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TRANSPORT

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## **1. CURRENT SITUATION IN THE ASIA-PACIFIC REGION**

1. Asia and the Pacific has witnessed remarkable economic growth over recent years, with developing economies growing at an average 7 per cent annually, prior to the recent economic downturn. The provision of transport services, along with lower barriers to trade and investment, and lower information technology costs are widely acknowledged as the principal driving forces behind this growth and development.

2. High economic growth rates have allowed lifting millions across the region out of poverty: the percentage of population living on less than US\$ 1.25 a day has decreased from 41.7 in 1990 to 24.5 in 2005. Poverty remains, however, one of the principal persistent challenges in the region, still home to 2/3 of the world poor.

3. The benefits from improved transport have benefited mainly populations in coastal areas in Asia, particularly near seaports. There remains, therefore, a substantial transport task in reaching out to large populations in deeper hinterlands and rural areas as well as landlocked countries to encourage inclusive prosperity.

4. At the same time, negative externalities associated with transport, in particular its impact on the global and local environment, as well as on health and safety, are source of growing concern. The transport sector is the third largest consumer of energy and the largest consumer of petroleum products in the ESCAP region. Its energy consumption is growing faster than other sectors and other regions driven by rapid increase of motorization and strong transport demands from economic development. Meanwhile, the transport sector is the primary sources or precursors of air pollution and the second largest contributor to carbon dioxide emissions. These facts require the transport sector in the region to take more effective measures to reduce energy consumption and emissions.

### **1.1 Economic outlook and drivers of transport demand**

5. Except for the period of the 1997-1998 crisis, economic growth in Asia and the Pacific has been robust over the past two decades. The region's real GDP nearly doubled between 1990 and 2007. Asia and the Pacific is now one of the world's most important sources of economic output: in 2007, it was responsible for 27.6 per cent of global output – 1.3 percentage points higher than in 1990 (shares calculated in current prices).<sup>1</sup>

6. During 1990-2007 for Asia and the Pacific as a whole, the share of agriculture in value added declined from 9.5 to 8.1 per cent, that of industry grew from 37.6 to 39 per cent, while that of services remained stable at 52.9 per cent. Except in the least developed countries of the region, industry has generally grown faster than agriculture. Indeed one of the most notable aspects of growth in Asia and the Pacific region has been the phenomenal growth in industry in the middle-income economies – which in value-added terms has made this the world's most industrialized region.

7. International trade is one of the main drivers behind accelerated economic growth in the region. International trade has been growing rapidly, faster than global production. Globally since 1990, the volume of merchandise trade has more than tripled, while in Asia and the Pacific it has almost quadrupled, and the speed of growth is increasing all the time. During the period 2000-2006, merchandise exports from Asia and the Pacific grew annually by 12.9 per cent, two percentage points faster than the world average. Annual growth was highest in the Asian-Pacific middle-income economies, 18.4 per cent, while the high-income economies it was only 8.2 per cent.<sup>2</sup>

8. Transport plays a crucial role in the economic and trade development of countries and consequently in the welfare of their people. The ability of industries to produce goods and services is

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<sup>1</sup> ESCAP Statistical Yearbook for Asia and the Pacific 2008

<sup>2</sup> UNESCAP (2009). *Statistical Yearbook for Asia and the Pacific for 2008* (Bangkok: United Nations Publications).

dependent on transport to bring raw materials, spare parts, labour and energy from different locations and to deliver manufactured goods, agricultural products and services to domestic consumers and international markets.

9. The Asia-Pacific's freight sector is experiencing growth rates that are testing both the provision of infrastructure and the sector's long-term sustainability. With the Asia-Pacific as both an export and import hub, strains on road, rail, port, waterway, and air infrastructure have become evident.

10. Between 2005 and 2006, the number of twenty-foot equivalent unit containers handled by the world's ports increased by 12 per cent, to 427 million. Of this throughput, more than half was in the Asia-Pacific region, which that year increased its share from 60 to 61 per cent. In 2006, of the world's top 25 container ports in terms of throughput, 17 were in Asia. The economies handling the most traffic were: China; Singapore; Hong Kong, China; Japan; and Republic of Korea.”<sup>3</sup>

11. As development in coastal areas outpaces that in hinterland locations, the levelling out of adverse spatial effects is important. A functioning transport system is not only a precondition for greater efficiency but also a tool for more equitable development across territorial units both within and across countries. This also leads to a more efficient integration of the hinterland markets into the economy.

12. Improved accessibility is even more crucial to landlocked countries that suffer from limited access to regional and global markets. Such countries bear the costs of inefficiencies at land border crossings and transits through neighbouring countries. Improved transport accessibility allows landlocked developing countries to participate in and benefit from the globalization.

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<sup>3</sup> UNESCAP (2009). *Statistical Yearbook for Asia and the Pacific for 2008* (Bangkok: United Nations Publications).

13. The Asia-Pacific region has witnessed extraordinarily rapid urbanization in recent years. Currently 1.6 billion people or 40 per cent of Asians live in urban areas. By 2030, a majority (around 2.7 billion) will live in cities and towns. This means adding a new town of about 120,000 people every day for the next 20 years.

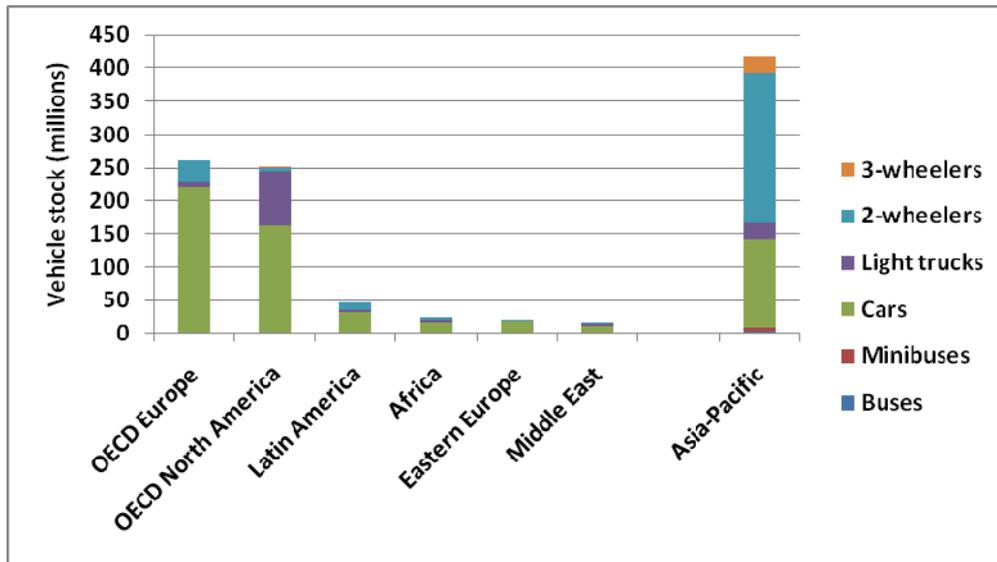
14. Urbanization levels in the Asia-Pacific region are also influencing mobility patterns and private vehicle usage. At the same time that Asia's cities are expected to grow by over 40 million per annum, urban densities are expected to fall as a result of increasing wealth and declining household size. The result is that most developing cities are likely to at least double in geographical size over the next 20 years.<sup>4</sup>

15. As a region, the Asia-Pacific holds the highest total number of motorized vehicles in the world as summarized in Figure 1.

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<sup>4</sup> Asian Development Bank (2009). *Changing Course: A New Paradigm for Sustainable Urban Transport* (Manila, ADB)

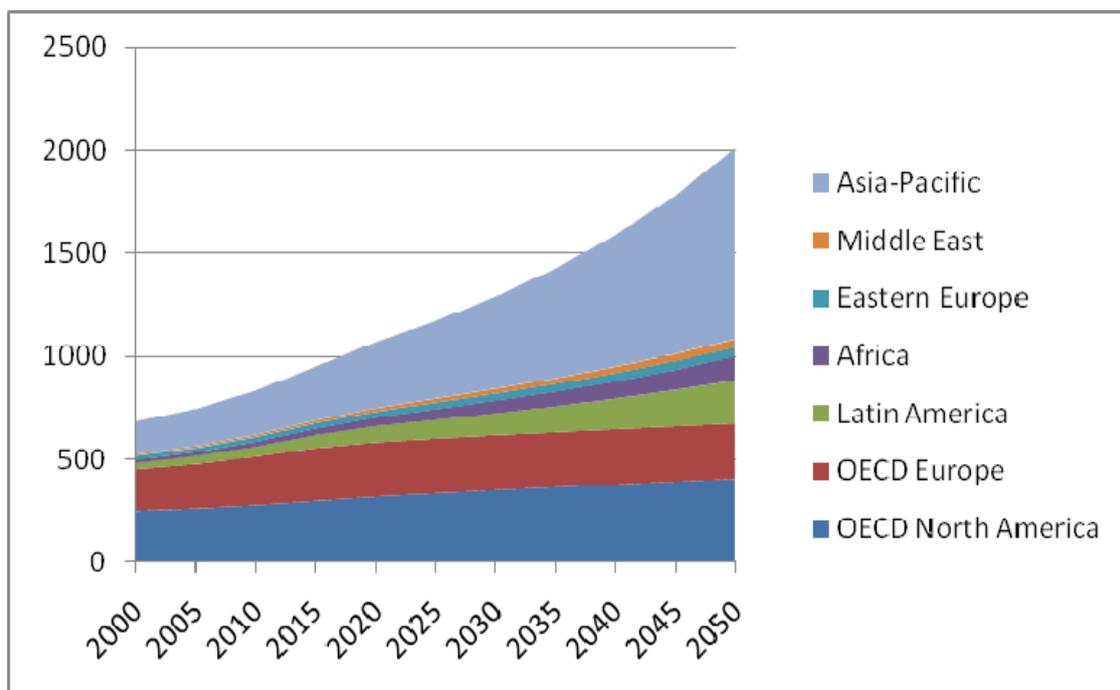
Figure 1. Total stock of motorized vehicles (2005), millions<sup>5</sup>



16. Vehicle ownership in the Asia-Pacific region is currently dominated by two-wheelers such as mopeds, scooters and motorcycles. Two-wheelers are likely to be merely the first step towards full individual motorized mobility. Figure 2 summarizes the vehicle growth patterns projected by the International Energy Agency.

<sup>5</sup> International Energy Agency (forthcoming). *Mobility Model* (Paris, IEA).

**Figure 2. Project growth rate in motorized vehicle stock, millions<sup>6</sup>**



17. The growth rates are such that “even if considerable improvements could be made in fuel efficiency and in reducing vehicle emissions, the growth in vehicle numbers may at the aggregate level offset many of these gains.”<sup>7</sup>

## 1.2 Rural transport services and its socio-economic impacts

18. Transport provides rural areas with the ability to participate better in development opportunities. Rural entrepreneurship and trade will be promoted by adequate transport services and infrastructure. Transport infrastructure projects have both direct and indirect impacts on poverty reduction in rural areas.

<sup>6</sup> International Energy Agency (2004). *The IEA/SMP Transportation Model* (Paris: IEA).

<sup>7</sup> ESCAP (2008). *Transport and Environment: Energy Consumption (Utilization) and Emissions*, E/ESCAP/CTR/3 (Bangkok: ESCAP).

19. The lack of adequate transport services in rural areas negatively affects rural economic development and can lead to greater migration to cities. Efficient access to markets, especially for transporting agricultural goods, is an imperative for making rural economies a viable choice.

20. A well-defined transport network between towns and villages can also be instrumental in achieving flexibility with seasonal employment. Ease of movement allows persons to efficiently react to economic changes from one area to another.

21. Economic inefficiencies are not the only outcome of poor accessibility. The lack of access to educational and healthcare facilities represents a significant social and economic cost. In rural areas, the distance to schools and the quality of the roads is a major determinant in education completion rates. In one study, poor quality access translated into attendance rates of only 21 per cent for girls and 58 per cent for boys. Evidence from Thailand also suggests the high cost of transport is a principal reason for removing children from school.<sup>8</sup> Likewise, the ability to deliver healthcare is compromised by poor access. Research has shown the proximity to a hospital as a significant explanatory variable in infant and child mortality. Distance also affects the success of vaccination programmes, especially when a regimen of multiple vaccinations is required.

### **1.3 Sustainability concerns in the transport sector**

22. The transport sector ranked third in total energy consumption in the ESCAP region in 2006. As shown in Table 1a, total energy consumption by ESCAP member countries was 3.4 billion tons of oil equivalent, of which industrial uses consumed the largest amount at 33.9 per cent, followed by residential 27.8 per cent, transport 17.2 per cent, others 14.6 per cent, and commercial and public services 6.5 per cent.

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<sup>8</sup> UK Department for International Development (2002). *Transport's Role in Achieving the Millennium Development Goals* (DFID: London).

23. The principal energy product used by the transport sector is petroleum. In 2006, it represented 90.6 per cent of the energy consumed by the sector (Table 1b). Of all the sectors, transport is the largest consumer of petroleum, accounting for 46.6 per cent (Table 1c).

**Table 1. Asian and Pacific Energy Consumption by Source and Sector, 2006**

(a) Total final consumption (thousand tons of oil equivalent)

	Transport	Industrial	Residential	Commerce & Public Services	Others	Total	Percentage by Source
Petroleum	539,197	158,405	93,819	58,000	306,682	1,156,104	33.4
Natural Gas	38,873	123,622	132,898	36,736	78,755	410,884	11.9
Coal	3,747	455,291	55,005	11,740	50,040	575,823	16.6
Renewable Energy	242	57,280	494,071	7,411	4,703	563,706	16.3
Electricity	12,947	286,304	112,603	92,731	45,050	549,636	15.9
Others	12	91,384	74,071	19,656	18,496	203,620	5.9
Total	595,018	1,172,286	962,467	226,274	503,726	3,459,773	100.0
Percentage by Sector	17.2	33.9	27.8	6.5	14.6	100.0	

(b) Consumption by sector (percentage)

	<b>Transport</b>	<b>Industrial</b>	<b>Residential</b>	<b>Commerce &amp; Public Services</b>	<b>Others</b>	
Petroleum	90.6	13.5	9.7	25.6	60.9	
Natural Gas	6.5	10.5	13.8	16.2	15.6	
Coal	0.6	38.8	5.7	5.2	9.9	
Renewable Energy	0.0	4.9	51.3	3.3	0.9	
Electricity	2.2	24.4	11.7	41.0	8.9	
Others	0.0	7.8	7.7	8.7	3.7	
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	

(c) Consumption by source (percentage)

	<b>Transport</b>	<b>Industrial</b>	<b>Residential</b>	<b>Commerce &amp; Public Services</b>	<b>Others</b>	<b>Total</b>
Petroleum	46.6	13.7	8.1	5.0	26.5	100.0
Natural Gas	9.5	30.1	32.3	8.9	19.2	100.0
Coal	0.7	79.1	9.6	2.0	8.7	100.0
Renewable Energy	0.0	10.2	87.6	1.3	0.8	100.0
Electricity	2.4	52.1	20.5	16.9	8.2	100.0

Others	0.0	44.9	36.4	9.7	9.1	100.0
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Source: International Energy Agency, *Database of Energy Balances of OECD Countries* and *Database of Energy Balances of Non-OECD Countries*, 2008.

24. The transport sector in the ESCAP region consumed 556 million tons of petroleum in 2006, representing 26 per cent of the global petroleum consumption by the transport sector, see Table 2. The growth rate of petroleum consumption by the transport sector in the region has been much higher than that of the rest of the world since 1990.

**Table 2. Petroleum Consumption in the Transport Sector**

	1990	1995	2000	2005	2006
Asia & Pacific (million tons of oil equivalent)	343.5	393.0	453.3	538.3	556.3
World (million tons of oil equivalent)	1490.8	1639.4	1853.3	2063.4	2110.2
Share of Asia & Pacific in world	23.0%	24.0%	24.5%	26.1%	26.2%
Average annual growth of Asia & Pacific	2.8%	2.9%	3.1%	3.7%	3.3%
Average annual growth of the rest of world	0.9%	1.7%	2.5%	1.8%	1.9%

Source: International Energy Agency, *Energy Balances of OECD Countries* and *Energy Balances of Non-OECD Countries*, 1998-1999, 1999-2000, 2008.

25. Table 3 shows that within the transport sector in the region, road transport consumed the largest share of petroleum, 78.9 per cent. This is also true in the oil consumption pattern within the transport sector in the world.

**Table 3. Petroleum Products Consumption by the Transport Sector, 2006**

	Asia and the Pacific		World	
	Million tons of oil equivalent	Percentage	Million tons of oil equivalent	Percentage
Road	437.2	78.9%	1,591.4	75.6%
Aviation	72.5	13.1%	246.1	11.7%
World marine bunkers			183.0	8.7%
Domestic navigation	16.9	3.1%	37.3	1.8%
Rail	13.7	2.5%	37.6	1.8%
Pipeline transport	5.4	1.0%	5.4	0.3%
Non-specific	8.3	1.5%	4.1	0.2%
Total	554.0	100%	2,104.9	100%

Source: International Energy Agency, *Energy Balances of OECD Countries* and *Energy Balances of Non-OECD Countries*, 2008.

26. Large and increasing demand for oil coupled with supply and capacity constraints push up oil prices in the world. High oil prices naturally increase transport cost and thereby high production costs

and prices of products. This finally affects trade, welfare of people and economic performance of countries. The interaction between oil prices and that of other goods and services has been observed in most countries during the period from 2007 to 2009. Forty-four countries in the Asia-Pacific region are net energy importing countries. These countries are particularly affected by volatile oil prices.

27. Available data shows that road transport is the primary source of air pollution from the transport sector in the developed countries and also most probably in the developing countries in the ESCAP region, see Table 4. The transport sector, in particular the road transport subsector, produces significant amount of CO, NO<sub>x</sub>, VOC and PM<sub>10</sub>.

**Table 4. Contribution of road transport (RT) and other modes of transport (OT) to selected pollutant emissions by percentage of total emissions for the EU (EU15) and the United States in 1999, and a sample city in Asia in 1995**

	CO		NO <sub>x</sub>		VOC		SO <sub>x</sub>		PM <sub>10</sub>		PM <sub>2.5</sub>	
	RT	OT	RT	OT	RT	OT	RT	OT	RT	OT	RT	OT
EU15	57	7	45	18	31	6	3	4	28 <sup>a</sup>	11 <sup>a</sup>	NA	6.1 <sup>b</sup>
United States	51	26	34	22	29	18	2	5	1.4 <sup>b</sup>	2.2 <sup>b</sup>	3.4 <sup>b</sup>	NA
Sample Asian city	85.5	NA	82.4	NA	84.1	NA	39	NA	15.6 <sup>a</sup>	NA	NA	NA

Source: WHO, *Air Quality Guidelines Global Update 2005*, Page 21.

Note: <sup>a</sup> Emissions of particulates assigned as primary and secondary fine particulates, of which 12% are considered primary PM<sub>10</sub>.

<sup>b</sup> Direct emissions only (i.e. does not include fugitive dust).

28. The main gases contributing to climate change are carbon dioxide (CO<sup>2</sup>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), accounting for over 99 per cent of greenhouse gas emissions, among which CO<sup>2</sup> is the dominant. Black carbon, formed through the incomplete combustion of fossil fuels, biofuel and biomass, is also one of significant contributor to global warming. The transport sector contributes large amount of CO<sup>2</sup> emissions and black carbon, small amount of CH<sub>4</sub> and N<sub>2</sub>O emissions from the fuel combustion and fluorinated gases from vehicle air conditioning.

29. The transport sector is the second largest contributor to the global CO<sup>2</sup> emissions with 23% of total emissions. The emissions from the transport sector increased 41 per cent during the period from 1990 to 2006 while total emissions from all sectors grew 33 per cent on average during the same period. According to the International Energy Agency (IEA), the top-five CO<sup>2</sup> emitting countries in world in 2006 are members of ESCAP, and four of them are in Asia. The five countries produced together 55 per cent of the global CO<sup>2</sup> emissions.<sup>9</sup>

30. In 2006, 1,603 million tons of CO<sub>2</sub> emissions were produced by the transport sector in the ESCAP region, of which 81 per cent or 1,291 million tons was by the road subsector. The OECD predicted that greenhouse gas emissions will increase by about 37 per cent in 2030 compared to 2005 levels if no new policies are adopted. One of key drivers of the growth is transport.<sup>10</sup>

31. Meanwhile, climate change impacts are already affecting the region. Asia-Pacific stands as one of the most vulnerable regions to the effects of climate change, and adaptation to climate change will be one of the most pressing issues for the region. Recent research has shown that “climate change will affect transportation primarily through several types of weather extremes, such as very hot days; intense precipitation events; intense hurricanes; drought, and rising sea levels, coupled with storm surges and land subsidence. The impacts will vary by mode of transportation and region, but they will

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<sup>9</sup> IEA, *CO<sub>2</sub> Emissions from Fuel Combustion*, 2008, Page xxi.

<sup>10</sup> OECD, *OECD Environmental Outlook to 2030*, 2008.

be widespread and costly in terms of human and economic terms and will require significant changes in the planning, design, construction, operation and maintenance of transport systems.”<sup>11</sup>

32. Road safety remains an issue of concern. In 2005, a total of 299,446 road fatalities and at least 2 million injuries were reported by police in 26 Asian and the Pacific countries. However, underreporting rates are very high in the region, in particular with respect to injuries. This is confirmed by hospital data. When adjusted for underreporting, the ESCAP secretariat conservatively estimates that approximately 470,000 people were killed<sup>7</sup> and between 20 and 30 million were injured in road crashes in Asia-Pacific in 2007. More than half of the world’s traffic fatalities occur in Asia-Pacific, even though only one in five of the world’s motor vehicles are registered there. Half of all road fatalities in the Asia-Pacific region occur in China and India.<sup>12</sup>

33. Small Island Developing States (SIDS) in the Asia-Pacific region can be disadvantaged from competing in the global economy for several reasons. First, these nations often lack the capital investment basis to develop adequate infrastructure for both freight and passenger services. Second, the physical location of SIDS means that transport costs are higher in terms of accessing markets.

34. Landlocked nations and those nations with limited port access also have special needs that must be addressed if transport is to contribute meaningfully to sustainable development. Such nations include Afghanistan, Armenia, Azerbaijan, Bhutan, Kazakhstan, Kyrgyzstan, Lao People’s Democratic Republic, Mongolia, Nepal, Tajikistan, Turkmenistan, and Uzbekistan. For these nations, the establishment of reliable and efficient linkages to neighbouring countries and to port cities is fundamental to participation in the wider global economy.

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<sup>11</sup> Committee on Climate Change and U.S. Transportation, National Research Council, *Potential Impacts of Climate Change on U.S. Transportation*, 2008.

<sup>12</sup> ESCAP, *Transport and Society: Improving Road Safety in Asia and the Pacific*, E/ESCAP/CTR/4, 2008

## 2. COMMITMENTS ON TRANSPORT AND SUSTAINABLE DEVELOPMENT

35. A number of international and regional agreements are of relevance to the issue of transport and sustainable development for the Asia-Pacific region.

### 2.1 International Commitments

36. Given its relevance for sustainable development, both in terms of positive and negative impacts, the transport sector has been considered within the environment and development agenda since the outset.

37. More recently, the United Nations General Assembly at its 19th special session in June 1997 adopted the Resolution for the programme for the further implementation of Agenda 21, which includes a section on transport (Paragraph 47). The Resolution acknowledged the essential and positive role that transport plays for socio-economic development and highlighted the fact that transport would be the “major driving force behind a growing world demand for energy” in the next couple of decades.

38. The Commission on Sustainable Development (CSD) has previously addressed the transport sector at its 9th Session in April 2001, and adopted Decision 9/3 on transport. The decision emphasized the need to consider transport in the context of sustainable development and identifies priority areas for international cooperation and action in this regard.

39. References to transport are included in the 2002 Johannesburg Plan of Implementation of the World Summit on Sustainable Development. Transport is mentioned in particular under the headings of poverty reduction (chapter II), changing unsustainable patterns of consumption and production (chapter III) and health and sustainable development (Chapter IV). Paragraph 21, in particular, refers

specifically to transport and calls for an “integrated approach to policy-making (...) with a view to providing safe, affordable and efficient transportation, increasing energy efficiency, reducing pollution, congestion and adverse health effects and limiting urban sprawl, taking into account national priorities and circumstances.”

40. The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol aim to reduce global warming and cope with whatever temperature increases are inevitable. The objective of reducing greenhouse gas (GHG) emissions (responsible for global warming) has implications for all sectors of the economy, including transport. The Protocol sets binding reduction targets for the period 2008-2012 for a number of its Parties (Annex I countries – mainly developed economies). At present, no sectoral targets exist, but current negotiations on a post-2012 agreement are considering setting sectoral targets. Transport is globally one of the major sources of GHG emissions. This is also true for developing countries, or non-Annex I countries, where transport is also the fastest growing sector in terms of CO<sub>2</sub> emissions.

41. The transport and movement of dangerous goods is another transboundary topic which is covered by international conventions. These include the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Linked to these two is the Stockholm Convention on Persistent Organic Pollutants but it deals mainly with the production and use of these substances, rather than their movement. Several countries in Asia and the Pacific are signatories to these conventions. A number of Asian countries (Azerbaijan, Kazakhstan and the Russian Federation) are also parties to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), which seeks to increase the safety of international transport by road.

42. The Ministerial Conference on Global Environment and Energy in Transport (MEET) held in Tokyo in January 2009 recognized the urgent need to address the negative impacts of transport on the

global environment and health through emissions of GHG and pollutants, and identified priority areas for achieving low-carbon and low-pollution transport. The meeting was attended by G8 countries (including Japan and the Russian Federation), Australia, China, India, the Republic of Korea, as well as ASEAN member countries.

## **2.1 Regional Commitments**

43. The Intergovernmental Agreement on the Asian Highway Network was adopted on 18 November 2003 by an intergovernmental meeting held in Bangkok, was open for signature in April 2004 in Shanghai and entered into force on 4 July 2005. The Agreement is an important tool to facilitate international trade and tourism, promote regional integration and enhance international cooperation. The Asian Highway network is a network of 141,000 kilometres of standardized roadways crisscrossing 32 Asian countries with linkages to Europe.

44. The Intergovernmental Agreement on the Trans-Asian Railway Network opened for signature on 10 November 2006 in Busan, Republic of Korea. The Intergovernmental Agreement on the Trans-Asian Railway Network entered into force on 11 June 2009. The Agreement sets out a coordinated plan for the development of railway lines of international importance which they intend to be undertaken within the framework of the national programmes of the Parties.

45. The Fifth Ministerial Conference on Environment and Development in Asia and the Pacific (MCED 5), held in Seoul, Republic of Korea, in March 2005, acknowledge the urgent need for countries in the region to move away from the conventional development path of “grow first, clean up later”, and pursue instead an environmentally sustainable economic growth, or Green Growth. The Conference adopted a Ministerial Declaration and a Regional Implementation Plan for 2006-2010, which identified priority areas for action and for regional cooperation. This included “undertaking policy measures to promote sustainable consumption and production patterns that could be used for

demand-side management in such areas as energy, water and transportation”. The outcomes of MCED were adopted at the 61st ESCAP Commission Session through Resolution 61/9.

46. The Ministerial Conference on Transport in Asia and the Pacific, held in Busan, Republic of Korea, in November 2006, recognized the importance of transport for sustainable development, and adopted a Ministerial Declaration on Transport, a Regional Action Programme for 2007-2011, as well as a Ministerial Declaration on Improving Road Safety in Asia and the Pacific. The Ministerial Declaration on Transport recognized the importance of regional integration for socio-economic developing in Asia-Pacific and called for the development of integrated intermodal transport and logistic systems, and the prioritization of investments in the Asian Highway and Trans-Asian Railway networks. It also called for the formulation of “integrated policies and decision-making frameworks based on strategic assessments of economic, environmental, social and poverty-related aspects.”

47. The Ministerial Declaration on Improving Road Safety in Asia and the Pacific recognizing that half of all fatalities and injuries worldwide occur in the Asian and Pacific region, most of which are vulnerable road users, such as pedestrians and children, resolved to save 600,000 lives and to prevent injuries on the roads of Asia and the Pacific by fostering a reduction of 20 per cent in the fatality rates and in the rates of serious injuries on the roads of Asia and the Pacific over the period 2007 to 2015. The outcomes of the Ministerial Conference on Transport were adopted at the 64th ESCAP Commission Session through Resolution 64/4.

48. As part of its Environmentally Sustainable Transport Initiative, the United Nations Centre for Regional Development (UNCRD) has convened a series of policy forums (Regional EST Forum) that have resulted in a number of commitments in advancing the sustainable transport agenda in the region, as detailed in the box below.

## **United Nations Centre for Regional Development (UNCRD)**

### **Environmentally-Sustainable Transport (EST) Initiative**

In collaboration with the Ministry of Environment of the Government of Japan, the UNCRD initiated the Asian EST Initiative in 2004 to bring together government officials, experts, and other stakeholders in resolving transport and sustainable development. The Initiative aims to build a common understanding across Asia on the essential elements of EST and the need for an integrated approach at local and national level to deal with multi-sectoral environment and transport issues, including GHG emission reduction. Currently the participating countries include the member nations of the Association of South-East Asian Nations (ASEAN), Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Maldives, Sri Lanka, Mongolia, People's Republic of China, Republic of Korea, and Japan.

Under the Initiative, the First Regional EST Forum held in Aichi Prefecture of Japan in 2005 resulted the Aichi Statement, which articulated a comprehensive list of sustainable transport objectives based upon the twelve major thematic areas. This Statement provides a basis for the participating countries to regularly report upon progress in reaching the objectives. Subsequently over thirty Asian cities signed the Kyoto Declaration on EST (2007) endorsing the objectives underlined in the Aichi Statement.

In 2009, the Initiative produced the “Seoul Statement Towards the Promotion of Environmentally-Sustainable Transport (EST) for a Low Carbon Society and Green Growth”. This Statement particularly highlighted the need to regional efforts for win-win solutions that capture co-benefit considerations in addressing sustainable transport and climate change.

### **3. ACHIEVEMENTS AND PROGRESS IN THE REGION**

#### **3.1 Regional integration**

49. The Intergovernmental Agreement on the Asian Highway Network entered into force in 2005 and 23 States became parties to the Agreement. The Agreement classifies Asian highways into four categories: Primary refers to access-controlled highways; Class I refers to highways with four or more lanes; and Class II and Class III to highways of two lanes. Class III is regarded as the minimum desirable standard.

50. As a result of the recent upgrades, the most typical category of Asian Highway roads is now Class II, with a 37 per cent share of the network, while the share of Class III has been reduced to 26 per cent. Between 2004 and 2006, Uzbekistan upgraded all its Asian Highway roads to meet the minimum standard while Cambodia, China and Bangladesh also achieved noticeable results in reaching the minimum standard.

51. Railway density in the Asia-Pacific region remains low in comparison with more advanced regions. Nevertheless, there has been a substantial increase in the demand for rail transport services, measured as freight ton-kilometres and passenger-kilometres. Between 2004 and 2005, total rail freight transport in Asia and the Pacific increased by 4.7 per cent, to 4,500 billion ton-kilometres, while total rail passenger transport increased by 5.1 per cent to 1,709 billion passenger-kilometres. The largest rail freight volume in 2006 was in China whose throughput in 2004 had surpassed that of the railways of the Russian Federation.<sup>13</sup>

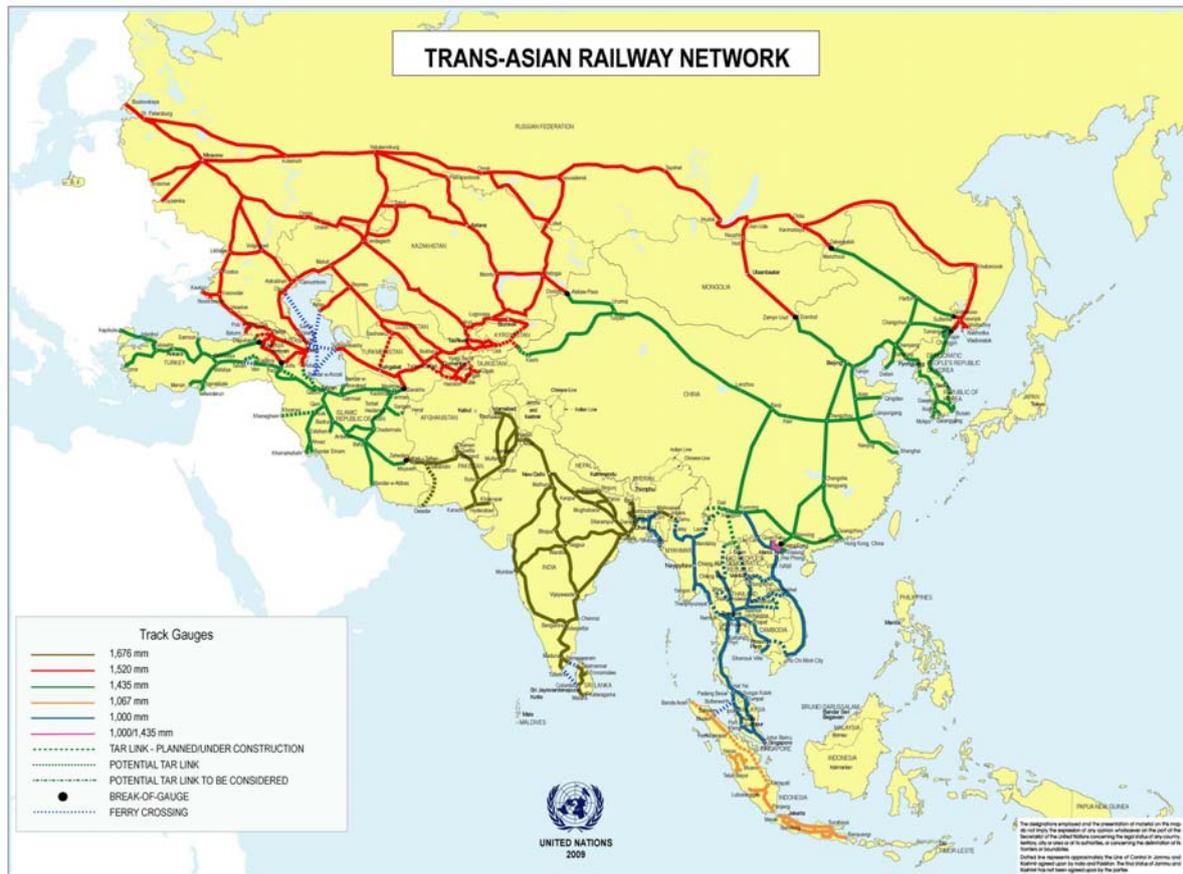
52. The Trans-Asian Railway network aims to offer efficient rail transport services for the movement of goods and passengers within the region as well as between Asia and Europe. The network will also provide improved access for landlocked countries to major ports. To date the Trans-

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<sup>13</sup> UNESCAP (2009). *Statistical Yearbook for Asia and the Pacific for 2008* (Bangkok: United Nations Publications).

Asian Railway network comprises of slightly over 114,000 km of rail routes that have been selected for their potential to serve international trade.

**Figure 3: Trans-Asian Railway Network**



### 3.2 Provision of better access to transport services

53. Access can be acquired through mobility, proximity and “telephony” (telecommunications). Improved transport and logistics infrastructure and services provide proximity (reduced travel times between origins and destinations) and mobility, thereby increasing physical and economic access.

54. While initiatives are being implemented in countries of the region, physical access, especially in rural areas, remains a general problem in many countries. For example, “India has essentially a rural-oriented economy with 74 per cent of its population living in its villages. In 2000, it was

estimated that about 330,000 out of its 825,000 villages and habitations were without any all-weather road access. A majority of the poorly connected rural communities lie in ten States (Assam, Bihar, Chattisgarh, Himachal Pradesh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal).”<sup>14</sup>

55. In Lao People’s Democratic Republic, “Road connections between Vientiane and some provincial capitals remains a problem. Roughly half (47 per cent) of the national road network and almost all (96 per cent) provincial roads remain unpaved, and much of it is impassible during the rainy season. More than half of all district centers do not have year-round access by road, and almost one sixth are inaccessible by road at any time.”<sup>15</sup> In China, it was also noted in 2004 that there were 184 towns and 54,000 villages, mostly in the western regions that had no road access.<sup>16</sup>

56. The provision of quality transport services are intimately linked to economic performance and social equity. A socially-sustainable transport system means that investment must particularly support the mobility and access needs of society’s most vulnerable groups, including low-income families, women, the elderly, and the physically disabled. In urban areas, well-designed pedestrian pathways and bicycle networks can be especially useful to these groups. “Universal design” is the set of concepts that allow easy access to individuals with physical disabilities such as wheelchair users.

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<sup>14</sup> Pradhan Mantri Gram Sadak Yojana (PMGSY), (Prime Ministers Rural Roads Scheme), Operations Manual, National Rural Roads Development Agency, Ministry of Rural Development, Government of India, February 2005, <<http://pmsgsy.nic.in/opmn1.htm>>.

<sup>15</sup> World Bank, “Lao PDR: Transport Sector Brief”, East Asia and Pacific Region Transport Sector Unit, 1 May 2004. <<http://www.unescap.org/ttdw/ppp/reports/LaoPDR2001.pdf>>.

<sup>16</sup> Wang Ruijun, Li Huaijian and Li yang, “Government policy on provincial and rural road development in China”, Asia-Pacific Network for Transport and Logistics Education and Research (ANTLER) Conference on “Transport and Millennium Development Goals”, New Delhi, 14-15 April 2005.

Public transport systems in cities such as Auckland, Brisbane, Nagoya, Osaka, Singapore, and Sydney have well adopted universal design principles that permit ease of access for all.

### 3.3 Air quality and public health

57. As evidenced by the Clean Air Initiative Asia Centre (CAI Asia), air quality levels in Asia have generally improved in recent years, primarily thanks to successes in phasing-out lead gasoline, phasing-out two-stroke engines in motorcycles, improved vehicle emission and fuel quality standards. Air pollution levels in Asian cities are, however, generally still above World Health Organization (WHO) guideline values, resulting in an estimated half a million premature deaths every year.<sup>17</sup> Particulate matter is the main pollutant of concern, with ozone becoming increasingly problematic.

58. Among major pollutants from the transport sector, the annual average concentration of PM10 in Asia is the highest in the world and the level of NOx in Asia is higher than the WHO guiding level, as shown in Table 5. It is important to note that the health impacts of air pollution are disproportionately suffered by the most vulnerable groups in urban populations, in particular the poor.

**Table 5. Ranges of annual average concentrations ( $\mu\text{g}/\text{m}^3$ ) of PM<sub>10</sub> and dioxides of nitrogen for different regions based on a selection of urban data**

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<sup>17</sup> Summary Report of the Better Air Quality Workshop (BAQ) 2008

<http://www.baq2008.org/system/files/BAQ+2008+Report+by+IISD.pdf>

	PM <sub>10</sub>	NO <sub>x</sub>
Asia	35-220	20-75
Africa	40-150	35-65
Latin America	30-129	30-82
Canada/United States	20-60	35-70
Europe	20-70	18-57
Australia/New Zealand	28-127	11-28
WHO guidelines	20 Interim target-1: 70 Interim target-2: 50 Interim target-3: 30	40

Source: WHO, *Air Quality Guidelines Global Update 2005* Pages 31, 375 and 278.

### 3.4 Integrated land-use and transport planning

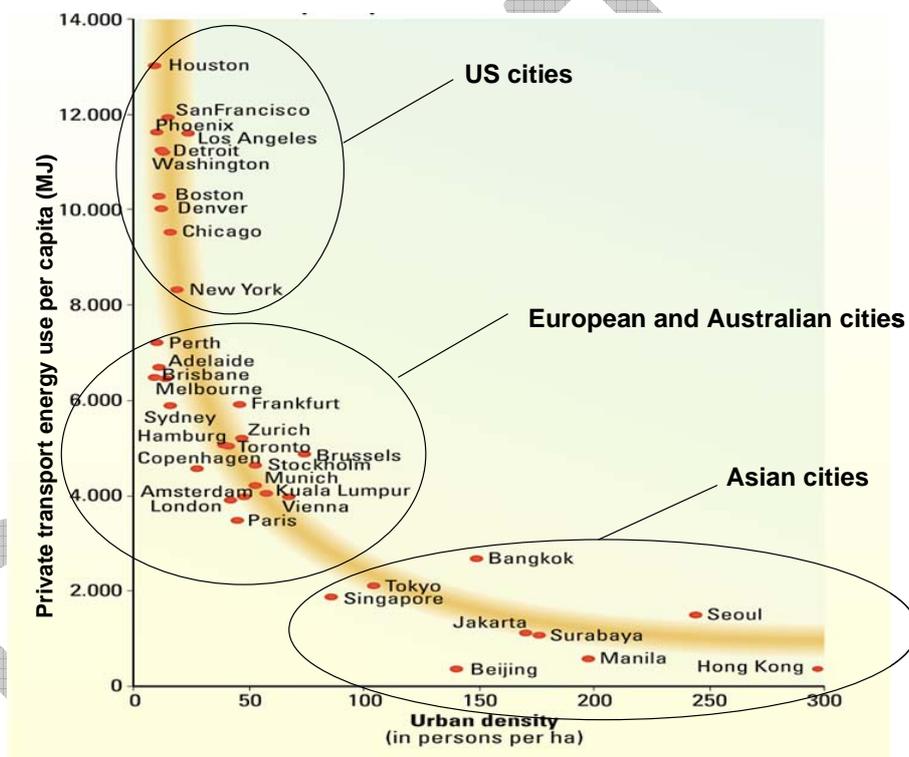
59. Rather than implement land-use policy in isolation of transport, progressive Asian-Pacific nations are beginning to integrate the two into a single synergistic policy. Amongst the land-use tools that promote more sustainable transport are mixed-use and medium-to-high density development, transit-oriented development (TOD), and urban greenbelts and boundaries.

60. Institutionally, bringing together land-use and transport responsibilities can help ensure a more integrative approach to planning and service delivery. Singapore's Land Transport Authority

represents a single agency combining both responsibilities. The success of Singapore’s transport systems is clearly in part due to its effective institutional structures.

61. Mixed-use, high-density development provides the population and diversity elements to reduce transport requirements at their source. Such development is known as “smart growth”. As shown in figure 4, cities in the Asia-Pacific region possess densities that should discourage the need for private motorized vehicles.

**Figure 4. Urban density and car use (Source: Newman and Kenworthy, 1989)**



Source: Newman and Kenworthy, 1989

62. Another mechanism to achieve smart growth is through transit-oriented development (TOD). By concentrating work places, shopping, schools, and mixed-use residential near public transport stations, greater numbers of persons can make use of public transport. The Bangkok SkyTrain, Hong Kong MTR, Jakarta BRT, and Singapore LRT and metro have all demonstrated the synergistic effects of TOD.

### 3.5 Energy efficient, low-carbon transport

<sup>63.</sup> Significant environmental and efficiency benefits can be achieved with freight movements by rail rather than road or air. The ability of rail to offer guaranteed transit times as well as better door-to-door speeds, while moving large volumes in one single movement at a fraction of the energy cost associated with other land transport modes, gives it a pivotal role in the region's integrated intermodal transport network.<sup>18</sup>

<sup>64.</sup> During the period between 2001 and 2005, the number of twenty-foot equivalent units (TEUs) carried along the Trans-Siberian Railway increased by 200 per cent. Likewise, the launch of rail freight services over the Malaysia-Thailand land-bridge in 1999 resulted in dramatic gains by rail.<sup>19</sup>

<sup>65.</sup> Non-motorized transport (NMT) options are effectively carbon free. Asia-Pacific nations have historically held very high mode share levels of NMT in terms of walking and bicycling. Preserving mode share with NMT must be the principle basis for achieving a low carbon transport system. Several pedestrianization efforts in Asia are quite notable. Guangzhou is currently in the process of developing green corridors that will form a pedestrian network of 145 kilometres.

<sup>66.</sup> Pedicabs (also known as cycle rickshaws) are a zero carbon vehicle that can replace motorized trips over short and medium distances. While pedicabs have been banned from Asian cities such as Bangkok and Jakarta and parts of Dhaka and Delhi, new modern designs are transforming this

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<sup>18</sup> UNESCAP (2006). *Regional Cooperation in Infrastructure Development for an International Integrated Intermodal Transport System in Asia*, E/ESCAP/MCT/SGO/3 (Bangkok, UNESCAP).

<sup>19</sup> UNESCAP (2006). *Regional Cooperation in Infrastructure Development for an International Integrated Intermodal Transport System in Asia*, E/ESCAP/MCT/SGO/3 (Bangkok, UNESCAP).

mode. Today, over 100,000 modernized pedicabs are plying the streets of Indian cities, bringing both the benefits of employment and enhanced mobility.

67. Support infrastructure for bicycling is critical to making it a viable option. Safe, high-quality cycle ways and convenient and secure bicycle parking is fundamental to this objective. A cycle way constructed along the Delhi BRT corridor allows effective modal integration between NMT and public transport. Bicycle rental facilities have been effective in attracting new users towards cycling. Bicycle rental initiatives have been implemented in Beijing, Guangzhou, Hangzhou, Seoul, and Shanghai.

68. The production and sale of electric bicycles and scooters have soared rapidly in the last five years. In China, electric bicycle sales grew from 40 000 in 1998 to over 40 million in 2007.<sup>20</sup> Electric bicycles produce zero local air emissions and reduce petrol use when replacing motorcycle trips. However, there are nevertheless concerns regarding the impact from electricity generation and lead pollution from battery disposal.

### **3.6 Safe, affordable and efficient public transport**

69. The urban densities achieved in much of the Asia-Pacific region should enable cities the opportunity to realize high-quality and cost-effective public transportation systems. Historically, quality public transport in the region has been restricted to the high-volume metro rail systems in cities such as Beijing, Hong Kong, Osaka, Seoul, Singapore, and Tokyo.

70. However, the introduction of Bus Rapid Transit (BRT) into the region has assisted in delivering quality public transport cost-effectively in a wider array of cities and urban conditions. Initial projects in Brisbane, Nagoya, Seoul, and Taipei have acted to showcase the BRT concept in the

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<sup>20</sup> Asian Development Bank (2009). *Electric Bikes in the People's Republic of China: Impacts on the Environment and Prospects for Growth* (Manila, ADB).

context of Asia. Subsequently, major BRT initiatives have been implemented in China, India, and Indonesia.

71. Inter-city public transport systems are increasingly being evaluated as alternatives to air travel, which represent a rapidly increasing source of greenhouse gas emissions in the Asia-Pacific region. Japan's success with the Shinkansen high-speed rail system has been a world leading example. Subsequently, high-speed rail initiatives have been implemented in the Republic of Korea, China, Taiwan Province of China, and Russia.

72. For much of the region, though, the upgrading conventional inter-city and commuter rail services remains the first priority. Efforts on the Trans-Asian Railway include the construction of 13 missing links and the double tracking of priority routes.

### **3.7 Transportation Demand Management**

73. Transportation Demand Management (TDM) represents a broad set of policies and measures that creates incentives to use alternatives to private vehicles. Many TDM measures also generate revenues that can be utilized to fund sustainable transport investments. Examples of TDM measures include congestion charging, vehicle license fees and permits, parking levies, entrance restrictions by license tag numbers, and fuel taxes.

74. Singapore has gained international recognition for its many applications of TDM measures. Singapore initiated an Area Licensing Scheme in 1975 that placed a charge on vehicles entering the central areas. As the technology progressed, the system became an Electronic Road Pricing system in 1998. The system places a monetary value on using road space, especially during peak travel periods, and thus has effectively reduced congestion in Singapore.

75. Singapore has also implemented a Vehicle Quota System which acts to discourage vehicle ownership in the first place. Shanghai also auctions vehicle licenses, raising estimated revenue of US\$ 600 million per year. In conjunction with other fees and duties, the net cost of vehicle ownership in Singapore and Shanghai helps to shift demand towards more sustainable options.

76. Parking fees, parking restrictions, and enforcement can also be highly effective TDM measures. Parking space levies as applied in Australia both discourage private car use and raise revenues for public transport development. While these measures have been successful in these applications, the extent to which the measures are applicable in the developing-nation context depends upon local circumstances.

77. Fuel pricing is also a major determinant affecting consumer mobility choices. In some instances, fuel prices in Asian-Pacific states are subsidized below the global market price, which effectively encourages transport inefficiencies.

### **3.8 Environmentally Sound Transport Technologies**

78. Technology alone will not ensure sustainability is achieved within the transport systems of the Asia-Pacific. The growth of the motorized vehicle fleets in the Asia-Pacific is outpacing the gains being realized through technological innovations. However, as part of an integrated strategy, technology in the form of fuels, vehicles, and Intelligent Transportation Systems (ITS) can do much to improve the sustainability gains from the other measures.

79. The Asia-Pacific region has been a pioneer in implementing alternative propulsion and fuel systems. In 2001, Delhi implemented a mandatory conversion to compressed natural gas (CNG) for all buses and auto rickshaws in order to reduce the city's immense air quality problems. Since Delhi's efforts, several other cities in the region have likewise undertaken fleet fuel conversions. In 2003,

Dhaka phased out two-stroke three-wheelers and replaced them with CNG-fuelled vehicles. Pakistan is also currently working towards bus fleet conversions to CNG. Indonesia has a national policy directed towards fuel diversification with both CNG and biofuels being operationalized.

80. Fuel economy standards and emission standards provide the regulatory safeguard against highly-polluting vehicles in the national fleet. The Government of China has implemented one of the world's most stringent fuel economy standards, surpassing developed nations such as the United States. The new-car fleet average for fuel economy in China is 15.6 kilometres per litre (36.8 miles per gallon), including SUVs and trucks. By 2015, this standard will rise to 17.9 kilometres per litre (42.2 miles per gallon).

81. Asian-Pacific nations are also working towards elevating vehicles emission standards to Euro III and above. Beijing has banned Euro I petrol vehicles and Euro III (and below) diesel vehicles from operating within the city's Fifth Ring Road. Hong Kong, China and Thailand have currently applied Euro III standards.

### **3.9 Major obstacles and continuing challenges**

82. Much progress has been made, but much more remains to be done if the region is to achieve sustainable transport. The lack of access and mobility in rural areas stifles the realization of true sustainable development. Incomplete freight infrastructure limits market reach for local products. The sheer growth in usage of motorized vehicles has eclipsed the promise of the various efforts currently underway.

83. Amongst the most critical obstacles to sustainable transport are:

- Inadequate institutional and governance structures;
- Lack of sufficient information to national and local policy-makers;

- Lack of adequate technical support to local implementation teams;
- Insufficient base data on existing mode shares, user needs, air quality, and other critical factors;
- Insufficient human resources to address the issues;
- Sole focus on a few major cities and the ignoring of sustainable transport actions in secondary and smaller cities as well as in rural areas;
- Inadequate funding resources and a lack of access to alternative financing options;
- Insufficient fuel and emission standards and the lack of vehicle testing regimes;
- Insufficient use of Environmental Impact Assessments, Strategic Environmental Assessments, and public participation processes;
- Lack of explicit policy direction, political will, and vision towards sustainable transport and many existing policies are in conflict with the objectives of sustainable transport.

#### **4. POLICY OPTIONS ON TRANSPORT FOR SUSTAINABLE DEVELOPMENT**

84. Policy options supporting a sustainable transport path are evident from several high-profile successes both within the Asia-Pacific region as well as internationally. The broader adoption of such policies and practices, though, remains lacking. Likewise, the shaping of singular successes with one mode in one area into a complementary and integrated package across a wider area is a global challenge.

85. An integrated strategy can enable the Asia-Pacific region to “leapfrog” past the current transport paradigm. By de-coupling the idea that economic growth can only follow from unsustainable transport technologies, the focus can instead be directed towards achieving economic, social, and environmental sustainability through options that place quality of life first.

##### **4.1 Integrated transport strategies**

86. An integrated transport strategy includes both incentives for sustainable modes as well as disincentives for private motorized vehicles. An integrated approach also means that all facets of sustainable transport are developed as a complementary package, including the planning of non-motorized and public transport options in both urban and rural areas, infrastructure for inter-modal freight systems, business models for financially-viable operations and maintenance, communications and outreach messages to influence behavioural patterns, and clean technologies to achieve energy efficiency and low emissions.

87. The “Avoid-Shift-Improve” concept prioritizes investment first to the most sustainable options.<sup>21</sup> “Avoiding” emissions before they are generated is a higher priority than tailpipe strategies that seek to clean up the problem after it has occurred. Land-use measures such as smart growth are examples of an “avoiding” strategy. Next are mechanisms that “shift” mode share towards NMT and public transport for passenger services and towards more efficient rail systems for freight. Finally, to the extent that motorized vehicles are utilised, the fuel and propulsion technologies should be “improved” so that the negative impacts are minimized.

88. Given the complexity of freight movements, integration is a particularly important objective. Integration requires a number of inland intermodal interfaces which are strategically located at cross-over points where networks of different modes converge. These cross-over points can be inland container depots, dry ports, logistics centres, freight villages or stations of international importance. By facilitating the coordinated planning of different transport modes and logistics activities, future intermodal interfaces will facilitate the flow of goods through the transport chain.<sup>22</sup>

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<sup>21</sup> Dalkmann H. and Brannigan, C. (2007). *Transport and Climate Change*, Sourcebook 5e (Eschborn, GTZ).

<sup>22</sup> UNESCAP (2006). *Regional Cooperation in Infrastructure Development for an International Integrated Intermodal Transport System in Asia*, E/ESCAP/MCT/SGO/3 (Bangkok, UNESCAP).

## 4.2 Win-win solutions to climate change and transport

89. The international efforts to address global climate change represent a unique opportunity to simultaneously realize transport systems that also deliver other economic, social, and environmental benefits. “Win-win solutions” refer to developing climate change mitigation strategies that also achieve other policy objectives. These multiple gains are also often referred to as “co-benefits”. Table 6 summarizes the type of co-benefits across various economic, social, and environmental indicators.

**Table 6. Types of co-benefits from sustainable transport initiatives<sup>23</sup>**

<i>Area</i>	<i>Benefit</i>
Economic benefits	Congestion reduction Consumer spending savings Employment creation Small- and medium-sized enterprise development Traffic accident reduction Technology transfer Reduced dependence on fuel imports / energy security
Environmental benefits	Greenhouse gas reductions Reductions of particulate matter, sulphur oxides, nitrogen oxides, carbon monoxides, and ground-level ozone Noise level reductions Solid waste reductions Water contaminant reductions
Social benefits	Health improvements

<sup>23</sup> Wright, L. (2009). *Win-Win Solutions to Climate Change and Transport* (Nagoya, UNCRD).

<p>Crime reduction / security enhancement</p> <p>Gender equity promotion</p> <p>Universal access for the physically disabled</p> <p>Scholar access improvement</p> <p>Convenience and comfort</p> <p>Community sociability</p> <p>Reduction in community severance</p>
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90. In effect, the consideration of co-benefits can improve the overall benefit-to-cost ratio of a project. Developing a framework for comparing and analysing the benefits and costs of different mitigation projects permits national and local governments to maximise the input investment. To maximise investment outputs, nations of the Asia-Pacific should particularly design policies and programmes that target co-benefits.

#### **4.3 Overcoming major obstacles**

91. The challenges noted in this report represent significant obstacles to the wide-spread adoption of sustainable transport principles in the Asia-Pacific region. The acute lack of financial and human resources and the lack of coherent institutional policy structures have limited the reach of sustainable development concepts.

92. Overcoming these challenges means that co-operation and co-ordination must exist between the major supporting stakeholders, including government, international organizations, non-governmental organizations, private foundations, and the private sector. Table 7 summarizes the actions from each major stakeholder group to achieve the objectives of sustainable development in the transport sector.

**Table 7. Actions required by stakeholder group**

<i>Stakeholder</i>	<i>Actions</i>
National Governments	<p>Establish national policy supporting and mandating sustainable transport priorities</p> <p>Remove the legal and statutory barriers that may inhibit sustainable transport measures</p> <p>Provide the technical human resources required to assist local and provincial governments with implementation</p> <p>Provide the bulk of the financial resources required to carry-out initiatives</p>
Provincial / State Governments	<p>Establish provincial policy structures to support sustainable transport</p> <p>Assist in the delivery of sustainable transport infrastructure and services in rural areas</p> <p>Assist in the provision of funding to local governments for sustainable transport initiatives</p>
Local Governments	<p>Articulate the vision of sustainable development and sustainable transport to the general public</p> <p>Collect the required data to define the existing transport sector and air quality situation (including transport demand and supply, vehicle fleet characteristics, fuel use, emission levels, and commuter preferences)</p> <p>Establish the local council resolutions required to proceed with project implementation</p> <p>Develop a Master Transport Plan highlighting sustainable transport options</p> <p>Conduct the appropriate detailed planning for each project</p> <p>Contribute to project financing from local sources</p> <p>Oversee project implementation and evaluation</p>
International	<p>Provide catalytic funding to initiate demonstration efforts</p>

Organizations	<p>Assist in the development of national policy frameworks</p> <p>Share lessons learned and best practice across the region</p> <p>Help standardize data collection and comparative analysis between cities and countries</p> <p>Provide technical assistance when appropriate</p>
Non-Governmental Organizations	<p>Assist in galvanizing political and public support for sustainable transport options</p> <p>Provide direct technical assistance to local projects</p> <p>Share lessons learned and best practice across the region</p>
Private Foundations	<p>Provide catalytic funding to initiate demonstration efforts</p> <p>Assist with joint procurement schemes of sustainable transport technologies</p>
Private Sector	<p>Seek opportunities to develop markets for sustainable transport infrastructure, vehicles, and services</p> <p>Participate in regional efforts to co-ordinate sustainable transport initiatives with the other stakeholders</p>

93. Establishing the appropriate institutional structure is fundamental to successful implementation. In turn, the appropriate governance and institutional structures can deliver synchronized master planning that synergistically encompasses land use, transport, social, economic, and environmental policies.

#### **4.4 International financial mechanism and cooperation**

94. Project finance represents another significant barrier to sustainable development through the transport sector in the Asia-Pacific region, and especially in the developing nations of the region. While the planning, infrastructure, and operational costs of many sustainable transport measures are often considerably less than the heavy investment required for roadway and flyover construction, the

sums are frequently beyond the budgets of many nations in the region. Overall transport requirements can often take up from 15 to 25 per cent of developing city budgets.<sup>24</sup>

95. Despite this general lack of financial resources, there is nevertheless a wide-range of funding opportunities that national and local governments should fully explore.

96. National government grants are one of the most common means to finance large-scale sustainable transport initiatives such as BRT systems. National governments must ensure that local governments are sufficiently resourced to meet national policy directives.

97. In some instances, this funding can be accessed from national revenue sources related to the transport sector. For example, the elimination of fuel subsidies and the addition of fuel levies can generate sufficient funding for a major sustainable transport undertaking. Fuel levies and carbon taxes can be justified on the basis of the externality costs that unsustainable transport practices place upon society. Studies show that in developing cities, congestion, accident and pollution externalities make up a significant proportion of the overall externalities from transport, amounting in some cases to over 10% of national or regional GDP. For instance, a recent study by Creutzig and He (2009) estimates for Beijing that the social costs induced by motorized transportation are equivalent to roughly 7.5–15.0 per cent of the city's GDP."<sup>25</sup>

98. National road funds are also commonly utilized to support roadway maintenance plans. Currently, dedicated road funds exist in India, Japan, Kazakhstan, Lao People's Democratic Republic, Mongolia, Nepal, New Zealand, Pakistan and Papua New Guinea. Road tolls are increasingly being utilized across the region. Toll revenues accounted for approximately 14 per cent of Japan's total

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<sup>24</sup> World Bank (2001). *Cities on the Move: A World Bank Urban Transport Strategy Review* (Washington, World Bank).

<sup>25</sup> Asian Development Bank and Clean Air Initiative for Asian Cities (2009). *Rethinking Transport and Climate Change* (Manila: ADB).

road sector investment budget in 2006.<sup>26</sup> Other nations utilizing road tolls include Bangladesh, China, India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, Thailand and Viet Nam.

99. Land and property development is another local source that can generate substantial revenues. Measures such as public transport systems and pedestrian upgrades often add considerable value to private land and property by increasing an area's desirability as a destination. A Location Benefit Levy (LBL) places a fee based on a land parcel's value, and thus producing additional funds when public enhancements are realized. Applications of LBL have been applied in Canberra, Hong Kong, Singapore, Sydney, and various cities in Taiwan Province of China.

100. Private sector collaborations through Public-Private Partnerships (PPPs) have been shown to be effective for road construction and maintenance, port development, airport projects, and certain high-density public transport corridors. Road projects comprise about one-half of the total investments with private participation in the transport sector in the region. These projects are especially concentrated in China, India, the Republic of Korea, and Malaysia. Private participation in port projects is currently under way in 12 Asian countries. In addition to China, major port sector investments are being made in India, Indonesia and Malaysia. It has been noted to make PPPs viable in the rail sector that the legal and regulatory systems with regard to railways should be improved and the Railway Law should be amended to make clear the relationship between government functions and commercial operations and to provide a legal foundation for further railway development."<sup>27</sup>

101. International sources are relevant both to catalyzing initial demonstrations as well as to the financing of full projects. A host of other international organizations, such as development banks and

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<sup>26</sup> UNESCAP (2006). *Financing of Transport Infrastructure and Public-Private Partnerships*, E/ESCAP/MCT/SGO/6 (Bangkok, UNESCAP).

<sup>27</sup> Parkash, M. (2008). *Promoting Environmentally Sustainable Transport in the People's Republic of China* (Manila: ADB).

bilateral agencies, play a crucial role in filling financing gaps. Major project finance for transport initiatives in the Asia-Pacific can be obtained from such entities as World Bank, the Asian Development Bank, the Japanese Bank for International Co-operation, and the German Development Bank (KfW).

## CONCLUSIONS

102. The provision of transport services has been an important factor contributing to the remarkable economic growth experienced by countries in the Asia-Pacific region, which has allowed lifting millions out of poverty. The benefits from improved transport, however, have benefited mainly populations in coastal areas in Asia, particularly near seaports. There remains an important task in extending transport services to reach out to large populations in deeper hinterlands and rural areas as well as landlocked countries to encourage inclusive prosperity.

103. At the same time, the transport sector is the third largest consumer of energy and the largest consumer of petroleum products in Asia-Pacific, and its energy consumption is growing faster than other sectors and other regions driven by rapid increase of motorization and strong transport demands from economic development. This has important repercussions in terms of energy security for the region, as forty four countries in the Asia-Pacific region are net energy importing countries. Meanwhile, the transport sector is the primary source or precursor of air pollution and the second largest contributor to carbon dioxide emissions. Other negative consequences of existing patterns of transport in the Asia-Pacific include severe congestion, traffic accident injuries and fatalities, freight inefficiencies, greater rural to urban migration and reductions in economic productivity.

104. A more sustainable basis for countering these trends is the concept of an integrated transport system. Measures such as intermodal freight systems, public transport and non-motorized transport

are effective options, especially when combined with the appropriate financial incentives. Improving fuel and propulsion technologies is also part of a complementary package of sustainable measures.

105. Much urgency is required to provide the human and financial resources for wider-scale adoption of sustainable transport measures. Additionally, institutional and governance structures must be aligned to a comprehensive approach to the issue. Without such a revised approach, the opportunity for a pro-active transformation of Asian-Pacific transport may be lost over the coming decade.

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