. This chapter examines the role that the private sector already plays in meeting the demands for transport infrastructure investment and in facilitating the development and management of infrastructure related projects.

B. Private sector financing of transport infrastructure

During most of the 20th century, the majority of infrastructure investments were covered by public funds. Since the early 1990s, however, there has been a significant increase in private funding for

[109] Asian Development Bank, Japan Bank for International Cooperation (JBIC) and World Bank 2005, *Connecting East Asia: A New Framework for Infrastructure,* viewed on ADB website, 21 November 2007, http://www.adb.org

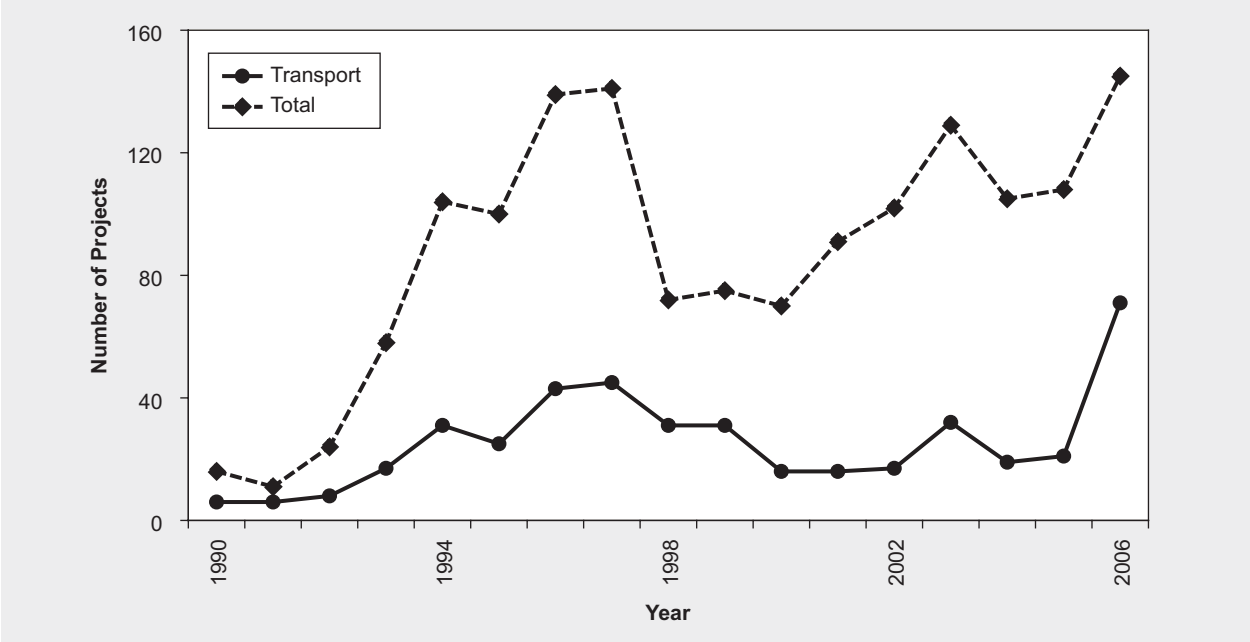
infrastructure projects in the ESCAP region. This has been due to a number of reasons, including budgetary constraints and an increased focus on short-term expenditure rather than longer-term capital investment.

1. Overview of number and value of projects

Globally, the aggregate value of transport projects that have been completed with private participation between 1990 and 2003 was over US$ 120 billion, almost half of which were in the ESCAP region.

In ESCAP developing countries, the number of *private participation in infrastructure* (PPI) projects increased rapidly in all infrastructure sectors, including in the transport sector, since the beginning of the 1990s until the 1997 Asian financial crisis (Figure VI-1). The number of PPI projects halved in 1998 compared to the 1997 peak, but in the following years confidence was regained rather quickly. In 2006, there were 145 PPI projects registered in ESCAP developing countries, 71 of which were in the transport sector. In other words, in 2006 there were more PPI projects registered in the region than in the 1997 boom year, roughly half of which were transport sector projects. The significant correlation between the total number of PPI projects and those in the transport sector also shows that general factors rather than sector-specific issues have been main drivers of the increased interest in private sector participation (Figure VI-1).

Figure VI-1. Annual number of infrastructure projects with private participation in ESCAP developing countries, 1990-2006

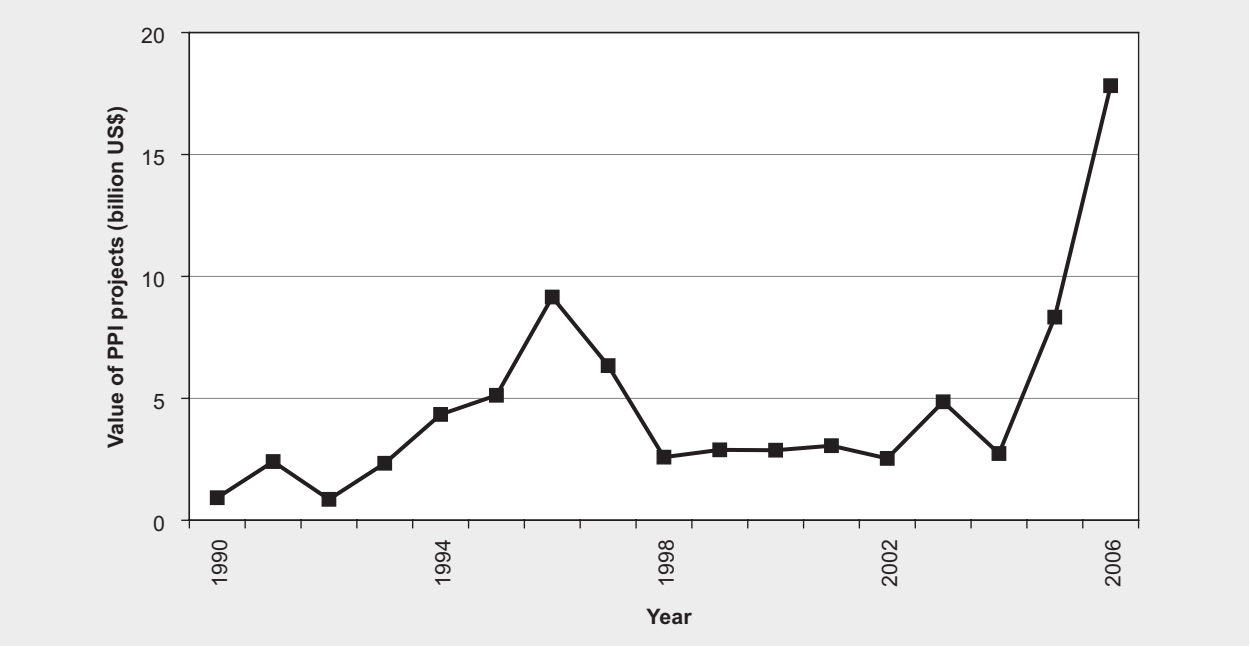


Source: Private Participation in Infrastructure Database, viewed on World Bank website, 21 November 2007, http://ppi.worldbank.org/

The average size of PPI projects in the transport sector of ESCAP developing countries has fluctuated in the range of US$ 80-400 million from year to year. However, the average size of projects has stayed roughly the same at around US$ 200 million. For example, the average size was US$ 250 million in 2006.

Thus, the total value of PPI projects in the transport sector of ESCAP developing countries has more or less followed the same trend as the number of PPI projects, i.e., it increased rapidly until the Asian financial crisis of 1997, then slumped and rebounded until 2006 (Figure VI-2). Their value in the region reached almost US$ 18 billion in 2006, which is almost twice the previous peak in 1997 and much larger than the US$ 2.7 billion just two years earlier in 2004.

Figure VI-2. Value of PPI projects in ESCAP developing countries, in million US$, 1990-2006



Source: Private Participation in Infrastructure Database, viewed on World Bank website, 21 November 2007, http://ppi.worldbank.org/

In other words, today's private sector involvement in transport infrastructure in ESCAP developing countries has reached a record level, despite much talk about heightened private sector wariness towards the risks of such investment.[110] One important reason for this development may also be demand from the very recent popularity of infrastructure funds. Globally, some 72 new infrastructure funds were launched in the past 15 months which have raised (or expect to raise) more than US$ 120 billion, compared to a current total of only US$ 40 billion.[111]

2. Types of private sector participation

A number of different mechanisms exist through which the private sector may participate in development projects in general, and in transport infrastructure projects in particular. The main types of PPI projects include management and lease contracts, concession, greenfield and divestitures. This Section a) provides an overview of each of these types of participation. Section b) will provide an overview of the number and value of each of these types of projects in developing ESCAP member countries.

a) Overview of types of projects

(i) Concession contracts

Under a concession contract, a private entity assumes the management of an enterprise of public ownership for the contract period and assumes considerable investment risk. Projects of this type include the Rehabilitate Operate Transfer (ROT), Rehabilitate Lease or Rent Transfer (RLT) and Build Rehabilitate Operate Transfer (BROT).[112]

[110] Asian Development Bank, Japan Bank for International Cooperation and the World Bank, 2005, *Connecting East Asia: A New Framework for Infrastructure,* ADB, Philippines

[111] Orr (2007). *The rise of infra funds, in: pfi Global Infrastructure Report 2007,* p. 2-12, www.pfie.com

[112] The World Bank, *Glossary of Terms Used in PPI Database,* accessed on World Bank website, November 2007, www.worldbank.org

(ii) Greenfield projects

Greenfield projects are those in which the private entity or public-private joint venture builds a new facility and operates it for the contract period, after which the facility may be transferred to public ownership. Contracts of this sort include Build-Lease-Own (BLO), Build-Own-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO), and Merchant.

(iii) Divestitures

Divestitures occur where a private entity buys an equity stake in a state-owned enterprise through an asset sale, public offering, or mass privatization programme. The World Bank categorizes these into two types:

- Full: The government transfers 100 per cent of the equity in the state-owned company to private entities (operator, institutional investors, and the like).
- Partial: The government transfers part of the equity in the state-owned company to private entities (operator, institutional investors, and the like). The private stake may or may not imply private management of the facility. [113]

(iv) Management and lease contracts

Management and lease contracts typically occur where a private entity takes over the management of a state-owned enterprise for a fixed period while ownership and investment decisions remain with the state. The World Bank offers two subclasses of management and lease contracts:

- Management contract – The government pays a private operator to manage the facility. The operational risk remains with the government.
- Lease contract – The government leases the assets to a private operator for a fee. The private operator takes on the operational risk.[114]

b) Number and value of projects by type and country

Greenfield projects are the most common form of PPI investment in the transport sector of ESCAP developing countries. From 1990 to 2006, 200 such Greenfield projects for a total of US$ 46.2 billion were registered. Almost as many projects involved concession contracts at a value of US$ 22.2 billion. Only few divestitures and management or lease contracts were concluded in the region (Table VI-2).

Table VI-2. Number and value of PPI projects in the transport sector of ESCAP developing countries, by investment type, 1990-2006

Type of PPI projects	Number of projects	Value of Projects (billion US$)
Concession	187	22,241
Divestiture	36	10,629
Greenfield project	200	46,193
Management and lease contract	12	93
Total	435	79,157

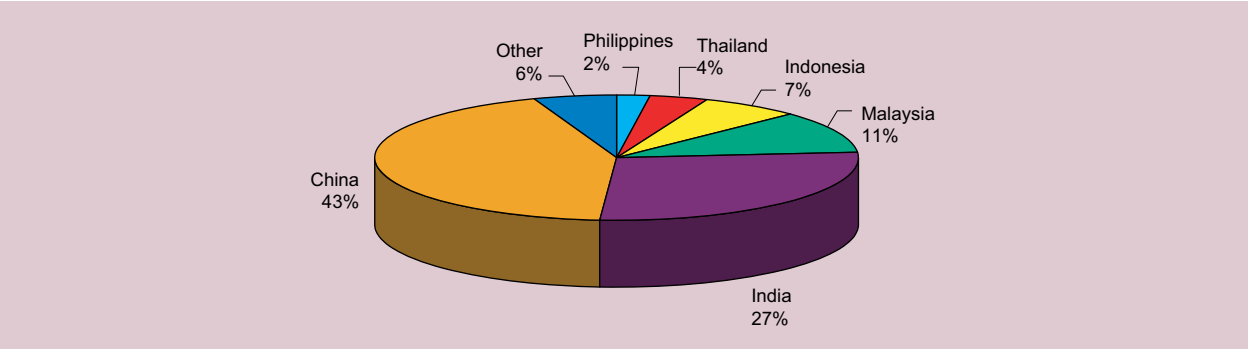
Source: Private Participation in Infrastructure Database, viewed on the World Bank website, 21 November 2007, http://ppi.worldbank.org/

[113] The World Bank, *Glossary of Terms Used in PPI Database,* viewed on World Bank website, November, 2007, www.worldbank.org

[114] The World Bank, *Glossary of Terms Used in PPI Database,* viewed on World Bank website, November 2007, www.worldbank.org

Most of the 435 PPI transport sector projects in ESCAP developing countries from 1990 to 2006 were Chinese (189 projects) and Indian projects (119 projects) which accounted for 43 and 27 per cent of the projects, respectively (Figure VI-3). Malaysia, Indonesia, Thailand and the Philippines accounted 47, 29, 17, and 10 such PPI projects, respectively. These six countries accounted for almost all or 94 per cent of all PPI transport projects in 56 ESCAP developing countries. In other words, PPI activity has been highly concentrated in very few countries. Furthermore, PPI activity was further concentrated in some coastal areas of these countries. Investment was greatest in the roads subsector, which accounted for roughly half of total all PPI transport projects in the region over the period. Roughly half of these road projects took place in China.

Figure VI-3. Geographic location of transport sector PPI projects in developing ESCAP member countries (share of the 435 projects from 1990 to 2006)



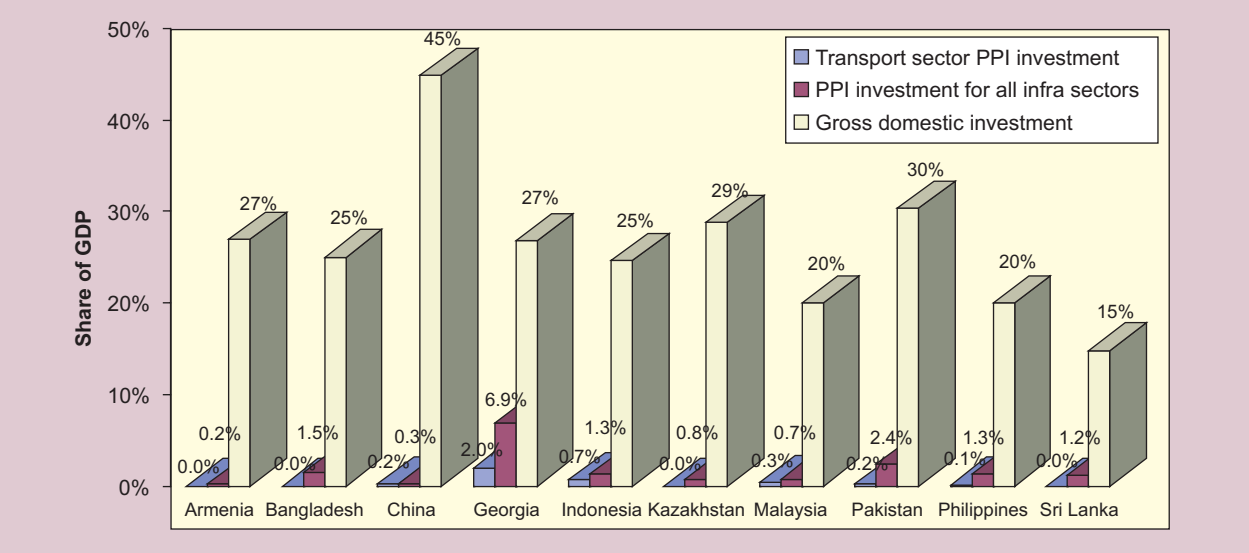
Source: Private Participation in Infrastructure Database, viewed on World Bank website, 21 November 2007, http://ppi.worldbank.org
Note: Others include: Myanmar, Armenia, Sri Lanka, Lao PDR, Georgia, Viet Nam, Bangladesh, Cambodia and Pakistan.

In 2006, gross domestic investment averaged around 20 to 30 per cent of GDP in the selected ESCAP developing countries, for example, in Armenia, Bangladesh, Georgia, Indonesia, Kazakhstan, Malaysia, Pakistan and the Philippines (Figure VI-4). In contrast, in the same year, gross domestic investment was as high as 45 per cent of GDP in China, and as low as 15 per cent in Sri Lanka.

PPI investment is a relatively small share of gross domestic investment in most ESCAP developing countries, typically amounting to a few per cent only, and this shares varies widely across countries. Even more so, the share of transport sector PPI investment ranges widely across countries (Figure VI-4). There are no obvious relationships that might have been expected. For example, large PPI activity does not correlate with high gross domestic investment levels.

However, the data contained Figure VI-4 should be used with care. The data for China are a case in point, as the very low shares for PPI investments are almost certainly due to definitional issues. For example, most road investments in China occur on the province level whereas international organizations typically report national totals that reflect only activities that are controlled directly on the federal level which, however, are only a small fraction of the real national totals. A particular limitation of using the PPI investment data for one year is that these data only refer to projects that were completed in 2006. Thus, if a large project that has extended over several years is completed during this year, the results may be distorted. For these reasons, cross-country comparisons of these data are not really very useful.

Figure VI-4. PPI transport sector investment, PPI investment for all infrastructure sectors, and gross domestic investment for selected ESCAP member countries in 2006



Sources: ADB Basic Statistics 2007 Developing Member countries, 2007 Private Participation in Infrastructure Database, viewed on the website of the World Bank on 21 November 2007: http://ppi.worldbank.org/; exchange rates taken from http://www.xe.com on 23/11/2007.

3. Selected public-private partnership projects

Table VI-3 summarizes the status of some key public-private partnership (PPP) projects in the ESCAP region. The information was gratiously provided by Thomson Project Finance International.

Table VI-3. Sample of PPP projects in ESCAP member countries, 2000-2007

Country	Description
Armenia	**Zvartnots Airport Passenger Terminal Project** The project involved the construction of a new international passenger terminal, the upgrade of airside facilities and the procurement of new terminal equipment at the Zvartnots Airport in Yereven. On July 2006, the European Bank for Reconstruction and Development (EBRD) and KFW subsidiary Deutsche Investitions und Entwicklungsgesellschaft (DEG) closed a US$ 30 million package for the project. The financing saw the EBRD lend US$ 20 million with a seven-year tenor and DEG further contributed US$ 10 million. The project was awarded to Armenian International Airports on a 30-year concession contract. The concession payments would be based on landing charges from the aircraft, which was viewed an important issue because of the country's geography and the fact that Yereven was the country's only major traffic air centre.
Australia	**Gold Coast Rapid Transit Project** In March 2007, a business case was started for the A$ 500 m PPP Gold Coast Rapid Transit System, a high-speed public transport system that stretched from Helensvale in the north to Coolangatta in the south, connecting Southport, Surfers Paradise and Broadbeach precincts. It was planned to have a light rail transit (LRT) system with low floor and air-conditioned vehicles, and a bus rapid transit (BRT) system. In April 2007, the Queensland Government undertook a feasibility study (schedule for completion in late-2007) to finalize the effectiveness of the project's alignment, whether BRT or LRT. The government also called interested parties for registration to finance, deliver, operate and maintain the project as part of the market sounding process. The project is planned for completion by 2011.
Azerbaijan	**Hajigabul-Georgian Border Motorway Expansion Project** In December 2006, BNP Paribas part-financed the highway from Hajigabul to the Georgian border in Azerbaijan with the French Bank to allocate US$ 450 million for the scheme. The project, to expand the 184 km dual-lane highway into a four-lane road, would see BNP Paribas provide US$ 450 million under a guarantee form JBIC and Japanese agency NEXI. It was claimed that the tenor would be 10 years with a margin to run between 160 bp and 170 bp. In addition, World Bank would provide between $ 150 and million. The tenor is reported to be 15 years with the margin to come in under 100 bp.

Table VI-3. *(continued)*

Country	Description
China	**Shanghai-Chongming Cross-River Expressway Project** In August 2007, Shanghai Chengtou Corporation planned to finance a US$ 2.2 billion Shanghai-Chongming cross-river expressway project by issuing US$ 158 million of 15-year fixed-rate bonds. The 25.5 kilometre road included two 8.9 kilometre-long tunnels connecting Wuhaogou in Pudong with Changxing Island and a 10.3 kilometre cable-stayed bridge connecting Changxing to Chenjiazhen Town on Chongming.
China	**South-West China Toll Expressway and Road Improvement Project** The proposed US$ 1.42 billion road project in South-West China, which involved the construction of a 143 kilometre four-lane toll expressway and upgrading of 430 km of local roads, had Asian Development Bank partly fund (US$ 200 million) the project in July 2007. In addition, the China Development Bank planned to provide US$ 556 million, the Chinese Ministry of Communications US$ 449 million and the local Sichuan Provincial Government US$ 440 million. The ADB loan proceeds would be made available by the borrower (the Chinese Government) to the Sichuan Provincial Government (SPG), and through SPG to the Sichuan Dashaan Expressway Company Ltd. (SDEC) on the same financial terms and conditions as those of the ADB loan. The SDEC was to bear the interest rate variation and foreign exchange risks. The loan was to be provided under its Libor-based lending facility, carrying a 25-year term including a grace period of five years, an interest rate determined in accordance with the Libor-based facility and a commitment charge of 0.35 per cent per annum. Main civil works for the expressway was planned to be procured through international competitive bidding.
China	**China Super Bridge Project** The feasibility study for the 29 kilometre super bridge project has been completed. The estimated cost for the project is $ 1.85 billion. The Beijing Government was reported to be looking for an adviser for the project. Hopewell Highway Infrastucture was said to be looking for a partner on the project. The project has a 65/35 debt/equity ratio. In February of 2007, the projected cost of the planned bridge to link Hong Kong, Macao and the mainland's Zhuhai City was estimated at HK$ 31.19 billion and several, as yet unidentified, international consortia, including groups from Britain and France expressed interest in investing in the project on a PPP basis.
China	**Kai Tak Cruise Terminal Project** In August of 2007, it was announced that bids were due in before the end of the year to develop the $ 411 million cruise terminal at Kai Tak. More than 18 months before, Hong Kong's tourism commission put out RFPs for the development of a new passenger port terminal. French construction contractor Dragages Hong Kong, a Bouygues subsidiary, proposed the former airport site at Kai Tak. This apparently was favoured by the government, but could not be developed until 2011. The world's top cruise liner companies expressed an interest in operating the terminal, which was likely to be funded through a mixture of public and private debt.
India	**Gopalpur Port Project** In September of 2006, the Orissa Government awarded a 25-year concession to build, operate, own and transfer the operation and ownership of an all-weather port to a group comprising Orissa Stevedores (OSL, 34%), Sara International (33%) and Hong Kong based Noble Group (33%). The project involved the development of the Gopalpur Port, which is estimated to cost about US$ 430 million. Construction is estimated to take five years, to be completed in two phases: The first phase, which is expected to be completed by the end of 2007, would see it handle more than 2.5 mmtpa of cargo, while the second phase would involve expanding capacity to 5 mmtpa and completing other facilities during the remaining four years.
Indonesia	**Tanjung International Feeder Port Project** The development of the International Feeder Port of Tanjung Api-Api in Southern Sumatra was estimated at US$ 280 million. It would be developed in consortium with Malaysian owned companies: PT Orient Technology Indonesia; Origin Technology (M) Sdn Bhd; Agresif Padu Sdn Bhd; Reka Rancang Sdn Bhd; MDS Consultant; Integra Bhd and UEM Group. The project is to be developed in four phases, and take more than 20 years to complete. The port was to support import and export activities for the South Sumatra, Jambi, Lampung and Bengkulu provinces. There was also a signing ceremony on the surrender land site regional regulation (PERDA) between Orient and the province of South Sumatra and regency of Banyuasin authorities. Orient had also obtained approval to develop the South Sumatra (SUMSEL) Eastern Corridor Development or SECDe.

Table VI-3. *(continued)*

Country	Description
Republic of Korea	**East Container Terminal Project** In October 2005, sponsors led by Hyundai Development Construction Company were seeking funds for the East Container Terminal Project 1, 2, 3. The project cost was estimated at US$ 136.5 million, funded by a loan of US$ 84 million, equity injection of US$ 27.5 million and government subsidy of US$ 25 million.
Malaysia	**Senai Airport Terminal Services Phase 2 Expansion Project** In July 2006, Senai Airport Terminal services announced a US$ 73.8 million loan to refinance a US$ 15 million loan it obtained from Affin Bank in 2005 and to fund its US$ 113 million phase two expansion programme. The facility was clubbed among three banks which used the Islamic project finance facility called Ijarah Muntahiah Bitamlik. The three banks involved were Bank Pembangunan with US$ 45 million, Kuwait Finance House US$ 24 million and Bank Muamalat US$ 12 million. The facility Ijarah Muntahiah Bitamlik (IMB) is a lease-to-own facility and is compliant with the Kuwaiti Syariah Board. Under the facility, the financiers were to purchase all the assets needed for the expansion programme and lease them to SATS. In return, SATS was to pay the financiers a lease rate of 2 per cent above the banks' respective cost of funds.
Pakistan	**Rawalpindi Bypass and Northern Interchange Project** The project involved the construction of the 29 kilometre Karachi Northern Bypass highway. MinConsult Sdn Bhd was to conduct a feasibility study on the project. In May of 2007, Malaysian companies led by CIDB reached an agreement with Pakistan's National Highway Authority to develop two highway projects. One of which was the 56 kilometre Rawalpindi Bypass and Northern Interchange, estimated to cost US$ 56.6 million. The project was to be implemented on a built-operate-transfer (BOT) basis. Joining CIDB were HCM Engineering and Ahmad Zaki Resources. MinConsult Sdn Bhd was to conduct a feasibility study on the project.
Philippines	**Cavite-Laguna North-South Road Project Stage 1** In May 2007, the Philippine Government announced that it would offer the construction of Cavite-Laguna North-South Road Project Phase 1 for private sector participation estimated at US$ 140 million.
Singapore	**Orchard Maritime Coal Barging & Transhipment Service Project** On June 7, 2006, mandated lead arrangers Calyon and Aozora Bank signed an $ 60 million to finance the development of a coal barging and transhipment service in Singapore. The loan would mature in 2012. The project was sponsored by a consortium of Indonesian companies.
Sri Lanka	**Colombo Port Expansion Project** In April of 2007, Colombo Port was to be expanded and the project would be implemented as a PPP. The ADB was to provide a US$ 300 million loan to support the expansion and upgrade, increasing its capacity from 3.3 to 5.7 million TEU by 2010, and eventually to 10.5 million TEU. The public sector was to take on the common user harbour infrastructure work, such as dredging and breakwater construction, sufficient to accommodate three new container terminals. The private sector, on the other hand, was to develop and operate the container terminals, which would be built in phases. The scheme involved the construction of a new marine operations centre, the relocation of an underwater oil pipeline and the provision of navigational aids. This expansion would assist Sri Lanka in generating additional income from transhipment. Foreign direct investment in the ports sector was expected to increase by about US$ 800 million by 2024. The loan, which was to have a 25-year term and include a five-year grace period, was to be administered by the Sri Lanka Ports Authority under the supervision of the Ministry of Ports and Aviation. In May of 2007, the Asian Development Bank signed the 25-year US$ 300 million debt facility with the Sri Lankan Government to support the project. The government itself planned to put in some US$ 180 million and the rest – around US$ 300 million – was to be provided by a private sector company that was still to be selected.

Table VI-3. *(continued)*

Country	Description
Thailand	**Bangkok Mass Transit Development Project (Blue Route)** In February 2006, the Thai Government started inviting both local and foreign investors to seven mega infrastructure projects, estimated to require a total of US$ 57 billion in funding. The biggest project was expected to be the Bt 500 billion Bangkok mass transit development plan, which would cover 10 routes with a distance of 300 kilometres. In May 2006, the Thai cabinet decided to postpone the US$ 57 billion mega-projects investment which meant the postponement of the May 29 deadline for the mass transit development proposals. All new investment decisions would be determined after the new government was formed. In June 2006, the Bangkok Metropolitan Council (BMC) approved an investment plan from Bangkok Metropolitan Administration (BMA) to construct three elevated train routes in the capital. BMA proposed to solely invest in the three elevated train projects. The elevated routes would be extended to parts of the existing skytrain system operated by Bangkok Mass Transit System Co (BTS). On June 14, 2006, the Thai cabinet approved the construction of three electric train projects in Bangkok and its peripheral areas. The Transport Ministry had proposed the projects, which were the extended red, purple and blue routes of the city's mass rail transit system. There was a possibility, however, that the project would be delayed since there were still no sponsors which would fund the project. In January 2007, the Thai Government planned to go ahead with the US$ 5.2 billion worth of mega rail projects in Bangkok. While it planned to fund the construction through bonds or JBIC, contracts for the signaling and rolling stock, worth about Bt 45 billion, would be granted to the private sector on a concessionaire basis. Bidding for three new Bangkok mass transit routes was scheduled to take place between March and July of the year. The blue route, covering 27 kilometres and budgeted at about $ 1.6 billion would be offered for bidding in July. On 24 January 2007, Bangkok Metro Public Company Limited (BMCL) planned to bid for the operating concessions of three of the five mass-transit routes, namely the blue, purple and red lines. BMCL was already in talks with suppliers of signalling systems and rolling stock such as Siemens of Germany and Alstom of France. The blue line's Bang Sue-Tha Pra Bang Khare section, which was the responsibility of the Mass Rapid Transit Authority of Thailand (MRTA), would be open for bidding on route operation in August. In September 2007, the JBIC decided that it would have to lift interest rates on its financing for the three proposed rail lines. The projects were designated as environmental development programmes and thus, carried interest rates for loans of 1.2 to 1.3 per cent per year. The three rail lines were expected to cost US$ 5.1 billion, with 48 per cent funded through domestic loans and Bt 84 billion from JBIC loans.
Viet Nam	**Ho Chi Minh City Metro Rail System (METRAS) Project** In November of 2006, the Ho Chi Minh City Government was preparing to develop two MRT lines in the city. The Asian Development Bank (ADB) provided a US$ 1.7 million grant towards the US$ 2.2 million technical assistance that would finance the preparation of a consolidated MRT network master plan. The remaining US$ 500,000 was to be funded by the government. The study would also look at the land use strategy that maximized MRT use. In addition, it would help draw up preliminary engineering designs and technical and operational standards, with supporting social, environmental, technical, economic and financial appraisals. Financing options, such as public-private partnerships, would likewise be proposed. The project, called the Ho Chi Minh City Metro Rail System (METRAS), would require a total investment of more than US$ 5 billion, although it would be developed in stages. ADB itself was preparing a two-tranche US$ 500 million loans for the project: US$ 20 million for METRAS project one and US$ 480 m for METRAS project two. The MRT lines planned under the project were two of six lines to be developed in the city between now and 2020. The two lines, projected to cover a total of 20.6 kilometres with 22 stations would run through the city's central business district.

Source: Thomson Project Finance International and Thomson SDC Platinum.

C. Institutions to facilitate private sector investment

An important reason for the high concentration of PPI investments in a few countries and locations is the large differences in terms of institutional capacities and good governance among ESCAP member countries. Consequently, many recent initiatives have aimed to create new institutions or to improve existing ones in order to better facilitate private sector investment in infrastructure. Section 1 and 2 summarize outcomes of the two ESCAP Ministerial Conferences (Busan in 2006 and Seoul in 2007) both of which concluded with recommendations on this subject. Section 3 summarizes country experiences.

1. Busan Ministerial Declaration on Transport Development in Asia and the Pacific

The ESCAP Ministerial Conference on Transport which was held in Busan, Republic of Korea in November 2006 highlighted a number of initiatives related to private participation in infrastructure projects. The concluding *Busan Ministerial Declaration on Transport Development in Asia and the Pacific* recognizes the notion that most countries in the ESCAP region are facing shortages of transport infrastructure and services, and that available funding from traditional sources (such as public funds) falls short of the investment needs of the region. The Busan Declaration aims to strengthen institutional capacities for the mobilization of additional funds for the transport sector from traditional and non-traditional sources, including public-private partnerships. The Annex to the Ministerial Declaration contains a Regional Action Programme which contains specific high priority activities to be supported internationally.

2. High-level Expert Group Meeting and Ministerial Conference on public-private partnerships for infrastructure development

The ESCAP Secretariat organized a *High-level Expert Group Meeting on Public-Private Partnerships for Infrastructure Development* which was held in Seoul, Republic of Korea, in October 2007. The Meeting was designed to provide an opportunity for vartious government institutions to discuss issues of common concern in the area of public-private partnerships (PPP) for infrastructure development. The Meeting was organized as part of an ongoing joint project of the United Nations Regional Commissions, led by UNESCAP, and financed by the UN Development Account. The project aims to enhance the sustainable capacity of Governments at the national, sub-national and municipal levels to promote, operate and manage PPP projects for infrastructure development.

The Expert Group Meeting was held back-to-back with the *Asia-Pacific Ministerial Conference on Public-Private Partnerships for Infrastructure Development* which was organized with support from the ESCAP Secretariat. The Conference supported the creation of an institutional network of PPP units and related institutions (Asia-Pacific Regional Public-Private Partnerships Network for Infrastructure Development). High-level government officials and Ministers from ESCAP member countries exchanged country experiences and provided policy guidance. The Conference concluded with the *Seoul Ministerial Declaration on Public-Private Partnerships*. It notes that PPPs are an effective means to complement the efforts of governments in the development and provision of infrastructure facilities and services. It notes the need to enhance or create a conducive environment for private sector participation in the provision of infrastructure facilities and services. In particular it refers to the need for:

- Formulation of a PPP policy framework
- Reform of legislative and regulatory regimes
- Establishment of administrative mechanisms to promote good governance in PPPs
- Enhancement of the capacity of the public sector to implement PPPs

Ministers resolved that their respective governments would develop and implement policies at the regional, subregional, national and sub-national levels in line with agreed principles of good governance.

3. Country experiences

A number of governments in the ESCAP region have identified the encouragement of private sector investment in infrastructure as a key priority. Consequently, several governments have developed policy and regulatory frameworks that are conducive to private sector involvement in infrastructure development.

To improve the inadequate institutional capacities in many public sector administrations for the promotion of private sector investment in infrastructure, a growing number of governments in Europe have introduced *PPP units* that are responsible for supporting the process of planning and implementation of partnerships. In contrast, in Asia and the Pacific only a small number of countries have created dedicated PPP units. These countries include Australia, Bangladesh, India (at the state or provincial level), the Philippines and the Republic of Korea, which are also some of the countries in where private sector participation in infrastructure development has concentrated.

The PPP units have been generally successful in playing a 'catalytic' role in promoting and implementing private projects, examples of which are presented in the remainder of this section.

a) Australia

Both the Federal Government and a number of state governments in Australia have begun to actively promote private investment in transport infrastructure through the introduction of policies, principles or guidelines, and the establishment of specific units typically attached to treasury and finance ministries. At the federal level, a PPP unit was established in the Department of Finance and Administration, and it has already released a set of *private financing principles*. In May 2004, the inaugural National PPP council forum was held in Brisbane, followed six months later by a second Council meeting, held in Melbourne. The third meeting was convened on October 2005 in Sydney.[115]

In New South Wales (NSW), the NSW Infrastructure Council was established in 2001. It is a consultative body consisting of the State Premier and five other ministers including the Minister for Transport and twelve infrastructure industry chief executives and union representatives. The Council has no executive authority but provides high-level advice to the government on policy and development priorities in the delivery of infrastructure, as well as facilitates shared learning between government and the private sector players on best practice in relation to privately financed projects.

By the end of 2001, the NSW government released its policy on privately financed infrastructure projects, the so-called *Working with Government Policy for privately financed Projects*. The policy also established a specialist Private Projects Branch which is located in the Treasury and whose function is to assist agencies with PFP proposals and to provide government advice to the private sector by drawing on expertise from across the public sector. By December 2002, the NSW government had announced its *State Infrastructure Strategic Plan*, which outlined its priorities for major infrastructure over the next ten years. Road, rail, and port development projects made up most of this planned investment. In December 2006 updated guidelines were issued. The guidelines seek to support the government's commitment to provide the best practicable level of public services by providing a consistent, efficient, transparent and accountable set of processes and procedures to select, assess and implement PFPs.

A similar structure called *Partnerships Victoria* operates from within that State's Department of Treasury and Finance. Its role is to:

- Develop and oversee the policy framework;
- Assess projects for private participation; and
- Provide support to government agencies embarking on a bid process.

As of November 2007, 18 *Partnership Victoria* projects have been contracted worth approximately $ 4.8 billion. Of these 18 projects, two relate specifically to infrastructure: the EastLink project valued at

[115] National Public Private Partnerships Forum website, viewed on 28 November 2007, http://www.pppforum.gov.au/vision.

$ 2.2 billion is due to be opened in 2008 and the Southern Cross Station project valued at $ 271 million was completed in 2006.[116]

By late 2001, Queensland, South Australia and Tasmania had released PPP policies, and South Australia had established a dedicated PPP unit within the South Australia Treasury. While some major transport infrastructure projects have been either short-listed or identified in annual budgets in these states, only a limited number have so far progressed under the PPP policy frameworks.

In Queensland, for example, the *Public-Private Partnership Policy* together with the *Value for Money Framework* and the *PPP Supporting Guidelines* make up the *PPP Guidance Material* which sets out the methodology for the delivery of PPP infrastructure facilities. As of October 2007, three transport-related PPPs in Queensland have been approved or are in the process of tendering: the Airport Link/Northern Busway (tenders close December 2007), Gold Coast Rapid Transit (construction is due to begin in 2009) and the Toowoomba Bypass (business case to be completed by late 2007).[117]

b) Bangladesh

In an attempt to promote private sector investment in the country's infrastructure development, the government of Bangladesh undertook a project called the *Private Sector Infrastructure Development Project*, which consisted of two components, project financing and transaction development. Through the Ministry of Finance, two facilitative bodies were established to implement these two components. The first of these, the *Infrastructure Development Company Limited* (IDCOL) was established in 1997 with the assistance of the International Development Agency. IDCOL is a non-banking financial institution. Its share capital is fully subscribed by the Government. One of the main functions of this company is to provide loans for private infrastructure projects or refinancing for small projects implemented by NGO's and other private entities.

IDCOL's activities were limited to the energy sector including rural energy projects such as solar home systems in remote coastal areas. However, in 2006, the Government of Bangladesh launched a fund called the *Investment Promotion Financing Facility* (IPFF) for financing private sector initiatives in infrastructure development. The International Development Association (IDA) gave US$ 50 million in assistance to this initiative. The Government's share of the fund comes from an ongoing financial institution development project of Bangladesh Bank, the country's central bank. Small-scale infrastructure projects are expected to benefit from the initiative. Banks and non-banking financial institutions will channel their loans to the private sector under the scheme.

The other key entity is the *Infrastructure Investment Facilitation Centre* (IIFC), which was established in 1999 and became operational in 2000, and through which a number of transport projects have been prepared over the last few years.

IIFC is body is fully owned by the Government of Bangladesh and was established with assistance from the International Development Agency, the Canadian International Development Agency and the Department for International Development of the United Kingdom. The function of the IIFC is to assist government ministries and agencies and other public sector bodies to:

- Develop policies that will encourage private sector participation in infrastructure development;
- Identify and structure projects, including BOT projects, for private sector participation;
- Prepare bids and evaluate and draft contract agreements;
- Monitor projects and enforce contracts; and
- Develop relevant skills in public sector officials in areas such as the identification and packaging of BOT projects as well as contract negotiation and management.

[116] Partnerships Victoria website, viewed on 28 November 2007, http://www.partnerships.vic.gov.au/

[117] Queensland Department of Infrastructure and Planning website, viewed on 28 November 2007, http://www.coordinatorgeneral.qld.gov.au

IIFC is managed by a seven-member board of directors whose Chairman is the Secretary of Economic Relations Division. Three of the directors are from the public sector, three are from the private sector, and the Chief Executive Officer is an ex-officio member. Although the intention was for IIFC to have 17 staff, a shortage of International Development Agency funding led to a delay in commencing operations. This has significantly constrained its function with the consequence that it now operates primarily "through managing consultants provided by donors".[118]

c) China

Private investment in public infrastructure is not new in China. The southern city of Guangzhou began using private capital for bridge construction more than a decade ago. At present, many cities in China, such as Shanghai, Wuhan and Zhangjiagang all have public bidding for the construction of public infrastructure.[119]

Rules governing foreign investment in port terminals have also been relaxed, although Chinese ports themselves remain state-controlled. Until 2002, foreign companies could only hold a 49 per cent share of a mainland terminal facility. Now this has been changed to allow foreign operators to obtain a controlling stake, or even to set up their own operating companies.[120]

However, most of the funding for construction of public infrastructure continues to come from public sources. Along with the deepening of the country's reform and its participation in the internationalization of production, more cities in China are realizing that better public infrastructure helps to improve their city's competitiveness, and thus tapping into private capital is considered as one way to accelerate the delivery of public infrastructure.

ADB and World Bank have both emphasized the potential benefits that could be derived increased private sector investment in China's infrastructure.

In June 2002, the Beijing Mayor Liu Qi announced the introduction of a bidding system for the design, construction and management of its subway projects to allow participation by prominent firms around the world. The mayor announced that about 150 kilometres of subway lines would be built in the coming six years, three times the total length built in the city over the past 37 years.[121]

In July 2003, the State Development and Reform Commission (SDRC) announced its intention to fast-track planned reform of investment policy by sending the draft to the State Council for primary reading, and completing its new investment financing scheme within the year. The aim of the reform is to encourage investment in different sectors such as water supply, public transportation, gas, electricity, heating and environment protection, and to introduce market mechanisms in investment, financing, operation and management processes.[122]

d) India

In 1999 the state of Gujarat established India's first institution specifically focused on overseeing private participation in infrastructure projects. The *Gujarat Infrastructure Development Board* (GIDB) was established to administer the *Gujarat Infrastructure Development Act, 1999* (named the BOT Law of Gujarat), and its power extends to 22 infrastructure sectors, with a current focus on 1. These are power,

---

[118] Islam, Nazrul, 2003, 'The Role of the Infrastructure Investment Facilitation Centre in the Development of Private Sector Infrastructure in Bangladesh', *Transport and Communications Bulletin for Asia and the Pacific,* No. 72, United Nations Publication, Sales No. E.03.II.F.42, pp. 77-100.

[119] Research Centre of Finance and Trade Economics: Chinese Academy of Social Science, http//www.china.org.cn/english/BAT/39

[120] *Containerisation International*, Chinese U-turn on foreign ownership of terminals, May 2002.

[121] People's Daily, "Beijing welcomes foreign participation in subway projects, 14 June 2002, <viewed on China.Org.Cn,29 October 2003, http://www.china.org.cn/english/2002/Jun/34605.htm

[122] Tang Fuchun, "Investment financing system reform to fuel economic growth", *People's Daily,* 17 July 2003, viewed on China.Org.Cn, 29 October 2003, http://www.china.org.cn/english/2003/Jul/70154.htm

ports, roads, airports, railways, urban infrastructure, water supply, information structure, industrial parks, gas grid and tourism.

Headed by the Chief Minister of State, the GIDB consists of ministers and top officials of ministries and departments with responsibilities for infrastructure and industrial development. Through an Executive Committee, the Board:

- Identifies and prepares projects;
- Screens projects and debates issues related to project choice and implementation;
- Overcomes obstacles including those related to policy and project development;
- Reduces risk and uncertainties for private sector participation by defining project cycle times;
- Conducts pre-feasibility and feasibility studies, and recommends public-private partnership risk sharing options;
- Uses Gujarat State BOT law to establish the terms of concession agreements covering the allocation of risk between the State and private investors; and
- Monitors progress of projects.

Currently, there are 13 port sector projects either completed or ongoing, with eight in the pipeline; 19 road sector projects either completed or ongoing, with nine more in the pipeline; and three rail sector projects are either completed or ongoing, with five in the pipeline.[123]

In a separate initiative, in January 2006, the Government of India established a wholly Government-owned company called the *India Infrastructure Finance Company Limited* (IIFCL). It has authorized capital of US$ 252 million. In addition to this capital, IIFCL will be funded through long-term debt from the open market. The Government plans to extend guarantees for repayment of the principal and interest of this debt. One of the expected roles of IIFCL is the refinancing of those private sector projects initially financed by banks, which find long-term financing for infrastructure projects difficult. Public-private partnership projects awarded to private companies for development, financing and construction will receive overriding priority for financing from IIFCL.[124]

e) Japan

In 1999 the Government of Japan enacted the *Private Finance Initiative Promotion Act* (PFIPA), (Law No. 117 of 30 July 1999), which established a private finance initiative scheme. This scheme introduced formal arrangements whereby the application of private investment resources to build, maintain and operate public sector infrastructure were available. The incidence of these schemes increased with decreasing availability of public sector funds. As well as transport infrastructure, the public facilities covered by the scheme include infrastructure, such as public office buildings, public housing, educational and cultural facilities, waste treatment plants, hospitals, IT facilities, and energy supply.

The *private finance initiative* (PFI) model of private sector participation used in Japan is based on one that first emerged in the United Kingdom. According to this model, the government awards a long-term contract and pre-defined payments to the private sector to design, finance, construct and possibly manage and operate the public facilities. An important difference between PFI and conventional ways of providing public infrastructure is that the public sector generally does not own the assets. In some cases such as the provision of clinical services in a hospital, the government may provide the services itself. In those cases in which the private investor also operates the facility, the government purchases the related services from it on behalf of the public users.

---

[123] Gujarat Infrastructure Development Board website, viewed on 28 November 2007, www.gidb.org

[124] Source for IDFC and IIFCL: India, *Economic Survey, 2005-2006*.

The Prime Minister formulates policies after consultation with relevant ministers and the PFI Promotion Committee. The Committee operates within the Prime Minister's Office and consists of nine members nominated by the Prime Minister. The Committee's role is to:

- Investigate and deliberate on matters that fall under its jurisdiction;
- Help to formulate policies;
- Oversee project evaluation and selection of contractors; and
- Monitor project implementation.

In August 2005 a number of revisions were made to the PFI laws.[125]

One of the biggest PFI projects in the transport sector was the development of Hita Chinaka Container Terminal, at Port Ibaragi.[126] As at the end of 2006, a total of 260 PFI projects (at a cost of approximately US$ 16.3 billion) had been announced. Currently, 130 projects have reached the operational stage.[127]

f) New Zealand

The New Zealand Government has introduced legislation known as the *Land Transport Management Bill*. The Bill was tabled in parliament in December 2002 and was passed in November 2003.[128] This Bill provides for an increased emphasis on the sustainability and broader outcomes of road and alternatives to road investment. The Bill also caters for the delivery of public infrastructure in collaboration with the private sector.

Public-private partnerships (PPPs) allow road agencies to spread the cost of infrastructure over time. The proposal is that the PPPs will involve a concession agreement between a public road controlling authority and a private sector partner to build and operate new infrastructure. Management of the infrastructure must revert to the public sector after the concession period, which cannot be longer than 35 years.

The Land Transport Management Act requires the Minister of Transport to approve concession agreements. Public road controlling authorities would undertake a tendering process before reaching agreement with a private operator and seeking Ministerial approval.

The New Zealand Act has certain precursors to any PPP proposal. These include the retention of land in public ownership, strong community support for the project and no liability to compensate any party if traffic forecasts are in below forecasts. The Act provides a general provision for the collection of tolls previously, it was necessary to pass specific legislation. Toll schemes can provide an alternative source of funding for roads. They have already been successfully used on the Auckland Harbour Bridge and the Lyttleton Tunnel. Tolling will only be used to fund new roads and an alternative route will need to be available.[129]

g) Philippines

Since 1989, a body responsible for promoting private sector participation in infrastructure projects has existed in some form in the Philippines. Originally focused on fostering assistance programmes, the Coordinating Council for Philippine Assistance Programme adopted in 1999 a more specific focus on private sector participation when it became the Coordinating Council for Private Sector Participation. This

[125] Viewed on the website of Private Finance Initiative Promotion Office, 3 November 2007, http://www8.cao.go.jp/pfi/e/6Progress.html

[126] Poulter Tony, "Japan's PPP experience – lessons for Europe?", viewed on http://www.pwc.com/uk/eng/about/svcs/pfp/pwc_JapanApril03.pdf, 29 October 2003.

[127] Viewed on the website of Private Finance Initiative Promotion Office, 3 November 2007, http://www8.cao.go.jp/pfi/e/6Progress.html

[128] Viewed on the official website of the New Zealand Government, http://www.beehive.govt.nz, 3 December 2007.

[129] Viewed on the website of Land Transport NZ on 3 December 2007 at http://www.transfund.govt.nz

body was then reorganized in 2002 and named the BOT Centre. Attached to the Department of Trade and Industry, the BOT Centre is a government agency with responsibility for coordinating and monitoring the Philippines BOT Law, which was first enacted in 1991 and then amended in 1994.

Under the leadership of an Executive Director who reports directly to the Secretary of the Department of Trade and Industry, the BOT Centre's core role is to help agencies and local governments to implement BOT infrastructure projects effectively by providing solutions to financial, technical, institutional and contractual problems. These solutions could be provided in a number of ways including by:

- Preparing terms of reference for technical assistance for the implementing agency;
- Reviewing and recommending changes to the Implementing Rules and Regulations for private sector participation;
- Reviewing and updating the screening guidelines for project funding;
- Intervening on behalf of a government agency or acting as a facilitator to help solve a problem related to a particular project; and
- Monitoring a project or the activity of a private sector player in a project.

The Centre is structured into two groups, one devoted to project development and the other focused on programme operations. The responsibilities of the project development group are managed by a number of sectoral divisions, with one of those divisions looking after the transport sector.[130]

Since 1991, the BOT Centre and its predecessors have assisted agencies to manage the completion of 47 infrastructure projects, which have been financed through US$ 16 billion worth of private capital (as at June 2006). Eight transport sector projects costing approximately US$ 2,654 million have been part of this investment in major infrastructure.[131]

h) Republic of Korea

To attract private investors to fund infrastructure projects at both the national and the provincial government levels, the Republic of Korea introduced the Private Participation in Infrastructure (PPI) Act 1999. The intention of the Act is to promote, facilitate and guide private sector participation for both solicited and unsolicited projects. By September 2002, regulations had been developed to frame the establishment of two separate bodies that will implement the intentions of the Act.

The first body is a policy making body called the Private Investment Project Committee which will be led by the Minister for Planning and Budget. As well as formulating major policies and enforcing decrees related to private sector participation, the Committee will also develop an annual plan that will list major projects that will be targeted for private sector investment, and proposed projects and their designated concessionaires that have been approved according to defined criteria. The annual plan will also detail the investment, management and operational requirements of each project and the government assistance provided for the projects.

The second body established under the PPI Act 1999 was the *Private Infrastructure Investment Center of Korea* (PICKO) in April 1999. The first organization of its type in the Republic of Korea, it was established to overcome confusion and inconvenience experienced by government agencies and private investors in trying to implement private infrastructure investment projects. PICKO's role is to provide a one-stop-shop service based on uniform criteria for evaluation and negotiation. Its key activities include:

- Providing technical and administrative support to sectoral agencies on private sector participation in infrastructure development projects:
  - The advice or assistance is in relation to investment matters, the review of solicited and unsolicited project proposals, negotiations and concession agreements;

[130] Quium A.S.M. Abdul, op. cit., p. 19.

[131] UNESCAP, 2007, *Public-Private Partnerships in Infrastructure Development: An introduction to issues from different perspectives*.

  - PICKO also carries out tasks such as the development of new projects or completion of feasibility studies at the explicit request of an agency.
- Providing skills to public and private sector personnel;
- Supporting the Private Investment Project Committee by formulating private investment policies and plans and by contributing to the development of the PPI annual plan; and
- Providing advice or consultancy services to foreign parties interested in investment prospects.

PICKO is structured on a roughly sectoral basis with one project team dedicated to road and port projects and the other team dedicated to rail and environmental projects. It is staffed by specialists in areas such as finance, accounting, law, ports, roads, transportation, environment, and civil engineering, and is supported when necessary by overseas consultants with expertise in international private investment.

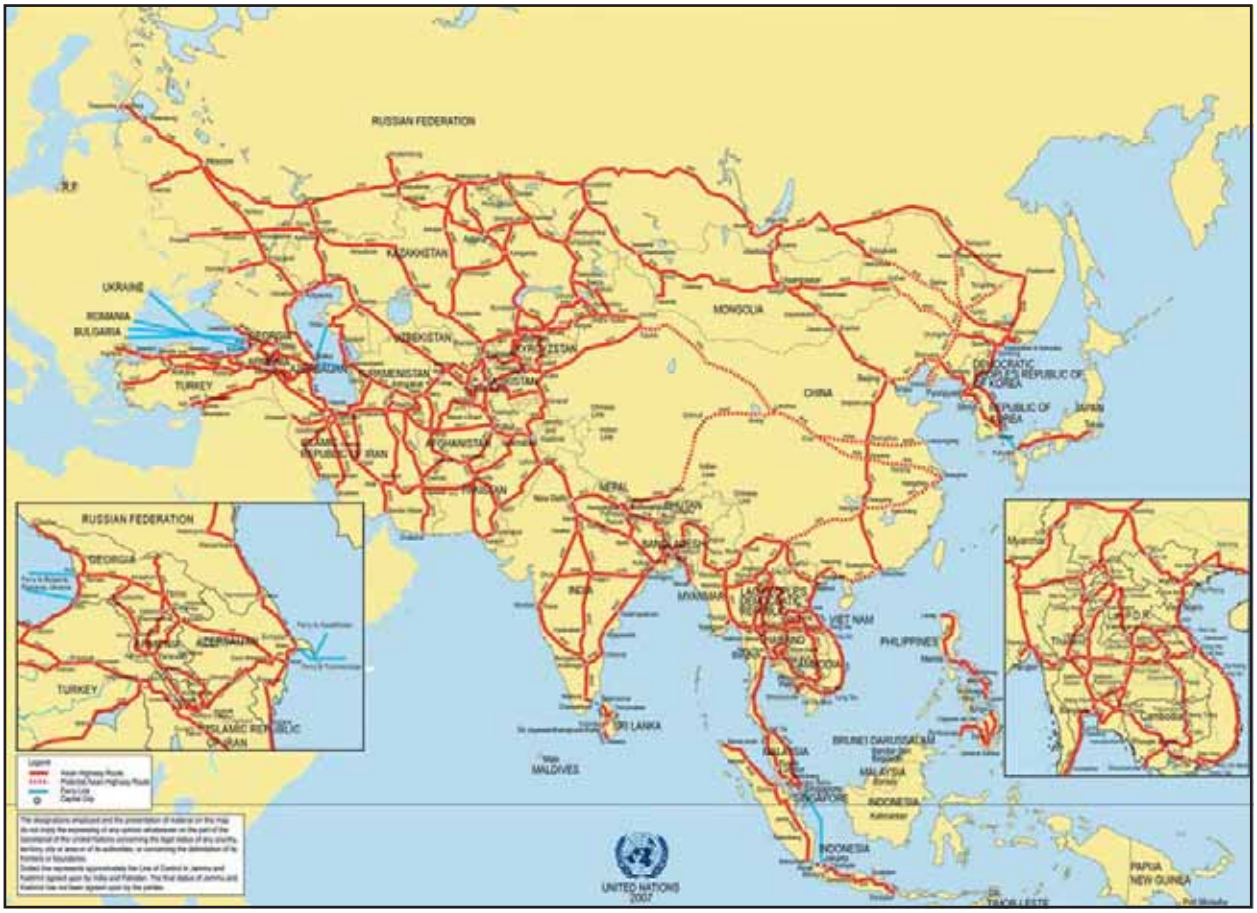
VII. ROADS AND ROAD TRANSPORT

This chapter provides an overview of road development in Asia and the Pacific. In particular, it summarizes recent developments in the Asian Highway (Section A) and road infrastructure and motorization in general (Section B), and recent road and highway investment projects in the region (Section C).

A. Asian Highway Network

The term *Asian Highway Network* refers to a particular subset of trunk roads of UNESCAP member countries. Since 2005, these 141,000 kilometres of roads of international importance are covered in the *Intergovernmental Agreement on the Asian Highway Network* (Figure VII-1).

Figure VII-1. Asian Highway Route Map (2007)



1. From project to intergovernmental agreement

The *Asian Highway Network* has a long history. In fact, it has been a UNESCAP project since 1959. The project has aimed to enhance the efficiency and development of road transport infrastructure in Asia and to promote economic and social development through improved international connectivity. The project served as framework for road projects in the region. Considerable progress was made in the 1960s, but it slowed in the 1970s and financial donor assistance ceased in 1975. Renewed interest and project progress has been strong since the early 1990s, due to the changed world political situation and rapid economic growth in some Asian economies.

The Asian Highway (AH) project forms part of the so-called *Asian Land Transport Infrastructure Development* (ALTID) project. The ALTID project was endorsed by the 48th session of UNESCAP in 1992. It is an umbrella project for the projects on the Asian Highway Network, the Trans-Asian Railway (TAR), and projects to facilitate cross-border land transport.

The *Intergovernmental Agreement on the Asian Highway Network* entered into force on 4 July 2005. At present, 28 Member States have signed the Agreement and 22 are contracting parties to it.[132] The main obligations of the contracting parties are to:[133]

- adopt the Asian Highway Network as a coordinated plan for the development of highway routes of international importance;
- bring the network into conformity with the Asian Highway classification and design standards; and to
- place Asian Highway route signs along the network within five years from the date of entry into force of the agreement for the State concerned.

2. Asian Highway routes and numbering

There are 55 routes on the network.[134] All Asian Highway route numbers begin with "AH" and have one, two to or three digit numbers depending on their international importance. Routes for inter-regional traffic assigned route numbers 1-9 (for example AH7). Routes for subregional or traffic are assigned a two or three digit number as follows:

- Numbers 10-29 and 100-299 relate to highway routes in South-East Asia, including Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam;
- Numbers 30-39 and 300-399 are allocated to East and North-East Asia, including China, the Democratic People's Republic of Korea, Japan, Mongolia, the Republic of Korea and the Russian Federation;
- Numbers 40-59 and 400-599 are assigned to the South Asian subregion, including Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka; and
- Numbers 60-89 and 600-899 are allocated to North, Central and South-West Asian subregion, including Afghanistan, Armenia, Azerbaijan, Georgia, the Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, Turkey,[135] Turkmenistan and Uzbekistan.

3. Asian Highway classes

The Asian Highway Network comprises more than 141,000 kilometres of road and passes through 32 ESCAP member countries. The physical status of the network varies considerably, both between and within the subregions of Asia: from a mix of expressways or access controlled roads, through dual carriageway highways, to single carriageway two-lane roads and, in rare cases, single lane roads. The Asian Highway routes are classified into four classes:

- *Primary class*: access-controlled road with four or more lanes, asphalt or cement concrete pavement;
- *Class I*: road with four or more lanes, asphalt or cement concrete pavement;
- *Class II*: road with two lanes, asphalt or cement concrete pavement;
- *Class III*: road with two lanes, asphalt or cement concrete pavement.

---

[132] www.unescap.org/ttdw/common/tis/AH/Tableofcountriessigned.asp

[133] For the full text of the Agreement, please see www.unescap.org/ttdw/common/tis/ah/IGA_intro.asp and www.unescap.org/ttdw/common/tis/AH/AH-Agreement-E.pdf

[134] *Asian Highway Agreement,* viewed on the UNESCAP website, 22 October 2007, www.unescap.org

[135] The Russian Federation is included in two subregions for the purpose of assigning route numbers because of its geographic extent. Source Annex I of the Agreement.

Figure VII-2 provides an overview of the road length and shares of theses classes. Significant improvements have been reported over the past five years and the shares of lower quality classes have decreased. As of 2006, 27 per cent or 39,300 kilometres were of Class I or Primary Class, and 37 per cent were of Class II. However, 72 per cent of the Asian Highway Network were still two-lane roads. 26 per cent were still of Class III, and most importantly, 9 per cent or 12,300 kilometres are still below the agreed Class III standard (Figure VII-2). The latter are therefore the main focus for improvement investments in the framework of the Asian Highway project.

Upgrading and improving the network to the requirements of international transport is one of the obligations of a member party within the Intergovernmental Agreement on the Asian Highway Network. In 2004, some 22,000 kilometres or 15.8 per cent of AH network were below the minimum Class III standard. By 2006, this had been reduced to 12,300 kilometres or 9 per cent, an impressive achievement. Thus, member countries are expected to have upgraded their network in line with the minimum standards by 2010.[136]

Figure VII-2. Asian Highway Network classes in 2006

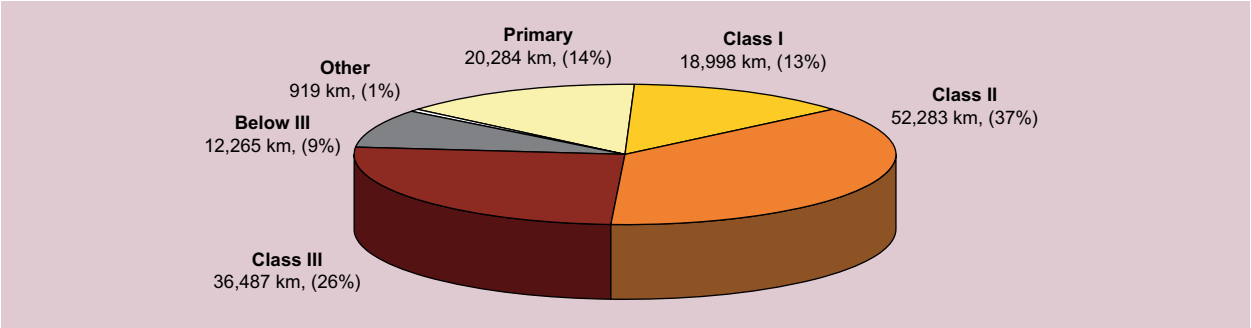


Table VII-1 provides a country-by-country overview of the status of the Asian Highway Network in 2006. China accounts for the longest national portion of the Asian Highway Network of any ESCAP country, with 26,181 kilometres, but only 42 kilometres are below the minimum standard of Class III. Afghanistan, Mongolia, Myanmar, Pakistan, and the Russian Federation all have sizable AH portions of more than 1,000 kilometres each that are below the minimum standard. For example, 1,271 kilometres in Myanmar are below the minimum Class III standard which accounts for 42 per cent of the AH network in Myanmar. On the other hand, all of Japan's AH network is of Primary Class. Three quarters of the access-controlled AH network of Primary Class, or 14,900 kilometres, are in China. Other sizable AH portions of Primary Class are found in Indonesia, Islamic Republic of Iran, Japan, Malaysia, Pakistan, Republic of Korea, Thailand and Turkey.

While some ESCAP members are capable of mobilizing the resources to develop their portions of the Asian Highway to the minimum standard (Class III) specified in the Intergovernmental Agreement on the Asian Highway Network, a number of countries will continue to require assistance.

[136] UNESCAP, 2007, *Status of implementation of the Intergovernmental Agreement on the Asian Highway Network: Item 4 of the provisional agenda,* viewed on website of UNESCAP, 24 October 2007, http://www.unescap.org/ttdw

Table VII-1. Status of the Asian Highway in Member States in 2006. Kilometres of road of each Asian Highway Class (a quality standard).

Country	Primary	Class I	Class II	Class III	Below III	Other	Total
Afghanistan	0	10	2,314	77	1,846	0	4,247
Armenia	0	147	710	109	0	0	966
Azerbaijan	0	97	1,017	348	0	0	1,462
Bangladesh	0	20	1,718	0	30	0	1,768
Bhutan	0	6	0	0	161	0	167
Cambodia	0	0	453	879	3	0	1,335
China	14,859	2,255	5,788	3,237	42	0	26,181
Democratic People's Republic of Korea	0	492	0	15	220	735	1,462
Georgia	0	17	924	160	0	0	1,101
India	90	3,787	1,962	5,690	121	0	11,650
Indonesia	409	188	1,734	1,550	55	34	3,970
Iran (Islamic Republic of)	752	2,468	7,933	0	0	0	11,153
Japan	1,111	0	0	0	0	0	1,111
Kazakhstan	0	557	4,671	6,835	793	0	12,856
Kyrgyzstan	0	60	981	338	316	0	1,695
Lao People's Democratic Republic	0	0	0	2,032	285	0	2,317
Malaysia	795	67	733	0	0	0	1,595
Mongolia	0	16	432	595	3,243	0	4,286
Myanmar	0	147	0	1,585	1,271	0	3,003
Nepal	0	0	208	1,098	8	0	1,314
Pakistan	358	1,272	349	2,224	1,174	0	5,377
Philippines	0	134	928	1,917	388	150	3,517
Republic of Korea	466	255	186	0	0	0	907
Russian Federation	0	1,532	13,085	670	1,759	0	17,046
Singapore	11	8	0	0	0	0	19
Sri Lanka	0	49	337	151	113	0	650
Tajikistan	0	20	707	977	221	0	1,925
Thailand	182	2,926	1,187	813	2	0	5,110
Turkey	1,251	885	797	2,312	0	0	5,245
Turkmenistan	0	60	0	2,120	24	0	2,204
Uzbekistan	0	1,185	1,111	670	0	0	2,966
Viet Nam	0	338	2,018	85	190	0	2,631
Total	**20,284**	**18,998**	**52,283**	**36,487**	**12,265**	**919**	**141,236**
Percentage	**14**	**13**	**37**	**26**	**9**	**0.65**	**100**

4. Asian Highway investments and investment requirements

Despite tight budget constraints in many ESCAP member countries, in the current decade significant investments have been undertaken by member countries to upgrade the Asian Highway Network. This section summarizes the level and type of these investments as well as future investment requirements. More details on particular AH road investment projects are listed in section C.

a) Current investments

Table VII-2 provides on overview of the funds that are presently committed by governments or others for upgrading of the Asian Highway in each member country. As of 2004/2005, an estimated US$ 25.9 billion was being invested for upgrading 36,600 kilometres of Asian Highway in 28 Asian countries. The largest investments in terms of value were reported from China, India, the Russian Federation, Bangladesh and Kazakhstan. The longest road length was being upgraded in the Islamic Republic of Iran, Kazakhstan and Indonesia.

Table VII-2. Current investments in the Asian Highway Network (2004/2005 data)[137]

Country	Km	US$ million	Country	Km	US$ million
Afghanistan	3,134	829	Mongolia	430	78
Armenia	35	31	Myanmar	268	66
Azerbaijan	447	126	Nepal	179	49
Bangladesh	1,373	2,392	Pakistan	1,317	807
Bhutan	161	26	Philippines	505	413
Cambodia	308	190	Russian Federation	3,049	2,655
China	2,855	6,650	Sri Lanka	164	271
Georgia	0	108	Tajikistan	140	20
India	3,180	3,640	Thailand	1,273	373
Indonesia	3,576	245	Turkey	215	722
Iran (Islamic Republic of)	5,594	1,151	Turkmenistan	220	67
Kazakhstan	3,649	2,068	Uzbekistan	2,761	59
Kyrgyzstan	656	328	Viet Nam	572	1,961
Lao People's Democratic Republic	369	245	**Total**	**36,566**	**25,851**
Malaysia	106	281			

Source: ESCAP (2006). *Priority Investment Needs for the Development of the Asian Highway Network*, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Document number ST/ESCAP/2424, http://www.unescap.org/ttdw/PubsDetail.asp?IDNO=187

b) Priority AH investment requirements

Between 2004 and 2006, the ESCAP Secretariat organized subregional processes to identify a number of priority Asian Highway investment projects. In 2006, the results were published in an ESCAP study entitled "*Priority Investment Needs for the Development of the Asian Highway Network*".[138] It identified 121 priority projects, for which project profiles are reproduced in the Annex of the study. Some of the identified priority projects are already at different stages of development.

A shortfall of AH investments totalling US$ 18 billion were identified by the study, in order to make these priority projects a reality. These include investments to upgrade 26,000 kilometres of Asian Highway sections in 25 countries, and they include especially sections that are at or below Class III. These AH investment requirements were estimated at roughly US$ 7.3 billion in Central and South-West Asia, US$ 4.6 billion in South-East Asia, US$ 3.2 billion in North-East Asia, and US$ 2.3 billion in South Asia (Table VII-3).

[137] These data represent investments as at 2004 and 2005 that are backed by a financial commitment from either a government or other source, including where construction will be carried out in future. These data have largely been compiled from the country reports submitted, presentations made by the member States during subregional expert group meetings and information on donors' websites. This neither represents the current level of investment in the highway sector (as the Asian Highway in a country is only part of that country's highway system), nor is it an annual figure as projects typically take several years to be completed.

[138] ESCAP (2006). *Priority Investment Needs for the Development of the Asian Highway Network,* United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), ST/ESCAP/2424, http://www.unescap.org/ttdw/PubsDetail.asp?IDNO=187

Table VII 3. Priority investment requirements in the Asian Highway Network (2004/2005 data)[139]

Country	Km	US$ million	Country	Km	US$ million
Afghanistan	1,317	331	Mongolia	3,120	454
Armenia	276	116	Myanmar	674	82
Azerbaijan	355	160	Nepal	328	135
Bangladesh	592	353	Pakistan	2,076	776
Bhutan	179	60	Philippines	199	126
Cambodia	980	714	Russian Federation	1,983	1,351
China	1,443	1,430	Sri Lanka	144	916
Georgia	623	2,462	Tajikistan	1,118	102
India			Thailand		
Indonesia	572	29	Turkey	300	350
Iran (Islamic Republic of)	927	1,224	Turkmenistan		
Kazakhstan	4,567	1,579	Uzbekistan	966	480
Kyrgyzstan	1,589	497	Viet Nam	855	3,624
Lao People's Democratic Republic	316	63	**Total**	25,587	17,425
Malaysia					

Source: ESCAP (2006). *Priority Investment Needs for the Development of the Asian Highway Network*, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Document number ST/ESCAP/2424, http://www.unescap.org/ttdw/PubsDetail.asp?IDNO=187

c) Asian Highway investment prospects in selected member countries

An *Asian Highway Investment Forum* was organized by the ESCAP Secretariat in Bangkok on 16 November 2007.[140] The Forum provided the most recent update on the progress in development and upgrading of the Asian Highway and priority investment needs and opportunities.[141] A brief account of the delegates' statements is presented here.

Armenia: The Kapan-Tsav-Shvanidzor-Meghri road has been recently completed to connect Armenia with the Islamic Republic of Iran. A new road development plan through Georgia will connect Poti and Batumi Ports in the Black Sea from Armenia.

Azerbaijan: The East-West and North-South highway routes are of particular importance in Azerbaijan, and current improvement plans for its highway network require some US$ 800 million.

Bangladesh: Construction of Padma Bridge and upgrading of the AH1: Bhatiapara-Benapole section for about US$ 1.5 billion of investment are priorities of the Government and illustrate the good investment environment in Bangladesh.

Bhutan: Upgrading of Phuentsholing-Thimphu Highway (AH48) is progressing with target completion by 2010. The investment need is about US$ 143 million for the construction of the southern Gelephu-Phuentsholing highway.

Cambodia: Installation of AH route signs has been initiated and AH11 has been upgraded. JICA is assisting in the construction of the Mekong River Bridge at Neak Loeung (AH1). US$ 2.6 billion are needed to implement the Road Development Master Plan.

[139] These data represent investments as at 2004 and 2005 that are backed by a financial commitment from either a government or other source, including where construction will be carried out in future. These data have largely been compiled from the country reports submitted, presentations made by the member states during expert group meetings and information on donors' websites. These data neither represent the current level of investment in the highway sector (as the Asian Highway in a country is only part of that country's highway system), nor is it an annual figure as projects typically take several years to be completed.

[140] www.unescap.org/ttdw/common/TIS/AH/ah_investment_forum.asp

[141] National status papers and presentations are available at www.unescap.org/ttdw/common/TIS/AH/ah_investment_forum.asp

China: The development of expressways are financed through support of central and local government as well as through tolls. Four projects needing investment: AH3 (Jinhong-Mohan), AH3 (Jinhong-Dulao), AH4 (Kashi-Honquiraf) and AH42 (Lhasa-Zhangmu).

Democratic People's Republic of Korea: It was mentioned that the Democratic People's Republic of Korea considers joining the Asian Highway project and the Agreement in the near future.

Georgia: The Improvement of the East-West Highway (AH5) is progressing and will be completed by 2016. A PPP project for upgrading of a 100 kilometres section is being developed.

India: The AH sections in India are being upgraded under the various phases of the National Highway Development Project which is mainly financed through a cess on diesel and petrol. There are many PPP projects being developed, as the government has offered various incentives to the private sector.

Indonesia: The majority of Asian Highway routes AH2 and AH25 in Indonesia now meet the minimum AH standards, except for a few in Sumatra. Both toll-road and non-toll road projects are being developed, and viable projects are being proposed for PPP.

Islamic Republic of Iran: The 11,000 kilometres of AH routes passing through the republic are of particular interregional importance. Three freeway projects are proposed for financing, namely Ghazvin-Saveh (144 kilometres), Srijan-Bandar Abbas (300 kilometres) and Tabriz-Bazargan (260 kilometres).

Kazakhstan: Transport sector investment has increased sharply in has now reached US$ 900 million. There is a need to upgrade about 2,000 kilometres for about US$ 2.3 billion, in order to connect Western China with Europe through Kazakhstan.

Kyrgyzstan: The development of the following three roads need about US$ 330 million in investment: Bishkek-Naryn-Torugart, Osh-Sarytash-Irkeshtam, and Sarytash-Karamyk.

Lao People's Democratic Republic: Construction of the AH3 section from Houayxai to Boten at the border of China will be completed by February 2008. The Mekong Bridge between Chaing Khong (Thailand) and Huayxai was committed under grant assistance from the governments of Thailand and China, and the AH13 section from Houi Kon, Mouang Ngeun to Pak Beng is under construction, with loan assistance from Thailand. US$ 345 million is required for the implementation of the road sector development plan until 2020.

Myanmar: About 40 per cent of the Asian Highway in Myanmar (1,200 kilometres) is below Class III standard, and donor support on the order of US$ 185 million is needed for the improvement of AH1 Myawady-Thaton (194 kilometres), AH1 Monya-Kalewa (184 kilometres), and AH2 Meiktila-Kyaington (634 kilometres).

Nepal: In addition to the construction of Koshi Bridge and widening of bridges along AH2 (US$ 35 million), the current priority is to construct a new 90 kilometres North-South road section between Kathmandu and Pathalaiya connecting China and India through Kathmandu costing US$ 250 million for 2 lanes. The project is being studied by ADB and will reduce the length of AH42 by 150 kilometres. It is proposed to become a PPP project.

Pakistan: The focus is on the implementation of the Mid Term Development Framework in Pakistan. All Asian Highway sections of Pakistan are expected to meet AH standards by 2014.

Philippines: Asset preservation, rehabilitation and upgrading, improvement of black spots along AH26 will require about US$ 725 million.

Republic of Korea: The installation of AH route signs has been initiated and ill be completed by 2009.

Russian Federation: The Moscow-St. Petersburg expressway section of AH8 will be widened using a PPP. Other projects proposed for PPP include the Ring Road in St. Petersburg, Moscow-Minsk and Moscow-Novosibirsk roads.

Singapore: AH2, the only Asian Highway route in Singapore, meets the standards for the Primary and Class I categories.

Tajikistan: 700 kilometres of roads have been improved recently. The government has identified 31 priority projects requiring investment of US$ 795 million. Donor support and assistance is needed.

Thailand: The Intercity Motorways Development Master Plan is guiding road development in Thailand. A PPP project is proposed to upgrade the Bang-Pa In-Saraburi-Nakhon Ratchasima Motorway (199 kilometres) requiring about US$ 788 million.

Turkey: An investment of US$ 350 million is needed to improve the 310 kilometres AH5 section Gerede-Merzifon. The current level of traffic on the road was 10,000 vpd.

Uzbekistan: A strategy has been developed for the creation of logistics centre and international hub airport in Novoi, Samarkand.

Viet Nam: All four Asian Highway routes in Viet Nam are in good condition. Due to increase in the traffic along AH1 and AH14, development of a 2,000 kilometres long expressway network is planned. It may cost about US$ 8 billion. Assistance from donors and the private sector is needed.

B. Road networks in Asia and the Pacific

The previous section discussed the recent development of the *Asian Highway Network* which basically comprises of major trunk roads of international importance in 32 Asian countries. In contrast, the present section provides an overview of national-level data and trends for the *whole road network*, including secondary and rural roads.

1. Data issues

For the purpose of this publication, we define a *road* as an identifiable path suitable for use by all forms of non-guided vehicular transport. It can vary from the most fundamental of formed tracks through remote territory to multi-lane, high-speed motorways through cities or links between them.

Note: Unfortunately, no global harmonization for transport-related data exist. A *glossary of transport statistics* (www.unece.org/trans/main/wp6/transstatglossmain.html) has been developed and promoted jointly by United Nations ECE (the sister organization of ESCAP in Europe), ECMT and Eurostat, that has also been promoted by the ESCAP Secretariat in Asia and the Pacific, to date very few countries have actually followed these recommendations and reported data that are comparable across countries. In practise, differing definitions result in inconsistencies of scope among the statistics published by individual UNESCAP countries: a road in one country may not necessarily be defined as such in another. Also, responsibility for roads is often shared between two or more government organizations, and data reported often only refers to the road network that is controlled by one lead organization. As a result, reported data for the same country can easily vary by one order of magnitude.

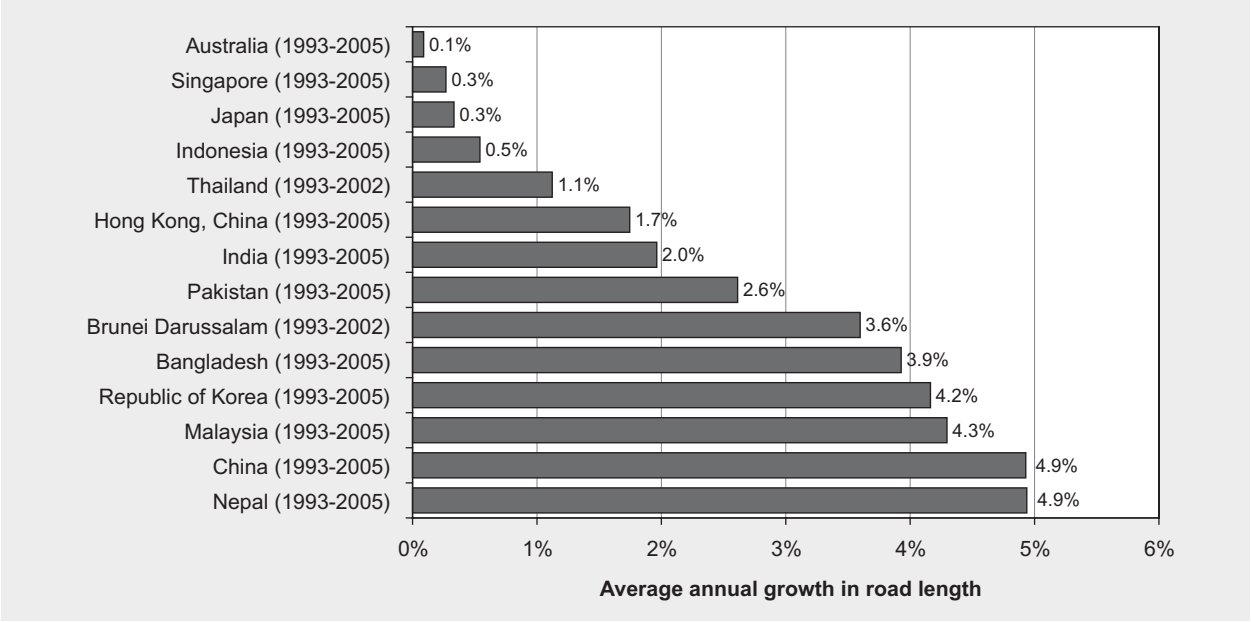
As explained in the above note, there are serious data deficiencies in the Asian road sector that limit the possibility to provide an accurate account developments in the region. This is due to inconsistencies in data definitions and reporting systems, as well as the uneven availability of data for various jurisdictions. Fortunately, changes in Asia have been rapid, so that it is still possible to paint a broad picture of developments despite the data discrepancies.

2. Road length and share of paved roads

Road length in the ESCAP region has grown at a faster pace than in other parts of the world. In fact, many Asian countries have doubled their road network length over the past two decades,[142] which is an enormous achievement by historical standards.

Figure VII-3 shows the annual average growth in road length for selected ESCAP countries between 1993 and 2005. Of course, developed nations with mature road networks have lower growth rates than developing nations. While Australia's road network grew only at 0.1 per cent per year, the Nepal's and China's network grew at an average rate of 4.9 per cent per year. The latter rate implies almost a tripling in 20 years. Rapid growth in road length was also registered in Malaysia, the Republic of Korea and Bangladesh.

Figure VII-3. Annual average growth in road length in selected ESCAP countries, 1993-2005



Sources: United Nations and ESCAP Statistical Yearbooks (2002, 2003, 2004, 2005, 2006, 2007)

Table VII-4 shows the total road network length in selected ESCAP countries. India and China have the largest road networks of the ESCAP region, comprising roughly 3.5 and 1.7 million kilometres of road respectively. Thus, India's road length is now roughly half that the United States of America. There are now 12 Asian countries with national road length larger than 100,000 kilometres.

Table VII-4 also lists road density, i.e., road length per land area. Road density is not only an indicator of the maturity of an economy's road network, but also a function of the geography of a country. Rich countries with a high population density, such as Singapore and Japan, have the highest road density. But also poor countries with high population density can have quite high road density as illustrated by the case of Bangladesh. Order of magnitude differences in road density between countries with otherwise similar population density show the large future potential for increases in road length in many ESCAP developing countries, including India and China.

Table VII-4 also lists road length per capita. In a way this is a road infrastructure affordability measure. Australia has the highest road network length per capita in the ESCAP region, whereas Hong Kong, China; and Myanmar have the lowest road length per capita, albeit for different reasons.

Figure VII-4 shows the proportion of roads that are paved. This proportion ranges widely, from 2 to 3 per cent in the Solomon Islands, Papua New Guinea and Mongolia to 100 per cent in Singapore, Hong

[142] UNESCAP, 2007, *Statistical Yearbook*.

Kong, China; and Armenia. For the whole ESCAP region, roughly 59 per cent of roads are paved. This is considerably higher than a decade ago.[143]

Although there is a correlation between a country's wealth and the incidence of paved roads in urban areas, overall, other factors such as the extent of uninhabited or sparsely populated land, have an important role in determining the proportion of paved roads in a country. Australia for example, is one of the region's three developed countries, yet only 42 per cent of its roads are paved.

In view of the road data deficiencies mentioned earlier, care should be taken when comparing these data across countries. When in country A the reporting agency only report data for major roads, whereas in country B it includes all rural roads in its report, country A will report a much higher share of paved roads, even if the road networks were actually quite similar.

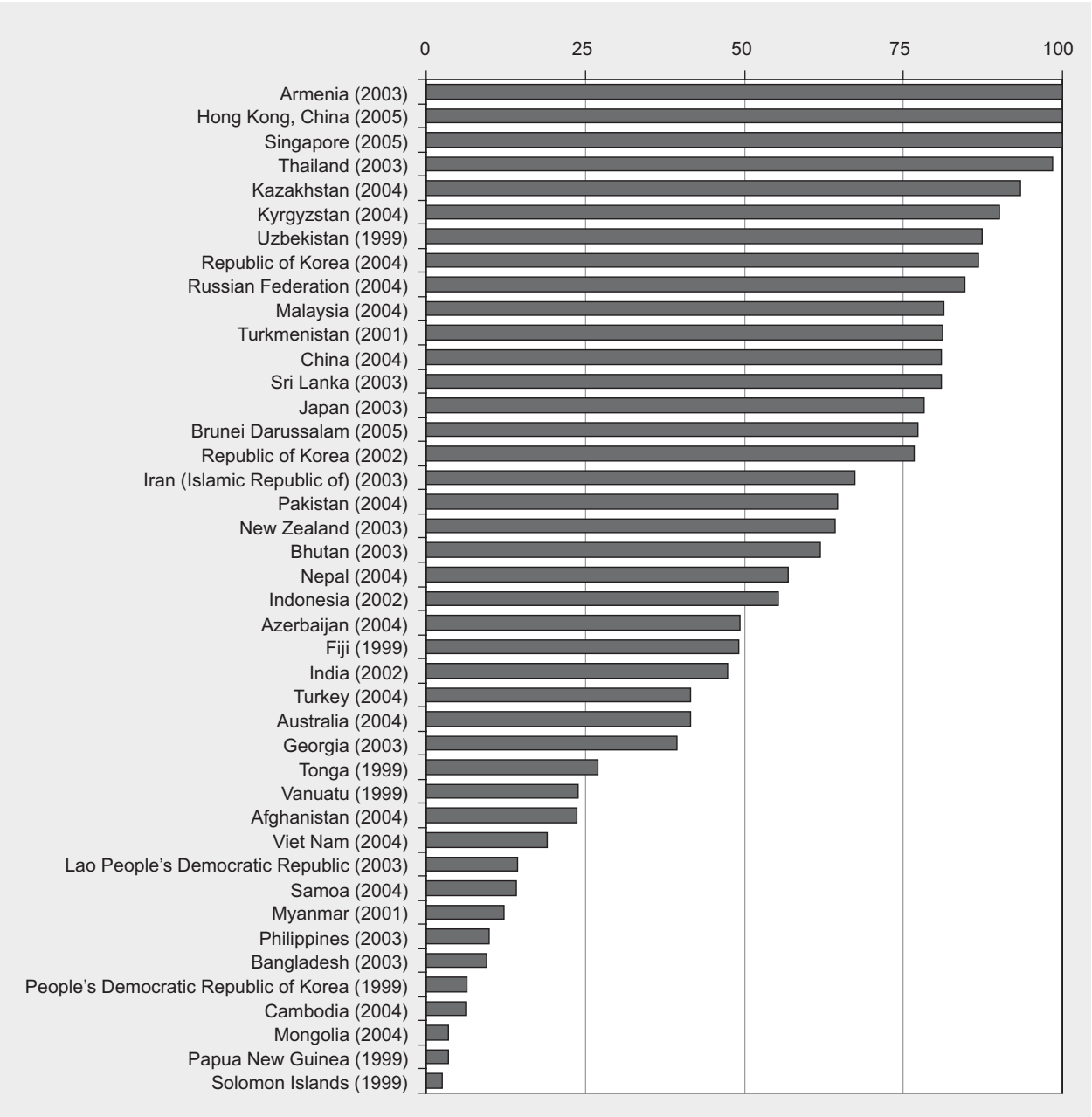
Table VII-4. National road length, road length per capita and road length per land area in selected ESCAP economies in 2005

Country	Road length (km)	Road length per capita (km/1,000 people)	Road length per land area (km/1,000 ha)
India	3,383,000	3.0	11.4
China	1,931,000	1.5	2.1
Japan	1,177,000	9.2	32.3
Australia	810,000	39.4	1.1
Turkey	427,000	5.8	5.5
Indonesia	368,000	1.6	2.0
Pakistan	258,000	1.6	3.3
Bangladesh	239,000	1.7	18.4
Viet Nam	222,000	2.6	7.2
Philippines	200,000	2.3	6.7
Iran (Islamic Republic of)	179,000	2.5	1.1
Republic of Korea	100,000	2.1	10.1
Malaysia	99,000	3.7	3.0
Sri Lanka	97,000	4.9	15.0
New Zealand	93,000	22.6	3.5
Kazakhstan	90,000	6.1	0.3
Azerbaijan	59,000	7.0	7.1
Thailand	53,761	0.9	1.1
Cambodia	38,000	2.7	2.2
Afghanistan	35,000	1.1	0.5
Lao People's Democratic Republic	31,000	5.1	1.3
Myanmar	28,200	0.6	0.4
Tajikistan	27,767	4.2	2.0
Georgia	20,000	4.5	2.9
Papua New Guinea	19,600	3.3	0.4
Nepal	17,000	0.7	1.2
Bhutan	8,000	3.6	1.7
Fiji	5,300	6.2	2.9
Singapore	3,000	0.7	43.5
Brunei Darussalam	2,398	6.3	4.6
Hong Kong, China	2,000	0.3	19.0
Tonga	680	6.6	9.4

Sources: United Nations Statistics Division website, viewed on 26 November 2007 at http://unstats.un.org/ and ESCAP Population Data Sheet 2006, and World Bank website, http://www.worldbank.org visited 5 November 2007.

[143] see earlier versions of this Review, e.g., ESCAP (2001). Review of transport and communications in 2001.

Figure VII-4. Proportion of paved road in selected ESCAP countries, in per cent



Sources: United Nations and ESCAP Statistical Yearbooks (2002, 2003, 2004) which have used data from Country Statistical Yearbooks, CIA (2007) *World Factbook 2007*, and World Bank (2004) *World Development Indicators 2004*.

Investment in road infrastructure in the ESCAP region during 2006 was approximately US$ 170 billion – accounting for approximately two-thirds of all transport infrastructure investment in the region. In addition to road lengthening programmes, ESCAP countries have also invested in widening roads and upgrading road quality. The most significant of these programmes in the ESCAP region is the Asian Highway project.

3. Road vehicle fleets and motorization trends in the region

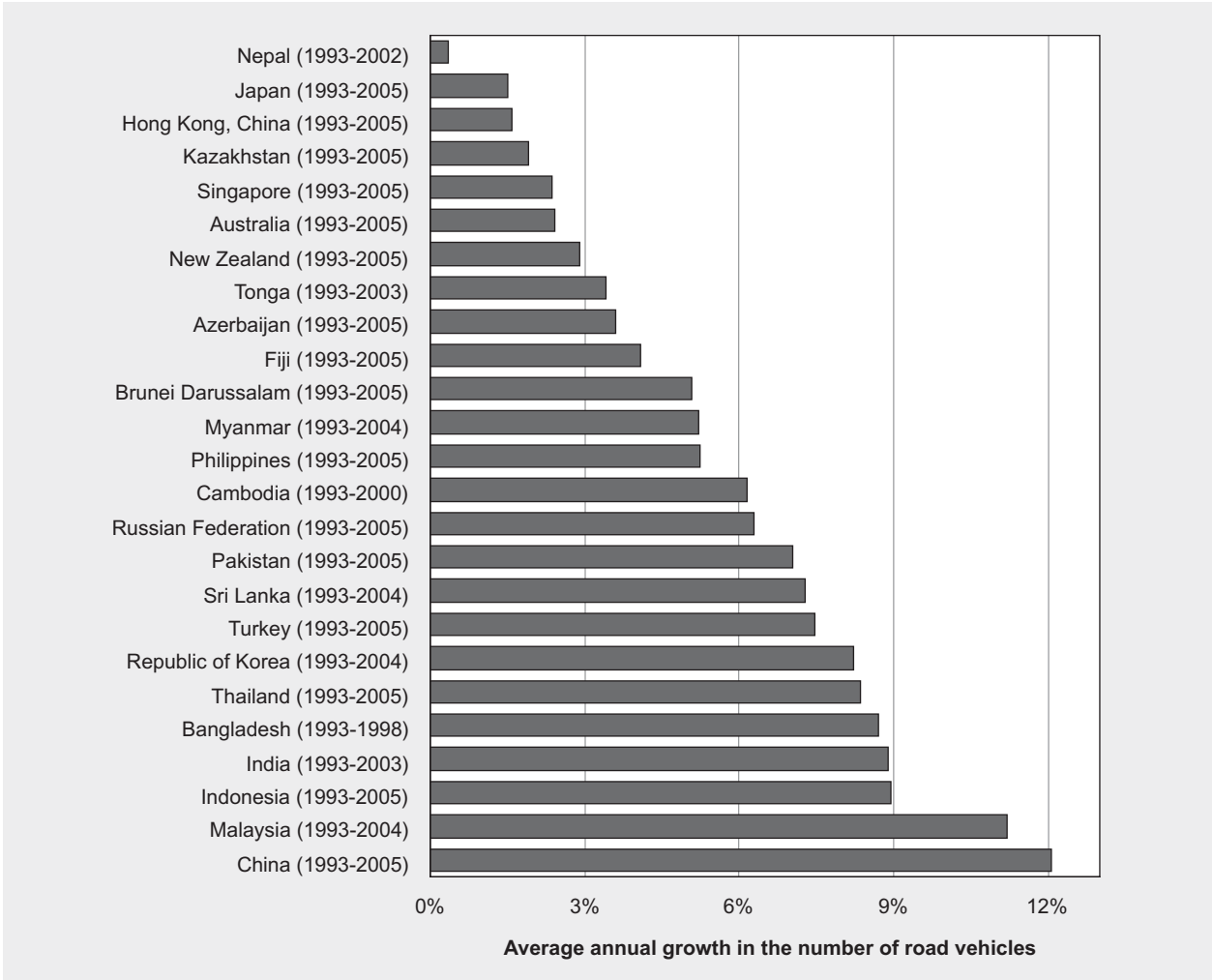
Motorization rates and vehicle density are indicators which are often used to measure a country's development. The same note on data deficiencies applies to this section as above.

Figure VII-5 compares the average annual growth in the number of road vehicles in selected ESCAP countries over the period 1993-2005. For the whole ESCAP region, the number of vehicles grew at

an average 5 per cent per year, from 128 million in 1993 to roughly 224 million in 2005. All types of registered vehicles, both passenger and commercial, have been included in these estimates.

Road vehicle fleets in Nepal, Japan, Hong Kong, China and Kazakhstan grew less than 2 per cent per year from 1993 to 2005. In Nepal this growth was only 0.3 per cent per year. Japan has the highest number of motor vehicles (74 million) in the region, but one of the region's slowest growth rates (1.5 per cent). On the other end of the spectrum, in Malaysia and China the number of road vehicles grew at double-digit rates of 12 and 13 per cent, respectively. Over 11-12 years, the Malaysian and Chinese vehicle fleets increased from 166,000 to 535,000 and from 0.787 to 30.9 million, respectively (Figure VII-5). In Indonesia, India, Bangladesh, Thailand and the Republic of Korea, vehicle fleets also grew at an annual average of 8-9 per cent.

Figure VII-5. Average annual growth in the number of road vehicles, 1993-2005



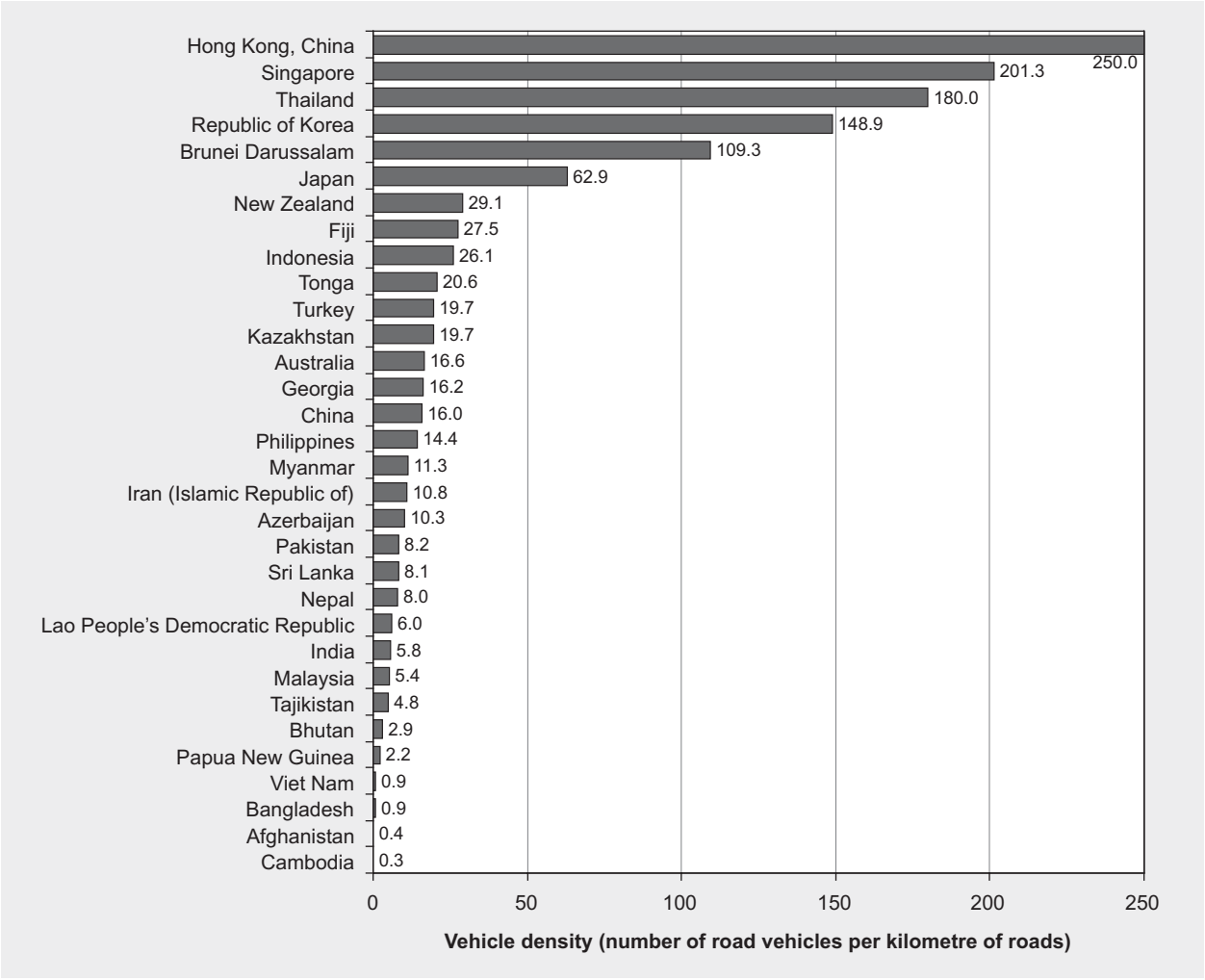
Source: Viewed on the Website of United Nations Statistics Division, 15 November 2007, http://unstats.un.org/unsd.
Note: All passenger and commercial road vehicles are included.

Figure VII-6 illustrates the wide range of vehicle densities in the ESCAP region. Vehicle density is the number of road vehicles in a country divided by the length of roads. The variable length of roads is simply the route length and not the lane length, as the latter is not available for most countries. Thus, vehicle density provides only limited information on possible under-provision of road infrastructure or the potential for traffic jams (which are local phenomena anyway).

The average vehicle density in the ESCAP region is roughly 20 road vehicles per road kilometre, comparable to that of Turkey, Kazakhstan or Australia. Not surprisingly, the cities of Hong Kong, China and Singapore show the highest vehicle density of more than 200. But also Thailand and the Republic of Korea

registered very high vehicle densities of 180 and 149 vehicles per kilometre, respectively. Thailand's vehicle density is three times as high as Japan's, even though population density of Japan is almost four times as high, which clearly indicates very different levels of road infrastructure provision. On the other hand of the spectrum, Cambodia, Afghanistan, Bangladesh and Viet Nam still have very low vehicle densities of less than one vehicle per kilometre of road.

Figure VII-6. Vehicle density in selected ESCAP economies, 2006

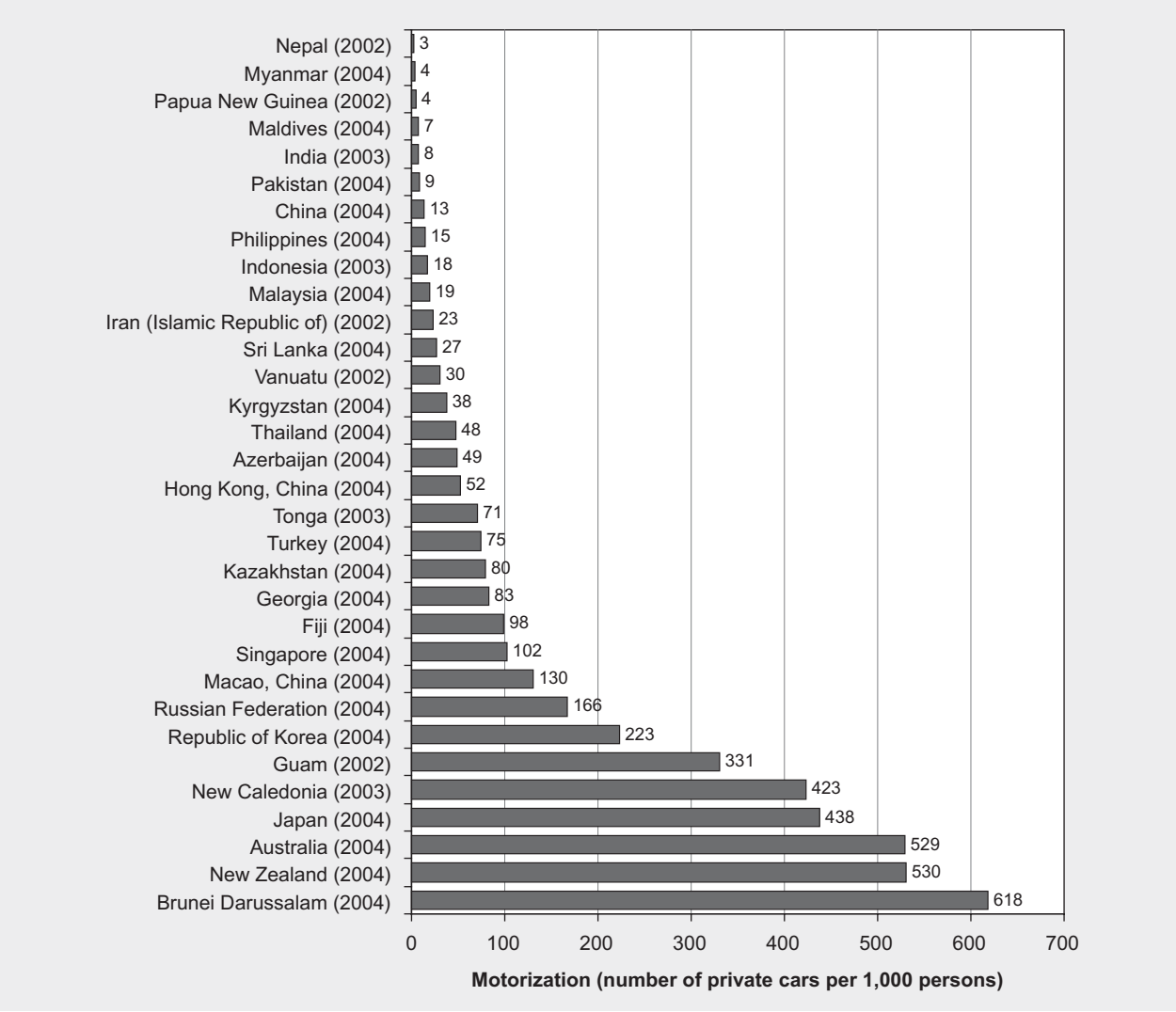


Sources: UN and ESCAP Statistical Yearbooks (1999, 2001, 2003); WB's *World Development Indicators 2007*.

Figure VII-7 illustrates the level of motorization in selected ESCAP economies. Motorization here is measured as the number of private cars per 1,000 people in a country, in line with the commonly used UN definition.

In most countries, motorization is a good proxy for GDP per capita, and thus the level of development. Such correlation would be best if the total number of passenger vehicles (private, public and commercial) with at least four wheels were used in the definition of motorization. Wile the motorization rate based on the UN definition used here correlates well with GDP per capita, it is not a good indicator of personal mobility. This particularly the case for the developing economies of South, South-East and East Asia where the share of two and three-wheelers in the national vehicle fleet is often more than 60 per cent, in contrast to other world regions and the developed countries. Different definitions of motorization are used by international organizations. For example, the ASEAN Statistical Yearbook differentiates between total and goods (commercial) vehicles, and the World Bank distinguishes between passenger cars and two-wheeled vehicles.

Figure VII-7. Motorization rates in selected economies of the ESCAP region, 2002-2004



Sources: United Nations and ESCAP Statistical Yearbook (2007).

The overall motorization level of the ESCAP region is estimated at 60 private cars per 1,000 persons, which is slightly higher than motorization in Thailand and Azerbaijan and somewhat less than in Turkey and Tonga (Figure VII-7).

Five ESCAP economies had motorization levels greater than 400 private cars per 1,000 persons, including the three developed countries, Australia, New Zealand and Japan, as well as New Caledonia and Brunei Darussalam (Figure VII-7). Brunei Darussalam has the region's highest motorization level at 618 private cars per 1,000 persons.

Given the correlation between income and motorization, it is not surprising that Nepal, Myanmar and Papua New Guinea had the lowest motorization levels at 3-4 private cars per 1,000 persons.

A number of very populous ESCAP economies still have motorization levels that are one to two orders of magnitude lower than that in developed countries. For example, motorization in India, China, Indonesia and Pakistan was still as low as 8, 13, 18 and 9 private cars per 1,000 persons, respectively. In other words, current numbers of road vehicles are only a fraction of what they will be in two to three decades, as these populous and rapidly growing economies will go through a phase of rapid motorization.

C. Selected road and highway investment projects

Table VII-5 summarizes selected road and highway investment projects in the ESCAP region. It includes projects that have either been completed during the past five years, are currently in progress, or are planned for commencement within the next five years. The list is not comprehensive, but rather indicative of major road construction projects in the region. In making a selection, priority has been given to Asian Highway road developments.

Table VII-5. Selected road and highway investment projects in the ESCAP region (status: 2007)

Country	Selected road and highway investment projects	Stat
Afghanistan	*Ring Road Highway* **Overview:** The Asian Development Bank has approved a grant for construction of the remaining section of Afghanistan's Ring Road Highway. In addition to the ADB's grant, Afghanistan's Government is contributing US$ 4 million towards the project. The ADB has approved the grant for the following activities: Construction, ancillary and emergency works, maintenance, and business process development. The first stage of the grant is the construction of a 143 kilometre two-lane road from Bala Murghab to Leman. **Funding:** The ADB and the Afghanistan Government will provide $ 176 million and $ 4 million respectively towards the project. **Completion date**: The project is due for completion at the end of 2012.	Funds committed
Bangladesh	*Chittagong – Cox's Bazar-Ramu-Gundum Road* **Overview:** The construction and upgrading of the Arkan Road between Chittagong, Akiub and Yangon will provide a direct link between Bangladesh and Myanmar. The project will reconstruct the road from Ramu to Gundum to national road standards. The remaining portion of the project will upgrade the road to four lanes. **Funding:** The estimated cost of the project is US$ 144 million. **Completion date:** As at October 2007, the feasibility of the project had been examined by both the Bangladesh and Myanmar Governments and a Memorandum of Understanding had been signed; however, a project completion date has not yet been confirmed.	Planned/In progress
Cambodia and Viet Nam	*Phnom Penh to Ho Chi Minh Highway Project* **Overview:** Completed in 2006, the project linked Phnom Penh in Cambodia with Ho Chi Minh City in Viet Nam. ADB, Viet Nam Government and Cambodian Government contributed US$ 140 million, US$ 44.8 million and US$ 10.7 million, respectively. The project provided for the construction of 240 kilometres of road (160 kilometres in Cambodia and 80 kilometres in Viet Nam). The primary objective of the project was to encourage traffic and trade flows between Cambodia and Viet Nam.	Completed 2006
China	*Jinghong (Xiaomengyang) – Mohan, AH3* **Overview:** The road between Jinghong and Mohan in the southern Yunnan Province of China is the only Asian Highway link between China and the Lao People's Democratic Republic. The project will shorten this road link from 211 kilometres to 184 kilometres through the construction of a four-lane expressway. Construction began in 2004. The project has the goal of facilitating trade and tourism between China and the Lao People's Democratic Republic. **Funding:** The US$ 800 million project has been partly financed by the Central Government of China. Local governments will support the remaining project expenses. **Completion date:** Late 2007.	In progress

Table VII-5. *(continued)*

Country	Selected road and highway investment projects	Status
China	*Lasha – Zhangmu Road, AH42* **Overview:** The 754 kilometre road is the main road transport connection between China and Nepal. The road connects the cities of Lasha and Rikaze in Xizang Tibet Autonomous Region. It is the north-south corridor for Xizang, linking the Chinese inland province of Qinhai with Nepal. The project will upgrade and shorten the highway: at the time of the project's inception, 120 kilometres of the road was of Asian Highway Class III standard and the remainder was below Class III. **Funding:** The project has an estimated cost of approximately US$ 410 million; the majority of funding will come form the Central Government of China. **Completion date:** A completion date for the project has not as yet been confirmed.	In progress
Georgia	*Secondary and Local Roads Project* **Overview:** The project primarily aims to improve the economic and social well-being of the rural population in selected regions through road upgrading. The project has two infrastructure related components: (1) rehabilitation of approximately 500 to 750 kilometres of paved secondary and local roads, including between 150 to 250 kilometres of local roads; and (2) assisting in the design and supervision of the road works. **Funding:** The project is funded by way of loan from the World Bank to the Government of Georgia. The cost of project is estimated to be US$ 27.44 million. **Completion date:** The project is due to be completed at the end of 2009.	In progress
India	*Western Transport Corridor* **Overview:** The aim of the project is to establish a policy and institutional framework for efficient and sustainable development of the national highway systems. The primary objective of the project is: (i) to remove capacity constraints on a critical section of the Western Transport Corridor. It also aims at (ii) maximizing private sector participation in the highway development and operations; and (iii) introducing design features that will improve safety and maximize positive impacts for those people within the project's zone of influence. One of the projects undertaken to achieve this goal is the widening of the two-lane single carriageway to a four-lane divided carriageway highway between Haveri and Tumkur (including the Tumkur bypass) on NH4 and AH47 (sections 18, 19 and 20). **Funding:** The project is financed through the ADB and is estimated to cost US$ 240 million. **Completion date:** The project is due for completion in mid 2008.	In progress
Iran (Islamic Republic of)	*Zanjan-Tabriz, AH1* **Overview:** The Islamic Republic of Iran is currently investing roughly US$ 2.2 billion in the AH network. This is in addition to the construction of highways in the North-South and East-West Corridors. One of the largest of these investment projects is in the 285 kilometre-long Zanjan-Tabriz section of the AH1, at a cost of US$ 261 million. The road has been upgraded to a six-lane freeway.	Completed

Table VII-5. *(continued)*

Country	Selected road and highway investment projects	Status
Kazakhstan	*Development of various highways* **Overview:** The Government of Kazakhstan, through the State Programme on the Development of Highways for 2006-2012, is reconstructing 2,259 kilometres of highways. The reconstruction will take place on highway passes that lead from the border of the Russian Federation, Aktobe, Kyzylorda, Skymkent, Taraz, Almaty and Khorgos up to the border of China. The objective of the project is to upgrade the technical standards of the road to international standards and reduce transportation costs. **Funding:** The project is funded by the Government of Kazakhstan at a cost of approximately $ 1,320 million. **Completion date:** The project is due for completion in 2012.	In progress
Kyrgyzstan	*Southern Transport Corridor Road Rehabilitation Project* **Overview:** The Osh-Sary Tash-Irkeshtam road comprises part of the transport corridor linking the Kyrgyz Republic, Uzbekistan, and the China. It connects to the Bishkek-Osh road, a vital national transport corridor that is being rehabilitated under ongoing projects financed by ADB, and on to Almaty and other cities in Kazakhstan. The project includes the improvement of approximately 124 kilometres of road (Osh-Gulcha-Sopu Korgon). **Funding:** The project is sponsored by way of loan by the Asian Development Bank. The estimated value of the loan is US$ 32.8 million. **Completion date:** September 2008.	In progress
Lao People's Democratic Republic	*Greater Mekong Subregion, North-South Corridor* **Overview:** The Northern Economic Corridor project of the GMS aims to accelerate the development process of the Lao PDR by linking its economy to two rapidly growing economies of the region, namely Thailand and the People's Republic of China (PRC). It is anticipated that a direct link between PRC and Thailand via the Lao PDR will reduce transport costs in the area, and increase the efficiency of goods and passenger traffic. The project includes upgrading the existing 220 kilometres of road between Houayxay to Boten, capacity building for the provincial level officials in environment and social monitoring and a social action plan for the ethnic minorities in the area. **Funding:** These activities are being financed by loans from ADB and the governments of China and Thailand. **Completion date:** The section of the road financed by China was due for completion in 2006 and the Thai and ADB section in 2007.	In progress
Pakistan	*Islamabad – Peshawar Motorway (M1)* Currently under construction, the upgrade of the 154 kilometres of Islamabad – Peshawar Motorway (M1) is due for completion in 2008. Investment in the project totals US$ 460 million.	In progress
Pakistan	*Pakistan Highways Rehabilitation* **Overview:** The objective of this project is the sustainable delivery of a productive and efficient national highway network, contributing to lower transportation costs. In particular, this project targets approximately 856 kilometres of National Highways N-5 and M-9. Component 1 of the project covers network rehabilitation and improvement works. Component 2 focuses on policy support and institutional development. **Funding:** The World Bank has provided US$ 261.4 million by way of loan to the Government of Pakistan. **Completion date:** The estimated completion date for the project is June 2009.	In progress

Table VII-5. *(continued)*

Country	Selected road and highway investment projects	Status
Russian Federation	*Chita – Khabarovsk Highway Upgrade* **Overview:** When completed, the Chita – Khabarovsk federal highway will stretch some 2,097 kilometres from Russia's western border to the Pacific Ocean. **Funding:** The Government of the Russian Federation has provided the US$ 1,597.6 million to finance the project. **Completion date:** 2008.	In progress
Sri Lanka	*National Highway Sector Project* **Overview:** The project will upgrade 270 kilometres of national highways consisting of the Puttalam – Anuradhapura Highway, hilly roads and south highway links. A land acquisition and resettlement of approximately 80 kilometres is also funded by this project. **Funding:** The World Bank has provided funding by way of loan to the Sri Lankan Government for approximately US$ 150 million. **Completion date**: A completion date for the project has not yet been confirmed.	In progress
Tajikistan	*Dushanbe – Kyrgyz Border Road Rehabilitation Project (Phases I-III)* **Overview:** Phase I of the project consists of the improvement of 140 kilometres of the two-lane highway between Dushanbe and Darband running from Dushanbe northeast to the border with the Kyrgyzstan, as well as 77 kilometres of rural roads. Phases II and III are still in the feasibility and design stage (as at November 2007): • Phase II is currently assessing the feasibility and producing preliminary designs to rehabilitate approximately 77 kilometres of road between Nurobod and Nimich, • Phase III is currently assessing the feasibility and producing preliminary designs to rehabilitate approximately 121 kilometres of road between Nimich and the Tajikistan – Kyrgyzstan border. **Funding:** The ADB has provided funding by way of loan a total of $ 16 million to the Government of Tajikistan for the project. **Completion date:** A completion date for the project has not yet been confirmed; however, Phase I of the project is estimated to be completed by December 2007.	In progress
Thailand	*World Bank Highways Maintenance Project* The project consists of four components, designed to enhance the efficiency, productive use, and management of the road network: 1) Highway Rehabilitation and Maintenance: (a) periodic maintenance of about 700 kilometres of priority national highways (b) three long-term (five-year) pilot contracts for perfor-mance-based maintenance of about 900 kilometres of national highways. 2) Highway Upgrading and Intersection Improvement: (a) widening of three selected sections (Si Chon-Tha Sala, Nikhom Kham Sroi-Loeng Nok Tha, and Nong Bua Khok-Chaiya Phum) of priority national highways totalling 73 kilometres, from two to four lanes; and (b) construction of three overpasses at critical intersections; 3) Road Safety Improvement: (a) improvement of 10 hazardous locations; and (b) support for implementation of the road safety action plan in collaboration with the GRSP. 4) Institutional Strengthening: (a) development of a centralized road database, road asset maintenance and management system and a bridge management system; (b) development of a framework for and a case study on public-private partnerships (PPP) in highways; technical assistance (TA) for project coordination; external audit; and introduction of e-procurement.	In progress

Table VII-5. *(continued)*

Country	Selected road and highway investment projects	Status
Turkey	*Gaziantep – Sanliurfa Motorway* **Overview:** The upgrading of the Gaziantep – Sanliurfa Motorway (part of AH84) is one of a portfolio of projects detailed in the Government of Turkey's 2006 Investment Programme. The motorway stretches 213 kilometres and consists of the following four sections: • Gaziantep peripheral motorway (34 km, US$ 122 million) • Gaziantep – Birecik (55 km, US$ 215 million) • Birecik – Suruc (53.2 km, US$ 185.9 million) • Suruc – Sanliurfa (73 km, US$ 199 million)	In progress
Viet Nam	*Kunming – Haiphong Expressway Project (Lao Cai – Hanoi Section)* **Overview:** Under the umbrella of the GMS North-South Economic Corridor project, this project consists of the construction of a new four-lane expressway (expandable to six lanes) between Hanoi and Viet Tri and two lanes (expandable to four lanes) between Viet Tri and Lao Cai on the Viet Nam/China border. **Funding:** The total estimated cost of the project is US$ 600 million. **Completion date:** 2010.	In progress

Sources: ESCAP meeting notes, World Bank and ADB project databases and country websites.

VIII. RAILWAY TRANSPORT

This chapter provides an overview of railway transport and infrastructure in Asia and the Pacific. In particular, it summarizes trends in railway traffic (Section A), rail systems (Section B), recent developments of the Trans-Asian Railway (Section C), and selected railway infrastructure projects in the region (Section D).

Data and information was sourced from rail industry publications and databases, country statistical yearbooks and government publications. As the data availability varies from country to country, the years are indicated separately for each country in the following tables (where appropriate). Due to data quality limitations, cross-country comparability is limited, even though it generally appears better than for most other transport modes.

A. Trends in railway traffic

This section contains an assessment of the trends in railway traffic by railways in Asia and the Pacific, including freight (Section 1) and passengers (Section 2).

1. Railway freight traffic

a) Freight traffic in terms of net tons

There are very large differences in terms of both the absolute levels of railway freight traffic and their expansion or decline. Table VIII-1 provides an overview of recent trends in railway freight tonnage (net tons) for selected ESCAP countries from 1997 to 2006.

Table VIII-1. Trend in railway freight tonnage in the ESCAP region, 1997-2006

Subregion	Country (first year – most recent year)	Rail Freight Tonnage (million net tons)		
		First year	Most recent year	Average annual growth rate
Central Asia	Armenia (1997-2004)	1.3	1.4	1%
	Georgia (1997-2005)	7.2	22.6	15%
	Kazakhstan (1998-2006)	170.0	247.0	5%
	Tajikistan (1998-2002)	0.6	11.8	111%
	Uzbekistan (1996-2001)	80.3	41.5	-12%
Developed Member Countries	Australia (1999-2005)	453.0	701.0	8%
	Japan (1999-2005)	36.2	51.0	6%
	New Zealand (1998-2005)	11.7	14.3	3%
East and North-East Asia	China (1998-2005)	1,621.0	2,693.0	8%
	Mongolia (1997-2004)	7.4	14.1	10%
South Asia	Bangladesh (1996-2006)	2.5	3.1	2%
	India (1998-2005)	446.0	724.0	7%
	Pakistan (1998-2006)	5.4	6.3	2%
	Sri Lanka (1996-2003)	1.1	1.6	5%
South-East Asia	Cambodia (1997-1999)	0.2	0.3	22%
	Indonesia (1998-2005)	18.2	17.4	-1%
	Malaysia (1997-2005)	7.3	4.6	-6%
	Viet Nam (1998-2006)	4.9	9.2	8%
South-West Asia	Iran (Islamic Republic of) (1997-2005)	21.5	28.7	4%
	Turkey (1997-2005)	17.1	19.2	1%

Source: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

The largest absolute increases in railway freight tonnage were registered in China where it increased by 1,072 million tons from 1997 to 2006 (Table VIII-1). Rail freight tonnage in India and Australia also expanded significantly by 181 and 102 million tons respectively over a similar time period. The largest relative increases were achieved in Central Asian. For example, freight tonnage on the Georgian rail network grew by an average 15 per cent per year from 2003 to 2006, i.e., it was more than three times as large in 2006 than eight years earlier. Rail freight tonnage in Viet Nam increased by an average annual 8 per cent per year, whereas it decreased in Malaysia and Indonesia by 6 and 1 per cent, respectively.[144]

b) Freight traffic in terms of net ton-kilometres

A net ton-kilometre (ton-km) represents one net ton of freight transported for one kilometre. A "net-ton", as distinct from a "gross ton", includes the weight of the freight consignment and its packaging, but excludes the weight of the railway wagon. When aggregated across a railway system, net ton-kilometres provide a measure of the work done by the system, or the task of the railway system, in moving freight traffic.

Table VIII-2. Trends in railway freight traffic task (in net ton-km) in the ESCAP region, 1997-2006

Subregion	Country (first year – most recent year)	Rail freight tonnage (billion net ton-km)		
		First year	Most recent year	Average annual growth rate
Central Asia	Armenia (1997-2004)	0.38	0.35	-1.0%
	Azerbaijan (1997-2004)	3.52	7.72	11.9%
	Georgia (1997-2005)	2.01	7.39	17.7%
	Kazakhstan (1998-2006)	99.88	191.19	8.5%
	Tajikistan (1998-2002)	1.46	1.09	-7.1%
	Uzbekistan (1996-2001)	19.65	15.70	-4.4%
Developed	Australia (1999-2005)	127.40	192.57	7.1%
	Japan (1999-2005)	24.70	23.00	-1.2%
	New Zealand (1998-2005)	3.55	3.67	0.5%
East and North-East Asia	China (1998-2005)	1,163.00	2,073.00	8.6%
	Republic of Korea (1998-2004)	12.74	10.64	-3.0%
	Mongolia (1997-2004)	2.45	11.70	25.0%
South Asia	Bangladesh (1996-2006)	0.69	0.82	1.8%
	India (1998-2005)	286.77	441.70	6.4%
	Pakistan (1998-2006)	4.45	6.46	4.8%
	Sri Lanka (1996-2003)	0.11	0.13	2.6%
South-East Asia	Cambodia (1997-1999)	0.04	0.09	62.1%
	Indonesia (1998-2005)	4.96	4.39	-1.7%
	Malaysia (1997-2005)	1.34	1.18	-1.6%
	Thailand (1997-2005)	2.93	2.93	0.0%
	Viet Nam (1998-2006)	1.32	3.45	12.7%
South-West Asia	Iran (Islamic Republic of) (1997-2005)	12.60	18.05	4.6%
	Turkey (1997-2005)	9.49	9.15	-0.4%

Source: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

Table VIII-2 above compares the freight traffic task in terms of net ton-kilometres across a selection of ESCAP countries. It shows a substantial difference in total freight task and growth in freight task, within and between ESCAP subregions. For example, in 2005, China recorded a freight traffic task approximately 349 billion ton-km greater than in 2003, representing a 20.2 per cent increase. In terms of freight traffic, the China's railway network that is owned and operated by the State is the world's second largest rail system in the world after that of the United States of America.

[144] Cambodia is also excluded due to unavailability of data.

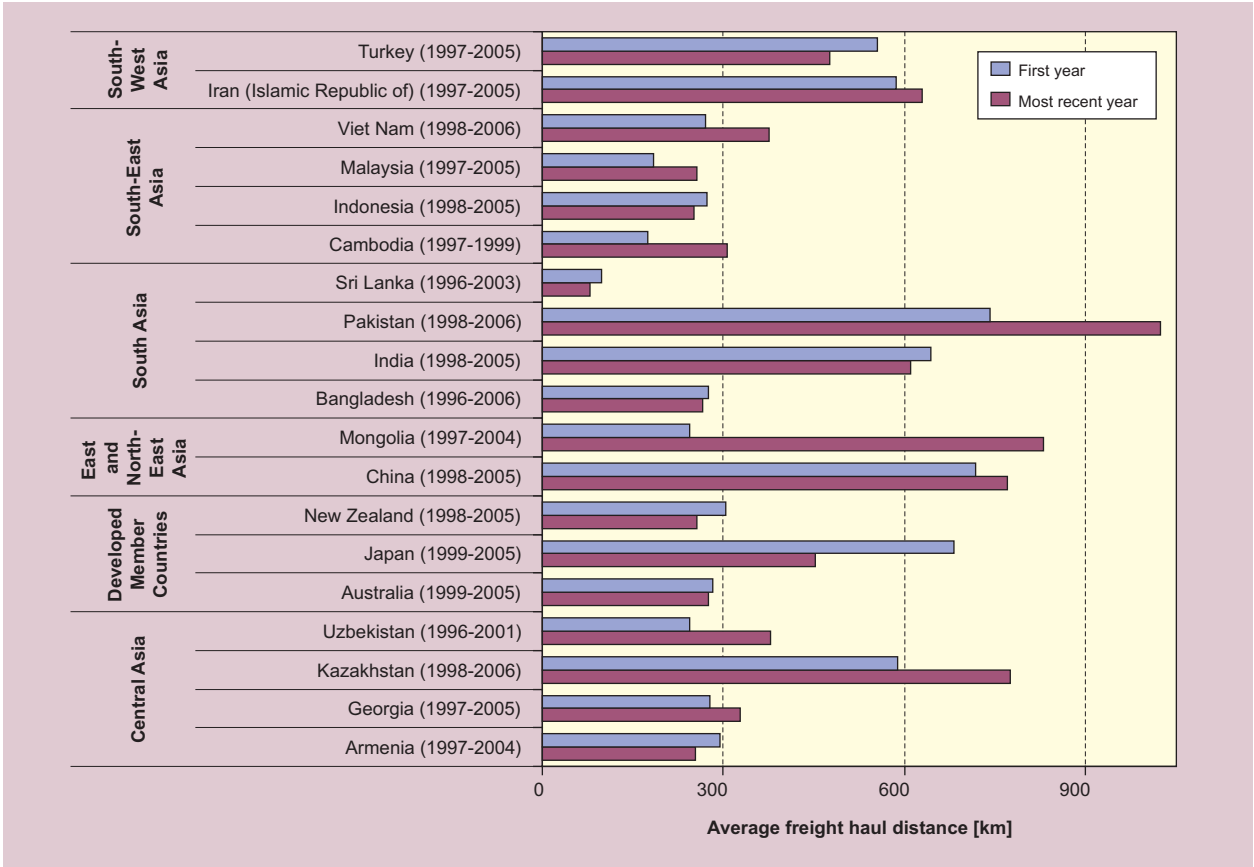
Mongolia has shown the most rapid growth in freight task, achieving an average annual growth rate of 25 per cent over the period, mostly due to international traffic.[145] Georgia, Viet Nam, Azerbaijan, Kazakhstan and China all have recorded average annual growth rates of more than 8.5 per cent. Apart from China, in aggregate terms, India, Kazakhstan and Australia recorded the largest increases in the total freight task, with increases of 86, 44 and 28 billion ton-km respectively.

While a number of countries have, to varying degrees, achieved an increase in freight task since the late 1990s and early 2000s, a number have experienced decreases. Countries in which the freight task has reduced include Armenia, Tajikistan, Uzbekistan, Japan, Republic of Korea, Indonesia, Malaysia and Turkey.

c) Average freight haul distances

The average distance over which rail freight traffic moves is one of the indicators of the financial viability of the rail freight business. It is widely accepted that average freight hauls of less than about 300 kilometres are unlikely to generate sufficient net revenue to be able to offset fixed costs, unless they involve regular very high volume shipments (of the type which can be generated in the region by container feeder train movement between ports and inland terminals). When a railway carries freight between 500 and 5,000 kilometres, it is more competitive compared to road transport, which is better suited to distances below 500 km.[146] Table VIII-3 below compares average freight-haul distances across a selection of ESCAP countries.

Table VIII-3. Average freight haul distance in selected ESCAP member countries, 1997-2006



Source: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

[145] Cambodia is not included in this analysis due to the unavailability of data.

[146] *World Development Indicators 2005,* World Bank, Washington.

Available data suggests that ESCAP countries vary widely in the average freight haul distances carried by their rail networks. Twelve countries of the profiled countries have average freight haul distances exceeding 300 kilometres. Pakistan recorded the region's highest average freight haulage distance of 1,025 kilometres.

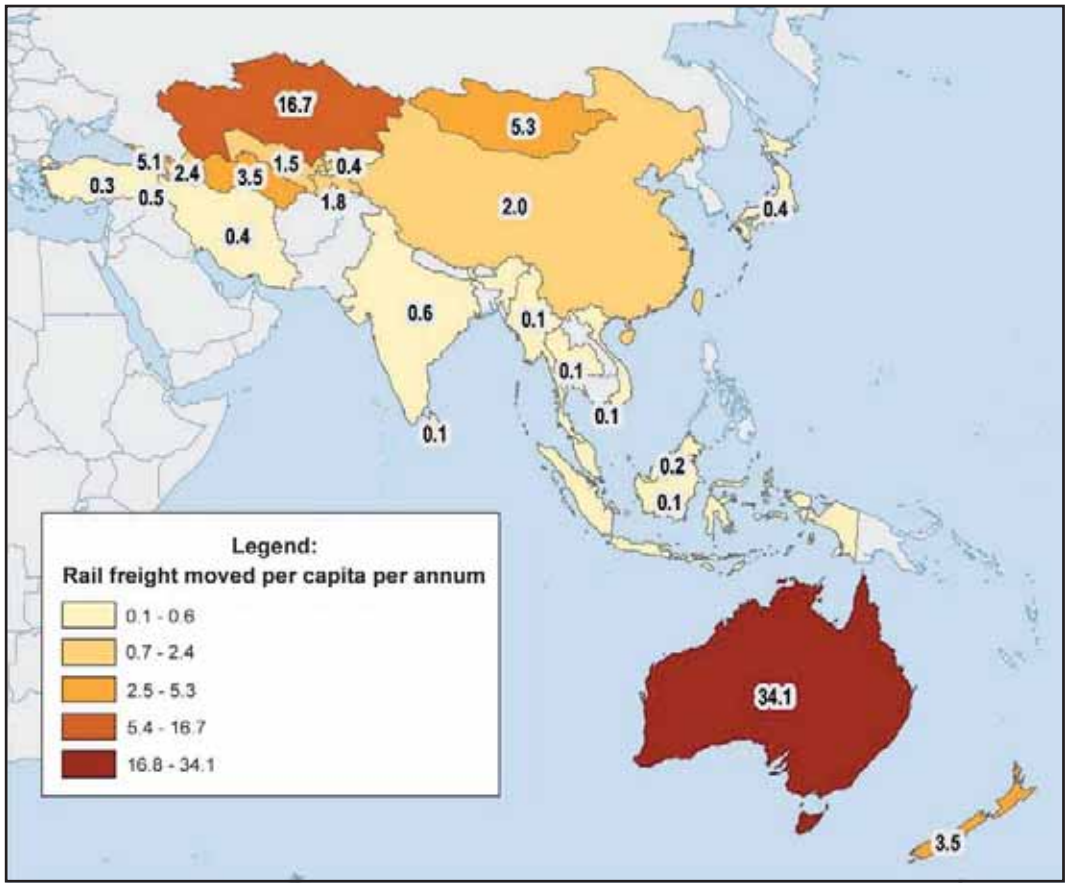
Seven ESCAP countries recorded average freight haul distances that were shorter than 300 kilometres. For example, the average freight haul distance of Sri Lanka was only 80 kilometres.

The data also suggests considerable cross-country differences in terms of the growth of freight haul distances from 1997 to 2006, although some anomalies in reported figures suggest that they should be treated with some caution. Over the same period, the average freight haul distance decreased by an average of 9 per cent per year in Japan, and increased by an average of 9 per cent per year in Uzbekistan.

d) Freight tons moved per capita per year

Figure VIII-1 below illustrates the number of freight tons moved per capita per year in selected ESCAP member countries. It is highest in Australia and Kazakhstan, which is primarily due to the movement of large volumes of primary resources (minerals, ore, oil, gas) for exports and relatively low population densities. Mongolia, Georgia, Turkmenistan and New Zealand are the region's next highest movers of freight tons per capita, moving 5.3, 5.1, 3.5 and 3.5 tons per capita per year, respectively.

Figure VIII-1. Rail freight tons moved per capita in selected countries



Source: Meyrick and Associates analysis based on Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

e) Efficiency: freight ton-kilometres per freight wagon and locomotive wagon

Ton-kilometres per freight wagon and ton-kilometres per locomotive provide a broad measure of the efficiency of a country's railway network (Table VIII-4). However, ton-kilometres per freight wagon is a stronger measure of efficiency than ton-kilometres per locomotive, as not all locomotives are specifically designated to carry freight.

Table VIII-4 shows that Australia, Tajikistan and Mongolia registered the largest number of ton-kilometres per freight wagon in the ESCAP region. Australia, Kazakhstan and Tajikistan achieved the largest number of ton-kilometres per locomotive. On the other side of the spectrum, Pakistan, Bangladesh and Armenia achieved the lowest number of ton-kilometres per freight wagon. Myanmar, Bangladesh and Pakistan registered the lowest number of ton-kilometres per locomotive.

Table VIII-4. Efficiency measures of the rail network in selected ESCAP countries

Country and Year	Ton-kilometres per freight wagon	Ton-kilometres per locomotive
Australia (2005)	7,072	282,775
Tajikistan (2002)	6,611	207,018
Mongolia (2004)	5,476	114,634
China (2005)	4,878	150,472
Japan (2005)	4,737	35,427
Kazakhstan (2006)	4,450	221,525
Indonesia (2005)	3,670	177,551
India (2005)	3,616	90,848
New Zealand (2005)	3,303	59,833
Georgia (2005)	1,967	152,703
Viet Nam (2006)	1,846	27,879
Iran (Islamic Republic of) (2005)	1,695	47,360
Turkmenistan (2001)	1,530	51,964
Uzbekistan (2001)	1,447	111,260
Malaysia (2005)	1,380	71,875
Turkey (2005)	1,189	36,090
Thailand (2005)	1,148	30,976
Myanmar (2003)	1,145	10,625
Cambodia (1999)	1,091	15,000
Sri Lanka (2003)	1,067	13,008
Kyrgyzstan (2003)	921	44,681
Azerbaijan (2003)	804	39,648
Armenia (2004)	467	12,727
Bangladesh (2006)	303	10,877
Pakistan (2006/07)	292	11,710

Source: Meyrick and Associates analysis based on Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

2. Railway passenger traffic

a) Efficiency: rail passenger-kilometres per passenger wagon

Table VIII-5 below shows the number of passenger-kilometres per passenger wagon which is a measure of productivity. However, cross-country comparisons of this indicator should also be taken with caution. In countries where there are many rail operators (e.g., Japan) and different types of rail transport (e.g., metro vs. long-distance operators), the number of passenger-kilometres per passenger wagon can vary widely between operators.

Table VIII-5. Passenger kms per passenger wagon in selected ESCAP member countries[147]

Country and Year	Passenger kms per passenger wagons
Georgia (2005)	260,427
Turkey (2005)	258,492
Malaysia (2005)	253,345
Japan (2005)	225,446
Uzbekistan (2001)	219,048
Iran (Islamic Republic of) (2005)	171,415
Sri Lanka (2003)	155,862
India (2005)	143,890
Thailand (2005)	130,557
Indonesia (2005)	112,855
Australia (2005)	92,465
Myanmar (2003)	74,607
Pakistan (2006/07)	52,104
China (2005)	40,962
Armenia (2004)	37,660
Bangladesh (2006)	33,557
Mongolia (2004)	15,926
Cambodia (1999)	13,333
Viet Nam (2006)	10,913
New Zealand (2005)	9,962
Turkmenistan (2001)	8,136
Kazakhstan (2006)	7,515
Azerbaijan (2003)	4,215
Tajikistan (2002)	1,558
Kyrgyzstan (2003)	966

Source: Meyrick and Associates analysis based on Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

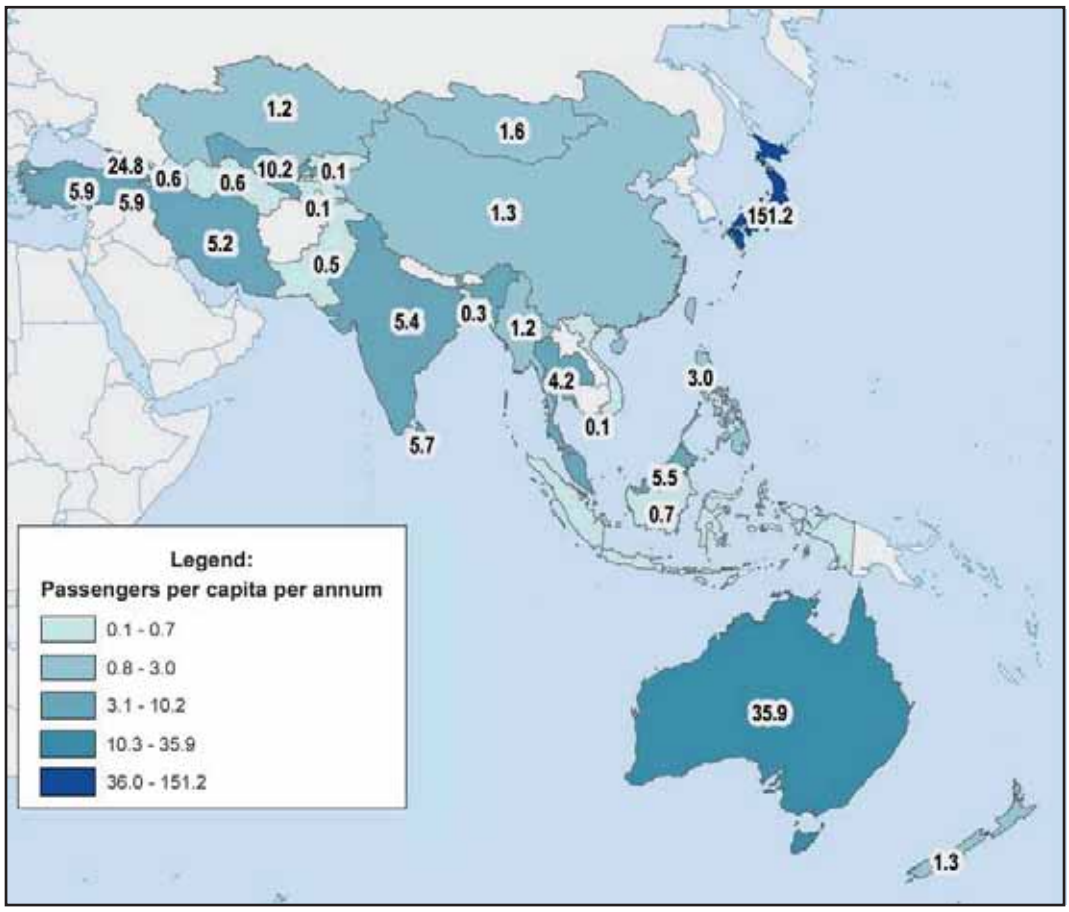
Whereas Georgia, Turkey, Malaysia, Japan and Uzbekistan achieved more than 200,000 passenger-kilometres per passenger wagon, Kyrgyzstan, Tajikistan, Azerbaijan, Kazakhstan, Turkmenistan, New Zealand and Viet Nam each recorded less than 10,000 passenger-kilometres per passenger wagon.

b) Number of railway passengers moved per capita per year

Figure VIII-2 below illustrates the number of passengers carried per capita per year. Again, due to data quality issues, caution need to be exercised in comparing this indicator across countries. Nevertheless, the developed countries Japan and Australia move the largest number of passengers per capita per year: 151 and 36 passengers per capita per year, respectively. In comparison, the developing countries India and China move only 5.4 and 1.3 passengers per capita per year, even though they possess some of the largest rail networks in the world.

[147] The passenger coach stock of the region comprises powered and unpowered diesel multiple unit and electric multiple unit vehicles, in addition to locomotive-hauled carriages.

Figure VIII-2. Rail passengers moved per capita in selected countries



Source: Meyrick and Associates analysis based on Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

B. Rail systems growth

This section provides an overview of recent trends in the route length of railway networks (Section 1), electrification (Section 2), railway employment (Section 3), locomotive fleets (Section 4), freight wagon fleets (Section 5), and passenger coach fleets (Section 6).

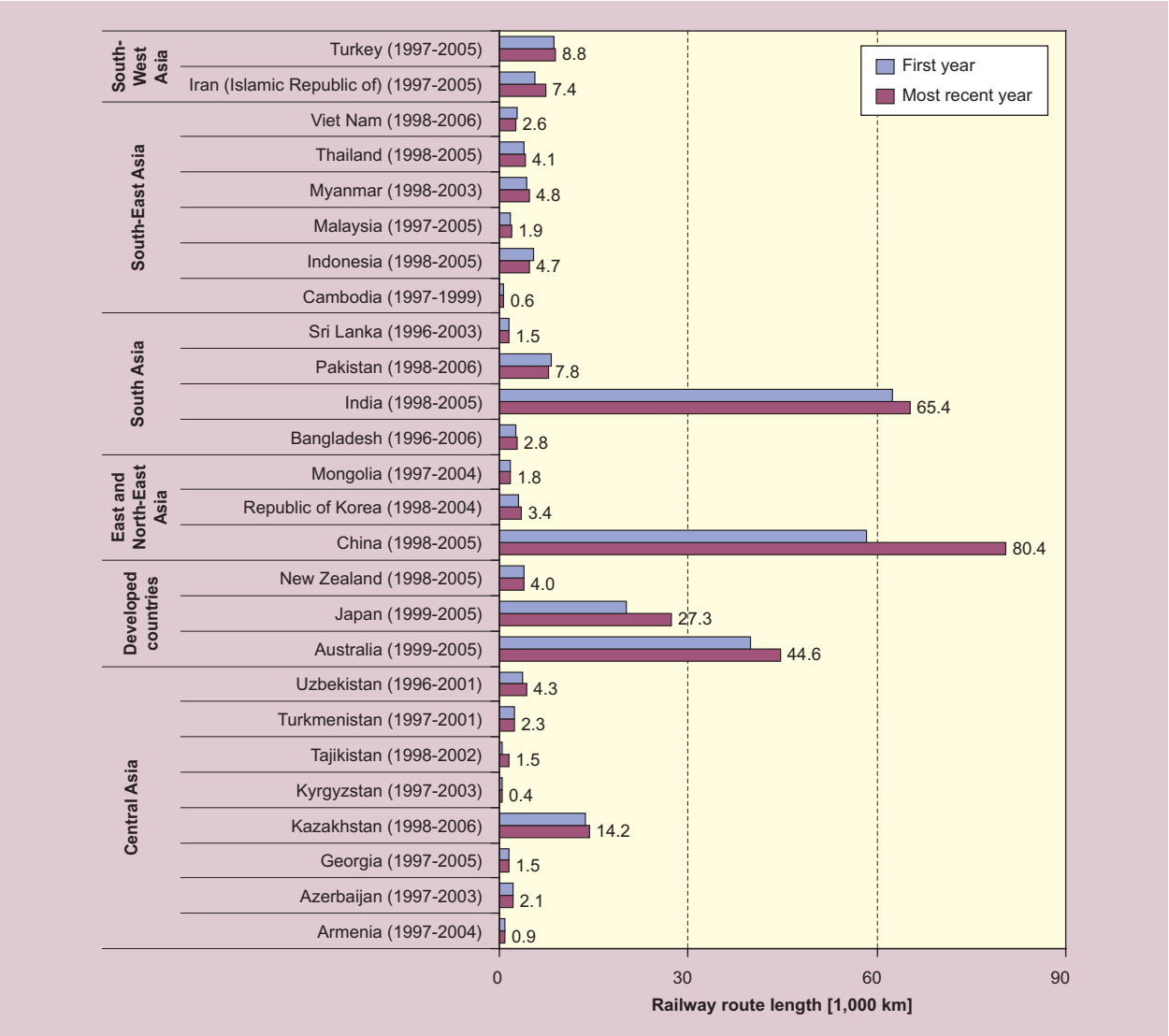
1. Railway route length

Figure VIII-3 compares trends in railway route length for selected ESCAP countries. In this publication, we define the route length of a railway network as the sum of the distances (in kilometres) between the mid-points of all stations on the network.[148]

In general, most ESCAP countries experienced little or no expansion in terms of railway route length over the period of 1997 to 2006. However, there have been a number of exceptions. For example, between 1998 and 2005, China's railway route length grew to 80,400 kilometres: an increase of approximately 22,200 kilometres, or an average annual growth of 4.7 per cent per year. As a result of this growth, by 2003, China had surpassed India as the country with the longest rail network in the ESCAP region. The fastest growing railway route length in relative terms over this period has been Tajikistan, followed by Japan, with average annual growth rates of 33.4 per cent and 5.2 per cent respectively, although it should be noted that Tajikistan's growth was from a rather low base (Figure VIII-3).

[148] This is different from track length. In the case of two parallel tracks between two stations, track length is twice route length.

Figure VIII-3. Railway route length in selected ESCAP countries, 1996-2006



Sources: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

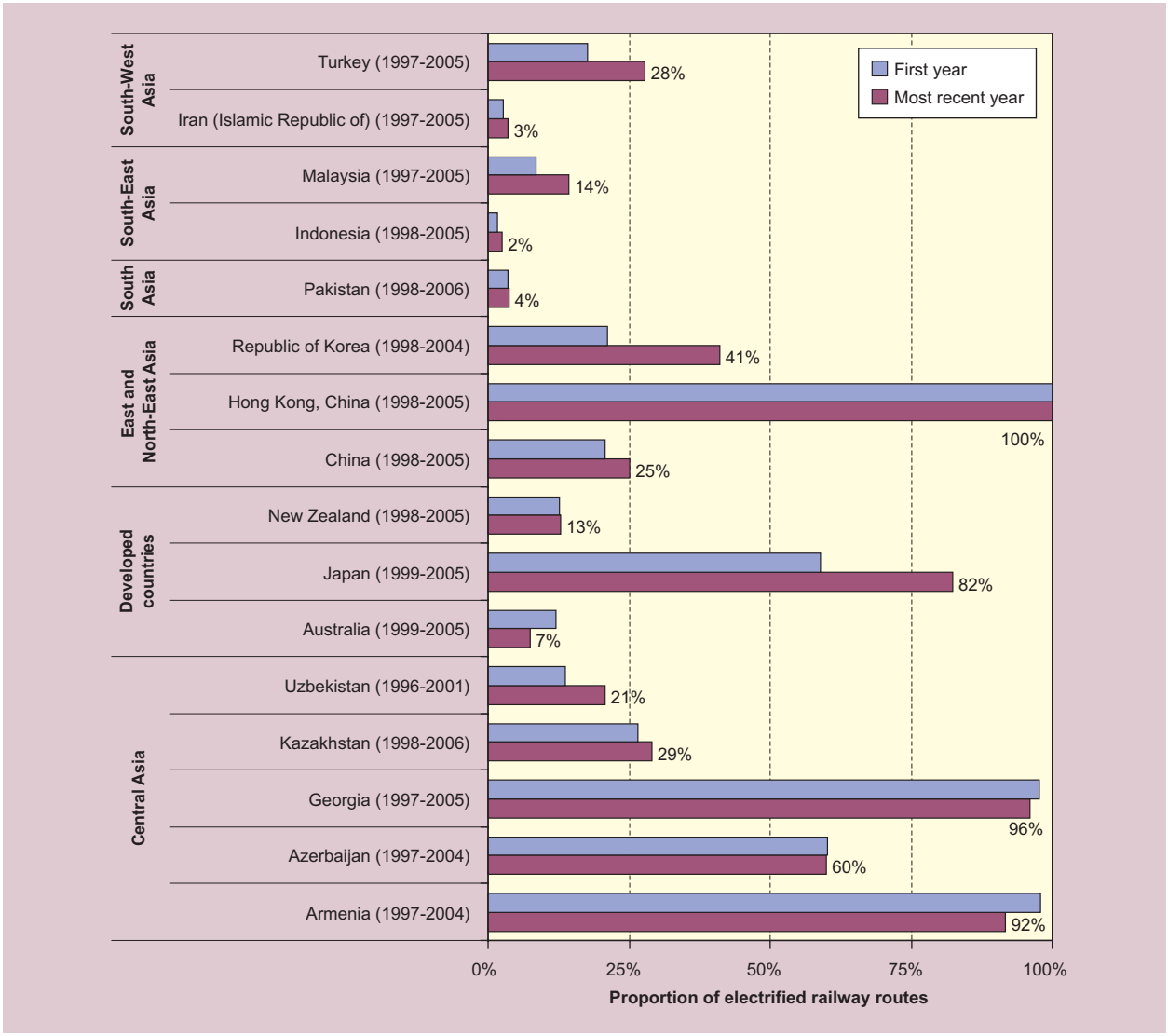
India's railway route length grew at an average annual rate 0.6 per cent, but remained the region's second longest. Railway route length also remained largely unchanged in Georgia, Kyrgyzstan, New Zealand, Mongolia, and Bangladesh. In contrast, railway route length decreased in Azerbaijan, Pakistan, Indonesia and Viet Nam.[149]

2. Electrified route length

The adoption of electric traction by railway organizations is sometimes seen as a measure of their preparedness to accept cost-saving advanced technology, and an indication of their preference for environmentally friendly methods of operation. Figure VIII-4 shows the trend in electrification in selected ESCAP countries. While these represent less than half of the 42 rail networks in the region, it is evident that ESCAP countries vary greatly in the level of electrification. For example, more than 90 per cent of railway routes in Hong Kong, China; Georgia and Armenia are electrified, compared to less than 10 per cent in the Islamic Republic of Iran, Indonesia, Pakistan and Australia.

[149] Railway network development in this case has focussed on unigauging the network.

Figure VIII-4. Proportion of electrified railway routes in selected ESCAP countries, 1997-2006



Source: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

Over the period 1997 to 2006, electrified railway routes made up an increasing proportion of the total rail network in a number of ESCAP countries. Of the countries presented in Figure VIII 4 above, the Republic of Korea recorded the fastest move towards electrification: in between 1998 and 2004, the average annual growth rate in electrification was 11.7 per cent – an increase from 21 to 41 per cent. The proportion of electric railways in Indonesia, Malaysia, Turkey and Japan increased at an average annual rate above 5 per cent.

3. Railway employment

Table VIII-6 compares the national numbers of railway employees in selected ESCAP countries from 1997 to 2006. Generally, there has been a steady decline in the number of railway employees in many ESCAP countries. The total number of railway employees in the ESCAP countries listed in the table declined from 4.1 million 1997/98 to 3.5 million in 2003/04, and 3.4 million in 2005/06, which is equivalent to a an overall reduction of almost 18 per cent.

Table VIII-6. Railway employment in selected ESCAP countries, 1997-2006

Region	Country (first year – most recent year)	Number of Railway Employees		
		First year	Most recent year	Average annual growth
Central Asia	Armenia (1997-2004)	3,806	5,900	6.5%
	Georgia (1997-2005)	16,966	14,925	-1.6%
	Kazakhstan (1998-2006)	148,405	81,504	-7.2%
	Kyrgyzstan (1997-2003)	5,545	4,756	-2.5%
	Tajikistan (1998-2002)	4,200	4,497	1.7%
	Uzbekistan (1996-2001)	56,863	52,700	-1.5%
Developed countries	Australia (1999-2005)	37,000	42,516	2.3%
	New Zealand (1998-2005)	4,720	4,055	-2.1%
East and North-East Asia	China (1998-2005)	1,927,000	1,506,049	-3.5%
	Hong Kong, China (1999-2006)	4,190	7,329	8.3%
	Republic of Korea (1998-2004)	33,270	29,278	-2.1%
	Mongolia (1997-2004)	9,200	15,180	7.4%
South Asia	Bangladesh (1996-2006)	40,800	34,200	-1.7%
	India (1998-2005)	1,582,454	1,362,583	-2.1%
	Pakistan (1998-2006)	96,000	87,900	-1.1%
	Sri Lanka (1996-2003)	18,070	16,422	-1.4%
South-East Asia	Indonesia (1998-2005)	34,682	30,000	-2.1%
	Malaysia (1997-2005)	6,582	6,530	0.5%
	Philippines (1997-2003)	2,261	3,663	8.4%
	Viet Nam (1998-2006)	42,000	43,000	0.3%
South-West Asia	Iran (Islamic Republic of) (1997-2005)	28,000	20,114	-4.1%
	Turkey (1997-2005)	42,000	33,892	-2.6%
Total[a]		**4,144,014**	**3,406,993**	-2.4%

Sources: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

[a] Total of selected countries only

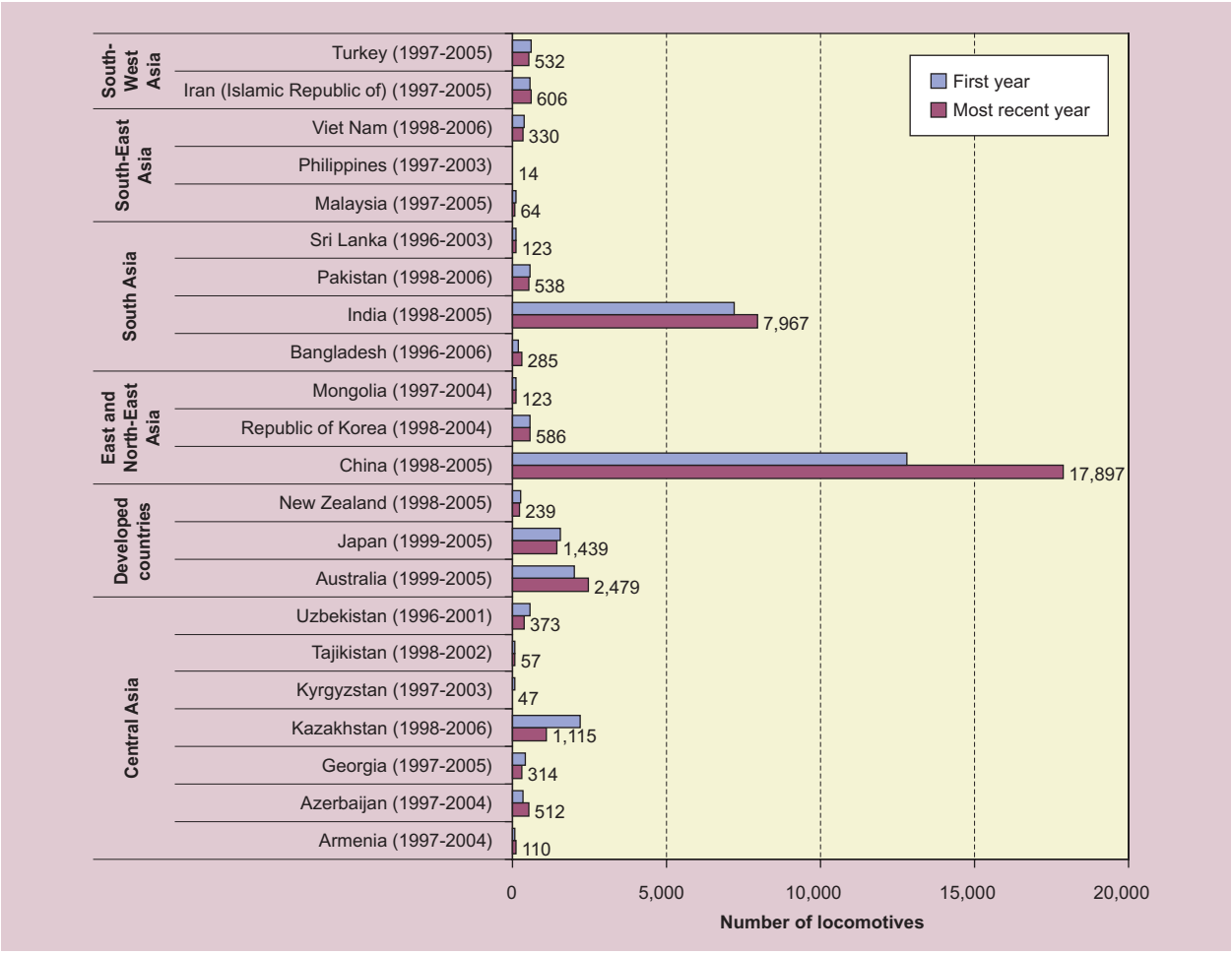
In recent years, there has been a general decline in railway employment in many ESCAP countries. There are also large differences from country to country in terms of total railway employment and its growth or decline over the years. By 2005, roughly 3.4 million people were employed by railways in the ESCAP region, 1.5 million of which in China and almost 1.4 million in India. However, from 1998 to 2005, Chinese railway employment decreased by 22 per cent or more than 400,000. Indian railway employment decreased by almost 14 per cent, or roughly 220,000 from 1998 to 2005. Five of the 22 selected countries reported a growth in railway employees: Armenia; Tajikistan; Mongolia; Hong Kong, China; and the Philippines. The first three of these countries also reported a growth in their railway network (data was not available for the remaining two).

4. Locomotives

The locomotive fleets considered here include all types of locomotives (main line and shunting, electric, diesel-electric, diesel-hydraulic and, in a small number of cases, steam) in the serviceable fleets of 22 selected countries within the ESCAP region (Figure VIII-5). From 1997 to 2005, the number of locomotives in the ESCAP region as a whole appears to have increased by roughly 4,900 to roughly 35,800.

There are large differences from country to country in terms of the size of the locomotive fleets. For example, India and China have by far the largest locomotive fleets. China registered 12,816 locomotives in 1998 and 17,897 locomotives by 2005. India had 7,206 locomotives in 1998 and 7,967 by 2005. Australia, Japan and Kazakhstan are the only other countries with fleets larger than 1,000 locomotives.

Figure VIII-5. Number of locomotives in selected ESCAP countries, 1997-2006



Sources: Railway Gazette International, Railway Directory 2000, 2005 [online database], viewed July 2005, www.railwaydirectory.net

Among the selected countries listed in Figure VIII-5, the Philippines had the smallest number of locomotives – only 14 – in 2003. Kyrgyzstan and Tajikistan also had no more than 47 and 57 locomotives, respectively (Figure VIII-5). Each of these three countries reported a reduced number of locomotives over the period 1999-2003. The size of locomotive fleets recently decreased in 14 of the 22 countries listed in Figure VIII-5. Of these, Kazakhstan and the Islamic Republic of Iran have reported the largest absolute reduction in the number of locomotives. The fleets are expected to further decline in the coming years. Most of the existing locomotive fleet in Armenia will become obsolete over the next five years. Armenian Rail estimates that without any additional locomotives (new or rebuilt) there will not be enough locomotives available after 2010 to sustain current traffic levels.[150]

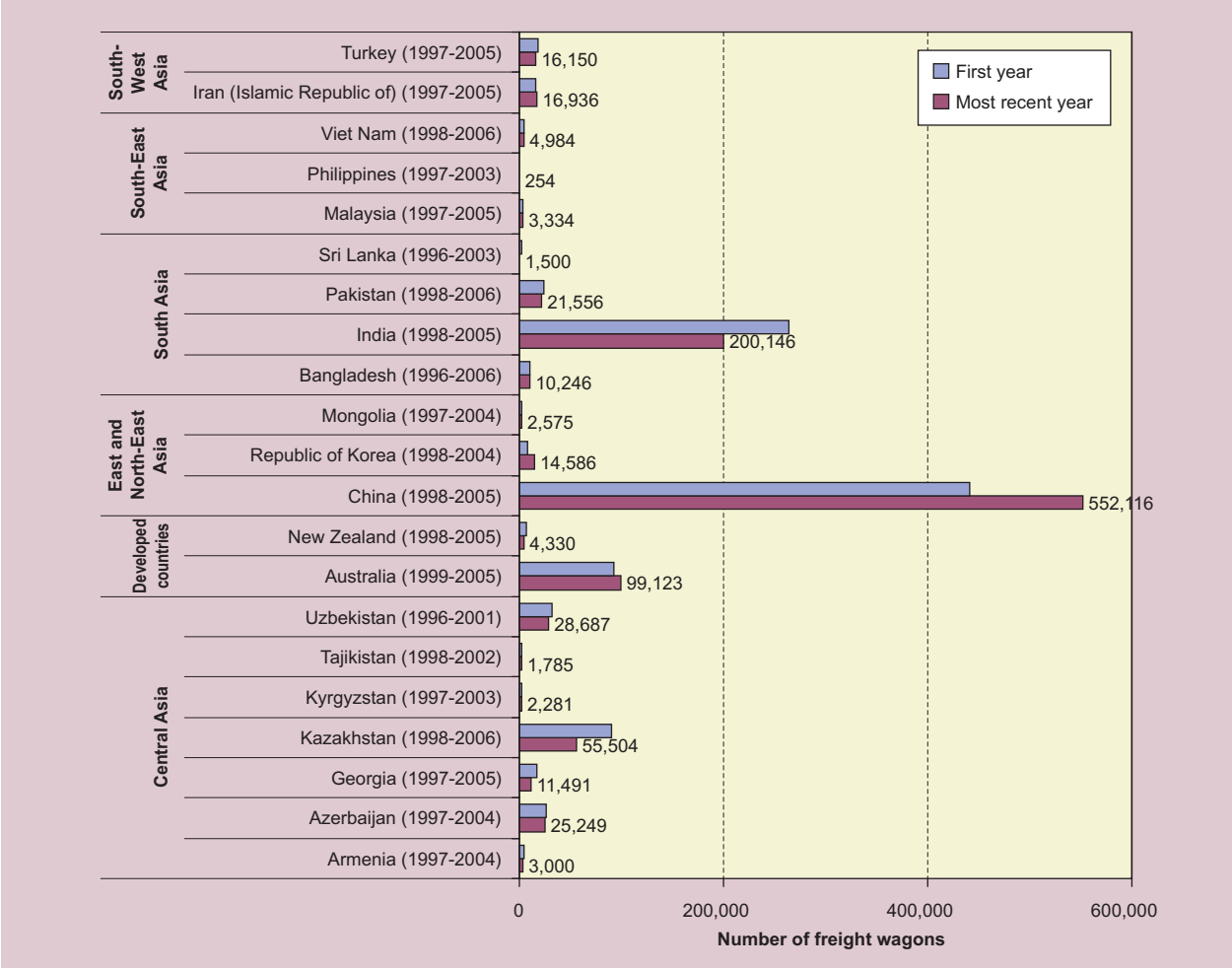
5. Freight wagons

Figure VIII-6 illustrates changes in the number of rail freight wagons in selected ESCAP countries from 1997 to 2006. Over this period, this number is estimated to have increased slightly by some 8,000 wagons to 1.08 million for the ESCAP region as a whole.

Some of the largest increases in wagon fleets occurred in the East and North-East Asia region. In particular, wagon fleet size in the Republic of Korea and in China grew at an average 10.3 and 3.2 per cent per year, respectively. For China, this was an increase from 441,434 wagons in 1998 to 552,116 in 2005. The number of freight wagons in the Republic of Korea grew from 8,121 in 1999 to 14,586 in 2004.

[150] Armenia Rail Concession, 2006, Preliminary Information Memorandum: Armenian Railways Concession, viewed on website of Armenia Rail Concession on 11 November 2007, http://www.armeniarailconcession.com

Figure VIII-6. Number of freight wagons in selected ESCAP countries, 1997-2006



Sources: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

6,723 freight wagons were added in Australia from 1999 to 2005, 404 wagons in Viet Nam from 1998 to 2006, and 936 wagons in the Islamic Republic of Iran from 1997-2005.

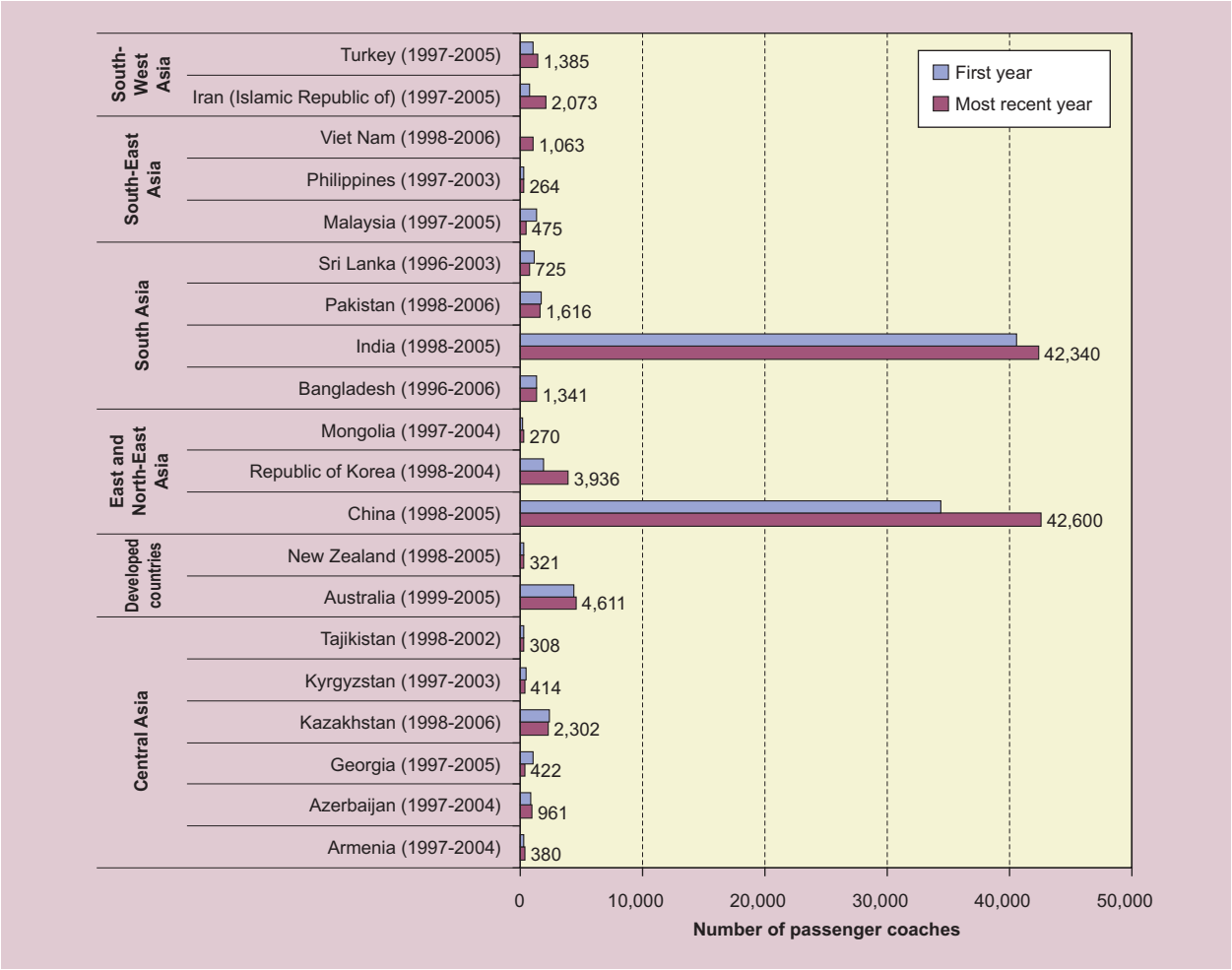
Wagon fleet size declined significantly in all other ESCAP countries. For example, in recent years the number of freight wagons decreased by more than an in Kazakhstan, Georgia, New Zealand and Armenia each decreased on average by 4.5 to 5.5 per cent per year. It should also be noted that in some countries the substantial decrease in wagon fleet size can be attributed at least in part to the replacement of traditional four-wheel wagons with eight-wheel wagons, which effectively allow more freight to be carried per wagon. For example, in New Zealand only 42 high-volume aluminium bulk wagons were required to replace 600 of the old freight wagons in 1998.[151]

6. Passenger coaches

The passenger coach fleets considered here comprise powered and unpowered diesel multiple unit and electric multiple unit vehicles, in addition to locomotive-hauled carriages. Figure VIII-7 illustrates the changing number of rail passenger coaches in 20 ESCAP countries from 1997 to 2006. Over this period, the total number of passenger coaches in the ESCAP region increased by almost 13,000 to 107,800.

[151] *The Privitisation of New Zealand Rail*, New Zealand Treasury, Wellington, 1999.

Figure VIII-7. Number of rail passenger coaches in selected ESCAP countries, 1997-2006



Sources: Railway Gazette International, Railway Directory 2000, 2005, 2007 [online database], viewed November 2007, www.railwaydirectory.net

Thirteen of the selected countries recorded increases in their passenger coach fleets over the period 1997-2006. The largest absolute increases occurred in China (+8,254 coaches), the Republic of Korea (+1,986) and India (+1,762). It should be noted, however, that India's passenger coach fleet increased from 1997 to a peak in 2003 and declined to 42,340 coaches in 2006. This is roughly equal to the 42,600 passenger coaches in China.

In relative terms, Viet Nam and the Islamic Republic of Iran recorded the most rapid increase in the number of passenger coaches, at 51 and 13 per cent, respectively. More than 1,000 passenger coaches were added in each country since 1997.

Of the ESCAP countries that experienced a reduction in their passenger coach fleet over the period, Malaysia underwent the sharpest decline in absolute terms. In 1997 it totalled 1,356 passenger coaches; by 2005 this had declined to 582 coaches.

In relative terms, Georgia experienced the fastest rate of decline. In 1997, its passenger coach fleet totalled 1,000; by 2005 it had decreased to 422 passenger coaches.

C. The Trans-Asian Railway Network

This section provides an overview of recent trends regarding the Trans-Asian Railway Network which basically consists of a subset of railway lines of international importance in the region. Section 1 outlines the history of the Trans-Asian Railway leading up to the recent signature of the *Intergovernmental Agreement on the Trans-Asian Railway Network*. Section 2 discusses break-of-gauge issues and Section 2 deals with remaining "missing links" in the network.

1. From project to Intergovernmental Agreement

The Trans-Asian Railway (TAR) was initiated as a project in the early 1960s with the then objective of providing a continuous 14,000-km rail link between Singapore and Istanbul (Turkey), and possible onward connections to Europe and Africa. This link therefore offered the potential to greatly shorten distances and reduce transit times between countries and regions, while being a catalyst for the notion of international transport as a tool for trade expansion, economic growth and cultural exchanges.

The trade expansion and economic growth aspects of the project took on particular relevance in the 1990 as new trade patterns arising from globalization boosted the dynamism of Asian economies and called for the establishment of efficient cross-border infrastructure and services.

Recognizing that the situation required a coordinated approach, in April 1992 the 48th session of the Economic and Social Commission for Asia and the Pacific launched the Asian Land Transport Infrastructure Development (ALTID) project with the objective of assisting member countries in planning and developing a transport infrastructure able to serve the unprecedented surge in international trade between Asian countries and their main trading partners – primarily in the European Union and North America – and amongst Asian countries themselves.

The railway component of ALTID was implemented through a series of corridor studies to assist in the formulation of the network. Over the period 1994-2001 the following studies were carried out by the secretariat in close collaboration with its member countries.

- The *northern corridor*, linking China, Kazakhstan, the Korean Peninsula, Mongolia and the Russian Federation;
- The *southern corridor,* including Sri Lanka and connecting Thailand and Yunnan Province (China) with Turkey through Bangladesh, India, Islamic Republic of Iran, Myanmar and Pakistan;
- The *north-south corridor*, connecting Northern Europe to the Persian Gulf, through the Caucasus Region, Central Asia and the Russian Federation; and
- A *subregional network*, including the ASEAN and Indo-China subregions.

The studies led to the identification of a network of 81,000 km of rail routes of international importance linking capital cities, main industrial and agricultural centres, major ports as well as major inland container terminals and depots (Figure VIII-8 below). The network currently serves 28 member countries in all parts of Asia (Table VIII-7 below).

Understandably, the network was a composite of national railway infrastructures that had been primarily designed and operated to serve domestic priorities. However, member countries acknowledged that the surge in international trade called for a new transport strategy giving greater attention to international traffic. With this in mind, countries opted to define a framework within which they could discuss and plan the future expansion, upgrading and operation of the Trans-Asian Railway Network. They agreed that an *Intergovernmental Agreement on the Trans-Asian Railway Network* would provide such a framework and, with this idea on mind, the 60th session of the Commission mandated the ESCAP Secretariat to formalize the network identified through the corridor studies in an Intergovernmental Agreement.

Figure VIII-8. Map of the Trans-Asian Railway Network, 2006

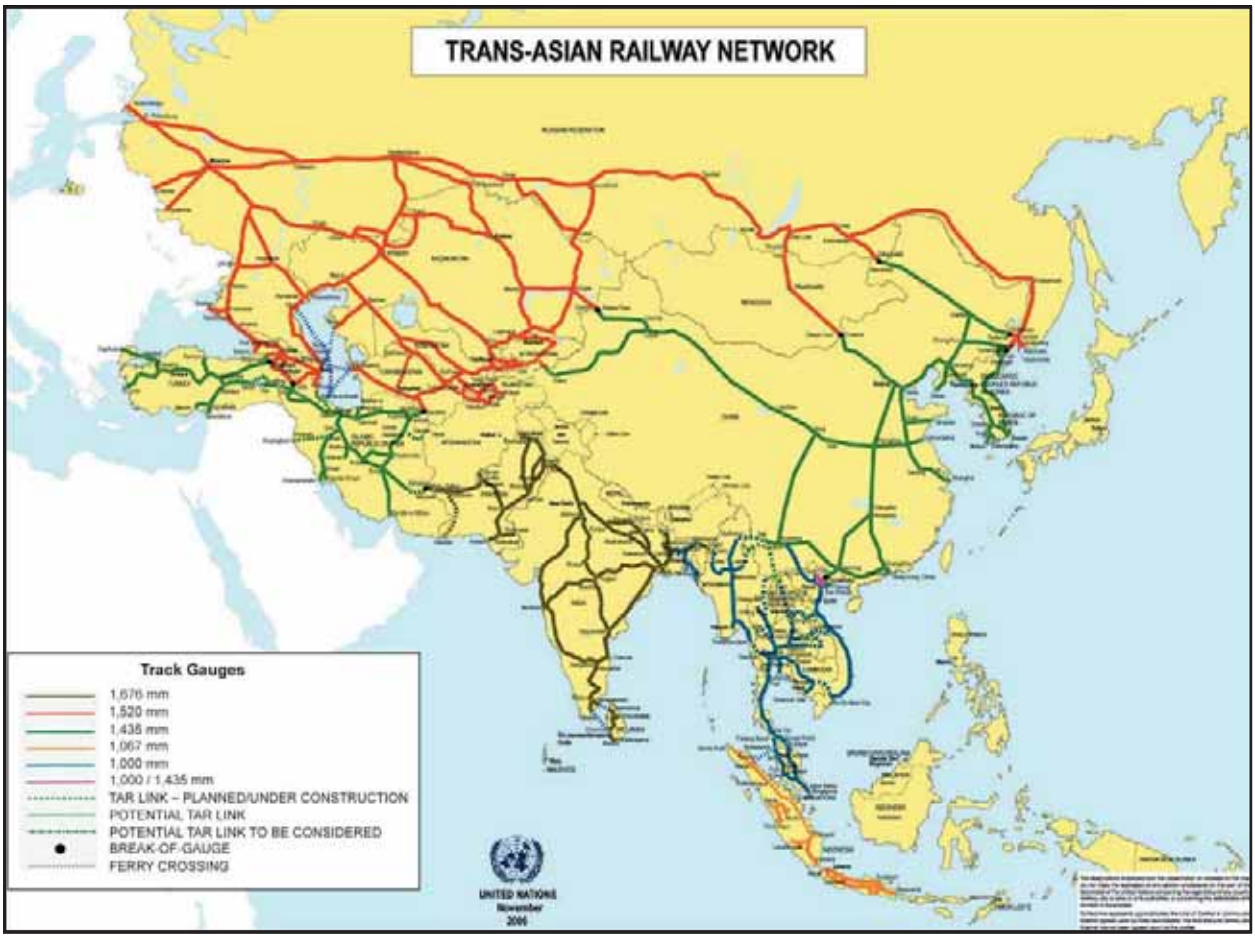


Table VIII-7. Participating countries in the Trans-Asian Railway Network

Region	Countries	Network length [km]
South-East Asia	Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, Viet Nam	12,600
North-East Asia	China, Democratic People's Republic of Korea, Mongolia, Republic of Korea, Russian Federation	32,500
Central Asia and Caucasus	Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	13,200
South Asia, plus Islamic Republic of Iran and Turkey	Bangladesh, India, Iran (Islamic Republic of), Nepal, Pakistan, Sri Lanka, Turkey	22,600
Total:		**80,900**

Source: ESCAP Secretariat, 2007.

The Intergovernmental Agreement was negotiated over the years 2004-2005 and was adopted by senior government officials at the 62nd session of the Commission (Jakarta, Indonesia) through Resolution 62/4 of April 2006.

To date, the Agreement has been signed by 20 States and ratified by two. It will enter into force after eight member States have deposited their instruments of ratification with the Secretary-General of the United Nations at UN headquarters in New York. Once the Agreement has entered into force, the first Meeting of the Working Group on the Trans-Asian Railway will convene. The Working Group is intended as a forum within which transport policy makers and railway managers will define a common vision, adopt joint programmes of actions, identify investment requirements and sources, and benchmark progress. It is

also thought as a tool to evaluate investment requirements along international corridors and strengthen the case for railway expansion in loan negotiations with international financial institutions such as the Asian Development Bank, the Islamic Development Bank or the World Bank.

2. Break-of-gauge along the Trans-Asian Railway

The identification of the rail routes best able to serve international trade revealed the existence of a number of break-of-gauge points, primarily but not exclusively at the meeting point between railways of neighbouring countries, and missing links between neighbouring countries.

A break-of-gauge occurs when the railways of neighbouring countries have different track gauges,[152] such as between China and Mongolia, or the Democratic People's Republic of Korea and the Russian Federation. However, discontinuity of track gauge also occurs within individual domestic railway networks.[153] This is the case, for example, in Bangladesh and India.

Table VIII-8. Break-of-gauge along the Trans-Asian Railway

Break-of-gauge			Gauge transition
China	⇔	Viet Nam	1,435 mm ⇔ 1,000 mm
China	⇔	Russian Federation	1,435 mm ⇔ 1,520 mm
China	⇔	Kazakhstan	1,435 mm ⇔ 1,520 mm
China	⇔	Mongolia	1,435 mm ⇔ 1,520 mm
Russian Federation	⇔	Democratic People's Republic of Korea	1,520 mm ⇔ 1,435 mm
Turkmenistan	⇔	Iran (Islamic Republic of)	1,520 mm ⇔ 1,435 mm
Azerbaijan	⇔	Iran (Islamic Republic of)	1,520 mm ⇔ 1,435 mm
Armenia	⇔	Turkey	1,520 mm ⇔ 1,435 mm

The mainline railway networks that make up the TAR are comprised of five different track gauges: 1,676 mm, 1,520 mm, 1,435 mm, 1,067 mm and 1,000 mm (see Figure VIII-8 and Table VIII-8).[154]

When the construction of the rail link between Kerman and Zahedan in the Islamic Republic of Iran is completed, another break-of-gauge will occur between Islamic Republic of Iran and Pakistan.

A break-of-gauge is often seen as an obstacle to the smooth flow of traffic. However, a number of technical solutions exist to reduce its effect on the efficiency of rail services. These solutions include trans-shipment, bogie changing and the use of wagons with 'variable-gauge' bogies. They are briefly summarized below:

(i) *Trans-shipment* is the transfer of freight by manual or mechanical means from wagons of one gauge to wagons of another gauge.

(ii) *Bogie changing* is the operation by which wagons are lifted on a set of jacks, bogies of one gauge rolled out and bogies of the other gauge rolled in.

(iii) The *use of wagons with 'variable-gauge' bogies* enables wagons to be pulled along a special transition track at reduced speed. During the process, the distance between wheels is adjusted from one track gauge to another.

(iv) Two other solutions exist. One involves the provision of dual gauge, i.e. the provision of two different track gauges on a single track foundation through the insertion of a third rail (or sometimes a fourth rail to obtain the so-called 'composite gauge'). The other option is to convert tracks of different gauges to a single gauge standard. However, these two solutions are

[152] The track gauge is the distance between the inner surfaces of each rail and is conventionally measured in millimetres.

[153] Various techniques exist to overcome these discontinuities. They include trans-shipment (manual or mechanical), bogie exchange and the use of variable gauge bogies.

[154] It must be noted that there may be more than one break-of-gauge points between two neighbouring countries.

viable only when different standards are applied within the same country or for cross-border movements over a very short distance to fit specific requirements such as extending a line section of one country onto the territory of another country to gain access to specific installations or sites, e.g. ports or mining sites.

How real is the obstacle? While continuity of gauge along all routes of the Trans-Asian Railway would be ideal, a break-of-gauge does not constitute a major problem to efficient services. With limited exception, break-of-gauges occur mostly at border points where a range of operations already require trains to stop. These operations are generated by railway needs (e.g. change of locomotives, change of crew) or the requirements of other administrations (e.g. Customs, border police). Well-designed and well-organized facilities allow for trans-shipment to take place within the time allocated for these other operations, the disappearance of which cannot yet be realistically envisaged. In addition, the bulk of time-sensitive traffic is containerized cargo which, by nature, lend itself well to fast and efficient trans-shipment. Finally, efficient trans-shipment often takes place within a few hours representing a fraction of the overall transit time along international rail freight corridors which often have distances well in excess of 2,000 kilometres.

3. Missing links along the Trans-Asian Railway

A 'missing link' is an absence of physical linkages between the railway networks of neighbouring countries or an absence of continuous railway infrastructure within one country, often due, in this latter case, to local geography. Missing links between networks of neighbouring countries are due to the fact that (a) because the link was never there in the first place, or (b) because it ceased to exist due to political events. Bridging the former will require a joint approach by the railways concerned and by their respective governments. Such elements as the importance of the link in regional economic development or trade may influence the decision to consent to a particular project. However, the traffic-generating potential of each route compared to the cost of constructing the necessary infrastructure will no doubt be a crucial factor, especially if private sector investments are to be sought. Meanwhile, bridging and, more importantly, operating the politically-induced missing links, requires a high-level of bilateral cooperation and understanding.

Table VIII-9. Selected inter-country missing links in the Trans-Asian Railway Network (2007)

Countries			Missing link
Armenia	⇔	Islamic Republic of Iran	Jermuk (Armenia) – Marand (Islamic Republic of Iran)
Bangladesh	⇔	Myanmar	Dohazari (Bangladesh) – Gundum (Bangladesh)
Cambodia	⇔	Viet Nam	Bat Deng (Cambodia) – Ho Chi Minh City (Viet Nam)
China	⇔	Kyrgyzstan	Kashi (China) – Torugart (Kyrgyzstan)
China	⇔	Lao PDR	Xiangyun (China) – Thanaleng (Lao PDR)
China	⇔	Myanmar	Dali (China) – Lashio (Myanmar)
Georgia	⇔	Turkey	Akhalkalaki (Georgia) – Kars (Turkey)
India	⇔	Myanmar	Jiribam (India) – Kalay (Myanmar)
Islamic Republic of Iran	⇔	Afghanistan	Torbat Heidarieh (Islamic Republic of Iran) – Herat (Afghanistan)
Islamic Republic of Iran			Kerman – Zahedan
Kyrgyzstan	⇔	Uzbekistan	Uzgen – Osh (border) – Andizhan
Lao PDR	⇔	Thailand	Nongkhai (Thailand) – Thanaleng (Lao PDR)
Nepal	⇔	India	Kakarvitta (Nepal) – New Jalpaiguri (India)
Thailand	⇔	Myanmar	Namtok (Thailand) – Thanpyuzayat (Myanmar)
Turkey			Lake Van by-pass
Uzbekistan			Angren – Kholkobad

Table VIII-9 above shows a selection of missing links in the TAR network in its current configuration. The remainder of this section describes the most advanced initiatives being taken to see some of them being realized in future. The description is in the expected order of realization depending on whether work has already commenced, funding has been made available, feasibility studies have been carried out or the political will has been clearly demonstrated.

a) Kerman – Zahedan (Islamic Republic of Iran)

The 545-km link is located within the territory of the Islamic Republic of Iran. Construction is nearing completion and inauguration is scheduled to take place in the first half of 2008. The line will make possible direct rail connection between the Islamic Republic of Iran and Pakistan. Within a more global context it will also make possible direct rail connection between Moscow and New Delhi via a route travelling east of the Caspian Sea through Kazakhstan, Uzbekistan and Turkmenistan.

b) Nongkhai (Thailand) – Thanaleng (Lao PDR)

Construction is under way for a 3.5 km rail line that will extend the rail infrastructure of Thailand across the friendship bridge to the city of Thanaleng in Lao PDR. Completion is scheduled for April 2008. The line is estimated to have cost about US$ 6.2 million, 70 per cent of which is financed through soft loan from the Thai government. It brings the TAR network closer to the capital city of Vientiane 11 km north from Thanaleng and allows rail connections with three other major capital cities in South-East Asia, namely: Bangkok, Kuala Lumpur and Singapore. It also allows landlocked Lao to have rail connections to the ports of Laem Chabang (Thailand), Port Klang (Malaysia) and Singapore.

c) Marmaray Tunnel under the Bosphorus (Turkey)

The Government of Turkey is implementing a US$ 3 billion project to build a rail tunnel under the Bosphorus. The project has a total length of 76.6 km, including 63 km of new and upgraded railway, i.e. 43.4 km on the Asian side and 19.6 km on the European side. Between the two sections lies the centre piece of the project, i.e. a 13.6 km tube tunnel section, 1.4 km of which will lie at the bottom of the Bosphorus at a depth of 58 metres below the surface. Beyond connecting the eastern and western side of Istanbul, the link will mythically rail-connect Asia and Europe for the first time in history. Opening is scheduled for 2011.

d) Akhalkalaki (Georgia) to Kars (Turkey)

In February 2007, the Presidents of Azerbaijan and Georgia and the Prime Minister of Turkey signed the 'Tbilisi Declaration on Common Vision for Regional Cooperation' which formally recognizes the Baku – Tbilisi – Kars 'Silk Road' railway project as being of geo-strategic importance. The project involves the construction of a new 98-km section between Kars (Turkey) and Akhalkalaki (Georgia) and upgrading of existing infrastructure from Akhalkalaki to Tbilisi and Baku in Azerbaijan. The construction requirements are of 68 km in Turkey and 30 km in Georgia. A coordination council has been set up to overview the overall implementation of the project scheduled for completion in 2010. The link will give Azerbaijan and Georgia direct rail connections with Ankara and Istanbul as well as access to Turkey's ports on the Mediterranean Sea, i.e. Iskenderun and Mersin, for shipments to Southern Europe, North Africa or Asia through the Suez Canal.

e) Dali (China) – Lashio (Myanmar)

The Government of China has approved the feasibility study report on the 366-km line section from Dali to Ruili at the border between China and Myanmar. Construction is scheduled to start in the last quarter of 2007. However, no word has been forthcoming from the Government of Myanmar regarding the construction of the 230-km section from Muse, the station on the Myanmar side of the border, and Lashio. At Lashio the line would connect with the existing trunk line to Mandalay and Yangon. Coupled with the development of a deep-sea container port in the vicinity of Yangon this line would be of strategic commercial importance for China as it would give the country an access to a port on the Indian ocean.

f) Jiribam (India) – Kalay (Myanmar)

Connecting the railways of India and Myanmar involves constructing a 315-km line from Jiribam in India to Kalay in Myanmar. The line will go through the border point of Moreh (India)/Tamu (Myanmar). The construction requirements are 180 km from Jiribam to Moreh and 135 km from Tamu to Kalay. The

estimated cost of the project stands at US$ 678 million.With the construction of the rail corridor between India and Myanmar, India will be linked by rail to South-East Asia. In addition within the more general context of Myanmar getting a rail link with China in future, the Jiribam – Kalay line could see the advent of rail traffic between India and China. The issue of financing the project will be crucial as the Government of Myanmar has limited resources for infrastructure development and does not easily attract assistance from traditional financial institutions. However, the Government of India has already sanctioned work on the 97-km Jiribam – Tupul portion on the Jiribam – Tamu section.

g) Torbat Heidarieh (Islamic Republic of Iran) – Herat (Afghanistan)

The railways of the Islamic Republic of Iran are implementing a number of projects aiming to offer transit through their country as well as fast connections to the ports of Bandar Abbas on the Persina Gulf and Chabahar on the Gulf of Oman. This is particularly crucial for the landlocked countries of the region such as the Afghanistan and the Republics of Central Asia. One such project is the development of the line section from Torbat Heidarieh on the Mashhad – Bafq line to Herat in western Afghanistan. Work has already started on the Iranian side of the border.

h) Poipet (Cambodia) – Aranyaprathet (Thailand)

Connecting the railways of Cambodia and Thailand involves the reconstruction of the 48-km section between Poipet and Sisophon in the north-western part of Cambodia and a short six kilometre section between Poipet and Aranyaprathet on the Thai side of the border. The link is part of the eastern route of the Singapore-Kunming Rail Link Project pursued by the ASEAN Secretariat since 1995. In January 2007, at an official ceremony organized in Poipet, the Government of Cambodia took delivery of the track components donated by the Government of Malaysia to reconstruct the Poipet-Sisophon section. Work will start as soon as a concessionaire has been selected by the ADB to take over the network as part of the process to restructure Cambodia's railways. Under the process the ADB has pledged a US$ 80 million package to assist Cambodia in rebuilding the link and upgrading the line to Phnom Penh and Sihanoukville. Resettlement issues have yet to be resolved before work can actually start. However, the link will reportedly be in place by 2010.

D. Selected railway infrastructure projects

Table VIII-10 summarizes selected railway investment projects in the ESCAP region. It includes projects that have either been completed during the past five years, are currently in progress, or are planned for commencement within the next five years. The list is not intended to be comprehensive, but presents a sample of some of the more significant construction undertakings in the region.

Table VIII-10. Selected railway infrastructure development projects in the ESCAP region (Status: 2007)

Country/ Region	Selected railway investment projects	Status
Australia	Port of Melbourne Rail Link **Overview:** The Dynon Port Rail Link will allow 24 hour rail access to the Port of Melbourne, via a two dual gauge rail lines into Australia's largest container port. This projected is also aimed at and alleviating congestion on Footscray Road, one of Melbourne's key arterial routes. **Funding:** The Australian Government has contributed US$ 100 million to the project, with additional funding to be provided by the State Government and the Port of Melbourne Corporation. **Completion date:** End of 2009	In progress

Table VIII-10. *(continued)*

Country/ Region	Selected railway investment projects	Status
China	Rail-connectivity projects with ASEAN countries China's Ministry of Railways is actively pursuing the development of rail lines to connect its network with Lao PDR, Myanmar and Viet Nam as part of the Singapore-Kunming Rail Link Project. Total investment is estimated to be US$ 6.25 billion. (a) *Link to Viet Nam*. Construction of the 142-km Yuxi-Mengzi line started in 2005. Completion is scheduled for 2009. (b) *Link to Myanmar*. The feasibility study report on the 366-km Dali-Ruili line has been approved and construction is scheduled to start in the last quarter of 2007. (c) *Link to Lao PDR*. The detailed feasibility study has yet to be initiated on the 599-km Yuxi-Mohan line. Progress is linked to the extension of the line into Lao PDR. **Funding:** The three lines are part of the "Middle and Long-term Railway Network Plan" approved by the State Council of China and funding is expected to come from the Government.	Announced
China	New coal line Xinqiu to Bayan Ul The line, dubbed an "energy line", will eventually carry coal from north China's Inner Mongolia Autonomous Region and neighbouring Mongolia. When completed the line will connect at Choibalsan in the eastern part of Mongolia from where a line already exists to Borzya in the Russian Federation. The project is planned to undergo three phases of construction. Phase I involves the construction of a 487-km section from Xinqiu in China's Liaoning Province to Bayan Ul in northern Inner Mongolia. The second phase will see construction of a 230-km extension from Bayan Ul northward to Zhuengadabuqi Port, on the border with Mongolia, while the third section will connect to Choibalsan in Mongolia. **Funding:** Phase I will cost an estimated Yuan 5.9 billion (US$ 790 million). **Completion date:** 2010.	
China	Beijing-Shanghai high-speed line The Government of China plans to link Beijing and Shanghai via a 1,318-km high-speed line that will be designed for 350 km/h operation. End-to-end travel time between the two cities will be 5 hours. **Funding:** A special investment group will be established to cover the cost estimated at Yuan 220 billion (US$ 29.1 billion).The Chinese government will take a 35 per cent stake in the investment group that will also comprise of the provincial governments of Hebei, Shandong, Anhui and Jiangsu as well as the municipalities of Beijing, Shanghai and Tianjin. Finances will also be provided by five institutional investors, four of which will be the state-controlled Bank of China, Industrial and Commercial Bank of China, China Construction Bank and the National Council for Social Security Fund. **Completion date:** 2010	
China	Second National Railways Project (Zhe-Gan Line) **Overview:** This project is part of the greater China Railways 2003-2007 Development Plan, which aims to increase the speed and quality of passenger services on China's major railway corridors. Financed by a World Bank loan, the project has three components, covering track upgrade, electrification and maintenance and the improvement of business processes. The IBRD/IDA loan was approved in June 2004. **Funding:** World Bank, US$ 1,755.5 million **Completion date:** 2008	In progress

Table VIII-10. *(continued)*

Country/ Region	Selected railway investment projects	Status
China	Dali-Lijiang Railway Project **Overview:** An ADB loan was approved in December 2004 for the construction of a 168 km single-track electrified railway between Dali and Lijiang in the north-west of Yunnan Province. The goal is to establish an efficient, safe and environmentally sustainable railway transport system in the region. **Funding:** ADB, US$ 180.0 million **Completion date:** Estimated December 2009	In progress
China	Taiyuan-Zhongwei Railway **Overview:** In 2006, the Asian Development Bank approved a loan for the development of the Taiyuan–Zhongwei Railway. The project is designed to promote sustainable economic growth by constructing 944 km of railway between Taiyuan (Shanxi) to Zhongwei and Yinchuan (Ningxia). 520 km of this will be double track (from Dingbian to Yinchuan) and the remaining 424 km will be single track. **Funding:** ADB, US$ 300 million **Completion date:** A completion date for the project is not yet available.	In progress
Georgia	Construction of link from Akhalkalaki (Georgia) to Kars (Turkey) The authorities in Turkey and Georgia have agreed to complete project studies in their respective countries on the missing link between Kars and Tbilisi. In February 2007, the Presidents of Azerbaijan and Georgia and the Prime Minister of Turkey signed the 'Tbilisi Declaration on Common Vision for Regional Cooperation' which formally recognizes the Baku – Tbilisi – Kars 'Silk Road' railway project as being of geo-strategic importance. The project involves the construction of a new 98-km section between Kars (Turkey) and Akhalkalaki (Georgia) and upgrading of existing infrastructure from Akhalkalaki to Tbilisi and Baku in Azerbaijan. **Funding:** US$ 422 million. **Completion date:** 2010.	
India	Dedicated freight corridors **Overview:** The Government of India has agreed on plans to develop a US$ 20-billion dedicated freight network. The network which is an important part of Indian Railways' 2015 vision will eventually consist of 11,500 km of dedicated freight lines and another 15,000 km of feeder lines. The corridors aim to ease traffic on the four "Golden Quadrilateral" routes linking New Delhi, Mumbai, Kolkatta and Chennai plus their two diagonals. Currently, the six routes which represent only 16 per cent of IR's route-kilometres carry 52 per cent and 58 per cent of IR's passenger and freight traffic, respectively. **Funding:** IR has estimated that achieving its entire development programme over the period 2007-2012 will require resource mobilization of over US$ 60 billionThis will be done through a mix of budgetary allocations from government, revenues from IR's operation, borrowing and Public-Private sector partnerships. The extent of the mix will vary from one project to another. **Completion date:** the first two corridors in this dedicated freight network will total 2,700 km and comprise a western and eastern corridor that will be constructed at a cost of about US$ 7.15 billion.The western corridor will run between Tughlakabad and JNP/Mumbai and will be used primarily for container traffic. The eastern corridor will run between Ludhiana and Sonnagar and will primarily carry heavy-haul freight such as coal, iron-ore and steel. Completion of these two corridors is scheduled for 2012.	Planned

Table VIII-10. *(continued)*

Country/ Region	Selected railway investment projects	Status
Islamic Republic of Iran	*Connectivity with ports and neighbouring countries.* For a number of years the Government of the Islamic Republic of Iran has pursued an ambitious rail infrastructure development policy aiming to development international trade with neighbouring countries while offering transit to its existing or planned ports. Among the key projects are: Development of Qazvin – Rasht – Anzali line to be extended later to Astara at the border with Azerbaijan. Total route length is 275.6 km. **Funding:** n/a **Completion date:** n/a Other cross-border linkages being considered include the development of a line from Sangan (IR of Iran) to Herat (Afghanistan) and from Arak to Khosravi at the border between the Islamic Republic of Iran and Iraq.	
Islamic Republic of Iran	*Link to Port of Chabahar* The project aims to construct a line linking the port of Chabahar on the Gulf of Oman to connect with the Bam – Zahedan. The link will be 600 km and reinforce the position of the Islamic Republic of Iran as a transit country, especially for the landlocked republics of Central Asia. **Funding:** US$ 610 million **Completion date:** 2011.	
Islamic Republic of Iran	*High-speed line Tehran – Esfahan* The line will improve transit time between Esfahan and Tehran through the construction of a double-track high-speed line between Esfahan and Qom (240 km). The new line will be built for 250 km/h operation; at Qom it will connect with the existing line to Tehran (174 km) which will be upgraded for speeds of up to 200 km/h. **Funding:** n/a **Completion date:** 2011	
Sri Lanka	*Upgrading of Colombo-Matara railway line* **Overview:** The upgrade/construction of a railway line linking Colombo – Matara is split into two stages. During the first stage, the existing rail line will be strengthened by adding new rails and sleepers. During the second stage a dual railway line will be constructed from Kalutara South to Matara. **Funding:** Sri Lankan Government, US$ 34 million and foreign funding (by way of loan or grant) of US$ 137 million. **Completion date:** Stages 1 and 2 of the project are due for completion by 2012.	Planned
Sri Lanka	*Matara-Kataragama Railway line Extension (Stage 1& 2)* **Overview:** The construction of a 110 km railway line between Matara and Kataragama is aimed at benefitting commuters who travel to the remote areas of Matara by promoting economic development and inter-regional connectivity. The first stage of the project involves the construction of 27 km of track between Matara and Beliatta. The second stage of the project involves the construction of 83 km of railway between Beliatta and Kataragama. Construction is due to begin late 2007. **Funding:** US$ 54 million Sri Lankan Government, and foreign funding (by way of loan or grant) of US$ 217 million. **Completion date:** Stages 1 and 2 of the project are due for completion by 2014.	Planned

Table VIII-10. *(continued)*

Country/ Region	Selected railway investment projects	Status
Turkey	*High-speed passenger lines* *Ankara-Istanbul*. Phase I of the Ankara-Istanbul line which runs over 251 km from Sincan to Iskensehir is nearing completion and test runs were carried out in April 2007. Phase II of the line will run over 158 km between Inönü and Köseköy. When the line opens in 2009, travel time between Ankara and Istanbul will be 3 hours, down for the current 6 h 30 min. High-speed extension from Polatli on the Ankara-Istanbul line to Konya and Izmir are also planned. **Funding:** US$ 2.01 billion **Completion date:** 2009	In progress
Turkey	*Bosphorus Tunnel* The Government of Turkey is implementing a US$ 3-billion project to rail-connect the Asian and European sides of Istanbul. The project has a total length of 76.6 km, including 63 km of new and upgraded railway (43.4 km on the Asian side and 19.6 km on the European side). Between the two sections lies the centre piece of the project, i.e. a 13.6 km tube tunnel sections, 1.4 km of which will lie at the bottom of the Bosphorus at a depth of 58 metres below the surface. **Funding:** US$ 3 billion **Completion date:** 2011	
Viet Nam	The Government of Viet Nam has established a 2020 vision for the development of the country's rail network. The programme comprises of the two following components: (i) upgrading the existing network and (ii) constructing new lines to ports, industrial areas and economic zones. Viet Nam Railways also plans to build a high-speed passenger line. Key projects in each of these components are: • Upgrading/track-doubling/electrification of Lao Cai – Hanoi – Haiphong corridor (398 km) and Dong Dang – Hanoi line (165 km). Both lines will be upgraded to 1,435-mm track gauge and developed to serve transit traffic to and from China through north-east Viet Nam. Cost of the work is evaluated at US$ 9.86 billion. Funding will come from the government of Viet Nam and Overseas Development Assistance from China. • High-speed passenger line between Hanoi and Ho Chi Minh City. The 1,630-km long line will be double-track, electrified and of standard-gauge configuration, i.e. 1,435 mm. Its maximum speed will be 300 km/h. Current plan is to development the line over the period 2009-2019. The cost of the project is estimated at US$ 33 billion.As the system will use Japanese Shinkansen technology, funding is expected to be partly covered by Overseas Development Assistance from Japan.	

IX. SHIPPING

A. Registered merchant fleet capacities

At the end of 2006, the total capacity of the world maritime fleet stood at 721 million gross tons (gt), representing an increase of 8.4 per cent since 2005. This is over 47 per cent greater than the total of 491 million gross tons in 1995[155] (Table IX-1 below). Whereas the fleet capacity increased on average by 3.2 per cent a year from 1995 to 2000, it increased on average by 3.9 per cent from 2000 to 2006. However, year-to year changes fluctuated a lot. For example, between 2000 and 2003, the world fleet's gross tonnage grew at an average of 1.2 per cent per year, whereas it increased by 8.4 per cent from 2005 to 2006, in line with trends in world trade.

The capacity of the merchant fleet registered in the ESCAP region as a whole expanded on average by 1.0 per cent per year which was considerably slower than the world average (Table IX-1). When Asian economies recovered from the effects of the 1997 Asian financial crisis, the capacity of the merchant fleet registered in the ESCAP region expanded on average 5.8 per cent per year from 2000 to 2006, which was faster than the world average of 3.9 per cent over the same period.

The slow growth in the ESCAP region during the second half of the 1990s was also due to the reduction in the tonnage registered under two of the major flags of the region: Japan and the Russian Federation. Tonnage sailing under the Japanese flag fell from over 40 million tons in 1980 to 16.2 million tons in 2000. In 1990, tonnage under the flag of the Soviet Union was around 22.6 million, whereas Russian-registered vessels totalled 8.0 million tons in 2006. Some of this reduction resulted from the assignment of some vessels formerly registered in the Soviet Union to the flags of other members of the former Union, but an overall decline in fleet numbers played the major part.

The tonnage of vessels registered under the flags of Pacific island economies more than tripled from 5.2 million tons in 1995 to 17.7 million tons by the end of 2006. This growth was due almost entirely to the registration of ships under the open registers of Vanuatu and the Republic of the Marshall Islands.[156]

From 2000 to 2006, by far the largest absolute increase in the capacity of merchant fleets was registered in Hong Kong, China; where it increased from 8.6 to 32.7 million tons. Most of the capacity increases in South-East Asia were due to Singapore, where it grew from 23.4 to 32.2 million tons from 2000 to 2006.

In line with trends in world trade, the capacity of vessels registered in South-East Asian countries grew strongly in the late 1990s, slumped 2000 and 2003 and rebounded from 2003 onwards.

From 2005 to the end of 2006, merchant fleet capacity increased in almost all ESCAP economies where data is available. However, over this period, it significantly declined in Bangladesh, Democratic People's Republic of Korea, Myanmar, Russian Federation, Turkey, Thailand, and Tonga (Table IX-1).

[155] Derived from UNCTAD, 2006, *Review of Maritime Transport 2006,* New York and Geneva; and UNCTAD, 2007, *Review of Maritime Transport 2007,* New York and Geneva.

[156] Unfortunately, for the latest years, there are no data are available from the Marshall Islands where most of the growth has occurred. Thus, growth might have been even higher.

Table IX-1. Capacity of merchant fleets registered in the ESCAP region, 1980-2006[a]

Subregion or country or area	Maritime merchant fleets (million gross tons)							Average change per year (%)			
	1980	1990	1995	2000	2003	2005	2006	1995-2000	2000-2003	2003-2005	2005-2006
North and Central Asia	**23.44**	**22.63**	**15.48**	**10.25**	**11.25**	**9.42**	**9.18**	**-7.9**	**3.1**	**-8.5**	-2.6
Georgia	n/a	n/a	0.28	0.28	0.82	1.08	1.13	-0.2	42.9	15.3	4.2
Russian Federation[b]	23.44	22.63	15.20	9.97	10.43	8.34	8.05	-8.1	1.5	-10.6	-3.5
South and South-West Asia	**9.71**	**16.49**	**17.39**	**17.76**	**17.74**	**22.11**	**19.57**	**0.4**	**0.0**	**11.6**	-11.5
Bangladesh	0.35	0.46	0.38	0.38	0.45	0.48	0.44	0.0	5.6	3.1	-6.5
India	5.91	6.48	7.13	6.84	6.96	8.08	8.38	-0.8	0.6	7.7	3.7
Iran (Islamic Republic of)	1.28	4.74	2.90	3.73	4.85	5.27	5.21	5.2	9.2	4.2	-1.2
Maldives	0.14	0.08	0.09	0.09	0.06	0.09	0.10	0.3	-9.6	16.6	14.9
Pakistan	0.48	0.35	0.40	0.28	0.32	0.40	0.42	-6.5	4.2	11.2	4.3
Sri Lanka	0.09	0.35	0.23	0.18	0.14	0.18	0.17	-4.2	-8.3	12.4	-2.2
Turkey	1.46	4.03	6.27	6.26	4.95	7.62	4.85	0.0	-7.5	24.1	-36.4
South-East Asia	**12.43**	**22.61**	**31.80**	**45.21**	**44.37**	**53.76**	**56.73**	**7.3**	**-0.6**	**10.1**	**5.5**
Brunei Darussalam	0.001	0.36	0.37	0.36	0.48	0.48	0.48	-0.3	9.9	-0.1	-0.2
Cambodia[c]	0	0	0.06	1.79	2.00	2.00	2.00	97.3	3.7	0.0	0.0
Indonesia	1.41	2.18	2.77	3.39	3.84	4.31	5.29	4.1	4.3	5.9	22.8
Malaysia	0.70	1.72	3.28	5.66	5.75	5.76	6.39	11.5	0.5	0.1	11.0
Myanmar	0.09	0.83	0.52	0.51	0.43	0.44	0.40	-0.4	-5.4	0.3	-8.9
Philippines	1.93	8.52	8.74	7.19	5.12	5.27	5.07	-3.8	-10.7	1.5	-3.7
Singapore	7.66	7.93	13.61	23.41	23.24	30.82	32.17	11.5	-0.2	15.2	4.4
Thailand	0.39	0.62	1.74	1.96	2.27	3.03	2.88	2.4	5.0	15.5	-4.7
Viet Nam	0.24	0.47	0.70	0.93	1.25	1.67	2.05	5.8	10.4	15.6	22.9
East and North-East Asia	**12.94**	**28.25**	**33.43**	**31.16**	**46.65**	**62.64**	**67.70**	**-1.4**	**14.4**	**15.9**	8.1
China	6.87	13.90	16.94	16.27	18.43	22.29	23.49	-0.8	4.2	10.0	5.4
Democratic People's Republic of Korea	0	0	0.72	0.66	0.96	1.26	1.05	-1.7	13.5	14.5	-16.2
Hong Kong, China	1.72	6.57	8.80	8.59	20.51	29.85	32.69	-0.5	33.7	20.7	9.5
Republic of Korea	4.34	7.78	6.97	5.65	6.76	9.25	10.48	-4.1	6.1	17.0	13.3
Pacific	**0.06**	**2.34**	**5.16**	**10.00**	**17.14**	**17.44**	**17.75**	**14.1**	**19.7**	**0.9**	**1.8**
Fiji	0.015	0.056	0.032	0.029	0.023	0.030	0.032	-2.3	-6.9	14.2	6.7
Kiribati	0.001	0.004	0.006	0.004	0.004	0.006	0.028	-9.1	2.3	22.5	366.7
Marshall Islands[d]	0.000	0.000	3.10	8.44	15.17	n/a	n/a	22.2	21.6	n/a	n/a
Federated States of Micronesia	0.000	0.000	0.008	0.010	0.009	0.010	0.010	5.1	-4.3	5.4	0.0
Papua New Guinea	0.025	0.037	0.049	0.079	0.073	0.081	0.085	10.0	-2.5	5.3	4.9
Samoa	0.005	0.027	0.006	0.002	0.010	0.010	0.010	-18.5	66.8	n/a	n/a
Solomon Islands	0.003	0.008	0.008	0.009	0.007	0.008	0.010	2.6	-8.3	6.9	25.0
Tonga	0.015	0.040	0.012	0.044	0.170	0.086	0.079	29.5	57.2	-28.9	-8.1
Tuvalu	0.000	0.001	0.064	0.053	0.061	0.231	0.359	-3.5	4.5	94.6	55.4
Vanuatu	0.000	2.16	1.87	1.33	1.62	1.81	1.97	-6.7	6.8	5.9	8.6
Developed countries	**42.87**	**29.85**	**23.07**	**18.38**	**15.67**	**14.89**	**14.99**	**-4.4**	**-5.2**	**-2.5**	**0.7**
Australia	1.64	2.51	2.85	1.94	1.89	1.88	1.85	-7.4	-1.0	-0.1	-1.6
Japan	40.96	27.08	19.91	16.19	13.56	12.76	12.80	-4.1	-5.7	-3.0	0.3
New Zealand	0.26	0.26	0.31	0.24	0.22	0.25	0.34	-4.7	-2.6	5.0	37.4
ESCAP regional total	**101.4**	**122.2**	**126.3**	**132.8**	**152.8**	**180.3**	**185.9**	**1.0**	**4.8**	**8.6**	**3.1**
World total	**419.9**	**423.6**	**490.7**	**573.1**	**594.6**	**665.5**	**721.1**	**3.2**	**1.2**	**7.8**	**8.4**

Source: Lloyd's Register of Shipping: Statistical Tables, London, various issues; 2003-2006 data from *Review of Maritime Transport,* UNCTAD, various issues (2004, 2006 and 2007).

Notes: Data refers to merchant ships of 100 tons gross and above, excluding wooden and non-propelled craft.

[a] Data as at 31 December of each year, except for 1990 (as at 30 June).

[b] 1980 and 1990 data shown for the Russian Federation are for the former Soviet Union

[c] Data for Cambodia is for 2001.

[d] Data for Marshall Islands is estimated from deadweight tonnage data.

B. Vessels by country of domicile

There are significant differences between the share of global tonnage that is *domiciled* in a country and the share that is *registered* in that country. UNCTAD defines *domiciled vessels* as follows: "*the country of domicile indicates where the controlling interest (for example, the parent company) of the fleet is located*".[157]

Table IX-2 below illustrates the differences between the capacity of vessels registered in selected ESCAP countries with the capacity of vessels beneficially owned or controlled by residents of those economies. Shipowners in many countries – especially, but not exclusively, countries with relatively high incomes – have increasingly chosen to register their vessels in other countries in which registration of vessels by non-residents is permitted.

An interesting comparison can be made between Japan and Hong Kong, China. In 2000, the capacity of controlled vessels exceeded the capacity of registered vessels in each case. In Japan the registered fleet has been in sharp decline while the controlled fleet has been increasing steadily. On the other hand, in Hong Kong, China, the controlled fleet declined somewhat since 2000, while the registered fleet increased rapidly, so that the registered fleet exceeded the domiciled fleet by 2003.

Table IX-2. Registered and domiciled[157] vessels for selected ship owning economies in the ESCAP region 2000-2006 (million dwt)

		2000	2001	2002	2003	2005	2006	Average annual growth rate
Japan	Registered Fleet	20.2	17.4	16.6	13.0	11.8	11.8	-8.6%
	Domiciled Fleet	96.3	99.1	104.5	110.1	119.9	135.7	5.9%
	Ratio	4.8	5.7	6.3	8.5	10.2	11.5	
China	Registered Fleet	22.5	22.9	23.0	24.2	29.8	32.2	6.2%
	Domiciled Fleet	39.2	40.3	41.9	47.4	35.7	38.2	-0.4%
	Ratio	1.7	1.8	1.8	2.0	1.2	1.2	
Hong Kong, China	Registered Fleet	15.1	20.2	23.7	34.2	18.0	19.2	4.1%
	Domiciled Fleet	36.7	38.5	35.2	30.9	25.9	25.9	-5.6%
	Ratio	2.4	1.9	1.5	0.9	1.4	1.3	
Republic of Korea	Registered Fleet	8.5	8.8	9.3	8.6	12.7	14.5	9.3%
	Domiciled Fleet	25.5	26.2	25.7	25.2	17.0	17.8	-5.8%
	Ratio	3.0	3.0	2.8	2.9	1.3	1.2	
Taiwan Province of China	Registered Fleet	8.1	7.4	7.1	5.2	4.8	4.0	-11.1%
	Domiciled Fleet	19.9	19.8	23.0	22.9	19.6	20.8	0.7%
	Ratio	2.5	2.7	3.2	4.4	4.1	5.2	
Singapore	Registered Fleet	33.2	34.2	32.9	34.8	14.7	14.9	-12.5%
	Domiciled Fleet	19.0	18.9	18.1	22.3	8.3	10.8	-9.0%
	Ratio	0.6	0.6	0.6	0.6	0.6	0.7	

Source: Based on data in Institute of Shipping and Logistics, *Statistics and Market Review*, No. 11/12, Nov/Dec 2002. Hereafter cited as ISL, 2002. Also UNCTAD, 2004, *Review of Maritime Transport 2004*; and UNCTAD 2006, *Review of Maritime Transport 2006*.

Note: Registered fleet includes vessels of 300 gt and over, controlled fleet only vessels over 1,000 gt.

[157] See UNCTAD *Review of Maritime Transport 2007*. UNCTAD further notes that in practise it is difficult to clearly separate the "domiciled" and "registered" categories due to insufficient transparency ("in several cases, determining this has required certain judgements to be made").

C. Shipbuilding

The ESCAP region continues to dominate the world shipbuilding industry. IN 2006, more than 62 per cent of new ships (measured in gross tonnage terms) delivered in the world were built at shipyards in Asia, and more than 92.7 per cent of deadweight tonnage was built at shipyards in Asia (Table IX-3). The Republic of Korea and Japan are pre-eminent and together account for more than half of the global order book. Almost all berths are booked out in Korean shipyards until the end of 2009.[158] China's shipbuilding production has increased rapidly in recent years, with total orders rising by around 250 per cent between 2002 and 2004. China is now the third largest shipbuilding country in the world, accounting for approximately 10 per cent of the global total.

Table IX-3. World shipbuilding production; total ships delivered in 2006 in selected ESCAP member countries

Region, country or area	Number	GT (1,000s)	CGT (1,000s)	DWT (1,000s)	Share (%) in terms of gt	Share (%) in terms cgt	Share (%) in terms dwt
Republic of Korea	370	19,177	10,908	25,305	25.4	34.5	33.5
Japan	468	18,354	9,279	29,422	24.3	29.4	39.0
China	366	7,842	4,741	12,747	10.4	15.0	16.9
Other Asia	182	747	848	1,091	1.0	2.7	1.4
Taiwan Province of China	16	706	384	998	0.9	1.2	1.3
Turkey	56	285	426	400	0.4	1.3	0.5
Total of selected countries	1,458	47,111	26,585	69,963	62.4	84.2	92.7
World	1,911	75,513	31,575	75,513	100.0	100.0	100.0

Source: Clarksons Research Services, viewed on the website of Clarksons, 30 November 2007, at http://www.clarksons.net

D. Trends in container slot capacity and ship size

The size of mainline container ships has increased steadily over the past three decades. From 3,000 TEU in 1975, the size of the largest vessel in operation rose to 4,000 TEU in 1991, to 6,800 TEU in early 2000, and to 11,000 TEU in 2007 (Figure IX-1). These developments are especially significant for the countries of the ESCAP region, as almost all vessels in the world fleet in excess of 6,000 TEU currently operate on two routes: the trans-Pacific route between Asia and North America and the Asia-Europe route.

As the size of mainline vessels has been increasing, so has the size of feeder vessels and vessels deployed in regional services. Feeder vessels of up to 2,000 TEU are now common, whereas in the mid-1990s vessels 1,200 to 1,300 TEU marked the top end of the feeder range. Similar trends are evident on some of the major intra-regional trade routes: between Australia and South-East Asia, for example, the size of the largest vessel deployed rose from 1,250 TEU in 1992 and 2,900 TEU in 1997 to 3,600 TEU by 2005.[159] In fact, older mainline vessels of 1,500 to 4,000 TEU capacity that are being replaced by the latest generation of high-capacity cellular vessels are now being used on feeder and intra-regional routes.

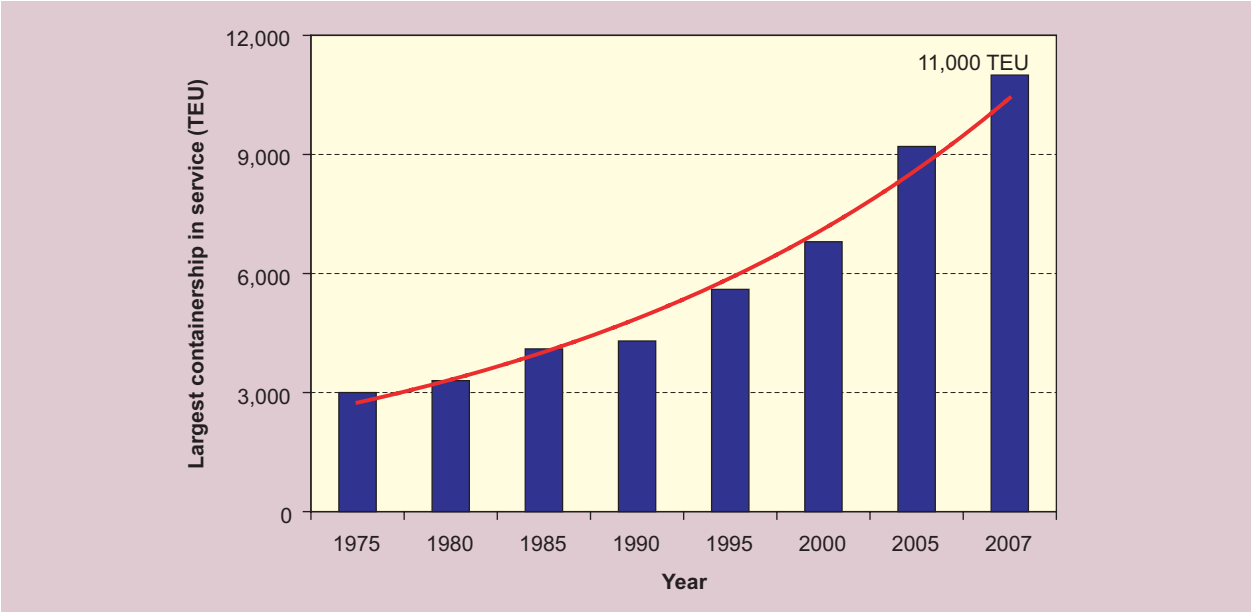
Figure IX-2 below shows the past and possible future evolution of the cellular fleet from 1988 to 2010. Over this period, both the number of container ships and their average size has grown steadily. In fact, the average increase in the number of cellular container ships is estimated at roughly 7 per cent per year. This is to be compared to the growth 10.7 per cent per year in terms of the available container slots.

By 2007, a total of 3,949 cellular container ships in service offered a total capacity of 9.57 million slots: this is up from 2,337 ships offering a total of 3.8 million TEU slots a decade earlier in 1997, and up from 1,156 vessels offering a total of 1.49 million TEU slots almost two decades earlier in 1988. By implication, the increase in the average size of container ships, measured in terms of slot capacity, is from 1,290 TEU in 1988 to 2,693 TEU in 2010.

[158] BRS, 2007, *Shipping and Shipbuilding Markets: 2007,* viewed on the website of BRS, 28 November 2007, at http://www.brs-paris.com/

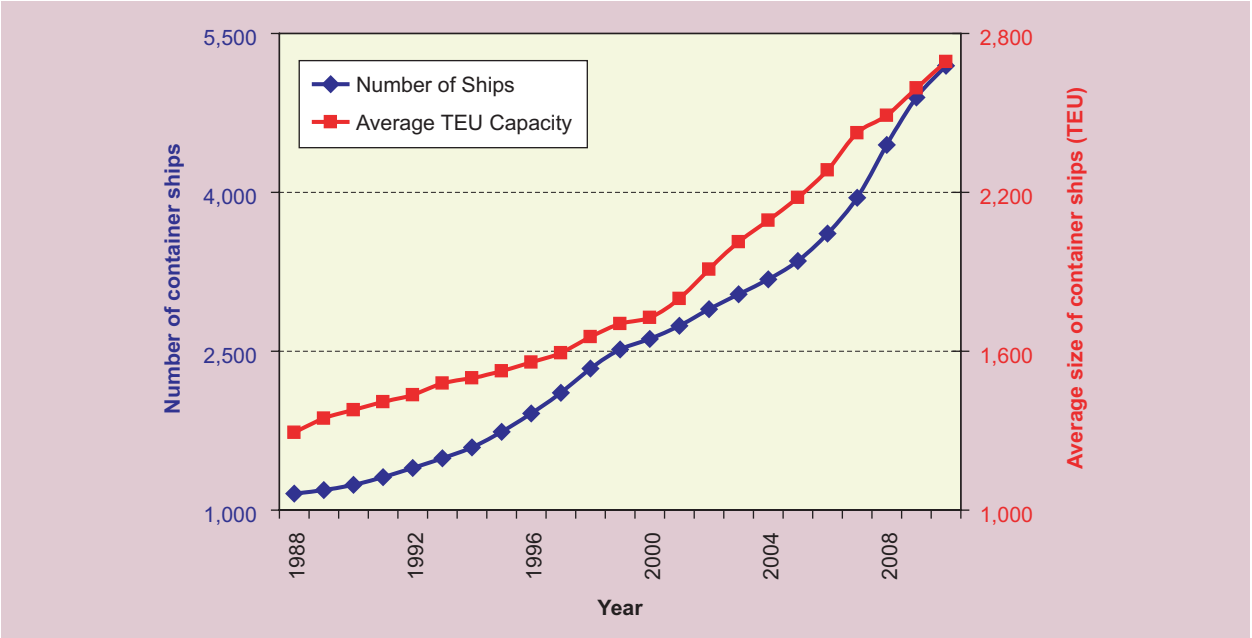
[159] *Containerisation International Yearbook,* various issues.

Figure IX-1. Largest container ships in service, 1975-2007



Source: Lloyd's Register of Shipping, *World Fleet Statistics*, various issues.

Figure IX-2. Developments in the numbers of container vessel numbers and their average size, 1988-2010



Source: BRS, 2007, *Shipping and Shipbuilding Markets 2007*.

Notes: Figures for 2007 to 2010 are derived from vessels currently on order.

The relatively rapid increase in the container fleet has meant that container ships are, on average, significantly younger than other major components of the world fleet. Whereas the average age of the world merchant fleet at the end of 2006 was 12 years, the average age of the cellular container fleet was 9.1 years. This has implications for the future level of global supply of ships: the average age of broken-up tonnage in 2006 was 30 years for tankers, 28.9 years for dry-bulk carriers and 28.1 years for containerships.[160]

[160] UNCTAD 2007, *Review of Maritime Transport 2007*, New York and Geneva.

From 2000 to 2006, the container shipping fleet controlled by shipping lines in the ESCAP region has grown 10.1 per cent per year which is in line with the world average of 10.6 per year. Hong Kong, China, followed by Singapore and China, are the most important registries for container ships in Asia (Table IX-4).

Table IX-4. Containership fleets of ESCAP economies (1,000 gt), 2000-2006

Region, country or area	Container ship fleet (1,000 gt) in	
	2000	2006
Australia	37	7
Bangladesh	6	45
Brunei Darussalam	0	0
China	1,456	3,247
Democratic People's Republic of Korea	0	17
Georgia	0	17
Hong Kong, China	1,492	5,069
India	116	127
Indonesia	92	349
Islamic Republic of Iran	154	275
Japan	695	425
Malaysia	696	690
Maldives	0	0
Pakistan	32	18
Philippines	68	166
Republic of Korea	700	1,224
Russian Federation	271	115
Singapore	3,422	4,639
Sri Lanka	0	25
Thailand	134	259
Turkey	169	254
Tuvalu	0	9
Vanuatu	0	25
Viet Nam	36	71
ESCAP Region	**9,576**	**17,073**
World	**60,326**	**110,689**

Source: UNCTAD *Review of Maritime Transport*, 2000 and 2007.

E. Trends in bulk shipping fleet capacities

The world oil tanker fleet increased from 156 million gross tons in 2000 (end of year) to 214 million gross tons by the end of 2006, corresponding to an average growth rate of 5.2 per cent per year (Table IX-5). Over the same period, the oil tanker fleet registered in ESCAP economies grew much faster at 10.1 per cent per year and reached 48.2 million gross tons or 23 per cent of the world total by the end of 2006. At the end of 2006, Singapore, followed by Hong Kong, China, had the largest oil tanker fleets with 16.1 million and 7.1 million gross tons, respectively.

The world's dry bulk carrier fleet increased at an average rate of four per cent per year from 161 million gross tons in 2000 to 205 million gross tons by the end of 2006. The dry bulk fleet registered in ESCAP economies grew slightly faster at and average of 4.7 per cent per year and reached 26.7 per cent of the world capacity by the end of 2006 (Table IX-5). At the end of 2006, the largest bulk carrier fleets in gross tonnage terms were registered in Hong Kong, China; and China with 17.9 and 9.2 million gross tons, respectively.

Table IX-5. Oil tankers and bulk carriers controlled by ESCAP economies 2000-2006 (1,000 gt)

	Oil Tankers		Bulk Carriers	
	2000	2006	2000	2006
Australia	247	240	627	463
Azerbaijan*	176	211	–	–
Bangladesh	62	59	6	52
Brunei Darussalam	–	1	–	–
China	2,250	4,576	6,618	9,227
Democratic People's Republic of Korea	6	60	63	161
Fiji	3	–	–	–
Georgia	8	107	–	390
Hong Kong, China	920	7,191	7,113	17,909
India	2,553	4,883	2,663	2,100
Indonesia	812	1,288	335	486
Iran (Islamic Republic of)	2,101	3,266	1,148	993
Japan	3,742	2,539	3,239	2,561
Kazakhstan	–	37	–	–
Kiribati	–	–	–	16
Malaysia	869	2,511	1,568	343
Maldives	3	8	–	–
Myanmar	3	3	231	208
New Zealand	57	54	12	12
Pakistan	50	215	–	36
Papua New Guinea	2	2	–	6
Philippines	154	403	4,366	2,459
Republic of Korea	607	1,276	2,915	5,845
Russian Federation	1,402	1,334	864	692
Singapore	9,118	16,120	4,781	6,492
Sri Lanka	2	8	77	7
Thailand	364	370	443	919
Tonga	–	1	–	6
Turkey	625	860	3,303	2,101
Turkmenistan	2	6	3	3
Tuvalu	–	101	–	53
Vanuatu	17	95	839	875
Viet Nam	136	371	122	267
ESCAP Region	**26,291**	**48,196**	**41,336**	**54,682**
World	**156,485**	**214,018**	**161,661**	**204,717**

Source: UNCTAD Review of Maritime Transport, 2000, 2006 and 2007.

*Notes: * = 2005 data*

F. Trends in the average age of merchant fleets

The average age of the world fleet decreased from 14.1 years in 1999 to 12 years in 2006 (Table IX-6.). The decrease in age affected almost all vessel classes, but was most pronounced in tankers (the average age of tankers fell from 13.9 to 10 years). General cargo ships continue to record the highest average age of all vessel classes. The average age for general cargo vessels has remained relatively constant over this period, increasing by 0.1 years.

Table IX-6. Average age of the world fleet 1999-2006

Type of Ship	Average age (years)							
	1999	2000	2001	2002	2003	2004	2005	2006
All Ships	14.1	13.9	13.9	12.6	12.5	12.3	12.2	12.0
Tankers	13.9	14.1	13.2	11.6	10.9	10.3	10.0	10.0
Bulk carriers	13.8	13.2	13.7	12.7	12.9	13.0	13.1	12.9
General Cargo	17.3	17.0	16.2	17.0	17.4	17.5	17.5	17.4
Container ships	9.7	10.4	11.0	9.1	9.2	9.4	9.4	9.1

Source: Institute of Shipping Economics and Logistics, *Shipping Statistics Yearbook 2004* (ISL: Bremen, 2004; and UNCTAD, *Review of Maritime Transport 2000, 2001, 2002, 2003, 2004, 2005, 2006 and 2007*.

Notes: The year columns in the table denote the average age of the fleet as at 31 December of the corresponding year.

Percentages are calculated based on total dwts.

G. Productivity trends in the world merchant shipping fleet

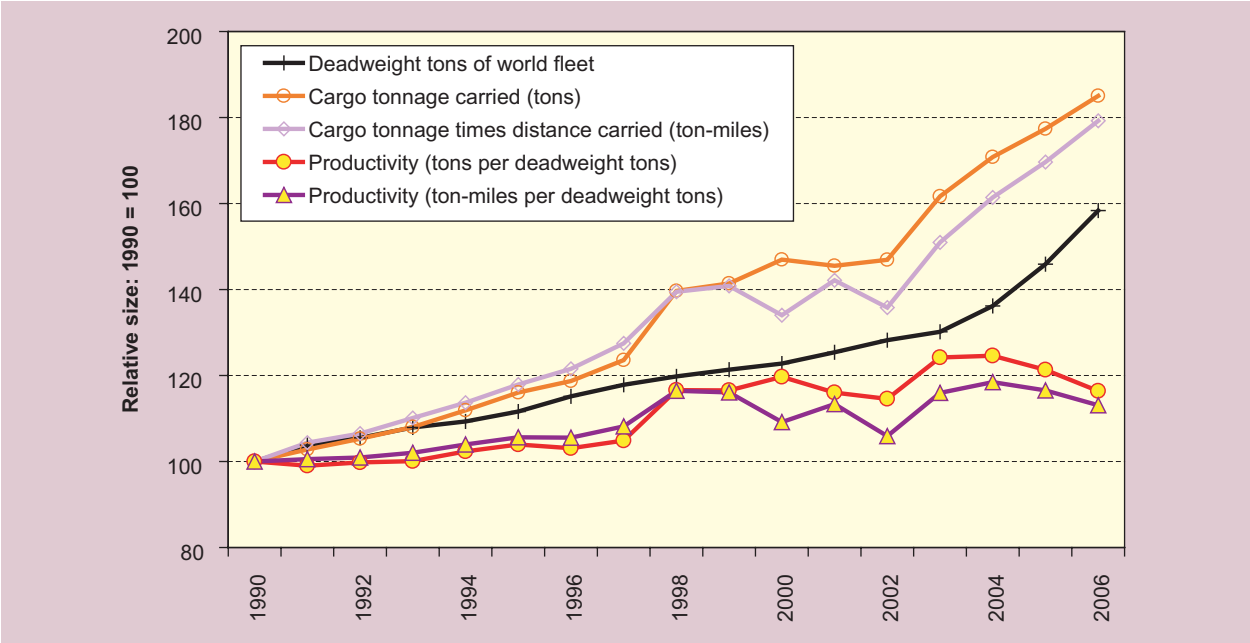
Two possible indicators of the productivity of the merchant fleets are (i) the cargo tonnage carried per ton of cargo carrying capacity, and (ii) the number of ton-miles performed per ton of cargo carrying capacity. In the section below, we use aggregate deadweight tons (dwt) as a proxy for the cargo carrying capacity of the world fleet, and thus the following indicators of productivity:

(a) cargo tonnage per deadweight ton (dwt) of capacity;
(b) number of ton-miles per deadweight ton (dwt) of capacity.

Even though unadjusted for factors such as the proportion of the fleet laid up or the impact of slow steaming, these indicators illustrate the change in long-term productivity. The discussion is limited to the global level, since the necessary data for the fleet serving the ESCAP region were not available.

Figure IX-3 illustrates the productivity trends of the world merchant fleet between 1990 and 2006. The operational productivity of the world fleet, measured in tons of cargo per deadweight ton of capacity increase from 1990 to a peak in 2004, and then in 2006 decreased to a level roughly 16 per cent higher than in 1990. The majority of this improvement was achieved during the strong surge in world seaborne trade from 1997 to 1998, when the demand for shipping far outstripped the expansion in capacity. However, the

Figure IX-3. Various indices for the productivity of the world merchant fleet, 1990-2006



Source: UNCTAD, Review of Maritime Transport 2005, 2006 and 2007.

reduction in this productivity measure since 2004 is primarily a result of a large influx of new vessels in 2005, which continued into 2006. Productivity in terms of cargo ton-miles per deadweight ton of capacity has increased by a similar percentage, but in a somewhat more erratic fashion, peaking in 2004 at a level 18.6 per cent higher than in 1990, and it was down to above the 1990 level in 2006.

H. Supply-side developments in world container shipping

The international container shipping industry today is characterized by the increasing concentration of container-carrying capacity in the hands of a limited number of "mega-carriers". *Lloyd's Shipping Economist* identifies the following key factors driving consolidation in the industry:

- Chronic excess capacity;
- A large number of operators by the standards of other capital-intensive global industries;
- Potential for economies of scale through the use of larger vessels;
- Customer service demands and the development of logistics chains;
- Barriers to entry created by the need to maintain fixed day weekly services as the minimum acceptable quality of service;
- De-consolidation of transport conglomerates including the spin-off of specialist liner shipping companies;
- Privatization making former government-owned lines available for acquisition;
- Deregulation removing nationality restrictions on ownership and undermining the conference system; and
- Constantly poor financial performance.[161]

For quite some time, cooperation between container shipping companies has come in many different forms such as slot purchase, slot exchange, vessel-sharing agreements or joint services, mainly on a trade-specific basis. In recent years the trend has been towards carrier alliances on a global basis, by which carriers enter into partnerships that cover their operations worldwide, or at least on the main East-West routes, rather than on a single trade route. Major carriers have entered into groupings by integrating their service structures with those of their main competitors to reduce operating costs and increase market power. In essence, this is the maritime equivalent of "code-sharing" by international airline alliances. This has offered significant additional advantages in container logistics and the rationalization of port terminals, while allowing shipping lines to retain their distinctive marketing identities and ownership.

Since the turn of the 20th century, there has been a resurgence in mergers and acquisitions. For example, AP Moller-Maersk Group in August 2005 acquired one of its major competitors, P&O Nedlloyd, i.e., the largest container shipping company in the world purchased the fourth largest. The APM-Maersk Group now controls approximately 15.3 per cent of world container capacity. However, in the past two years, this activity has somewhat diminished; instead there has been a renewed focus of the largest shipping lines (in terms of container slot capacity) on naturally outgrowing their competitors.

According to Containerisation International, at the start of December 2007 the top 20 container lines operated 8.64 million TEU, or approximately 82 per cent of total world cellular container capacity.[162] Data from AXS-Alphaliner indicates that the top five lines operate almost 45.6 per cent of world cellular capacity (Figure IX-4).[163] This trend of industry consolidation (i.e., where the largest shipping lines control an even higher proportion of world container capacity) is expected to continue: the vessel order book for the

[161] *Lloyd's Shipping Economist,* "Time is ripe for consolidation", October 2002.

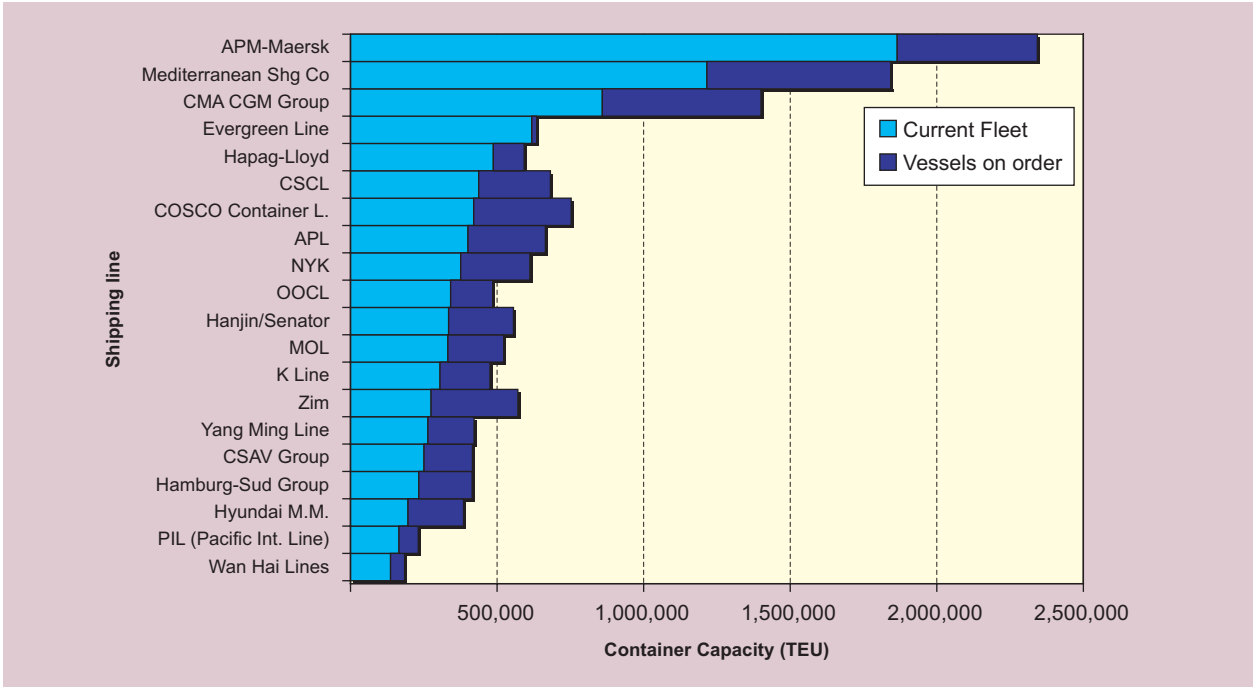
[162] Containerisation International, viewed on the CI_Online website, 3 December 2007, at http://www.ci-online.co.uk

[163] AXS-Alphaliner top 100 as at 28 November 2007, viewed on the AXSMarine website, 28 November 2007, at http://www.axsmarine.com

three largest shipping lines (APM-Maersk, Mediterranean Shipping Co and CMA CGM Group) are the largest of any of the top 100 cellular liners.

Fourteen of the world's top 20 container shipping operators are based in the ESCAP region, and they control 41.6 per cent of the world cellular capacity. The growing importance of intra-Asian trade is illustrated by the inclusion of regional specialists Pacific International Line and Wan Hai in this group which is dominated by global carriers.

Figure IX-4. Current fleet and vessels on order for the top 20 cellular shipping lines (as at November 2007)



Source: AXS-Alphaliner top 100 as at 28 November 2007, viewed on the AXSMarine website, 28 November 2007, http://www.axsmarine.com

X. PORTS

This Chapter provides an overview of container port development in Asia and the Pacific. A general overview of data and trends in the ESCAP region (Section A) is followed by a summary of the status of major container and bulk port construction projects in the region (Section B).

A. Trends in container port throughput

Growth in container port throughput has continued to be strong throughout most parts of the ESCAP region. This section provides an overview of general trends (Section A.1), information on mega-port development (Section A.2), and developments in selected ESCAP economies (Section A.3).

1. Overall ESCAP and global trends

From 1995 to 2006, container port throughput in the ESCAP region has increased by an average of 11.8 per cent per year, which was in line with the 11.2 per cent increase for the world as a whole (see Table X-1 below). Total container port throughput in the ESCAP region increased from 68 million TEU in 1995 to 232 million TEU in 2006. According to UNCTAD estimates, the world container port throughput reached 440 million TEU in 2006, up from 137 million in 1995. Thus, the ESCAP region's share in container port throughput increased somewhat from 49 to 53 per cent over the same period. For comparison, the ESCAP region's share is only 29 per cent of the world's merchandise trade in value terms. This illustrates the increasing importance of Asian countries in the international production systems (see Chapter I).

From 1995 to 2000, container port throughput in the ESCAP region grew at an average of 11.1 per cent per year. This rate was slower than the world average, which was largely the result of the impact of the Asian financial crisis of 1997 and its effect on intraregional demand.

Over the period of 2000 to 2006 world container port throughput grew at 10.9 per cent per year, which was at a rate slightly lower than that of the preceding 5 year period. In the ESCAP region, container throughput increased at an average of 12.4 per cent per year, and as a result, the share of region in global container port traffic increased. However, year-to-year changed between 2000 and 2006 were quite volatile.

In 2001, growth in container traffic slowed markedly, due to the bursting of the technology bubble in developed countries. In that year, the world total increased by only 4.2 per cent which was the lowest rate of growth recorded for over 20 years. The ports of some economies of the ESCAP region were particularly hard hit, with Japan, Singapore, New Zealand, Hong Kong, China, Sri Lanka and Turkey all recording falls in total throughput.

By 2003, however, strong growth in world container traffic returned quickly. Port container throughput in the world grew by 15 per cent in 2003, 8 per cent in 2004, 14 per cent in 2005, and 15 per cent in 2006, to the current record level of 440 million TEU.

2. Mega-port development

The world's top 20 container ports handled 186.2 million TEU in 2005, which accounted for 48.7 per cent of the world's container port total, up from 45 per cent in 2001. This indicates a further concentration of container traffic in large mega-ports.

The concentration of container port traffic is even more pronounced in Asia and Pacific, where the 10 busiest container ports handled 122 million TEU, or 53 per cent of the region's total throughput in 2005. The world's six busiest container ports are located in the ESCAP region. These six ports alone handle 26.4 per cent of world container throughput, or 44.3 per cent of the ESCAP region's total.

Table X-1. Port container throughput in selected ESCAP economies and ports, 1995-2006

Economy, region or port	Container port throughput (1,000 TEU)				Average annual change (%)			
	1995	2000	2005	2006*	1995-2000	2000-2006	1995-2006	2005-2006
Australia	**2,280**	**3,497**	**4,830**	**5,176**	**8.9**	**6.8**	**7.7**	**7.2**
Melbourne	852	1,274	1,863	1,925	8.4	7.1	7.7	3.3
Sydney	669	1,016	1,445	1,620	8.7	8.1	8.4	12.1
Bangladesh	**191**	**456**	**901**	**999**	**19.0**	**14.0**	**16.2**	**10.9**
Brunei Darussalam	**71**	**61**	**131**	**–**	**-3.0**	**–**	**–**	**–**
China	**4,682**	**19,374**	**66,121**	**81,927**	**32.8**	**27.2**	**29.7**	**23.9**
Qingdao	600	2,120	6,307	7,702	28.7	24.0	26.1	22.1
Shanghai	1,527	5,613	18,084	21,710	29.7	25.3	27.3	20.1
Shenzhen	284	3,994	16,197	18,469	69.7	29.1	46.2	14.0
Tianjin	702	1,708	4,801	5,900	19.5	22.9	21.4	22.9
Fiji	**44**	**47**	**72**	**–**	**1.3**	**–**	**–**	**–**
French Polynesia	**41**	**62**	**71**	**68**	**8.6**	**1.5**	**4.6**	**-4.5**
Hong Kong, China	**12,550**	**18,100**	**22,427**	**23,230**	**7.6**	**4.2**	**5.8**	**3.6**
India	**1,360**	**2,314**	**4,938**	**5,643**	**11.2**	**16.0**	**13.8**	**14.3**
Mumbai/JN Port	731	1,319	2,667	3,084	12.5	15.2	14.0	15.6
Indonesia	**2,048**	**3,798**	**5,503**	**5,738**	**13.1**	**7.1**	**9.8**	**4.3**
Tanjung Priok	1,300	2,476	3,282	3,347	13.8	5.2	9.0	2.0
Iran (Islamic Republic of)**	**182**	**437**	**1,353**	**1,529**	**19.2**	**23.2**	**21.4**	**13.0**
Japan	**10,604**	**13,296**	**16,777**	**18,155**	**4.6**	**5.3**	**5.0**	**8.2**
Kobe	1,464	2,266	2,262	2,413	9.1	1.1	4.7	6.7
Nagoya	1,477	1,912	2,491	2,752	5.3	6.3	5.8	10.5
Osaka	1,159	1,474	1,802	2,232	4.9	7.2	6.1	23.8
Tokyo	2,177	2,899	3,593	3,696	5.9	4.1	4.9	2.9
Yokohama	2,757	2,317	2,873	3,200	-3.4	5.5	1.4	11.4
Malaysia	**2,075**	**4,642**	**12,027**	**13,365**	**17.5**	**19.3**	**18.4**	**11.1**
Port Klang	1,134	3,207	5,544	6,326	23.1	12.0	16.9	14.1
Tanjung Pelepas	0	418	4,177	4,770	**–**	50.0	**–**	14.2
New Caledonia	**41**	**52**	**72**	**75**	**5.0**	**6.3**	**5.7**	**3.5**
New Zealand	**793**	**1,122**	**1,613**	**1,726**	**7.2**	**7.4**	**7.3**	**7.0**
Pakistan*	**551**	**775**	**1,565**	**1,761**	**7.1**	**14.7**	**11.1**	**12.5**
Papua New Guinea	**115**	**155**	**n/a**	**n/a**	**6.2**	–	**–**	**–**
Philippines	**1,892**	**3,043**	**3,634**	**3,974**	**10.0**	**4.5**	**7.0**	**9.4**
Manila	1,668	2,292	2,625	2,638	6.6	2.4	4.3	0.5
Republic of Korea	**4,918**	**9,030**	**14,754**	**15,521**	**12.9**	**9.4**	**11.0**	**5.2**
Busan	4,503	7,540	11,843	12,030	10.9	8.1	9.3	1.6
Singapore	**11,846**	**17,096**	**23,192**	**24,796**	**7.6**	**6.4**	**6.9**	**6.9**
Sri Lanka	**1,029**	**1,733**	**2,455**	**3,079**	**11.0**	**10.1**	**10.5**	**25.4**
Taiwan Province of China	**7,849**	**10,511**	**12,791**	**13,102**	**6.0**	**3.7**	**4.8**	**2.4**
Kaohsiung	5,232	7,426	9,471	9,775	7.3	4.7	5.8	3.2
Keelung	2,170	1,955	2,092	2,129	-2.1	1.4	-0.2	1.8
Taichung	447	1,130	1,229	1,204	20.4	1.1	9.4	-2.0
Thailand	**1,962**	**3,179**	**5,115**	**5,701**	**10.1**	**10.2**	**10.2**	**11.5**
Bangkok	1,433	1,074	1,349	1,451	-5.6	5.2	0.1	7.6
Laem Chabang	529	2,105	3,766	4,123	31.8	11.9	20.5	9.5
Turkey	**738**	**1,074**	**3,170**	**3,337**	**7.8**	**20.8**	**14.7**	**5.3**
Viet Nam	**–**	**977**	**2,694**	**3,215**	**–**	**22.0**	**–**	**19.3**
Ho Chi Minh	0	825	1,911	2,532	–	20.6	–	32.5
ESCAP region total***	**67,861**	**114,830**	**206,209**	**232,319**	**11.1**	**12.5**	**11.8**	**12.7**
ESCAP share of world total	**49.4%**	**48.7%**	**53.9%**	**52.8%**			n/a	
World Total******	**137,239**	**235,900**	**382,622**	**440,000**	**11.4**	**10.9**	**11.2**	**15.0**

Source: Containerisation International Yearbooks 1996-2007; *Global Container Terminals: Profits, Performance and Prospects* (Drewry: London, 2002); *Review of Maritime Transport*, UNCTAD, 2007.

Notes: (a) The year refers to calendar or fiscal year; (b) Identified economies only – includes estimates for identified economies for which figures were not available in a particular year.

* Preliminary estimate

** Includes only Port Mohammad Bin Qasim. Data from Ports and Shipping Organization of the Islamic Republic of Iran

*** Identified economies only. Data for 2006 is an ESCAP estimate.

**** Sources: 1995 and 2005 data from FCPL, 2000 data from Drewry Shipping Consultants, and 2006 data from UNCTAD.

The world's top two container ports in terms of container throughput were Hong Kong, China; and Singapore which handled approximately 48 million TEU in 2006. However, in each case the mega-port's dominance of its subregion has faced a new challenge in recent years, resulting in a struggle to maintain market share. In the case of Hong Kong, China, this has come from the emergence of Shanghai and the Shenzhen ports as major global players. In the case of Singapore, it resulted from the emergence of Tanjung Pelepas as a new regional hub and the growing role of Port Klang as a mainline port with a strong trans-shipment business.

3. Port container throughput in selected ESCAP economies

a) North and North-East Asia

Container throughput for ports of China[164] has increased from 19.4 million TEU in 2000 to 81.9 million TEU in 2006, equivalent to an average annual growth of 29.7 per cent for this period. This rapid growth has consolidated the position of China as the world's most important container shipping market. Chinese container port throughput is now more than four times as large as that of Japan (Table X-1 above).

The most dramatic growth has occurred in the ports of Shanghai and the Shenzhen. Container throughput in the port of Shanghai is now nearly 15 times its 1990 level, reaching 21.7 million TEU in 2006. Growth in the Shenzhen ports has been equally impressive, rising from a negligible volume in 1990 to over 18.5 million TEU in 2006.

The container throughput of the Taiwan Province of China increased rapidly during the first half of the 1990s, but has subsequently slowed significantly. Total throughput reached 13.1 million TEU in 2006, reflecting an annual average growth of container throughput from 2000-2005 of 3.7 per cent per year.

Growth of container throughput at Japanese ports has also been more moderate in recent years. From 7.8 million TEU in 1990, container throughput grew at nearly 6 per cent per annum to reach 10.6 million in 1995. From 1995-2000, growth slowed to an annual average rate of 4.6 per cent, and has maintained a similar rate (5.3 per cent per year) from 2000-2006 reaching 18.2 million TEU in 2006.

Unlike most of the other ESCAP member countries (with the notable exception of China), in which container shipping is concentrated in one or two major ports, the container business in Japan is relatively disbursed. Five ports – Kobe, Nagoya, Osaka, Tokyo and Yokohama – all had throughputs in the range of 2.2 million TEU to 3.7 million TEU. In 2003, the Government of Japan announced its intention to concentrate future investment in two to three major international hubs.[165] However, at present, total container throughput is still quite evenly spread amongst the five main ports.

Container throughput for the Republic of Korea continued to grow strongly from 2000 to 2006, rising from 9.0 million to 15.5 million TEU; an average growth rate of 9.4 per cent per year. Development of a significant trans-shipment business at the major container port of Busan has contributed significantly to this growth. In the past few years, the port of Gwangyang has made a substantial contribution to the national total, with throughput approaching 1.3 million TEU in 2004; an 11.4 per cent increase from the previous year. However, this rate of growth moderated in 2005 to 9 per cent.

Container throughput in the Russian ports at the Pacific totalled around 428,000 TEU in 2005, with an increase of approximately 6 per cent on 2004. Container traffic through Vladivostok now appears to be in decline (down 15.7 per cent in 2006); however, container volumes through Vostochniy are estimated to have increased by 7 per cent in 2006.

---

[164] Excluding container throughput for ports in Hong Kong, China and Taiwan Province of China.

[165] 'Japan to develop super-hubs as regional trans-shipment competitors', *Containerisation International News Services, 24 September 2003*.

b) South-East Asia

The port container throughput of South-East Asia has grown at an average rate of 9.8 per cent per year from 2000 to 2005, comparable to the developments in East and North-East Asia. In several ASEAN countries, the second half of the 1990s witnessed a major shift in trade balance, with imports declining sharply while exports grew strongly, due to lower exchange rates and government efforts. This changed trading pattern has in most cases persisted through the first half of the 2000s.

The highest sustained growth rates in of South-East Asia were achieved by the ports of Viet Nam, with an average compound rate of 22.0 per cent per year between 2000 and 2006. Container port traffic in Viet Nam grew strongly from a small base of less than one million TEU in 2000 to 3.2 million TEU in 2006. From 2000 to 2006, Malaysian container port throughput also grew rapidly at 19.3 per cent per year, largely because of the rapid growth in trans-shipment traffic at the new port of Tanjung Pelepas which expanded by an average of 50 per cent per year over this period.

Indonesia's container trade volume slowed considerably as a result of the Asian financial crisis during early parts of the 1990s, but showed swift recovery in 1999, when port container throughput grew by 21 per cent from a recession low in 1998. Overall, growth over the second half of the 1990s was maintained at a robust rate of 13.1 per cent per year, down slightly from the 17 per cent growth experienced in the first half of the decade, but moderated to a level of 5.2 per cent per year between 2000 and 2006.

In Thailand, growth, although a little slower than in the first half of the 1990s, has been consistently strong through the second half of the 1990s and the first half of the 2000s; growth over the period 1995-2006 averaged around 10.2 per cent per year. A salient feature of the development of Thailand's container traffic is the rise of Laem Chabang as the country's premier container port. With the advantage of high productivity terminals and deep water berths, and backed by a policy decision to cap the throughput of the congested Bangkok port at or near one million TEU, Laem Chabang's total throughput grew from a negligible level in 1990 to 2.1 million TEU in 2000 and 4.1 million TEU in 2006. Laem Chabang now handles approximately 75 per cent of Thailand's total international container trade.

In Singapore, container port throughput rose at 17.8 and 7.6 per cent per year in the first and second half of the 1990s, respectively. In 2001, it fell by nearly 10 per cent to its 1998 level. However, it quickly solid if unspectacular growth. In fact, the annual average growth was 6 per cent per year from 2000 to 2006, reaching almost 25 million TEU in 2006. This somewhat slower growth also reflects increased competition from the Malaysian ports for Singapore's large trans-shipment business.

c) South and South-West Asia

In South and South-West Asia, port container throughput has almost tripled from 2000 to 2006, as growth averaged some 16 per cent per year. Yet, total throughput of container ports in the subregion reached only 16.3 million TEU in 2006, which still is barely more than one tenth the size of the throughput of North and North-East Asia (at 152 million TEU), a subregion of similar population size.

The Islamic Republic of Iran has registered the fastest growth in port container throughput, at an average 23 per cent per year from 2000 to 2006, reaching 1.5 million TEU. In fact, the growth in container port throughput was almost as rapid as in China over this period.

In India, the growth of container port throughput has accelerated from an average of 11 per cent per year in the second half of the 1990s to 16 per cent per year from 2000 to 2006. Indian container port throughput was estimated at 5.6 million TEU in 2006. The modern, largely privatised Jawaharlal Nehru port is India's premier container port, and volumes through the nearby older Mumbai port have shown a corresponding continued decline. However, Jawaharlal Nehru port's share of the national total actually decreased from 63 per cent in 2003 to 54 per cent in 2005. This has been due to the emergence of significant container ports in other regions of India. For example, the Southern port of Chennai has now overtaken Mumbai as India's second largest container port.

In Bangladesh, container port throughput continues to be strong, as it grew by an average 14 per cent per year from 2000 to 2006, reaching roughly one million TEU in 2006. However, growth has actually decelerated from 20 per cent per year in the second half of the 1990s to 11 per cent from 2005 to 2006.

In Pakistan, container port throughput grew at 15 per cent per year from 2000 to 2006, reaching 1.8 million TEU in 2006. Growth has been twice as fast than in the second half of the 1990s and continues to be strong.

In Sri Lanka, container port throughput grew at 10 per cent per year from 2000 to 2006, reaching 3.1 million TEU in 2006. In contrast to Bangladesh and India that suffered only a modest slowdown in 2001, the Sri Lankan trans-shipment port of Colombo was severely affected with an absolute decline in container throughput in that year. However, Sri Lankan ports recovered quickly thereafter. From 2005 to 2006, container port throughput grew more than 25 per cent.

d) Pacific

Container port throughput in Australia and New Zealand has grown at roughly 7 per cent per year since the mid 1990s. Their combined throughput reached 6.9 million TEU in 2006. Growth has been significantly lower than the world average.

The only container ports of significant size in Pacific island developing economies are located in Fiji and New Caledonia which had container port throughputs of slightly more than 70,000 TEU in 2006. Growth in container throughput has been considerably lower than the world average, due to a number of reasons. Pacific island developing economies facing special challenges due to small populations and long distances.

B. Selected port infrastructure projects

During the 1990s, most of the large port investments were in the upgrading and extension of container-handling capacities. In recent years, however, a number of significant bulk port projects have emerged to meet demand for other commodities.

Table X-2 below lists selected port infrastructure in the ESCAP region that are either in the planning stage, in progress or recently completed. The list is not comprehensive; it is intended simply to provide a broad indication of the physical scale of the included projects. The information is compiled from Thomson project finance international and other information gathered by the secretariat.

Table X-2. Selected port infrastructure projects in the ESCAP region (status as of 2007)

Country	Selected port infrastructure projects	Status
Australia	*Port Botany Expansion Project* The Botany expansion will be one of the largest port redevelopments undertaken in Australia. The project includes infrastructure for 1,850 metres of extra berth length by reclamation of approximately 60 hectares of land, dredging, road works, community facilities and environmental enhancement works. Commissioning is believed to commence in 2011.	Planned
Australia	*Oakajee Port and Railway Project* The project is aimed to service several iron ore mines in the face of strong present and expected future demand for Australian mineral commodity exports. An estimated A$ 3 billion will be invested in the construction of a privately owned and operated deepwater port north of Geraldton, as well as a supporting rail network.	Planned

Table X-2. *(continued)*

Country	Selected port infrastructure projects	Status
Australia	*Melbourne Channel Deepening Project*	
	In excess of 25 per cent of container vessels using the port of Melbourne are unable to enter or leave the port fully laden because of current draught restrictions in the approach channels. The deepening project is expected to commence in 2008 and will see dredging of Port Phillip Bay at select locations to accommodate vessels of 14 m draught at a cost of approximately A$ 763 million.	Planned
Bangladesh	*Construction of Container Terminal near Chittagong Port*	
	After the completion of various infrastructure projects, container traffic through the port of Chittagong rose from roughly 487,000 TEU in 2001 to 784,000 TEU in 2005. Construction of a container terminal, with five berths of 1 km length, 22 hectares of storage and other ancillary facilities is expected to be completed by late 2007.	In Progress
	There are also plans for the construction of Karnaphuli Container Terminal, including dredging at Jetty 11, 12 and 13 of Chittagong Port and construction of Patenga Container Terminal outside the port protected area.	Planned
China	*Yangshan Port Construction*	
	Due to the difficulty of maintaining water depth of port in Huangpu River, the Mother River of Shanghai, and rapid growth of container volume, the construction of a mega-deepwater port became a must for Shanghai.	
	Construction of the Yangshan deepwater port in Shanghai is well underway. By 2020, there will be capacity for 50 container berths and a channel depth of 16 m. The port will also have an annual handling capacity of 25 million TEU.	In Progress
	With investment at approximately $ 7.5 billion, the first phase project of Yangshan port was completed in 2005, and handled 3.1 million TEU in its first year of operation.	Complete
	Phase II, at a cost of approximately $ 7 billion, was completed in December 2006 and included an additional four berths. Another two phases are expected to be operational by 2012 with the provision of another 20 berths with a cost in excess of $ 20 billion.	In Progress
China	*Port of Shanghai Upgrade*	
	The port of Shanghai benefited significantly from a $ 350 million dredging project to deepen the channel at the mouth of the Yangtze River. Phase I, which deepened the channel depth from 7 to 8.5 m, was completed in May 2000.	Completed
	Phase II of the project is now underway and by 2010 is planned to provide the river mouth with a navigable depth of 12.5 m.	In Progress
	Phase III of the Waigaoqiao Container Terminal project will boost the cargo capacity of the terminal to 400,000 TEU and increase the quay length of 680 m. Future plans include the addition of more than 30 container berths with 6.5 million TEU annual capacity at Wuhaogou in Pudong.	Planned
China	*DP World Qingdao Port Project*	
	DP World development of the green field site at Qingdao is expected to have a capacity of over 2.2 million TEU and commence operations before 2009. The DP World owned facility will include four deep draft berths across 1,320 metres of quay. Total investment in this project is expected to be in the order of US$ 435 million.	Planned
China	*Nansha Construction of New Berths*	
	Phase I was completed in 2004; it saw the construction of four berths with a channel depth of 11.5 m. Phase II with six deep-water container berths is also now complete increasing the number of container berths to 10 with total quay length of 3.5 km.	Completed
	After several years of construction, Nansha area has been turned into a transit hub for containers, oil products and automobiles. The expansion of Nansha port area will double the size of Guangzhou port by 2010 when the total cargo throughput is expected to hit 350 million tons and container volume should exceed 10 million TEU.	In Progress

Table X-2. *(continued)*

Country	Selected port infrastructure projects	Status
China	*Hong Kong, China – Kai Tak Cruise Terminal Project* Development of a new cruise terminal to help Hong Kong, China become a regional cruise hub is believed to open by 2012. Development of the new facilities on 7.6 hectares at the end of the former airport runway includes two berths of 8,000 metres, support facilities and a commercial area. The estimated development cost, excluding the commercial area is about HK$ 2.4 billion.	Planned
India	*Visakhapatnam Port* In 2005, construction was planned for a multipurpose berth at the inner harbour and upgrade of the Ore Handling Complex to accommodate 14 million tonnes of iron ore per year (up from eight million tons). The work on Stage I deepening of the inner harbour is now complete and an MOU has been signed with a BOT operator for Stage II.	In Progress
India	*Expansion plan for Jawaharlal Nehru Port* A fourth terminal will be developed on the basis of the port's existing liquid bulk terminal, and a dedicated marine chemical terminal will be established. The project is to be developed in two phases, with a two kilometre quay line for a total four million TEU handling capacity (two million TEU in each phase). The project should be completed by 2011-2012.	Planned
	In order to keep up with the increasing vessel sizes entering the port, a two-phase plan has been devised for the deepening and widening of the main harbour. Phase I will allow for a container vessel of capacity of 6,000 TEU and up to 14 m draught by making use of the tidal window by mid 2009. Phase II will accommodate vessels with a capacity of 6,000 TEU and up to a 14 m draught at all times, and 9,000 TEU with up to a 15 m draught by making use of the tidal window.	Planned
India	*Gangavaram Greenfield Port Project* A greenfield port is to be developed as an all-weather, deepwater, multipurpose port for handling vessels with a draught of 18 to 20 metres at Gangavaram.	Planned
India	*Reliance Jamnagar Port Project* Reliance's Jamnagar complex represents the largest industrial project ever implemented by the Indian corporate sector. The Jamnagar complex is a fully integrated manufacturing facility, with a petroleum refinery complex, an aromatics/petrochemical complex, a power generation complex and a port and terminal complex that provides access to a pipeline network. The Jamnagar complex will involve a total investment of about Rs 25,000 crore (about US$ 6 billion) and is believed to reach completion before December 2008 – taking less than three years to build.	In Progress
India	*Krishnapatnam Port Project* A US$ 1.6 billion investment in a new container port with initial annual capacity of one million TEU is scheduled to open for vessels in June 2008 and be completed by 2011. Krishnapatnam Port is already handling bulk cargos and will handle specialized cargoes such as liquefied natural gas and oil and petroleum products once the expansion is complete.	In Progress
India	*Gopalpur Port Project* The project which is estimated to cost about Rs 1,700 crore will take five years to be completed. The first phase, will see the port able to handle more than 2.5 mtpa of cargo, while the second phase will expand capacity to 5 mtpa over a period of four years. Works will involve repair to existing infrastructure as well as new simultaneous dredging, breakwater construction and new cargo berths. The proposed port with eight cargo berths is set to be operational by 2009.	Planned

Table X-2. *(continued)*

Country	Selected port infrastructure projects	Status
Indonesia	*Tanjung Priok Port* The construction work of 513 metres of deepwater quay at Tanjung Priok Port was completed in 2003. The new quay links the facilities of JICT and Koja terminals, resulting in a continuous 1.2 kilometre quay length. Further plans for 2005-2009 will see the construction of a car, bulk and container terminal. This new project is estimated to cost Rp 4,597 billion.	 In Progress
Indonesia	*Bojonegara Port* Phase I of the Bojonegara Port project is scheduled for completion in 2010. The main areas of work will include the construction of a multipurpose/container terminal. Phase II, which is planned for completion in 2014, includes the construction of a container terminal, Ro-Ro terminal and container yard. Phase III, with a planned timeline of 2014-2025 will see the extension of existing container terminals, construction of a general cargo terminal and the construction of dedicated wharves with a handling capacity of 7.4 million TEU.	 In Progress Planned Planned
Indonesia	*Tanjung Perak Port Development* Phase I, scheduled for 2005-2009, will see the installation of cargo handling facilities, along with the improvement of road access to the port. The project's costs will be split between various levels of government and the private sector, and it is estimated to be worth Rp 1,560 billion. Phase II, which is scheduled for the end of 2014 will see an increase in port capacity, particularly multipurpose cargo. Phase III will then see work on passenger and general cargo handling performance undertaken by 2025.	 In Progress Planned
Indonesia	*Tanjung Api-Api International Feeder Port Project* The development of the International Feeder Port of Tanjung Api-Api in Southern Sumatra is estimated to cost approximately US$ 280 million. The feeder port will be developed in four phases and take more than 20 years to complete.	 Planned
Islamic Republic of Iran	*Improved operations of Bandar Anzali* In addition to the dredging of berths and the construction of a breakwater in Anzali, a US$ 70 million project is underway in Bushehr for a new container terminal and quay wall to extend capacity. There are also development projects in Noshahr, Amir-abad, as well as a new port in Assaluyeh to meet anticipated export demands for LNG.	 In Progress Planned/ In Progress
Japan	*Nagoya Port* The new berth at the south side of Tobishima Pier Container Terminal has been completed and was operational in December 2005. The berth has an approximate area of 17.5 hectares, a 350 metres long berth and 16 metres channel depth.	 Completed
Malaysia	*Port of Tanjung Pelepas* In January 2000, the Port of Tanjung Pelepas began operating with two berths, and there is a plan (five phases) to significantly increase its capacity and throughput. By the end of Phase I, the port had six berths providing a total length of 2.16 kilometres. PTP has recently completed Phase II construction work which involved dredging and reclamation for an additional eight berths, and the construction of two additional berths. At present, the port has a total container throughput in excess of four million TEU, up from two million TEU in 2001. When all five phases are completed in 2020, the facility will have 27 berths.	 In Progress

Table X-2. *(continued)*

Country	Selected port infrastructure projects	Status
Pakistan	*Gwadar Port Project* The port at Gwadar is currently Pakistan's flagship infrastructure project. The project consists of two stages. The first phase includes the construction of three multipurpose ship berths and is believed to become operational late in 2007. The second phase of the Gwadar Port project, which is anticipated to be completed by 2010, involves nine more berths, an approach channel and storage terminals, by which time it will provide full warehousing, trans-shipment and industrial facilities.	In Progress Planned
Republic of Korea	*New Busan Port under construction* In order to meet the growing demand for better and more efficient port logistics services and sharpen the global competitiveness, Busan New Port is currently under construction and scheduled for completion by 2011. Initially, three berths were opened in January 2006, with a total of 30 berths to be built by 2011. The total cost is estimated at US$ 9.15 billion and, once complete, the new port will be capable of handling 8.04 million TEU annually.	In Progress
Singapore	*Expansion of Pasir Panjang Terminal* The Singapore Government released plans in early 2005 (Phase III and IV) for the construction of 16 more berths. When complete, the terminal is expected to have 42 berths. The first two phases of this project saw 26 berths completed (six were constructed at Phase I and 20 during Phase II)	In Progress
Sri Lanka	*Colombo Port* Colombo Port Expansion Project (CPEP) is the largest project undertaken by the Sri Lanka Ports Authority with a US$ 1.2 billion investment. Construction work on the breakwaters and the first terminal is scheduled to be commissioned in 2010. CPEP consists of two breakwaters and four container terminals of four berths each. The new port basin will have a dredged depth of 18 m and an access channel with 20 metres depth. The South terminal to be launched first will be 1,200 metres in length. After the completion of the CPEP the capacity of the Colombo Port will increase to 12 million TEU, a threefold increase from the present capacity of four million TEU.	In Progress
Viet Nam	*SP-PSA Port Projects* SP-PSA is a joint venture between state-owned Saigon Port, Vinalines and PSA Viet Nam Pte. Ltd., a wholly-owned subsidiary of Singapore's PSA International Pte. Ltd. Construction of the first phase near the mouth of the Cai Mep-Thi Vai River is anticipated to be operational by 2009 and will have a capacity of 1.1 million TEU per year. This will be followed by Phase II which will increase capacity to two million TEU per year. *Other Port Projects* The state-owned Vinalines was recently given the go ahead to build a US$ 185 million port complex in central Viet Nam's Khanh Hoa Province. This project will see the development of the Van Phong port with two berths able to accommodate vessels of up to 9,000 TEU. Initial construction is scheduled to begin early in 2008 while completion in 2010 will see the port have handling capacity of up to 700,000 tons of cargo shipments per year. Other major projects include the estimated US$ 1.6 billion Lach Huyen port in the northern city of Hai Phong, the Hutchison Port Holdings (HPH)'s Saigon International Terminals Viet Nam Limited (SITV) in Cai Mep-Thi Vai, and the Ben Dinh-Sao Mai port complex which is scheduled to be operational by 2010.	In Progress

Sources: Thomson Project Finance International and Thomson SDC Platinum. Other information gathered by the ESCAP Secretariat.

XI. URBAN TRANSPORT

This chapter provides an overview of trends in urban transport in Asia and the Pacific. In particular, after a short introduction (Section A), the role of motorization is discussed (Section B) and developments in public transport analyzed, including status information regarding major investment projects in urban transport (Section C). The chapter also briefly covers the importance of para-transit (Section D) and non-motorized transport in the region (Section E), and it concludes with three case studies of transport in the cities of Dhaka, Hanoi and Bangkok (Section F).

A. Introduction

The provision of urban transport affects and is affected by a range of social, cultural, economic, political and environmental factors. In recent times, countries in the ESCAP region have undergone considerable change across all of these dimensions. For many of the region's urban areas, this change has come in the form of increased growth in population, economy and size. The ESCAP region is now home to twelve of the world's mega cities, and urban areas are expected to continue to absorb the majority of future population growth (see Chapter II).

However, in many cities of the ESCAP region the provision of urban transport has failed to keep up with the ever-increasing demand. Often, increasing density and expansion have occurred with little or no development planning, while in some cases governance failures have resulted in a significant wasting of resources and/or substandard infrastructure. Furthermore, the relatively large capital costs and time required to develop high capacity transit systems have prevented the timely implementation of such systems in rapidly growing urban areas.

As a result, despite high population densities many cities have relied on road-based systems, which have serious capacity and performance constraints, negative environmental consequences and other limitations. Motorization has increased rapidly, with vehicle fleets doubling in many of Asia's cities every five to seven years.[166] While rapidly increasing motorization creates both economic and individual benefits, it can also be associated with negative impacts, such as pollution and congestion. Increasing motorization within crowded cities also has unfavourable economic and social effects. The rising number of individual vehicles in urban areas intensifies competition for road space and makes it increasingly difficult to effectively implement traffic control measures, which leads to more traffic congestion, parking problems and safety issues.

In order to realize sustained economic growth, an efficient and sustainable transport system for both people and goods is essential. Building these systems will require a broad-based approach that takes advantage of all options for promoting the use of more environmentally sustainable transport alternatives. In many cases previous policies have concentrated on constructing capital intensive, high-cost public transport systems, and under-played the potential of other options, such as non-motorized transport and Bus Rapid Transit (BRT) systems.

B. Motorization and its consequences for cities

1. Rapid growth of motorization

Cities in the ESCAP region do have lower motorization levels than most cities in the European Union or the United States of America. Motorization levels and their rate of change vary widely from city to city, which is primarily due to differences in income as well as government policy. With the exception of a few cities in Central Asia, the number of private vehicles in the region's cities has grown significantly in recent years.

[166] Asian Development Bank and EMBARQ, The World Resource Institute Centre for Transport and Environment, *Sustainable Urban Transport in Asia: Making the Vision a Reality,* A CAI-Asia Programme, publication stock No. 111606, 2006.

Consistent and up-to-date data on the progress of national motorization levels is difficult to find.[167] Comparable data on motorization in cities is not available. Table XI-1 summarizes national motorization levels in the ESCAP region from 1990 to 2002. Rapid motorization was also experienced in some countries with already high levels of motorization in the early 1990s.

Table XI-1. Motorization in UNESCAP region

Country	Motor vehicles (with at least four wheels)[1] per 1,000 people		Passenger cars per 1,000 people		Two-wheelers per 1,000 people[2]	
	1990	2002	1990	2002	1990	2002
Australia	530	–	450	–	18	18
Japan	469	581	284	428	146	106
New Zealand	524	731	436	613	24	21
China	5	12	1	7	3	26
Hong Kong, China	66	77	42	57	4	5
Mongolia	21	41	6	26	22	10
Republic of Korea	79	292	48	205	32	59
Azerbaijan	52	52	36	43	5	1
Georgia	107	72	89	56	5	1
Kazakhstan	76	89	50	72	–	5
Russian Federation	87	176	65	132	–	43
Bangladesh	1	1	0	0	1	1
India	4	9	2	6	15	–
Pakistan	6	8	4	7	8	11
Sri Lanka	21	34	7	–	24	49
Turkey	50	90	34	66	10	15
Indonesia	16	–	10	–	34	59
Malaysia	124	–	101	–	167	238
Philippines	10	34	7	9	6	18

Source: World Bank, *2005 World Development Indicators*, viewed on World Bank website, November 2007, http://devdata.worldbank.org/wdi2005/Cover.htm

[1] Motor vehicles include cars, buses, and freight vehicles but not two-wheelers

[2] Two-wheelers refer to mopeds and motorcycles

In the Republic of Korea the number of motor vehicles per 1,000 people more than tripled from 79 in 1990 to 292 in 2002.

In the Russian Federation, there were 87 motor vehicles per 1,000 persons in 1990. By 2002, this had increased to 176 motor vehicles per 1,000 persons, which was mainly due to the increase in the number of passenger cars from 65 to 132 per 1,000 people.

In Thailand, approximately 17.5 million vehicles were registered in 1997, 22.5 million in 2001,[168] and more than 25 million in 2005, one quarter of which were registered in Bangkok.[169]

In China, the number of registered passenger cars in China increased from one million in 1994 to five million in 2001,[170] and to 16 million in 2004.[171] In the next 10 to 15 years, car ownership in China is

[167] Widely varying definitions are being used and some of the more consistent time series that were available in the past have recently been discontinued (e.g., the World Bank's World Development Indicators).

[168] ASEAN Statistical Yearbook 2005, viewed December 2007, http://www.aseansec.org/

[169] Asian Development Bank and Clean Air Initiative for Asian Cities, *Country Synthesis Report on Urban Air Quality Management: Thailand,* Discussion draft, December 2006.

[170] The World Bank "Motorization, Demand & City Development", online document, viewed 11 August 2005, http//web.worldbank.org

[171] World Bank, *China: Building Institutions for Sustainable Urban Transport,* Transport Sector Unit, Infrastructure Department, East Asia and Pacific Region, January 2006, www.worldbank.org, viewed October 2007.

expected to exceed 100 million.[172] While two-wheelers still dominate much of the Chinese urban transport system, the number of two-wheelers in China is expected to start declining after 2050 when personal incomes will reach a level that allows people to purchase a car instead of a motorcycle.[173] Beijing, in particular, has experienced a rapid growth in its private car ownership, which increased rapidly from 0.5 million in 1990 to 2 million in 2002, respectively. Yet, to-date the majority of urban households do not own a car, and this is likely to remain the case for the next 10 to 15 years.

In India, the number of registered motorized vehicles, two and three wheelers has increased from approximately 37.3 million in 1997 to 72.7 million in 2004. Over the same period, Delhi's motor vehicle population grew from 3 million to 4.2 million.[174] In 2003, 23 out of 35 cities in India accounted for approximately two-thirds of the 67 million vehicles registered, while close to 45 per cent of all cars in India are confined to the country's urban areas. In particular, population growth in the country's five major cities (Mumbai, Kolkata, Delhi, Chennai and Bangalore) has been overtaken by the growth of registered motor vehicles.[175]

One of the remarkable aspects of increased motorization in Asia, particularly in the region's mega-cities, is the increase in the number of two-wheelers. For example, in 2003, the principal mode of transport in India's five major cities were two and three-wheelers, which accounted close to half of all vehicles. In Bangalore, this share was as high as three quarters.[176] Two-wheelers, motorcycles in particular, are also the dominant transport mode in Ho Chi Minh City. Motorcycles in Ho Chi Minh City account for 60 to 65 per cent of vehicular trips, while bicycles contribute another 25 per cent of trips. Between 2001 and 2004, the total number of registered motor vehicles in Ho Chi Minh City increased from 137,000 to 245,000 respectively.[177]

2. Air quality management in cities

The unmanaged growth of motorization is the root cause of many of today's urban transport problems. Due to imperfect systems of transport pricing, prices do not reflect the true cost of providing transport services and facilities. This has led to a waste of resources, insufficient funds for developing and maintaining infrastructure, distortions in modal choice and negative externalities (e.g., pollution and congestion) that are larger than necessary. For example, transport emissions are generally the main cause of air pollution in Asian cities. Air pollution, in turn, leads to major health problems, the most serious of which are lung cancer and other cardiopulmonary mortalities.

There are several regional air quality management programmes in the ESCAP region, one example of which is the Clean Air Initiative for Asian Cities (CAI-Asia) programme. Under CAI-Asia several recent studies on sustainable transport indicators for three partner cities were carried out: Pune in India, Hanoi in Viet Nam, and Xian in China. It was found that 60 per cent of all trips in each of these cities are walked, cycled, in two-wheelers, or in cycle rickshaws (Pune and Hanoi) and three-wheeled rickshaws (Pune). This means many people are directly exposed to exhaust fumes while themselves using non-motorized

---

[172] Shipper, L. and Wei-Shiuen, N., *Rapid Motorization in China: Environmental and Social Challenges,* paper commissioned for the ADB-JBIC-World Bank East Asia and Pacific Infrastructure Study, World Resources Institute, 18 October 2004.

[173] Asian Development Bank and Clean Air Initiative for Asian Cities, *Country Synthesis Report on Urban Air Quality Mangement: China,* Discussion draft, December 2006.

[174] Department of Road Transport and Highways India, *Motor Transport Statistics,* viewed October 2007, http://morth.nic.in

[175] Bose, R, *Energy Efficiency and Climate Change Considerations for On-Road Transport in Asia,* 19 May 2006, available at www.cleanairnet.org, viewed October 2007.

[176] Bose, R, *Energy Efficiency and Climate Change Considerations for On-Road Transport in Asia,* available at www.cleanairnet.org accessed October 2007.

[177] World Bank, Transport Strategy: Transition, Reform and Sustainable Management, Vietnam's Infrastructure Challenge, 37187.

transport.[178] CAI-Asia currently supports exchange of experiences on air quality management in cities among relevant government officials and researchers.[179]

In response to the major role vehicle emissions have in influencing the quality of air in cities, many countries in the ESCAP region are introducing and implementing legislation and tougher standards to reduce vehicle emissions (see Chapter III). For the majority of Asian nations this means new vehicles must satisfy increasingly strict emissions standards.[180]

While in many countries the rapid growth in the numbers of motorcycles has not been accompanied by effective regulation to control their emissions, there have nonetheless been other related developments such as the removal of high-emission vehicles and the conversion of vehicles from high-emission fuels to cleaner fuels. For example, emissions have been significantly reduced as a result of some of the cities in Pakistan converting their auto-rickshaws to compressed natural gas. Furthermore, many countries in the region have also committed to significant improvements in mass transport, particularly within the large cities of the China, India, Malaysia and Singapore. Accordingly, bus rapid transit systems are becoming increasingly prevalent, which in turn contributes to the reduction in growth of private motorization.

C. Public transport

Compared with private cars, public transportation is more sustainable in terms of economic, financial, social and environmental aspects. The majority of cities in the UNESCAP region offer low-cost, relatively fast public transport; but it is often overcrowded, dirty and highly polluting. Dissatisfaction with the level and quality of public transportation leads those people who can afford it to turn to private modes of transport. As long as public transport fails to deliver the comfort and convenience of private transport it will not attract commuters who can afford to use cars. For these reasons the failings of public transportation have become one of the major challenges faced by many cities.

Governments in the region's urban areas, particularly the large cities, have recently been investing in Mass Rapid Transit (MRT) projects. The term "Mass Rapid Transit" refers to "public transport modes operating on fully or partially exclusive tracks (rail or road), away from street traffic and are thus subject to full or at least considerable managerial control by the operator".[181] In a number of cases, these projects are undertaken with private sector participation.

1. Urban rail projects

Rail-based mass transit systems MRT systems have many advantages. Most notably, rail-based systems can provide high capacity as well as high quality services. At the same time however, they require considerable funding, and their viability is contingent upon high passenger flows. These systems therefore tend to work best in large and densely populated cities.

Governments of many countries have begun studying or implementing projects to develop rail-based mass transit systems in response to the shortcomings of road-based transport systems to meet growing demand in very large cities.

Most Asian megacities have developed or are in the process of developing rail-based MRT systems. Underground rail systems are already a long-established feature of Tokyo, Hong Kong, China and Seoul, and their systems continue to be enhanced and improved.

---

[178] Asian Development Bank and CAI-Asia, *Sustainable Urban Transport in Asia: Making the vision a reality,* main report, Asian Development Bank and EMBARQ, The World Resource Institute Centre for Transport and Environment, Publication Stock No. 111606, 2006, viewed October 2007, http://www.cleanairnet.org/caiasia/1412/article-58616.html

[179] Asian Development Bank and CAI-Asia, *Sustainable Urban Transport in Asia: Making the vision a reality,* main report, Asian Development Bank and EMBARQ, The World Resource Institute Centre for Transport and Environment, Publication Stock No. 111606, 2006, accessed October 2007, http://www.cleanairnet.org/caiasia/1412/article-58616.html

[180] Asian Development Bank and the Clean Air Initiative for Asian Cities (CAI-Asia) Centre, *Urban Air Quality Management: Summary of Country/City Synthesis Reports Across Asia,* Discussion Draft 2006.

[181] World Bank *Public Transport Modes & Services,* viewed 11 August 2005, http://web.worldbank.org

More recently, rail-based public transport systems have also been introduced in several other Asian cities, including light rail (Bangkok, Manila, Shanghai) and metro (Beijing, Delhi, Nanjing, Shanghai) systems. Other cities in which rail-based mass transit systems have either been implemented, are planned or are under active consideration, include Busan and Incheon (Republic of Korea), Kolkata (India), Daegu and Tianjin (China), Bangalore, Karachi and Mumbai (India), Karachi (Pakistan) and Dhaka (Bangladesh).

More details of investment projects in rail-based MRT systems are provided in Table XI-2. Many other Asian cities have also planned such rail-based systems, and many such projects are currently underway in China.

Table XI-2. Selected rail-based mass transit systems in the ESCAP region (Status: 2007)

City, economy	Investment projects
Changchun, China	*Changchun metro and railway lines:* In Changchun, a city situated in north-eastern China, a number of projects have been planned for the development of several of the city's railway lines. Construction of a new line 4 and a two-kilometres extension of line 3 are planned to commence in 2007, estimated to cost approximately US$ 230 million. Additionally, line 1 (a planned North-South metro line) and line 2 (a planned East-West metro line) are expected to be completed by 2020.
Chongqing, China	*Chongqing light rail, monorail and underground rail lines:* The Chinese city of Chongqing is developing a network with a combination of light rail, monorail and underground rail lines. Three lines are to begin construction before 2010. These three lines, with two in an east-west direction and one in a north-south direction, will establish a network of 45 stations and a total track length of approximately 50 kilometres. A number of projects are also taking place in Shenzhen, including phase two of line 4 (to be opened in 2009), construction online 3 which is set for completion in 2009, as well as lines 2 and 11 which are scheduled to open in 2010.
Beijing, China	*Beijing metro network:* Beijing is investing in a metro network, including subways, light rail and suburban trains, in anticipation of the 2008 Olympics. In December 2002, construction began on the 27.6 kilometre subway line 5, and the line officially commenced operating 8 October 2007. Construction of subway line 4 (28.6 km) and line 10 (30.5 km) began in December 2003, and it is due for completion by December 2007. By 2008, Beijing will have nine lines totaling 200 kilometres, and 19 lines totaling 561.5 kilometres by 2020. *Beijing Light Rail* The Beijing Light Rail is another important component of the infrastructure investment programmes in preparation for the 2008 Olympics. The elevated Light Rail network connects the eastern suburbs of Tongzhou to the subway terminus at Sihuidong. Construction on the Light Rail began in 2000. Line 13, from Xizhimen to Huoying opened in September 2002, while the remaining network opened for operation in 2003. The Light Rail link connecting the airport and the city centre is planned to be in operation before the Olympics in August 2008. The rail's highest speed will be 110 kilometres per hour which will make the journey between Dongzhimen and the airport approximately 16 minutes.
Shanghai, China	*Shanghai metro lines* Shanghai is reported to have 11 metro lines, totaling more than 300 km, and 10 light rail lines, totaling 120 km, planned for construction over the next 25 years.
Delhi, China	*Delhi Metro System:* Development of the Delhi Metro System has been under consideration for over 50 years. Scheduled for completion by 2021, the master plan includes the construction of 240 kilometres of high capacity rail transit. In December 2005, the system consisted of three lines totaling 56 km with 50 stations. Phase II of the proposed rail projects in Delhi is expected to be completed 2010 and involves the extension of each of the system's metro lines. The DMRC estimates patronage on the Metro in 2011 for Phase I and Phase II corridors of approximately 12 million passenger trips per day.

Table XI-2. *(continued)*

City, economy	Investment projects
Jakarta, Indonesia	*Jakarta monorail system:* The construction of a monorail system for Jakarta began in 2004. When completed, the system will consist of two lines. The green line is to have a total length of 14.8 km with 17 stations and the blue line will be 12.2 km long with 12 stations. Since construction began, the project has experienced some setbacks. Most notably, PT Jakarta Monorail, the company responsible for the construction of the monorail, halted construction after requesting more than US$ 20 million annually in operating subsidies for seven years as well as government equity investment in the order of US$ 60 million.
Almaty, Kazakhstan	*Almaty Metro Municipal Project* The Almaty Metro Municipal project is estimated to be completed by 2010. The project has three phases in total, covering the construction of some 40 km of track and 44 stations. When operational, the system will be able to support 500,000 passengers per day. A 400-room hotel, and shopping mall as well as fast food services in each station are also part of the project.
Tehran, Islamic Republic of Iran	*Tehran–Karaj express electric train* In Tehran, the Tehran–Karaj express electric train started a limited service of 31.4 km between Azadi Square (Tehran) and Malard (Karaj) in March 1999. A further 11 stops are planned to be made available in the future and over 100 million passengers per year are expected to use the service.
Perth, Australia	*Perth–Mandurah light rail* The rail extension of the Perth–Mandurah light rail in Australia is scheduled to commence services on 23 December 2007. The project cost is estimated at AU$ 1.6 billion.

Sources: www.urbanrail.net (viewed Aug. 2005 and Oct. 2007); Xinhua, Beijing completes track construction of airport rail, 7/11/2007, viewed November 2007, www.chinadaily.com.cn/olympics/2007-11/07/content_6237290.htm; Delhi Metro Rail Corporation website, October 2007, www.delhimetrorail.com; ABC website, viewed 26 November 2007, search.abc.net.au/search; Government of Western Australia, December date set for Mandurah rail commencement, 10/11/07, accessed November 207, http://www.mediastatements.wa.gov.au.

2. Bus Rapid Transit Projects

Bus rapid transit (BRT) systems, which comprise of "*high-capacity (usually articulated) buses operating in exclusive segregated bus lanes, with rapid loading and unloading of passengers at stations that provide electronic fare pre-payment and obstacle-free waiting areas and level access to the buses*",[182] are also becoming an increasingly popular option for many cities in the ESCAP region. BRT systems can be attractive economical alternatives to rail-based MRT systems especially but not exclusively in developing countries, as BRT systems tend to be cheaper and faster to construct, more profitable to operate and cheaper for commuters.

Across Asia there is increased interest in the development of BRT, which also contribute to reductions in congestion and pollution within cities. A number of these systems are already either operational, planned, under construction or under consideration in 36 cities in 10 countries in Asia. A large proportion of Asia's operational BRT systems are in Japan.[183]

According to the Asian Development Bank,[184] more cities in the region are planning the development of BRT systems as opposed to rail-based solutions. The majority of BRT systems that are planned, under construction or under consideration are in Chinese cities. China is now formally integrating BRT projects into its plans to improve urban public transportation. In September 2005, a memo proposing

[182] Asian Development Bank and Department for International Development in collaboration with CAI-Asia, Energy Efficiency and Climate Change Considerations for On-road Transport in Asia, 2006, Publication Stock No. 110406, viewed November 2007, http://www.adb.org

[183] Viewed on Clean Air Initiative Asia (CAI-Asia) website, August 2005, http://www.cleanairasia.org

[184] Asian Development Bank and Department for International Development in collaboration with CAI-Asia, Energy Efficiency and Climate Change Considerations for On-road Transport in Asia, 2006, Publication Stock No. 110406, viewed November 2007, http://www.adb.org

high priority be given to the development of urban public transportation was released by the Chinese State Council Office. The proposal emphasized the importance of increasing energy efficiency and reducing congestion in the transport sector. The guidelines "directly promote the development of multimode intelligent public transportation systems (including BRT) with priority treatment being given to public transport over private vehicles."[185] Table XI-3 lists selected BRT projects.

Table XI-3. Selected investment projects in Bus Rapid Transit (BRT) in the ESCAP region

City	Investment project
Bangkok, Thailand	In Bangkok, "the current bus system [in Bangkok] is deteriorating and losing patronage at the rate of 5 per cent per annum." (according to the World Bank) [186] Thus, there is a need for reform of the system in order to address the existing issues currently facing the city's bus system, including high costs, inefficiencies, a major need for investment and the inability for the existing system to meet current users' needs. The Governor of the Bangkok Metropolitan Administration (BMA) has promoted the development of five BRT routes. Construction of the first route will cost THB 1.9 billion and will extend 16.5 kilometres from Chong Nonsi to Ratchaphrueck. The second route, with an estimated cost of THB 4.5 billion, is the 38 kilometres Don Muang–Min Buri Suvarnabhumi route. BRT systems in Bangkok will complement rail-based MRT. The World Bank estimates the development of BRT in Bangkok to be between one tenth to one fifth of the cost of rail-based MRT. The establishment of the Bangkok BRT system is part of a greater portfolio of mass transit projects. BMA's plans for the first two routes of the Bangkok BRT system were completed by early 2005, and the first BRT services are expected to begin in July 2008.
Beijing, China	The development of the Beijing BRT is part of the Energy Foundation's *China Sustainable Energy Program*, funded by the Hewlett Packard and Blue Moon foundations. With its first stage opened for operation in December 2004, the Beijing BRT system is the second 'closed' BRT system outside Latin America. With a total of 16 kilometres punctuated by 18 stops along the city's main north-south axis, the cost of the project was US$ 72 million.
Delhi, India	In January 2004, the Delhi Government approved funding for the completion of the technical designs for seven corridors of a *High Capacity Bus System* (HCBS) and for 10 high-capacity low-floor buses. The Indian Institute of Technology's Transportation Research and Injury Prevention Programme (IIT-TRIPP) originally proposed the system. In collaboration with Rail India Technical and Economic Services (RITES), an engineering firm, ITT-TRIPP has completed two of the seven designs. The proposed HCBS was to operate mainly using normal buses and as an 'open' busway. Therefore, the HCBS is not strictly a BRT system, as "it does not have closed, pre-paid boarding stations, did not involve a re-routing of existing bus routes to a trunk and feeder system, and does not involve shifting bus operators to a payment per kilometre basis".[187] Nonetheless, the HCBS is to have a number of distinct features, including separate busways, special bus shelters, feeder services, and safe, high quality pedestrian and cycling facilities. Its design also provides for the integration of cycle rickshaw parking and vendor sites.[188] The HCBS, which will cover 103 kilometres, is estimated to be completed by December 2009, ahead of the Commonwealth Games to be hosted in the city in 2010. The first phase will cover 14.3 kilometres, and it is expected to be completed by July 2008.

[185] Asian Development Bank and Department for International Development in collaboration with CAI-Asia, Energy Efficiency and Climate Change Considerations for On-road Transport in Asia, 2006, Publication Stock No. 110406, viewed November 2007, http://www.adb.org

[186] World Bank, *Strategic Urban Transport Policy Directions for Bangkok,* Urban Transport Development Partnership, June 2007.

[187] Fjellstrom, Karl, Diaz, Oscar Edmundo, and Gauthier, Aimee. "BRT's Great Leap Forward", *Sustainable Transport,* (Winter, 2004): 24-28, viewed on www.itdp.org

[188] The Transportation and Research and Injury Prevention Programme (TRIPP) "High Capacity Bus Systems", *TRIPP Bulletin,* Vol. 1, No. 3, Winter 2004 viewed on TRIPP website, August 2005, http://www.iitd.ac.in/tripp

Table XI-3. *(continued)*

City	Investment project
Hanoi, Viet Nam	With financial assistance from the World Bank, the Japan Policy and Human Resources Development Fund and the Global Environment Facility (GEF), the Hanoi People's Committee Transport and Urban Works Projects Management Unit is investing US$ 170 million in an ongoing *Urban Transport Development Project* (HUTDP). The project has three components. The first of these covers an estimated US$ 60-90 million of investment into developing the city's bus network. Project activities include increasing the capacity of the bus system, building two experimental BRT routes, developing bus maintenance facilities, and the implementation of modern secure ticketing systems. The project is due for completion in 2010.[189]
Jakarta, Indonesia	TransJakarta was the first full BRT system in Asia. It was opened in January 2004 by the municipal government of Jakarta and cost US$ 49 million. The system is currently being expanded and is expected to comprise of ten corridors by 2008. Since commencement in 2004, the number of passengers using this system has tripled, currently reaching 160,000 per day. This number is expected to reach 300,000 by 2008 when the system will have ten corridors. Furthermore, carbon dioxide emissions are being reduced at the rate of 20,000 metric tons a year.[190]
Shanghai, China	A BRT network is currently being consideration in Shanghai. EMBARQ, the Washington-based World Resources Institute's Center for Transport and the Environment, will provide some financial assistance for the project. The proposed network is to complement Shanghai's metro network. It is reported that lines of 100 and 150 kilometres length will be constructed over the next five years. When complete, these lines will service both downtown and suburban areas, absorbing 20 per cent of the city's daily commuter traffic.[191]

D. Para-transit

Public transport in many Asian cities is characterized by a mix of formal public transport routes – often publicly operated – and a wide range of both motorized and non-motorized conveyances available for hire to public. Less formal means of public transport play a particularly important role in developing countries. "While most of the cities in emerging Asia have formal bus services, a greater percentage of the passenger trips are conducted on informal buses and para-transit vehicles."[192] For example, in cities such as Manila, Jakarta, Kuala Lumpur and Bangkok, motorized para-transit is estimated to provide from 20 to 50 per cent of public transport services.[193] Despite this, forms of para-transit using older vehicles often contribute to congestion and air pollution, and attract customers away from more established bus lines and rail systems.

Bangkok has a large para-transit fleet of 49,000 licensed taxis, 7,400 three-wheelers (so-called tuk-tuks), 8,400 small four-wheelers (so-called silor-leks), and about 40,000 motorcycles for hire which provide services in streets off the main roads. The majority of taxis and all tuk-tuks are LPG-powered. A recent innovation was the introduction of mini vans by the informal sector. About 8,000 fourteen-seater minivans serve commuters on 103 routes, mainly between suburban locations and the central areas.

---

[189] World Bank (2004), *VN-Hanoi Urban Transport Project,* [Project Information Document (PID) Concept Stage], (World Bank, Washington), viewed on World Bank website projects database, www.worldbank.org

[190] Asian Development Bank, Bus rapid transit systems offer effective solution for Asian cities, 15 December 2006, accessed November 2007, http://www.adb.org/Media/Articles/2006/11186-asian-transit-systems/

[191] Organization of Asia-Pacific News Agencies, "Shanghai to Build 150 km Bus Rapid Transit", *Industry Updates,* 25 March 2005.

[192] Bose, R, *Energy Efficiency and Climate Change Considerations for On-Road Transport in Asia,* viewed October 2007, www.cleanairnet.org/caiasia/1412/articles-70656_draft2.pdf

[193] World Business Council for Sustainable Development, *Mobility 2030:Meeting the challenges to sustainability,* the sustainable mobility project, full report 2004, viewed November 2007, http://www.wbcsd.org

In 2003, Sri Lanka carried out a project to introduce zero-emission electric three-wheel-scooters for para-transit, and to do an awareness campaign to highlight the benefits of electric vehicle use for reducing vehicular emissions.

In the city of Dhaka, Bangladesh, buses and minibuses remain the main forms of motorized public transport. In 2004 the city had approximately 22,000 registered private buses and minibuses and 400 Bangladesh Road Transport Corporation (BRTC) buses.[194] Dhaka also has an estimated 9,500 taxis and 10,000 auto rickshaws. The DTCB reports that a large number of rickshaws enter the city daily, increasing the total rickshaw fleet to up to 80,000 vehicles, but these are only rough estimates.[195]

E. Non-motorized transport

Non-Motorized Transport (NMT), such as walking, bicycles and three-wheel pedal-powered vehicles, is still an important form of transportation for a many people in a number of Asia's major cities. Currently, over 40 per cent of all trips made by individuals in Asia are made by NMT. However, this is changing in many Asian cities: "walking and non-motorized transport are traditionally the main means of transport in emerging Asia… these are becoming more difficult and less socially acceptable in many Asian cities." [196]

In Bangkok (Thailand), 2.7 million trips per day, involving 14 per cent of the population in the Bangkok Metropolitan Region (BMR), are taken using non-motorized transportation.[197]

In Dhaka (Bangladesh) provides an illustration of the important role played by non-motorized transport in many Asian cities. Dhaka has a low motorization rate. In fact, automobiles make up only 9 per cent of Dhaka's traffic, whereas non-motorized transport modes, particularly cycle rickshaws and walking, account for the majority of trips. Dhaka's total cycle rickshaw population has been estimated at 500,000. Women and school children are the population group most dependent on cycle rickshaws.[198]

NMT remains a viable option to meet the basic mobility needs of all groups in an environmentally sustainable way. The endorsement of "segregated walk- and bike-ways to provide the safety and user-friendliness that these activities require" is a necessity. [199] A number of countries in the ESCAP region are promoting the use of the bicycle as a sustainable means of transportation. For example, the Environmental Planning Collaborative (EPC) is redesigning some 120 kilometres of road space in Ahmedabad, the largest city in the Indian state of Gujarat, with a view to creating exclusive bicycle lanes.[200]

Bicycle lanes have also been developed in Marikina, Metro Manila. This development is a component of the greater Metro Manila Urban Transport Integration Project, co-financed by the World Bank and the Government of the Philippines. Implemented by Global Environment Facility (GEF), the

---

[194] Source of information: Dhaka Transport Coordination Board (DTCB).

[195] Institute for Transportation and Development Policy, "World Bank says Dhaka rickshaw ban should not go ahead", Sustainable Transport E-Update, No. 16, April 2005, viewed on Institute for Transportation and Development website, August 2005, www.itdp.org

[196] Asian Development Bank, *Energy Efficiency and Climate Change Considerations for On-road Transport in Asia,* Working Paper Consultation Draft, May 19, 2006, viewed October 2007, http://www.cleanairnet.org/caiasia/1412/articles-70656-draft2.pdf

[197] World Bank, *Strategic Urban Policy Transport Directions for Bangkok,* Urban Transport Development Partnership, June 2007.

[198] Institute for Transportation and Development Policy, "World Bank says Dhaka rickshaw ban should not go ahead", Sustainable Transport E-Update, No.16, April 2005, viewed on Institute for Transportation and Development website, August 2005, www.itdp.org

[199] Asian Development Bank, *Energy Efficiency and Climate Change Considerations for On-road Transport in Asia,* Working Paper Consultation Draft, May 19, 2006, viewed October 2007, http://www.cleanairnet.org/caiasia/1412/articles-70656-draft2.pdf

[200] Institute for Transportation and Development Policy, "Ahmedabad, India moves ahead with bike lanes and BRT", Sustainable Transport E-Update, No. 18, August 2005, viewed on Institute for Transportation and Development Policy website, August 2005, www.itdp.com

component includes the construction, evaluation and promotion of the Marikina Bikeway System – a 66 kilometre network of trails and road lanes designed specifically for NMT, plus bicycle parking and traffic calming systems. It is hoped that the new NMT-friendly facilities will encourage the use of NMT modes, and connection with the public transport terminals will promote the combined use of NMT and train/bus for trips between Marikina and the rest of metropolitan Manila.

As with bicycles, rickshaws in a number of Asian cities are constrained to certain streets as they slow the speed of motor vehicles. However, certain cities in India, including Agra, Delhi, Lucknow, Jaipur and Vrindaran, have recently introduced modern human-powered rickshaws. Furthermore, "the 2006 India Urban Transport policy makes specific reference to the need to maintain and expand the share of NMT in urban transport."[201]

In contrast, in some cities the pressures of increased motorization are leading to the removal of facilities for non-motorized transport. Many bicycle lanes which were built in China and Viet Nam during the 1960s and 1970s are either being systematically removed or extended for cars. Similarly, in Indonesia bicycles lanes, which were built in a number of cities in the 1970s, are also being removed.

F. Transport in Dhaka, Hanoi and Bangkok

In the following, briefly the cases of transport in Dhaka, Hanoi and Bangkok are presented. These examples provide an useful overview of the situation in Asian cities with several million inhabitants, even though it should be noted that these cities are not fully representative of the whole range of urban transportation situations in the ESCAP region. Furthermore, data availability and quality continue to be a major challenge in urban transport in Asia.

1. Dhaka

Dhaka has experienced significant vehicle and population growth in recent years. Between 1998 and 2005 the population of Dhaka increased at 9.1 per cent per year which was much faster than the 1.8 per cent per year total population growth of Bangladesh. Dhaka's population is expected to reach 22-25 million people by 2020. This massive urban population growth combined with rapid motorization has placed serious pressures on the public transport system. An important government priority is to improve urban infrastructure and services.

The urban transport sector in Bangladesh is affected by a number of factors, such as the rapid increase in the urban population, an overall poor condition or lack of infrastructure and services, natural disasters (particularly flooding), and a low revenue base.

The Dhaka Integrated Transport Study of 1994 which was funded by the United Nations Development Programme was the basis for the Dhaka Urban Transport Project which described Dhaka's transport environment as "chaotic with chronic traffic congestion, lack of traffic management, conflict of jurisdictions and poor coordination among agencies. The demand for more public transport could not be met by the existing bus fleet of 1,400 buses, the city's 2,200 km of roads were not properly maintained and over 15,000 premature deaths were attributed to diseases related to air pollution."[202] Accordingly, the project suggested an improved traffic management and the regulation of public transport services.

The Dhaka Urban Transport Project aimed to help the government of Bangladesh to "develop, refine, and implement appropriate strategies for managing road traffic and services in Dhaka",[203] as well as

[201] Asian Development Bank, *Energy Efficiency and Climate Change Considerations for On-road Transport in Asia,* Working Paper Consultation Draft, May 19, 2006, viewed October 2007, http://www.cleanairnet.org/caiasia/1412/articles-70656-draft2.pdf

[202] World Bank, Project performance assessment report – Bangladesh: Dhaka Urban Transport Project, 4 April 2007, Report No. 39323, viewed October 2007, www.worldbank.org

[203] World Bank, Dhaka Urban Transport Project, viewed November 2007, www.worldbank.org

to prepare a 20-year strategic transport plan and transport policy for Dhaka. A number of improvements have been brought about as a result of the project:

- Gradual reduction of three-wheelers with two-stroke engines
- Footways and footbridges have been built to facilitate the movement of the poorer population of Bangladesh who can only afford to walk
- Flood-damaged roads have been repaired
- Improved traffic conditions as a result of better traffic management
- Improvement of a number of public transport services
- Rehabilitation of three major inter-district bus terminals
- Development of an urban transport policy to improve transport services in Dhaka between 2005 and 2025.

A project performance assessment report[204] claimed that the project also managed to improve public transport utilization in addition to the reduction in emissions and road accidents. The project improved urban air quality and the mobility of the urban population as a whole.

2. Hanoi

Hanoi, the capital of Viet Nam, is located in the north of the country and has a population of approximately three million people. Over the past 15 years, the city has undergone rapid motorization. Whereas in 1990, some 90 per cent of all trips in Hanoi were made by bicycles and public transport, by 2005, some 65 per cent of vehicular trips were made on motorcycles. At present, there is on average one motorcycle per household in Hanoi, i.e., 1.5 million motorcycles in the city. There are approximately 150,000 passenger cars in the city, the number of which is increasing at over ten per cent each year.

In view of the continuing rapid motorization and the expected doubling of Hanoi's population by 2020, large pressures are put on the urban transport system. The poor air quality in Hanoi is to a significant extent due its transport situation. In response, the city is taking project initiatives and is trying to improve its institutions to more effectively address these issues.

The Hanoi Urban Transport Development Project "supports construction of critical sections of road infrastructure to facilitate future city development, development of a Bus Rapid Transport (BRT) system and capacity building in transport and planning/implementing institutions…The project facilitates environmentally sustainable urbanization of Hanoi [and] targets improvement in sustainable transport modes (buses, bicycles and walking) to upgrade the urban environment and the mobility needs of the urban poor."[205]

Expanding Hanoi's very limited road network would require the resettlement of residents, adding to both the social and economic costs of expansion. Consequently, congestion is rapidly developing into a serious problem. Hanoi People's Committee has been concentrating on public transport as a fundamental means by which it can increase the efficiency and capacity of the city's major corridors. However, despite the fact that bus patronage increased from 1.2 million to 24 million between 2001 and 2006, public transport currently represents only ten per cent of total trips. In view of the high level of congestion in Hanoi, the long-term appeal of normal bus services is limited as opposed to BRT.

A master plan funded by the Japanese International Cooperation Agency has proposed the implementation of bus-based mass rapid transit systems for the city. Rail systems are also being planned for the city, even though it is unlikely that these rail systems will be implemented in the short to medium term due to the large financing needs.

---

[204] World Bank, Project performance assessment report – Bangladesh: Dhaka Urban Transport Project, April 4, 2007, Report No. 39323, viewed October 2007, www.worldbank.org

[205] World Bank, *Viet Nam: Hanoi Urban Transport Development Project,* Report No: AB2656, project information document (PID) appraisal stage, 2007.

Hanoi is presently carrying out reforms in the management and operations of public transport. For example, subsequent to a study funded by the Public Private Infrastructure Advisory Facility, six new bus routes changed ownership from TRANSERCO, a state owned enterprise, to two new private operators. Similar privatizations are planned for other routes. In view of experience elsewhere such initiatives only have a chance for success, if powerful independent planning and regulatory agencies are created.

While the city has also tried to manage the ownership of vehicles, there has not been much focus on vehicle use. Parking continues to be relatively inexpensive for motorcycles and automobiles, petrol costs are extremely low, and there is no standard system for vehicle registration charges for motorcycles.

Traffic safety, management and efficiency issues remain serious concerns. According to surveys, traffic causes high levels of stress for women and motor-cyclists in Hanoi.

3. Bangkok

The Bangkok Metropolitan Region (BMR) comprises the city of Bangkok and five neighbouring provinces. In 2003, the BMR had an estimated population of 10.4 million people, 16 per cent of the total population of Thailand. The Bangkok Metropolitan Administration (BMA) is the administering body for the city of Bangkok. However, many of the projects in Bangkok are controlled by national government agencies, which are responsible for the key transport infrastructure in neighbouring provinces.[206]

In 2005, an estimated 19.4 million trips were taken in the BMR per day. Of these, 46 per cent were by private motorization, 3 per cent by rail-based mass rapid transit (MRT) and 14 per cent by non-motorized transport, including walking. It has been estimated that between 2006 and 2026 daily person trips by motorized means of transport will increase by 0.44 million each year. Furthermore, by 2015 it is forecast that 40 per cent of trips will be made by private motorized means of transport.

In 2001 and 2004, earlier urban transport plans were updated, in order to provide a framework for mass rapid transit development in the Bangkok Metropolitan Region. The city's first rail-based mass rapid transit system, the so-called Skytrain cost an estimated US$ 1.7 billion and commenced operations in December 1999. The BTS Skytrain, which was built by Siemens and is currently operated by the Bangkok Mass Transit System (BMTS), mainly serves the commercial areas of the inner city, but does not link to major residential and touristic areas. It has 23 stations and is comprised of two lines which total 23.5 km, and carries approximately 43,000 passengers per average weekday. In 2007, construction started for an additional 6 km BTS route from On Nut station south to Bearing, set for completion in 2009. The Government has also approved a project to extend the Phaholyothin Sytrain section from Mochit to Saphan Mai which is expected to be completed by 2011.

In August 2004, a 20 kilometres underground system was opened (the Blue Line). The underground has been renamed "Chaloem Ratchamongkhon" which means the "Celebration of the Auspicious Kingship". Bangkok Metro operates the subway under a concession agreement. There are currently approximately 180,000 passengers per average weekday who take this service.

In 2006, a new plan was approved for the proposed priority mass rapid transit railway projects (to be completed by 2012) with a total length of 118 km and an estimated total investment of around US$ 4.5 billion. This comprises a number of extension projects, including the Red Line Commuter (Bang Sue to Talingchan, Bang Sue–Rangsit and Bang Sue–Hua Mark), the Purple Line (Bang Sue to Bang Yai).

A 28 kilometres rail link from the city to the new Suvarnabhumi airport is currently under construction. It is expected to commence operation by 2009.

The Bangkok Mass Transit Authority (BMTA) directs urban bus services in Bangkok. It is responsible for 12,200 buses, 3,600 of which are directly operated by the BMTA whereas the rest is operated by the private sector. The Governor of the Bangkok Metropolitan Administration (BMA) has recently promoted the development of five BRT routes for the city (Table XI-3).

[206] Strategic Urban Transport Policy Directions for Bangkok, World Bank, June 2007, Urban Transport Development Partnership.

XII. AIR TRANSPORT

This chapter provides an overview of trends in the air transport sector in Asia and the Pacific. In particular, it reviews developments in airlines (Section A), airports, and air navigation services (Section B), developments in aviation safety and security (Section C), medical issues (Section D) and environmental protection (Section E) are summarized.[207]

A. Airlines

1. Traffic trends

a) Factors underlying air traffic demand

Demand for air passenger travel is primarily determined by socio-economic factors such as income levels, demographics and the cost of air travel. World energy demand, supply and prices are critically important both to economic progress and to the cost of travel. As a result, the airline industry is highly vulnerable to economic cycles and fluctuations in fuel prices.

The successful economic development and rapid economic growth in Asia and the Pacific[208] over the past two decades has led to one of the fastest growing air transport sectors in the world that facilitates international trade in goods and services, including tourism. In 2007, more than 880 million tourists[209] travelled to foreign countries. International tourist arrivals grew the fastest Asia and the Pacific (10 per cent per year), compared to 5.7 per cent worldwide. Please refer to Chapter I for more details on recent trends in economic growth in the region.

b) Passenger traffic

Historic trends

Scheduled traffic of air carriers registered in ICAO Contracting States grew worldwide, measured in terms of both total ton-kilometres performed (tkm) or passenger-kilometres performed (pkm), at an average annual rate of 5.5 per cent between 1996 and 2006 (Figure XII-1). As a result of the speedy economic recovery of the Asian economies after the 1997/1998 financial crisis, air traffic rebounded in 1999 and 2000 achieving growth rates of 6.9 and 10.5 per cent, respectively. After a slowdown in 2001 with a growth rate of only 1.2 per cent, traffic regained momentum in 2002 and grew at 6.2 per cent. In 2003, traffic declined by 4.4 per cent which was mainly due to the SARS outbreak. However, the year 2004 witnessed an impressive economic recovery at 19.4 per cent average annual growth, followed by just over 7 per cent in 2005 and 2006.

The historic trend of global airline passenger traffic growth over the 1996 to 2006 period is shown in Figure XII-3, along with the medium-term traffic growth forecasts that will be discussed later on. From 1996 to 2006, scheduled passenger traffic of airlines registered in Asia and the Pacific grew from 614 billion pkm to over 1 trillion pkm at an average rate of 5.5 per cent per annum, compared to 4.9 per cent for the world, see Figure XII-1 and Table XII-1. In Asia and the Pacific, the share of international traffic was 63 per cent in 2006.

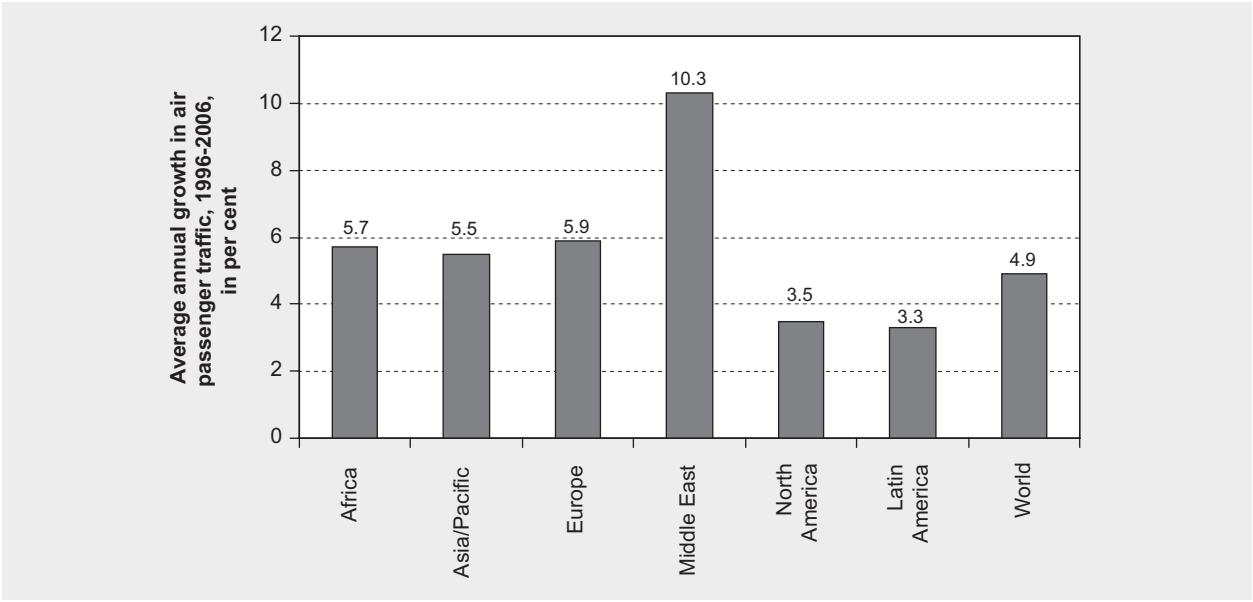
---

[207] This Chapter was provided by the Air Transport Bureau of the International Civil Aviation Organization, a specialized agency of the United Nations. For more information go to: www.icao.int/icao/en/atb

[208] ICAO statistical regions refer to Asia and the Pacific as one region. However, the ICAO Regional Office for Asia and the Pacific refers to the countries accredited to it as belonging to two separate regions. Therefore, this Chapter respects this convention and presents Asia and the Pacific as two regions.

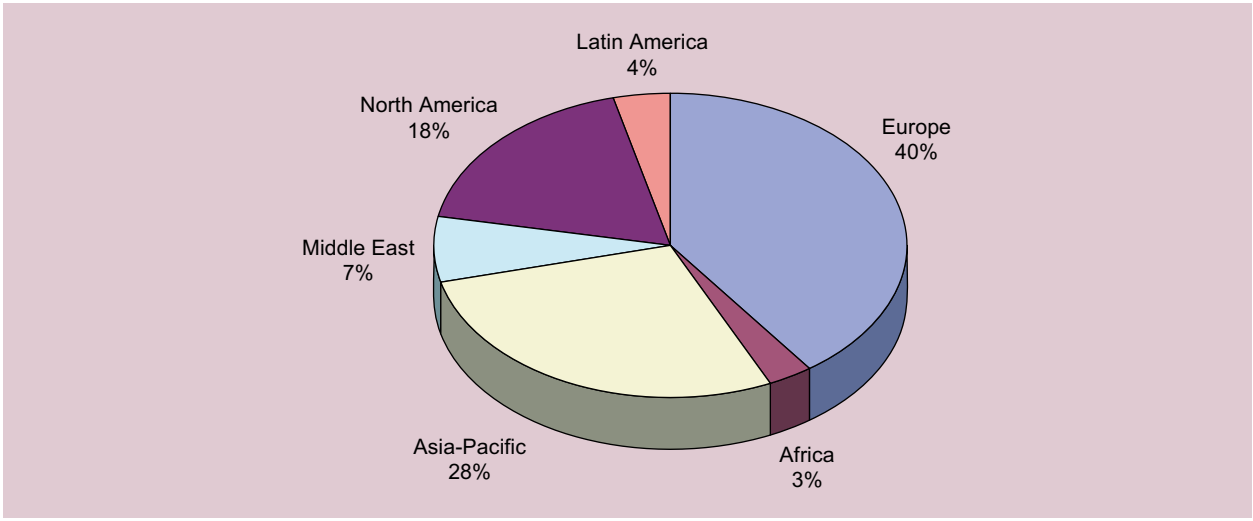
[209] defined as overnight stays with border crossing moves using all transport modes.

Figure XII-1. Average annual growth in scheduled air passenger traffic (measured in pkm) by world region from 1996 to 2006



International scheduled air passenger traffic reached almost 4 trillion pkm worldwide in 2006, 28 per cent of which were performed by airlines registered in Asia and the Pacific (Figure XII-2). In 2007, international passenger traffic performed by airlines in Asia and the Pacific was estimated to have increased by 6.6 per cent.

Figure XII-2. Shares of each world region in international scheduled air passenger traffic (measured in pkm) in 2006



Medium-term forecasts

In the medium-term future, growth in air passenger traffic is expected to vary by geographic region in line with specific local and regional factors. Traffic of airlines registered in Asia and the Pacific is expected to continue to increase significantly faster than the world average from 2007 to 2009 (Figure XII-3, Figure XII-4 and Table XII-1). At the current pace of traffic growth of roughly 100 million additional passengers per year, the air transport markets of Asia and the Pacific will overtake those of Europe and North America in size in the next ten years. The bulk of the air traffic growth in the region is expected to take place in China and India, both in terms of the domestic and international traffic.

Figure XII-3. Average annual growth of scheduled air passenger traffic (measured in pkm) worldwide and in Asia and the Pacific region, 1996 to 2006 and forecast for 2007 to 2009

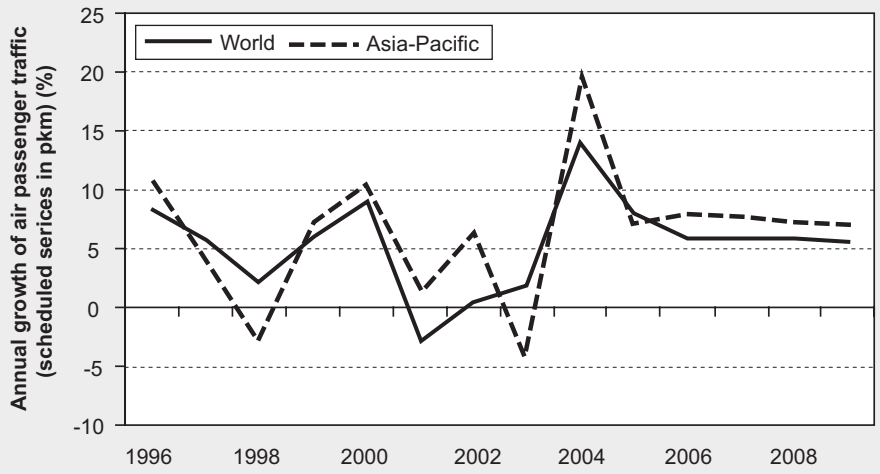
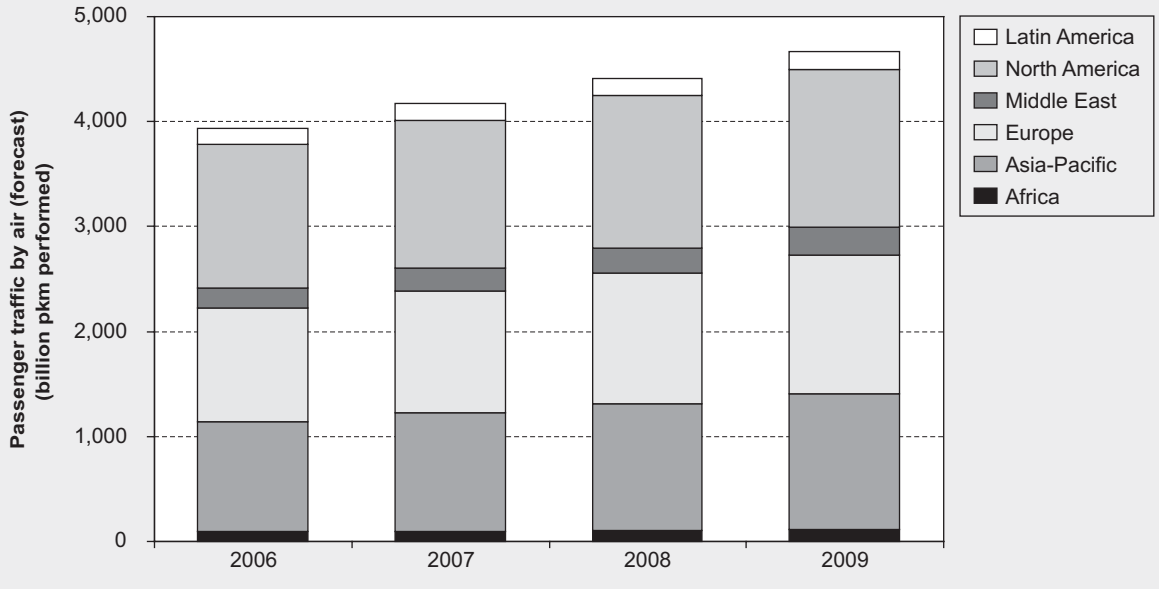


Table XII-1. Scheduled air passenger traffic (measured in pkm) by world region, 1996, 2006 and forecasts for 2007, 2008 and 2009

Region of airline registration	Traffic history			Traffic forecast					
	1996	2006	1996-2006	2007		2008		2009	
	Traffic (billion pkm)	Traffic (billion pkm)	Annual growth (%)	Traffic (billion pkm)	Traffic growth (%)	Traffic (billion pkm)	Traffic growth (%)	Traffic (billion pkm)	Traffic growth (%)
Africa	53.1	92.3	5.7	99.0	7.3	106.2	7.2	113.6	7.0
Asia-Pacific	614.0	1,044.3	5.5	1,123.7	7.6	1,206.8	7.4	1,292.5	7.1
Europe	609.4	1,084.0	5.9	1,162.0	7.2	1,242.2	6.9	1,320.5	6.3
Middle East	72.2	192.2	10.3	216.2	12.5	243.3	12.5	272.4	12.0
North America	968.5	1,368.9	3.5	1,408.6	2.9	1,450.9	3.0	1,494.4	3.0
Latin America/Caribbean	114.5	158.9	3.3	161.6	1.7	165.6	2.5	170.6	3.0
World	**2,431.7**	**3,940.6**	**4.9**	**4,171.2**	**5.9**	**4,415.0**	**5.8**	**4,664.0**	**5.6**

Source: ICAO

Figure XII-4. Scheduled air passenger traffic (measured in pkm) by world region, 2006 and forecast for 2007 to 2009



Long-term forecasts

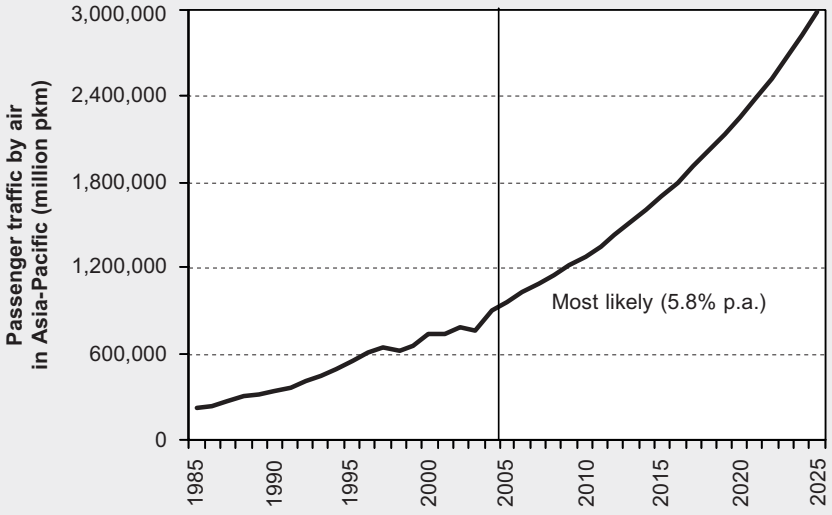
ICAO's long-term passenger traffic forecasts for the 2005-2025 period predict a "most likely" average annual growth rate of 5.8 per cent for total scheduled services provided by airlines registered in Asia and the Pacific. This is almost one percentage point higher than the respective worldwide growth (Figure XII-5, Figure XII-6 and Table XII-2). This prospect makes Asia-Pacific, apart from the Middle East, the fastest growing region in the world. International traffic of airlines registered in Asia and the Pacific is growing at an even faster pace, namely 6.3 per cent on average per annum, precisely one percentage point above the global international traffic for scheduled passenger services, predicted to grow at a 5.3 cent rate over the 20-year forecast period.

Table XII-2. ICAO passenger traffic trends, World and Asia-Pacific – 1985 to 2005 and 2005 to 2025

	Passenger-kilometres (billions)			Average annual growth rate (per cent)		Regional share of world traffic (per cent)		
	Actual 1985	Actual 2005	Forecast 2025	1985-2005	2005-2025	1985	2005	2025
Asia-Pacific								
Total	222.3	967.4	2,980	7.6	5.8	16.3	26.0	32.5
International	150.3	622.5	2,100	7.4	6.3	25.5	28.3	33.7
Domestic	72.0	344.9	880	8.1	4.8	9.3	22.7	29.8
World								
Total	1,365.6	3,719.7	9,180	5.1	4.6	100	100	100
International	589.3	2,197.4	6,225	6.8	5.3	100	100	100
Domestic	776.3	1,522.3	2,955	3.4	3.4	100	100	100

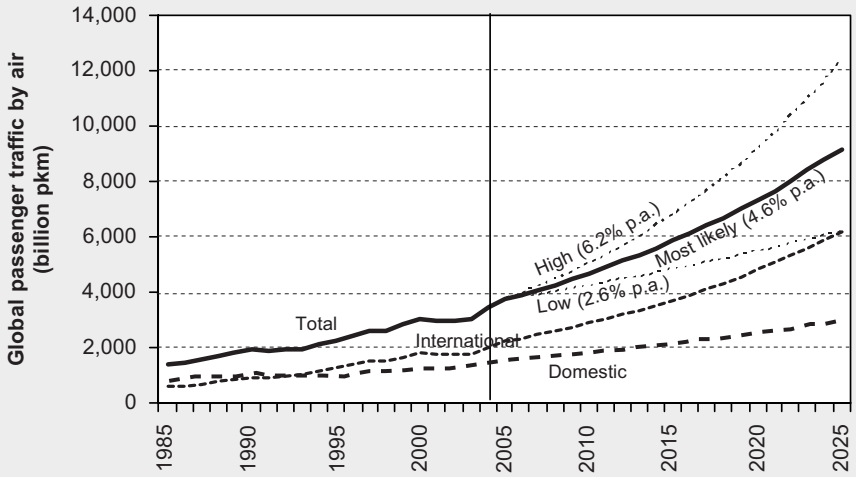
Source: ICAO

Figure XII-5. Scheduled passenger services (measured in pkm) by airlines registered in Asia and the Pacific, 1985 to 2005 and forecast for 2005 to 2025



As a result of the projected growth in passenger traffic from 2005 to 2025, the airlines of the Asia and the Pacific region are expected to increase their share of world passenger traffic (in terms of passenger-kilometres) by almost 7 percentage points to 33 per cent, the highest among all the regions, with their share of total international scheduled passenger traffic increasing to about 34 per cent.

Figure XII-6. Global scheduled passenger services (measured in pkm) by air, 1985 to 2005 and forecast for 2005 to 2025



International route-groups involving Asia and the Pacific

The traffic forecasts, originally developed at the global level, were disaggregated to the major route-group levels on the basis of the most recent historical performances and forecasts. All international route groups involving Asia and the Pacific are anticipated to grow at average rates ranging from 5.8 per cent to 6.6 per cent per annum, well above the global average of 5.3 per cent over the forecast horizon (Table XII-3). The fastest growing route groups are (a) the Middle East to Asia and the Pacific, (b) Trans-Pacific, (c) Intra-Asia and the Pacific, and (d) Europe to Asia and the Pacific. These forecasts are based on expectations of relatively high economic growths for Asia and the Pacific, expanding tourism, emerging affluent middle classes in the region and other factors. Average growth rates on domestic route groups in Asia and the Pacific are anticipated at an average rate of 5.1 per cent per annum compared to 3.4 per cent at the global level.

Table XII-3. Scheduled air passenger traffic in pkm for international route-groups involving Asia and the Pacific, 1985, 2005 and forecast for 2025

	Passenger traffic by air (billion pkm performed)			Average annual growth of air passenger traffic (%)	
	Actual 1985	Actual 2005	Forecast 2025	1985-2005	2005-2025
International scheduled services					
Trans-Pacific	67.4	262.5	842	7.0	6.0
Between Europe and Asia-Pacific	69.2	263.9	815	6.9	5.8
Between Middle East and Asia-Pacific	23.0	98.4	355	7.5	6.6
Intra-Asia-Pacific	70.5	295.8	949	7.4	6.0
Global international	589.3	2,198.0	6,225	6.8	5.3
Domestic scheduled services					
Asia-Pacific	72.0	344.9	933	8.1	5.1
Global domestic	776.2	1,522.3	2,955	3.4	3.4
Global total (international + domestic)	1,365.5	3,720.3	9,180	5.1	4.6

Note: The historical database has been developed from several sources, including ICAO and IATA.

c) Freight traffic

With respect to freight traffic volume in 2006, Asia and the Pacific was already the second largest regional market after North America. In addition, Asia and the Pacific showed the fastest growth in international scheduled air freight among all world regions in 2006, at 8.6 per cent compared to a world average of 6.6 per cent (Figure XII-7). China's international scheduled air freight expanded at an estimated 15 per cent in 2006.

In 2006, airlines registered in Asia and the Pacific accounted for 37 per cent of the global international scheduled air freight traffic of almost 124 trillion freight ton-kilometres performed (Figure XII-8).

Figure XII-7. Growth in international scheduled air freight (in tkm) for each world region in 2006

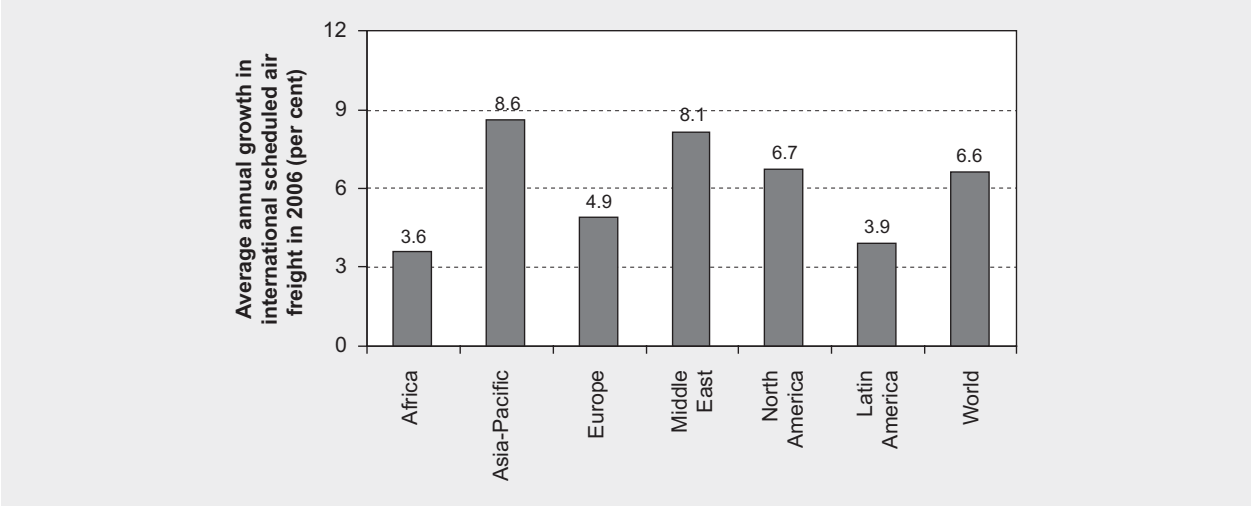
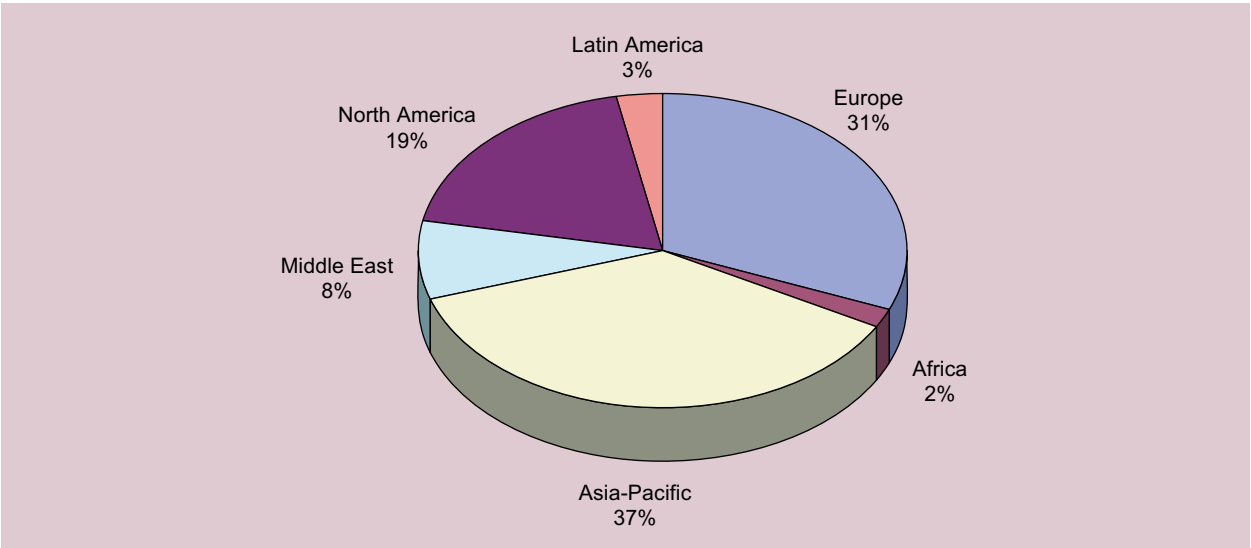


Figure XII-8. Shares of international scheduled air freight traffic (in tkm) by world region in 2006

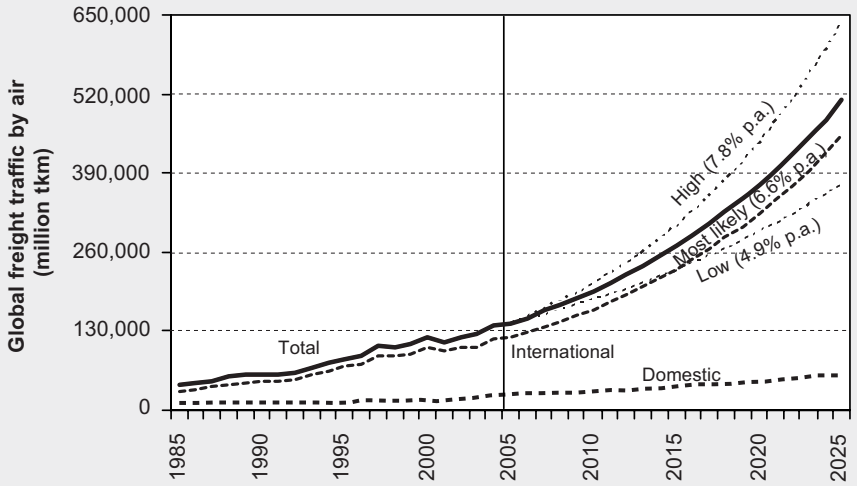


In the long term, global scheduled freight traffic, measured in ton-kilometres, is forecast to grow for the period 2005-2025 at the "most likely" growth rate of 6.6 per cent per year based on econometric analyses and the assumptions for passenger traffic forecasts mentioned above. International traffic did outperform and is expected to continue to outperform domestic traffic, both in terms of volume and growth path (Figure XII-9, Table XII-4).

Table XII-4. Global scheduled air freight services (measured in ton-kilometres) and those in Asia and the Pacific, 1985 to 2005 and forecasts for 2005 to 2025

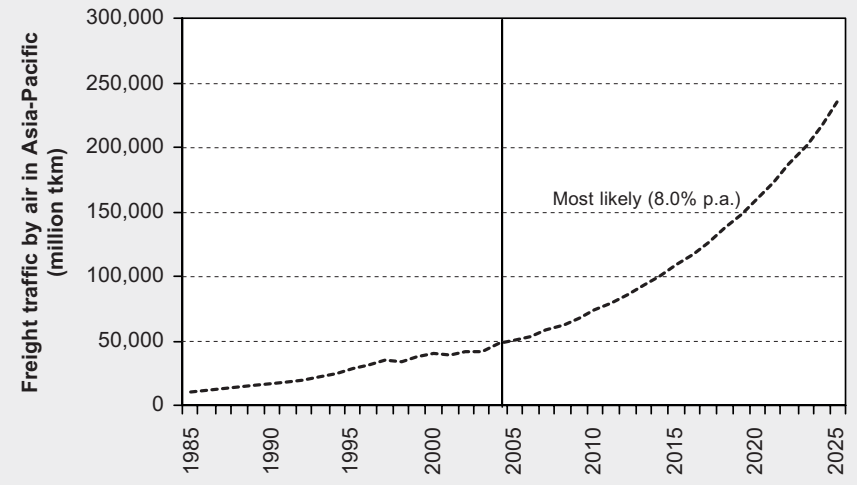
	Air freight services (million tkm)			Growth in air freight services (% per year)		Share of world traffic (%)		
	1985	2005	2025	1985-2005	2005-2025	1985	2005	2025
Asia-Pacific Total	9,605	50,105	235,000	8.6	8.0	24.1	35.1	46.1
International	8,589	45,070	215,000	8.6	8.1	29.2	38.0	47.6
Domestic	1,016	5,035	20,000	8.3	7.1	9.7	20.9	34.6
World Total	39,813	142,579	510,000	6.6	6.6	100	100	100
International	29,384	118,482	452,120	7.2	6.9	100	100	100
Domestic	10,429	24,097	57,880	4.3	4.5	100	100	100

Figure XII-9. Global scheduled air freight traffic (measured in ton-kilometres), 1985 to 2005 and forecast for 2005 to 2025



Asia and the Pacific are expected to become the leading region for air freight services which are expected to continue to expand at roughly 8 per cent per year until 2025 (Figure XII-10). The region's share of international air freight volume is expected to increase from 29.2 per cent in 1985 to almost 48 per cent by 2025 (Table XII-4).

Figure XII-10. Scheduled air freight services (measured in tkm) in Asia and the Pacific, 1985 to 2005 and forecast for 2005 to 2025



2. Financial results

From 1996 to 2006, operating revenues and expenses of the world's airlines increased at an average annual rate of about 4.5 and 4.9 per cent per year, respectively. In 2006, the last year for which data is available, airlines of ICAO Contracting States collected operating revenues in the amount of US$ 452.4 billion and encountered operating expenses of US$ 439.5 billion. Thus, their operating profit amounted to an estimated US$ 12.9 billion which was 2.9 per cent of operating revenues. This was the first profit since 2001, the year when airlines had to cope with total record losses of some US$ 13 billion. In contrast, scheduled airlines in Asia and the Pacific enjoyed positive operating results between 1996 and 2006 (Figure XII-11), even for the years 2001 and 2002. An estimated operating profit of about $ 0.8 billion was achieved in 2006.

Figure XII-11. Scheduled airlines' operating revenues and expenses in Asia and the Pacific, 1996 to 2006

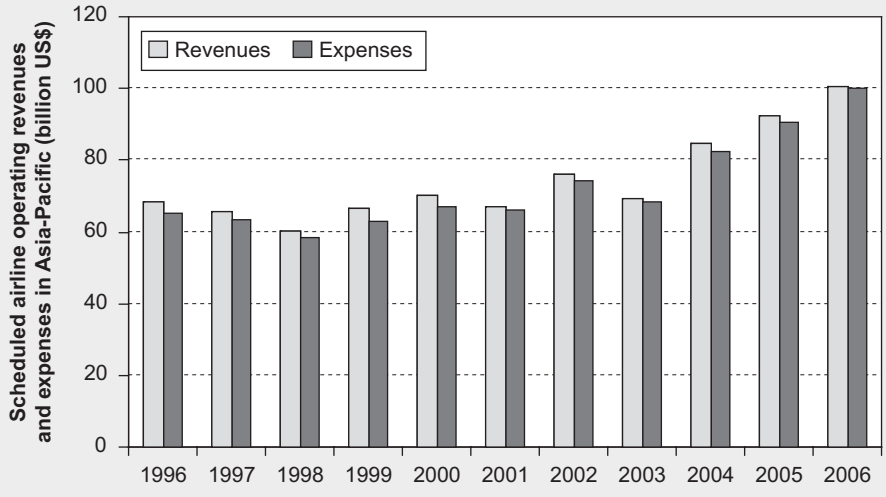
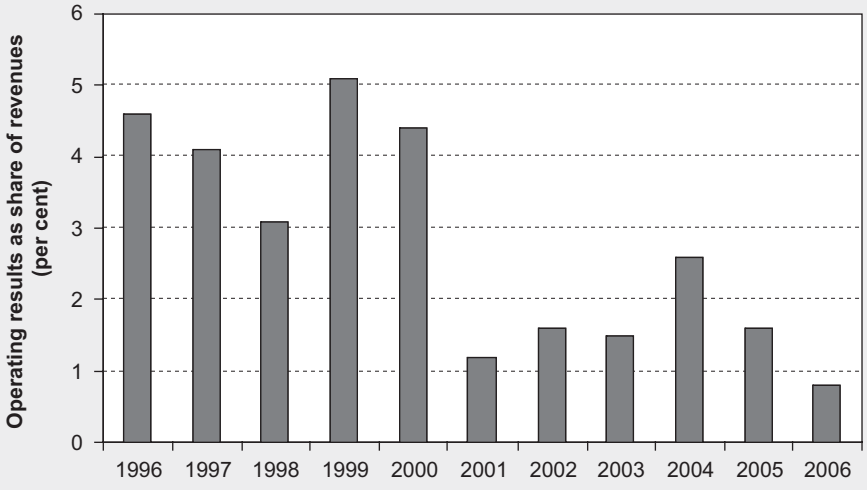


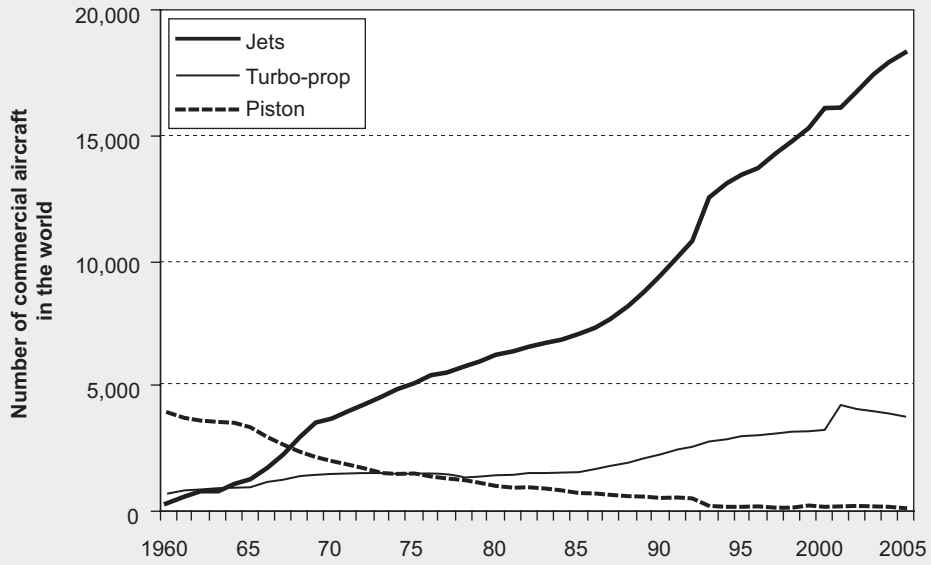
Figure XII-12. Scheduled airlines' operating results as share of revenues in Asia and the Pacific, 1995 to 2005



3. Fleet composition

At the end of 2005, the scheduled and non-scheduled carriers in the world had a combined fleet of about 22,130 aircraft with more than nine tons maximum take-off mass (MTOM) for their international and domestic operations, which was more than double the fleet size in 1985. The number of jet aircraft at the end of 2005 was some 18,240, which is more than two and a half times the corresponding 1985 fleet

Figure XII-13. World commercial aircraft fleet by type of propulsion, 1960 to 2005 (only aircraft of at least 9 t MTOM are included)

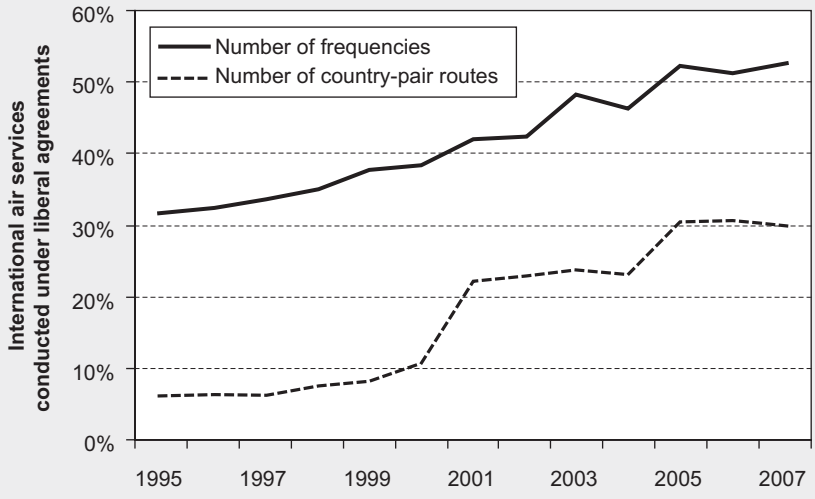


(Figure XII-13). It should also be noted that the average jet aircraft capacity is much larger than that of turboprop and piston engine aircraft.

4. Liberalization, regulation and privatization

Increased liberalization of international air transport services has been a key feature of the industry since the mid 1990s, in particular through (a) changes in provisions contained in the existing 4,000 bilateral air transport services agreements, or (b) regional and multi-lateral liberalization. By 2007, almost one third of country-pairs with non-stop, scheduled air transport passenger services, as well as roughly half of the frequencies offered were between States that have initiated some kind of liberalization. These States typically entered either (a) "open skies" air services agreements (ASAs) on a bilateral basis, or (b) joined liberalized agreements and arrangements on a regional or otherwise plurilateral basis (among "like-minded" States).

Figure XII-14. International air transport services conducted under liberal agreements, 1995 to 2007



Bilateral "open skies" air service agreements attracted much attention, and were initially promoted by the United States of America. An "open skies" agreement provides for full market access without restriction as to the destinations served, aircraft capacity or flight frequency, the number of airlines that can be designated, or pricing structure. Of the 136 "open skies" agreements concluded from 1992 to 2007, 46 involve at least one State from the Asia and Pacific region. Of these, 13 involved two States within the region while 12 others were between one State from the Asian and Pacific region and the United States.

Within the Asian subregions, traditional-type bilateral air service agreements have been significantly liberalized in recent years, inter alia, between:

- China and Australia; Hong Kong [Special Administrative Region (SAR), China], Japan, Singapore, Thailand, respectively, and Hong Kong (SAR, China) and Japan; and
- Japan and the Republic of Korea.

These new agreements removed or relaxed most of the restrictions between the parties on market access, flight frequencies and aircraft capacities. The liberalization of bilateral air service agreements with other regions have also been accelerated. One of the landmarks in 2007 was the new agreement between the China and the United States, gradually giving greater freedom to airlines registered in either country.

Until 1994, the only multi-state liberalization agreements existed in the European Union and among the Andean Pact countries of South America, now the Andean Community. Since then, there has been a dramatic increase in interest in regional, subregional or plurilateral initiatives to liberalize among groups of countries. Of the dozen or so initiatives, several are being actively pursued in the Asia and Pacific region, namely:

- the Memorandum of Understanding on Expansion of Air Linkages of BIMP-East ASEAN Growth Area (1995, Brunei Darussalam, Indonesia, Malaysia and the Philippines);
- the Memorandum of Understanding on Expansion of Air Linkages of IMT-Growth Triangle (1995, Indonesia, Malaysia and Thailand);
- the Multi-lateral Agreement on Air Services among Cambodia, Lao People's Democratic Republic, Myanmar and Viet Nam (CLMV) (2003, this agreement formalized a liberalization arrangement earlier agreed in 1998);
- the Multi-lateral Agreement on the Liberalization of International Air Transportation (MALIAT, or "Kona" "open skies" agreement) (2001, six States from within the region, namely, Brunei Darussalam, Cook Islands, New Zealand, Samoa, Singapore and Tonga and two from the Americas, namely Chile and the United States);
- the Memorandum of Understanding on Air Freight Services of the Association of Southeast Asian Nations (ASEAN) (2004, ten member States);
- the Multi-lateral Agreements on the Full Liberalization of All Cargo Services (2004, four ASEAN member States, namely Brunei Darussalam, Cambodia, Singapore and Thailand);
- the Multi-lateral Agreements on the Liberalization of Passenger Air Services (2004, three ASEAN member States, namely Brunei Darussalam, Singapore and Thailand); and
- the Pacific Islands Air Services Agreement (PIASA) of the Pacific Island Forum (2007, 6 member States).

In addition, ten member States of ASEAN agreed in 2004 to accelerate the integration of air services as one of 11 priority sectors, aiming at the establishment of the common ASEAN aviation market by 2010. In 2007, ASEAN and China adopted an Aviation Cooperation Framework with a view to concluding an ASEAN-China Regional Air Services Agreement.

At the regional level, the Asia-Pacific Economic Cooperation (APEC) has been playing an active role in the liberalization of air transport since the mid-1990s. APEC adopted eight options related to the liberalization of air carrier ownership and control, tariffs, doing business matters, air freight, multiple airline designation, charter services, airlines' corporative arrangements and market access.

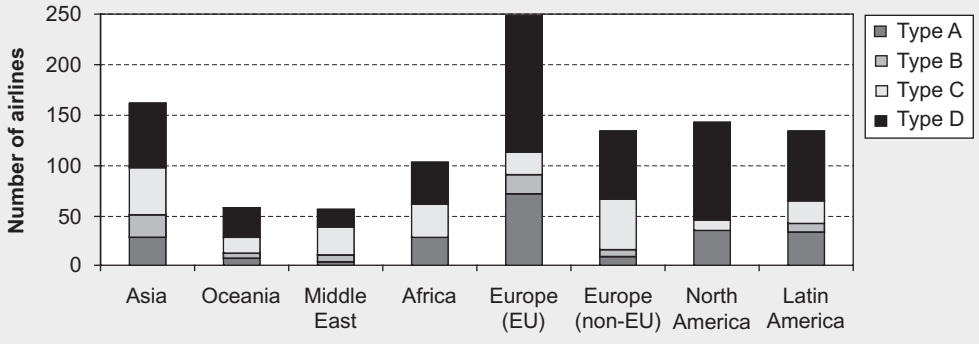
Added to the progress of liberalization at the bilateral and regional levels has been the shift in the regulatory approach taken at the national level from detailed regulation of airline operations to relying more on market forces. Liberalization of domestic air services has been further progressed in China, India, Indonesia, Japan and Thailand. "Open skies" policies were adopted by Cambodia, China, India, Pakistan and Philippines on a unilateral basis, allowing for foreign airlines' international air services at specific airports and/or for limited durations. In 2007, Japan also liberalized foreign airlines' access to 23 regional airports to strengthen the country's gateway position for international traffic.

Privatization of state-owned airlines has been one of the pre-eminent transformations in air transport. The motives for privatization have been highly diverse, ranging from improvement of operational efficiency and raising international competitiveness to purely economic advantages. These include liquidation of assets to reduce the burden of governments for financing heavy capital investment for fleet modernization, other aviation technologies and new equipment.

About 200 airlines, registered in 135 States, have been involved in privatization initiatives. However, progress is intermittent and only 134 cases of privatization have been carried through to completion. In Asia and the Pacific, about 40 per cent of airlines continue to be state-owned to a varying extent. Full government-control over national flag-carries still prevails for airlines registered in South Asia, South-East Asia and Pacific Island States. Major airlines in Australia; Japan; Hong Kong, China; and the Republic of Korea are fully owned by private interests. Since 2004, partial privatization has progressed with carriers registered in China (Air China, China Eastern Airlines and China United Airlines) and with Pakistan International Airlines. In addition, several countries are gradually relaxing foreign ownership rules, and 11 airlines registered in Asia and the Pacific have equity in foreign airlines, while 51 airlines of the region have equities owned by foreign investors to various degrees.

Figure XII-15 shows the ownership structure of airlines in various world regions, classified into four types A to D and combinations thereof (see legend). The majority of Asian carriers has an ownership structure of type D, almost as many are of type C, and fewer of type A or B. Almost one third of carriers have foreign shareholders (i.e., types A+B combined) while close to every second carrier has governments as shareholders (i.e., types B+C combined). Among carriers in Oceania or Pacific subregion, where Australia and New Zealand have the most developed air transport infrastructure and services, type D dominates.

Figure XII-15. Ownership structures of airlines by region



Legend:
- Type A: airline with all or part of its shares owned by one or more foreign shareholders but with no governmental shareholding
- Type B: airline with all or part of its shares owned by one or more foreign shareholders and government as a shareholder
- Type A+B: airlines with foreign shareholdings
- Type C: airline with all or part of its shares owned by one or more governments as shareholders but with no foreign shareholding
- Type B+C: airlines with governments as shareholdings

Type D: airline with all shares owned by one or more domestic private shareholders

5. Commercial strategies and operational management

Liberalization also affected the commercial strategies and management practices of airlines, both in administration and marketing as well as in operations. The focus of strategic planning is on alliances, consolidation and cross-border equity investments to exploit network-based economies of scale and scope. The traditional business model of the full-service airline has come under scrutiny in an increasingly competitive environment.

A common phenomenon in Asia and the Pacific is the formation of airline alliances. Airline alliances cover a wide range of commercial and operational matters, in particular code-sharing agreements that enable airlines to rationalize their route structures and adjust their market strategies. The emphasis of strategic airline alliances is to concentrate their marketing and operations around major hubs which impacts airline business and nature of air services to and from so-called feeder airports.

Bilateral airline alliances have been driven by the emergence of three global alliances (Star Alliance, Oneworld and SkyTeam). Their membership and business strategies are still evolving and their partnership relations are getting increasingly complex. For example, in 2004, Cathay Pacific Airways (Oneworld) acquired a ten-per-cent stake in Air China (Star Alliance). In 2006, the two airlines strengthened their equity and marketing relationship through cross-shareholding. Table XII-5 shows the global airline alliances and their membership with airlines from the regions highlighted.

Table XII-5. Airline alliances, as of end 2007

Name of airline alliance	Members	Year joined
Oneworld	American Airlines	1998
	British Airways	1998
	Cathay Pacific Airways	1998
	Finnair	1999
	Iberia	1999
	Japan Airlines	2007
	LAN Airlines	2000
	Malev Hungarian Airlines	2007
	Qantas Airways	1998
	Royal Jordanian	2007
SkyTeam	Aeroflot	2006
	AeroMexico	2000
	Air France	2000
	Alitalia	2001
	CSA Czech Airlines	2001
	China Southern Airlines	2007
	Continental Airlines	2004
	Delta Air Lines	2000
	KLM Royal Dutch Airlines	2004
	Korean Air	2000
	Northwest Airlines	2004
Star Alliance	Air Canada	1997
	Air China	2007
	Air New Zealand	1999
	All Nippon Airways	1999
	Asiana Airlines	2003
	Austrian Airlines	2000
	bmi British Midland	2000
	LOT Polish Airlines	2003
	Lufthansa	1997

Table XII-5. *(continued)*

Name of airline alliance	Members	Year joined
	SAS	1997
	Shanghai Airlines	2007
	Singapore Airlines	2000
	South African Airways	2006
	Spanair	2003
	Swiss International Air Lines	2006
	TAP Portugal	2005
	Thai Airways International	1997
	United Airlines	1997
	US Airways	2004
	Air India	(forthcoming)
	Egyptair	(forthcoming)
	Turkish Airlines	(forthcoming)

Source: Aviation press

Airlines in the Asia and Pacific region have continued the pursuit of perceived advantages of enhanced market strength through mergers, acquisitions or operational integration under a single holding company. For example, three Chinese airline groups headed by Air China, China Eastern Airlines, and China Southern Airlines were established by 2005 through mergers with other smaller airlines. Air India and Indian Airlines were merged under a government-owned holding company in 2007. Japan Airlines Domestic merged Japan Airlines International in 2006.

Many low-cost carriers (LCCs) have challenged the full-service network models of major airlines. Examples of LCCs in the region are AirAsia (Malaysia), Air Deccan (India), AirBlue (Pakistan), Hansung Air and Jeju Air (Republic of Korea), Oasis Airlines (Hong Kong, China), One-Two-Go (Thailand), Skymark Airlines (Japan), SpiceJet (India), Spring Airlines (China), Starflyer (Japan), Virgin Blue Airlines (Australia), and Viva (Macau, China). The low-cost phenomenon has been spreading quickly with some successful LCCs investing in airlines in neighbouring countries. For example, AirAsia established its affiliate airlines in Indonesia and Thailand, while Virgin Blue Airlines established Pacific Blue Airlines (New Zealand) and Polynesian Blue Airlines (Samoa).

Facing growing cost and competitive pressures, major network airlines have been forced to change their business priorities towards re-designing their business concepts and developing alternative models for their operations. One of the responses taken by major airlines is to set up separate organizations or subsidiaries to handle operations on routes competing with LCCs or having potential threats from new entrants. Examples are Air India Express (by Air India), Citilink (by Garuda Indonesia), Freedom Air (by Air New Zealand), Jetstar (by Qantas), Jetstar Asia (by Qantas, based in Singapore), Nok Air (by Thai Airways International) and Tiger Airways (by Singapore Airlines).

The introduction of information technology into sales, marketing and distribution of the airline products continues to make rapid progress and is having a significant impact. While there were earlier regulatory concerns about the airlines' control of the four global distribution systems (Amadeus, Galileo, Sabre and Worldspan), a recent trend has been the divestment of ownership of these systems to non-airline interests. In Asia and the Pacific, there are at least five regional vendors of computer reservation systems: Axess and Infini in Japan, Topas in Republic of Korea, Abacus in South-East Asia and Travelsky in China, which distribute Sabre products tailored to local needs.

Electronic ticketing (e-ticketing) has seen rapid expansion since it was first implemented for domestic travel in the USA in 1993. At the end of 2007, 91.4 per cent of tickets sold by member airlines of the International Air Transport Association (IATA) were issued electronically with about 1,500 interline e-ticketing agreements, compared to 25 per cent at the end of 2004. IATA projected that the elimination of paper tickets and 100 per cent implementation of e-ticketing worldwide will be achieved by May 2008.

B. Airports and air navigation services

1. Airport traffic

The world's airports processed 4.4 billion passengers, 85.6 million metric tons of cargo and 72.2 million aircraft movements in 2006, according to the Airports Council International (ACI) and based on reports from 1,100 member airports. In 2006, global airport passenger traffic grew by 4.8 per cent over 2005, while cargo traffic rose by 3.6 per cent. In Asia and the Pacific, there are 96 ACI members operating 448 airports. These airports handled 1.1 billion passengers, 31.3 million tons of cargo and 10.4 million aircraft movements in 2006. Airport traffic increased by 10 per cent, mainly due to strong Chinese and Indian markets in 2006.

Traffic at major individual airports grew higher than the regional average. Table XII-6 and Table XII-7 list the 25 busiest airports worldwide in terms of the numbers of passengers processed (embarked and disembarked) in 2006. In terms of total passenger traffic, five out of the 25 busiest airports worldwide are located in Asia and the Pacific. In 2006, Tokyo Haneda was Asia's busiest airport with 65.2 million passengers embarked and disembarked and 324,000 aircraft movements. The other four airports in decreasing order are Beijing Capital, Hong Kong Intl., Bangkok Suvarnabhumi Intl. and Singapore Changi (highlighted airports in Table XII-6).

Table XII-6. Top 25 airports in the world in terms of total passenger traffic in 2006

Rank No.	City	Airport	Passengers embarked and disembarked			Aircraft movements		
			2006 (1,000)	2005 (1,000)	2005-2006 (%)	2006 (1,000)	2005 (1,000)	2005-2006 (%)
1	ATLANTA, GA	HARTSFIELD-JACKSON INTL	84,847	85,508	-0.8	976	968	0.9
2	CHICAGO, IL	O'HARE INTL	76,249	76,154	0.1	959	942	1.7
3	LONDON	HEATHROW	67,339	67,683	-0.5	471	472	-0.2
4	TOKYO	HANEDA	65,226	63,297	3.0	324	309	4.8
5	LOS ANGELES, CA	LOS ANGELES INTL	61,049	61,489	-0.7	657	611	7.6
6	DALLAS/FORT WORTH, TX	DALLAS-FT. WORTH INTL	60,079	59,176	1.5	700	712	-1.6
7	PARIS	CHARLES DE GAULLE	56,809	53,480	6.2	542	514	5.4
8	FRANKFURT	FRANKFURT INTL	52,811	51,791	2.0	489	476	2.8
9	BEIJING	CAPITAL	48,748	41,004	18.9	376	335	12.4
10	DENVER, CO	DENVER INTL	47,325	43,388	9.1	597	549	8.8
11	LAS VEGAS, NV	MACCARRAN INTL	46,195	43,990	5.0	619	534	16.0
12	AMSTERDAM	AMSTERDAM – SCHIPHOL	45,989	44,078	4.3	423	405	4.6
13	MADRID	BARAJAS	45,158	41,561	8.7	428	410	4.5
14	HONG KONG, CHINA	HONG KONG INTL	44,020	39,800	10.6	290	264	10.1
15	HOUSTON, TX	GEORGE BUSH INTERCONTL	42,629	39,685	7.4	603	547	10.1
16	NEW YORK, NY	JOHN F. KENNEDY INTL	42,605	41,885	1.7	375	342	9.8
17	PHOENIX, AZ	SKY HARBOR INTL	41,440	41,214	0.5	541	504	7.4
18	BANGKOK	BANGKOK INTL	41,012	37,162	10.4	280	268	4.4
19	DETROIT, MI	DETROIT METRO WAYNE COUNTY	36,356	36,389	-0.1	482	509	-5.3
20	MINNEAPOLIS, MN	MINNEAPOLIS-ST PAUL INTL	35,633	37,604	-5.2	476	494	-3.6
21	NEW YORK, NY	NEWARK LIBERTY INTL	35,495	34,000	4.4	444	422	5.1
22	ORLANDO, FL	ORLANDO INTL	34,818	34,128	2.0	350	327	7.2
23	LONDON	GATWICK	34,080	32,693	4.2	254	252	1.0
24	SINGAPORE	CHANGI	33,368	30,720	8.6	214	204	4.9
25	MIAMI, FL	MIAMI INTL	32,534	31,008	4.9	386	373	3.2
		TOTAL	**1,211,813**	**1,168,889**	**3.7**	**12,257**	**11,740**	**4.4**

Sources: ICAO Air Transport Reporting Form I and websites.

Table XII-7. Top 25 airports in terms of international passenger traffic in 2006

Rank No.	City	Airport	Passengers embarked and disembarked			Aircraft movements		
			2006 (1,000)	2005 (1,000)	2005-2006 (%)	2006 (1,000)	2005 (1,000)	2005-200 (%)
1	LONDON	HEATHROW	61,346	61,010	0.5	412	409	0.8
2	PARIS	CHARLES DE GAULLE	51,847	48,869	6.1	490	464	5.4
3	AMSTERDAM	AMSTERDAM – SCHIPHOL	45,943	43,999	4.4	421	400	5.1
4	FRANKFURT	FRANKFURT INTL	45,697	44,787	2.0	407	396	2.8
5	HONG KONG, CHINA	HONG KONG INTL	43,453	39,800	9.2	276	264	4.9
6	SINGAPORE	CHANGI	33,368	30,720	8.6	214	204	4.9
7	LONDON	GATWICK	30,019	28,752	4.4	205	202	1.3
8	BANGKOK	BANGKOK INTL	29,589	26,821	10.3	182	177	2.7
9	TOKYO	NARITA	28,920	26,969	7.2	174	173	0.3
10	DUBAI	DUBAI	27,926	23,922	16.7	211	193	8.9
11	SEOUL	INCHEON INTL	27,662	25,591	8.1	173	161	7.4
12	MADRID	BARAJAS	24,822	21,993	12.9	221	211	4.6
13	MUNICH	FRANZ JOSEF STRAUSS	21,391	19,474	9.8	272	261	4.2
14	LONDON	STANSTED	21,002	19,326	8.7	161	150	7.6
15	TAIPEI	TAIPEI	20,285	19,213	5.6	156	151	2.8
16	DUBLIN	DUBLIN	20,271	17,697	14.5	180	170	5.9
17	NEW YORK, NY	JOHN F. KENNEDY INTL	19,607	19,123	2.5	129	118	9.0
18	COPENHAGEN	COPENHAGEN ARPT (KASTRUP)	18,899	18,191	3.9	227	230	-1.6
19	ZURICH	ZURICH	18,845	17,230	9.4	223	231	-3.6
20	MILAN	MALPENSA	18,654	16,347	14.1	193	182	6.2
21	MANCHESTER	MANCHESTER INTL	18,602	18,695	-0.5	143	151	-5.2
22	TORONTO	LESTER B. PEARSON	17,210	16,044	7.3	224	222	0.9
23	ROME	FIUMICINO	17,166	16,128	6.4	158	159	-0.5
24	LOS ANGELES, CA	LOS ANGELES INTL	16,917	17,486	-3.3	112	104	7.6
25	BRUSSELS	NATIONAL	16,571	16,072	3.1	232	231	0.4
		TOTAL	**696,011**	**654,260**	**6.4**	**5,794**	**5,615**	**3.2**

Sources: ICAO Air Transport Reporting Form I and websites.

In terms of international passenger traffic, six Asian airports are among the 25 busiest airports worldwide. Hong Kong, China; takes the lead in international passenger traffic with a throughput (embarkations and disembarkations) of 43.5 million passengers in 2006. Singapore, Bangkok, Tokyo, Seoul and Taipei are other Asian airports in this traffic category (Table XII-7).

In 2006, in terms of airport passenger traffic, China was the second most dynamic market in Asia and the Pacific after India. China's airports handled 385 million passengers in 2007, which was 16 per cent higher than a year earlier. If recent growth rates are sustained, 500 million passengers might be reached by 2010.

2. Major airport projects

The ICAO Air Navigation Plan lists 209 airports in use for international operations.[210] The seven countries with ten or more airports open for international operations are: China, which takes the lead with 36 airports (including Chek Lap Kok Intl. Airport of Hong Kong, China; and the Intl. Airport of Macao, China) followed by Indonesia (22), Japan (18), Australia (16), Malaysia (13), India (12) and Thailand (10).

[210] ICAO Air Navigation Plan Asia and Pacific Regions (Doc. 9673, 2006 edition, Vol. 1, Basic ANP, Appendix III-A-1). The Plan also includes 8 airports on territories in the regions that belong to the United States of America (6), Chile (1) and France (1).

Numerous airports and to a lesser extent air navigation service providers in the Asia and Pacific region are in the process of changing ownership structures, control mechanisms and management, in order to adjust capacity to the growing demand for air services. Significant investments into air transport infrastructure will be required, in order to overcome or avoid infrastructure bottlenecks.

According to ACI, capital expenditures for airport infrastructure in Asia and the Pacific amounted to US$ 8 billion in 2007, which was 14 per cent increase over 2006. China accounted for about half of that regional capital expenditure volume or for about one fifth of global airport investments.

In an effort to increase airport infrastructure capacity by 2020, China plans capital investments of US$ 62 billion for 97 new airport projects. In addition to the existing large-scale airports in Beijing, Shanghai, Shenzhen and the international airports in Hong Kong, China and Macao, China, the planning target is to add ten more airports that will have the capacity and dimensions to handle on the order of 30 million passengers per year. Such capacity expansion is unmatched anywhere on the globe and the mobilization of funding for such unprecedented airport development will be a challenge for public and private investors in China and abroad. Provincial and municipal governments in China are expected to raise public sector financing in order to ensure their significant participation.

Table XII-8 lists major airport projects, including the construction of new airports, airports undergoing modernization, and projects that are either under construction or in the planning stage. The new off-shore airport in Kobe, Japan, with an estimated investment of US$ 2.9 billion, opened in February 2006. In September 2006, Suvarnabhumi International Airport opened in Bangkok, Thailand, where reportedly US$ 5.6 billion were invested.

Table XII-8. Major airport projects in Asia and the Pacific

Country	International airports by location/name	Status	Estimated investment (U.S.$)
Australia	Brisbane	doubling of terminal capacity, new runway	1.1 billion
	Sydney	ongoing improvement of existing airport until 2024	1.67 billion
China	Beijing-Capital	3rd expansion phase: additional passenger terminal opened in Feb. 2008, apron and 3rd runway to become operational for the 2008 Olympics	3.5 billion
	Guangzhou-Baiyun	Phase II work of new airport	907 million
	Hangzhou-Xiaoshan	CAAC-approved expansion plan	1.6 billion
	Hong Kong – Chek Lap Kok	terminal and apron expansion ongoing until 2010, Phase I opened in July 1998	580 million
	Kunming	completely new airport in south-western China	1.9 billion
	Nanjing-Lukou	on-going expansion of new airport opened in work 1997	500 million
	Shanghai-Pudong	Phase II of new airport opened in 1999	4.8 billion
	Shenzhen	second runway, third terminal	3.62 billion
Japan	Kobe	new off-shore airport opened in February 2006	2.9 billion
	Naha/Okinawa	proposed second runway	2.68 billion
	Osaka-Kansai	second runway and terminal opening planned by 2007	14.6 billion
	Tokyo-Haneda	fourth runway, terminal car park extensions	8.1 billion
	Tokyo	Third airport planned with land reclamation in Tokyo Bay	35 billion
India	Nagpur	Development of a major cargo hub (Mihan project)	745 million
	Navi Mumbai	new airport planned after 2010	3.6 billion (basic costs 950 million)
	New Delhi	upgrading and new developments of existing airport	1.5 billion
	Bangalore Intl. Airport	due for opening on 30 March 2008	approx. 1 billion
	Mumbai Intl. Airport-	modernization of existing airport	approx. 1.5 billion
	Kolkata	modernization planned	total cost approx. 1.5 billion

Table XII-8. *(continued)*

Country	International airports by location/name	Status	Estimated investment (U.S.$)
India	Chennai	modernization planned	
	Hyderabad-Shamshabad	new airport – opening March 2008	1 billion
Indonesia	Jakarta	Terminal 3	533 million
	Medan	new airport planned	600 million
Lao PDR	Vientiane	new airport planned	1 billion
Pakistan	Islamabad	New airport planned with private participation	Cost details not available
Philippines	Clark International	opening 2010 (air base conversion)	3 billion
	Manila-Ninoy Aquino	ongoing terminal and airfield work	2.5 billion
Republic of Korea	Incheon International. Airport, Seoul	Phase II (new Concourse A, additional runway, cargo terminal) to be completed in June 2008	5 billion
Singapore	Changi	additional Terminal 3	1 billion
Thailand	Suvarnabhumi International Airport, Bangkok	• new airport opened Sept. 2006 • 2nd expansion phase with 3rd runway & mid-field concourse	5.6 billion 1.46 billion
Viet Nam	Hanoi-Hai Phong	completely new major airport after 2015	4-5 billion
	Long Thanh	major new international airport for Mekong Delta with construction to start in 2012 at the earliest	8 billion (Phase I: 3 billion)

Sources: ICAO, Momberger Airport Information, various press reports and websites.

3. Ownership, governance and control issues

a) Airports

The institutional landscape of airport ownership and management is changing in favour of commercially oriented and increasingly fully or partially privatized enterprises. Various governments have enacted reforms in airport ownership, governance and control that are paving the way for corporatization, privatization, including cross-border investments, and other modes of commercialization. These structural changes in ownership and business administration are intended to attain benefits for both airports as providers of facilities and services as well as their users, most prominently the well consolidated airline industry and their customers. The balance of power for ownership, control and corporate governance/ executive management is shifting from the formerly wholly government-owned autonomous entities, directorates of civil aviation, ministries or other government departments (including regional/provincial and/or municipal government authorities) to equity acquisitions and power sharing with concession or leasing arrangements, or even wholly privately-owned airport entities. Another notable trend is that airport services, such as passenger and cargo terminals, ground handling facilities, and security, are owned or operated by private interests.

Airport transaction activities in recent years indicate that airport privatizations peaked in 2006 when 15 major airports or airport groups followed schemes that changed public ownership to full or partial ownership, according to the Global Airport Privatization Report of the Centre for Asia-Pacific Aviation. The results of a second global survey conducted by ICAO, covering 2007 status and planned activities, will be made available to the Conference on the Economics of Airport and Air Navigation Services (CEANS) to be held from 15 to 20 September 2008 at ICAO Headquarters in Montreal, Canada (for more information go to: http://www.icao.int/ceans/).

Privatization is already a reality at several important Asian airports. It is underway at one of the major hubs, namely at Tokyo-Narita. In some cases, agreements have been signed between airport operators and airlines (IATA), according to which charges at Tokyo-Narita and Seoul-Incheon airports have been reduced by ten per cent. Provided these examples will be followed by others, relationships between airports and users (or airlines and affiliated economic activities) are expected to improve in the process.

The emergence of the low-cost carriers (LCCs) has been a challenge for both airports and regulators. In fact, LCCs have started operations in Japan, the Republic of Korea, Malaysia, Singapore and Thailand. Sofar, there has been only limited activity in China. While some foreign LCCs have started to operate international services into China, some private airlines have been authorized to start operation in Hong Kong, China; and Macao, China; since February 2005. How to meet the specific requirements of such LCCs is a challenge to both regulators and airports, as these requirements often differ significantly from the established carriers.

Air transport for short-haul trips is facing increasingly fierce competition from other modes of transport. This is similar to the situation in Europe but rather unlike in other world regions. The modal-split between air and land transport is changing and high speed trains will operate as feeders in several key corridors with projects under development or in the planning stage both in South-East and North-East Asia. A prominent example is the current project of a high-speed train link between Shanghai and Beijing in China. Apart from being one of the busiest commercial urban centres in Asia, Shanghai will host the EXPO 2010 for which around 150 countries already committed to participate.

The Asia and the Pacific region mirrors general trends toward increased private participation in infrastructure across the world, even though the pace of change has slowed recently. Examples include the following: The Government of Thailand completed the public offering of 428.6 million new shares in Airports of Thailand early in 2004 in a heavily oversubscribed sale raising US$ 445 million. In the Philippines, a long-running dispute is finally about to be resolved between the Government of the Philippines and investors in a joint venture for a concession to build and operate Terminal III at Manila International Airport. Hong Kong, China decided to make public offerings for the Hong Kong Airport Authority which is now traded at the city's stock exchange. The Government of India approved joint ventures for major airport construction and upgrading in Bangalore, Hyderabad and New Delhi, and continued to evaluate proposals from joint ventures established for the specific purpose of upgrading more of India's airports, including in Mumbai. The Hong Kong Airport Authority purchased more than 30 per cent of the equity in Hangzhou Airport for US$ 120 million. Table XII-9 lists the airports in the region that are publicly traded at various stock exchanges.

Table XII-9. Airports in Asia and the Pacific that are publicly traded at stock exchanges

Airport company	Year of Privatization
Shanghai International Airport Co. Ltd.	1994
Xiamen International Airport Group Co. Ltd.	1996
Auckland International Airport Ltd. (AIAL)	1998
Malaysia Airports Holdings Bhd	1999
Beijing Capital International Airport Co. Ltd.	1999
Shanghai Pudong International Airport Co. Ltd.	2000
Hainan Meilan Airport Co. Ltd.	2002
Guangzhou Baiyun International Airport Co. Ltd.	2003
Airports of Thailand Public Co. Ltd. (AOT)	2004

Source: Momberger Airport Information.

b) Air navigation services providers

In addition to airport capacity, management of airways is an infrastructure challenge in some parts of Asia. For example, airspace congestion is notable in the Yangtze and Pearl River delta regions and has the potential to become a major impediment to the growth of China's aviation industry.

Air navigation service providers (ANSPs) and most prominently air traffic control services are also undergoing organizational change in terms of ownership structures, governance and management. This is similar to the situation with airports, even though to a lesser extent. Government-owned autonomous authorities or directorates of civil aviation were predominant in the region. So far only a few States created autonomous or semi-autonomous ANSPs, such as Australia, New Zealand and Thailand. Additional States plan to hand over the provision of such services to autonomous authorities. Results of ICAO's survey on the Organization's website after CEANS.

4. Air navigation systems

Performance-based navigation (PBN) is a key component of the ICAO Global Air Navigation Plan and addresses objectives of the Global Air Traffic Management Operational Concept that forms an integral part of the Plan. It enables harmonized and predictable flight paths which result in more efficient use of existing aircraft capabilities, better fuel efficiency and resolution of noise issues as well as improved safety and expanded airspace capacity.

In this regard in 2007, ICAO reached a critical milestone in issuing the Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual, in short the Performance-based Navigation Manual as guidance material. Additionally, ICAO Contracting States were advised by State letter (AN 11/45-07/22) on guidance concerning the issuance of PBN operational approvals, the first step in enabling regions and States to implement PBN as part of a performance-based global air traffic management system.

On a related matter, the initial, high-level provisions necessary to support the introduction of required communication performance, an important supporting element of PBN, were incorporated into Annex 6 – Operation of Aircraft and Annex 11 – Air Traffic Services.

ICAO's work on technology and infrastructure development in support of a performance-based air navigation system covers a wide variety of topics involving diverse technologies. Significant progress was made in the development of provisions allowing for public internet use for the exchange of information in the fields of non-time critical meteorology and aeronautical information services.

In the communications/surveillance fields, comprehensive amendments to the above-mentioned Annexes and the Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444) were introduced in 2007. Specifically, the amendments addressed a variety of data link applications for air traffic services (ATS), including automatic dependent surveillance-broadcast, ADS Contract, ATS inter-facility data communications and controller-pilot data link communications. These will facilitate implementation of the available data-link technologies.

C. Aviation Safety and Security

1. Aviation security and facilitation

Traditionally, customs and immigration procedures (border controls) have been considered to be the biggest obstacles to the smooth flow of traffic through airports. Enhanced aviation security requirements posed challenges in recent years in the form of new public health and quarantine measures as well as complex aviation security procedures for airline and airport operations. State-of-the-art configurations of terminals and air cargo processing centres, involving automated baggage-handling systems, streamlined passenger-processing and flow-management, have been introduced at new and upgraded airports in the region.

Further technological and operational advances are expected to have even greater impacts on customer-processing by airlines and at airports in the future. In 2007, 150 countries (83 per cent of ICAO Contracting States) have started to issue machine-readable travel documents (MRTDs). Only 12 States in the Asia and Pacific region have not yet converted to machine-readable passports. Since it will be mandatory for ICAO's Contracting States to issue only MRTDs by 1 April 2010, it is expected that improved document security measures will be implemented at an early stage. ICAO published a blueprint for a worldwide, standardized system of identity confirmation based on MRTDs enhanced with biometrics. These so-called electronic MRTDs enable the speedier passage of travellers through airport controls, heighten aviation security and add protection against identity theft. Various initiatives are being pursued by governments, airlines and airport operators to take advantage of these technologies and place greater reliance on automated screening, clearance and tracking processes to speed up a more secure flow of people, their baggage and cargo at international airports.

2. ICAO Safety and Security Audits Programmes

Since August 2006, ICAO has one single audit entity, the Safety and Security Audits Branch (SSA) within the Office of the Secretary General, which combines two audit programmes, namely the Universal Safety Oversight Audit Programme (USOAP) and Universal Security Audit Programme (USAP). SSA streamlines audit functions in the interest of efficiency and economy.

a) Universal Safety Oversight Audit Programme

The objective of the USOAP is to promote global aviation safety through auditing Contracting States on a regular basis. The audits serve to determine the States' capability for safety oversight. This is accomplished by assessing the effective implementation of the critical elements of a safety oversight system and the status of States' implementation of safety-related ICAO Standards and Recommended Practices (SARPs), associated procedures, guidance material and safety-related practices.

A comprehensive systems approach (CSA) for conducting safety audits was implemented in 2005, with a six-year cycle ending in 2010. As of 29 February 2008, 14 States in the Asia and Pacific region had received a CSA audit, while seven more States are scheduled to receive their audits by the end of that year.

b) Universal Security Audit Programme

The objective of the USAP is to promote global aviation security through the auditing of Contracting States on a regular basis. The audits evaluate the implementation of Annex 17 – Security and provide recommendations to States on achieving better implementation and global harmonization of aviation security measures.

The initial cycle of USAP security audits was completed at the end of 2007, and a second cycle of audits was initiated in 2008. This cycle of audits is being carried out in accordance with principles directed by the Assembly of ICAO, such that security audits focus, whenever possible, on a State's capability to provide appropriate national oversight of its aviation security activities, and that the audits be expanded to include relevant security-related provisions of ICAO Annex 9 – Facilitation. A total of four audits are planned for States in Asia and the Pacific in 2008.

In addition to aviation security audits, follow-up visits are conducted in the second year following an initial audit in order to validate the implementation of State corrective action plans and provide support to States in remedying deficiencies. Nineteen such follow-up visits have been conducted in Asia and the Pacific region since 2005, with an additional nine visits scheduled for 2008.

3. ICAO Cooperative Aviation Safety and Security Programmes

a) CASP-AP

Cooperative Aviation Security Programme – Asia/Pacific Region (CASP-AP) is co-funded by 22 partners (Bhutan; Cambodia; China; Hong Kong, China; Macao, China; Fiji; India; Indonesia; Japan; Kiribati; Lao People's Democratic Republic; Malaysia; Maldives; Mongolia; Nepal; Philippines; Republic of Korea; Singapore; Sri Lanka; Thailand; Timor-Leste; and Viet Nam). It is aimed at ensuring compliance with international conventions, ICAO SARPs and guidance material related to aviation security. Furthermore, it creates a regional structure for cooperation and coordination concerning aviation security matters, including human resources development and management for aviation security personnel.

By the end of 2007, the national aviation security legislation and regulations in 18 CASP-AP participating States/Administrations were reviewed in accordance with ICAO SARPs. Subsequently, draft legal evaluation reports on the legislation and regulations of those 18 States/Administrations were prepared, including specific recommendations as to how to remedy existing deficiencies. Assistance was provided as required to certain States/Administrations in the process of drafting and modelling such legislation/ regulations. Draft National Civil Aviation Security Training Programmes were prepared for 13 States/

Administrations. Training courses for aviation security instructors were held in six States/Administrations, bringing the total number of aviation security instructors trained within the framework of this project to over 100. A draft National Civil Aviation Security Quality Control Programme was prepared for one State.

b) COSCAPs in Asia

The objectives of Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAPs) are to enhance the safety and efficiency of air transport operations in the three Asian subregions and to enhance the training and professional development of national aviation safety inspectors; harmonize policies and regulations; provide certification and inspection assistance to States currently unable to meet regulatory obligations; coordinate technical assistance programmes; and establish a regional aviation safety team to implement globally developed solutions for safety concerns. They provide an efficient and cost-effective method for the inspection and certification of operators, aircraft and training establishments and for training of a large number of safety oversight personnel.

By the end of 2007, COSCAP-South Asia is executed by means of a Trust Fund project by the seven participating and co-funded States (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka). In-kind and funding support is also provided by the Federal Aviation Administration (FAA), U.S. Department of Transportation, Transport Canada, Boeing, Airbus and the European Aviation Safety Agency (EASA). The objective is to enhance the safety and efficiency of air transport operations in the subregion. This goal is pursued through a variety of measures:

- the establishment of a pool of highly qualified safety inspectors;
- the enhancement of the individual oversight capability of each participating State through the provision of on-the-job training of national inspectors; and
- assistance with safety oversight activities as required.

Similarly, the COSCAP in South-East Asia (SEA) is a cooperative agreement among 13 States (Brunei Darussalam; Cambodia; China; Hong Kong, China; Macao, China; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Timor-Leste; and Viet Nam) and follows the overall objectives set for the programmes throughout Asia and the Pacific. It is also executed by a Trust Fund of participating States with supplementary in-kind and funding support from the FAA, Airbus, Boeing, the Directorate General of Civil Aviation (DGCA) France and EASA.

Finally, the COSCAP in North Asia (NA), is joined and co-funded by four States (China, Democratic People's Republic of Korea, Mongolia, and Republic of Korea). In-kind and funding support is provided by the FAA, EASA, Airbus, Boeing, Bombardier and DGCA France. COSCAP-NA is a dedicated forum for the promotion of dialogue, coordination and cooperation in matters related to flight safety among the well-developed and smaller participating civil aviation administrations, as well as for fostering an environment for the harmonization of, and advancement in, safety oversight policies, procedures and regulations. States are also able to promote accident prevention through the establishment and supervision of the North Asia Regional Aviation Safety Team (NARAST) as proposed by the ICAO GASP.

The three Asian COSCAPs, pioneered with the cooperative, co-funding and subregional approach and served as models for other regions. Africa has two subregional COSCAPs while similar arrangements are developing in Latin America and the Caribbean.

D. Medical issues related to aviation

In 2007, many activities in this area in Asia centred on pandemic preparedness planning (PPP). The outbreak of SARS in 2003 indicated the risk from the international spread of disease to society, particularly through globally operating air transport services. At that time Asia was the most severely affected region, and some States responded quickly to the need for improved planning for a similar or more severe event. Two years after SARS, the risk of avian influenza initiating a human influenza pandemic once again raised warning flags concerning the risk from a serious disease being spread by air travel.

ICAO took a proactive approach regarding PPP for commercial air transport services whilst health-related organizations, such as the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), concentrated on detection of disease in the bird and human population, the provision of preventive medication and vaccinations. FAO pursued an inter-disciplinary and multi-organizational approach, collaborating with the WHO and assisted by the IATA, ACI as well as several others at the national level, such as the United States Centers for Disease Control and Prevention. ICAO Guidelines for States Concerning the Management of Communicable Disease Posing a Serious Public Health Risk (published at http://www.icao.int/icao/en/med/guidelines.htm) were developed primarily for States, airports and airlines.

The ICAO Cooperative Arrangement for Preventing the Spread of Communicable Disease by Air Travel (CAPSCA) was established to promote implementation of these preparedness planning guidelines at international airports, together with the revised International Health Regulations that came into force in June 2007. The Guidelines will evolve in close collaboration with CAPSCA Member States.

In Asia and the Pacific, nine civil aviation administrations had joined the cooperative programme on the basis of co-financing by the end of 2007: Indonesia; Malaysia; Nepal; China; Hong Kong, China; Macao, China; Philippines; Singapore; and Thailand. Funds were also made available by the United Nations Central Fund for Influenza Action. The first CAPSCA – Steering Committee Meeting (SCM) was held in August 2007 in Hong Kong, China. The second SCM is scheduled for 11 and 12 June 2008 in Kuta, Bali, Indonesia. The Regional Aviation Medicine Team (RAMT) provides technical advice to CAPSCA Member States and their selected major airports in preparing an adequate plan of action and resources. It met for the first time in October 2007 in Bangkok, Thailand. In 2006 and 2007, seven airports received assistance in the form of evaluation visits and on-the-job training from the ICAO Aviation Medicine Expert/Project Coordinator based in Singapore. The important experience gained in Asia will form a template for development in other regions until CAPSCA becomes a global project. Africa is planned for 2008.

E. Aviation Environmental Protection

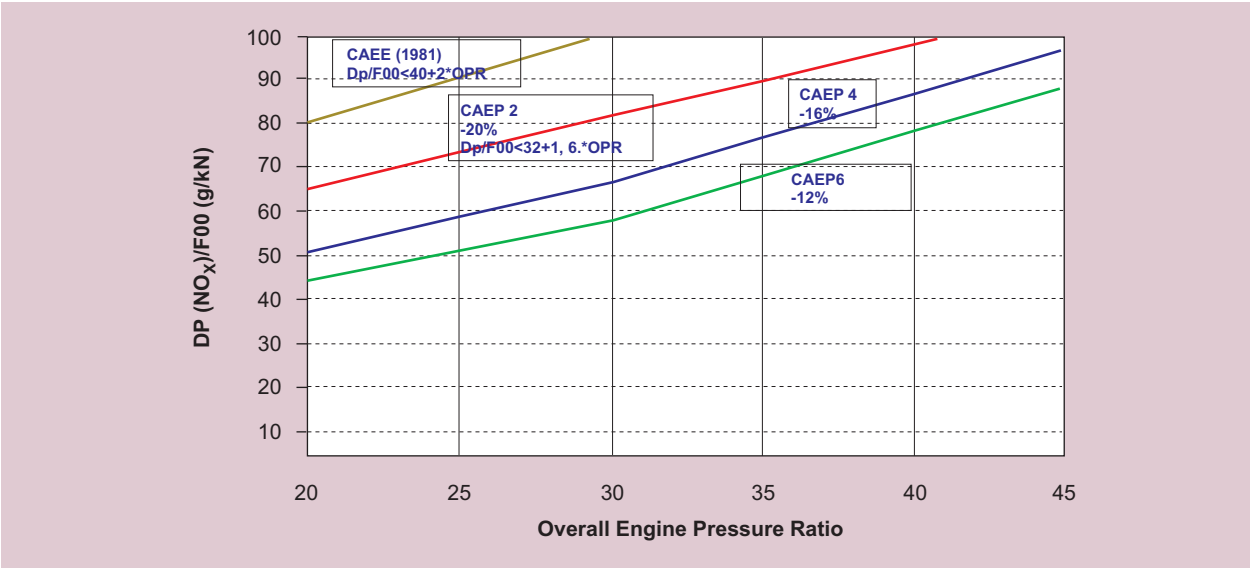
ICAO with its 190 Contracting States is internationally recognized as the lead agency to address aviation's impact on climate change. The Organization acts chiefly through its Committee on Aviation Environmental Protection (CAEP) [www.icao.int/icao/en/env/caep.htm]. CAEP is composed of representatives from States who advise the Secretariat in their respective fields of expertise. Observer status is granted to Representatives from aviation industry associations (airlines, airports and aerospace) as well as from relevant national, regional and international non-governmental organizations. The seventh meeting of CAEP (CAEP/7) was held at ICAO Headquarters (HQs) in Montreal, Canada in February 2007.

ICAO's function as a clearing house is essential to develop appropriate technical Standards and Recommended Practices (SARPs), published in Annex 16 – Environmental Protection, that exploit technological innovations and economically viable operational measures. It enables ICAO to facilitate dialogue and collaboration within the international aviation community achieved through high-level intergovernmental meetings, conferences and subregional training workshops. The Colloquium on Aviation Emissions, held in May 2007 with a wide regional representation, highlighted progress made regarding assessment methodologies of aviation emissions and possible solutions to address aviation emissions impacts (www.icao.int/envclq/clq07).

Moreover, ICAO develops guidance material, recommendations for remedial policy or operational measures as well as market-based instruments that are aimed at limiting or reducing aircraft emissions and noise at source throughout the usually three-year cycle between meetings of the whole Committee. Major achievements of the CAEP/7 cycle were the definition of medium-term and long-term goals (10 and 20 years, respectively) for jet engine emissions [nitrogen oxides (NO_x)], fuel burn and aircraft noise. Figure XII-16 displays NO_x stringencies established by CAEP cyles.

The Draft Guidance on the Use of Emissions Trading for Aviation (Doc 9885) describes how to incorporate internationally set SARPS for aviation emissions into States' emissions trading schemes, consistent with the process established by the United Nations Framework Convention on Climate Change. In addition, seven new ICAO documents have been developed addressing aircraft noise and emission issues while existing ones have been amended (www.icao.int/icao/en/env/document.htm).

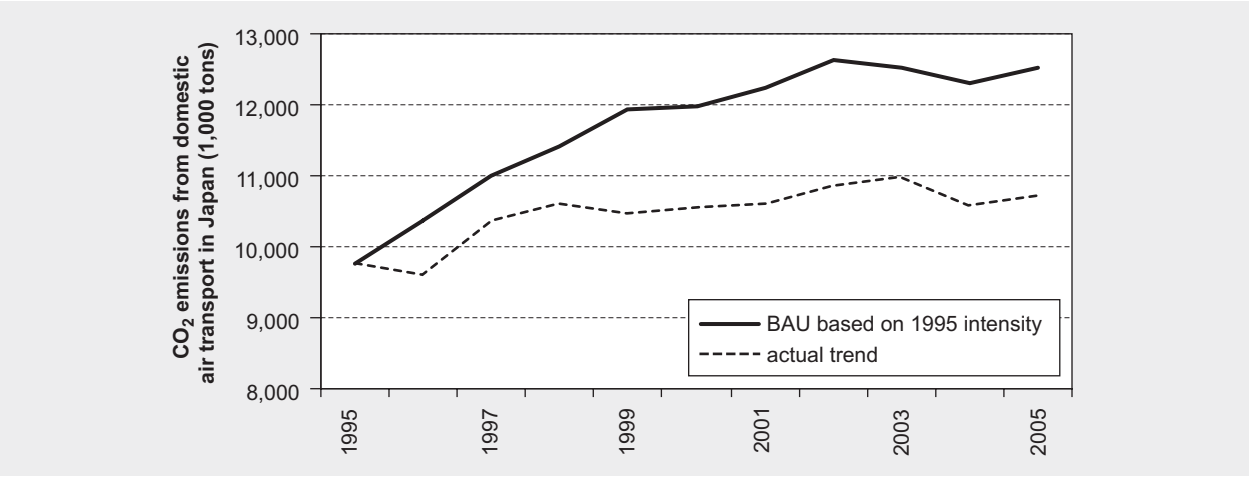
Figure XII-16. NO_x stringencies by ICAO CAEP cycles



Furthermore, guidance material has been developed during the CAEP/7 cycle on the implementation of best practices with respect to local air quality at airports and on how to assess and quantify airport emissions at source. This manual contains information on the regulatory context, drivers for addressing local air quality at airports and on how aircraft emissions contribute to total emissions that are measured around airports. It is meant to help users in creating inventories of aircraft and airport source emissions.

In Asia and the Pacific, Japan, China and Singapore are members of CAEP. Japan has appointed a Focal Point on Voluntary Measures who works towards limiting or reducing international aviation emissions and keeping ICAO guidelines on such measures up-to-date.

Figure XII-17. CO_2 emission from domestic air transport in Japan



ICAO's first Environmental Report is a compendium on technical and policy aspects of aircraft noise and engine emissions. It also provides an update on the work of ICAO and other organizations relevant aviation and the environment. It was published in 2007 and is available at http://www.icao.int/icao/en. Singapore Changi International Airport is among the corporate sponsors.

During the 36th Session of the ICAO Assembly (A36) in September 2007, attended by 1488 delegates, ICAO Contracting States adopted Assembly Resolution A36-22: Consolidated statement of continuing ICAO policies and practices related to environmental protection. The work of ICAO on technical and operational approaches to reduce aviation emissions had strong support from Member States.

In contrast, the implementation schemes of market-based measures aimed at reducing or mitigating aviation emissions were intensely debated. The Assembly reiterated the position of ICAO that a consensus should be reached for the introduction of such schemes.

A36 concluded that an aggressive Programme of Action on International Aviation and Climate Change should be developed to address the issue of international aviation and climate change, covering both technical and market-based approaches. It requested ICAO to form a Group on International Aviation and Climate Change, composed of senior government officials and tasked with developing such a programme. Japan and China are members of this Group and the first meeting is planned for February 2008.

PART THREE:

TRADE AGREEMENTS, TRANSPORT REGIONALISM AND INTERMODAL TRANSPORT

XIII. TRADE AGREEMENTS

Efficient transport lowers the costs of trade and thus promotes international trade. In fact, successive trade rounds since 1947 have lowered the customs tariff levels of many products to such an extent that changes in non-tariff barriers and transport costs have become much more important than many tariffs. On the other hand, higher trade volumes also imply higher transport volumes which will also reduce unit transport costs.

This chapter outlines developments in the WTO and regional trade agreements in the region that are of importance for transport development. The chapter discusses the history of the GATT/WTO system and economic globalization (section A), describes transport-related aspects of the General Agreement on Trade in Services (section B) and bilateral and regional trade agreements in the ESCAP region (section C), as well as describes in somewhat more detail the cases of ASEAN+3, BIMP-EAGA, and SCO.

A. GATT/WTO system

Prior to World War II, international trade was limited to a system of bilateral trade negotiations between governments. With the establishment of GATT in 1947, a multilateral and rule-based trading system was born. Through a succession of so-called "trade rounds" under GATT, agreements between governments regarding the terms of trade (in particular tariffs) were concluded. The GATT system has been credited for much of the rapid increase in international trade since 1945. World trade in 2000 was 22 times what it was in 1950.[211]

The Uruguay Round of Trade Negotiations that began in 1986 led to the establishment of the World Trade Organization (WTO) in 1995 which henceforth took on the role of facilitating the successive trade rounds. While trade negotiations under GATT were limited to tariff reductions, anti-dumping and a series of non-tariff barriers to trade, WTO has a much wider mandate which covers merchandise trade, trade in services (see next section), and trade-related intellectual property rights. Most WTO agreements are multi-lateral and have to be agreed by all members of the WTO. There are also two 'plurilateral' WTO agreements that have been approved only by a limited group of members, and which relate to trade in civil aircraft and government procurement. As of July 2007,[212] WTO had 151 member states.

B. General Agreement on Trade in Services (GATS)

This section provides a brief overview of the General Agreement on Trade in Services (GATS) and its coverage of transport-related services.

1. Overview

The General Agreement on Trade in Services (GATS) is the first multi-lateral set of legally binding rules for international trade in services. GATS was negotiated in the Uruguay Round and is overseen by the WTO Council for Trade in Services. Under GATS, the trade in services is subdivided into economic sectors, one of which is transport. Each sector is characterized by four modes of supply:

- Mode 1 – cross-border supply;
- Mode 2 – consumption abroad;
- Mode 3 – commercial presence; and
- Mode 4 – presence of natural persons.[213]

[211] Website of WTO, 26 November 2007, at http://www.wto.org/english

[212] ibid.

[213] World Trade Organization, "Discussion Paper on the Environmental Effects of Services Trade Liberalization (WT/CTE/W/218)", October 2002, viewed on the WTO website on 26 November 2007 at http://www.wto.org/english

Like the agreements on goods, GATS operates on three levels: the main text containing general principles and obligations; annexes dealing with rules for specific sectors; and individual countries' specific commitments and exemptions to provide access to their markets. Unlike the agreement on trade in goods, GATS has a fourth special element: lists showing where countries are temporarily not applying the 'most-favoured-nation'[214] principle of non-discrimination. These schedules, like tariff schedules under GATT, are an integral part of the agreement. So are the temporary withdrawals of most-favoured-nation treatment.

The GATS commits member governments to undertake negotiations on specific issues and to enter into successive rounds of negotiations to progressively liberalize trade in services. Services negotiations started officially in early 2000 under the Council for Trade in Services. In March 2001, the Council established the negotiating guidelines and procedures. The Doha Ministerial Declaration of 14 November 2001 endorses the work already done, reaffirms the negotiating guidelines and procedures, and establishes some key elements of a timetable, including, most importantly, the deadline for the conclusion of the negotiations as part of a single undertaking.

Within the timeframe of the overall negotiating deadline of 1 January 2005, paragraph 15 of the Doha Development Agenda establishes that "participants shall submit initial requests for specific commitments by 30 June 2002 and initial offers by 31 March 2003". Pursuant to the Doha mandate, participants in the services negotiations have been exchanging bilateral initial requests since 30 June 2002. Members have submitted 69 initial offers since 31 March 2003 and since 19 May 2005 there have been 30 revised offers submitted by Members.

The Fifth Ministerial Conference was held in Cancún, Mexico, in September 2003. The meeting ended in discord on agricultural issues, including cotton, and a deadlock on Singapore issues.[215] Significant progress on the Singapore and agricultural issues was not evident until 1 August 2004 when a set of decisions by the General Council was handed down (now referred to as the July 2004 package). A deadline of January 2005 was set to resolve these issues. However, that deadline was missed. Following that, members were unofficially aiming to finish the negotiations by the end of 2006. The last meeting was in Hong Kong, China in December 2005.

Paragraph 25 of Hong Kong Ministerial Conference on "Services Negotiations" (adopted on 18 December 2005) stipulates that "the negotiations on trade in services shall proceed to their conclusion with a view to promoting the economic growth of all trading partners and the development of developing and least-developed countries, and with due respect for the right of Members to regulate. In this regard, we recall and reaffirm the objectives and principles stipulated in the GATS, the Doha Ministerial Declaration, the Guidelines and Procedures for the Negotiations on Trade in Services adopted by the Special Session of the Council for Trade in Services on 28 March 2001 and the Modalities for the Special Treatment for Least-Developed Country Members in the Negotiations on Trade in Services adopted on 3 September 2003, as well as Annex C of the Decision adopted by the General Council on 1 August 2004".[216]

2. GATS and transport-related services

There are two specific annexes to GATS that relate directly to trade in transport services. These annexes outline special conditions in the trade in air transport services and maritime services.

[214] Under Article II of the GATS, Members are held to extend immediately and unconditionally to services or services suppliers of all other Members "treatment no less favourable than that accorded to like services and services suppliers of any other country". This amounts to a prohibition, in principle, of preferential arrangements among groups of Members in individual sectors or of reciprocity provisions which confine access benefits to trading partners granting similar treatment.

[215] The 'Singapore issues' on the agenda of the Doha Development Agenda of the World Trade Organization are investment, competition, transparency in government procurement and trade facilitation. More accurately the issue is what role the WTO should play in each of these policy areas." See www.lse.ac.uk/collections/internationalTradePolicyUnit/pdf/theSingaporeIssuesInCancunRev1.pdf

[216] Source: WTO on services negotiations, WTO website, 20 November 2007, www.wto.org/english

a) Air transport services

Under the Annex on air transport services, traffic rights and directly related activities are excluded from GATS. They are handled by other bilateral agreements, i.e., directly between two governments. However, the Annex establishes that GATS will apply to aircraft repair and maintenance services, marketing of air transport services and computer-reservation services.

b) Maritime services

Maritime services are an area where further negotiations were scheduled to improve on the commitments included in the initial Uruguay Round schedules. Negotiations were originally scheduled to end in June 1996, but participants failed to agree on a package of commitments. The talks resumed with the new services round, which started in 2000. Some commitments already exist in some countries' schedules covering the three main areas in this sector: access to and use of port facilities, auxiliary services and ocean transport.

c) Services Auxiliary to all modes of Transport

While not a specific annex, this general sector includes cargo handling services, storage and warehouse services, freight transport agency services including other auxiliary transport services, and other supporting and auxiliary transport services (freight brokerage services; bill auditing and freight rate information services; transportation document preparation services; packing and unpacking services; freight inspection, weighing and sampling services; and freight receiving and acceptance services). Like the previous sectors, negotiations are currently ongoing.

d) Current status of negotiations

In 2006, UNCTAD assessed the status of GATS negotiations relating to transport and logistics services. It was concluded that only a limited number of quality offers had been submitted to-date. Of the 68 offers available at the time, 28 had maintained existing commitments on maritime transport services, 14 had entered new commitments and 26 still had offered no commitments in this sector. Four offers had maintained existing commitments regarding multimodal transports, as well as four new offers.

In June 2005, an assessment of offers relating to logistics services indicated that of the 61 offers which had been tabled, 41 maintained existing commitments, and that five of the 20 offers from members who did not have commitments were new in this sector. In terms of specific transport sub-sectors, 14 offers were made regarding air transport services, 13 in road transport services, 9 in rail transport services, and 13 in services auxiliary to all modes of transport.[217]

C. Bilateral and regional trade agreements in the ESCAP region

In recent years, many countries including those in Asia and the Pacific have experienced a proliferation of new bilateral and regional trade agreements (RTA). These are trade agreements between two or more governments which are often but not exclusively confined to some geographical area, the most well-known being in the form of Free Trade Agreements (FTAs). Newer RTAs have moved from formal, geographically related groupings such as the European Union, with coverage over almost all trading sectors in the economy, to agreements between nations as geographically separate as Australia and Chile.

The ESCAP region has experienced a rapid increase in the number of preferential trade agreements (PTAs) both at the bilateral and regional levels. This phenomenon has significantly changed the landscape of trade relations in the region and increased the complexity of regional markets.

[217] UNCTAD, Geneva 2006, Negotiations on Transport and Logistics: Issues to consider.

Although bilaterals and RTAs are for the most part outside the WTO arrangements, WTO has recognized that they can contribute to international trade liberalization in Article XXIV of GATT and Article V of GATS. WTO provides some guidance on RTAs and requires that they cover substantially all sectors of the trading economy and that they do not result in barriers being raised on third parties who are not members of the RTA in question.

Most ESCAP member economies, whether they are members of the WTO or not, are also signatories to one or more RTA. APTA, which is the new name of the Bangkok Agreement that was concluded under the auspices of ESCAP in 1976, is one of the oldest RTAs in the region. It is especially interesting as it includes both India and China and thus does not only include half the world population, but de-facto also links the East and South-East Asian trade agreements with those of South Asia.

Other well-known RTAs in the ESCAP region include the Association of Southeast Asian Nations (ASEAN) and the Economic Cooperation Organization (ECO). RTAs have proliferated especially after the Asian financial crisis of 1997. The new approach of governments to trade agreements and the emerging new system of agreements has been referred to as *new regionalism*.[218]

There is a debate about the long-term impact of these recent trends on trade flows and the further liberalization of trade worldwide. RTAs can have a trade diversion affect to the detriment of third parties. Some governments are party to many RTAs and are also involved in multi-lateral trade negotiations (Table XIII-1). Keeping track of the entry requirements and tariff levels and implementing different rules of origin might ultimately lead to a more complex and less transparent trading system, including higher transaction costs. Although WTO requires that RTAs include most of the major trading sectors, many RTAs do not follow this guidance. For example, a number of Free Trade Agreements do not cover the agricultural sector. The WTO has argued that this flexibility is detrimental and that multilateral negotiations would be a more appropriate arena for agreements so that trade-offs can be found.[219]

Table XIII-1. Selected bilateral and regional trade agreements that include ESCAP countries

Agreement	Member Countries	Year
ACFTA	Brunei Darussalam, Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, Singapore, Viet Nam	2005
ACFTA-Services	Brunei Darussalam, Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam	2007
AJCEP	Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Myanmar	2004
AKFTA	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Republic of Korea, Malaysia, Myanmar, Philippines, Singapore, Viet Nam	Pending country ratification
ANZCERTA	Australia, New Zealand	1983
APTA	Bangladesh, China, India, Republic of Korea, Lao PDR, Sri Lanka	1976
ARMENIA - EU	Armenia, European Union	1999
ARMENIA - KAZAKHSTAN	Armenia, Kazakhstan	2001
ARMENIA - MOLDOVA	Armenia, Moldova	1995
ARMENIA - RUSSIAN FEDERATION	Armenia, Russian Federation	1993
ARMENIA - TURKMENISTAN	Armenia, Turkmenistan	1996
ARMENIA - UKRAINE	Armenia, Ukraine	1996
ASEAN - CER	Australia, Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, New Zealand, Philippines, Singapore, Thailand, Viet Nam, Myanmar	Under negotiation since 2004

[218] Rajan, Ramkishen S., "Trade Liberalization, New Regionalism and Poverty Reduction in Asia and the Pacific", paper prepared for Expert Group Meeting on Regional Trade Agreements in Asia and the Pacific, Bangkok, 30-31 January 2003, UNESCAP website, http://www.unescap.org/

[219] Ibid.

Table XIII-1. *(continued)*

Agreement	Member Countries	Year
ASEAN Goods	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam	1993
ASEAN Services	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam	1996
ASEAN-CHINA FA	China, Malaysia, Myanmar, Brunei Darussalam, Indonesia, Lao PDR, Philippines, Singapore, Thailand, Cambodia, Viet Nam	2003
ASEAN-INDIA FA	Brunei Darussalam, Cambodia, India, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam	2004
ASEAN-REPUBLIC OF KOREA FA	Brunei Darussalam, Cambodia, Indonesia, Republic of Korea, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Viet Nam	2006
AUSFTA	Australia, United States	2005
AUSTRALIA - CHINA	Australia, China	Under negotiation since 2005
AUSTRALIA - JAPAN	Australia, Japan	Under negotiation since 2003
AUSTRALIA - MALAYSIA	Australia, Malaysia	Under negotiation since 2005
AUSTRALIA - THAILAND	Australia, Thailand	2005
AUSTRALIA - UAE	Australia, United Arab Emirates	Under negotiation since 2005
BHUTAN - INDIA	Bhutan, India	2006
BIMSTEC	Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand	1997
CANADA - REPUBLIC OF KOREA	Canada, Republic of Korea	Under negotiation since 2004
CHINA - CHILE	China, Chile	2006
CHINA - HONG KONG, SAR	China, Hong Kong, Special Administrative Region	2004
CHINA - REPUBLIC OF KOREA	China, Republic of Korea	Under negotiation since 2005
CHINA - MACAO, SAR	China, Macao, Special Administrative Region	2004
CHINA - NIGER	China, Niger	2005
CHINA - PAKISTAN	China, Pakistan	Pending country ratification
CHINA - THAILAND	China, Thailand	2003
CISFTA	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, Kyrgyzstan	1994
ECOTA	Afghanistan, Azerbaijan, Islamic Republic of Iran, Kazakhstan, Pakistan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Kyrgyzstan	2003
EFTA - REPUBLIC OF KOREA	European Free Trade Association, Republic of Korea	2006
EFTA - SINGAPORE	European Free Trade Association, Singapore	2003

Table XIII-1. *(continued)*

Agreement	Member Countries	Year
EurAsEC	Belarus, Kazakhstan, Russian Federation, Tajikistan, Kyrgyzstan, Uzbekistan	1997
GEORGIA - ARMENIA	Armenia, Georgia	1998
GEORGIA - AZERBAIJAN	Azerbaijan, Georgia	1996
GEORGIA - KAZAKHSTAN	Georgia, Kazakhstan	1999
GEORGIA - RUSSIAN FEDERATION	Georgia, Russian Federation	1994
GEORGIA - TURKMENISTAN	Georgia, Turkmenistan	2000
GEORGIA - UKRAINE	Georgia, Ukraine	1996
GSTP	Algeria, Argentina, Bangladesh, Brazil, Cameroon, Chile, Cuba, Colombia, Ecuador, Democratic People's Republic of Korea, Egypt, Ghana, Guyana, Guinea, India, Indonesia, Islamic Republic of Iran, Iraq, Libya, Malaysia, Mexico, Mercosur, Morocco, Mozambique, Myanmar, Sudan, Thailand, Tunisia, Viet Nam, Benin, Bolivia, Tanzania, Trinidad & Tobago, Venezuela, Zimbabwe, Nicaragua, Nigeria, Pakistan, Peru, Philippines, Republic of Korea, Romania, Singapore, Sri Lanka	1989
INDIA - AFGHANISTAN	India, Afghanistan	2003
INDIA - BANGLADESH	Bangladesh, India	2006
INDIA - CHILE	Chile, India	Pending country ratification
INDIA - GCC	Gulf Cooperation Council, India	2006
INDIA - MERCOSUR	India, Mercosur	2005
INDIA - NEPAL	India, Nepal	1991
INDIA - SACU	India, South African Customs Union	Under negotiation since 2002
INDIA - SINGAPORE	India, Singapore	2005
INDIA - SRI LANKA	India, Sri Lanka	2001
INDIA - THAILAND	India, Thailand	2004
JAPAN - BRUNEI DARUSSALAM	Brunei Darussalam, Japan	Pending country ratification
JAPAN - CHILE	Chile, Japan	2007
JAPAN - INDIA	India, Japan	Under negotiation since 2007
JAPAN - INDONESIA	Indonesia, Japan	Under negotiation since 2005
JAPAN - REPUBLIC OF KOREA	Japan, Republic of Korea	Under negotiation since 2004
JAPAN - MALAYSIA	Japan, Malaysia	2006
JAPAN - MEXICO	Japan, Mexico	2005
JAPAN - PHILIPPINES	Japan, Philippines	Pending country ratification

Table XIII-1. *(continued)*

Agreement	Member Countries	Year
JAPAN - SINGAPORE	Japan, Singapore	2002
JAPAN - THAILAND	Japan, Thailand	Pending country ratification
JAPAN - VIET NAM	Japan, Viet Nam	Under negotiation since 2006
KAZAKHSTAN - UZBEKISTAN	Kazakhstan, Uzbekistan	1997
REPUBLIC OF KOREA - CHILE	Chile, Republic of Korea	2004
REPUBLIC OF KOREA - EU	Republic of Korea, European Union	2001
REPUBLIC OF KOREA - INDIA	Republic of Korea, India	Under negotiation since 2006
REPUBLIC OF KOREA - SINGAPORE	Republic of Korea, Singapore	2006
REPUBLIC OF KOREA - UNITED STATES	Republic of Korea, United States	Pending country ratification
KYRGYZSTAN - ARMENIA	Armenia, Kyrgyzstan	1995
KYRGYZSTAN - KAZAKHSTAN	Kazakhstan, Kyrgyzstan	1995
KYRGYZSTAN - MOLDOVA	Moldova, Kyrgyzstan	1996
KYRGYZSTAN - RUSSIAN FEDERATION	Russian Federation, Kyrgyzstan	1993
KYRGYZSTAN - UKRAINE	Ukraine, Kyrgyzstan	1998
KYRGYZSTAN - UZBEKISTAN	Uzbekistan, Kyrgyzstan	1998
LAO, PDR - THAILAND	Lao PDR, Thailand	1991
MALAYSIA - REPUBLIC OF KOREA	Malaysia, Republic of Korea	Under negotiation since 2005
MALAYSIA - NEW ZEALAND	Malaysia, New Zealand	Under negotiation since 2005
MALAYSIA - PAKISTAN	Malaysia, Pakistan	2006
MALAYSIA - UNITED STATES	Malaysia, United States	2004
MOLDOVA - UZBEKISTAN	Moldova, Uzbekistan	1995
MSG	Papua New Guinea, Solomon Islands, Vanuatu, Fiji	1994
NEW ZEALAND - CHINA	China, New Zealand	Under negotiation since 2004
NEW ZEALAND - GCC	Gulf Cooperation Council, New Zealand	Under negotiation since 2007
NEW ZEALAND - HONG KONG SAR	Hong Kong, Special Administrative Region, New Zealand	Under negotiation since 2001
NEW ZEALAND - SINGAPORE	New Zealand, Singapore	2001
NEW ZEALAND - THAILAND	New Zealand, Thailand	2005
PAKISTAN - SRI LANKA	Pakistan, Sri Lanka	2005
PANAMA - SINGAPORE	Panama, Singapore	2006
PATCRA	Australia, Papua New Guinea	1977

Table XIII-1. *(continued)*

Agreement	Member Countries	Year
PERU - THAILAND	Peru, Thailand	Pending country ratification
PICTA	Cook Island, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu	2006
PTA-D-8	Bangladesh, Indonesia, Islamic Republic of Iran, Egypt, Malaysia, Pakistan, Turkey, Nigeria	Pending country ratification
SAFTA	Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka, Bangladesh, Afghanistan	2006
SINGAPORE - AUSTRALIA	Australia, Singapore	2003
SINGAPORE - BAHRAIN	Bahrain, Singapore	Under negotiation since 2004
SINGAPORE - CANADA	Canada, Singapore	Under negotiation since 2001
SINGAPORE - EGYPT	Singapore, Egypt	Under negotiation since 2004
SINGAPORE - JORDAN	Jordan, Singapore	2005
SINGAPORE - KUWAIT	Kuwait, Singapore	Under negotiation since 2004
SINGAPORE - MEXICO	Mexico, Singapore	Under negotiation since 2000
SINGAPORE - PAKISTAN	Pakistan, Singapore	Under negotiation since 2005
SINGAPORE - PERU	Peru, Singapore	Under negotiation since 2004
SINGAPORE - QATAR	Qatar, Singapore	Under negotiation since 2004
SINGAPORE - SRI LANKA	Sri Lanka, Singapore	Under negotiation since 2003
SPARTECA	Cook Island, Australia, Fiji, Marshall Islands, Micronesia, Nauru, New Zealand, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Kiribati, Niue	1981
THAILAND - BAHRAIN	Bahrain, Thailand	2002
THAILAND - UNITED STATES	Thailand, United States	Under negotiation since 2004
TPS - OIC	Bangladesh, Cameroon, Egypt, Guinea, Jordan, Lebanon, Libya, Maldives, Pakistan, Senegal, Syria, Tunisia, Turkey, United Arab Emirates, Islamic Republic of Iran, Uganda	Pending country ratification
TRANS - PACIFIC SEP	Brunei Darussalam, Chile, New Zealand, Singapore	2006
TURKEY - BOSNIA AND HERZEGOVINA	Bosnia H, Turkey	2003

Table XIII-1. *(continued)*

Agreement	Member Countries	Year
TURKEY - BULGARIA	Bulgaria, Turkey	1999
TURKEY - CROATIA	Croatia, Turkey	2003
TURKEY - EC	European Union, Turkey	1996
TURKEY - EFTA	European Free Trade Association, Turkey	1992
TURKEY - FYROM	Former Yugoslav Republic of Macedonia, Turkey	2000
TURKEY - ISRAEL	Israel, Turkey	1997
TURKEY - MOROCCO	Morocco, Turkey	2006
TURKEY - PALESTINE	Palestine, Turkey	2005
TURKEY - ROMANIA	Romania, Turkey	1998
TURKEY - TUNISIA	Turkey, Tunisia	2005
UNITED STATES - INDONESIA	Indonesia, United States	2006
UNITED STATES - LAO PDR	Lao PDR, United States	2005
UNITED STATES - PAKISTAN	Pakistan, United States	Under negotiation since 2004
UNITED STATES - PHILIPPINES	Philippines, United States	Under negotiation since 2006
UNITED STATES - SINGAPORE	Singapore, United States	2004
UNITED STATES - VIET NAM	United States, Viet Nam	2001
US - AFGHANISTAN	Afghanistan, United States	2004
US - ASEAN	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam, United States	2006
US - CA TIFA	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, United States	2004

Source: ESCAP database of trade agreements, website as of 26 November 2007, www.unescap.org/tid/

D. Case studies: ASEAN+3, BIMP-EAGA, SCO

This final section of the chapter provides somewhat more detail on three RTA initiatives: ASEAN+3, BIMP-EAGA, and SCO.

1. From ASEAN to ASEAN+3

Since the Asian Financial Crisis of 1997/98, the ten ASEAN countries have initiated a regular series of meetings at the cabinet and head-of-government levels with their counterparts from Japan, China and the Republic of Korea. ASEAN is negotiating separate free trade deals with all three countries.

There have been annual meetings of ASEAN ministers of foreign affairs, trade and investment, and finance, with their counterparts of Japan, China and the Republic of Korea. In addition, heads of government from the 13 countries meet during the annual ASEAN summits which also include meetings of all ministers of trade, finance, and foreign affairs.

The meetings have taken place both on a "10 + 3" and a "10 + 1" basis. They are generally held during scheduled annual meetings of the various ASEAN forums, although ASEAN and the "+3" – countries also meet at other points during the year on an ad-hoc basis. These meetings have been useful in fostering increased cooperation and consultation among the 13 countries. Indonesia hosted the 7th ASEAN+3 Summit in Bali from 4 to 8 October 2003. China displayed its effective emergence as the most important new partner of ASEAN, as it signed the ASEAN Treaty of Amity and Cooperation (TAC)

and signalled its firm commitment to complete the China-ASEAN Free Trade Agreement on schedule by 2010.[220]

On 31 July 2007, the Chinese government announced its willingness to expand its "open and inclusive" partnership with ASEAN, Republic of Korea and Japan, saying the grouping is the main driver for greater economic cooperation in East Asia. "*China is committed to building good-neighbourly relations and partnerships with its neighbours*," Chinese Foreign Minister Yang Jiechi said at the opening of the "ASEAN+3" meeting. His remarks affirmed the Chinese governments support for a new ten-year plan for ASEAN+3.

To-date, the ASEAN+3 initiative has promoted currency swaps, infrastructure development and free trade talks. The Chinese government affirmed that it supported ASEAN's plans for economic integration and the creation of a single market. The grouping has made a "*great contribution to peace, stability, economic development, social progress and common prosperity of the region and has become the main vehicle of East Asia cooperation*".[221]

2. Case Study BIMP-EAGA

The Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN (Association of Southeast Asian Nations) Growth Area, or BIMP-EAGA initiative, was launched by the four governments in 1994. The objective was to accelerate the development of the cross-border economy through regional cooperation.

BIMP-EAGA consists of:

- Brunei Darussalam
- Central Kalimantan
- North Sulawesi
- South Sulawesi
- Maluku
- Sabah and Sarawak states and the Federal Territory of Labuan in Malaysia
- East and West Kalimantan
- South Kalimantan
- Central Sulawesi
- South-East Sulawesi
- Irian Jaya in Indonesia
- Island of Mindanao and Palawan Province in the Philippines

Some of these areas are geographically rather distant from their national capitals. Yet, they are very close to each other and located in one of the most resource-rich region of the world. The BIMP-EAGA initiative is market-driven, and operates through a decentralized structure of organization which involves the four governments and the private sector.

BIMP-EAGA cooperation aims to increase trade, tourism and investments by:

- facilitating the free movement of people, goods, and services;
- making the best use of common infrastructure and natural resources;
- taking full advantage of economic complementation.

In addition to the cooperation in the sectors of agro-industry, tourism, fisheries and energy, BIMP-EAGA established a "working group cluster" for transport. The working group clusters are composed of related or similar smaller working groups. The clusters provide a mechanism to strengthen the coordination and consolidation of BIMP-EAGA's development initiatives, particularly at the operational level. The Transport Cluster, led by Brunei Darussalam, has a particular focus on the improvement of air and sea linkages within the region. EAGA is connected by sea and air to most major cities in Asia. To ensure its competitiveness, the subregion is in the process of upgrading its airports and seaports and implementing multi-lateral agreements to facilitate cross-border movement.[222]

[220] ASEAN website, 26 November 2007, www.us-asean.org/

[221] Malaysia business news website, 26 November 2007, www.biznewsdb.com

[222] ADB website, viewed on 26 November 2007, www.adb.org

3. Case Study The SCO Summit, Shanghai, June 2006

The Shanghai Cooperation Organization is an intergovernmental organization which was founded by China, Russian Federation, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan in Shanghai on 15 June 2001. Its member states cover an area of over 30 million square kilometres, or about three fifths of Eurasia, with a population of 1.46 billion or roughly one quarter of the world's population. Its working languages are Chinese and Russian.

The SCO originated and grew from the Shanghai Five mechanism, also known as the "Shanghai Five", which was founded in 1996 and comprised China, Russian Federation, Kazakhstan, Kyrgyzstan and Tajikistan, in a bid to strengthen confidence-building, disarmament in the border regions and to promote regional cooperation. In 2000, the president of Uzbekistan was invited to the Dushanbe Summit as a guest of the host state. In 2001, the SCO was established in Shanghai and accepted Uzbekistan as a new member.

According to the SCO Charter and the Declaration on the Establishment of the SCO, the main purposes of the SCO are: strengthening mutual trust and good-neighbourliness and friendship among member states; developing effective cooperation in political affairs, economy, trade, science and technology, culture, education, energy, transportation, environmental protection and other fields; working together to maintain regional peace, security and stability; and promoting the creation of a new international political and economic order featuring democracy, justice and rationality.

At present, the SCO cooperation has covered wide-ranging areas such as security, economy, transportation, culture, disaster relief and law enforcement, with security and economic cooperation being the priorities.[223]

A major current initiative are negotiations of a cross-border facilitation agreement. Such an agreement is expected to become a nucleus for a wider intergovernmental agreement that may cover the whole ESCAP region.

[223] Website of the SCO Summit, viewed on 26 November 2007, english.scosummit2006.org/

XIV. TRANSPORT REGIONALISM

This chapter[224] provides an overview of developments in regional cooperation agreements and major programmes in Asia (Section A)[225] and reviews examples of transport-related intergovernmental agreements in the region (Section B).

A. Overview of regional cooperation for transport in Asia

In the absence of deeper regional integration in Asia, international transport-related agreements and programmes have gained increasing importance in the region. These agreements are considered an essential government response to enabling participation by economies in international production networks, as well as to mitigating systemic risks related to participation in these networks.

1. Types of regional cooperation in transport

Agreements and programmes in transport in Asia take many different legislative and non-legislative forms that are reflected in the variety of intergovernmental organizations, agreements and programmes. Government cooperation typically comes in one of the following forms:

(a) Global UN conventions:
  – of a general nature;
  – in a specific sector;

(b) Intergovernmental agreements/organizations addressing regional cooperation:
  – in general;
  – in a specific sector;

(c) Intergovernmental agreements/organizations addressing subregional cooperation:
  – in general;
  – in a specific sector;

(d) Programmes addressing regional or subregional cooperation:
  – in general;
  – in a specific sector;

(e) Frameworks for agreements;

(f) Guidelines for legislation.

It should be noted that this categorization does not give a static picture. For example, programmes are often designed to have a catalytic role in leading to various formal, intergovernmental agreements. Also, some programmes start out as a programme, but are later transformed into a specific intergovernmental agreement (e.g., TRACECA become IGC-TRACECA).

Table XIV-1 provides examples of the types of transport-related policy, infrastructure, operations and facilitation issues that are often dealt with at the national level and those that are typically areas for regional cooperation. To date, there is little cooperation on actual operationalization of infrastructure. While many regional cooperation initiatives generally seem to target socio-economic subregional development (e.g., along infrastructure corridors), the explicit link between the various network layers and regional development using a strategic and long-term network perspective, is surprisingly non-existent.

---

[224] The current chapter is based on a more detailed review of regional cooperation in transport that is contained in: ESCAP 2007, *Toward an Asian Integrated Transport Network,* ESCAP Monograph Series on Managing Globalization, No. 1 (second edition), www.unescap.org/publications/detail.asp?id=1200

[225] This section is based on: Moon, J., and Roehrl, R.A. 2004, Infrastructure Networks to Extend Regional Production networks to Inland Sites in Asia: Strategies, Programmes and Activities, Proceedings of the High-level Conference on Asia's Economic Cooperation and Integration, Manila, June 2004, http://www.adb.org/Documents/Books/Asian-Economic-Cooperation-Integration/default.asp.

Table XIV-1. Examples of substantive content of national vs. regional activities for transport development

Type of Activity	National	Bilateral, subregional or regional
Policy	Policy planning/coordination (within governments) Public sector reform	Cooperation/dialogue transit policy Bilateral/subregional agreements International transport conventions
Infrastructure	New construction Rehabilitation/upgrading Modernization (application of ICT) Equipment (vehicles, rolling stock) Facilities (intra- and intermodal) Maintenance	Facilities (border-crossing) Infrastructure development coordination Resource mobilization Joint financing
Operations	Services, related businesses Capacity-building (e.g., asset management)	Cross-border service coordination, including equipment exchange; Transit tariffs
Facilitation	Improvement of business environment for transport operators working in international transport (e.g., one stop windows for processing Ex/Im documents)	Border crossing facilitation (TIR, traffic rights, driver qualifications vehicle inspection etc.)

Some countries in Asia and the Pacific have benefited more than others from participation in transport-related intergovernmental agreements, organizations and programmes. In fact, some observers claim that countries at the hubs of an emerging "hubs-and-spokes" system of transport related agreements have been reaping special benefits. This may be in part due to their geographical location and in part due to their active "transport diplomacy". In any case, only through their participation in the agreements have governments had the opportunity to actively shape agreements to reflect their national interests.

It also appears that this system of agreements is currently entering a consolidation phase. In fact, in Asia and the Pacific, there has been a clear trend to more and often overlapping transport-related organizations and programmes with fewer and fewer members. Especially in the past 20 years, most new initiatives involved only a handful of countries at a time.[226]

The organizations and programmes have promoted intergovernmental agreements and economic cooperation on many issues including cross-border transport and increasingly also communications. One prominent example of regional cooperation with open and relatively comprehensive membership is the Asian Highway, which was created by ESCAP in 1959 as a programme and was transformed into an intergovernmental agreement in 2004 and entered into force in 2005.

2. Existing gaps

Multinational companies have been very successful in developing regional production and distribution networks in Asia, a powerful process that is often referred to as "regionalization" (see also Chapter I). It has become increasingly apparent that the private-sector led "regionalization" needs to be complemented with a similar collaboration among governments that is often referred to as "regionalism" which is needed in order to address the many social, economic and political inter-country challenges.

In particular, there is a need for policy intervention in the land transport sector. In this sector, deep concerns have been voiced that hinterlands, regions of countries, and landlocked countries, located far away from the centres actively participating in regional production networks, will be marginalized.

Most governments have recognized the importance of playing an active role in the major regional, subregional and bilateral agreements in key areas related to globalization, such as trade, transport, and

[226] Smaller groups and groups of a "like-mind" can reach consensus easier, which increases the effective speed of implementation.

communications. Yet, for various reasons, some governments have been more successful in this respect than others.

The number, magnitude and extent of regional and subregional cooperation initiatives and organizations has increased significantly. In the past 20 years, a complex web of cooperation mechanisms and relationships has emerged in the transport infrastructure sectors of Asia and the Pacific.

Table XIV-2 shows a matrix of a selection of the main agreements, organizations and programmes against their membership in Asia. As the regional arm of the United Nations, ESCAP is the organization with the most comprehensive membership coverage in Asia and the Pacific. Within the table, groupings of countries can be clearly identified that would appear to follow topographical, historical and cultural lines. Furthermore, some countries are members of a large number of organizations, whereas others are only members of a few regional organizations.[227] While it should be noted that the list of regional and subregional organizations and programmes that is plotted in the matrix is not comprehensive, a number of otherwise intuitive general trends are reflected in the table (with notable exceptions, of course). Landlocked countries, such as Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, as well as geopolitically important countries such as China, India, Russian Federation, Thailand and Turkey are the countries that are members of the largest number of agreements and organizations. In contrast, island countries and other developed or newly-industrialized countries in the region[228] are only part of a limited number of such mechanisms or programmes of the region.

The result of these trends is a "hub-and-spoke" system of agreements and programmes. For example, the International North-South Transport Corridor (INSTC) founding members were India, Islamic Republic of Iran and Russian Federation, and BIMSTEC links a subset of members of SAARC with a subset of members of ASEAN. This network of agreements can be seen as yet another non-physical "soft" network complementing the "hard" infrastructure.

Concerns have been voiced over a tendency of the system to become increasingly difficult to "manage". Against this background, ESCAP has promoted openness of agreements and adherence to regional and global standards for such agreements, in order to avoid the marginalization of ESCAP members. One example of this is in the area of cross-border transport facilitation, where ESCAP resolution 48/11 calls for ESCAP members to sign up to a list of key agreements. However, concerns remain, some of which are discussed in this section.

The situation in transport is somewhat similar to that in trade, where some experts have been discussing the implications of an increasingly complicated "spaghetti bowl" of overlapping bilateral, plurilateral, and subregional trade agreements.[229] This has raised concerns regarding possible inconsistencies between these agreements and the multilateral trade agreements of the WTO. There are also concerns that such inconsistencies could lead to lock-in of negotiation positions at the WTO level. The proliferation of bilateral and subregional agreements in the transport sector raises similar concerns regarding their consistency with regional and global conventions. For example, the current proliferation of bilateral and smaller plurilateral agreements makes it increasingly difficult for countries like China to negotiate new commitments, since it has a large number of neighbouring countries that are parties to many different agreements.

Since issues of cross-border land transport[230] are regional by nature, a large part of relevant harmonization can be achieved at the regional level. In the context of linkages with other regions (Europe, West Asia, Africa, Latin America and the Caribbean), global harmonization is highly desirable, if not necessary. Cooperation between the regional commissions of the United Nations are means by which this can be achieved.

---

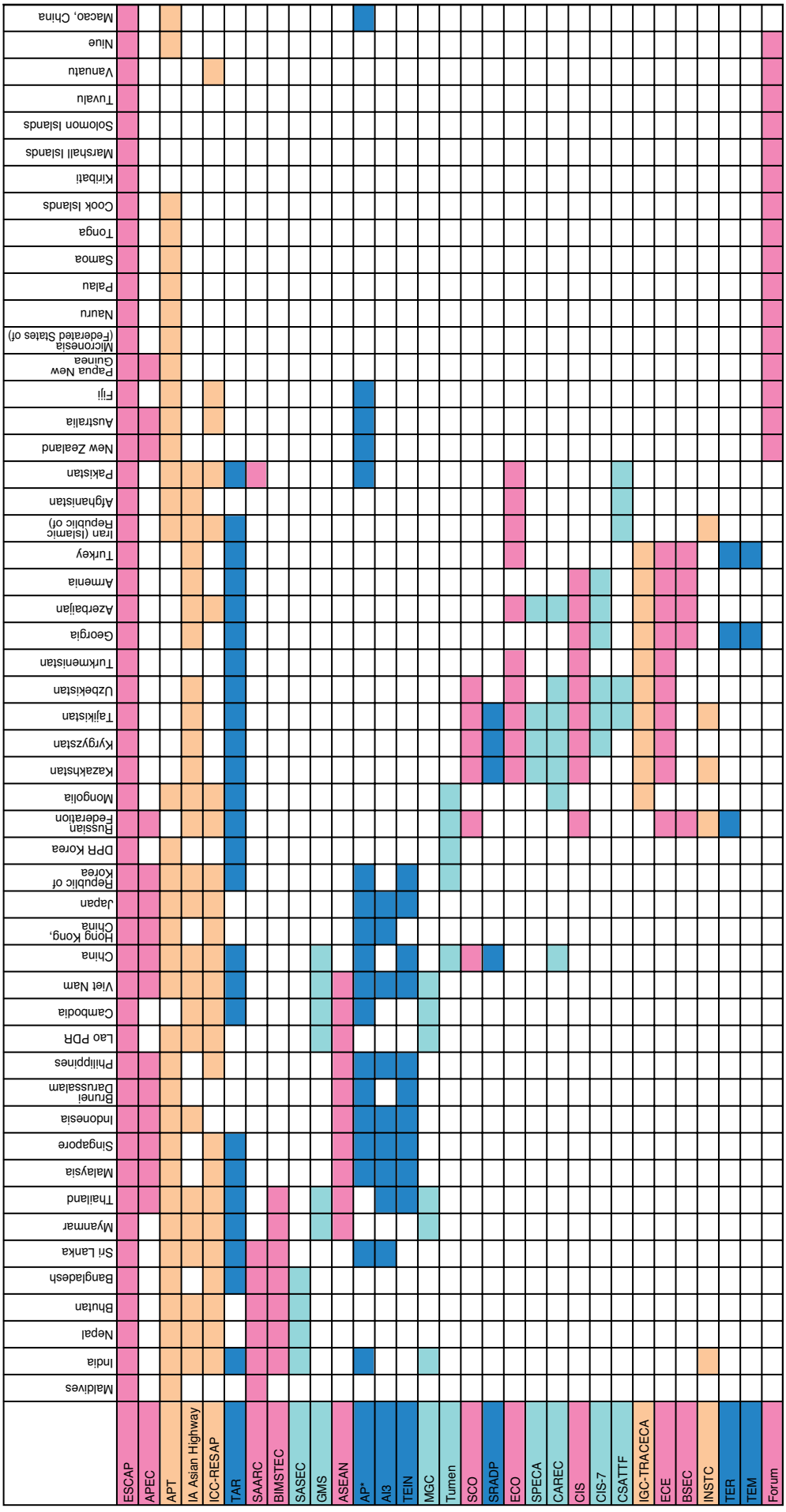
[227] The rank size distribution of membership size shows a typical power law distrubution.

[228] Instead, NIEs tend to have more agreements with developed countries, many of which are not located in the region. These agreements are not reflected in the matrix of Table XIV-2.

[229] See, e.g., T. Bonapace, *ADB Highlevel Forum on Regional Integration,* Manila, 2004.

[230] For example, it doesn't matter very much whether land transport agreements in South America differ from those in Asia.

Table XIV-2. Matrix of subregional and regional agreements/organizations with a transport or communications component, versus its member countries in Asia



B. Examples of regional cooperation agreements

The growth of international trade and consequent focus on global integration has encouraged regions to seek connectivity through new and existing infrastructure networks. Two major infrastructure projects within the ESCAP region are the Asian Highway Network and Trans-Asian Railway Network[231] both of which have the aim of facilitating trade across borders. This chapter examines the existing non-physical barriers of trade across borders and the efforts of bodies such as ESCAP and national governments to alleviate these barriers.

The construction of the Asian Highway Network and Trans-Asian Railway Network will provide a solid framework for countries within the ESCAP region to enter into regional cooperation agreements to reduce the non-physical barriers of cross border trade. That is, these networks will provide the physical means to reduce these barriers. Both of these networks will be considered before examining a number of regional cooperation agreements facilitated by bodies such as ESCAP and the Asian Development Bank.

1. Intergovernmental Agreement on the Asian Highway

The Asian Highway project has aimed to enhance the efficiency and development of road transport infrastructure in Asia. The key tenets of the project have been to promote international and bilateral trade and tourism to encourage regional economic and social development.

The Intergovernmental Agreement on the Asian Highway Network was adopted in November 2003 by 32 member states and entered into force on 4 July 2005, ninety days after the requisite number of states had ratified or approved it. The Asian Highway project had entered into a new phase with its opening for signature at the sixtieth session of ESCAP held at Shanghai, China, in April 2004. To date, 28 member States have signed the Agreement and 22 have ratified, approved or accepted it.[232]

It is expected that the Agreement will play a catalytic role in the development of international highways in the Asia-Pacific region. In 2006 there were 121 priority investment road projects within the ESCAP region covering over 26,000 kilometres of road in 25 member countries comprising almost US$ 18 billion in investment. Resolution 60/4, adopted at the sixtieth session of the ESCAP at Shanghai in 2004, invites international and regional financing institutions and multi-lateral and bilateral donors to provide financial and technical support for the development of the Asian Highway Network and related infrastructure, particularly taking into account the special needs of landlocked developing countries.

In order to support the process of raising and prioritizing sufficient funds on an international level for further development of the Asian Highway Infrastructure, the ESCAP Secretariat carried out a project to identify investment needs and development priorities for the Asian Highway Network and related intermodal connections and freight terminals. The highest priority has been given to the upgrading of substandard sections of the Asian Highway. A major outcome of the project was a list of priority projects of international importance as wellas and project profiles for potential donors. ESCAP may also play a role in the dissemination of high priority projects that have not yet received adequate funding, but are of such importance that, if realized, the whole Asian region would benefit.

2. Trans-Asian Railway (TAR)

Historically, physical and non-physical barriers have prevented the movement of goods by rail across international borders within the ESCAP region. The Trans-Asian Railway Network is a major step towards the identification of an integrated and international network that transcends these barriers. The network comprises of over 80,000 km of rail routes linking 27 ESCAP countries. Its primary aims are to provide a link between Asia and Europe as well as improved access for landlocked countries to major ports.

In order to illustrate the potential of further development of the Trans-Asian Railway as a backbone for container trade, ESCAP has promoted, with support from OSJD, a number of demonstration runs of container block trains along the different routes of the northern corridor of TAR.

---

[231] See Chapters VI and VII for further discussion on the Asian Road and Rail Networks.

[232] www.unescap.org/ttdw/common/tis/AH/Tableofcountriessigned.asp

In fact, five of the nine countries participating in the runs have signed a Memorandum of Understanding (MOU) to this effect at the ministerial level.[233] The MOU is articulated on a series of Steering Committee Meetings (SCM) which agreed on four runs of container block trains along key segments of the northern corridor of TAR between November 2003 and July 2004. The first such run was successfully organized between the Chinese port of Tianjin and Ulaanbaatar in Mongolia; the second one between the Chinese port of Lianyungang and Almaty in Kazakhstan; the third one between Ulaanbaatar and Brest; and the fourth one between Vostochny in the Far East of the Russian Federation and Malaszewicze in Poland. Meanwhile other services have been or are being tested.

It should be noted that a container block train between Western Europe and the Far East that travels at about 1,000 km per day on average would have at least seven days advantage in transit time as compared with sea transport. The demonstration runs have already been followed by more than 200 commercial container block trains between 2004 and 2005.[234]

On 17 May 2007, in a landmark event, trains crossed the border between the Democratic People's Republic of Korea and the Republic of Korea. These train runs which are the first in 56 years raise hope of future full operation of trains along the Trans-Asian Railway Northern Corridor.[235]

The Intergovernmental Agreement on the Trans-Asian Railway Network was signed at Busan, Republic of Korea, on 10 November 2006 during the Ministerial Conference on Transport. To-date, twenty[236] of the 28 project member countries that are part of the TAR network signed and two have ratified the Agreement. "For the railways of the region, this new international environment offers an opportunity to upgrade existing infrastructure or construct new ones with the aim of defining and operating international corridors. It also calls for a higher level of cooperation to find synergies between national infrastructure projects and international corridors."[237] The Agreement remains open for signature at the United Nations headquarters in New York until 31 December 2008.

Several subregional workshops are imminently scheduled: New Delhi in December 2007 to identify investment needs and development priorities for the Trans-Asian Railway Network in countries of South Asia; and Tehran in February 2008 to develop intermodal interfaces and identify investment needs and develop priorities for countries of Caucasus region, Central Asia, Islamic Republic of Iran and Turkey.

Regional transit cooperation agreements (including the Shanghai Cooperation Agreement, Greater Mekong Subregion Transport Agreement and the Central Asia Regional Economic Cooperation Programme) have been formed using the Asian Highway and the Trans-Asian Railway Network as a basis to provide the physical framework. The following sections examine some of the aforementioned agreements and other selected agreements.

3. Landlocked and transit developing countries

The last few years have seen significant advances in the development of international cooperation in issues affecting landlocked and transit developing countries. On 20 December 2002, the United Nations General Assembly resolved that an International Ministerial Conference on Transit Transport Cooperation should be convened at Almaty on 28 and 29 August 2003. In preparation for the Conference, ESCAP undertook a series of case studies to identify the common issues and concerns related to physical and non-physical barriers that characterize the transit transport systems of landlocked and transit developing countries in the ESCAP region.

---

[233] China, Kazakhstan, Mongolia, Republic of Korea, and Russian Federation have signed the MOU at the ministerial level. Relevant authorities of Democratic People's Republic of Korea have indicated their agreement in principle. The other participating countries are Belarus, Germany and Poland.

[234] Source of information: OSJD.

[235] http://www.unescap.org/ttdw/common/TIS/TAR/tar_nc_press.asp

[236] The twenty signatories are: Armenia, Azerbaijan, Cambodia, China, Indonesia, India, the Islamic Republic of Iran, Kazakhstan, Lao People's Democratic Republic, Mongolia, Nepal, the Republic of Korea, the Russian Federation, Sri Lanka, Tajikistan, Thailand, Turkey, Uzbekistan and Viet Nam.

[237] Viewed December 2007, http://www.unescap.org

This research resulted in a framework of recommendations designed to focus resources and inputs of all parties on improving the efficiency of transit transport and thereby the access of landlocked and transit developing countries to global markets. The framework also recognized the increasingly important potential of landlocked countries to provide transit opportunities for their neighbours, an important factor in the planning of future transit arrangements.[238]

The framework made detailed recommendations under eight broad headings:

- Policy related actions;
- International Ministerial Conference on Transit Transport Cooperation;
- Trade and transport facilitation;
- Promoting competition in the provision of transit transport services;
- Better monitoring;
- Enhancing transit infrastructure;
- Application of information and communications technology; and
- Capacity-building and human resources development for transit transport.

Subsequently, the Conference of Ministers developed and adopted a comprehensive programme of action to address the special issues faced by landlocked and transit countries while facilitating international trade. This comprehensive programme, the Almaty Programme of Action, is consistent with and reflects many of the priorities of ESCAP Transport Issues report.[239]

4. Shanghai Cooperation Organization (SCO)

The Shanghai Cooperation Organization (SCO) was formed from regular Summit Meetings between China, Kazakhstan, Kyrgyzstan, the Russian Federation and Tajikistan – the first meeting took place in Shanghai, China on 26 April 1996. The main aim of these Summit Meetings was to promote cooperation, regional and global peace, security and stability.

In June 2001, during their Sixth Summit Meeting, the SCO countries along with Uzbekistan declared the establishment of SCO to strengthen mutual trust and good neighbourliness between themselves and signalled their intention to cooperate in broad economic and social fields, as well as improving regional peace, security and stability.

These six member countries signed the 'Charter of the Shanghai Cooperation Organization' at the Second Summit Meeting of SCO held at Saint Petersburg, Russian Federation in June 2002, and approved the establishment of the SCO secretariat at the Third Summit Meeting of SCO at Moscow, Russian Federation in May 2003. The secretariat was subsequently established at Beijing, China on 15 January 2004.

The heads of the SCO members declared on 15 June 2001 in Shanghai, China[240] that the goals of SCO were to 'strengthen mutual trust, friendship and good-neighbourliness between the members and encourage effective cooperation in transport and other economic and social areas, and also that a negotiating process should be undertaken on facilitation of trade and investment, and that a long-term programme of multi-lateral trade and economic cooperation should be drawn up and relevant documents should be signed.'

The Prime Ministers of the SCO members signed a Memorandum of Understanding (MOU) on Fundamental Goals and Directions of Regional Economic Cooperation and Kick-off of the Process for Facilitation of Trade and Investment between the Governments of Members of the Shanghai Cooperation

---

[238] UNESCAP, *Transit Transport Issues in Landlocked and Transit Developing Countries,* 2003.

[239] Almaty Programme of Action for Addressing the Special Needs of Landlocked Developing Countries within a New Global Framework for Transit Transport Cooperation for Landlocked and Transit Developing Countries, 2003. Viewed 6 December 2005, UN website, http://www.un.org.

[240] Articles 2 and 9, Declaration on the Establishment of the Shanghai Cooperation Organization, Shanghai, China, 15 June 2001.

Organization at Almaty, Kazakhstan on 14 September 2001. The MOU stated to further exploit the potential of transit transport with effective utilization of the existing transport and communication infrastructure and to realize facilitation of trade and investment through ensuring legal, economic, organizational and other conditions for goods and passenger transport (including transit transport).

The MOU also accords priority to transport cooperation.[241] The Second SCO Summit Meeting signed the Charter of the Shanghai Cooperation Organization, which stated the support and encouragement of all types of regional economic cooperation and promotion of facilitation of trade and investment. It also underlined the need for the improvement of transit potential of member countries with effective utilization of existing transport infrastructure.[242]

In September 2003, the Prime Ministers of the SCO members approved the Programme for Multilateral Trade and Economic Cooperation of the Shanghai Cooperation Organization Members during their meeting at Beijing, China. The programme includes cooperation in utilization and further development of transport as one of the essential tasks, and utilization of existing transport infrastructure and common use of potential of transit transport as priority areas.[243] The Prime Ministers' Meeting in Beijing also issued a communiqué, which stated that the Prime Ministers of the six countries advocate that the SCO members should further strengthen cooperation in transport, improve transport infrastructure, coordinate transit transport policies, establish international transport corridors and formulate relevant multi-lateral instruments.[244]

The Ministers of Transport of the SCO members held their first meeting in Bishkek, Kyrgyzstan, from 20 to 21 November 2002. They recognized that the effective use of existing transport infrastructure and improvement of transit potential should be an important task for cooperation in transport among the SCO members, and required to study the feasibility of development of international transport corridors and formulation of multi-lateral transport agreement among the SCO members.[245, 246]

During the subsequent Meeting of the Ministers of Transport held at Saint Petersburg, Russian Federation, in September 2003, the ministers of transport reiterated the goal of realizing the fundamental targets for regional economic cooperation and facilitation of passenger and goods transport (including transit transport) and required to continue the study on necessity of formulation of multi-lateral agreement for road transport at expert level, to facilitate international trade.

5. GMS Transport Agreement

The Agreement for the Facilitation of the Cross-Border Transport of Goods and People in the Greater Mekong Subregion (GMS CTA) was signed by the Lao People's Democratic Republic, Thailand and Viet Nam on 26 November 1999. Subsequently it was acceded to by Cambodia on 29 November 2001; by China on 3 November 2002; and by Myanmar on 19 September 2003.[247] The agreement is a 10-year development strategy that aims to facilitate the cross border movement of people and goods.[248]

---

[241] Articles 1, 2 and 3, Memorandum of Understanding on Fundamental Goals and Direction of Regional Economic Cooperation and Kick-off of the Process for Facilitation of Trade and Investment between the Governments of Members of the Shanghai Cooperation Organization, Almaty, Kazakhstan, 14 September 2001.

[242] Article 3, Charter of the Shanghai Cooperation Organization, Saint Petersburg, Russian Federation, 7 June 2002.

[243] Items 1 and 2, Programme for Multilateral Trade and Economic Cooperation of the Shanghai Cooperation Organization Members, Beijing, China, 23 September 2003.

[244] Paragraph 5, Joint Communiqué on the Meeting of the Prime Ministers of the Shanghai Cooperation Organization Members, Beijing, China, 23 September 2003.

[245] Joint Declaration of the First Meeting of the Ministers of Transport of the Shanghai Cooperation Organization Members, Bishkek, Kyrgyzstan, 21 November 2003.

[246] Paragraph 2, Minutes of the First Meeting of the Ministers of Transport of the Shanghai Cooperation Organization Members, Bishkek, Kyrgyzstan, 21 November 2003.

[247] Study of transit charges to be assessed under Protocol 2 of the Agreement for the facilitation of the Cross Border Transport of Goods and People in the Greater Mekong Subregion, November 2004.

[248] http://www.johannesburgsummit.org/html/prep_process/national_reports-/cambodia_natl_assess.pdf.

Historically, the GMS region has faced inconsistent and difficult border crossing formalities and procedures, restrictions on entry of motor vehicles, restrictive visa requirements, different standards on vehicles and drivers across countries. The GMS agreement attempts to harmonize these procedures and reduce the non-physical barriers of cross-border freight movement. Full implementation of the Agreement and its annexes and protocols is expected by 2007/2008.[249] The main provisions of the GMS agreement relevant to cross-border freight transport include:

(a) Facilitation of Border Crossing Formalities

- Single window inspections and single stop inspections;
- Coordination of hours of operation;
- Advance exchange of information and clearance; and
- Harmonization and simplification of border documents.

(b) Cross Border Movement of Goods

- Grant of freedom of transit through each GMS country;
- Exemption of goods in transit from border inspection;
- Guarantee mechanism for cargo in transit; and
- Classification of dangerous goods/perishable goods.

(c) Requirements of Road Vehicles

- Mutual recognition of vehicle registration certificates, registration plates and inspection certificates and drivers licence;
- Adoption of international standards on road traffic regulations and signage; and
- Grant of temporary admission to motor vehicles without payment of import duties and taxes.[250]

(d) Selected Past and Future Milestones

A year after the signing of Protocol 1 of the GMS Agreement on 30 April 2004, member countries completed negotiations of Protocol 2 on 5 July 2005 in Kunming, China. Protocol 2 relates to fares and charges concerning transit traffic between countries. Some of the main provisions of Protocol 2 are as follows:

With regard to cross-border traffic:

Article 1 – Member countries must not discriminate on basis of nationality of transport operator, registration of vehicle, origin/destination of transport operation.

Article 5 – Member parties must prevent the collection of charges from interfering with the facilitation of cross-border transport.

Article 6 – Member parties may levy the following charges on cross-border traffic (subject to the provisions in the agreement) – tolls, excess weight, administrative expenses, taxes on fuel purchased in the host country and road charges.

Protocol 3 regarding the Frequency of Capacity and Services (Quotas) and Issuance of Permits, was signed in March 2007. The reported milestones for future work on cross-border transport facilitation were and are expected as follows:

- 2004-2007 – Ratification by all GMS governments of the Annexes and Protocols (As at December 2007, 16 Annexes and 3 protocols have been ratified.)
- 2005-2007 – Initial implementation of the GMS Agreement and its Annexes and Protocols

[249] Viewed December 2007, www.adb.org

[250] Managing Regional Public Goods Cross-Border Trade and Investment: Labour Migration and Public Health, Bangkok, June 2005, Silvio Cattonar.

- 2007-2008 – Complete implementation of the GMS Cross-Border Agreement and its Annexes and Protocols.

Members have also signified that a number of border crossing points (including, Mukdahan-Savannakhet, Hekou-Lao Cai, Mae Sot-Myawaddy, Mae Sai-Tachilek) will have adopted and implemented the GMS agreement by 2008. However, some border crossing points have already implemented the agreement and are currently operational – the first of these are the governments of Lao People's Democratic Republic and Viet Nam.

(e) Lao People's Democratic Republic – Viet Nam

Lao People's Democratic Republic and Viet Nam were the first two countries to implement the GMS agreement. The initial stage saw the Lao Bao border gate in Huong Hoa district and central Quang Tri Province commence single window and single stop inspections. Representatives of the Governments of Lao People's Democratic Republic and Viet Nam have signed a memorandum of understanding on initial implementation of the GMS agreement at the two border gates and are continuing to negotiate the remaining annexes and protocols of the agreement. As a result of this initial signing, the time required for cross border procedures and transport costs has been cut and the regions have seen an increase in the competitiveness of their goods.[251]

(f) East-West Corridor

The East-West corridor linking Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam previously allowed most trucks to move freely across the Lao-Thai border. However, any movements further inside the countries were restricted to the border areas. Because of the absence of inland container depots near the border, Lao goods are brought across the border as loose cargo, transferred to Thai trucks, and transported by them to the port where they are loaded into containers. The implementation of the GMS agreement is an attempt to reduce the above barriers by creating a streamlined process of transit through this corridor. Initial Memoranda of Understanding were signed for Mukdahan-Savannakhet (July 2005) and Lao Bao-Dansavanh (March 2007).

Similar initial Memoranda of Understanding have also been signed for Poipet-Aranyaprathet (Thailand/Cambodia border gate) in July 2005, and Bavet-Moc Bai (Cambodia/Viet Nam border gate) in March 2006.

6. IGC-TRACECA

The Basic Multi-lateral Agreement (MLA) on International Transport for the Development of the Transport Corridor Europe-Caucasus-Asia routes, and its technical annexes were signed by Armenia, Azerbaijan, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Ukraine and Uzbekistan, 8 September 1998. An Intergovernmental Commission (IGC) TRACECA has been established to administer and promote the agreement. The signatories to this agreement are also contracting parties of major conventions on international land transport formulated under the auspices of ECE. The basic principles and requirements for international land transport under the agreement are complemented by the conventions. A project on harmonization of border crossing procedures commenced in 2001 to standardize the documents and control processes.

Two new Parties to the MLA have been accepted since April 2005 by consensus of all Member countries: Afghanistan and the Islamic Republic of Iran. These countries are still in the process of finalizing the accession procedures to the MLA.[252]

[251] Viewed on VOV Radio News, 2005, http://www.vov.org.vn

[252] Viewed December 2007, http://igc.traceca-org.org/

7. ECO

The members of the Economic Cooperation Organization (ECO), namely, Afghanistan, Azerbaijan, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan and Uzbekistan, signed the Transit Transport Framework Agreement (TTFA) on 9 May 1998. In 2002, ECO undertook a reconciliation of the inconsistencies between the agreement and the Transit Trade Agreement signed on 15 March 1995. The main purposes and objectives of the Transit Transport Framework Agreement and its Annexes are as follows:

- To facilitate the movement of goods, luggage and passengers through the respective territories of the Contracting Parties and provide all necessary facilities for transit transport under the provisions of this Agreement;
- To ensure the safety of goods, luggage and passengers and avoidance of unnecessary delays during the transit traffic through territories of Contracting Parties; and
- To cooperate and coordinate the efforts of the Contracting Parties to avoid the incidence of customs frauds and tax evasion and harmonizing necessary administrative affairs dealing with transit traffic.[253]

The 9th ECO Summit was held in Baku, Republic Azerbaijan on 5th May 2006, during which the member states re-affirmed their commitment to establish a free trade area in the ECO region by 2015 as a priority task, welcomed ratification of the ECO Trade Agreement by Afghanistan, Pakistan and Tajikistan, and called on signatories that had not yet ratified the agreement to do so, and the non-signatories to expedite signing the agreement.

Member nations also acknowledged the importance of transport and communications as the cornerstone of ECO policy for greater regional integration, and made the following key points for action: [254]

- Called for early establishment of the Transit Transport Coordination Council (TTCC) to ensure successful implementation of the TTFA. It was also urged that signatory Member States should ratify and the non-signatory states should sign and ratify the TTFA.
- Reiterated the importance of early operationalization of regular container train to Istanbul-Tehran-Turkmenabab-Tashkent-Almaty route of Trans-Asian Railway Main Line and passenger train from Almaty on the same route and called on Member States, particularly those that fall on that route, to attach high priority to the project and facilitate its early implementation.
- Underlined the importance of the Programme of Action for ECO Decade of Transport and Communications (1998-2007) and asked Member States to expedite implementing relevant projects in their respective territories.

[253] Eco Transit Transport Framework Agreement, Almaty, May 1998.

[254] Viewed December 2007, http://www.ecosecretariat.org/

XV. INTERMODAL TRANSPORT

In recent years there has been an increased demand for intermodal trade and transport practices to facilitate trade flows by integrating railway transport, road transport and maritime shipping. These practices are commonly referred to as "*intermodal transport*".[255]

This chapter provides an overview of intermodal transport development in the ESCAP region. In particular, it reviews the Busan Ministerial Declaration (Section A), defines different types of transport logistics and distribution centres (Section B), discusses the specific role of dry ports (Section C). It also summarizes examples of logistics centres and distriparks (Section C) and free trade zones in the ESCAP region (Section D) and briefly reviews intermodal systems development in selected ESCAP countries (Section F).

A. Busan Ministerial Declaration

In November 2006, the *ESCAP Ministerial Conference on Transport* was held in Busan, the Republic of Korea, in order to provide high-level guidance for the region and to promote regional cooperation. The key decisions of the conference were adopted in the form of the *Busan Declaration on Transport Development in Asia and the Pacific*. One of the long-term goals of the Busan Declaration is the creation of an *international integrated intermodal transport and logistics system for Asia and the Pacific* through providing support for the development of dry ports and logistical activities at modal interface points. In particular, Ministers resolved that:

"… in order to meet the growing challenges of globalization effectively, respective government authorities will develop and implement transport policies at the national, subregional and regional levels in line with the following principles:

a) Formulating integrated policies and decision-making frameworks based on strategic assessments of economic, environmental, social and poverty-related aspects;

b) Developing an international integrated intermodal transport and logistics system that contributes to the long-term objective of regional cooperation in support of production and distribution networks and of international trade;

c) Giving priority to investment in the Asian Highway and Trans-Asian Railway Networks, including intermodal interfaces to link them with water and air transport networks;

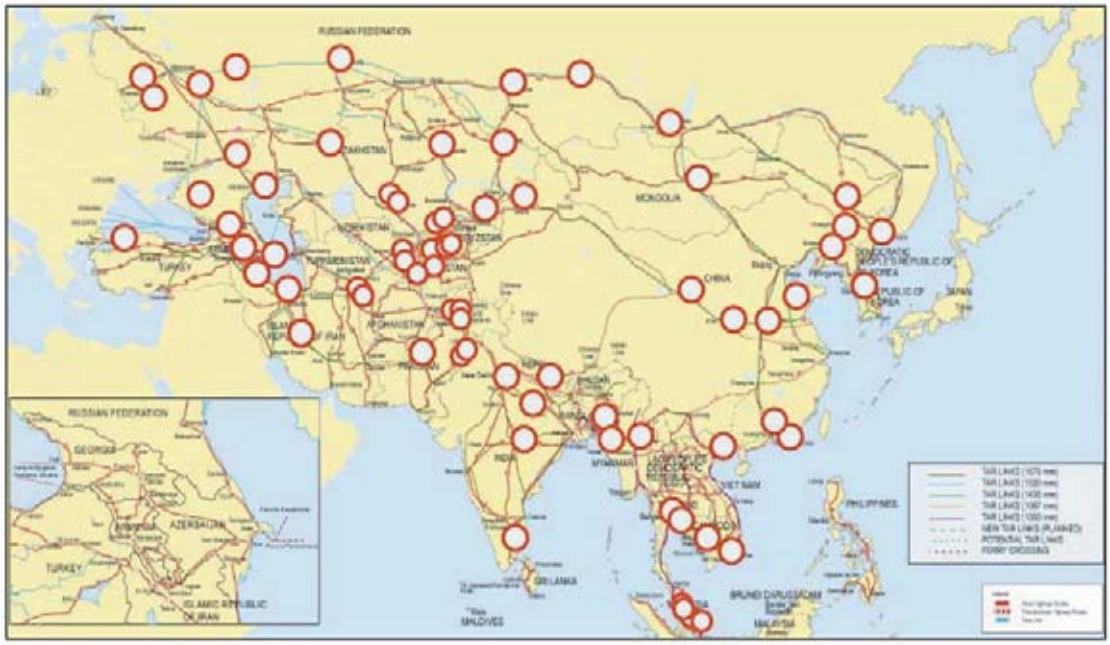
d) Promoting the development of economic and logistical activities at intermodal interfaces, particularly at production and consumption centres, and around seaports and dry ports;

e) Mobilizing financial resources for the development of the transport system, its maintenance and operation from all possible sources, including private sector partnerships and other financial arrangements."

The Declaration identifies the Asian Highway Network (AH) and the Trans-Asian Railway (TAR) as key elements for developing an international integrated intermodal transport and logistics system. The system will be achieved by integrating the AH, TAR and links to the maritime transport network, through the development of intermodal facilities, such as dry ports and inland container depots (Figure XV-1 below).

[255] Viewed 25 October 2005, http://www.unescap.org/TTDW/common/TFS/ImprovingTx/IntegratedTx.asp

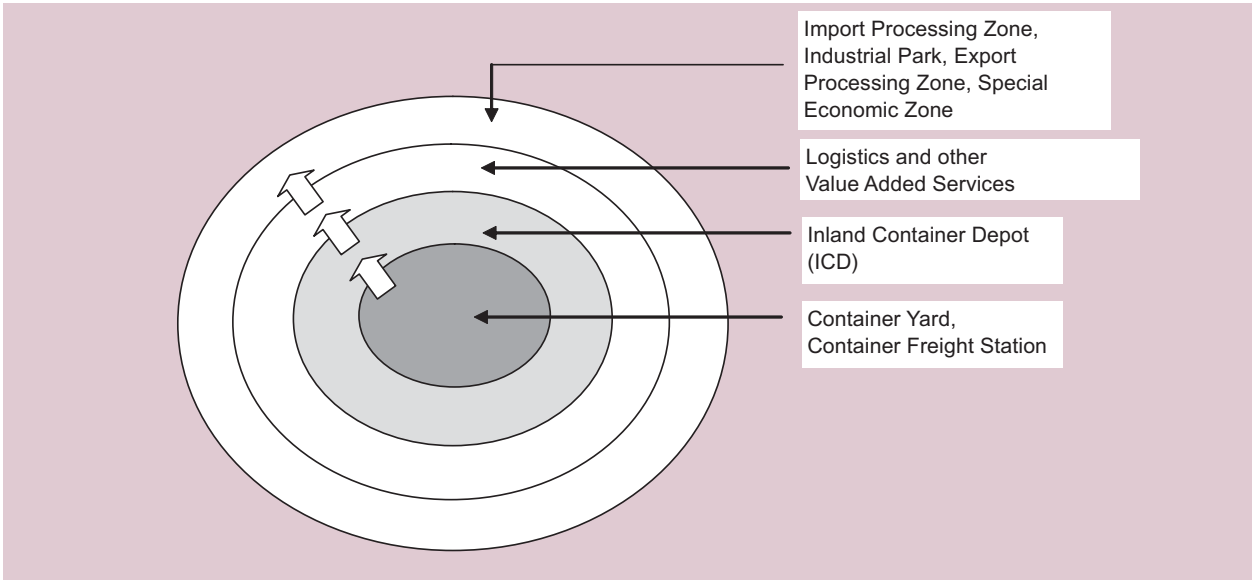
Figure XV-1. Potential key intermodal facilities of international importance in Asia and the Pacific



B. Different types of transport logistics and distribution centres

New logistic and distribution systems have emerged around the world, as today multinational companies consider logistics services as an integral aspect of their supply chain. The systems are based on distribution centres that are designed to allow more rapid and flexible customer service.[256]

Figure XV-2. Potential expansion of functions at an inland intermodal facility



Note: The shaded area indicates the minimum services required for a dry port.

Figure XV-2 illustrates the progressive expansion of functions that may grow from dry ports,[257] beginning with the location of value added services, such as packaging, labelling and storage facilities, expanding to include logistics services, then broadening even further towards full import/export processing, industrial parks or special economic zones for goods assembly, manufacturing and agricultural processing.

[256] *Building a Logistics Center in Northeast Asia: A New Paradigm for National Development Strategy,* Paper 7, Il-Soo Jun, Senior Research Fellow, Korea Transport Institute.

[257] The figure also aims to clarify the nomenclature used to define facilities with different services and functions.

(a) Dry Port (DP)

A dry port provides all the services of a port except for the loading of cargo to and from seagoing ships. It may be distinguished from an inland container depot (ICD) in that it can accommodate all types of cargo, whereas an ICD specializes in the handling of containers and containerized cargo. A dry port facility typically provides container handling and storage, break bulk cargo handling and storage, and customs inspection and clearance. At ESCAP high-level meetings, the term "dry ports" was defined to *include full customs-related services*, in contrast to the ICD where this need not necessarily be the case.

(b) Inland Container Depot (ICD)

An inland container depot is a container terminal located inland from seaport(s), which offers services for the handling, temporary storage and customs clearance of containers and general cargo that enters or leaves the ICD in containers. In essence an ICD has the same functions as a port container terminal except ship to shore transfer. An ICD typically provides: container handling and storage, break-bulk cargo handling and storage and customs inspection and clearance.

(c) Freight Village (FV)

Europe has most recently begun to witness the emergence of *freight villages*. Essentially, a freight village is an area of land that is devoted to a number of transport and logistics facilities, activities and services, which are not just co-located but also coordinated to encourage maximum synergy and efficiency.

Central to a freight village is an intermodal terminal that is connected to major freight corridors and a nearby seaport. This enables flexible, quick movement of containerized and de-containerized cargo between wharf, warehouse and ultimate destination by both road and rail. The juxtaposition of the intermodal terminal with facilities such as container storage (full and empty) and handling areas, and warehouses that are linked to rail, is intended to significantly reduce cargo handling costs and time, and reduce the use of roads for container transportation.

The second distinguishing feature of a freight village is shared access to other facilities, equipment and services. While some of the operators use their own facilities and services and others hire facilities and pay for services from other providers, some facilities such as customs and quarantine services, a truck cleaning area, post office and conference and training rooms would be used on a common access basis by all companies involved in the activities. As well as providing opportunities for sharing operational facilities, some freight villages cater for the social needs of people working there by including bus services, parking facilities, and amenities such as cafes and canteens, and recreation and child care facilities. Facilities such as these could be provided if not initially, perhaps as the freight village attracts enough operators to warrant their use.

A centralized management and ownership structure is the third distinguishing feature of a freight village. This is similar to the strategic management role of a port authority/corporation. Centralized management has responsibility for planning the long-term investment and growth of the village as well as the short-term maintenance of the village infrastructure. It is responsible for establishing corporate governance and administrative arrangements for the village, including those related to quality control, safety, and risk and environmental management. As part of the strategic oversight of the village, the manager would lead village members in designing and implementing ways of attracting business to the village.

C. Dry ports in Asia and the Pacific

This Section summarizes the economic promise that economic role of dry ports, their demand and supply conditions in the ESCAP region, and presents estimates of future dry port requirements in the region. More details are available in ESCAP document number E/ESCAP/CMG(3/I)/1, Committee on Managing Globalization, third session, Part I, 12-14 September 2006.

1. Dry ports as growth centres

Establishing dry ports would allow shippers to undertake consolidation and distribution activities as well as export/import procedures at inland locations that are at relatively short distances from factories and farms. Completing necessary documentation and procedures at these facilities could help reduce congestion and delays at border crossings and ports, thereby reducing transaction costs for exporters and importers. This is particularly important for landlocked countries, and is consistent with the objectives of the Almaty Programme of Action.

However, as was the case with economic activity around coastal regions and ports, the dry port could facilitate broader benefits by attracting the same types of associated services and manufacturing, and also potentially nurture the development of manufacturing and service clusters. Such an expansion would be particularly beneficial to small and medium-sized enterprises in providing opportunities for joint procurement, as well as consolidation and distribution services.

The success of dry ports in this regard will be conditional upon several factors, including choosing locations that are close to existing or potential production or consumption centres, international demand for local goods, support from national Governments and partnerships between local government and business.

While there may be some natural geographical reallocation of resources from coastal regions as manufacturers take advantage of the new inland facilities, tangible new contributions to growth could arise both directly via reduced transaction costs, particularly for exporters (leading to greater export competitiveness), and indirectly via productivity gains as producers organize their manufacturing and distribution more efficiently. Ultimately, dry ports could potentially act as "growth poles" similar to seaports, which could lead to increased employment, higher living standards and improvements in geographic income distribution. This may also have the added benefit of mitigating population migration towards coastal areas.

2. Demand and supply conditions affecting dry port construction

Approximately 200 dry ports were located in Europe in 2005, providing important logistic services to industry and trade. In the United States of America, there are approximately 370 major inland container depots, and at least 200 smaller ones. Yet, in the ESCAP region less than 100 facilities exist, despite differences in geographical and population sizes, suggesting that, at first sight, Asia may be under supplied.

In Asia, much of the discrepancy may be explained by the different purposes for which dry ports have usually been constructed. In many countries, dry ports have been used primarily as a tool to relieve seaport congestion rather than to promote hinterland development. Seaport container throughput therefore is a good predictor of the number of dry ports in many Asian countries – more effective than output measures such as GDP, for example. The secretariat estimates that in the ESCAP region there is approximately one dry port per million twenty-foot equivalent unit (TEU) of containers handled at a country's seaport.

However, this does not reflect the situation across all countries in Asia. For example, in several Central Asian countries there are a number of dry ports where container handling capacity already exists, but many of these facilities are currently underused and in need of modernization. In addition, in India there is much more frequent use of Inland Container Depots (ICDs), with approximately one per 140,000 TEU containers handled at seaports.

In Europe and the United States, by contrast, container throughput at seaports is a poor predictor of the number of dry ports in a country, which suggests that, particularly in Europe, both production and consumption centres are important, and that cargo moving through a European seaport typically serves several European countries rather than a single country. The size, output and density of cities (as well as logistic issues) in Europe are also considerably more important in determining the quantity and location of dry ports. For example, there is approximately one dry port for each city with an output exceeding US$ 2.5 billion (in purchasing power parity terms) and where that city services a wider region with output typically around US$ 30-50 billion. Where GDP and population density are very high, dry ports tend to be larger and generally located around 10,000 km^2 apart.

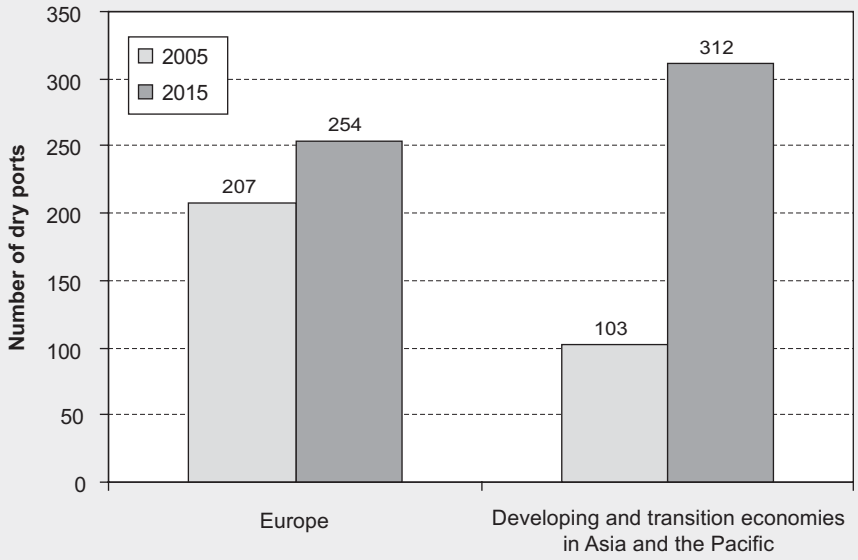
3. Estimating future dry port requirements in Asia

Assuming that Asia will gradually move towards utilizing dry ports to develop hinterlands (rather than constructing them based on seaport congestion), the secretariat estimates that there may be a need for an additional 200 dry ports in the region by 2015 (Figure 3), for a total of approximately 312. This estimate is based on (and therefore sensitive to) an assumed transition in the region from a relationship between number of dry ports and seaport container throughput to one based on the relationships prevalent in industrialized countries (expected purchasing power parity, geography, population and logistics development as discussed above).

The secretariat considers these estimates to be conservative: the "no transition" case (keeping container throughput as the dominant determinant), yields an estimate of 275 dry ports in 2015. Moreover, if the forecast of approximately 312 dry ports by 2015 proves correct, only two countries, China and India, would exceed the number of dry ports currently in Germany.[258]

Alternatively, if one assumes a faster transition to a situation similar to Europe and makes approximate adjustments for existing and future expected port capacities, long-term demand for dry ports in the ESCAP region could be around 600 to 700. Outcomes in this regard, however, will depend on many factors, including whether government policies are oriented towards the development of dry ports.

Figure XV-3. ESCAP estimates of major dry port requirements for Asia in 2015



D. Logistics Centres and Distriparks in the ESCAP Region

While he "freight village" concept is a European one, in the ESCAP region there are well-established logistics centres and distriparks that share many of the features of the freight village. Many ports of the ESCAP region have shifted, or are shifting, their emphasis from traditional cargo-handling services to value-added logistics services, in order to remain competitive in the regional and international markets.[259]

The terms "logistics centre" and "distripark" are used widely and loosely – and sometimes interchangeably. Both share the principle that they comprise not only infrastructure but also the services necessary to satisfy and respond to requirements arising from the primary transport activity.

[258] The secretariat estimates that, by 2015, there may be a need for 130 dry ports in China, 69 in India, 10 in Kazakhstan, 12 in the Republic of Korea, 4 in Sri Lanka, 3 in Thailand, 2 in Bangladesh, and 1 each elsewhere.

[259] United Nations, *Commercial Development of Regional Ports as Logistics Centres,* New York, 2002.

A distripark is a large-scale, advanced, value-added logistics centre with comprehensive facilities for distribution operations at a single location, typically with an emphasis on consolidation and deconsolidation of containerized goods. The origins of the distriparks can be traced back to Singapore in the 1980s, when the government of Singapore embarked on an active campaign to develop the city-state into a transhipment hub for products originating from other Asian countries. The government not only developed the port, but used a range of incentive schemes, including tax exemptions, to actively encourage multinational corporations and international logistics service providers to locate in Singapore and to establish their regional or global distribution centres there.[260]

Distriparks are typically located close to container terminal and multimodal transport facilities. Being located very close to the cargo terminal means that transport between these two places is fast and cheap. In addition to these benefits, customers are often able to choose among a variety of transport modes, which has the possibility of further reducing delivery time and costs. Distriparks in Asia are often located in Free Trade Zones.

Some common features of distriparks in the UNESCAP region are: (a) facilities for distribution operations; (b) location close to cargo terminals so that the empty container can easily and cheaply taken back into the system; (c) location close to various hinterland transport facilities; (d) provision of value added services; (e) on-site customs facilities.

Table XV-1 lists selected distriparks and logistics centres in the UNESCAP region. The list intends to provide a broad indication of the physical scale and facilities of the included projects.

Table XV-1. Selected distriparks and logistics centres in the ESCAP region

Country	Selected Logistics Cluster
Singapore	*Keppel Distripark* Keppel Distripark (KD) is a modern cargo distribution complex located within one of Singapore's six port-related Free Trade Zones. The distripark, which provides extensive warehousing facilities, is connected to PSA's container terminals via a flyway that allows cargo to be speedily delivered to and from the port. It is located on a 23 hectares site along Singapore's Southern Seafront. There are 45 warehousing modules in KD that cover 118,000 square metres, including four blocks of storage space, a five-storey office block, and open storage yards. KD has a 14.6 metre-high ceiling to support high rack automated storage and retrieval systems. The distripark provides not only conventional warehousing services such as storage and regional redistribution of cargo, but also value-added services such as bar-coding, online tracking, fumigation, sampling, surveying, topping-up of cargo, quality assurance and control, pick-and-pack, and repackaging-and-relabeling of goods to be carried out, without the requirement for customs formalities. It is a home for many major shipping lines, international freight forwarders, and domestic IT firms.

[260] UNESCAP, http://www.unescap.org/ttdw/Publications/TFS_pubs/pub_2194/pub_2194_ch4.pdf, Cases of Leading Ports in Setting up Logistics Centres.

Table XV-1. *(continued)*

Country	Selected Logistics Cluster
Singapore	*Pasir Panjang Distripark* Pasir Panjang Distripark, located next to the Port of Singapore's main conventional terminal and new container terminal. It comprises nine single-storey warehouses, and has a total warehouse area of 144,000 square metres. Its single-storey warehouse offers tenants exclusivity in operations. It is ideal for those dealing in odd-size cargo or cargo with a very fast turnover. The warehouse is supported with an ample open storage yard for heavy machinery storage and heavy lift operations. Also located in the distripark is the three-storey Pasir Panjang Districentre, which is specially designed for high value goods that require good security, clean environment and facilities for a quick turnover. The distripark provides some 250,000 square metres of warehousing and office space. Block 1 has a total area of more than 50,000 sqm with ceilings up to 6.6 metres. Blocks 2-10 have 9 metres ceilings and each has 447 square metres of floor space.
China	*ATL Logistics Centre Hong Kong Ltd. – Logistics Centre* Logistics Centre is the world's first and largest intelligent multi-storey drive-in cargo logistics centre designed for fast turnaround of cargo. Located in the heart of Kwai Chung Container Terminals and within near reach of Hong Kong's commercial and population centres, airport, as well as the Mainland border, the Centre offers warehouse and leasing as well as a full range of cargo handling, a container freight station (CFS) and distribution services. ATL Logistics Centre comprises 7 floors at Centre A and 13 floors at Centre B providing over 9.3 million square feet total floor area and approximately 6 million square feet leasable area to CFS, logistics, air freight and all kind of business operators under one roof. It has 3 lane ramps (2 lanes up and I lane down) for vehicular access and its traffic throughput averages 8,000 vehicles a day. *Source:* ATL Logistics Centre Hong Kong Website, 4 Dec. 2007, www.atlhk.com
Malaysia	*North Port – Port Klang* North Port was established in 1993 as Malaysia's first distribution centre in the Free Commercial Zone (FCZ) of Port Klang. Currently it offers a wide range of services, which include warehousing, pre-shipment activities such as documentation, internal haulage, packing and relabeling, minor assembly and other value-added activities to complement the core business activities at Northport. Contents of containers are stored here, processed if necessary and then distributed further. The centre has a total land area of 296,594 square metres and a covered warehouse area of 44,296 square metres. Over 100,000 square metres have been set aside for future development. *Source:* North Port Website, 4 December 2007, www.northport.com.my

E. Free Trade Zones

A *Free Trade Zone (FTZ)* is defined as a fenced-in industrial estate specializing in manufacturing for export and offers resident firms free trade conditions and a liberal regulatory environment.[261] FTZs promote the host country's participation in trade and commerce by eliminating, or reducing, the unintended costs or obstacles associated with host country's trade laws.[262] At the same time, there are certain negative consequences of GTZ development that should not be forgotten. Also, while many FTZs were created in Asia in recent decades, some argue that Asian mega cities have de-facto taken the development role that FTZs had in the past.

Today, some 42 per cent of the world's FTZs are located in Asia. Singapore and Hong Kong, China; have a long history of FTZs in ports. Japan and the Taiwan province of China have also established FTZs in several ports. FTZs have been an integral part of China's development model at least since the early 1990s, in through which FDI of multinational firms was attracted and subjected to different rules than "domestic Chinese firms". Recently, the Malaysia has developed a number of FTZs for distribution, logistics and industries to cater for increased traffic in the Port of Tanjung Pelepas.[263]

Table XV-2 lists selected free trade zones in the ESCAP region. The list provides a broad indication of the physical scale and facilities of the included projects.

Table XV-2. Selected Free Trade Zones in the ESCAP region

Country	Selected Free Trade Zones
Turkey	*Antalya Free Trade Zone* The Antalya Free Zone has been operational since 1987. It covers an area of 580,000 square metres and is located in the port area 12 kilometres from Antalya's city centre and 25 kilometres from the airport. Whereas the land and infrastructure was financed by the state, the superstructure was developed by the investing companies. The management of the Antalya Free Trade Zone was handed over to the private sector. Infrastructure and facilities have been very well developed, including roads and green areas, electricity, water, telecommunication and refining facilities. The Zone includes a wharf with a depth of 10 metres and 218 metres in length. It is also closely linked to immediately adjacent wharves of the port of Antalya. Today, 92 firms are operating in the zone, and roughly 3,500 people are employed there. The Turkish Government has spent more than US$ 11.5 million on infrastructure and development, whereas foreign investment in the superstructure was roughly US$ 60 million. The Free Trade Zone is deemed to be outside the customs borders. Legislative provisions pertaining to taxes, levies, duties, customs and foreign exchange obligations are not applicable. Unlike free zones in many countries, goods produced in the Antalya Free Zone may be offered for sale on Turkey's domestic market (Source: www.searchturkey.com, 5 Dec. 2007).

[261] World Bank, 1992, *World Bank Port Reform Toolkit*.

[262] ESCAP, 2002, *Commercial Development of Regional Ports as Logistics Centres,* New York.

[263] ESCAP, 2002, *Commercial Development of Regional Ports as Logistics Centres,* New York.

Table XV-2. (*continued)*

Country	Selected Free Trade Zones
Republic of Korea	Masan and Iksan Export Processing Zones were established as Export Processing Zones with special incentives such as preferential tariffs and taxes to attract foreign direct investment for promoting export, employment and technology transfer in 1970 and 1973. In 2000, the name Export Processing Zone was changed to Free Trade Zone (FTZ). In January 2002, Busan and Gwangyang ports were designated as Customs Free Zones. In January 2003, Incheon Port and Incheon International Airport were also designated as Customs Free Zones to promote the international logistic industry. There were differences between Free Trade Zone and Customs Free Zones at first. A Free Trade Zones was a manufacturing-oriented special zone while a Customs Free Zone was a logistics-related zone where manufacturing was not allowed. However, in 2003 the two concepts were integrated with the establishment of the 'FTZ Act.' Under the FTZ Act, the areas that can be designated as a FTZ may be industrial complexes, adjacent hinterlands of airports and seaports, distribution complexes, or freight terminals. The government puts considerable efforts into developing FTZs. It currently explores policies, simplification of regulations, better marketing strategies, improved administration, and it actively develops logistics land areas around ports.
Singapore	FTZs in Singapore were first established in September 1969. Their aim was to facilitate inter-port trade in dutiable goods. Today, Singapore has seven FTZs, six for seaborne cargo and one for air cargo. A wide range of facilities and services are provided for storage and re-export of dutiable and controlled goods. Goods may be stored in the zones without any customs documentation until they are released for the market. They can also be processed and re-exported with minimum customs formalities. FTZs in Singapore are primarily for trans-shipment of cargoes. The FTZs are located at the Port of Singapore, Jurong Port, Sembawang Wharves, Pasir Panjang Wharves and Changi Airport. The FTZs offer 72 hours free storage for import/export of conventional and containerized cargo and 14 days free storage for trans-shipment/re-export cargo.
China	*Shanghai Waigaoqiao FTZ* The Shanghai Waigaoqiao Free Trade Zone is one of China's earliest and largest FTZs. It was approved by the State Council in 1990, and it encourages investment in international trading, export processing, distribution, cargo forwarding and commodity exhibition. The Waigaoqiao FTZ is at the northeast corner of the city and is next to the Waigaoqiao Container Port at the estuary of Yangtze River. It lies at the intersection of China's eastern coastline and the golden waterway. It is around 20 kilometres from Pudong International Airport. The FTZ can also be easily accessed from downtown by road. The total cumulative investment in the zone has reached US$ 4.63 billion. The zone currently accommodates 3,582 enterprises producing an annual output of RMB 6.32 billion. The planned area of the zone is around 10 square kilometres and is divided into four areas. Besides the division of the port area, the other three areas are managed and developed by three different firms, all of which are part of a group named Shanghai Waigaoqiao Free Trade Zone (Group) Co. Ltd. *Source: http://www.cadz.org.cn*

F. Intermodal systems development in selected ESCAP countries

This section reviews intermodal systems development in selected ESCAP countries, in particular Australia, China, India, the Republic of Korea, Malaysia, Nepal, and the Philippines.

ESCAP countries differ greatly in their levels of income and economic development. Similarly, the extent to which intermodal transport is used and the maturity of their intermodal systems varies widely in the region. Thus, countries face different challenges in upgrading or creating intermodal infrastructure and institutions, as well as in promoting the use of these systems. Countries are also at different stages in devising strategies to remedy existing deficiencies and to plan for future needs.

But despite these differences, there is a common recognition by governments and industry groups of the benefits that an intermodal freight system can deliver for social and economic performance in the ESCAP region.

1. Australia

Recently, Australia has witnessed a major developments in intermodal domestic and international transport. Several state governments have set targets for moving freight to rail (typically 30 to 40 per cent of port-related container movements). In pursuit of these targets, the states, in conjunction with the Australian Federal Government's 'AusLink' funding programme and the private sector, have promoted a significant amount of investment into intermodal facilities. Today, Australia has an advanced intermodal framework in terms of institutions and infrastructure. An interesting example of intermodal facilities in Australia is the Parkes facility (Table XV-3) which is primarily concerned with the movement of domestic rather than international freight.

Table XV-3. The Parkes facility in Australia

Parkes, New South Wales
The Parkes facility is located approximately 365 kilometres west of Sydney, and 995 kilometres south from Brisbane. It is owned and operated by FCL. The facility is said to be located at the 'crossroads of Australia' where the Newell Highway (which links Melbourne and Brisbane) intersects with the transcontinental railway (which links Sydney and Perth).[264] It is primarily concerned with the intermodal movement of freight within Australia for the domestic market. The site covers 1,000,000 m^2 of land and the facility has a 4,000 m^2 transit warehouse, as well as 5 hectares of paved hardstand. The rail siding can be extended to 1,100 m. On average the facility sees seven trains per week and 30 trucks per day.   Growth expectations for the terminal are high, with containerized cargo expected to double and non-containerized traffic expected to increase by around 50 per cent over the next few years. A number of factors drive the expected expansion of throughput to this facility. Firstly, Australian Rail Track Corporation (ARTC) has signalled its intention to invest A$ 21 million on the Main Western Line linking Parkes and Broken Hill, which is the main trade route of the Sydney to Adelaide corridor. Improvements will focus on raising height clearances, upgrading communications systems, and strengthening and upgrading bridges to improve efficiency and capacity. FCL owns a significant area of land around its present facility, which has been earmarked for future factory and warehouse developments. Another terminal has been approved for development at a location near the above existing terminal. The proposed terminal, when completed, will be capable of handling up to 240,000 TEU per annum during the first stage (years 1-5 of operation) and up to 530,000 TEU after this period. The terminal has a capital investment value of around A$ 110 million, and is expected to employ up to 600 people. The terminal will have a paved hardstand container storage area of 24 ha, and have two rail sidings of 1,000 m each with the capacity of handling eight trains per day.[265]

2. China

A number of recent initiatives have promoted intermodalism in China and will add to the present annual throughput, which is provided in Table XV-4 for selected intermodal facilities. For example, a container transport project initiated by the World Bank in December 1999 saw the construction of eight ICDs by the end of 2003.[266] By 2010, at least 140 million TEU is projected to be handled on rail, which compares with approximately 100 million TEU in 2006.[267] The need to adequately plan and cater for this expansion in the container transport task – which will be carried primarily on rail, but also on road – is therefore of significant importance to governments, shippers and consumers.

[264] www.fcl.com.au, 20 Oct. 2005

[265] Government of New South Wales, Department of Planning (2007). Major project assessment: Terminals Australia, Parkes Intermodal Terminal, viewed 7 December 2007, www.planning.nsw.gov.au.

[266] World Bank Report No. 33620: Implementation Report on a Loan in the Amount of US$ 71 million to the People's Republic of China for a Container Transport Project, 18 November 2005.

[267] Containerisation International, 2007, Informing the Industry – 40 years.

Table XV-4. Intermodal transport capability of selected facilities in China

Primary port connections	Hinterland connections	Location	Type	Served by (mode)	Annual throughput
Qingdao	Hebei Shanxi	Cangzhou	ICD	Road/Rail	
	Shandong	Handan	ICD	Road/Rail	~ 70,000 TEU
		Tangshan	ICD	Road/Rail	
		Quinghuangdao	ICD	Road/Rail	
Tianjin	Beijing	Chaoyang Inland Port	ICD	Road	160,000 TEU
		Feng Tai Wulidian	DP	Road/Rail	not known
	Inner Mongolia	Erenhot	DP	Road/Rail	3.5 m tons, 23,000 TEU
		Ceke	DP	Road/Rail	878,000 tons
		Ganqinmaodao	DP	Road/Rail	80,100 tons
		Jining	ICD	Road/Rail	not known
		Hohot	ICD	Road/Rail	not known
		Baotou	ICD	Road/Rail	~ 12,000 TEU
		Bayannao'er	ICD	Road/Rail	not known
		Linhe	ICD	Road/Rail	not known
Dalian	Liaoning				
	Jilin				
	Heilingjiang	Harbin	DP	Road/Rail	not known
	Inner Mongolia	Manzhouli	DP	Road/Rail	10.89 m tons

Sources: *1. World Bank: Implementation Completion Report on Loan for Container Transport Project (2005).*
2. ADB Technical Assistance Consultant's Report, Inner Mongolia Autonomous Region – Logistics Development Strategy, September 2006.
3. Integrated Shipping website: http.islcn.com viewed 5 December 2007.

One major initiative to cater for this expansion has been a programme launched by Railway Container Transport Corp. Ltd. (a subsidiary of the Ministry of Railways) in 2003. The project will see the construction of 18 new inland hub container handling facilities throughout China through joint venture private partners at a cost of US$ 1.6 billion.

These terminals will form the basis of a transport network composed of approximately 16,000 kilometres of railway by 2020. The terminals are planned for completion by 2010. The first of these terminals was completed in 2006 at a cost of US$ 60 million. As at December 2007, Shanghai and Kunming have been completed, and construction on Qingdao, Zhengzhou, Chongqing and Dalian have started.[268] The joint venture partnership will set its own tariffs, provide logistics services (including cargo consolidation, warehousing and storage), customs declarations, transhipment, and clearance and inspection.[269] Along with the creation of these terminals, it is reported that in 2007 the Chinese Government will have invested US$ 34 billion into railway construction with the support of international funding.[270]

3. India

Until 2005 when the Indian railway network was opened to 13 new entrants, intermodal transport in India was almost exclusively handled by one company, the Container Corporation of India (CONCOR). In 1988, CONCOR was established by the Ministry of Railways to promote containerized transport in India. After its incorporation, CONCOR inherited the then network of seven ICDs from the Indian Railways and was charged with their operation. By the end of 2007, the number of ICDs had grown to 57.[271]

[268] Containerisation International, 2007, Informing the Industry – 40 years.

[269] Viewed on the website of CB Richard Ellis, 5 December 2006, http://www.cbre.com/

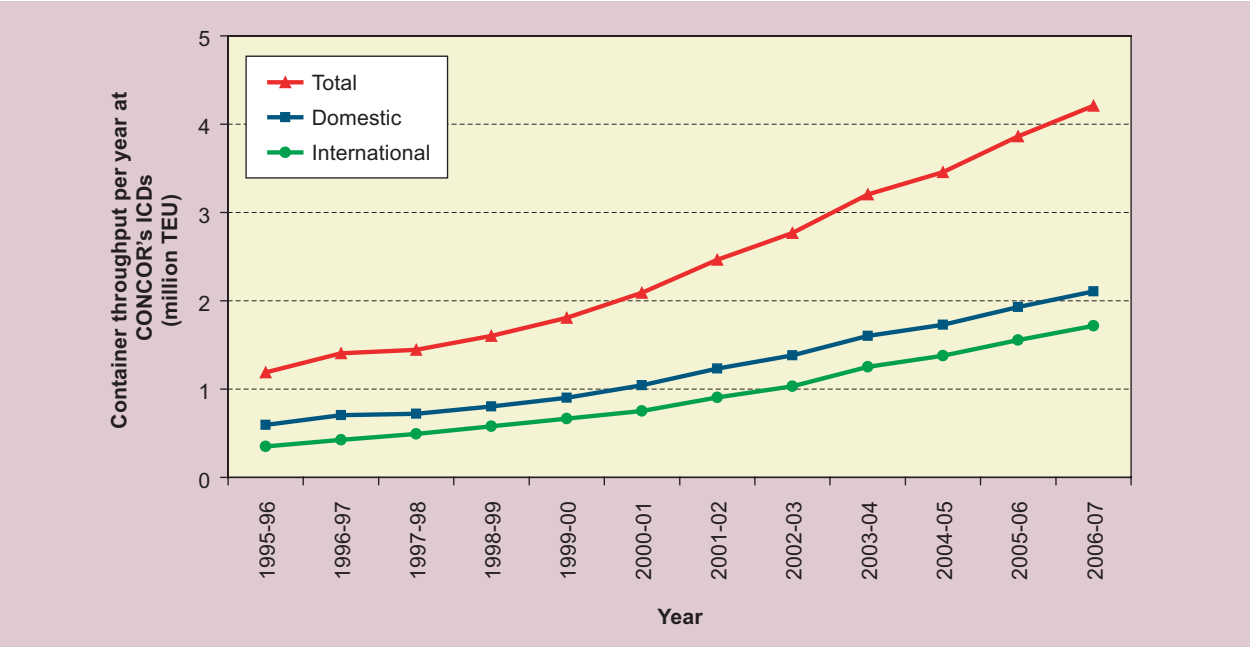
[270] Containerisation International, 2007, Informing the Industry – 40 years.

[271] Website of Container Corporation of India Ltd., 5 December 2007, www.concorindia.com

CONCOR provides multimodal transportation for both international and domestic traffic. 48 of CONCOR's ICDs are export-import container depots and nine are used exclusively for domestic containers. For domestic traffic, point-to-point container trains (called CONTRACKS) are run. CONCOR operates a wagon fleet of approximately 1,550 wagons (which it procured under a World Bank Loan in 1994);[272] and it has plans to procure another 1,680 of these wagons.

As can be seen in Figure XV-4 the number of containers (TEU) handled by CONCOR more than trebled since 1995 as its role has expanded to cover management of ports, air cargo complexes and cold-chain logistics.

Figure XV-4. Container throughput at ICDs operated by CONCOR 1995-2007



Source: Website of Container Corporation of India Ltd., 5 December 2007, www.concorindia.com

4. The Republic of Korea

Given that the Korea Maritime Institute has forecast that total container throughput of the ports of the Republic of Korea will grow at a rate of nearly five per cent per year until 2010,[273] there is a need to plan for such strong growth. The National Intermodal Transportation Network Plan (2000-2019) was set up to secure transportation infrastructure to boost national competitiveness in the 21st century and to build a transport system that will be sufficient to handle the expected intermodal freight.

There are five large-scale inland container depots that are in operation or under development in the Republic of Korea (Table XV-5). These ICDs are used primarily to distribute trade between the country's two main ports (Busan and Gwangyang) and the hinterland. Each of these facilities is connected by rail to both of these ports, and all (except Yangsan) have, or will be provided with full customs service. The first of these facilities, Uiwang ICD, was completed in 1993 with funding provided through a Build-Operate-Transfer contract with a private concessionaire.

[272] World Bank website, 5 December 2007, www.worldbank.org

[273] Korea Maritime Institute: *Inland Transport and Logistics in the ESCAP Region – Republic of Korea, China and Uzbekistan Cases,* December 2005.

Table XV-5. Inland container handling facilities in the Republic of Korea

Region	Location	Area (sqm)	Annual throughput (TEU)
Seoul	Uiwang, Kyunggi-do Province	74,520	1,300,000
Busan	Yangsan, Kyungsanam-do Province	93,960	1,412,000
Honam	Jangsung, Chollanam-do Province	190,923	400,000
Central	Chungboo, Chungchung buk-do Province	68,040	470,000
Youngnam	Expected to be operational in 2009	–	220,000

Source: Data received from Korea Maritime Institute, 2005.

5. Malaysia

Containerized cargo accounts for 55 per cent of the total throughput tonnage at Malaysian ports. By 2020, this share is expected to grow to 60 per cent. Malaysia's largest container ports, Port Klang and Tanjung Pelepas, were ranked 17th and 20th in the world in terms of throughput with 5.95 and 4.75 million containers, respectively.[274] Both have an established role in the international trans-shipment of containers by providing a feeder business to and from South Asia, Cambodia, Thailand and Viet Nam.

There are four major inland container depots located in Malaysia. Keretapi Tanah Melayu Bhd (KTMB), the national railway corporation, owns and jointly operates those at Padang Besar and Segamat together with its associated company, Multimodal Freight Service Sdn Bhd. A third terminal, the Nilai Inland Port is a joint venture between a private partner and the Negeri Sembilan State Government. The fourth terminal, the Ipoh Container Terminal, was developed as a joint venture between KTMB and the ports, through the Port Klang Authority (Table XV-6).

Table XV-6. Facilities and operations at four inland ports in Malaysia

Name	Location	Served by (mode)	Container yard area (m^2)	Annual handling capacity (TEU)
Ipoh Cargo Terminal	181 km south of Penang Port and 250 km north of Port Klang	Road/Rail	30,000	250,000
Nilai Inland Port	50 km South of Kuala Lumpur and 93 km from Port Klang	Road/Rail/ Inland waterway	Not known	not known
Padang Besar Cargo Terminal	158 km north of Penang Port and 588 km north of Port Klang	Road/Rail	20,000	>100,000
Segamat Inland Port	212 km south of Kuala Lumpur and 188 km north of Port Tanjung Pelepas	Road/Rail	101,000	>300,000

Source: Keretapi Tanah Melayu Bhd

6. Nepal

In Nepal, the increasing containerization of trade and the need for streamlining transit trade, led to a project on trade facilitation in 1994. A major component of the project was the construction of three Inland Container Depots (ICDs) in the bordering towns of Biratnagar, Bhairahawa and Birgunj, which are key land customs points. The first two are road-based and the third is a rail-based facility. The ICDs are designed to offer the complete range of modern infrastructure to facilitate expeditious clearance of import and export cargo movement by containers.

The Biratnagar ICD is spread over an area of 2.86 hectares and the Bhairahawa covers 3.23 hectares.The Birgunj ICD, located at Sirsiya, 4 km west of Birgunj town, is the biggest of the three, stretching over an area of 38 hectares. It is connected by broad gauge rail line with the Indian border town

[274] Containerisation International website, 6 December 2007, www.ci-online.co.uk

of Raxaul. Six full-length railway tracks inside the ICD were constructed with the grant assistance of the Government of India. The Birgunj ICD is equipped to provide rail/road trans-shipment, storage and customs facilities for containerized, break-bulk and bulk cargo moving by rail. The construction of the Birgunj ICD was completed by the end of December 2000, with rail line construction completed in March 2001. In addition, the construction of a 4 kilometres-long link road from the ICD to the main highway was completed in April 2001. Under the project, three reach stackers of 45 ton and one reach stacker of 7.5 ton were made available at the ICD for handling empty and loaded 20 ft and 40 ft ISO containers.

In March 2002, management and operation of the road based-facilities at Biratnagar and Bhairahawa were handed over to a Nepal–India joint venture company which was selected through competitive bidding for a 10-year lease contract. The terminal covers almost 38 hectares and has a maximum capacity of 200,000 TEU per year. It is connected by rail with Raxaul.

7. The Philippines

The geography of the Philippines archipelago promotes a natural requirement for freight to be moved using a combination of transport modes. Consequently, intermodal transport systems have been identified as playing a crucial role in the economic development of the widely dispersed regions of the country and are intended to alleviate areas with high poverty incidence. Historically, many regions have suffered from both inadequate infrastructure facilities and reliable and safe transport services, thus significantly impeding the movement of freight.

The Department of Transportation and Communications commissioned US$ 1 million to prepare an intermodal transport project to improve the existing infrastructure within the Philippines in 2003.[275] This initiative will complement the efforts of the Government of the Philippines to develop the Strong Republic Nautical Highway.

[275] www.adb.org/Documents/Profiles/PPTA/37233012.ASP

ANNEX
STATISTICAL NOTES

A. Aggregation

The regional aggregations used in this study are summarized in Table A-1. However, it should be noted that aggregations used for reporting trade in Part One, Chapter I, are slightly different, since they were motivated by strictly geographical criteria only.

Note that aggregates for groups of economies are simply the sums of available data for the various economies. If not explicitly mentioned otherwise, we have not established independent estimates for unknown totals or averages.

Small differences between sums of subgroup aggregates are due to independent rounding.

Table A-1. Groupings of countries and regions used throughout the present publication, except in Chapter I on merchandise trade, where groupings were made strictly according to geographical criteria

Groupings	Administrative regions and countries
Developed ESCAP countries	Australia
Developed ESCAP countries	Japan
Developed ESCAP countries	New Zealand
East and North-East Asia	China
East and North-East Asia	Hong Kong, China
East and North-East Asia	Democratic People's Republic of Korea
East and North-East Asia	Macao, China
East and North-East Asia	Mongolia
East and North-East Asia	Republic of Korea
East and North-East Asia	Taiwan Province of China
North and Central Asia	Armenia
North and Central Asia	Azerbaijan
North and Central Asia	Georgia
North and Central Asia	Kazakhstan
North and Central Asia	Kyrgyzstan
North and Central Asia	Russian Federation
North and Central Asia	Tajikistan
North and Central Asia	Turkmenistan
North and Central Asia	Uzbekistan
Pacific Islands	American Samoa
Pacific Islands	Cook Islands
Pacific Islands	Fiji
Pacific Islands	French Polynesia
Pacific Islands	Guam
Pacific Islands	Kiribati
Pacific Islands	Marshall Islands
Pacific Islands	Micronesia, (Federated States of)
Pacific Islands	Nauru
Pacific Islands	New Caledonia
Pacific Islands	Niue
Pacific Islands	Northern Mariana Islands
Pacific Islands	Palau
Pacific Islands	Papua New Guinea
Pacific Islands	Samoa
Pacific Islands	Solomon Islands

Table A-1. *(continued)*

Groupings	Administrative regions and countries
Pacific Islands	Timor-Leste
Pacific Islands	Tonga
Pacific Islands	Vanuatu
South and South-West Asia	Afghanistan
South and South-West Asia	Bangladesh
South and South-West Asia	Bhutan
South and South-West Asia	India
South and South-West Asia	Islamic Republic of Iran
South and South-West Asia	Maldives
South and South-West Asia	Nepal
South and South-West Asia	Pakistan
South and South-West Asia	Sri Lanka
South and South-West Asia	Turkey
South-East Asia	Brunei Darussalam
South-East Asia	Cambodia
South-East Asia	Indonesia
South-East Asia	Lao People's Democratic Republic
South-East Asia	Malaysia
South-East Asia	Myanmar
South-East Asia	Philippines
South-East Asia	Singapore
South-East Asia	Thailand
South-East Asia	Viet Nam

Note: See also http://www.unescap.org/ttdw/review/statisticalabstract.html for data availability.

B. Growth rates

If not explicitly mentioned otherwise, growth rates in this study are calculated as annual averages and expressed as percentages.

To calculate growth rates three different methods are commonly used:[276]

- *Least squares growth rate:* This growth rate r is calculated by fitting a linear regression trend line to $1n\ X_t = a + bt$, which is the logarithmic transformation of the growth equation $X_t = X_0 (1 + r)^t$, where X_t is the time series (values of the annual variable in year t). If the time series is sufficiently long enough, $r = e^{best} - 1$ is the least squares estimate for the growth rate, with *best* being the least-squares estimate for b;
- *Exponential growth rate:* This growth rate is defined as $r = \{1n\ (X_t/X_0)\}/(t - 0)$ for a continuous time parameter; and
- *Geometric growth rate:* This growth rate is calculated as $r = \exp\ \{1n\ (X_n/X_0)/n\} - 1$ for discrete periods ($n = 0, 1, 2, 3,...$).

In contrast to the least squares estimate, both the exponential growth rate and the geometric growth rate r only depend on the variable at two points in time and is independent of what happens between those two points. The exponential growth rate can also be used to measure continuous growth, in contrast to the geometric growth rate.

Owing to the different professional backgrounds of the staff who have contributed to the various chapters of this review, both the exponential and geometric growth rates have been used.

[276] For background information, see *World Development Indicators 2001* (World Bank, 2001).

Differences in growth rates may arise from:

- the different methods used to calculate the rates;
- whether growth rates are computed from constant price series or current prices series;
- whether growth rates are calculated based on rounded absolute numbers or not (to account for uncertainties in the form of error intervals); and
- from using different original data sets (absolute values) to start with.

In other words, statements such as "the average annual GDP growth rate was 6 per cent from 1990 to 1998" and "The average annual GDP growth rate was 5.6 per cent from 1990 to 1998" may well both be correct, even if they are based on the same original data set. The numbers are necessarily different, since they are a shorthand for two different statements.

More information on data from this and previous reviews published by the Secretariat will be made available on its website on a continuous basis at http://www.unescap.org/ttdw/review/

كيفية الحصول على منشورات الامم المتحدة

يمكن الحصول على منشورات الامم المتحدة من المكتبات ودور التوزيع في جميع انحاء العالم • استعلم عنها من المكتبة التي تتعامل معها أو اكتب الى : الامم المتحدة ،قسم البيع في نيويورك او في جنيف •

如何购取联合国出版物

联合国出版物在全世界各地的书店和经售处均有发售。请向书店询问或写信到纽约或日内瓦的联合国销售组。

HOW TO OBTAIN UNITED NATIONS PUBLICATIONS

United Nations publications may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to: United Nations, Sales Section, New York or Geneva.

COMMENT SE PROCURER LES PUBLICATIONS DES NATIONS UNIES

Les publications des Nations Unies sont en vente dans les librairies et les agences dépositaires du monde entier. Informez-vous auprès de votre libraire ou adressez-vous à : Nations Unies, Section des ventes, New York ou Genève.

КАК ПОЛУЧИТЬ ИЗДАНИЯ ОРГАНИЗАЦИИ ОБЪЕДИНЕННЫХ НАЦИЙ

Издания Организации Объединенных Наций можно купить в книжных магазинах и агентствах во всех районах мира. Наводите справки об изданиях в вашем книжном магазине или пишите по адресу: Организация Объединенных Наций, Секция по продаже изданий, Нью-Йорк или Женева.

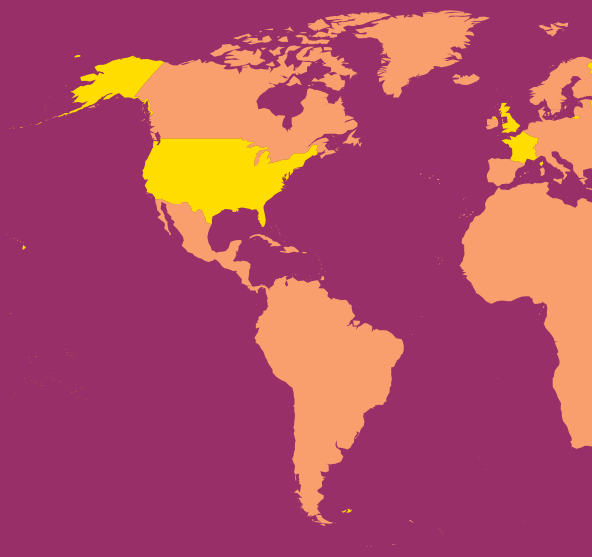
COMO CONSEGUIR PUBLICACIONES DE LAS NACIONES UNIDAS

Las publicaciones de las Naciones Unidas están en venta en librerías y casas distribuidoras en todas partes del mundo. Consulte a su librero o diríjase a: Naciones Unidas, Sección de Ventas, Nueva York o Ginebra.

Printed in Bangkok
March 2009 – 540

United Nations publication
Sales No. E.08.II.F.4
Copyright © United Nations 2009
ISBN: 978-92-1-120534-3
ST/ESCAP/2485

9 789211 205343



UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

United Nations Building • Rajadamnern Nok Avenue • Bangkok 10200 • Thailand
www.unescap.org/ttdw