

**The Asian Development Bank**  
**and the**  
**People's Republic of China:**  
**Partnership in the Road Sector**

**Roads Promote Pro-Poor Economic Growth**

ADB experience in PRC shows that investment in transport infrastructure, and especially roads, together with capital investments, provides a key boost to local, regional and national economies. These investments stimulate economic growth, which generates higher standards of living, over the longer term. Many of the 30 million rural absolute poor who live in PRC, reside in either partial or full isolation which requires them to pay more for transport and restricts their ability to access basic goods and services. Lack of access deprives the poor of their ability to take advantage of job opportunities. Access improvements have a strong income effect, which makes investment in road projects a catalyst to reduce poverty.

**PRC's Road System**

The road network included about 1.81 million km of roads at the end of 2003, but it is still underdeveloped in both quality and extent. While 44,600 km of new roads were opened to traffic in 2003, including 4,615 km of expressways, expressways and Class I highways still account for only 3.3% of the total road network, and Class II highways for about 11.7%. The remaining 85.0% (Class III highways and below) are medium- to low-grade paved roads and gravel roads. With only about 1,392 km of roads per million inhabitants, the density of the PRC's road network is low. Many roads are constructed to low design standards and have neither the capacity nor the structural strength to carry current traffic volumes and loads. Roads tend to be congested and pavements show signs of roughness and failure.

PRC's road investment needs from 1996 to 2010 are estimated at \$504 billion. Available revenues are estimated at \$302 billion from road user charges, and \$29 billion from toll collections, leaving a financing gap of \$173 billion or about \$12 billion per year. Consistent with ADB's policy dialogue, the Government is creating a framework to attract private sector finance for road construction. While the private sector is willing to participate under concession agreements, or in refinancing, leasing, and securitization, it has been difficult to the use of build-operate-transfer (BOT) type projects which entail taking the initial risks of construction and traffic demand. Private sector financing is most likely to be available to finance about a small portion of the high-grade and provincial road networks.

**ADB's Road Sector Strategy**

ADB's PRC country operational strategy gives high priority to removing infrastructure constraints and supporting policy and institutional reforms. Given the importance of road transport in the development of a market economy and reducing poverty, ADB will continue its lending to the road subsector for (i) the National Trunk Highway System and

Eight Western Development Road Corridors; (ii) roads that improve the access of less developed, poor rural areas to regional market centers; and (iii) selected urban transport projects. With the completion of the northeast transport corridor, the focus of ADB's activities in the road subsector has shifted to poorer western and central provinces. Improving road infrastructure will help create an environment that facilitates economic growth in these poor areas. Sustained, broad-based economic growth will, in turn, help reduce poverty. ADB's PRC operational strategy in the road subsector supports: (i) construction of roads that connect major growth centers, promote linkages with hinterland economies, and/or promote regional cooperation; (ii) integration of the network so that the National Trunk Highway System is supported by a system of local roads, particularly those that provide access to poor areas; (iii) promotion of road safety; (iv) institutional strengthening to increase the commercial operation and efficiency of expressway organizations; (v) improvement of highway planning and evaluation techniques; (vi) adoption of appropriate pricing policies to ensure optimum use of road transport capacity; and (vii) use of alternative methods of investment financing, including private sector participation.

### **How ADB Tackles Poverty through Road Projects**

Transport conditions for the rural poor are not adequate in the PRC. The poor have limited mobility beyond their immediate communities because of geographical isolation and the high cost of motorized transport. As a result, people generally view roads as the most important economic infrastructure development. Benefits for poor rural areas include lower transport costs, lower cost of inputs, expanded agricultural support services and therefore improved farming practices, greater access to employment opportunities in urban areas and better access to health, education or social services. Better roads promote the transition from subsistence farming rural economy to a cash crop economy with a higher and more stable income flow leading to poverty reduction.

Research shows that prior social and economic assessment regarding where roads are located matters in their impact on development. ADB assistance to poorer interior provinces is designed to maximize the poverty reduction impact of road investments. To facilitate the spread of economic benefits to poorer households, the scope of ADB-financed projects have included improvements to complementary roads connecting poor rural areas to the main trunk roads. Complementary road programs are formulated by prioritizing road sections that serve areas where most poor people live and where the most beneficial impact can be made on poverty reduction.

The link between road development and poverty reduction is generally recognized, and is supported by evidence from several completed ADB-financed transport projects. In Liaoning Province, construction of a 109 km expressway with 203 km of local roads is associated with a more than doubling of rural incomes in the project area. The significant socioeconomic impact of road projects, including expressways and other high standard roads, has also been confirmed by the experience in other projects elsewhere in PRC and in other countries. Experience has shown the importance of developing trunk routes between urban/market centers, along with rural roads, to maximize the benefit of rural development and reduce poverty. Under an ADB pilot project in Guizhou, rural roads, in addition to other rural infrastructure such as electricity and water supply, are being provided to poor villages. Farmer incomes are on the rise and small businesses are opening along the road. The effects of this infrastructure has been systematically measured, monitored, and evaluated.

Infrastructure is necessary to create the conditions for economic growth to occur, and economic growth is necessary to reduce poverty. Good infrastructure is part of the enabling environment for the private sector to flourish as the private sector will be PRC's engine to create the jobs that are necessary to reduce poverty. Several studies have found that the provision of adequate infrastructure is a necessary condition to reduce poverty.<sup>1</sup> Major investments were made to improve infrastructure including roads, electricity, telecommunications and water, particularly in regions where the poverty incidence exceeds the national average. Research has concluded that investments in education, roads and agricultural research are correlated to poverty reduction.<sup>2</sup> During one ADB survey, when the domestic private sector was asked to identify infrastructure constraints, 21% responded poor roads, the highest response rate for any type of infrastructure. The road network is particularly underdeveloped in the poor central and western provinces. Poor infrastructure was also cited as a major reason that foreign companies do not expand their operations into the poor interior provinces.

### **Who Benefits from ADB Road Projects?**

Construction and operation of roads accelerate economic growth by lowering transport costs which, in turn, lead to the development of new industries, exploitation of natural and agricultural resources, and development of associated businesses and commerce. The resulting increased income and employment opportunities in the road influence area improve living standards and decrease the number of people living below the poverty line. ADB-financed expressway projects, together with the planned access and link roads to the hinterland, improve transport access for the rural population to nearby markets and social services and help develop industry, natural resources, and agroprocessing by creating new employment and income-generating opportunities that benefit people in general, and the poor in particular.

### **ADB's Policy Partnership with the PRC**

*Highway Design Standards.* While the quality of ADB-financed road projects in the PRC has generally been good, there have been a few instances of bridge failure, tunnel collapse, and pavement cracking. These project quality issues partly reflected the lack of suitable highway design standards for safety, capacity, and pavement strength, including interchange layouts, pavement design, and the design of major structures such as tunnels and bridges. Part of the problem was also related to the lack of a legal framework to enforce highway design and quality control procedures. This problem was resolved when the new Highway Law was made effective on 1 January 1998. Recognizing the importance of sound engineering practices in the context of increasing traffic volumes and heavy vehicles, MOC revised, with ADB assistance, its highway engineering standards. In addition to the review of technical standards, ADB helped produce a highway design manual for national road sector. Where applicable, the manual will promote the Government's efforts to improve construction quality, protect the

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<sup>1</sup> See ADB (2001), *A Study of Rural Asia. The Quality of Life in Rural Asia, Volume 4*, by David M. Bloom, Patricia H Craig and Pia N. Muloney; Oxford University Press.

<sup>2</sup> See International Food Policy Research Institute (2001), *Growth, Inequality, and Poverty in Rural China: The Role of Public Investments* by Shenggen Fan, Linxiu Zhang and Xiaobo Zhang.

environment, and enhance road safety and transport efficiency. This manual needs to be updated to reflect the new technical standards adopted in 2004.

*Road Safety.* Rapid traffic growth on the largely substandard road network has led to increasing traffic accidents. Official statistics indicate that there were 667,507 road accidents in 2003, killing 104,372 people and injuring 494,174 people. Reducing the high accident rate is an important element of ADB's policy dialogue (see attachment 1).

In 1999, ADB provided the Ministry of Public Security (MPS) with TA grant (TA 3341-PRC: Capacity Building in Traffic Safety, Planning and Management, \$600,000, approved on 14 December 1999) to deepen the understanding of road safety and traffic management problem, enhance capacity of its over 200,000 traffic police members, produce promotional material, and to develop a national road safety program and action plan. After reviewing PRC's practices and procedures in the road safety sector, the consultants developed a National Road Safety Program (NRSP). The NRSP discussed the requirements of road safety legislative framework and made recommendations on (i) establishment of a national road safety council; (ii) road infrastructure improvement; (iii) data system; (iv) education; (v) emergency service; (vi) traffic management and police enforcement; (vii) driver training; (viii) vehicle testing; and (iv) donors support. In addition to training of over 220 mid-level officers representing all provinces and autonomous regions, ADB and MPS organized a Leader's Conference in Nanjing in November 2001 to assess the NRSP, and to explore the size of the problem to the policy makers and senior government officials.

To meet the TA recommendations for improving traffic regulations and emergency response and promotion, MPS submitted a draft road and transport safety law that has been approved by the National People's Congress in 2003. The law covered the main issues and NRSP components addressed by the ADB TA, such as traffic laws, regulations, and rules in areas such as emergencies, vehicle registration, drivers licenses, rules for motorcycles and agricultural vehicles, non-motorized transport, expressway use, speeding violations, and accident data systems. The Road Traffic Safety Law became effective on 1 May 2004. Although the law mandates the use of seatbelts, it does not require the use of car seats to protect infants.

The integration of ADB's social policies and transport strategy into infrastructure projects is increasingly viewed as key component of ADB-financed projects. ADB's long-term strategic framework therefore has given high priority to road safety, which is defined as 'major health issue, associated with negative socioeconomic growth, and poverty problem'.

*Vehicle Emissions.* Air quality in most PRC cities, and in many rural areas, is poor. The major cause is the burning of coal in power plants, boilers, district heating systems, and factories. However, pollution from vehicles is increasing rapidly and has drawn attention to particular pollutants. In some cities, vehicles already account for 80% of total carbon emission levels, 50% of nitrogen oxides, and a substantial proportion of lead. The Government has recognized this problem and the amendments to the Air Pollution Law in 2000 added a chapter on motor vehicle pollution. An ADB case study in Beijing explored the use of market-based instruments such as subsidies, vehicle taxes, fuel taxes, emission charges, congestion charges, and tradable area licenses, to help reduce vehicle emissions. Implementation of recommended actions are being considered by the Government. ADB is assisting governments in developing and implementing policies to reduce vehicle emissions on a regional basis, including the PRC, with activities focusing

primarily on fuel quality, alternative fuels, the regulation of two and three wheeled motorized vehicles, vehicle testing, inspection, and transport planning (see attachment 2).

*Pricing Policies.* The Government's policy on road user charges allows cost recovery through tolls for expressways and highways partly funded through loan financing, and which meet the following conditions: (i) high traffic volumes, (ii) a relatively inelastic demand for road transport in relation to the toll level, and (iii) high values attached to time savings for passengers and freight. ADB has undertaken a study to develop a toll traffic diversion model applicable to socioeconomic conditions prevailing in the PRC. This will assist the Government in introducing toll pricing policies that improve cost recovery and transparency, and provide adequate incentives to attract private sector investment. ADB's policy on expressway toll levels requires full cost recovery including regular review of toll levels to ensure the recovery of operation and maintenance costs and debt service, and generation of an additional return for replacement and improvement investments. However, toll rate levels established for new expressways also take into account the toll affordability for transport users.

*Commercialization and Corporatization.* The move to a market economy has put pressure on existing expressway organizations and their staff to become commercially oriented and more efficient. There is scope for improvements in financing and commercial business management practices. To support good governance in the subsector and the institutional development of expressway organizations, the Government, with assistance from ADB, is pursuing capacity-building programs to encourage commercialization and corporatization in all provinces. Assistance has been provided to develop case studies of the best practices in corporatization and securitization in the road subsector, and to explore the possibility of provincial authorities entering into formal concession agreements with the corporations established to construct and operate highway sections.

*Mobilizing Domestic Resources.* Apart from encouraging the user-pay principle, ADB's policy agenda emphasizes mobilizing domestic resources and promoting commercial financing, including foreign loans. The Government has taken a number of significant steps to mobilize domestic resources, including developing capital markets and transforming specialized banks into commercial banks. ADB has provided assistance to help develop the capital markets, and made a major contribution to improving governance in the capital markets by supporting the drafting of the 1998 Securities Law. The Government is also seeking a greater role for private sector financing in highway and other infrastructure projects. Apart from increasing the resources available for highway development, the use of foreign direct investment would allow project risks to be spread over a large community of investors, and help improve the management efficiency and quality of highway services. In the road subsector, ADB provided assistance for (i) preparing a feasibility study on financing a road project using a BOT scheme, and for capacity building in relation to BOT processes; and (ii) developing institutional capacity to promote corporatization, leasing, and securitization.

### **What road projects has ADB supported in the PRC?**

ADB has provided around \$4.6 billion to finance 25 road projects in PRC (see map). These projects involved the construction of about 3,500 km of expressways and

construction, upgrading, and improvement of over 5,800 km of provincial, county, and village feeder and access roads. ADB's future program from 2004-2007 includes -10 projects for which ADB will provide about \$2.5 billion in financing.

Road projects financed by ADB are contributing to the development of Asian Highway Network (AHN). The UN Economic and Social Commission for Asia and the Pacific (UNESCAP) is working on a trans-regional highway project and 25 countries signed the Asian Highway Agreement. The AHN will cover 140,000 km and the PRC, of which 26,000 km are in the PRC. Five road projects financed by ADB with loans totaling \$874 million are firm AHN routes. In addition, six road projects financed by ADB for a total of \$958 million are potential AHN routes. Two future road projects to be financed by ADB with a total of \$610 million are designated as potential AHN routes. The total length of these AHN roads is around 2,100 km.

No.	Loan	Project Name	Road Length (km)	Loan Amount (\$ million)	Date Approved
1.	1168-PRC	Shenyang-Benxi Highway	75	50	02-Jul-92
2.	1261-PRC	Hunan Expressway	52	74	09-Nov-93
3.	1262-PRC	Jilin Expressway	133	126	09-Nov-93
4.	1324-PRC	Heilongjiang Expressway	350	142	29-Sep-94
5.	1325-PRC	Yunnan Expressway	200	150	29-Sep-94
6.	1387-PRC	Hebei Expressway	200	220	28-Sep-95
7.	1388-PRC	Liaoning Expressway	110	100	28-Sep-95
8.	1470-PRC	Chongqing Expressway	89	150	27-Sep-96
9.	1483-PRC	Shenyang Jinzhou Expressway	192	200	19-Nov-96
10.	1484-PRC	Jiangxi Expressway	134	150	19-Nov-96
11.	1617-PRC	Hebei Roads Development Project	140	180	18-Jun-97
12.	1638-PRC	Chengdu-Nanchong Expressway	208	250	10-Nov-98
13.	1641-PRC	Changchun-Harbin Expressway : Changyu Expressway	161	220	27-Nov-98
14.	1642-PRC	Changchun-Harbin Expressway : Hashuang Expressway	101	170	27-Nov-98
15.	1691-PRC	Southern Yunnan Road Development Project	147	250	24-Jun-99
16.	1701-PRC	Shanxi Road Development Project	176	250	30-Sep-99
17/18	1783/1784-PRC	Chongqing-Guizhou Roads Development Project	176	320	21-Nov-00
19	1838-PRC	Shaanxi Roads Development	176	250	30-Aug-01
20	1851-PRC	Guangxi Road Development	135	150	30-Oct-01
21	1918-PRC	Southern Sichuan Roads Development	160	300	20-Sep-02
22.	1967-PRC	Shanxi Road Development II	65	124	12-Dec-02
23	2004-PRC	Ningxia Roads Development Project	182	250	11-Sep-03
24	2014-PRC	Western Yunnan Roads Development Project	77	250	28-Oct-03
25	2024-PRC	Xi'an Urban Transport Project	87	270	28-Nov-03
<b>Total</b>			<b>3,526</b>	<b>4,596</b>	

No.	TA	Project Name	Amount (\$)	Approval Date
1	1664	Shenyang-Benxi Highway	100,000	22-Jan-92
2	1724	Institutional Strengthening for Highway Operation and Management	500,000	2-Jul-92
3	1725	Jilin Province Highway Network Study	600,000	2-Jul-92
4	1728	Changsha-Xiangtan Expressway	100,000	9-Jul-92
5	1940	Efficiency Improvements in Road Transport	550,000	25-Aug-93
6	1972	Policy and Institutional Support in the Road Sector	1,200,000	9-Nov-93
7	1975	Policies for Strategic Development of Transport and Communication	100,000	11-Nov-93
8	1981	Heilongjiang and Yunnan Expressways	320,000	16-Nov-93
9	2155	Sichuan Expressway	350,000	16-Sep-94
10	2177	Preparation of a Road Safety Program	600,000	29-Sep-94
11	2178	Provincial Highway Network Planning	600,000	29-Sep-94
12	2195	Hebei and Liaoning Expressways	560,000	31-Oct-94
13	2212	Beijing Urban Transport	715,000	28-Nov-94
14	2302	Symposium on Urban Transport	100,000	22-Feb-95
15	2409	Appraisal Methodologies and Restructuring Highway Financing	740,000	28-Sep-95
16	2482	Liaoning and Jilin Expressways	400,000	18-Dec-95
17	2486	Jiangxi Highway	250,000	20-Dec-95
18	2573	Review of Highway Design Standards	420,000	24-May-96
19	2649	Facilitating the Build-Operate-Transfer Modality in the Highway	1,100,000	27-Sep-96
20	2663	Hebei Roads Development	600,000	16-Oct-96
21	2777	Chengdu to Nanchong Expressway	600,000	7-Apr-97
22	2846	Changchun-Harbin Expressway	600,000	22-Aug-97
23	2952	Corporatization, Leasing and Securitization in the Road Sector	1,000,000	17-Dec-97
24	3033	Shanxi Expressway	570,000	24-Jun-98
25	3039	Yunnan Road Environmental and Social Analysis	150,000	7-Jul-98
26	3086	Regional Road Sector Study	1,185,000	13-Oct-98
27	3102	Chongqing-Guizhou Expressway	1,000,000	26-Nov-98
28	3220	Guangxi Highway Development	540,000	12-Jul-99
29	3248	Shanxi and Shaanxi Roads	792,000	30-Aug-99
30	3341	Capacity Building in Traffic Safety, Planning and Management	600,000	14-Dec-99
31	3546	Southern Sichuan Roads Development	800,000	16-Nov-00
32	3569	Jiangsu Highway Build-Operate-Transfer Project	555,000	12-Dec-00
33	3642	Western Yunnan Roads Development	770,000	20-Mar-01
34	3776	Ningxia Roads Development	600,000	16-Nov-01
35	3907	Xi'an Urban Transport	750,000	27-Aug-02
36	3900	Socioeconomic Assessment of Road Projects	250,000	12-Aug-02
37	3929	Hunan Roads Development II	600,000	23-Sep-02
38	4211	Gansu Road Development	500,000	5-Nov-03
39	4274	Central Sichuan Roads Development	700,000	18-Dec-03
40	4322	Poverty Impact of Area-Wide Road Networks	1,000,000	26-Mar-04
<b>Total</b>			<b>23,467,000</b>	

### What are ADB's plans for future road investment?

<b>Loan</b>	<b>Project Name</b>	<b>Amount (\$ million)</b>
2004	Guangxi Roads Development II	200
	Hunan Roads Development II	312.5
2005	Gansu Road Development	300
	Hunan Road Development III	200
	Sichuan Road Development III	300
	Sichuan Road Development IV	300
2006	Sichuan Road Development V	200
	Chongqing Road Development	300
	Gansu Roads Development II	200
2007	Inland Road Development	200
<b>Total</b>		<b>2,512.5</b>

<b>TA</b>	<b>Project Name</b>	<b>Amount (\$ '000)</b>
2005	Chongqing Road Transport	500
	Gansu Road II (Lintao-Guanzikou)	500
	Inland Road Development	500
	Highway Transport Information Modernization Study	150
	Rural Road Development Strategy	350
	Gansu Road Project (Poverty Reduction)	500
	Road Safety and Urban Transport Improvement	1,000
2006	Rural Development in Mountainous Areas in Southern Ningxia	500
	Western Road I	500
	Urban Transport Project	500
2007	Rural Transport Services Study	500
	Sustainable Road Asset Management-Pilot Road Concession Project	500
	Regional Road Development Study	600
	Policy Study on Financing, Building and Maintaining Local Road Network	500
<b>Total</b>		<b>7,100</b>

## Road Safety in the PRC: Past, Present, and Future

Motor vehicle and population growth, economic development, increased demand for road transport, attraction of urban centers for work, services or leisure, together with inability of road networks to meet the ever increasing demand, have resulted in road safety problems in the PRC.

Road safety may be defined as 'a major health problem, associated with negative socioeconomic growth, and poverty problem'.

### Highway and Motor Vehicles Growth

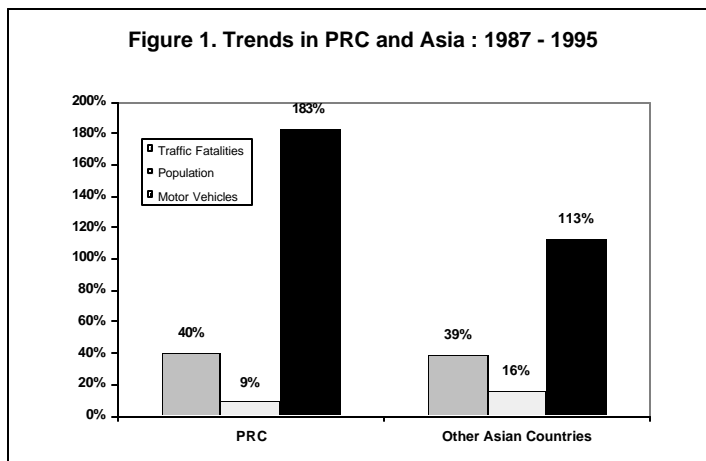
Implementation of the Government's economic reform policies since 1978 has resulted in rapid growth of the economy, and a corresponding increase in the demand for transport services.

By the end of 2003, the PRC land transport system comprised about 72,000 km of railways, 1.81 million km of highways. However, the density of the PRC transport networks ranks among the lowest in the world relative to either population or geographic area.

Between 1990 and 2003, when economic growth averaged 10.2% per annum, domestic passenger transport in all modes grew by 8.0% per annum in passenger-km.

In addition, car ownership is growing sharply. In 2003, the PRC motorized vehicle fleet had reached over 96 millions, including 24.3 million trucks, cars and buses and 72.3 million motorcycles and agriculture vehicles. The privately owned fleet of motor vehicles increased more than 40 times during 1985-2003, from 0.3 million vehicles to 12.5 million.

Despite the rapid increase in total vehicles, there are only about 1.9 vehicles – truck, car, or bus – for 100 persons. This figure is low relative to other countries in the Asia - Pacific region. Over the next five years, plans are to invest up to \$7 billion in automotive manufacturing.



### Urban Road Problems

The developed economy of the PRC is predominantly urban, and urbanization growth is expected to increase, creating more pressure on the inefficient urban road transport systems. The worrying sign is that the current ambitious highway road construction program has not been matched by corresponding investment to develop efficient urban roads infrastructure.

As a result of inefficient highway and urban roads, traffic congestion, and road safety accidents are now major concerns, which significantly inhibit poverty reduction and socioeconomic development.

### **Road Safety in the PRC**

Increased road safety requirements is an unavoidable consequence of rapid economic growth and poverty reduction. Unless road safety is improved, the resultant economic and social costs will erode a portion of the benefits of economic development.

In 2003, there were about 667,507 road accidents, killing 104,372 and injuring 494,174 persons, down 13.7%, 4.6% and 12.1%, respectively from the previous year. More than 1 person dies each 5 minutes in PRC from a traffic accident, the highest rate in the world.

Studies indicate that road accidents cost PRC between 1-3% of GDP annually, and equivalent to over \$12 billion in 2001 – Table 1.

**Table 1: PRC Economy Losses Due To Road Accidents – 1% of GDP\***

<b>Year</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>GDP (\$billion)</b>	903.4	963.5	1010	1080	1190
<b>Losses (\$billion)</b>	9	9.6	10.1	11	12

\* The economy losses due to road accidents = 1–3% of GDP, as per various studies.

### **ADB's Road Safety TA**

In 1999, ADB provided the Ministry of Public Security with TA grant to deepen the understanding of road safety and traffic management problem, enhance capacity of its 200,000 traffic police members, produce promotional material, and to develop national road safety action plan.

In November 2001, ADB and MPS organized a Leader's Conference in Nanjing to assess the resulting national action plan, and to explore the size of the problem to the policy makers and senior government official.

## Required Actions and Dialogue

It is the poor who are most affected by poor road safety conditions and accidents. The poor normally do not own vehicles. Their main mode of travel is walking. They normally have to spend a considerable amount of time in obtaining access to supplies, services, and facilities for their subsistence needs. Access to school, health services and workplace, are also associated with non-motorized transport.

Women, elderly, children, sick people, and other disadvantaged groups in society are also more vulnerable to traffic accidents since their main mode of transport is non-motorized. Death of the head of family due to road accidents has significant adverse effects on the family welfare. The death of student means the loss of many productive years.

Road safety enhancement, leading to improvements in access, can have direct welfare benefits for the poor. Improving the quality of life of the community's poor in the PRC requires successfully addressing the problem of road safety and creating a safer and sustainable transport system.

Successful strategies need to combine legislative action, government commitment, and appropriate enforcement measures. To carry out such strategies, the PRC, like all other countries in Asia and developed world, will have to substantially strengthen the capacity of organizations charged with management of highway system, urban road, and road safety, at the national, provincial and local levels.

Road safety in the PRC has not been given the priority it deserved. Without improving road safety, the impact of Government investments in other poverty-related initiatives will be diminished. Road projects usually achieve greater than 12% of economic internal rate of return, but they can perform even better if safety is one of the objectives.

The successful coordination of the three E's – Engineering, Enforcement, and Education has resulted in saving thousands of lives every year, and billions of dollars which reduced demand for health services and spent on community welfare. This success can be built in the PRC.

ADB has considerable experience in the formulation and implementation of transport and road safety projects. Road safety and traffic problem cannot be tackled by the government on its own. Active involvement is required from both national and local government agencies. NGOs and other civil society organizations can help in lobbying for policy reform, and the implementation of awareness raising campaigns. Private sector involvement can bring management and finance. The ADB's TA action plan will pave the way for involvement of multi-sectoral groups.

ADB is continuing its dialogue with the government to facilitate the implementation of the national action plan of the road safety TA. The leader's conference has identified what is needed to do to strengthen road safety and prevention measures through better initiatives.

## Vehicle Emissions in the PRC

Automotive vehicle emissions, once largely a problem of developed countries, is now an alarming environmental problem in many developing countries.

Rapid urbanization, motorization and economic growth, outdated technology, pollution increase, and demand for road services are contributors to an increasing air pollution problem in most growth centers.

Without effective measures to curb air pollution, some 300-400 million city-dwellers in developing countries will become exposed to unhealthy and dangerous levels of air pollution in the next decade. The PRC especially its large cities, is facing a similar environmental threat.

Air quality in most PRC cities and in many rural areas is poor. Pollution from vehicles is increasing and has drawn attention to particular pollutants. They are associated with:

- millions of premature deaths and injuries
- high medical costs
- strain in welfare service
- reduction of productivity

The contribution from the transport sector is estimated by 30-50% of air pollution in PRC cities. Recent data of some large cities show that the air pollution contribution from motor vehicles is much higher than before, as shown in Table 1: Share of Traffic Emissions in Selected Cities. Vehicle emission has become one of the most important sources of urban air pollution in Beijing, Shanghai, and Guangzhou.

**Table 1: Share of Traffic Emissions in Selected Cities**

	CO	HC	Nox
Beijing (2000)	76.8%	78.3%	40.0%
Shanghai (1996)	86.0%	96.0%	56.0%
Guangzhou (2000)	83.8%	50%	45%
Shenyang (1990)	27-38%		45-53%

Various sources.

Studies on transport and emission control often take a technological focus. Technology improvements can be aimed at the vehicle (e.g. emissions control) and the fuel (e.g. alternative fuels). Wide ranges of policy measures have recently been proposed to cope with the high social costs of automotive pollution, including:

- information campaigns
- economic instruments
- travel demand management
- transport planning

Experience from different countries and cities have shown that there is no single unambiguous and effective remedy. Because there are so many complex factors

interacting in the transport sector's effect on pollution, a holistic approach is necessary, combining all the types of policy measures.

These control strategies and policies should be based on a scientific understanding of the pollution characteristics. Within this framework, it is important to project the total vehicular emissions and the high pollutants concentration in the development of new projects in order to develop sound vehicular pollution control policies.

Regulating vehicle emissions is the responsibility of local environmental protection bureaus, in cooperation with the traffic division of the public security bureaus. Vehicles are subject to annual inspection, which can be done on a customized basis for fleets of transport enterprises.

In addition, vehicle emission testing is carried out at some city boundaries, where time-bound permits are issued for use of the vehicle in the city. There is also random testing on highways. These activities are self-financing; inspection fees and fines are sufficient to fund expanding the inspection and testing programs.

As development of the national highway will introduce inter-provincial movement of vehicles, there is a need to harmonize differences in vehicle emission control and regulations, and the related enforcement and monitoring, testing, certification, and inspection procedures among provinces.

This issue is being addressed under an ADB Regional Technical Assistance including the PRC, which is assisting the Government in developing and implementing policies to reduce vehicle emissions on a regional basis, with activities focusing primarily on:

- fuel quality
- alternative fuels
- regulating two- and three-wheeled motorized vehicles
- vehicle testing
- inspection
- transport planning

Under this TA, a workshop was held in Chongqing in November 2001 to discuss vehicle inspection and maintenance and to develop an action plan for the PRC. The final action plan has been assessed at a regional workshop held in Manila in February 2002.