18. Transport infrastructure

The strategic supply-driven provision of transport infrastructure in many Asian and Pacific countries has significantly contributed to their economic growth and integration into the world economy.

Although the focus herein is on investment in road and railway infrastructure, it should be noted, that seaport and airport infrastructure stocks have contributed significantly to transport infrastructure growth in the region (ESCAP, 2005a).

The density of roads per unit of surface area, measured in kilometres of road per 1,000 square kilometres of land, is an indicator of geographical accessibility. In Asia and the Pacific, there is an extremely wide range of road density, from 33 km per 1,000 square km in Kazakhstan to 4,627 km per 1,000 square km in Singapore. In fact, Singapore, along with Macao, China, and Hong Kong, China, is among those with the highest road density in the world (table 18.1).

Among the countries with the largest increase in the road network, Bhutan, Nepal, Viet Nam and Lao PDR more than doubled their road density between 1990 and 2004, Republic of Korea and India also almost doubled their road networks between the 1990s and 2000s, as shown in figure 18.1.

In addition to increasing the road length, countries have also invested in road widening schemes that have significantly contributed to the total lane width. According to some estimates, about US\$ 170 billion was invested in improving Asian roads in 2006, accounting for roughly two thirds of all transport infrastructure expenditures in the region.

Yet, road densities and effective network access levels in most Asian countries continue to be much lower than in European or North American countries of similar geography and settlement patterns. This implies a great need for further transport infrastructure development in the region.

The need for such investments is also reflected in the share of paved roads in all roads. Although this share has increased considerably in many countries during the last decade, it continues to be less than one quarter in some, such as Cambodia, the Democratic People's Republic of Korea, Myanmar and Papua New Guinea, according to the latest available estimates.

Figure 18.2 shows the percentage of paved roads for 1990 and latest available data. All roads in Macao, China, Hong Kong, China and Singapore



Figure 18.1 Index of change in road density in Asia and the Pacific, 1990-latest available data

are paved. What is notable is that Thailand experienced one of the highest increases in the entire region, from 55 per cent in 1990 to 98 per cent in 2000. The percentage of roads paved also increased, at varying rates, in Kazakhstan, the Republic of Korea, Malaysia, Brunei Darussalam, Pakistan, and Afghanistan.

While Brunei Darussalam more than doubled the percentage of roads paved, from 31 per cent in 1990 to 78 per cent by 2004, this share increased in Afghanistan to 24 per cent from only 13 per cent in 1990. Kazakhstan also registered a sizeable rise in the proportion of roads paved, from 55 per cent at the beginning of the 1990s to 93 per cent by the mid-2000s.

Although railway density in Asia and the Pacific remains low in comparison with more advanced regions, it is the highest among the developing regions of the world. According to 2005 figures, Asia and the Pacific has a railway density of 7 km per 1,000 square km, which places it ahead of Africa, at 4, and Latin America and the Caribbean, at 6. North America and Europe, on the other hand, have railway densities twice as high and six times as high, respectively, as that of Asia and the Pacific.



Figure 18.2 Proportion of paved roads to total roads in Asia and the Pacific, 1990-latest available data

According to ESCAP (2005a), barely half of the countries in the region have constructed a sizeable intercity railway system. Moreover, in the recent years, only a handful of Asian developing countries have invested extensively in railways. Almost all the increase in the region's railway length is attributed to the improvement in China and, to a lesser extent, the Republic of Korea. Japan, however, continues to have, by far, the highest railway density in the region, at 55 km per 1,000 square km, followed by the Republic of Korea, at 34 km per 1,000 square km, and some Central Asian countries, such as Armenia, Azerbaijan and Georgia, which have densities of about 20 km per 1,000 square km. Still, there are some signs of a possible revival of railways across the region, which would have substantial environmental and safety benefits.





Motorization rates, measured as the number of passenger cars in use per 1,000 people, have increased appreciably in the Asian and Pacific region. While this has improved mobility, contributing to economic growth, it has also led to an increase in pollution levels and traffic accidents.

Brunei Darussalam can lay claim to the highest number of passenger cars per 1,000 people, estimated at 618 in 2004. It also recorded the largest increase in the entire region since 1990, when it had 416 passenger cars per 1,000 people. Motorization rates also rose considerably in Japan and the Republic of Korea, to 438 and 223, respectively, an increase of more than 150 cars per 1,000 people.

Populous countries, on the other hand, have low motorization rates. China and India, for example, have rates of just 13 and 8 per 1,000 people, respectively. Some ASEAN countries also have low motorization rates. Myanmar, Malaysia, Indonesia and the Philippines have less than 20 passenger cars per 1,000 people.

It should be noted, however, that personal mobility levels in many South and South-East Asian countries are considerably higher than the relative number of cars in use suggests, as two- and threewheelers constitute more than two thirds of all motorized vehicles in Cambodia, Bangladesh, Nepal, Sri Lanka, Indonesia, the Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam, among other developing countries.





Figure 18.4 Number of passenger cars in Asia and the Pacific, 1990 and 2004

As motorization rates continue to rise globally, leading to higher vehicle densities, road traffic accidents have increased as well. Worldwide, road accidents kill an estimated 1.2 million people and injure or disable up to 50 million people per year. Most road traffic deaths occur in poor countries, where these types of accidents rank as a leading cause of death.

The upgrading of the road network in Asia and the Pacific has been followed by rapidly increasing traffic levels, which have contributed to one of the worst road safety records in the world. More than half of the world's traffic fatalities occur in Asia and the Pacific, even though only one in five of the world's motor vehicles are registered in this region.

Roughly half of all road fatalities in the Asian and Pacific region occur in China and India, although, in terms of the ratio to total number of deaths, they are considerably lower than in other parts of the region. In China 1,205 out of every 100,000 deaths was due to traffic accidents in 2003, up from 592 in the early 1990s. In India, 887 out of every 100,000 deaths in 2003, compared to 618 in 1990, were traffic-related. Malaysia ranks highest in the region, with traffic accidents causing 5,669 out of every 100,000 deaths. In Brunei Darussalam and the Republic of Korea, there are 2,837 and 2,780 traffic fatalities per 100,000 deaths, respectively. In Viet Nam and Thailand, on the other hand, the contribution of traffic accidents to all deaths was slightly lower in 2003. It is noteworthy, however, that Brunei Darussalam and the Republic of Korea experienced the largest reduction in the share of traffic fatalities in all deaths between 1990 and 2003, while Malaysia, Viet Nam and Thailand are among the countries with the highest increase in this share during the same period, as shown in figure 18.5.





Railway density (km per 1,000 km²): The length of rail lines divided by the land area expressed in 1,000 km². Rail lines are the length of railway route available for train service measured in kilometres, irrespective of the number of parallel tracks. *Aggregates:* Averages are calculated using land area as weight. *Source:* World Bank, *World Development Indicators* (online database, accessed in June 2007).

Roads density (km per 1,000 km²): The total road network divided by the land area. Total road network includes motorways, highways, and main or national roads, secondary or regional roads, and all other roads measured in kilometres in a country. *Aggregates:* Averages are calculated using land area as weight. Missing data for roads density have been imputed. *Source:* World Bank, *World Development Indicators* (online database, accessed in June 2007).

Paved roads (percentage of total roads): The share of roads surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, concrete, or cobblestones, expressed as a percentage of the length of all roads. *Aggregates:* Averages are calculated using land area as weight. Missing data for paved roads have been imputed. *Source:* World Bank, *World Development Indicators* (online database, accessed in

June 2007).

Passenger cars in use (per 1,000 population): The number of passenger cars, expressed per 1,000 population. Covers road motor vehicles designed for the conveyance of passengers and seating not more than nine persons including the driver. Taxies, jeep-type vehicles and station wagons are included. Special-purpose vehicles, such as two-wheeled or three-wheeled cycles or motorcycles, trams, trolley-buses, ambulances, hearses, and military vehicles operated by police or other governmental security organizations, are excluded. *Aggregates:* Averages are calculated using total population as weight. *Source:* United Nations Common database (online database, accessed in August 2007).

Traffic accident casualties (per 100,000 deaths): The total number of deaths caused by traffic accidents during a given period divided by the total number of deaths from all causes during the same period, expressed per 100,000 deaths. *Aggregates:* Averages are calculated as the sum of accident casualties divided by the sum of total deaths. Missing data for traffic accident casualties have been imputed. *Source:* Asia-Pacific Road Accident Database (APRAD) (online database, accessed in June 2007).

18.1 Railways and roads infrastructure

	Rail	way dei	nsity		Paved roads						
	Km per 1,000 km ²			Km per 1,000 km ²				% of total roads			
	1990	2000	2005	1990	2000	2003	2004	1990	2000	2003	2004
East and North-East Asia											
China	6	6	7	127	151	195	201			79	81
DPR Korea				231		4.040	4.050	6		100	400
Macao, China				1 499	16 200	12 778	12 929	100	100	100	100
Mongolia	1	1	1	27	31	12 110	12 525	10	4	100	100
Republic of Korea	31	32	34	574		985	1 016	72		77	87
South-East Asia											
Brunei Darussalam				192				31			78
Cambodia	3	3	4	203	100		217	8			6
Indonesia				159	196	125		45	57	14	
Malavsia	5	5	5	262		281	300	70		81	81
Myanmar	5	Ū	Ū	38		201	000	11		0.	0.
Philippines	2			538	676	671			21	22	
Singapore	0	0		4 176	4 584	4 606	4 627	97	100	100	100
I hailand	8	8		141	112			55	98		
Viet Nam	9	10	9	295	693		717	24			
South and South-West Asia	Ū	10	Ū	200	000			21			
Afghanistan				32			53	13			24
Bangladesh	21	21	22	1 444		1 838	00			10	
Bhutan				50		171		77		62	
India	21	21	21	673	1 115				47		
Iran (Islamic Rep. of)	3	4	4	80		110				67	
Nenal			0	48		111	122	38			30
Pakistan	11	10	10	219	311	330	335	54	56	60	65
Sri Lanka	22			1 439		1 505				81	
Turkey	11	11	11	477	463	554	555		35		
North and Central Asia											
Armenia		30	26			271		99		100	
Azerbaijan		22	26		332	201	715	04		20	49
Kazakhstan		5	19		293	291	291	94 55		39 94	93
Kvrgvzstan		U	2			00	00	90		54	50
Russian Federation		5	5		32			74			
Tajikistan			4		198			72			
Turkmenistan		0	5					74			
Uzbekistan		9	9					79			
Pacific											
Cook Islands											
Fiji			33	167				44			
French Polynesia											
Guam											
Kiribati Marehall Islands											
Micronesia (E.S.)								16			
Nauru											
New Caledonia											
Niue											
Northern Mariana Is.											
Papua New Guinea				41				3			
Samoa								Ū			
Solomon Islands				43				2			
Tonga											
ruvalu Vanuatu								22			
ESCAP Dovelaged Economics								22			
Australia	1	1	1	105		105		35			
Japan	56	55	55	3 057	3 200	105		69	77		
New Zealand	15			346	343	347		57	63	64	
50040	-	0	-	000	101			40			
LLDC	/	6	7	226	191			48			
LDC	7	11	8	143		189		15		17	
SIDS			Ū	56	62	63	63	5	6	6	6
ASEAN				180	226			37	49		
SAARC	19	19	18	519	817				43		
Central Asia	10	6	6	200	100				20		
Middle-income	13	13	6	322	402 100	115			33		
High-income	4	4	4	247	257	110		38	42		
Africa	4	4	4	58				26			
Latin America & Carib.	6		6	150				17			
North America	13	17	16	387	412	429	430	47		51	50
Europe	47	49	46	1 099		1 107		82		86	
Other Asia-Pacific											
World											

18.2 Passenger cars and traffic casualties

		Passe	enger cars	s in use		Traffic accidents casualties					
		Por	- 1 000 popu	lation							
	1990	1995	2000	2003	2004	1990	1995	2000 u	2003	2004	
Fast and North-Fast Asia											
China	1.4	3.4	6.7	11.4	13.3	592	857	1 118	1 205		
DPR Korea											
Hong Kong, China	37.7	48.8	52.5	51.7	52.0	1 056	780	500	548		
Macao, China Mongolia	67.2	85.0	111.1	123.6	130.4	1 905	1 188	858	854		
Republic of Korea	48.4	133.4	172.8	216.4	222.7	4 893	4 163	4 056	2 780	2 494	
South-East Asia				21011					2.00	2.01	
Brunei Darussalam	416.3	481.4	548.8	592.9	618.0	5 384	6 569	4 404	2 837		
Cambodia	0.5	0.7	0.6				74	308	617		
Indonesia	7.2	10.7	14.4	17.6		687			606		
Lao PDR	0.0	10.4	45.0	47.5	10.1	183	600	5 704	955		
Malaysia	8.6	12.4	15.0	17.5	19.1	3 495	5 /58	5 /01	5 669		
Philippines	17.5	3.4 23.7	28.3	3.9 13.5	4.0	345	209	234	273		
Singapore	95.1	104.7	103.1	101.2	102.5	1 550	1 337	1 118	1 041		
Thailand	22.5	33.3	43.9	54.7	47.8	1 451	3 754	2 364	2 479		
Timor-Leste											
Viet Nam						395			2 648		
South and South-West Asia											
Afghanistan	2.4	0.1	0.3								
Bangladesh	0.4	0.4				135		253			
Bhutan	0.4	4.0	5.0	7.0		96	764	000	007		
India Iran (Islamic Rep. of)	27.5	4.0	5.9 17.2	7.0		010	764	603	007		
Maldives	4.6	4 0	7.3	7.0	6.9						
Nepal	1.1	1.6	2.0			212	336	412			
Pakistan	4.9	6.1	7.4	8.4	8.8	396	472	434	414	447	
Sri Lanka	10.2	12.7	17.9	23.4	26.6	1 613	1 393	1 602			
Turkey	28.8	48.8	64.9	66.1	75.0		1 443	1 372	963		
North and Central Asia											
Armenia						2 749	1 079	806	928		
Azerbaijan	36.1	35.7	40.8	44.8	48.6	2 463	1 /60	1 086	1 263	1 383	
Kazakhstan	00.3 49.0	65.0	66.9	76.6	79.7	2 842	1 714	1 195	1 708		
Kyrgyzstan	44.4	43.1	38.4	37.0	38.0	193	1 675	1 547	2 213		
Russian Federation	60.3	95.2	137.3	160.0	166.5	1 967	1 602	1 330	1 540		
Tajikistan		28.8	19.0			1 919	1 110	934	992	980	
Turkmenistan						2 248	1 261		1 372		
Uzbekistan						2 116	1 184	1 283			
Pacific											
American Samoa	84.9	95.0									
Cook Islands	FF 2	65.1	76 1	017	09.4	1 047	1 724				
French Polynesia	55.5	05.1	70.1	31.7	90.4	1 547	1754				
Guam	530.2	549.6	418.9								
Kiribati											
Marshall Islands											
Micronesia (F.S.)											
Nauru New Caledonia	215 7	274.5	404.6	122.5							
Niue	515.7	274.5	404.0	423.5							
Northern Mariana Is.											
Palau											
Papua New Guinea		4.2	4.6			655					
Samoa						1 626					
Tonga	21.2	82.1	51.0	70.0		1 961					
Tuvalu	21.2	02.1	51.0	10.9		1 901					
Vanuatu	26.8	40.6	15.8								
ESCAP Developed Economies											
Australia	454.7	479.3		522.4	529.3						
Japan	282.7	356.1	415.1	432.5	438.2	1 367	1 165	1 055			
New Zealand	440.1	453.3	494.5	510.5	530.3	2 686	2 125	1 648	1 626		
ESCAD	22.0	20.7	22 E	11 2	62.1	701	0.20	1 000			
	23.0	29.1	33.5	41.3	03.1	1 454	920	990			
LDC	0.9	1.1				142	1 000	282			
SIDS	101.7	59.6	59.5	107.4	96.7	981	855	794	754		
ASEAN	11.5	16.3	20.7	21.9		675			1 202		
SAARC	3.1	3.9	6.1	8.1		539	665	759	777		
Central Asia	0.4	4.0	E 0	7.0		2 205	1 393	1 194	1 403		
Middle-income	3.1 10 Q	4.0	5.9 22.6	27.6	31.1	529 QO1	1 003	1 162	0∠1 1.242		
High-income	239.0	305.4	337.1	374.3	380.2	2 168	1 778	1 628	1 242		
Africa	15.2	16.0				1.00					
Latin America & Carib	15.5	70.1	87 1								
North America	700.5	691.3	727.3	738.7							
Europe	293.5	339.2	381.3	403.0	408.6						
Other Asia-Pacific											

World