



# Technical Assistance Consultant's Report

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## Armenia: Transport Sector Development Strategy (Financed by the ADB Technical Assistance Special Fund)

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Ministry of Transport and Communication  
Republic of Armenia

*Armenia*  
*Transport Sector*  
*Development Strategy 2020*

*Final Report*



in association with



**Yerevan, November 2008**

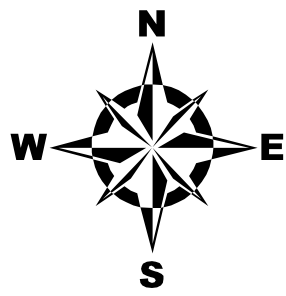
# Armenia Transport Strategy 2020



- ★ Capital
- ✈ Airport
- Body of Water
- Road
- +— Railroad
- International Corridor
- City
- ✕ Border Point

Boundaries are not necessarily authoritative

0 25 50 100 Kilometers



Iran

## Abbreviations and Acronyms

AADT	annual average daily traffic	HWTSK	Harral Winner Thompson Sharp Klein
ADB	Asian Development Bank	IATA	International Air Transport Association
ADR	Agreement Concerning the International Carriage of Dangerous Goods by Road	ICAO	International Civil Aviation Organization
AEPLAC	Armenian-European Policy and Legal Advice Centre	IFI	international financial institutions
AETR	European Agreement Concerning the Work of Crews of Vehicles Engaged in International Road Transport	IFRS	International Financial Reporting Standards
AGR	European Agreement on Main International Traffic Arteries	ILS	Instrument Landing System
AH	Asian Highways	IMF	International Monetary Fund
AIA	Armenian international airports	IT	information technology
AMD	Armenian dram	JAA	Joint Aviation Authorities
ANS	Air Navigation System	JICA	Japan International Cooperation Agency
ARD	Armenian Roads Directorate	KATB	Kars-Akhalkalaki-Tbilisi-Baku
ARMATS	Armenian Air Traffic Service	km	kilometer
ASIF	Armenian Social Investment Fund	kph	kilometer per hour
ATC	Avia Training Centre	kV-DC	kilovolt direct current
ATM	Air Traffic Management	LAN	local area network
ATP	Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment used for Such Carriage	LGU	local government unit
		LLC	Limited Liability Company
		LRNP	Lifeline Roads Network Program
		m	meter
		M&E	monitoring & evaluation
		MAK/IAC	Interstate Aviation Committee
		MCC	Millennium Challenge Corporation
		MIS	management information system
		MNP	Ministry for Nature Protection
		MOE	Ministry of Economy
		MOED&T	Ministry of Economic Development and Trade
BRT	bus rapid transit	MOTC	Ministry of Transport and Communication
BSEC	Black Sea Economic Cooperation	MTA	Ministry of Territorial Administration
CAPS	Competitive Armenia Private Sector	MTEF	Medium-Term Expenditure Framework
CD	Capacity Development	NATO	North Atlantic Treaty Organization
CIM	Uniform Rules Concerning the Contract for International Carriage of Goods by Rail	NAS	National Academy of Sciences
CIS	Commonwealth of Independent States	NASP	National Aviation System Plan
CIV	Uniform Rules Concerning the Contract for International Carriage of Passengers and Luggage by Rail	NGO	non-government organization
CJSC	Closed Joint-Stock Company	NRSC	National Road Safety Council
CMR	Convention on the Contract for the International Carriage of Goods by Road	NSS	National Statistics Service
CNG	compressed natural gas	OSJD	Organization for Railway Cooperation
COTIF	Convention Concerning International Carriage by Rail	P&E	Program and Evaluation
CPI	Consumer Price Index	PIU	project implementation unit
DC	direct current	pkm	passenger kilometers
DGCA	Directorate General of Civil Aviation	PPP	private public partnership
EASA	European Aviation Safety Agency	PRSP	Poverty Reduction Strategy Paper
EBRD	European Bank for Reconstruction and Development	PSP	private sector participation
ECA	Europe and Central Asia	PSRC	Public Service Regulatory Commission
ECAC	European Civil Aviation Conference	RMA	Railway Monitoring Agency
ECMT	European Conference of Ministers of Transport	ROW	right of way
EIA	environmental impact assessment	RZD	Russian Railways
EMU	electric multiple unit	SCR	South Caucasian Railway
EO	environmental officer	SEEC	State Environmental Expertise Commission
ESA	equivalent standard axle	SID	Standard Instrument Departure
ESCAP	Economic and Social Commission for Asia and the Pacific	sq	square
EU	European Union	SCJSC	State Closed Joint-Stock Company
GDCA	General Department of Civil Aviation	STAR	standard arrival routes
GDP	gross domestic product	SUT	sustainable urban transport
GRM	Shirak Airport	t	ton
GTZ	German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit)	TA	technical assistance
HR	human resources	TACIS	Technical Assistance to Commonwealth of Independent States
		TDCP	Tourism Development Concept Paper
		TEM	Trans-European Motor Highway
		TER	Trans-European Railway
		TIR	Transports Internationaux Routiers

tkm	ton kilometers	UNFCCC	United Nations Framework Convention on Climate Change
TP	Traffic Police	USAID	United States Agency for International Development
TRACECA	Transport Corridor Europe Caucasus Asia	US	United States
UNCBD	United Nations Convention on Biological Diversity	USSR	Union of Soviet Socialist Republics
UNCLOS	United Nations Convention on Law of the Sea	UT	urban transport
UNDP	United Nations Development Programme	WAN	Wide Area Network
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific	YM	Yerevan Municipality
UNECE	United Nations Economic Commission for Europe	YUTP	Yerevan Urban Transport Project
		ZVR	Zvartnots Airport

Note: \$ = United States Dollar  
\$1 = AMD 305.

VAT (@ 20%) is excluded from costs, unless stated otherwise.

## EXECUTIVE SUMMARY

Location, topography, and geopolitics present a particular transport challenge in the Republic of Armenia (Armenia) situated in the strategically important southern Caucasus. With an average elevation of 1,800 meters (m) and a severe climate, very low winter temperatures, heavy snowfall, and high intensity rainfall are experienced throughout the country, including in key transport routes. The combination of these factors results in high transport costs and expensive infrastructure maintenance and development.

The infrastructure legacy after independence was substantial in terms both of network coverage and capacity. Transport infrastructure had deteriorated in the difficult years after independence because maintenance was deferred due to lack of funds. Globalization presents both challenges (such as increasing demands for more complex logistics and more timely transport services and reductions in transport costs) and economic opportunities.

The Government of Armenia (the Government) has achieved impressive economic performance in the past several years despite substantial challenges experienced after independence and the rather limited resources under a small government model, while keeping its fiscal management and external borrowing prudent. It has also substantially transformed transport sector management from wholly a public sector responsibility to a largely privatized operation. Starting from the mid-1990s, it has actively mobilized external financing to restore transport infrastructure. Furthermore, the Government has strengthened economic relations with other countries by improving the business environment to promote investment and exports.

The Armenia Transport Sector Development Strategy 2020 (the Strategy) pursues improved management, infrastructure, and technology to maximize the transport sector's performance until 2020, and envisages a long-term prosperity through the establishment of efficient, cost effective, and environmentally and socially sustainable transport infrastructure and services. The Strategy has been developed, based on past achievements, to respond to the present and future transport sector-related challenges and capture the potential opportunities in the current and future global markets. It has also been developed, bearing in mind the increasingly challenging outputs that the Government must deliver in the context of limited resources and the Government's prudent fiscal and external borrowing policies. The Strategy encourages partnerships within the Government and with external financing institutions as well as with the private sector to attain the Strategy's vision.

The Strategy entails an Action Plan for the Strategy (the Action Plan) which comprises a time-bound program of policy reforms and investment and technical assistance projects identified for 2009-2020, totaling about \$2.2 billion.

Like other countries in the world, the global financial crisis that started in late 2008 will likely slow economic growth in Armenia. The years ahead will inevitably be a challenging period for the Government. However, the global financial crisis and possible fiscal and external financing constraints (including financing provided by the Armenian Diaspora) will require the Government to pursue the Strategy more progressively—effectively targeting high priority investments together with intensified transport and trade facilitation coordination within the Government and with Armenia's neighboring countries in order to achieve quick and cost effective returns from limited resources. Removing impediments to transport and trade in a cost-effective manner is essential to ensure sustainable, inclusive economic development and business development in Armenia and a critical action to turn economic opportunities into economic realities, building a better future for the country.

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## I INTRODUCTION

1. This report sets out a transport sector development strategy 2009-2020 (the Strategy) for the Republic of Armenia (Armenia). It is based on (i) a detailed assessment of the economy and the transport sector, including achievements, challenges and opportunities; (ii) extensive consultations with relevant agencies and stakeholders; and (iii) discussions at two workshops at the beginning and end of the study.

2. Chapter 2 reviews economic and transport sector development (including geopolitical aspects): the foundation for the Strategy. Chapter 3 assesses sector achievements, challenges and opportunities. Chapter 4 presents the key points of the Strategy. Sector development in the last decade is reviewed in Appendix 1. Annexes cover subsector issues in more detail. A bibliography is provided in Annex 11 and a list of people met in Annex 12.

3. Appendix 2 presents the Action Plan for Strategy implementation, including policy reforms, major investments and necessary technical assistance (TA). Project profiles and TA descriptions are given in Appendix 3.

4. The Consultants conducted their work from May to November 2008. The Consultants extend their appreciation to staff of the Ministry of Transport and Communication (MOTC), the Armenian Roads Directorate (ARD) and the Asian Development Bank (ADB) for their encouragement and support throughout the study. The Strategy has been developed following extensive consultations and with considerable assistance from responsible agencies. It has benefited greatly from discussions with stakeholders and from feedback received at the Inception Workshop and the Draft Final Report Workshop. Comments on a draft of this report were provided by ADB, the World Bank, MOTC and a number of other government agencies.

## II CONTEXT FOR STRATEGY DEVELOPMENT

### A. Development Context

#### 1. Good Infrastructure Legacy, Change in Transport Demand and External Financing Mobilized for Transport Infrastructure Restoration

5. The infrastructure legacy at independence was substantial, in both network coverage and capacity. The former Union of Soviet Socialist Republics (former USSR) had a substantial heavy industrial sector with intensive transport of intermediate goods. Such transport has disappeared and the contribution of the transport sector to the economy has fallen dramatically. High volume products became few and border closures hindered trade, resulting in import substitution. Each transport mode used to handle traffic many times its current volume. In general, network capacity is expected to be sufficient to accommodate traffic growth to 2020. However, infrastructure deteriorated in the difficult years after independence because maintenance was deferred due to a lack of funds. Much of the investment in recent years has thus been for rehabilitation and reconstruction. The Government has so far mobilized a total of about \$350 million for transport infrastructure restoration from the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the Lincy Foundation, the Millennium Challenge Corporation (MCC) of the United States (US) and from the World Bank.

#### 2. Challenging Situation

6. Armenia's location, topography and geopolitics present a particular transport challenge. Landlocked, mountainous and situated in the strategically important and unstable southern Caucasus, its international links are vulnerable, as the events of August 2008 demonstrated. Of four bordering countries, only two borders are open: with Georgia to the north and Iran to the south. As a result of the Nagorno-Karabakh conflict, the western border with Turkey was closed in 1993 and the eastern border with Azerbaijan was closed in 1991. With an average elevation of 1800 meters (m) (90% of the country is above 1,000 m) and a severe, continental climate, there are very low winter temperatures and heavy snowfall affecting key routes. These circumstances result in both a high cost of transport, particularly for traded goods, and in expensive infrastructure maintenance and development.

7. Border closures increased the importance of maintaining good relations with Georgia, essential for road/rail access to Black Sea ports (and points west and north) and with Iran, the only alternative route to ports. Crossing points with Georgia are at Bavra, Dzoramut and principally Bagratashen, and with Iran at Agarak, 10 kilometers (km) from Megri. Closed borders result in: (i) a substantial increase in transport costs; (ii) restricted international and transit trading opportunities; (iii) limited development of the domestic trucking industry; (iv) poor prospects for the logistics sector; and (v) a reduced role for the railway. A 2001 study estimated that opening of both borders would reduce the trade deficit by a third to a half, and increase gross domestic product (GDP) by 30%.<sup>1</sup> A 2005 study (supported by the Armenian-European Policy and Legal Advice Center AEPLAC) indicated a more modest annual GDP increase of 0.67%, plus a further 2.7% increase over five years.<sup>2</sup> Resolution of border issues would also stimulate foreign direct investment in the Caucasus.

8. Efficient operation of remaining borders can mitigate the negative impact of border

<sup>1</sup> Evgeny Polyakov, World Bank, *Changing Trade Patterns after Conflict Resolution in the South Caucasus*, World Bank Policy Research Working Paper No. 2593, April 2001.

<sup>2</sup> *Study of the Economic Impact on the Armenian Economy from Re-Opening of the Turkish-Armenian Borders*, 2005.

closures. Country-specific trade and transport sector reviews<sup>3</sup> and this study have identified a number of issues/problems: (i) weak local and regional sector legal framework; (ii) lack of facilitation for driver visas; (iii) lack of a national law on freight forwarding; (iv) delays in issuance of road transport permits; (v) border control barriers (e.g., multiple windows/stops); and (vi) border infrastructure constraints (e.g., the narrow bridge Bagratashen-Sadakhlo, Georgia).

9. Dependence on one or two outlets to the sea poses the risk of becoming a “captive shipper”. Alternative routes need to be maintained to: (i) reduce the risk of dependence on infrastructure of transit countries; (ii) reduce fees, direct costs and delays due to transit and customs charges in transit countries; and (iii) reduce vulnerability to disruption in transit countries.<sup>4</sup>

### 3. Economic Development since Independence

10. Armenia has achieved impressive economic recovery despite the many challenges it experienced after independence in 1991 following the break-up of the former USSR. Independence precipitated a profound economic shock, while the country was still recovering from the devastating Spitak/Gyumri earthquake of 1988 (this killed 0.8% of the population and left 15% homeless). GDP declined by 65% between 1989 and 1993. There was large-scale emigration (some 15% of the population emigrated 1992-1994) and runaway inflation. Economic recovery began in 1993, with annual GDP growth for the period 1993-2000 averaging 5.4%.

11. The Armenian Dram (AMD) was introduced in November 1993. Consumer prices rose by 1884% in 1994, before the financial situation stabilized in 1995. The AMD has been one of the world’s strongest currencies since 2003. The rate per dollar in November 2008 was AMD305, as against AMD405 end-1994 and a low of AMD579 in 2003. The Dram strengthened markedly against the ruble and the Euro from mid-2008, tracking the rise in the dollar. The Government is pursuing a strong Dram policy as part of its strategy to contain inflation. The annual inflation rate in August 2008 was 11.5%. Average wages in the first eight months of 2008 were 21% higher than in the same period of 2007. The collapse in energy prices since mid-2008 will ease inflationary pressures.

12. Double-digit GDP growth was achieved annually during 2002–2007 (Table 1). Less than 10% growth is expected for 2008. GDP per capita expressed in US dollars quadrupled from 2001 to 2007, a combination of Dram appreciation and rapid growth. Support from the Diaspora and large remittances from an energy-resource rich Russian Federation were key factors, financing a large trade imbalance. In 2007 the value of imported goods and services was double that of exports. The gap widened in 2008, with imports projected to be 246% of exports.

**Table 1: GDP 2001-2007**

Item	2001	2002	2003	2004	2005	2006	2007
GDP growth rate %	9.6	13.2	14.0	10.5	14.0	13.4	13.8
GDP/Capita \$	659	740	874	1,113	1,524	1,988	2,853
GDP/Capita AMD '000	366	424	506	594	697	827	976
Exchange rate AMD/\$	555	573	579	533	458	416	342
Inflation rate %		1.1	4.7	7.0	0.6	2.9	6.6

AMD = Armenian Roads Directorate, GDP = Gross Domestic Product, Source: *Statistical Yearbook of Armenia 2007*

<sup>3</sup> E.g., Karine Simonyan, World Bank Consultant, *Workshop on Corridor Development for Caucasus Countries, Background Paper, Trade and Transport Facilitation, Armenia*, May 2004, pp. 17-18.

<sup>4</sup> T. Snow, M. Faye, J. McArthur, and J. Sachs, *Country Case Studies on the Challenges Facing Landlocked Developing Countries*, UNDP Human Development Report Office, Occasional Paper, 2003.

#### 4. New Economic Developments in 2008

13. 2008 witnessed a time of geopolitical disturbance in the Caucasus and of extreme financial and economic turbulence worldwide. Events during this period included: (i) the Georgia-Russia war, resulting in the *de facto* independence of South Ossetia and Abkhazia, temporary closure of the rail route to the key Black Sea port of Poti and severe disruption to Armenia's international trade; (ii) fluctuations in the oil price, from near \$150/barrel in June 2008 to below \$45/barrel in November; (iii) the first visit of a Turkish president to Armenia (football diplomacy); (iv) opening of the Turkish border (but only for the export of electricity); (v) the start of the operation of Armenian Railways under concession to a subsidiary of Russian Railways; (vi) the seizing up of international credit markets and the world banking system; (vii) the collapse, merger and bailout of major banks, investment banks and insurance companies; (viii) the biggest ever one-day point decline in the Dow Jones Industrial Index (28 September) and in the FTSE100 (6 October); (ix) near bankruptcy of Iceland and doubts about the financial strength of many other countries; and (x) the start of a worldwide recession, expected to deepen in 2009, with Armenia's major trading partner Russia particularly affected by the decline in energy prices.

#### B. Development to 2020

##### 1. Economic Development Prospects

14. Although the economy recovered rapidly and surpassed its pre-independence real GDP level in 2004, vulnerabilities remain: (i) all fuel is imported; (ii) remittances from the Diaspora, largely based in the Russian Federation and in the US, and external assistance remain important drivers of growth; and (iii) investment has focused on the property sector. The Poverty Reduction Strategy Paper II (PRSP-2) forecasts a gradual deceleration in GDP growth to 8% by 2011 and to 5.1% by 2020 (Table 2), with a major decline in the importance of the construction sector (Table 3). The International Monetary Fund (IMF) forecasts a more rapid slowdown, to 6% growth by 2011 (Table 2). Both these forecasts were made before the full extent of the international economic crisis became apparent and must now be considered optimistic.

**Table 2: GDP 2008-2021**

Item	2008	2009	2010	2011	2012-2015	2016-2018	2019-2021
<b>PRSP-2:</b>							
GDP real annual growth %	10.4	9.2	8.5	8.0	6.3	5.7	5.1
GDP AMD billion (current price)	3,671	4,169.3	4,703	5,280	7,837	10,228	13,114
GDP \$ million (current price)	12,022	13,651	15,399	17,290	25,662	33,490	42,939
Per capita GDP \$	3,718	4,210	4,734	5,297	7,725	9,945	12,618
CPI (average), % change	8.9	6.1	3.8	3.4	3.0	3.0	3.0
<b>IMF:</b>							
GDP real annual growth %	10.0	8.0	7.0	6.0	6.0		

CPI = consumer price index, GDP = Gross Domestic Product, IMF = International Monetary Fund  
Sources: Republic of Armenia, Poverty Reduction Strategy Paper 2 (PRSP-2). IMF, World Economic Outlook, October 2008 Edition.

**Table 3: GDP by Sector 2005-2021**

Sector Contribution %	2005	2006	2007	2008	2009	2010	2011	2015	2018	2021
Industry	21.8	17.9	15.0	13.7	13.3	13.3	13.6	16.4	18.5	19.7
Agriculture	19.0	18.1	18.1	16.4	15.6	14.8	14.2	12.5	11.5	10.5
Construction	19.6	24.5	24.7	26.9	17.9	28.1	27.7	23.0	19.3	16.4
Services	32.1	31.2	32.2	31.9	31.7	32.0	32.7	36.8	40.4	43.9
Net indirect taxes	7.4	8.2	10.0	11.1	11.6	11.7	11.8	11.3	10.5	9.5

<b>Sector Contribution %</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2015</b>	<b>2018</b>	<b>2021</b>
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Republic of Armenia, PRSP-2. IMF, World Economic Outlook, October 2008 Edition.

15. The Poverty Reduction Strategy Paper I (PRSP-1) targets have been substantially over-achieved to date. The PRSP-2 expects further rapid progress, although it notes with concern the widening gap in incomes between Yerevan and the rest of the country. Extreme poverty is expected to be largely eliminated by 2021, and the proportion of poor to fall to one third of its level in 2008 (Table 4).

**Table 4: Poverty Level 2005 - 2021**

<b>Indicators</b>	<b>2005</b>	<b>2008</b>	<b>2012</b>	<b>2015</b>	<b>2018</b>	<b>2021</b>
<b>National:</b> Poor, % of population	29.8	17.3	11.9	8.8	7.4	6.0
Extreme poor, % of population	4.6	2.4	1.8	1.4	1.2	1.1
<b>Yerevan:</b> Poor, % of population	23.9	11.9	7.3	4.5	3.5	2.6
Extreme poor, % of population	3.6	1.3	0.9	0.6	0.5	0.4
<b>Other Towns:</b> Poor, % of population	37.8	24.2	16.6	12.3	9.9	7.6
Extreme poor, % of population	7.2	4.0	2.7	2.2	1.8	1.5
<b>Rural Areas:</b> Poor, % of population	28.3	17.4	12.7	10.2	9.2	8.1
Extreme poor, % of population	3.2	1.8	1.5	1.2	1.2	1.1

Source: PRSP-2.

16. Fast growing economies such as Armenia will inevitably be impacted by the recent worldwide deterioration in the financial and economic situation. A strong currency and a property boom might transform into falling property values and difficulties for individuals in repaying loans. This report was completed in November 2008 when the prospect was for little or no growth in the world economy in 2009 and for international trade to contract, its worst performance since the Second World War. When and to what degree the position will stabilize and recovery begin was unclear.

17. Armenia is vulnerable, with the international economic situation increasingly challenging, riskier than it has been for perhaps the past 75 years. The short-term outlook for trade, output and employment is essentially unpredictable. Remittances, inward investment and tourism will all suffer from the worldwide recession. Economic growth in the short term (2009-2012) will be below the forecasts in Table 2. An average GDP growth rate of 5% over this period would now be considered an achievement. For 2009-2020, uncertainty is such that scenarios must range widely: with, in the worst case, GDP growth averaging below 4%, a central case range of 4-6% and an optimistic scenario of above 6% growth, the latter being the likely scenario before the world recession took hold.

18. Slower growth will have an impact on transport demand, particularly on the growth of the vehicle fleet, with its greatest impact in Yerevan. There will be additional social demands on the national budget and lower than expected tax revenues, transport will therefore become more difficult to provide for out of the budget. The Strategy focuses on actions that will be robust for all scenarios: improving sector management, mitigating externalities, service integration, training, improved application of technology, strengthened planning capability, improving efficiency and flexible programming of sound investments.

19. Population structure will impact the economy and the transport sector. The recorded total of 3.2 million includes a large number of people living or working abroad for most of the year. The average resident population is believed to be under 3 million. The birth rate is low (11.7/1000 in 2006) and with continuing emigration of the young, mainly males, the population is aging rapidly. By how much it will fall by 2020 will depend largely on the level of emigration. An aging population requires transport services tailored to its needs to maintain mobility, for example, easy access to public transport. The activity rate is low, with 36% of

the population economically active, 42% of whom are engaged in farming. Almost two-thirds live in urban areas. Population structural changes will reduce the growth of transport demand.

20. Inflation and the price of oil will have an impact on the cost of infrastructure investment and maintenance. The short-term outlook is for the rate of inflation to decline sharply, due to the effect on demand of the worldwide recession, reversing the experience of 2007-2008. However, the cost of transport, and infrastructure maintenance and investment will continue to be sensitive to changes in the oil price.<sup>5</sup> The future rate of inflation is an additional risk factor, oil prices for example must be expected to at some stage rebound sharply from their low level as of November 2008. Budgeting and investment planning must carefully consider future price levels and fluctuations in exchange rates and provide for appropriate contingencies.

21. Yerevan, the capital city which has one-third of the population, contributes two-thirds of GDP. Connectivity to and from Yerevan and urban transport are of high priority, but the widening income gap with the rest of the country may be exacerbated if limited resources are overly focused on the capital, at the expense of poverty reduction elsewhere.

## **2. Transport and Economic Development**

22. Improving the level of service and reducing the cost of transport directly stimulates trade and economic development. Both transport infrastructure asset management and operating performance can be strengthened through: (i) vehicle fleet modernization (scrapping of obsolescent vehicles, improving performance, reducing fuel consumption and accidents); (ii) improved logistics and distribution, including the provision of “just in time” services; (iii) improved road maintenance techniques; (iv) developing stronger institutions and policy coordination; (v) improved planning and resourcing; (vi) greater stakeholder involvement; and (vii) improved regulation of concessions and franchises to ensure that they better serve the national interest.

23. PRSP-2 notes how current high transport costs reduce competitiveness:

“With regard to the infrastructure sector, in the overall quality estimate in 2005 Armenia ranked 7<sup>th</sup> among 26 Europe and Central Asia (ECA) countries, with the major obstacle to investment transport cost (rank 23<sup>rd</sup>). Disregarding transport cost Armenia would rank 4<sup>th</sup> in quality of infrastructure services.”

24. There are a number of opportunities which depend on improving transport. The long-term growth prospects for tourism are good; however, it needs low cost, efficient air services and improved connectivity with potential markets. A number of products could be exported if transport costs were reduced. Improved rural feeder roads would provide better access to domestic and international markets for farm products and better delivery of social services to rural areas.

## **3. Transport and External Financing**

25. The Government has successfully mobilized grant support for transport from the Diaspora and concessional loans and grants from the international community (bilateral and multilateral). The Strategy encourages further such support. By 2020, Armenia is expected to be a middle-income country. There will be a consequent hardening of loan terms and fewer

<sup>5</sup> For example, a grant of \$67.1 million from the Millennium Challenge Corporation (MCC) of the US in 2003 for rehabilitation of 940km of road, would at mid-2008 prices have been sufficient for only 330 km. The bid price (in dollars) in June 2008 for 10 lots of the Rural Road Rehabilitation Project financed by ADB was 45% higher than that estimated at appraisal in July 2007, largely as a result of the then much higher oil price.

grants. Hard loans must be used effectively. External support should encourage: (i) improved services and cost-effective and safe transport; (ii) prudent asset management to sustain networks; and (iii) cost effective infrastructure development.

#### **4. Information Technology**

26. There have been significant developments in information technology (IT) over the last decade. This will continue, providing opportunities to further enhance transport sector management and to improve logistics. A strengthened planning and management capability requires accurate and comprehensive data, disseminated to users through a supporting IT infrastructure. Close cooperation between statistics providers and users is needed, with surveys conducted to improve databases. Data should be made more widely available. For effective sector management, information on the development of the vehicle fleet and similar information is essential. A comprehensive database is a key management tool for the transport sector.

#### **5. Government Role**

27. Under the principle of “small government” the Government with rather limited staff and resources has successfully devolved most sector management through franchising, concessions and privatization. It is now seeking to reengage with the sector, principally through strengthened supervision and monitoring, and with more understanding of relevant issues. The Government will need to achieve and deliver increasingly challenging outputs and services. This requires a clear strategic focus on resource use to address the increasingly complicated sector issues. In order to facilitate economic development, transport needs to function more efficiently and more safely. It also needs to support social and environmental objectives. A stronger partnership with relevant offices is playing an increasingly important role in supporting efficient and environmentally and socially sustainable transport development.

#### **6. Geopolitical Implications**

28. Geopolitical issues in surrounding countries might impact the economy and the transport sector. These include: (i) Turkey’s European Union (EU) candidature; (ii) Georgia’s North Atlantic Treaty Organization (NATO) application; (iii) Iran’s nuclear program; (iv) expiry in 2017 of the Russian Federation’s lease on Sevastopol port in Ukraine; (v) the future status of Abkhazia and South Ossetia; (vi) depletion of Azerbaijan’s energy reserves; (vii) developing relations with Turkey; and (viii) most critically, Nagorno-Karabakh and relations with Azerbaijan.



### III ACHIEVEMENTS, CHALLENGES AND OPPORTUNITIES

29. The Strategy seeks to build on past achievements, to address challenges and to exploit opportunities. These challenges and opportunities are manifold, as outlined in this chapter and discussed in detail in Appendix 1 - Transport Sector Assessment.

#### A. Achievements

##### 1. Transport Management and Policy Reform

30. The Government has substantially transformed transport sector management since independence from being wholly a public sector responsibility to a largely privatized operation. This transformation was influenced by the proposals of the first transport sector strategy prepared with assistance from the World Bank in 1997 (the 1997 strategy).<sup>6</sup> This strategy highlighted the following:

- Major sector issues included: (i) pace of reform needs to match changing macro-economic policies to take advantage of opportunities; (ii) asset base is eroding, with mounting rehabilitation, maintenance and renewal backlogs; (iii) traffic has contracted sharply and is likely to show a different modal split, with greater reliance on road; (iv) innovation and technological upgrading needs are not being sufficiently addressed; and (v) institutional and pricing reforms are needed.
- The only efficient choice is to operate commercially across modes, relinquishing Government regulatory control and ownership, and privatizing almost all services. Public sector infrastructure provision should be provided on the basis of full cost recovery.
- Major strategic actions were: (i) privatization of services; (ii) deregulation and price liberalization; (iii) cost recovery of public investment to ensure financial sustainability; and (iv) removal of transport bottlenecks to development.

31. Implementation of the 1997 strategy has been largely successful. Most services and operations have been privatized, franchised, or concessioned, with substantial deregulation of the sector. Tariffs have been partly liberalized and transport bottlenecks to development have been largely removed. However, during the last decade, and particularly as a result of events in 2008, the policy emphasis has changed considerably. The private sector was previously seen as the main solution to a critical problem of resourcing. Now, a much greater role is foreseen for the Government, in particular in regulation, planning and policy, and in fostering efficiency in transport services.

##### 2. Infrastructure and Transport Service Development

###### a. Roads and Road Transport

32. The initial post-independence economic collapse resulted in a dramatic decline in transport demand. Government resources were not sufficient to provide for the upkeep of the network, which deteriorated rapidly under little or no maintenance. Funded largely from the Diaspora (Lincy Foundation etc.) and international sources (ADB, EBRD, MCC and the World Bank - as detailed in Appendix 1), about 15% and 75% of the 1,686 km interstate network are in a good or fair condition, respectively. However, a substantial road length (about 40%: 3,014 km of 7,704km) still requires rehabilitation.

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<sup>6</sup> World Bank. 1997. *Republic of Armenia Transport Sector Review*. Washington, DC.

33. Routine maintenance has been contracted out under 3-year performance-based contracts since 2005. Road construction contracts incorporate environmental management concerns. Leaded fuel has been banned and emission standards have been set for imported vehicles. Automatic traffic counters have been set up at 10 locations on interstate routes to measure traffic development. Freight transport operations have been largely privatized. Armenia has ratified eight land transport facilitation conventions.

#### **b. Other Developments**

34. The former Armenian Railways (now South Caucasian Railway) has since 1 June 2008 been operated by a subsidiary of Russian Railways on a 30-year concession. Zvartnots and Gyumri airports are operated by Armenian International Airports under a 30-year concession. Air services are provided under an investment agreement with Armavia, which has exclusive rights for 10 years to domestic and international traffic by an Armenian carrier. Since 2002, most bus services in Yerevan, other major cities, and on intercity routes, have been progressively franchised to private operators on a route by route basis under 3-4 year concessions.

### **B. Challenges and Opportunities**

35. Globalization presents both challenges and opportunities, among them more complex logistics and more emphasis on transport cost in locating production facilities. Other major challenges are the need to: (i) complete road network rehabilitation and upgrade international corridors; (ii) overcome urban transport problems, in particular achieving a sustainable balance between private and public transport; (iii) make a success of the railway concession; (iv) further develop air transport services; (v) reduce the cost of transport, in particular international and air transport; (vi) reduce the negative impacts of increasing transport demand, and (vii) ensure that assets (in particular the road network) are managed sustainably.<sup>7</sup>

36. Opportunities include: (i) increased application of IT and other technology to improve sector management; (ii) mobilization of additional financial resources, for example, through a road fund and from external sources; (iii) reopening of borders; (iv) development of an improved planning database; and (v) exploiting tourism potential, developing industries and furthering transit potential.

37. These challenges and opportunities are set out below:

#### **1. Transport Management and Financing**

##### **a. Major Policy Priorities**

38. Short-term policy priorities are to: (i) define road strategy based on sound asset management, achieving a balance between capital and current spending for sustainability; (ii) address worsening road safety; (iii) address deteriorating urban transport in Yerevan; (iv) set up monitoring and regulatory frameworks for the rail concession; and (v) remove restrictive commercial and regulatory measures to improve aviation efficiency and connectivity.

39. Medium- and long-term policy priorities include: (i) strengthening policy making, monitoring and executing roles of institutions; (ii) strengthening local government ability to manage farm to market roads; and (iii) facilitating border crossing through continuation of the customs reform program.

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<sup>7</sup> World Bank. 2008. *Republic of Armenia Transport Sector Policy Note*. Washington, DC.

40. The highest sector management priority is to strengthen MOTC's policy making capacity, including redefining MOTC-ARD relations, with some transfer of responsibilities to ARD.

41. Risk management needs to be addressed. Armenia is an earthquake-prone country. The area around Yerevan, where economic and political activities are heavily concentrated, has the highest earthquake risk in the country. As such, disaster preparedness must play an important role. A 2006 analysis<sup>8</sup> estimated that there would be up to 300,000 fatalities in the event of a magnitude 7 earthquake. Transport is an essential component in disaster recovery. There is a need for two transport disaster recovery centers to be established, one in Yerevan and one at a safe distance away, say in Dilijan. Such centers, on permanent standby, would be equipped with secure international communications, satellite imagery of the whole transport network (post-quake imagery would provide the simplest method of prioritizing repairs), contingency plans for emergency reopening of borders for relief supplies, inventories of all transport facilities, networks and the locations of recovery vehicles and supplies etc. Operation of the centers might be coordinated with that of road safety task groups.

#### **b. Trade Facilitation**

42. Facing ongoing globalization, Armenia has progressively strengthened its tie between its economy and other economies. The Government has accelerated strengthening of the business environment to promote investment and exports. The Armenian Trade and Transport Facilitation Committee was established in 2002 and has played an active role in facilitating coordination between the Government, industry, private sector, and civil society; eliminating barriers to international and regional trade; bringing Armenian trade and transport procedures in line with international standards; and promoting harmonization of trade and transport procedures in the South Caucasus.<sup>9</sup>

43. The committee has been working with similar committees in neighboring countries. Internally, issues related to customs procedures were streamlined and other reforms have been implemented to develop private sector freight transporters. Armenia has signed all major international trade and transport protocols and conventions.<sup>10</sup>

44. Customs reform has been based on minimizing importer—customs officials' interaction and shifting to risk management-based procedures in place of excessive physical controls and interventions, with substantial progress, but substantial challenges remain. The World Customs Organization (WCO) is to conduct a diagnostic review of the customs area. De-industrialization after independence and import substitution (encouraged by border closures and high transport costs) have limited the volume of trade. Although value has increased, this is largely the result of the import and re-export (after polishing) of diamonds.

45. Most international freight is carried by rail to the Black Sea port of Poti, for onward carriage by train ferry to Ukraine. In 2007 imports by rail totaled 1.54 million tons (31% grain and 23% oil) and exports 0.68 million (48% cement for Georgia). Combined, these accounted for three-quarters of rail traffic. The Government is focusing development on IT, hi-tech industry and financial services, which generate low transport volume. Therefore the prospects for a significant increase in tonnage is limited.

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<sup>8</sup> Melkumyan, Mikayel, 2006. *Seismic Risk Assessment and Mitigation Strategy in Armenia*. Armenian Association of Seismically Safe Construction.

<sup>9</sup> ADB. 2007. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant Rural Road Sector Project (Armenia)*. Manila.

<sup>10</sup> ADB. 2007. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance Grant Rural Road Sector Project (Armenia)*. Manila.

### c. Private Sector Participation (PSP) and Public-Private Partnership (PPP)

46. Privatization and deregulation are not panaceas and their application needs to be kept under review. PSP has a continuing role to play, but more closely aligned with the national interest. Its core benefits are enhanced efficiency and innovation in infrastructure development. Market incentives and the rational sharing of project risks between the Government and private firms are vital. There has been PSP experience in transport and other sectors over recent years—mainly positive, but with the full potential yet to be realized. PSP strengths and weaknesses are presented in Table 5. Reforms and remedial measures are set out in Table 6. These need to be addressed on an integrated basis.

**Table 5: PSP Strengths and Weaknesses**

<b>Strengths</b>	<b>Weaknesses</b>
Significant and predominantly positive experience of PSP	Clarity, consistency and transparency in PSP imitation and administration
Government & society accepts private sector provision of infrastructure services	Legal and regulatory framework has not ensured truly competitive bidding or systematically protected the public interest during PSP awards or subsequent implementation.
Availability of regulatory tools for PSP	Human resource (HR) capacities in the civil service are limited in terms of ability to effectively conclude and manage PSP contracts.
Effective cost recovery performance achieved in key infrastructure sectors	Impact assessment and performance evaluation systems are piecemeal and not consistently applied.
Urgent need for transport infrastructure investment with limited public sector financing, creating strong demand for PSP	Limited business opportunities for international financial institutions, aggravated by the infancy of the domestic financial institutions, resulting in a strong dependency on external grants and concessionary loans.
	Limited impact on poverty reduction and regional economic development
	Civil society and the private sector retain doubts as to the 'fairness' of PSP deals. Some public sector resistance to PSP growth.

Source: *PPP in Armenia – A Concept Note*: UNDP 2008

**Table 6: Building Key PSP Capacities**

<b>Capacity</b>	<b>Remarks</b>
Institutional	Demands effective distribution of responsibilities and exercise of authorities, as between and amongst sector entities, supported by appropriate legislative and procedural frameworks
Administrative	Requires that there is appropriate separation between policy formulation/regulation and procurement of service delivery by entities which are appropriated resourced provided with the required HR capacities to meet their responsibilities, ensuring protection of the public interest through the provision of appropriate incentives.
Financial	Devolves on the consistent application of realism and pragmatism in both identifying and financing PSP projects with the associated transparency and accountability attributes in evidence during implementation.
Private Sector	Facilitates the creation of PSP companies and requires the PSP specific skills in bidding for contracts, project finance and management, public relations and customer service.

Capacity	Remarks
Social	Based on social awareness and participation, local monitoring and demand for greater transparency and accountability.

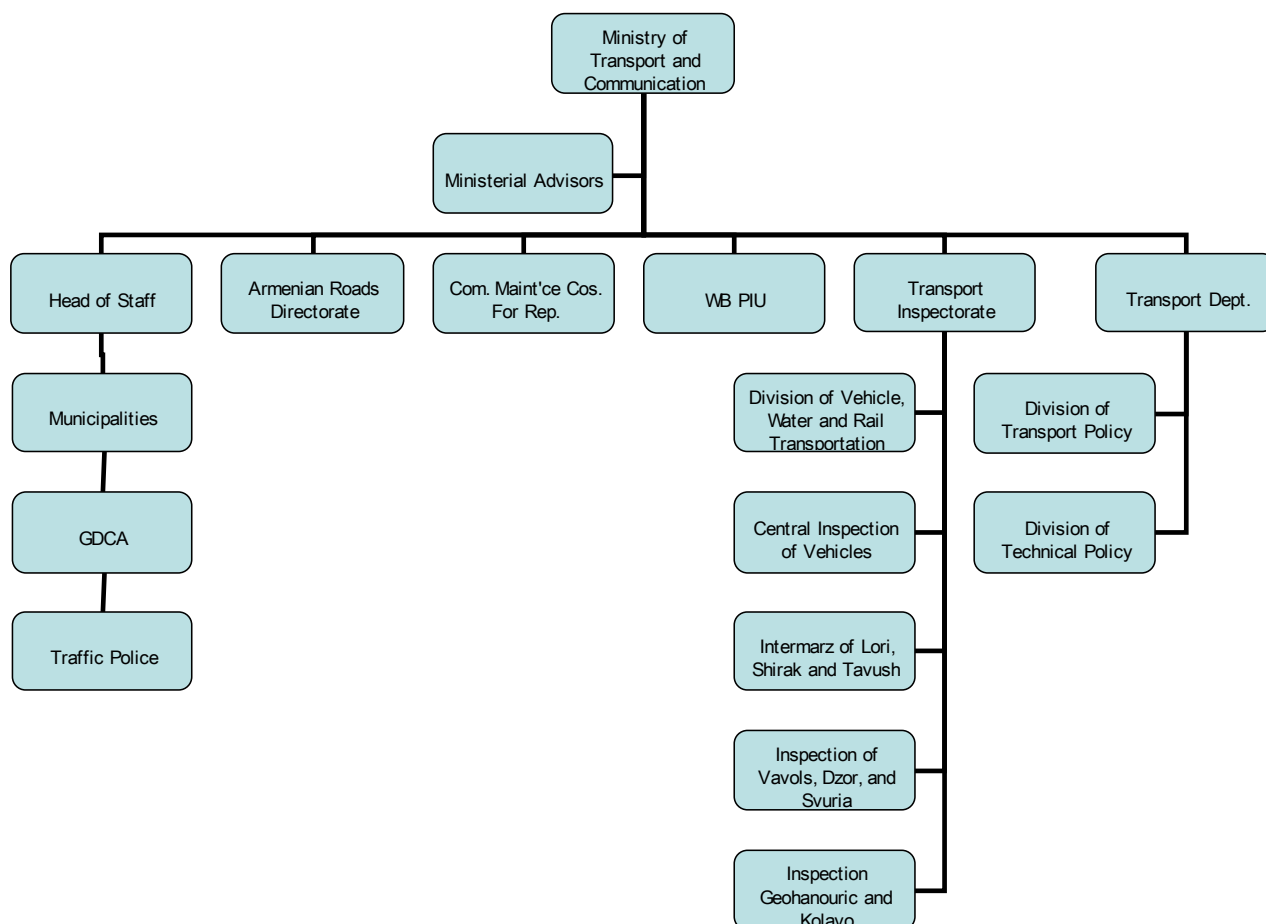
#### d. Institutional Structure and Operation

47. Despite its limited resources, MOTC has introduced many important reforms and has carried out transport development projects. The core issues are integration and consistency of application, rather than the more fundamental structural deficiencies frequently encountered in other countries. The core of the sector from the institutional perspective is focused on MOTC, as shown in Figure 1. The structure provides appropriate modal and responsibility coverage, but it has developed in a reactive context, rather than as a result of specific policy objectives. Core challenges relate to: (i) incomplete MOTC modal coverage of civil aviation, urban transport and (to a lesser extent) liaison with traffic police; and (ii) the presence of adjunct bodies outside direct MOTC authority, constraining integration of transport sector-wide prioritization policies and implementation and achievement of transport sector-wide policy cohesion and consistency.

48. While structural issues are relatively easily identifiable, responsibility allocation and application can be defined only after examination of how the major tasks (below) are applied.

- Separation of regulatory and oversight functions from service delivery and procurement responsibilities;
- Independence of regulatory functions;
- Capacity to meet oversight responsibilities and the consistency with which such responsibilities are applied;
- Given the relatively small number of MOTC staff, focused HR development programs are needed to ensure availability of an appropriate range of technocratic expertise. Similarly, to maximize the output from a limited number of personnel, appropriate IT and associated resource support is critical;
- Implementation of oversight responsibility in respect of concessions which have already been granted, and hence logically, those to be granted in the future, is seen as being fragmented both as a result of capacity constraints, institutional responsibility and perhaps most consistently inexperience of responsible officers in relation to commercial financial management;
- Support for PSP/PPP initiatives is fragmented and demands urgent harmonization and streamlining;
- Governance issues need careful attention;
- The allocation of responsibilities and liaison requirements between the various tiers of Government in relation to urban transport responsibilities requires attention; and
- Transport investment mechanisms and modalities need to be consistent to promote continuity and economies of scale/experience whilst maintaining fast response capacity to the continually changing financial environment.

**Figure 1: MOTC Organization Structure**



Source: MOTC

### e. Transport Sector Financing

49. Given the range, scope and cost of transport project opportunities, there is clearly a need to address a financing challenge. The major issue is the requirement to bridge the funding gap between investment needs and potentially available resources in a cost effective and sustainable manner, while maintaining fiscal prudence and external borrowing management which the Government has so far achieved. In recent years, transport projects have been financed from the national budget and concessionary IFI sources, with significant additional participation by way of PSP and from the Diaspora.

50. A consequence of expected economic development is that concessionary funding and grants will be at a materially lower level than to date. Mobilizing financing from the private sector and innovative financing mechanisms will become more important for transport projects in the future. This also has implications for institutional and governance issues and enhancements, which will need to be in place if funds from such sources are to be effectively accessed. Given commitments entered into with the IMF, the Government needs to maintain its prudent external borrowing by keeping nonconcessional borrowing at a sustainable level. Transport funding will be increasingly challenging and requires early recognition of necessary institutional and governance enhancements.

## 2. Roads and Road Transport

51. The main challenges are road infrastructure asset management and road safety.

#### **a. Infrastructure Asset Management**

52. The present road network coverage and capacity is largely sufficient, with the main exception being the lack of a bypass for Yerevan. The interstate network has been largely rehabilitated, although without upgrading its standard. The main challenge is to maintain the capacity and efficiency of international road corridors, which are lifelines for the economy. Much of the secondary and local road network feeding to international road corridors and major economic centers remains in need of rehabilitation or reconstruction. To date, there has been limited preventive periodic maintenance. As a result, roads have deteriorated, requiring expensive reconstruction. Existing road maintenance procedures require larger resources over the long term than with periodic maintenance in place. A shift from reconstruction to periodic maintenance will provide the Government with an important opportunity to use its limited financial resources more efficiently. Introducing periodic maintenance will quickly achieve a high economic return. In order to realize the opportunities, asset management and life-cycle analysis should be developed by ARD. The short-run emphasis should be on stabilizing network condition and avoiding further deterioration. The per km cost of routine maintenance should be reduced to free funding for periodic maintenance. There is ample scope to improve the performance of maintenance operations. In addition, road standards should be revised and low cost technical solutions applied on low volume roads. Stable and secure funding is required, including application of the “user pays” principle through the introduction of a flexible road fund.

#### **b. Traffic safety**

53. The road safety record is poor and still deteriorating. The social and economic costs of accidents are high. The Government recognizes the urgent priority of traffic safety and a strategy developed by the World Bank is in process of being implemented, defining realistic targets and appropriate interventions. The first step is a structure and culture of implementation responsibilities, with a task force or task manager within MOTC.

### **3. Railways and Railway Transport**

54. The railway faces challenges, with the concession entering into effect just as the worldwide recession takes hold. Prospects for traffic development are limited, unless progress with border opening is achieved. The railway faces increasing competition from road transport. Clearly, it is essential for South Caucasian Railways (SCR) and MOTC to cooperate closely to make a success of the concession and to exploit as far as practicable the potential of the large asset which the railway represents for the economy.

#### **a. Concession Management and Monitoring**

55. The Concession Agreement provides opportunities for a mutually rewarding partnership between the Government and SCR. Challenges include marketing and logistics service development to attract new traffic. Container services and intermodal terminals at Yerevan or Gyumri would enhance railway services and increase traffic. Projects outside of the concession should be subject to extensive economic and financial due diligence, to ensure their economic benefits and financial viability.

56. The concession is an important step forward, but rules and regulations for the Government–concession relations need to be further defined. In particular, the Government should ensure the enforcement of environmental and safety aspects under the concession agreement. The Government needs to consider the future of passenger services and the support necessary to sustain them, where this is considered socially desirable.

57. Russian Railways, through its subsidiary SCR, is the ideal partner and has entered into a long term commitment with the Government. The success of the concession depends on joint efforts. A railway monitoring agency is being set up in MOTC. This is a new Government function and it is important that it be carried out effectively (Appendix 1, Annex 5). The situation of the railway is challenging, due to border closures, its current deteriorated condition and poor traffic prospects. Rail strategy is essentially “make a success of the concession”. A large investment has been committed by SCR. If circumstances are less favorable than expected, for example due to international economic conditions, a flexible response by the Government is essential. The common objective is to utilize the railway assets effectively and efficiently.

#### **b. New Line Development**

58. New line construction should be subject to strict economic and financial appraisal. Where not viable, it should only be considered if essential for national security. New lines are therefore primarily a strategic issue for the Government (for example a new route to Iran). Project implementation will be dependent largely on the availability of international or government-to-government financial support. New line projects are discussed in Appendix 1 Annex 7.

#### **c. Marketing and logistics**

59. The skill base and management resources in these areas need strengthening to develop new rail traffic (Appendix 1 Annex 9).

#### **d. Intermodal Terminal**

60. The establishment of a large and efficient intermodal terminal at Yerevan or Gyumri will give all shippers, freight forwarders, and trucking companies new opportunities, improving trade flows and business environment. Should the Turkish border reopen, new opportunities would exist for freight for Turkey, Europe and beyond as it would use Mediterranean rather than Black Sea ports. There would be greater competition in the Mediterranean, lower tariffs and a more frequent service. Turkish railways are of European gauge and the majority of containers may therefore be road-hailed to Gyumri for loading directly onto Turkish trains. Rail containers to/from the border would be primarily those over the permitted highway weight limits, such as copper concentrate.

61. The airport concession holder has an option to develop a duty free logistics center. There is sufficient land, good road connection and a convenient rail connection to the main line. The freight forwarding community has mixed feelings about this option, since some forwarders already have duty free terminals and thus do not need new facilities that will compete with the existing facilities.

62. A German company is currently organizing an intermodal block train from Western Europe to Bulgaria and a ferry service to Poti. This will improve the service to Armenia.

63. A TACIS study International Logistical Centers for Caucasus and Western NIS countries (Armenia, Azerbaijan, Bulgaria, Georgia, Moldova, Romania, Turkey and, Ukraine) started in late-2008. This should address in detail what is necessary to create a marketable intermodal service.

#### **e. Containerization**

64. It is difficult for a railway as small as SCR to provide specialized wagons, but it can provide a superior intermodal service using the international pool of specialized containers.



If containers are shipped in block trains they are not subject to the impact loading and damage experienced by conventional wagons. For SCR to be successful, it must create an effective intermodal operation (competitive transit time, a range of containers, cost, delivery, etc). It is essential to have frequent and regular block trains. Currently about 30,000 containers (70% of them 40ft) are imported annually through Poti, of these, about 2,000 from the Russian Federation. Rail handles about 30%, with about 400,000 tons by truck. Including exports and additional containerizable cargo, there is a potential of 800,000 tons of international container freight: sufficient for two daily dedicated block trains. A possibility, given reopening of the Turkish border, would be to operate double-stack container trains to the Mediterranean, which would reduce cost by 40%.

#### **4. Airports and Civil Aviation**

65. PPP and PSP at the airports have been extensively applied, creating opportunities for the private sector to improve service quality. Such opportunities will continue to realize the country's economic potential fully by necessary improvements to regulatory and commercial practices.

##### **a. Regulatory and Commercial Practices**

66. There are considerable opportunities to reduce the high cost of air travel and to improve services to promote tourism and develop business opportunities by eliminating economic barriers to entry and improving integration in the world air services network.

##### **b. Airports**

67. Zvartnots, Shirak and Erebuni airports are all in service. Zvartnots and Shirak are managed and maintained by Armenian International Airports (AIA). AIA have upgraded the main international airport, Zvartnots, including the first phase of a new passenger terminal. A second phase is under construction, part-financed by EBRD. Upon completion, the airport will have an annual capacity of three million passengers (at IATA Level of Service 'B'), in line with the current forecast in the Zvartnots Master Plan. Current development is expected to accommodate demand through the Master Plan forecast year and to the end of the current concession agreement. Traffic growth over the past few years has been much higher than forecast. Although the international recession will slow growth in the short term, the passenger terminal will eventually either operate at a lower level of service or require additional capacity. The airport is currently limited to 15 movements per hour on Runway 09 and five on Runway 27, low for a single runway operation.

68. Shirak, which serves Gyumri and the north, is being upgraded by AIA under the 2007 Concession Agreement. The terminal building is small and in need of repair. Should traffic growth continue, the passenger terminal will need replacing or upgrading.

#### **5. Urban Transport**

69. The main challenges for urban transport are coping with increasing car ownership and usage, reversing the declining use of public transport, improving the environment for pedestrians, and improving the local road network to reflect changes in the distribution of traffic in line with rapid urban development and new spatial patterns. In cities other than Yerevan, the poor state of urban roads presents a major maintenance challenge. Opportunities to provide efficient urban transport may be realized by rationalizing public transport into a trunk-feeder system, with large buses operating on main corridors and by capitalizing on spare metro capacity by integrating it with surface transport.

### **a. Yerevan Municipality**

70. Reorganization of the Municipality by giving it financial autonomy and an elected mayor is a commitment under the Constitution, to be effected by end-2009. Enabling legislation has had its first reading. Pending the reorganization, a number of initiatives are on hold, including implementation of the World Bank's *Yerevan Urban Transport Project* and a proposed EBRD project for Metro improvement. The Municipality's urban transport management capacity is limited. The Government should prepare the foundation for sustainable urban transport funding.

### **b. Modal Shares**

71. A shift from public to private transport has led to growing congestion. Public transport has changed dramatically in recent years with the introduction of minibuses, the decline of large bus and trolleybus services, and a decline in Metro usage, the latter reversed in 2008. There has been little attention to traffic management. A comprehensive approach to mobility is required to achieve a sustainable balance between modes. Urban transport studies prepared as a background for the proposed World Bank project provide a blueprint for such change.

### **c. Public and Private Transport**

72. Public transport networks are not well integrated and there are interchange penalties between modes and routes, with no through ticketing. A proper balance needs to be struck between public and private transport, including adequate provision for private vehicles, to optimize the use of scarce road space, particularly in central Yerevan.

### **d. Yerevan Urban Transport Plan**

73. An urban transport plan for Yerevan has been largely defined in recent studies for the World Bank.<sup>11</sup> This recommended a complete reorganization of the bus system into a hierarchy comprising: Bus Rapid Transit (with an eventual three-route network); 23 express routes, and 29 feeder routes. This requires development of interchanges and through ticketing. The initial 9km BRT route is planned for Komitas Avenue, providing interchange with the northern terminus of the Metro. The estimated cost is \$1.5 million for development and design, and \$22.2 million for construction, including infrastructure improvements, buses (30 units of 12 m), terminals and depots. It is envisaged that there would be a smart card ticketing system in common with the Metro and much improved interchange.

74. A parallel study<sup>12</sup> developed a program of intersection improvements, at a cost of \$13.6 million for 200 intersections (with an alternative of improving 165 for \$11.5 million), traffic management measures at a cost of \$3.0 million, and paid on-street parking at an initial cost of \$5.6 million, with an annual operating cost of \$2.0 million. As the parking measures are estimated to generate annual revenue of \$4-6 million, they would be self-financing.

75. Construction of underground car parks, associated on-street parking measures which are included in the plans, commenced at four sites in central Yerevan in 2008, adding urgency to the need to proceed with the World Bank project or similar measures.

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<sup>11</sup> Advanced Logistics Group, September 2008. *Assistance to Yerevan Municipality for Passenger Transport - Final Executive Summary Report.*

<sup>12</sup> WYG International and Ameria 2008. *Assistance to Yerevan Municipality for Passenger Transport – Draft Final Report.*

**e. Minibuses**

76. Although minibuses are the dominant public transport mode, services are uncoordinated, operated with old vehicles and in some cases are not user-friendly. They do, however, offer high frequency, wide network coverage and competitive private sector participation. Providing for increased demand and reversing declining service quality in the congested central area are key issues. A low quality of service by public transport will encourage the use of private vehicles. The minibus fleet is being reduced from 3130 to 845 by 2020, substituted by medium and large buses, and more trolleybuses. Investment in buses to 2020 is forecast at an average of \$7 million per year. This investment needs to be optimized in both vehicle type and route structure to achieve maximum benefits. Some of the buses acquired recently are underpowered for the hilly city of Yerevan, are noisy and have poor access, with steep steps inaccessible to the old or infirm. Although there is a cost issue, minimum quality standards should be set for buses. The Municipality is still considering the future route structure: it is recommended that the World Bank study plan be considered as the ultimate objective, towards which interim route structure changes should lead.

**f. Trolleybuses**

77. The previously extensive network has been curtailed. The poor condition of the trolleybuses and equipment has resulted in low service frequency and loss of much of the traffic to minibuses. Investment in trolleybuses is continuing with acquisition of 20 units per year. This needs to be made effective by concentrating the new vehicles on a small number of routes, operated at higher frequency and with parallel bus and minibus services rationalized to act as feeders to the trolleybuses.

**g. Metro**

78. While a considerable asset, network coverage is limited and loss of market share to minibuses has been severe. There are opportunities for reinvigorating the system (limited refurbishment in 2008 has reversed the decline in usage) and, with integrated ticketing, for the Metro to play a more important role. Metro development should focus on increasing ridership through: (i) further refurbishment of stations and trains, and in the medium term new rolling stock (the cost for a first phase of four trains - 12 cars is estimated at \$12 million); (ii) improved access to stations (in particular a second entrance for Yeritasardakan on Abovian/Sayat-Nova Streets, at a cost of \$30-35 million); and (iii) integrated ticketing with trolleybuses, buses and minibuses extending use of the smart card system being introduced by the Metro. An inter-provincial bus terminal could also form part of this reorganization.

**h. Planning Database**

79. A comprehensive database and demand forecasts should be regularly updated based on actual travel data, including origin—destination surveys. Planning cannot be substantiated without such information, some of which is available from recent studies for the World Bank.

## IV TRANSPORT STRATEGY 2009-2020

80. The *Armenia Transport Sector Development Strategy 2020* is based on a detailed assessment of the past and future development of the economy and of the transport sector (including geopolitical aspects) and a review of transport sector achievements, challenges, and opportunities.

### A. Vision

81. The vision is to promote long-term prosperity through the development of efficient, cost-effective, and environmentally and socially sustainable transport infrastructure and services, serving the whole nation.

### B. Overarching Goals

82. There are three overarching goals:

- (i) Efficient and cost-effective transport infrastructure and services for the whole country;
- (ii) Cross-border trade facilitation; and
- (iii) Environmentally and socially sustainable transport infrastructure and services.

### C. Management and Institutional Issues

#### 1. Sector Management

83. Strategy implementation requires strong sector management, with more engagement and planning by the public sector, and coordinated mobilization of necessary resources. The subsector strategies require complementary management and institutional changes to become fully effective.

84. Action at both policy and working levels is required. At the policy level there is an urgent need to streamline sector management by augmenting the role of MOTC in terms of the incorporation of adjunct bodies into the Ministry's remit – at present MOTC has limited responsibilities in the civil aviation, urban transport, and traffic police functions. This constrains its capacity to effectively plan and co-ordinate resource deployment throughout the sector and limits subsequent liaison during policy implementation phases.

85. At the working level (application of routine procedural and system based responses), a similar set of constraints exist which constrain structural implementation of strategic initiatives. These devolve on technical capacities within the Ministry (such as supervising concessionary contracts and developing PSP capacities), harmonizing service delivery profiles by a clear separation of regulatory and operational functions, and the enhancement of governance and MOTC support systems.

86. At the sector level, there is a need to coordinate the implementation and subsequent monitoring of these initiatives rather than adopting piecemeal programs. The required institutional restructuring may be a major barrier to practical progress, given legacy conditions and associated change resistance. It will therefore be critical for Government (at Cabinet level) to promote the required augmentation of MOTC responsibilities and subsequently for MOTC to establish a Steering Committee, supported by working level co-

ordination group) to oversee and coordinate the recommended changes. Specifics are provided in Table 7.

## 2. Institutional Development

87. The Strategy focuses on *what* needs to be done, *how* the needs can best be realized, by *whom* and *when* specific elements should optimally be addressed. The plan envisages enhancement of existing capacities and institutional structuring to equip the sector to operate and manage more effectively in the changing business environment. The core requirements are for fine tuning institutional structuring to reflect heightened private sector participation and commercial orientation of major service providers, whilst addressing specific technical and management capacity issues on a case by case basis.

- (i) **Institutional Restructuring:** MOTC coverage of the transport sector is incomplete as adjunct bodies continue to be outside the scope of the Ministry's remit. Civil Aviation, Urban Transport (at the integration level) and liaison with traffic police are core examples. This has direct implications for integration planning and prioritization issue and impacts on regulatory procedures.
- (ii) **Building Key Capacities:** The application of PSP/PPP policies throughout the sector is fragmented with responsibilities shared amongst various entities both within and beyond the MOTC's direct responsibility. Streamlining, enhanced focus and consistency of policy application is needed. Oversight responsibilities relate to the manner in which service delivery is achieved and in particular to the monitoring and evaluation (M&E) of concessions granted by the public sector. Currently there is little consistency in the manner and system based procedures which are adopted to fulfill these responsibilities. Sector officers are generally proficient in their capacity to address traditional responsibilities within the public sector and Government budgetary arrangements. However, given the emergence of commercially based concessionary arrangements and other PSP structures, there is however a clear indication that serious constraints exist in relation to commercially based financial management capacities in addition to numerous technical needs.
- (iii) **Separation of regulation and service delivery responsibilities:** There are sector-wide instances (rail, civil aviation and some aspects of road passenger transport) where regulatory and service delivery responsibilities are combined in the same authority. Ideally regulators should be independent of political influence so that the establishment and subsequent operation is consistent with the cornerstones of good governance.
- (iv) **Enhance MOTC support systems:** Currently IT support systems employed in MOTC and many of its subordinate entities are stand alone and have developed piecemeal. Much could be gained both in terms of enhanced analytical (oversight and planning) capacity and diminution of routine (duplicated) activities by the introduction of an integrated transport sector database.
- (v) **Governance enhancement initiatives:** As with other aspects of the transport sector's detailed structuring and responsibility application, there are a range of enhancements to both systematic procedures and application methodologies that would enhance governance. The excellence or otherwise of governance structures is dependent on the key issues of accountability, predictability, participation and transparency. These are the very areas where existing arrangements are most urgently in need of attention. Good governance structures necessitate decisions and support procedures throughout the sector

which ensure that Government and society interact effectively in relation to service delivery and usage.

- (vi) **Investment mechanisms:** Traditionally prime reliance on financing of investment projects has been based on budget and donor sources although growing PSP/PPP structuring has been evidenced in recent years. This has resulted, in combination with a range of inconsistencies and piecemeal policy application, in the application of 'one off' financing schemes in response to specific investment needs, rather than the application of well defined, consistent policies and procedures to evaluate the full range of financing models to support investment demand, supported by an appropriate legal and procedural framework.
- (vii) **Development of Urban Transport travel data base:** A need for technical training of Yerevan Municipality staff was identified in the area of transport/ traffic management modeling. Currently staff are not familiar with the specifics of available models and as such the validity of applications and consequential outputs is questionable. Whilst external (local) consultants have been able to provide the required specialist skills on an ad hoc basis, the availability of 'in house' capacities would radically enhance continuity of application and associated output analysis.
- (viii) **Establish unified (urban) transport traffic authority:** establish a unified transport authority and an urban transport fund to subsidize transport services, financed by incomes including subsidies, special transport taxes, duties for sales and registration of transport modes, import taxes, parking revenue, and revenue from fines.
- (ix) **Develop national aviation system plan:** to determine infrastructure requirements, priorities and associated costs. This will clarify the needs and justify an investment program. The National Aviation System Plan (NASP) should:
- determine the ability of Zvartnots to accommodate future traffic and the physical requirements and costs to accommodate it;
  - determine when a new runway at Zvartnots, or a new airport, will be required;
  - forecast traffic at Shirak Airport and examine the feasibility of replacing the existing passenger terminal;
  - establish the need, feasibility and cost of reopening other airports;
  - determine the domestic passenger demand that could be serviced by either a domestic service of Armavia or a new entrant carrier; and
  - determine the feasibility of establishing a new Armenian passenger carrier for either domestic services or both domestic and international services.
- (x) **Establish Tourism Promotion Committee:** The first priority is for a high-powered Tourism Promotion Committee under the Prime Minister's Department. An Infrastructure and Services Plan for tourism needs to be formulated (with its own budget), drawing on the McKinsey and Competitive Armenia Private Sector recommendations<sup>13</sup>. A prioritized program of transport projects would be part of the plan. Many priority tourist projects will be common with domestic requirements: for example, upgrading of north-south corridors and improved public transport. Improving air services will benefit all users.

<sup>13</sup> McKinsey and Co. (2005). *Armenia2020 Armenia's Tourism Sector* and USAID (2007). *Tourism Development Concept Paper*, Competitive Armenia Private Sector (CAPS).

## D. Subsector Strategy

### 1. Main Strategic Focuses

88. Subsector strategies mainly focus on:

**Roads:** Development of international corridors focusing on the north-south corridor; completion of the LRNP; establishment of an efficient asset management system; and development of efficient road transport services of international standard.

**Railway:** Successful implementation of the Concession Agreement.

**Urban transport:** Development of an integrated public transport system, with a sustainable balance between public and private transport.

**Civil Aviation:** Development of competitively priced air services providing extensive international connectivity through efficient airports.

### 2. Roads and Road Transport

89. Road infrastructure strategy focuses on six areas: (i) funding, (ii) maintenance, (iii) rehabilitation and new construction, (iv) design standards, (v) safety, and (vi) database. The road transport strategy supports modernization of the vehicle fleet, improvement of vehicle safety and efficiency through enhanced inspection, consolidation of operation of inter-provincial bus services, further development of international bus services and exploitation of the potential to develop transit traffic.

#### a. Roads

##### i. Funding

- (i) Plan and fund the road network as a single entity, irrespective of implementation responsibilities, including strategic and through routes in Yerevan and other urban areas with roads under MOTC jurisdiction;
- (ii) Sustain increase in budgetary funding in real terms to 2020;
- (iii) Mobilize additional resources through the introduction of a flexible road fund, with the initial aim of funding a periodic maintenance program; and
- (iv) Agree with donors financing sources for a medium to long term network development program.

##### ii. Maintenance

- (i) Shift focus from reconstruction and rehabilitation to preventive maintenance and asset management;
- (ii) Improve cost effectiveness of maintenance program through good governance;
- (iii) Develop periodic maintenance program;
- (iv) Program strategic road maintenance to ensure long term network sustainability;
- (v) Investigate structural condition of bridges and develop bridge asset management program; and
- (vi) Set up permanent weigh scales on major routes.

### iii. **Priority Rehabilitation and New Construction**

- (i) Complete LRNP, focusing on priority feeder roads;
- (ii) Focus interstate program on upgrading north-south corridor routes; and
- (iii) Program missing links, bypasses and other new construction projects of high economic benefit.

### iv. **Design Standards**

- (i) Introduce international design standards, particularly for geometry and pavement design.

### v. **Safety**

- (i) Prioritize and adequately fund road safety program;
- (ii) Set appropriate speed limits and enforce them more rigorously;
- (iii) Improve MOTC liaison with traffic police;
- (iv) Protect or eliminate u-turn movements;
- (v) Provide run-offs on long descents and improve warning signage;
- (vi) Improve road signage and road marking comprehensively route by route;
- (vii) Widen shoulders through towns and in rural areas to protect pedestrians; and
- (viii) Improve safety inspection of natural gas vehicles and facilities.

### vi. **Database**

- (i) Develop a road asset management system including a maintenance database using IT for budgeting and road asset management including prioritization

## b. **Road Transport**

- (i) Provide incentives to owners to modernize the vehicle fleet;
- (ii) Tighten vehicle inspection to encourage replacement and improve safety and performance;
- (iii) Consolidate operation of inter-provincial bus services;
- (iv) Further develop international bus services; and
- (v) Exploit potential for transit traffic.

## 3. **Railway**

90. Railway strategy underlines the importance of the successful implementation of the concession, together with intermodal and logistics development to generate additional traffic, and encourages financial due diligence in network development.

### a. **Concession**

- (i) Make a success of the concession through Government acting as a supportive partner;
- (ii) Monitor concession effectively and pro-actively, including safety monitoring;
- (iii) Establish Railway Monitoring Agency within MOTC;
- (iv) Provide necessary training for Agency staff; and
- (v) Develop marketing skills and promote traffic development.



**b. Network development**

- (i) Undertake feasibility studies and prioritize non-concession projects;
- (ii) Support and develop industries that use rail transport.

**c. Intermodal and Logistics:**

- (i) Develop intermodal terminal at Yerevan or Gyumri;
- (ii) Further develop intermodal operations and containerization;
- (iii) Introduce necessary legislation to promote development of freight forwarding.

**4. Airports and Civil Aviation**

91. Civil aviation strategy focuses on the development of a national aviation system plan and planning for Armenian Air Traffic Service (ARMATS) re-equipment needs.

**a. National Aviation System Plan**

92. The main scope for a national aviation system plan covers:

- (i) Infrastructure requirements, priorities and associated costs;
- (ii) Zvartnots development requirements and associated infrastructure (new runway);
- (iii) Shirak new passenger terminal (demand assessment);
- (iv) Feasibility/viability of reopening airports;
- (v) Domestic passenger service development prospects; and
- (vi) Issue of new Armenian carrier (for either domestic services or both domestic and international services).

**b. ARMATS**

93. Identify re-equipment needs (expected to be required in about five years).

**5. Urban Transport**

94. Urban transport strategy is to promote integrated, efficient public transport, and to encourage a sustainable balance between public and private transport.

**a. Road Network**

- (i) Use network capacity more effectively, with better balance between public and private transport and pedestrian use;
- (ii) Promote sustainable development by aligning infrastructure development with land use planning;
- (iii) Introduce transit-oriented development, so that residential and commercial centers maximize access to both public transport and non-motorized infrastructure;
- (iv) Remove thoroughfare traffic from city center by providing bypasses;
- (v) Overcome natural (topographic) barriers, which limit connectivity between districts and address unbalanced network distribution;
- (vi) Infrastructure to accommodate large buses and bus interchanges;
- (vii) Remove bottlenecks by improving intersections, including grade separation; and
- (viii) Improve road surface condition through adequate maintenance.

**b. Public Transport Infrastructure**

- (i) Implement high quality public transport services for new commercial and residential development, in particular in the city center;
- (ii) Give priority to bus services to encourage shift from private vehicle use; and
- (iii) Develop infrastructure that encourages modal interchange at bus and Metro stations, interchanges, and park and ride facilities.

**c. Road Safety**

- (i) Improve road safety and reduce casualties through segregation of vehicles and pedestrians;
- (ii) Raise the priority given to pedestrians and to non-motorized transport by providing adequate sidewalk space, further pedestrianization in central areas, lighting, pedestrian crossings, and bicycle facilities; and
- (iii) Provide facilities that improve mobility for those with special needs, such as access ramps.

**d. Public Transport Services**

- (i) Rationalize bus network, with medium/large buses and trolleybuses serving high density corridors, and minibuses focused on lower density corridors and feeder services;
- (ii) Implement bus operating contracts with gross cost contractual system based on minimum vehicle km and service quality indices, with penalties and bonus incentives;
- (iii) Consolidate bus operators into small number of concessions of sufficient duration to encourage investment in larger buses;
- (iv) Develop Bus Rapid Transit on strategic routes, where economically viable;
- (v) Require bus services to assist socially disadvantaged groups; and
- (vi) Expand trolleybus service.

**e. Metro**

- (i) Improve service quality by refurbishing stations and trains;
- (ii) Introduce electronic ticketing and enforcement;
- (iii) Improve staff technical, management and commercial capability through comprehensive training programs; and
- (iv) Improve access to stations and interchange with other modes.

**f. Fare Integration**

- (i) Ensure that passenger transport is accessible to all social groups;
- (ii) Introduce integrated ticketing system to facilitate interchange with thoroughfares; and
- (iii) Establish the institutional framework for integrated ticketing.

**g. Traffic Management**

- (i) Improve and modernize traffic signal operations to accommodate increasing demand and improve safety;

- (ii) Adopt institutional improvements and modernize equipment to increase municipality's capacity to implement and regulate public transport services and measures for traffic management and data collection; and
- (iii) Establish a unified metropolitan transport authority and an urban transport fund.

#### **h. Parking**

- (i) Introduce paid on and off-street parking to control car use;
- (ii) Implement graded parking fees using electronic metering to reflect land value and limit availability for long-stay, particularly at destinations served by public transport;
- (iii) Establish an access to parking hierarchy: physically disadvantaged, residents, short-term visitors or commercial activities, long-term use, such as work commuters;
- (iv) Utilize revenue from parking fees and fines to invest in urban transport improvements;
- (v) Mobilize effective enforcement of parking regulations to ensure compliance;
- (vi) Encourage private sector investment and management of parking facilities by developing PPP; and
- (vii) Draft appropriate regulations for new development to ensure that developers pay adequate attention to parking and provide off-street parking spaces.

### **6. Cross-Sector Issues**

93. There are a number of issues that provide a framework for the implementation and ongoing management of the Armenian transport sector. These issues are multi-sectoral and are often mutually independent. They include issues with institutional restructuring and governance, legislation and conventions, disaster mitigation, tourism, and environmental and social policies.

#### **a. Institutional and Governance**

- (i) Consolidate responsibilities of MOTC;
- (ii) Hire transport advisor for MOTC with international experience (for at least two years to support the development/implementation of a five-year program of institutional and human resource development);
- (iii) Separate regulatory and procurement from service delivery responsibilities;
- (iv) Ensure independence of regulators;
- (v) Develop PSP/PPP units;
- (vi) Foster good governance
- (vii) Review organization of civil aviation; and
- (viii) Clarify organization of urban transport

#### **b. Legislation and Conventions**

- (i) Accede to and adhere to further international and regional transport conventions and agreements.

**c. Disaster Mitigation**

- (i) Establish transport disaster recovery centers, one in Yerevan and one in a provincial city.

**d. Tourism**

- (i) Implement tourism-specific strategy: infrastructure investment program, service improvements and cross-border facilitation; and
- (ii) Eliminate transport impediments to tourism development.

**e. Environmental and Social Policies**

- (i) Mitigate negative environmental and social impact of transport sector through application of stringent environmental and social due diligence and monitoring and close coordination with external assistance agencies such as bilateral and multilateral intuitions (including Joint United Nations Program on HIV/AIDS [UNAIDS] for transport-related HIV/AIDS issues and United Nations Development Programme (UNDP) for transport-related human trafficking issues;
- (ii) Increase transport access for the poor and vulnerable; and
- (iii) Apply pro-poor pricing policy.

## V ACTION PLAN

93. The Action Plan details policy reforms and investment, technical assistance (TA), and policy and management reform projects for the short term (2009-2012), medium term (2013-2016) and long term (2017-2020), based on a preliminary assessment. The major actions are summarized in Table 7. Subsector action plans are in Appendix 2.

94. The Action Plan includes the priority investment and TA projects to develop infrastructure, upgrade technology, and improve management through policy reforms and capacity strengthening. There are 42 investment projects, with an estimated cost of \$2,025.6 million. TA projects number 14 and will come to a total cost of \$36.2 million. Policy and management reform projects total 25 and total \$10.1 million. A cost summary of the overall strategy is given in Table 8 below and costs according to project are given in Appendix 2.

**Table 7: Action Plan Summary**

Goals and Objectives	Major Actions
<p><b>Transport Sector Goals</b></p> <ul style="list-style-type: none"> <li>• Establishment of efficient and cost-effective transport infrastructure and services across the nation</li> <li>• Trade facilitation across borders; and</li> <li>• Establishment of environmentally and socially sustainable transport infrastructure and services.</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional restructuring in the transport sector               <ul style="list-style-type: none"> <li>➢ Consolidate GDCA within MOTC</li> <li>➢ Enhance MOTC liaison in urban transport</li> <li>➢ Enhance MOTC liaison in traffic police</li> <li>➢ ARD capacity development (contractor performance, road fund strategy, enhancement of design standards)</li> </ul> </li> <li>• Separation of regulation and service delivery responsibilities</li> <li>• Development of urban transport travel database</li> <li>• Establishment of unified urban transport traffic authority</li> <li>• Establishment of national aviation system plan</li> <li>• Establishment of tourism promotion committee</li> <li>• Capacity enhancement (financial management, monitoring of concessions, and railway marketing and logistics)</li> <li>• More effective bilateral agreements</li> <li>• Adoption of additional international transport facilitation conventions</li> <li>• Better implementation of international transport facilitation conventions</li> <li>• Revision of domestic laws/regulations related to transport facilitation</li> <li>• Establishment of key PSP capacities</li> <li>• Establishment of regulatory and oversight authorities in the transport sector</li> <li>• Enhancement of MOTC support systems</li> <li>• Governance enhancement activities</li> <li>• Develop investment mechanisms</li> </ul>
<p><b>Roads and Road Transport Subsector Objectives</b></p> <ul style="list-style-type: none"> <li>• Development of international and interstate corridors focusing on the North-South Corridor</li> <li>• Completion of LRNP</li> <li>• Development of an efficient asset management system</li> <li>• Development of efficient road transport operations in accordance with international standards.</li> </ul>	<ul style="list-style-type: none"> <li>• ARD Capacity Development</li> <li>• Road maintenance database and condition survey</li> <li>• North-South Corridor               <ul style="list-style-type: none"> <li>➢ M2/M6: Bagratashen-Vanadzor, Vanadzor-Dilidjan, Yerevan-Ararat</li> <li>➢ M1: Bavra-Gyumri and Ashtarak-Yerevan</li> <li>➢ Yerevan Western Bypass/Links</li> <li>➢ M15 Yerevan Eastern Bypass</li> <li>➢ M4 Yerevan-Sevan-Dilijan</li> <li>➢ M2: Yerevan-Yeraskhavan</li> <li>➢ Gyumri Eastern Bypass</li> </ul> </li> <li>• Lifeline Roads Network Program (LRNP)               <ul style="list-style-type: none"> <li>➢ MCC 2009-11 - Balance of 330km</li> <li>➢ World Bank - 250km</li> </ul> </li> </ul>

Goals and Objectives	Major Actions
	<ul style="list-style-type: none"> <li>➤ Govt. - Balance of 532km</li> <li>➤ ADB Rural Roads SP - Balance of 227km</li> <li>➤ H45: M2-Tatev-Syunik 75km</li> <li>➤ JICA Rural Roads - 366km</li> <li>➤ Completion of LRNP</li> <li>• Other Interstate Rehabilitation (M3, M5, and M14 – 151 km)</li> <li>• Other Bypasses <ul style="list-style-type: none"> <li>➤ Aparan Western Link to M3</li> <li>➤ Yeghegnadzor S. Link to M2</li> <li>➤ Vaik S. Link to M2</li> <li>➤ Alagjaz W. Link to M3</li> </ul> </li> <li>• Shortcuts <ul style="list-style-type: none"> <li>➤ Noubarashen-Sovetashen</li> <li>➤ Gorbaik-Gndevaz</li> <li>➤ Artashat-Martuni</li> <li>➤ Geghard-Martuni</li> </ul> </li> <li>• Other TA Projects <ul style="list-style-type: none"> <li>➤ Road Safety Strategy</li> <li>➤ Road Maintenance Financing</li> <li>➤ Highway Design Standards</li> <li>➤ Road Maintenance Manual</li> <li>➤ Axleload Control</li> </ul> </li> </ul>
<p><b>Railway and Railway Transport Subsector Objective</b></p> <ul style="list-style-type: none"> <li>• Successful implementation of the Concession Agreement</li> </ul>	<ul style="list-style-type: none"> <li>• SCR - Concession Agreement 2009-2020 <ul style="list-style-type: none"> <li>➤ Rehabilitation/ Repairs</li> <li>➤ Rolling stock</li> </ul> </li> <li>• Other investment projects <ul style="list-style-type: none"> <li>➤ Bridge Renovation Gyumri-Georgia Border</li> <li>➤ Tamping Machine</li> <li>➤ Akhouryan Check Point</li> <li>➤ Optic Fiber Cable Macis-Nournous-Sevan-Zod</li> <li>➤ Optic Fiber Cable Yeraskh-Macis</li> <li>➤ Electrification Gyumri-Akhouryan-Turkey</li> </ul> </li> <li>• Other TA projects <ul style="list-style-type: none"> <li>➤ Small P&amp;E for Operating Works</li> <li>➤ Network Development</li> <li>➤ Logistics &amp; Market Development Training</li> <li>➤ Railway Monitoring</li> </ul> </li> </ul>
<p><b>Urban Transport Subsector Objective</b></p> <ul style="list-style-type: none"> <li>• Development of integrated public transport network and services, with a sustainable balance between public and private transport.</li> </ul>	<ul style="list-style-type: none"> <li>• Metro <ul style="list-style-type: none"> <li>➤ Refurbish Metro cars (30)</li> <li>➤ Refurbish stations</li> <li>➤ Training Program</li> <li>➤ New entrance at Yeritasardakan</li> <li>➤ Safety improvements</li> <li>➤ Smart card ticketing</li> <li>➤ Escalator modernization</li> <li>➤ Passenger information (real time)</li> <li>➤ New Metro cars (24)</li> </ul> </li> <li>• Bus/Trolleybus <ul style="list-style-type: none"> <li>➤ Medium/large buses</li> <li>➤ Trolleybuses</li> <li>➤ Passenger information etc.</li> <li>➤ Bus interchanges with hub facilities</li> <li>➤ Bus Maintenance Depots</li> <li>➤ Suburban dispatch centers</li> <li>➤ Inter-provincial bus terminals</li> <li>➤ BRT Line Komitas Avenue</li> </ul> </li> <li>• Traffic Management/ Parking</li> </ul>

Goals and Objectives	Major Actions
	<ul style="list-style-type: none"> <li>➤ Traffic signals, traffic management</li> <li>➤ Underground car parks</li> <li>➤ On-street parking &amp; cycling</li> <li>• Roads <ul style="list-style-type: none"> <li>➤ Road Surfacing and Maintenance</li> <li>➤ Grade Separation</li> </ul> </li> </ul>
<b>Airports and Civil Aviation Subsector Objectives</b> <ul style="list-style-type: none"> <li>• Development of competitively priced air services providing comprehensive international connectivity at efficient airports.</li> </ul>	<ul style="list-style-type: none"> <li>• Erebouni airport passenger</li> <li>• Airport Operations <ul style="list-style-type: none"> <li>➤ Zvartnots Terminal Phase 2</li> <li>➤ ARMATS Telecom &amp; Nav. Equip</li> <li>➤ Avia TC A/craft &amp; simulators</li> <li>➤ Reopen Stepanavan airport</li> <li>➤ Reopen Goris and Sisian airports</li> </ul> </li> <li>• Other aviation projects <ul style="list-style-type: none"> <li>➤ National Aviation Strategy study</li> <li>➤ Avia TC needs assessment</li> <li>➤ Broaden fuel supply base</li> <li>➤ Stepanavan, Goris, Sisian study</li> <li>➤ Enhance small airlines</li> </ul> </li> </ul>

GDCA = General Department of Aviation, MOTC = Ministry of Transport and Communication, ARD = Armenian Roads Directorate, PSP= Private Sector Participation, LRNP = Lifeline Roads Network Program, MCC = Millennium Challenge Corporation, SCR = South Caucasian Railways, ADB = Asian Development Bank, JICA = Japan International Cooperation Agency, P&E = Program and Evaluation, ARMATS = Armenian Air Traffic Service, BRT = Bus Rapid Transit

Source: the Consultants

**Table 8: Cost Summary: Investment, TA and Policy and Management Reform 2009-2020**

Mode	Investment	Technical Assistance	Policy and Management Reform	Total
	Total	Total	Total	Total
<b>By Cost Estimates</b>	(\$ million)	(\$ million)	(\$ million)	(\$ million)
Overall Transport Sector	0	0	5.7	5.7
Road and Road Transport	1,245.4	25.0	4.4	1,274.8
Railway and Railway Transport	349.2	6.9	0	356.1
Urban Transport	331.0	0	0	331.0
Airport and Civil Aviation	100.0	4.3	0	104.3
<b>Total</b>	<b>2,025.6</b>	<b>36.2</b>	<b>10.1</b>	<b>2,071.9</b>
<b>By Number of Projects</b>				
Overall Transport Sector	0	0	23	23
Road and Road Transport	12	5	2	19
Railway and Railway Transport	7	4	0	11
Urban Transport	20	0	0	20
Airport and Civil Aviation	3	5	0	8
<b>Total</b>	<b>42</b>	<b>14</b>	<b>25</b>	<b>81</b>

Source: the Consultants

## A. Financing

95. Out of the \$2.02 billion 2009-2020 investment program, a total of about \$1.1 billion has so far been identified from external sources including SCR under the railway concession agreement (\$282.4 million). The Government is expected to allocate a total of at least about \$400 million (low growth scenario) for high priority projects including financing about 532 km rural feeder roads included in LRNP during 2009-2020, leaving a financing gap of about \$650 million. This financing gap is expected to be closed by external financing, private sector and the Government during the medium and long-term periods.

96. The road investment program (\$1.3 billion) is expected to be financed by external sources (\$400-600 million, 33-50%) and the Government (\$400-600 million, 33-50 %). About 79 % of the railway investment program amount will be financed by the SCR under the railway concession agreement and the balance will be financed by external sources and the Government. The urban transport investment program will be financed by external sources and private sector (about 27%) and the Yerevan municipal government (about 73%). External financing and private sector will finance 94% of the civil aviation investment program.

97. Over the next few years the economy should be able to absorb \$150-200 million per year of non-concessional loans, including funds for transport projects, according to the IMF. However, during the current international financial and economic crisis, exchange rates may be expected to fluctuate widely. Both currency and interest rate risk will need to be carefully considered in sourcing such funds. Interest rates are at historic lows in some countries, but may rise sharply when recovery begins, particularly if inflation returns as a factor.

98. There is legislation in place for the establishment of a 10% fuel tax on gasoline and diesel imported into Armenia. In theory the tax is levied at the border, but in practice it does not seem to be implemented. As Armenia has a CNG-heavy transport sector, as a matter of fiscal sustainability and equality clearly this legislation should be amended to include a road fund tax on CNG as well. The implementation of this flexible road fund based on a modified version of the current legislation is recommended, initially to finance periodic road maintenance (Appendix 1, Annex 3 and Annex 5). Later, its scope could be expanded to the funding of road projects, including the north-south corridor. Even at an 8% level of equivalent \$0.10/liter, the fund could produce \$45 million/year of additional revenues for the road sector (Appendix 1, Annex 3). Promoting PSP will increase the number of projects that can be undertaken by 2020.

## B. Implementation and Monitoring

### 1. Implementation

99. Implementing the Action Plan requires: (i) incorporating objectives into annual work programs, with agencies “buying in” to the long term objectives; (ii) consistent project evaluation and planning; (iii) prioritization of programs in accordance with available resources; and (iv) regular updating and monitoring against benchmarks.

100. The process is outlined below:

#### **Step 1: Annual Programs and Buying-In**

Implementing agencies will need to structure their annual work programs in support of the action plans and to adopt longer planning time horizons. The planning cycle for the 2010 budget should be the target for this to be in place.

#### **Step 2: Project Development**



Project development will be systematic. This is a two-stage process: (i) developing projects in accordance with strategic objectives and evaluating them in a consistent format; and (ii) ensuring that project definition is optimal by considering alternative ways of achieving the objective.

### Step 3: Prioritization

The projects included in the Action Plan should be subject to strict due diligence, including economic (and financial) feasibility covering economic (and financial) rates of returns and sensitivity tests to ensure the robustness of the feasibility of projects, taking into consideration potential future negative changes in costs and benefits; and environmental and social assessment. Projects with the highest economic returns will be given high priority, followed by lower return projects as middle and low priority. The Government then defines priorities, both between sectors and within subsectors. This is a complex task requiring an effective planning structure to be in place, evaluating alternatives within a common analysis framework.

The Government through its endorsement of PRSP-2 has accepted that transport needs increased resourcing out of public funds. To balance programs is the next step: (i) the priority of upgrading north-south corridors against that of completing the LRNP; (ii) the balance between routine maintenance, periodic maintenance, and reconstruction and rehabilitation.

### Step 4: Planning and Monitoring

The projects included in the Action Plan will be implemented through annual budgets and plans and there needs to be: (i) consistency between annual plans and the Strategy; (ii) prioritization in accordance with long-term objectives; and (iii) benchmarking and monitoring of implementation.

## 2. Monitoring

101. A three-stage process is proposed to monitor implementation of the Action Plan. The first monitoring stage, the Preparatory Stage, involves measuring the potential achievements of the projects and whether these achievements match to certain targets set forth by the Strategy. The second stage, the Project-Related stage, consists of project related metrics aiming principally at management of timelines for implementation and budget adherence. The third stage, the Strategy-Related stage, aims to measure the goals of the overall project in the context of the aggregate projects that make up the Strategy implementation. These monitoring processes are presented in Table 10.

**Table 9: Implementation Monitoring**

Monitoring Stage	Remarks	Indicators
1. Preparatory	Monitoring at this level will focus on achievement of the various actions and policy decisions specified under the strategy – whilst many of these are preparatory insofar as they are supportive of the strategic investments; the focus will be on the full range of actions specified regardless of their chronological relationships with individual or sector wide hard and soft interventions.	EIRRs (and FIRRs for revenue generating transport projects) Monitoring will be undertaken by reference to the implementation timetable to be established for the various action proposals and policy decisions. At this stage it is not possible to specify precise performance indicators as they will be dependent on the timetable to be adopted by Government and other concerned stakeholders.
2. Project Related	Project related monitoring will focus on performance relative to individual projects and implementation programs.	Performance indicators prior to completion of construction phases will be the timeframe established

Monitoring Stage	Remarks	Indicators
	In the first instance monitoring should be based on project formulation, design, and procurement and construction timetables. After completion and once the operational phase has begun, monitoring focus will shift to performance indicators relative to such matters as infrastructure usage, management, and maintenance.	during the detailed project formulation stages. Monitoring after operational status will performance indicators relative to such matters as traffic volume, financial performance and other indicators as identified during the feasibility study stage of project formulation.
3. Strategy Related	The third level of monitoring will be in relation to the achievement of the goals and objectives identified under this strategy. At the aggregate level, contribution by the transport sector to such goal achievement can be determined by reference to national statistics as currently prepared by the Government. The contribution of individual projects to such goal achievement is however likely to be more problematical in terms of both data capture and subsequent analysis, while overall impact will be identifiable, disaggregation to contributions from individual projects is difficult.	This should be treated through aggregate statistics for the transport sector based on achievement of goals set for the sector. Such data might include, for example, disaggregated trade statistics, shipping time studies, accident rates, etc.

Source: the Consultants

102. Circumstances will necessarily change over time and it is difficult to quantify performance indicators, which should be quantified at the project formulation stage, to reflect actual status before implementation and to incorporate expected outcomes based on then current conditions.

103. Monitoring is of value only if it results in appropriate remedial action. It is therefore necessary to develop systems and procedures for such actions as part of the monitoring process, as and when performance indicators are identified.

104. Monitoring benchmarks need to be agreed between the Cabinet and implementing agencies, on a rolling basis - reviewed at least every three years, or when circumstances change. The benchmarks need to be carefully considered and defined for the end years of the short (2012), medium (2016) and long term (2020). They should reflect the resources allocated and be realistic, achievable targets, initially as guidance, but later, as the monitoring system becomes entrenched, a basis for reward or penalty. Inappropriate targets (either too demanding or not sufficiently demanding) will distort resource use and allocation. Table 11 provides example indicators for consideration and indicative targets.

**Table 10: Monitoring Benchmarks**

#	Parameters	Remarks
<b>Whole Sector:</b>		
1.	<ul style="list-style-type: none"> <li>Restructuring</li> <li>Regulatory &amp; oversight functions</li> <li>Management information &amp; support systems</li> </ul>	<ul style="list-style-type: none"> <li>100% complete by 2015.</li> <li>100% complete by 2014.</li> <li>100% complete by 2012.</li> </ul>
2.	<ul style="list-style-type: none"> <li>Staff training</li> </ul>	<ul style="list-style-type: none"> <li>No. of trainees (2012/2016/2020).</li> <li>Success completion rate (%) (2012/2016/2020).</li> <li>Training costs disbursed locally/internationally. (2012/2016/2020).</li> <li>Entities preparing accounts that are IFRS compliant (no. / %) (2012/2016/2020).</li> </ul>
<b>Roads:</b>		
3.	<ul style="list-style-type: none"> <li>Upgrading of international and interstate corridors</li> </ul>	<ul style="list-style-type: none"> <li>70% of international corridor length in good condition 2012, 85% in 2016 and 100% after 2020</li> </ul>
4.	<ul style="list-style-type: none"> <li>Completion of the LRNP</li> </ul>	<ul style="list-style-type: none"> <li>50% of LRNP length completed 2012, 75% by 2016, 100% by 2020.</li> </ul>
5.	<ul style="list-style-type: none"> <li>Asset management and road transport operations in accordance with international standards</li> </ul>	<ul style="list-style-type: none"> <li>Performance based maintenance contracts - 50% of network covered by 2012, 100% by 2016.</li> <li>Updated maintenance standards - 100% complete by 2012.</li> <li>Road condition database - 80% complete by 2010, 100% by 2011.</li> <li>Establishment of a road fund strategy by 2010, establish actual road fund by 2012 for periodic maintenance, by 2016 to also finance strategy projects.</li> <li>Number of staff undergoing/completing management training in planning, managing and implementing road sector projects (MOTC staff trained 2012/2016/2020).</li> </ul>
<b>Railways:</b>		
6.	<ul style="list-style-type: none"> <li>Successful operation and implementation of the concession.</li> </ul>	<ul style="list-style-type: none"> <li>Freight ton/km 2012/2016/2020.</li> <li>Passenger km 2012/2016/2020.</li> <li>No. of temporary speed restrictions.</li> <li>Level of service: accidents/delays.</li> <li>SCR investment as % of Concession commitment.</li> <li>SCR payments to Government.</li> </ul>
<b>Urban Transport:</b>		
7.	<ul style="list-style-type: none"> <li>Integrated public transport network and services.</li> </ul>	<ul style="list-style-type: none"> <li>Electronic ticketing system (by 2010).</li> <li>Integrated network: no.of routes incorporated/length/service frequency: 2012/2016/2020.</li> </ul>
8.	<ul style="list-style-type: none"> <li>Sustainable balance between public and private transport.</li> </ul>	<ul style="list-style-type: none"> <li>Modal split targets: 2012/2016/2020.</li> </ul>
<b>Airport and Civil Aviation:</b>		
9.	<ul style="list-style-type: none"> <li>Competitively priced air services</li> </ul>	<ul style="list-style-type: none"> <li>Cost per passenger km for flights to Yerevan against international benchmark services.</li> <li>Passenger numbers and freight ton/value transported (2012/2016/2020).</li> </ul>
10.	<ul style="list-style-type: none"> <li>Comprehensive international connectivity at efficient airports</li> </ul>	<ul style="list-style-type: none"> <li>Number of destinations served and frequency (2012/2016/2020).</li> <li>Comparative airport service fees on regional and international basis (2012/2016/2020).</li> <li>Aircraft turn-around time (2012/2016/2020).</li> </ul>

Source: the Consultants

## VI CONCLUDING REMARKS—CONTRIBUTING TO A BETTER FUTURE

105. The *Armenia Transport Sector Development Strategy 2020* and the *Action Plan* define a program of policy reforms and investment and technical assistance projects addressing management, infrastructure and technology issues. The vision is to contribute to long-term prosperity through the establishment of efficient, cost-effective and environmentally and socially sustainable transport infrastructure and services. The Strategy and the Action Plan seek to exploit existing opportunities and to address remaining challenges. They encourage necessary partnership between the Government and external financing institutions and the private sector to achieve the vision.

106. The Government has achieved impressive economic performance despite substantial challenges experienced after independence and with rather limited resources under the “small government” principle, maintaining fiscal and external borrowing prudence. The Strategy and the Action Plan support the Government's efforts towards sustainable, inclusive economic development and maintaining prudent fiscal and external borrowing practices, through prioritized interventions in all transport subsectors and trade facilitation.

107. The current global crisis will slow economic growth in the short term. This will inevitably be a challenging period. Fiscal and external financing constraints, including available financing from the Diaspora, will require the Government to pursue the Strategy more intensively—targeting high priority investments and transport and trade facilitation coordination to achieve quick, cost effective returns from available resources. Removing impediments to transport and trade in a cost effective manner is essential to ensure sustainable, inclusive economic development and a critical action to realize economic opportunities and to build a better future.

## APPENDIX 1: TRANSPORT SECTOR ASSESSMENT

### NATIONAL ECONOMY AND TRANSPORT

#### 1.1 Introduction

1. This Appendix provides (i) an overview of the recent development of the economy and of the transport sector; (ii) an assessment of current achievements, remaining problems and opportunities; and (iii) the background to the issues addressed in *Armenia Transport Sector Development Strategy 2020*. The annexes review specific modal questions.

#### 1.2 National Economy and Population

2. The development of the national economy, the main driver of transport demand, is discussed in chapter 1 of the main text. Changes in the population and in its age structure will also have an impact on transport. Population statistics for 2002-2007 are given in Table 1-1 (tables are at the end of the chapter). The population is aging, with a low birth rate and high emigration of young people, predominantly male. The population is expected to decline gradually to 2020.

#### 1.3 International Trade and Production

3. International trade statistics for 2003-2006 are given in Tables 1-2 to 1-4. The value of exports increased by 44% and of imports by 71% over this period. In 2006, import value was 223% that of exports. Imports per capita in 2006 were \$682 and exports \$306. Exports are predominantly of four product groups: precious stones (principally diamonds), ferrous metals, ores and drinks. These accounted for 69% of the total 2003-2006. Imports are less specialized, although fuel and bitumen and precious stones accounted for over one third (Table 1-3). Nearly 60% of exports and one third of imports were with the five largest trading partners (Table 1-4).

4. The output of major agricultural and industrial products for 2003-2006 is given in Table 1-5. The combined output of the top seven agricultural products (including milk) in 2006 was 2.8 million tons. Cement and building materials production was 1.08 million tons (Table 1-5).

#### 1.4 Economic Outlook

##### A. Medium Term Expenditure Framework

5. The Government's *Medium Term Expenditure Framework 2009-2011* (MTEF), July 2008, forecasts gross domestic product (GDP) growth of 10.0% for 2008, 9.2% in 2009, 8.5% in 2010 and 8.0% in 2011. GDP by sector data for 2005-2011 are given in Table 1-6. Notable is the rapid growth in the construction sector during 2005-2008, the result of the property boom, largely in Yerevan. The world recession will reduce growth to below the MTEF forecast. The full transport section of the MTEF is given in Annex 1.

##### B. Poverty Reduction Strategy

6. The *Poverty Reduction Strategy Paper* (PRSP-1, August 2003) is the main guide to economic policy. The successor PRSP-2 extends the planning horizon from 2015 to 2021 and provides detailed forecasts and a comprehensive review of progress to date. The PRSP-

2 economic forecasts to 2021 are given in Table 1-7 and the sector forecasts in Table 1-8. (Note: there are minor differences from the data in Table 1-6, which was completed later.) Industry's contribution to GDP fell from 32.7% in 1990 to 22.6% in 1999 and to 17.9% in 2006. Agriculture increased its share from 17.2% in 1990 to 28.9% in 1999, but with the rapid growth of the construction and the services sector, its share fell back to 18.1% in 2006.

**7. Transport Sector Targets.** PRSP-2 targets to 2021 are given in Table 1-9. A near doubling of state investment in transport as a percentage of GDP is foreseen, from 0.8% in 2007 to 1.5% in 2021. PRSP-2 notes that budgeted transport and communication expenditure for 2003-2006 did not reach the PRSP-1 target per cent of GDP (Table 1-10), while the GDP targets were themselves exceeded. Excellent progress was made in reducing poverty and extreme poverty 1999-2006 (Table 1-11). Most PRSP-1 targets are being comfortably exceeded. Targets to 2021 are given in Table 1-12. The PRSP-2 does note with concern the growing gap between the income level in Yerevan and in the rest of the country.

8. For PRSP-1, the main component of the road program to 2015 was expected to be rehabilitation and maintenance of the existing network, with particular attention to bridges in poor condition. PRSP-2 notes the impact of high transport costs:

“With regard to the infrastructure sector, by the overall quality estimate of which in 2005 Armenia was 7<sup>th</sup> among the 26 Europe and Central Asia (ECA) countries the major obstacle to investment is transport cost (23<sup>rd</sup> among ECA countries). Without taking into account transport cost Armenia is 4<sup>th</sup> in ECA countries in quality of infrastructure services. For transport PRSP-2 strategy envisages:

- substantial decrease (from present 9.2% to 4% by 2021) in transport costs and in the number of companies that consider transport costs as the major obstacle to development and investment – as a result of railway and aviation reforms, relevant investments, as well as construction of new Dilijan-Vanadzor railway. (*Consultants' note: the estimated construction cost of the 47km Fioletovo-Vanadzor line is \$91 million – Annex 7.*);
- development and increased efficiency of the transport system is viewed as an important prerequisite for ensuring high growth rate, increased access to and efficiency of social services, increase labor force mobility and elimination of regional disparities;
- in recent years due to a number of objective reasons the structure of transport services has changed considerably in favor of road transport. Currently this accounts for about 59% of cargo transport and about 90% of passenger transport. In the given situation the condition of the national road network significantly preconditions the margin of transport costs, basically, for the whole economy. In this respect PRSP-2 framework envisages large-scale investment aimed at improving the national road network, with the most intensively used segments of the network as a priority;
- at the same time, taking into consideration the importance of national road communication with respect to accessibility of social services, development of agriculture and tourism, increased labor force mobility, as well as reduction of regional economic and social disparities, it is planned to considerably increase public funding for local road infrastructure development. The investment priorities include ensuring at least one proper route that would connect each settlement in Armenia to the regional centers and developing the network of roads leading to major tourist attractions; a prioritized list of

such roads will be established within the framework of a long-term development program for the national road network;

- in order to prevent accelerated deterioration of the road network and ensure safer, faster and easier road transport public investment for road maintenance will be augmented and disbursed more effectively; and
- to design a transport structure that would be most balanced in respect of the transport system and most optimal for the country's sustainable development model, it is planned to continue and deepen management reforms in the railway and air transport sectors.”

## 1.5 Transport Demand

*Note: Transport statistics in the annual Statistical Yearbook are prepared by the National Statistical Service of Armenia based on reports from a sample of companies. While the NSS develops representative data, road passenger (minibus and taxi) and freight volumes may be significantly underestimated. Data on private vehicle use are not published. Companies may understate the volumes they report. For freight, the last survey of operators was in 1999. A Project Profile for a Road Transport Survey is given in Appendix 3.*

### A. Development 1988-2007

9. **Post-Independence Restructuring.** The network was highly developed and heavily utilized in the 1980s, with route densities per 1,000 sq km of

- (i) railway 31.6 km (for comparison: Georgia - 22.6 km, Azerbaijan - 28.9 km)
- (ii) road 266 km (Georgia – 290 km, Azerbaijan – 280 km)

10. In the former Union of Soviet Socialist Republics (USSR), the economy and transport use was centrally planned: it was highly integrated, non-competitive and regionally specialized. This resulted in a very high transport-intensity, a dominance of rail and specialized location of production facilities, requiring large-scale movement of intermediate goods.

11. Independence was followed by rapid de-industrialization throughout the former USSR. Transport volumes in Armenia fell sharply, peaking in 1988 at 320 million tons and 401 million passengers. The transformation from an industrial into (for a short time) a quasi-subsistence economy, reduced the economic importance of the transport sector.

12. **Fall in Demand.** There was a complete reorientation to cater primarily for domestic demand, with new trade patterns and trading partners and a rapid change from a heavy industrial to an agriculture/light industry/service economy: recorded passenger volume fell by 79% and freight volume by about 94% 1988-1995 (Tables 1-13 and 1-14). Infrastructure maintenance virtually ceased for some years. The newer industries, such as diamond processing, have very high unit value but low transport volume intensity.

13. Road is the dominant mode for passenger transport, with rail and pipeline also significant for freight. Published passenger and freight statistics by mode for 2001-2006 are given in Tables 1-15 and 1-16, with 1990 data shown for comparison. Rail freight by commodity in 2007 is given in Table 1-17 and air traffic for 2005-2007 in Table 1-18.

## 1.6 Government Strategy and Policy Reform

14. **Sector Reorganization.** Structural reforms were carried out from 1993 to modernize transport sector management and operation, with large-scale privatization of services and a diminished role for the public sector. The Government has focused on establishing a legal framework for private sector development and on building an open market economy. Macroeconomic stability and privatization of small and medium-sized state-owned enterprises has been achieved. From 2001, the Government accelerated the strengthening of the business environment to promote investment and exports. A focus on trade facilitation included simplifying customs clearance procedures, reducing bottlenecks in the business environment and shortening procedures for business registration and licensing. A private sector freight forwarding industry was established, improving road transport and bringing overall benefits to the economy.

15. **Current Focus.** The Government is currently focusing on (i) improving regional connections for transport and trade facilitation, (ii) improving rural roads to improve the livelihood of agricultural workers, and (iii) facilitating private sector investment. There is no defined medium to long term plan or strategy for the sector.

16. *Armenia 2020*, a private initiative financed by the Diaspora, primarily in the US, has evaluated development options in a series of strategy studies (McKinsey). These include (i) developing tourism; (ii) focusing on clusters of excellence, particularly information technology (IT); and (iii) using terminal capacity at Zvartnots airport for the development of a freight distribution hub.

## 1.7 Duties and Taxes on Transport

17. Government revenue from the transport sector is primarily from fuel import duties: the AMD equivalent of \$222 per ton for petrol and \$65 per ton for diesel, including value added tax (VAT). Customs duty on imported vehicles (other than for transit) is 10% and VAT is 20%. There is a fixed charge for customs processing of AMD9,500 and an environmental fee of AMD2,500 per vehicle. For transit, an additional fee of AMD10,000 is payable.

## 1.8 External Assistance

18. Many international financial institutions (IFIs) and other agencies, public and private, have provided assistance for the sector, substantially increasing the resources available for investment. The main participants and interventions are detailed below (listed by agency in alphabetical order):

- (i) Asian Development Bank (ADB). Armenia became a member of ADB in September 2005. ADB's assistance focuses on upgrading and rehabilitating priority roads and bridges, strengthening road management capacity and supporting transport sector development. Under the *Country Operational Business Plan 2008-2010* interventions will focus on: (i) rural development; (ii) private sector development; and (iii) regional cooperation.

ADB is financing under the *Rural Road Sector Project* the rehabilitation of 223 km of high priority LRNP roads. Loan 2351-ARM for \$30.6 million was signed on 15 November 2007. A supplementary loan of \$17.3 million was approved on 7 November 2008. Contracts have been let for 107.2 km of road. The remaining 116 km is expected to be tendered by end-2008.



In July 2008, the Government requested ADB to improve Route H-45, which runs parallel to and to the west of the difficult and dangerous Goris-Kapan section of the M-2, connecting Yerevan and the Iranian border. H-45 would become the main north-south route. It runs between M-2 km 227+790 and km 296+290 and serves the important tourist destination of Tatev. The project comprises:

- Reconstruction/rehabilitation M2-Halidzor-Devil's Bridge 18.7 km
- New construction Devil's Bridge-Tatev-Lernantsk 22.6 km
- Reconstruction Lernantsk-Aghvani-Syunik 33.7 km.

A project preparatory technical assistance (PPTA) which will evaluate priorities and funding modalities for the north-south corridor (including H-45) is expected to begin fieldwork in February 2009.

- (ii) Armenian-European Policy and Legal Advice Center (AEPLAC). AEPLAC commissioned a study to compare institutional arrangements in Armenia and the European Union (EU) in road and rail transport.
- (iii) Armenian Social Investment Fund (ASIF). ASIF, set up under World Bank auspices, has undertaken a number of small-scale rural road projects. ASIF develops projects at grass roots level and works in all villages of the country. It would be an effective partner for Bank intervention in the poorest areas of the country under a subsequent road sector project.
- (iv) European Bank for Reconstruction and Development (EBRD). In 1994, EBRD provided a Euro 21.8 million loan for air cargo terminal development at Zvartnots airport. In 2006 a loan of €15 million was made for terminal expansion at Zvartnots. A loan of \$20 million is under review for the second stage terminal development. An urban transport project of about \$20 million is in preparation (the total includes one-third associated grant component), for the Metro. This loan is subject to Government approval for the financial autonomy of Yerevan Municipality.
- (v) Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ): It provided for the development of the PSRP-2 (together with the World Bank) and for urban transport improvements in Gyumri.
- (vi) Japan International Cooperation Agency (JICA). JICA is reviewing a proposed Yen loan project for rehabilitation of up to 807 km of LRNP roads, at an estimated cost (excluding VAT) of \$181 million. Project cost estimate, including 20% contingency, is \$230 million. Implementation would be in three packages 2010-2013. JICA's financing will be in parallel with ADB financing. Draft Final Report of *Supplemental Study for Feasibility Study* issued (May 2008, Central Consultant Inc.).
- (vii) Lincy Foundation of the United States. Lincy Foundation, established by the Armenian Diaspora in the US, has provided grants for road rehabilitation and development: (i) \$71.6 million (2001-2003) for rehabilitation of 427 km of interstate and republican roads, five bridges and two tunnels (Sevan-Dilijan and Spitak-Gyumri); (ii) \$13.6 million for rehabilitation of 22 km of streets in Yerevan (2002-2003); (iii) \$14.1 million for rehabilitation of 56.9 km of rural roads (2006-2008), including H-17 Gyumri-Getap; and (iv) \$18.4 million for construction/rehabilitation

of 7.2km of Yerevan streets (2006-2008), including three underpasses on Khanjian Street. Lincy Foundation finances projects requested by the Government. Construction supervision is through its Road Project Implementation Unit (PIU).

- (viii) Millennium Challenge Corporation (MCC) of the United States: MCC has agreed a \$67.1 million grant for rehabilitation and improvement of rural roads, to be implemented by the Millennium Challenge Account (MCA), for completion by September 2011. Rehabilitation of 24.5 km of H17 Getap-Armavir, adjoining the Lincy foundation project, started in late 2007. Contractors have been selected for 273 km to be constructed during July 2008-June 2010. Due to a delay in the release of MCC funds, the Government is to finance the 2008 program and has allocated \$16.8 million from the national budget.
- (ix) MCC designed 940 km of road projects (*Feasibility Study and Design of Roads for the Rural Road Rehabilitation Project SWECO 2007*), the original program for grant financing. It is currently estimated that due to inflation and dollar depreciation the grant will be sufficient for 330km. Under its March 2006 agreement with MCC, the Government is itself renovating 532 km of road, by September 2011.
- (x) Transport Corridor Europe Caucasus Asia (TRACECA). TRACECA financed fiber optic communications cable along the Yerevan–Georgia railway under the World Bank’s Transport Project. TRACECA has also financed a number of transport sector studies (see [www.traceca.am](http://www.traceca.am)). Ongoing TACIS/TRACECA project *Trade Facilitation and Institutional Support for Armenia and 12 Countries*. Planned studies include *International Logistical Centers for Caucasus and Western NIS Countries* and *Improving the Rail Connection Tbilisi-Yerevan*.
- (xi) Turkish-Armenian Business Development Council. It sponsored report *The Stakes of Opening Turkish-Armenian Border*, Oct.2002.
- (xii) United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) supported a study of improving the Goris-Kapan section of Asian Highway, 2007.
- (xiii) United States Agency for International Development (USAID) prepared *Tourism Development Concept Paper*, 2007 under the Competitive Armenian Private Sector (CAPS) project, and a study of the competitiveness of the aviation sector.
- (xiv) World Bank. The World Bank undertook *Transport Sector Strategy Study in 1997*. A \$36.9 million *Highway Project* (September 1995-December 2000) included routine and periodic road maintenance, bridge and tunnel rehabilitation, road equipment and institutional strengthening of ARD. A *Transport Project* (approved June 2000, completed December 2004) of \$28.4 million, including the Government component: (i) rehabilitated 227 km of road; (ii) provided routine maintenance on 786 km and 11 bridge improvements; (iii) included a road safety component of \$4.5 million with Technical Assistance (TA) for the National Road Safety Council, which was established in 2001; (iv) included a \$14.8 million railway component financed track and bridge rehabilitation over 70 km (Ayrum-Ani) of the Yerevan-Georgia Border line and improved financial management of

Armenian Railways; and (v) \$0.9 million to support the Ministry of Transport and Communication (MOTC), primarily on legal issues.

World Bank (June 2004) strategy focused on: (i) promoting private sector growth by strengthening the financial sector, improving public sector management and reducing infrastructure bottlenecks; (ii) making growth more pro-poor by improving the labor market, promoting a more dynamic rural economy and making social assistance more effective; and (iii) reducing non-income poverty through better health, education and basic services. Strategy for 2008-2012 is in preparation.

The following projects are being considered for World Bank funding within the *Country Assistance Program 2009-2012*: (i) *Yerevan Urban Transport Project Phase 1* \$30 million 2009 (to include signaling and safety improvements for 165-200 intersections, assistance in setting up a funding agency for urban transport and in structuring car park concessions). As of October 2008 this project was on hold. Supporting TAs *Assistance to Yerevan Municipality for Passenger Transport* (Advanced Logistics Group) and *Yerevan Traffic Management and Safety* have been prepared. A Phase 2 of \$30 million 2011 to include passenger transport restructuring and a 10km bus rapid transit line; (ii) *Road Rehabilitation I* 2009 \$72 million for rural road rehabilitation and reconstruction within the Lifeline Roads Network Program (LRNP); and (iii) *Road Rehabilitation II* 2010 \$100 million, for rehabilitation and upgrading of north-south highways M-3 and M-6, Yerevan - Georgian border.

**Table 1-1: Population 2002-2007**

Item	2002	2003	2004	2005	2006	2007
Total ('000)	3,210	3,212	3,216	3,220	3,223	3,223
Of which: Urban (%)	64.2	64.2	64.1	64.1	64.1	64.1
Rural (%)	35.8	35.8	35.9	35.9	35.9	35.9
Below working age (%)	25.4	24.5	23.6	22.7	21.7	-
Economically active (%)	38.6	38.4	37.2	37.1	37.3	36.2
Of which: in farming (%)	39.7	40.9	41.9	42.0	41.8	-

Source: *Statistical Yearbook of Armenia 2007*.

**Table 1-2: International Trade 2003-2006 (\$ million)**

Item	2003	2004	2005	2006
Exports	686	723	974	985
Imports	1,279	1,351	1,802	2,192
<b>Of which CIS:</b>				
Exports	129	125	188	212
Imports	355	387	522	696

Source: *Statistical Yearbook of Armenia 2007*

**Table 1-3: Principal Traded Goods (% of value)**

Item	2003	2004	2005	2006
<b>Exports:</b>				
Precious stones, etc.	51.2	41.4	34.5	30.0
Ferrous metals	2.6	9.8	25.0	17.0

Ores	5.6	10.1	5.3	9.5
Drinks	8.8	7.9	8.7	8.0
Others	31.8	30.8	26.5	35.5
<b>Imports:</b>				
Fuel, bitumen etc.	14.0	15.3	14.7	16.0
Precious stones etc.	26.0	21.6	19.3	14.3
Vehicles	5.9	6.7	8.1	8.9
Machinery, appliances	6.3	5.1	8.7	7.7
Electrical machinery	4.2	4.9	4.2	6.2
Others	43.6	46.4	45.0	46.9

Source: *Statistical Yearbook of Armenia 2007*

**Table 1-4: Principal Trading Partners (% of value)**

Country	2003	2004	2005	2006
<b>Exports:</b>				
Germany	6.5	11.5	15.6	15.0
Netherlands	3.2	3.6	13.7	12.9
Russian Federation	13.8	10.8	12.2	12.3
Belgium	18.1	14.9	12.8	11.0
Israel	13.6	11.5	12.0	8.9
Others	44.8	47.7	33.7	39.9
<b>Imports:</b>				
Russian Federation	13.7	11.8	13.5	13.9
Ukraine	4.3	6.0	7.0	7.4
Kazakhstan	0.6	0.9	0.1	7.3
Germany	4.6	5.9	7.8	6.6
Belgium	9.8	7.6	8.0	5.5
Others	67.0	67.8	63.6	59.3

Source: *Statistical Yearbook of Armenia 2007*

**Table 1-5: Agricultural and Industrial Output 2003-2006 ('000 tons)**

Item	2003	2004	2005	2006
Grain	310	457	396	213
Potatoes	507	576	564	540
Vegetables	569	601	664	780
Melons	115	113	118	135
Fruit/Berries	103	114	316	286
Grapes	82	149	164	201
Milk	514	555	595	620
Cement	384	501	605	625
Building materials (non-metal)	336	459	402	452
Copper concentrate	67	65	63	68

Source: *Statistical Yearbook of Armenia 2007*

**Table 1-6: Sector Growth Rates 2005-2011 (in %)**

Item	2005	2006	2007	2008	2009	2010	2011
	Actual			Plan	MTEF Forecast		
GDP real growth %,including	13.9	13.2	13.8	10.0	9.2	8.5	8.0
Industry	5.6	-2.5	3.1	2.4	6.0	7.0	8.0
Agriculture	11.2	0.5	10.2	4.5	4.4	4.4	4.0
Construction	27.9	37.7	18.6	20.4	12.0	11.6	9.0

GDP deflator %	3.2	4.6	4.1	4.0	4.0	4.0	4.0
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GDP = gross domestic product, MTEF = Medium-Term Expenditure Framework.

Source: MTEF, 2009-2011

**Table 1-7 Economic Forecasts to 2021**

Indicators	2005	2006	2007	2008	2009	2010	2011	2015	2018	2021
	<i>Actual</i>	<i>Actual</i>	<i>Prelim</i>	<i>Forecast</i>						
Real GDP, % annual growth	14.0	13.3	13.7	10.0	9.5	8.5	7.5	6.0	5.8	5.2
GDP AMD billion	2,244	2,657	3,139	3,594	4,093	4,618	5,113	7,369	9,573	12,248
GDP \$ million	4900	6387	9179	11,783	13,418	15,141	16,765	24,161	31,385	40,156
Per capita GDP \$	1,523	1,981	2,844	3,635	4,124	4,632	5,105	7,228	9,299	11,833
CPI (average), % change	3.2	4.6	4.4	4.0	4.0	4.0	3.0	3.0	3.0	3.0
Exchange rate AMD per \$	457.7	416.0	342.0	305.0	305.0	305.0	305.0	305.0	305.0	305.0

AMD = Armenian Dram, GDP = gross domestic product, CPI = consumer price index.

Source: Poverty Reduction Strategy Paper-2

**Table 1-8 Sectoral Composition of GDP 2005-2021**

Indicators	2005	2006	2007	2008	2009	2010	2011	2015	2018	2021
	<i>Actual</i>	<i>Actual</i>	<i>Prelim.</i>	<i>Forecast</i>						
<b>GDP contribution</b>	<i>In current prices: AMD billion</i>									
Industry	488	476	491	537	589	649	715	1,100	1,599	2,326
Agriculture	428	482	549	588	630	675	730	979	1,158	1,343
Construction	440	651	803	905	1,024	1,144	1,244	1,509	1,395	1,289
Services	719	830	990	1,208	1,428	1,663	1,878	2,950	4,272	5,737
Net indirect taxes	167	218	307	356	422	488	547	831	1,148	1,553
GDP	2,242	2,657	3,139	3,594	4,093	4,618	5,113	7,369	9,573	12,248
<b>GDP sector structure</b>	<i>% of GDP</i>									
Industry	21.8	17.9	15.7	14.9	14.4	14.0	14.0	14.9	16.7	19.0
Agriculture	19.0	18.1	17.5	16.4	15.4	14.6	14.3	13.3	12.1	11.0
Construction	19.6	24.5	25.6	25.2	25.0	24.8	24.3	20.5	14.6	10.5
Services	32.1	31.2	31.5	33.6	34.9	36.0	36.7	40.0	44.6	46.8
Net indirect taxes	7.4	8.2	9.8	9.9	10.3	10.6	10.7	11.3	12.0	12.7
GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

AMD = Armenian Dram, GDP = gross domestic product.

Source: Poverty Reduction Strategy Paper-2

**Table 1-9 Transport Targets to 2021**

Item	Base	2012	2015	2018	2021	
Overall Index of road economy reform	2.33(2007)	3.00	3.33	4.00	4.00	
Localities having at least one satisfactory road	3%	20%	40%	60%	80%	
Maintenance performance	Interstate	90%	90%	90%	90%	
	Republican	40%	80%	90%	90%	
	Local	10%	30%	50%	70%	90%
State investment/GDP	Average for 3 previous years	0.8% (2007)	1.0%	1.2%	1.5%	1.5%

GDP = gross domestic product.

Source: Poverty Reduction Strategy Paper-2

**Table 1-10: Consolidated Budget Expenditure 2003-2007 (% of GDP)**

Indicators	2002	2003		2004		2005		2006		2007
	<i>Actual</i>	<i>PRSP</i>	<i>Actual</i>	<i>PRSP</i>	<i>Actual</i>	<i>PRSP</i>	<i>Actual</i>	<i>PRSP</i>	<i>Actual</i>	<i>Prelim</i>
<b>Total expenditure</b>	<b>25.0</b>	<b>26.2</b>	<b>22.8</b>	<b>24.1</b>	<b>21.0</b>	<b>24.0</b>	<b>22.1</b>	<b>24.1</b>	<b>21.6</b>	<b>23.8</b>
<b>Social sector, culture, science</b>	9.1	10	9	10.2	9	11	9.5	11.5	9.64	10.1
Education	2.3	2.3	2.2	2.7	2.5	3	2.7	3.1	2.7	3.1
Healthcare	1.2	1.4	1.2	1.5	1.3	1.8	1.4	1.9	1.5	1.5
Social security and social insurance	4.5	5	4.5	5.2	4.5	5.5	4.6	5.7	4.7	4.8
Culture, information, sports, religion	0.8	1.1	1.0	0.6	0.5	0.6	0.6	0.7	0.6	0.6
Science	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<b>Defense</b>	3.7	4.2	3.8	4.1	3.8	4.2	4.2	4.0	4.3	4.5
<b>Economic sectors</b>	5.2	7.4	5.8	5.4	3.6	4.4	3.4	4.2	3.6	5.0
Housing and utilities	1.7	2.5	2.6	1.5	1	1.4	1.4	1.4	1.2	1.1
Fuel and energy	0.6	0.8	0.4	0.8	0.5	0.5	0.1	0.4	0.2	0.9
Agriculture, forestry and fisheries	1.1	1.3	1.2	1.1	0.9	0.8	0.6	0.7	0.7	0.9
<b>Transport, roads and communication</b>	<b>1.8</b>	<b>2.5</b>	<b>1.9</b>	<b>1.6</b>	<b>1.0</b>	<b>1.5</b>	<b>1.0</b>	<b>1.4</b>	<b>1.2</b>	<b>1.7</b>
Other sectors	0.1	0.3	-0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.4
<b>General public service</b>	1.7	1.9	1.9	2.2	2.1	2.4	2.1	2.3	2.15	2.2
<b>Public debt liabilities</b>	0.9	0.9	0.7	0.8	0.5	0.7	0.4	0.7	0.3	0.3
<b>Other sectors</b>	4.5	1.7	1	1.4	2.0	1.4	2.5	1.4	1.6	1.7

GDP = gross domestic product, PRSP = Poverty Reduction Strategy Paper.

Source: National Academy of Sciences, Republic of Armenia, Ministry of Finance and Economy, Poverty Reduction Strategy Paper-1 projections

**Table 1-11: Poor and Very Poor 1999-2006**

Indicators	2006		2005			1999		
	Poor %	Very poor, %	Poor, %	Very poor, %	Per capita GDP, thousand dram	Poor, %	Very poor, %	Per capita GDP, thousand dram
Armenia	26.5	4.1	29.8	4.6	697.1	56.1	21.0	307.3
Yerevan	21.0	3.5	23.9	3.6	1134.1	58.4	24.8	376.7
Armenia (without Yerevan)	29.1	4.3	32.7	5.1	469.3	55.2	19.5	271.0
Aragatsotn	27.5	2.6	32.3	3.1	383.1	60.5	22.8	300.5
Ararat	27.0	5.5	30.9	7.4	437.3	52.3	13.3	267.5
Armavir	30.8	3.4	31.6	3.8	439.3	41.7	10.2	350.9
Gegharkunik	29.8	2.6	36.8	2.9	417.0	49.9	11.3	244.4
Lori	27.0	5.5	28.8	5.8	389.1	62.6	30.0	219.3
Kotayk	32.0	8.1	34.5	8.7	523.3	61.7	24.5	317.7
Shirak	37.3	3.7	42.5	4.3	321.0	75.8	33.0	226.6
Syunik	25.3	2.1	28.9	2.3	1,128.5	53.1	18.7	299.5
Vayots Dzor	11.4	1.3	19.2	1.8	616.2	34.7	12.9	276.3
Tavush	23.5	3.3	25.8	3.8	337.9	29.3	9.3	204.4
Other towns	35.8	6.6	37.8	7.2	427.2	65.5	27.4	241.2
Rural areas	23.4	2.4	28.3	3.2	479.8	48.2	14.1	295.3

GDP = gross domestic product.

Source: Poverty Reduction Strategy Paper-2

**Table 1-12: Poverty Reduction Targets to 2021**

Indicators	2005	2008	2012	2015	2018	2021
<b>National:</b> Poor, % of population	29.8	17.3	11.9	8.8	7.4	6.0
Poor '000	959	561	393	294	250	204
Extreme poor, % of population	4.6	2.4	1.8	1.4	1.2	1.1
Extreme poor '000	148	78	59	47	42	37
Poverty threshold, per month, AMD	20,289	23,362	26,807	29,293	32,009	34,977
Extreme poverty threshold, AMD/month	13,266	14,362	17,304	19,527	21,635	23,807
<b>Yerevan:</b> Poor, % of population	23.9	11.9	7.3	4.5	3.5	2.6
Poor '000	264	132	82	52	41	31
Extreme poor, % of population	3.6	1.3	0.9	0.6	0.5	0.4
Extreme poor '000	40	14	10	7	6	5
<b>Other Towns:</b> Poor, % of population	37.8	24.2	16.6	12.3	9.9	7.6
Poor '000	363	234	163	122	100	77
Extreme poor, % of population	7.2	4.0	2.7	2.2	1.8	1.5
Extreme poor '000	69	38	26	21	18	15
<b>Rural Areas:</b> Poor, % of population	28.3	17.4	12.7	10.2	9.2	8.1
Poor '000	327	202	151	123	111	99
Extreme poor, % of population	3.2	1.8	1.5	1.2	1.2	1.1
Extreme poor '000	37	21	17	15	14	13

AMD = Armenian Dram.

Source: Poverty Reduction Strategy Paper -2.

**Table 1-13: Passengers by Mode 1988-1999**

Year	Total		Mode					
			Railway		Road		Air	
	Million	%	Million	%	Million	%	Million	%
1988	401.4	100	3.86	1.0	396.0	98.6	1.54	0.4
1989	391.4	100	3.34	0.8	386.2	98.7	1.90	0.5
1990	382.8	100	3.53	0.9	377.4	98.6	1.84	0.5
1991	354.5	100	2.80	0.8	350.2	98.8	1.49	0.4
1992	185.8	100	2.91	1.6	182.0	98.0	0.85	0.4
1993	76.9	100	2.88	3.8	73.2	95.2	0.83	1.0
1994	70.8	100	3.50	4.9	66.7	94.3	0.60	0.8
1995	85.6	100	2.97	3.5	81.6	95.4	0.98	1.1
1996	87.3	100	1.86	2.1	84.4	96.7	1.00	1.1
1997	142.2	100	1.93	1.4	139.3	97.9	0.97	0.7
1998	146.3	100	1.61	1.1	143.8	98.3	0.86	0.6
1999	99.7	100	1.30	1.3	97.8	98.1	0.60	0.6

Source: *Statistical Yearbook of Armenia 1991, 1995, and 1999*

Note: excludes Yerevan electric transport

**Table 1-14: Freight by Mode 1988-1999**

	Year	Total	
	(Million tons)	Railway	Road
1988	319.8	18.7	301.1
1989	311.0	16.0	294.9
1990	277.3	15.7	261.5
1991	216.7	11.8	204.9
1992	40.6	2.6	38.1
1993	30.8	1.1	29.7
1994	20.4	0.8	19.6
1995	19.1	0.8	18.3
1996	20.3	0.7	19.7
1997	9.8	0.7	9.1
1998	13.9	0.7	11.1
1999	21.2	1.4	19.8

Source: *Statistical Yearbook of Armenia 1991, 1995, and 1999*

**Table 1-15: Passengers by Mode 2001-2006**

Item	1990*	2001	2002	2003	2004	2005	2006	% share 2006
<b>Passengers million:</b>								
Bus/Minibus	377.4	121.9	128.9	147.5	158.6	174.0	198.9	86.2
Taxi	0.0	0.0	0.7	1.2	2.8	7.8	10.0	4.3
Rail	3.5	1.2	1.3	1.1	0.8	0.7	0.7	0.3
Air	1.8	0.8	0.9	0.9	1.1	1.2	1.2	0.5
Metro	49.2	15.3	15.1	16.2	16.6	15.8	15.4	6.7
Trolleybus	39.0	7.4	5.7	4.1	5.1	4.8	4.1	1.8
Tram/Cable car	(In above)	5.3	4.2	3.0	0.6	0.5	0.4	0.2
<b>Total</b>	<b>470.9</b>	<b>151.9</b>	<b>156.8</b>	<b>174.0</b>	<b>185.6</b>	<b>204.8</b>	<b>230.7</b>	<b>100.0</b>
Index 2001=100	310.0	100.0	103.2	114.5	122.2	134.9	151.9	
<b>Passenger km million:</b>								
Bus/Minibus	N/A	1,562	1,707	1,858	1,954	2,072	2,265	69.2
Taxi		0	5	9	20	59	79	2.4
Rail	315	48	48	41	30	27	28	0.9
Air	5,400	725	754	719	984	960	822	25.1
Metro	187	58	57	62	63	60	59	1.8
Trolleybus	176	35	27	19	23	22	18	0.6
Tram/Cable car	(in above)	22	17	11	1	0	0	0.0
<b>Total</b>		<b>2,450</b>	<b>2,615</b>	<b>2,719</b>	<b>3,075</b>	<b>3,199</b>	<b>3,271</b>	<b>100.0</b>
Index 2001=100		100.0	106.7	111.0	125.5	130.6	133.5	
<b>Average journey km:</b>								
Bus/Minibus	N/A	13	13	13	12	12	11	
Rail	90	40	37	37	38	38	40	
Air	3,000	906	838	799	895	800	685	
Metro	4	4	4	4	4	4	4	
Trolleybus	5	5	5	5	4	4	4	
Tram/Cable car	(In above)	4	4	4	1	1	1	
<b>All</b>		<b>16</b>	<b>17</b>	<b>16</b>	<b>17</b>	<b>16</b>	<b>14</b>	

Source: *Statistical Yearbook of Armenia 2007*

Note: \* 1991 for metro, trolleybus and tram



Table 1-16: Freight by Mode 2001-2006

Item	1990	2001	2002	2003	2004	2005	2006	% share 2006
<b>Tons million:</b>								
Road	96.9	2.61	4.75	4.09	3.15	4.48	5.73	54.1
Rail	37.6	1.40	2.02	2.13	2.63	2.61	2.72	31.5
Pipeline		0.99	0.75	0.84	0.94	1.18	1.20	14.2
Air	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.1
<b>Total</b>		<b>5.01</b>	<b>7.53</b>	<b>7.06</b>	<b>6.73</b>	<b>8.28</b>	<b>9.66</b>	100.0
Index 2001=100		100.0	150.4	141.1	134.6	165.4	192.8	
<b>Ton km million:</b>								
Road	1533	43	68	79	55	56	91	2.4
Rail	4,884	344	452	529	678	654	668	28.4
Pipeline		1,327	1,010	1,127	1,264	1,580	1,574	68.7
Air	50	9	6	6	10	11	12	0.5
<b>Total</b>		<b>1,722</b>	<b>1,536</b>	<b>1,741</b>	<b>2,007</b>	<b>2,301</b>	<b>2,346</b>	100.0
Index 2001=100		100.0	89.2	101.1	116.6	133.6	136.2	
<b>Haul km:</b>								
Road	16	16	14	19	18	12	16	
Rail	130	246	224	249	258	250	246	
Pipeline		1,345	1,346	1,340	1,340	1,340	1,312	
Air	2,778	798	655	632	1,087	1,151	1,200	
<b>All</b>		<b>344</b>	<b>204</b>	<b>246</b>	<b>298</b>	<b>278</b>	<b>243</b>	

Source: *Statistical Yearbook of Armenia 2007*

Note: Air and pipeline figures include international components.

Table 1-17: Rail Freight Traffic 2007

Commodity	Tons '000				Ton Km Million	Haul Km	Revenue AMD Million	Revenue/Ton Km AMD
	Import	Export	Local	Total				
Grain	480.9	0.0	5.0	485.9	128.6	264.7	2,034	15.8
Raw Materials - Metals	2.8	32.9	76.2	111.9	29.9	267.2	288	9.6
Petroleum Products	354.9	1.6	0.0	356.5	100.5	281.9	1,506	15.0
Mineral Ore	10.9	520.8	21.9	553.6	45.7	82.6	483	10.6
Raw Materials Non-Metallic	18.1	68.3	116.5	202.9	51.5	253.8	511	9.9
Cement	0.0	50.1	331.2	381.3	112.8	295.8	992	8.8
Other	669.4	72.6	159.3	901.3	246.0	272.9	3,881	15.8
<b>Total</b>	<b>1,537.0</b>	<b>746.3</b>	<b>710.1</b>	<b>2,993.4</b>	<b>715.0</b>	<b>238.9</b>	<b>9,695</b>	<b>13.6</b>

AMD = Armenian Dram.

Source: South Caucasian Railways (SCR)

**Table 1-18: Air Traffic 2005-2007**

<b>Item</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Passengers handled ('000)	1,158	1,172	1,406
Take-offs/Landings (no.)	7,397	7,104	8,119
Freight/Mail (tons)	9,268	9,294	10,010
Overflights (no.)	25,937	26,741	29,155

Source: General Department of Civil Aviation under the Government of the Republic of Armenia

## 2. LEGISLATION AND ORGANIZATION STRUCTURE

### 2.1 Legislation

19. **Transport Laws.** There are seven laws (primary legislation) and 20 secondary legislative acts governing the sector. The laws and the regulations there under are:

- (i) On Transport (Adopted 3 February 1998, HO-201-N): regulates the legal, economic and organizational provisions in the sphere of transport activity, rights and responsibilities of participants engaged in the process of transport activity and carries out the protection of their legal interests. In particular, the law defines the main conceptions of transport and transport activity, transport system and transport services (Article 1), State regulation in the spheres of Transport activity and Transport system (Articles 4, 5), Licensing of Transport activity (Article 8), Main Transport activity provisions (Articles 8-15), Security and responsibility in the process of transportation (Articles 16-27).
- (ii) On Road Traffic Safety (Adopted 8 June 2005, HO -166-N): regulates activities related to traffic safety. The main task of the law is to protect the state and society interests on traffic safety sphere, especially the prevention and reduction of traffic accidents.
- (iii) On Automobile Transport (Adopted 5 December 2006, HO-233-N): regulates legal and economic relations of organization and implementation of vehicle transport activities in Armenia, vehicle exploitation, transport of passengers, luggage and goods, relations connected with safety of services and transport and also rights and responsibilities of legal and physical entities engaged in this process. In particular, the law defines the main concepts of Vehicle transport, Vehicle transport sphere, Vehicle transport activity (Article 1), problems and principles of legislative regulations in the sphere of Vehicle transport (Article 3), State regulation and management in the sphere of Vehicle transport (Articles 5,6), Licensing and insurance (Article 8), organizational issues of transport of passengers, luggage and goods in Vehicle transport (Articles 9-20), rights, obligations and responsibilities of ferryman and customer (Articles 21-25), Security requirements for transport by Vehicle transport (Articles 26-28).
- (iv) On Rail Transport (Adopted 28 October 2007, HO-293-N)
- (v) On Transport Inspectorate (Adopted 5 December 2006, HO-234-N): regulates legal, economic and organizational issues of the activities of Transport Inspectorate of Armenia, as well as the relations connected with the supervision of transport participants for compliance with the requirements of Armenia transport legislation during organization of transport process. Especially Article 6 of the law defines the functions of the Transport Inspectorate in the 18 sphere of transport regulation, which are the following; 1) carry out supervision of transport legislation, licenses in the sphere of transport activity, permissions on international transport, water, electro, metro and rail transport activities, legislation on advertising in state vehicle roads of common use, technical exploitation of moving structure of related to vehicle transport for the purposes of requirements of legislation of Armenia, 2) analyzes of occurred road-transport accidents on common use transport, reasons, and in case of necessity

jointly with respective state bodies take prevention measures; in accordance with Armenia legislation keep cadastre of self-propelled road-building vehicles and mechanisms, water, road-transport means.

- (vi) On Licensing (Adopted 30 May 2001, HO-193-N) defines types of activities subject to licensing and regulates the licensing procedure. Some provisions of the Law of Licensing relate to the transport sector. Thus, certain types of transport activities are subject to licensing; namely, "Activity on Organizing of regular transport by passenger vehicles of common use" and "Activity on Organizing transport of passengers by taxis" under Article 43 "16. Transport sector" licensed activity starting from December 2006. Another important point for licensing of transport sector is "Activity on Technical diagnosis of vehicles" (effective, starting June 19, 2007). The clause of the article defines that this function shall be implemented by licensed commercial organizations. "Organizing of railroad transport activity" Article 43 defines the types of activity which also should be licensed. Another licensed activity is vehicle driving training, which is included in the Law on licensing.
- (vii) On Imposition and Revision of Tariffs on Provision of Services in the Field of Mandatory Technical Inspection of Vehicles via Defect Identification Technical Means (Adopted 18 December 2007, HO-298-N).

## 2.2 Organization Structure

### A. Road and Rail

20. **Ministry of Transport and Communication (MOTC).** MOTC was established in 2000 through a merger of the Ministry of Transport with the Ministry of Communication. It is responsible for policy, regulation and planning of roads, for road transport and for railways. The organization chart is given in Figure 1 of the main text.

21. **Armenian Roads Directorate (ARD).** ARD is a non-commercial state organization which assists MOTC in the management of interstate and republican roads (including rural roads redesignated in 2008 as republican roads). ARD has divisions for (i) planning and feasibility studies; (ii) procurement; (iii) construction monitoring; (iv) maintenance monitoring; and (v) safety. The road safety group is also responsible for traffic surveys, analysis and safety audits. ARD has its own environmental officers.

22. **Railway.** A new railway law allows for operation of the railway by a third party and creates a Railway Authority within MOTC for concession supervision, ensuring safety and reviewing the audited accounts of SCR. This is in process.

### B. General Department of Civil Aviation

23. Civil aviation is the responsibility of the Office of the Prime Minister, through the General Department of Civil Aviation of the Government of the Republic of Armenia (GDCA), which oversees the regulation of air transport. The General Department employs a number of pilots and engineering specialists, who have sufficient experience and regularly have training in internationally standardized aviation training centers. The functions of GDCA are defined in the Law on Aviation and in Government Decision N 202-N of 13 February 2003. The primary functions are to (i) provide safety oversight of the users' agencies involved in civil aviation; (ii) interpret International Civil Aviation Organization (ICAO) Recommendations and Standards regarding air transport safety, security and facilitation; (iii) establish regulations relating to all

manner of civil aviation; and (iv) collect civil aviation statistics and report on air transport activity.

### C. Yerevan Urban Transport

24. Transport and the road infrastructure in Yerevan is under the responsibility of Yerevan Municipality, (which may become financially independent in 2009 - legislation has been submitted to the National Assembly). Under the Municipality's Transport Department, YerevanTrans (7 employees) is responsible for regulation of surface public transport, including minibus franchising, and Lusanshan carries out traffic management. The public transport operators are: Yerevan Bus Closed Joint Stock Company (CJSC) (396 employees), Yerevan Electric Transport CJSC (290 – which operates the trolleybus network) and Yerevan Metro CJSC (1100). The Metro has been under the responsibility of the Municipality since 2000.

### 2.3 Institutional Capacity and Advisory Needs

25. Current issues are summarized in Table 2-1.

**Table 2-1: Institutional Issues**

#	Item	Remarks
1	Institutional structure	MOTC coverage of the transport sector is incomplete as adjunct bodies continue to be outside the scope of the Ministry's remit. Civil Aviation, Urban Transport (at the integration level) and liaison with traffic police are core examples. This has direct implications for integration planning and prioritization issue and impacts on regulatory procedures (see below).
2	Separation of regulatory and service delivery responsibilities	There are sector-wide instances (rail, civil aviation and some aspects of road passenger transport) where regulatory and service delivery responsibilities are combined in the same authority
3	Independence of regulatory functions	Ideally regulators should be independent of political influence so that their establishment and subsequent operation is consistent with the cornerstones of good governance; namely accountability, participatory, predictability and transparency. Given current civil service establishment and financial constraints, this will need to be viewed as a medium term objective/ policy
4	Oversight responsibilities	Oversight responsibilities relate to the manner in which service delivery is achieved and in particular to the monitoring and evaluation (M&E) of concessions granted by the public sector. Currently there is little consistency in the manner and system based procedures which are adopted to fulfill these responsibilities.
5	Support systems	Currently IT support systems employed in MOTC and many of its subordinate entities are stand alone and have developed piecemeal. Much could be gained both in terms of enhanced analytical (oversight and planning) capacity and diminution of routine (duplicated) activities by the introduction of an integrated transport sector database.
6	PSP/PPP support	The application of PSP/PPP policies throughout the sector is fragmented with responsibilities being shared amongst various entities both within and beyond the MOTC's direct responsibility. Streamlining, enhanced focus and consistency of policy application is needed.
7	Governance issues	As with other aspects of the transport sector's detailed

#	Item	Remarks
		structuring and responsibility application, there are a range of enhancements to both systematic procedures and application methodologies that would enhance governance.
8	Sustainable urban transport policies	Short term responses and lack of technocratic management regimes typify current urban transport policies which radically constrains sustainability.
10	Investment mechanisms	Traditionally prime reliance on financing of investment projects has been based on budget and donor sources although growing PSP/PPP structuring has been evidenced in recent years. This has resulted, in combination with the range of inconsistencies and piecemeal policy application noted earlier, in the application of 'one off' financing schemes in response to specific investment needs, rather than the application of well defined, consistent policies and procedures to evaluate the full range of financing models to support investment demand, supported by an appropriate legal and procedural framework.
11	Capacity development and training	Sector officers are generally proficient in their capacity to address traditional responsibilities within the public sector and Government budgetary arrangements. Given the emergence of commercially based concessionary arrangements and other PSP structures, there is however a clear indication that serious constraints exist in relation to commercially based financial management capacities in addition to numerous technical needs.

Source: The Consultants

There are a number of managerial and institutional issues to be addressed:

- (i) To a significant extent the transport sector is not structured from an institutional viewpoint as an inter-related unity. While road and rail transport are the responsibility of MOTC, civil aviation, urban transport, and passenger and freight transport operators in the private sector are subject to oversight by other adjunct bodies and Government agencies. There is therefore a strong impression that intermodal considerations are not routinely subject to balanced evaluation and tend to compete without the benefit of an overall policy framework;
- (ii) Private sector participation is comparatively wide spread but appears to suffer from a lack of coordination and standardized policy application as between modes and programs within modes. It is apparent that issues are resolved on a case by case basis rather than benefiting from a clearly defined policy framework for PSP with implementation of those policies being the responsibility of a single government agency. While the historical climate within which this situation has developed is understandable, the time may now be appropriate to consider strengthening these procedures with concomitant benefits to all concerned stakeholders;
- (iii) Human resource development programs seem to be fragmented, which leads to doubts as to the vigilance with which routine oversight and regulatory matters are attended. Once again the background against which the situation has apparently developed, being largely attributable to budgetary constraints and rapidly changing sector arrangements (e.g.

concessioneering and widespread PSP) is understandable, but a more structured approach and detailed capacity development needs assessment is now indicated as being a matter of urgency;

- (iv) From the finance viewpoint, the development of the local capital market requires further attention. Traditionally sector financing has been largely budget-dependent, although development finance partnerships and support from Diaspora groups have been of importance in recent years. The period when Armenia can gain access to relatively cheap financing sources (as compared with market rates) now seems to be drawing to its conclusion and, as such, specific initiatives for capital market development within an established policy framework need to be addressed as a priority;
- (v) Road safety is a matter of growing concern, but institutional support for that objective has yet to be effectively established with responsibilities currently being spread between a number of agencies with both duplications and omissions of coverage discernible; and
- (vi) There is little in the way of coherent current policy applied across sector modal responsibilities.

26. Transport sector institutions suffer from the impact of change dynamics. Processes, routines and responsibilities that have been appropriate in the past, or which have developed in response to specific conditions and challenges, now need to be addressed on a more consistent basis, particularly with regard to the implementation of oversight and regulatory responsibilities. Annex 2 compares the existing institutional arrangements with those required by an EU candidate country.

**27. Institutional Structure.** Enhancements are required, although, in theory, institutional structuring is essentially consistent with requirements – MOTC takes the lead role in sector planning and implementation, with subordinate entities charged clearly defined responsibilities and, to the extent consistent with development status, appropriately resourced. At working level, however, there are a range of enhancements that require attention in order to realize the full benefits of effective structuring, appreciating that Government is relatively small and resources are limited.

**28. MOTC's Responsibilities.** Core requirements in relation to institutional restructuring devolve on the need to consolidate MOTC's responsibilities. Specifically, consolidation needs relate to civil aviation, urban transport and liaison with the traffic police. Additional restructuring requirements relate to Governance, PSP/PPP and regulation//oversight responsibilities.

**29. Organization of Civil Aviation.** The responsibility of the Directorate General of Civil Aviation (DGCA), an adjunct body not responsible to MOTC. This leads to two distinct difficulties: first that MOTC is not fully responsible for the whole transport sector and as such constraints are imposed on sector planning, prioritization and integration, and second, that DGCA as an adjunct body has a very high concentration of functions and is required to regulate and supervise the operation of major players in the civil aviation sector such as Armavia, Armenian Air Traffic Service (ARMATS) and Armenian International Airports (AIA), which inevitably results in routine and consistent conflicts of interest.

30. DGCA has responsibilities for setting policies and technical regulation while also being directly involved with airport and airline operation. This precludes it from effectively regulating and monitoring the sector or indeed protecting the public interest with any degree of

transparent independence. The situation is compounded by the absence of national Air Transport Policy for the promotion of travel, trade and tourism. It is therefore critical that policy, regulation and operating functions in the civil aviation sector be separated to promote impartiality of regulation and effectiveness of technical monitoring.

31. By termination of DGCA status as an adjunct body and transfer to the aegis of MOTC, together with the establishment of independent regulatory bodies, both of these difficulties would be overcome, with minimum fiscal impact and clear benefits to both sector optimization and the public.

32. **Organization of Urban Transport.** MOTC has some working-level responsibilities (such as inspection), but policy level responsibilities are, particularly in the case of Yerevan, vested in the Municipality. In principle, charging municipalities with responsibility for their own urban transport policies is a cornerstone of sustainability – but it needs to be accompanied by appropriate governance initiatives to promote the accountability, participation, predictability and transparency integral to that integration. At present, there appears to be some duplication and some omissions of responsibilities between MOTC and Yerevan Municipality, with the result that policies are not clear, initiatives are not consistently undertaken on the basis of technical management and innovations are developed in isolation from a broader city strategic vision, land use policies and environmental protection plans.

33. While development partners such as the World Bank have recently provided technical assistance and developed projects, these may not be implemented by the Municipality due to budgetary limitations. A task force comprising representatives of MOTC and the Municipality should be established to determine sustainable urban transport policies in the institutional and governance areas.

34. **Traffic Police.** There are few routine procedures for MOTC and other agencies to discuss traffic management policy and other pertinent issues with the traffic police. It is therefore suggested that part time liaison officers be appointed within both bodies to improve liaison and the subsequent implementation of policy considerations.

35. **Separation of Responsibilities.** Projection of public interests and adherence to effective governance principles require a clear separation of responsibilities for regulation and procurement/delivery of associated services. Currently that required separation is piecemeal in its application, as noted above for civil aviation, but also to varying extents for road, rail, and urban transport. To a significant extent, the situation can be attributed to current development status and the relatively small size of the civil service, so that while the constraint is understandable, it is now appropriate to consider relevant remedial actions.

36. The regulatory function should ideally be established as being independent of both service delivery/procurement agencies and political intervention, so that regulatory authorities are transparently evident as being distanced from all forms of self-interested influence. Given present resource constraints, as an interim proposal it is suggested that regulatory authority be vested in MOTC, with a clear intent for subsequent independent establishment over the next 3-5 years.

37. **Economic Efficiency and Social Equity.** The central challenge of regulatory policy is to balance economic efficiency and social equity in service provision. On the one hand, sustainable provision of transport infrastructure typically necessitates pricing and tariff regimes which permit a reasonable return on investment. On the other hand, ignoring social concerns will risk consumer discontent. It is therefore important in the context of the current development stage of the sector, that regulatory bodies be established to address this core issue. It should be noted that such regulatory bodies would not be large in terms of staff



numbers and initially at least, as noted above, could function within MOTC on a part-time or occasional basis and be supported by a small secretariat.

38. To realize the required balance between financial viability and social equity, particularly where PSP is actively sought, regulators require a degree of independence from political influence while at the same time being responsive to Government policies. International experience of seeking that balance in the regulatory function suggests that application of the following arrangements is helpful:

- (i) providing the regulatory agency with a distinct statutory authority, free of ministerial control;
- (ii) prescribing in advance the criteria for appointments and mandating the participation of both the executive and legislative branches of government in the appointment process;
- (iii) appointing regulators for fixed periods and prohibiting their removal, except for clearly defined due causes; and
- (iv) funding the agency's operation with user fees or levies on the regulated industry at a level that allows adequate remuneration of regulators and their staff.

39. Measures to hold regulators accountable and their actions transparent include:

- (i) specifying the duties, responsibilities, rights and obligations of regulatory agencies in laws;
- (ii) allowing for judicial review of regulatory decisions;
- (iii) mandating reporting and monitoring procedures by legislative oversight committees; and
- (iv) requiring publication of decisions and allowing for reviews by interested parties.

40. **Oversight Responsibilities.** Examples include civil aviation, rail, road and urban transport. They are particularly significant in the local context in relation to the various concessions that have been granted. Currently oversight responsibilities are undertaken by several entities, primarily determined on the basis of modal and historical considerations. Additionally those responsibilities have been developed on a needs basis rather than in accordance with a consistent technocratic framework to ensure appropriate capacity and consistency of application.

41. In the context of concession oversight, the required work essentially devolves on performance assessment and comparison of that assessment to specific obligations identified in the concession agreement. Such work is ideally suited to computer based systems although subsequent interpretation of identified results will typically demand modal and situation specific technical and management experience.

42. To streamline the potentially increasing number of concessionary applications requiring oversight attention, it will be resource effective to bring the basic operations involved, such as data capture, transmission and analysis, under the responsibility of a single Oversight Unit within MOTC. Liaison with modal and technical officers will then be required on a periodic basis to examine identified results and formulate remedial measures as necessary.

43. **Computerized Support Systems.** There is a growing demand for systems within MOTC and elsewhere in the sector. At present, nearly all applications are on stand alone spreadsheets, or similar, with very limited network-based capacity, so that sharing information, collaborative work and review is severely constrained.

44. **PSP/PPP.** PSP activities have been relatively extensive over recent years and have much to offer. From the institutional viewpoint, however, responsibilities for PSP life cycle requirements are widely dispersed, both within and without the sector. The strengths and weaknesses of current PSP experience are discussed in this Appendix.

45. In order to overcome diversification of focus, while building on strengths and mitigating weaknesses, it is appropriate to consider the formation of a dedicated PSP/PPP unit to be situated in, perhaps the Ministry of Economy, with appropriate representation from MOTC. (Given the broader application of PSP/PPP structuring to infrastructure development in the whole range of economic subsectors, establishment under MOTC auspices is not considered appropriate.)

46. Realization of finely tuned PSP/PPP support systems/procedures, calls for the implementation of the following actions:

47. **Legal and Administrative Reform.** While existing laws and associated judicial remedies have supported PSP activities to date, they are fragmented and hence constrain effective progress. Remedial measures are in hand to align legislation in this area with EU requirements but the desirability of incorporating those enhancements into a PSP/PPP specific law.

48. **PSP/PPP Unit.** This should be located in the Ministry of Economy and be charged with responsibilities for

- (i) PPP policy-making, including drafting and submitting necessary laws and regulations;
- (ii) development of a cross-cutting national PPP program;
- (iii) setting PPP selection, appraisal and procurements guidelines and standards;
- (iv) PPP project approval power and oversight;
- (v) providing assistance (covering technical, legal and financial aspects of PPP) to government agencies concluding PPP agreements;
- (vi) serving as PPP clearinghouse and resource center for best practice dissemination;
- (vii) arranging training for government officials and other stakeholders;
- (viii) preparation of major PPP projects and conducting due diligence impact assessment;
- (ix) participation in PPP contracts re-negotiation.

49. PPP units typically have an autonomous inter-departmental status. They themselves could also be public-private joint ventures (as in the United Kingdom). Specialized PPP units are particularly valuable in emerging market economies, where they signal Government's commitment to PPP, clarify process and decision-making authority and ensure uniformity and predictability in concluding and implementing PPP agreements. (Sources: Y. Kakatura, *Infrastructure Development by Private Sector: Institutional Setup for PPP*. World Bank, 2005 Grimsey, Lewis)

50. **Project Identification and Monitoring/Evaluation.** A systematic screening of Government provided services in relation to their potential for PSP/PPP structuring is required, rather than the current *ad hoc* response to specific projects and conditions. Selection should be based on technocratic decisions and supported by the preparation of a rigorous business plan incorporating clear proposals for parameters such as PPP mode, duration, risk allocation and financing mechanisms.

**51. Transparency and Accountability.** These facets of PSP structuring present the most concern in relation to current PSP status. That concern arises from the broadly held skepticism regarding the protection of public interests in PSP structures, which in turn arises from shortfalls in procurement, regulatory, oversight and monitoring procedures – coupled with very limited participatory processes. Many of these constraints will be addressed through the legislative and administrative enhancements noted above, but it will be critical for the proposed PSP unit to undertake a structured assessment of needs shortly after its establishment.

**52. Financing PSP/PPP.** In developing economies, PSP/PPP financing is always problematical given capital market constraints and limited resource bases. Essentially the need is to focus on innovative financing structures particularly focusing on investment and management contracts which offer the greatest potential for economic efficiency.

**53. Training and Human Resource Development:** PSP/PPP training will need to be directed to a broad range of stakeholders including the proposed PSP unit officers, other public sector civil servants, the private sector and civil society representatives.

**54. Fostering Good Governance.** The excellence or otherwise of governance structures is dependent on the key issues of accountability, predictability, participation and transparency. These are the very areas where existing arrangements are most urgently in need of attention. Good governance structures necessitate decisions and support procedures throughout the sector which ensure that Government and society interact effectively in relation to service delivery and usage. The sort of decisions and subsequent implementation processes that are involved include:

- (i) the distribution of policy and working level responsibilities between the various tiers of Government;
- (ii) responsibility for oversight and regulation;
- (iii) role of the national/urban transport authority and relationship with other agencies of local and national government;
- (iv) responsibility for strategic planning at the national/municipal/metropolitan level;
- (v) separation of regulatory and operational responsibilities;
- (vi) decentralization and financing capacity together with associated implication for accountability and transparency;
- (vii) determination of policies for private sector development and participation;
- (viii) financing modalities and mechanisms;
- (ix) participation of civil society; and
- (x) role of integrated transport systems with impact on management regimens and pricing.

55. Realization of these policies in a meaningful and consistent context is unlikely to be realizable in the short term, but needs to be consistently considered when initiating change and reviewing performance. Implementation of the structural changes and policy enhancement discussed in this section will go far towards laying stronger foundations for good governance in the future.

**56. Sustainable Urban Transport.** The institutional and governance elements of sustainable urban transport are very similar to those encountered in relation to national transport. The main difference, however, is the need to consider the relationship between

national and municipal levels of Government and ensure that there is clarity as regards precise responsibility allocation. Cities however have their unique challenges to face, apart from those encountered at the national level, such as traffic congestion, provision of passenger transport services consistent with rapidly expanding populations at affordable prices and integrating transport policies with the cities strategic vision, including environmental protection and land use strategies.

57. Discussion with Yerevan Municipality in the institutional and governance context does, however, indicate that the challenges and systemic constraints faced by the city largely reflect those applicable to the national level. Integrated planning in response to clearly specified transport objectives is not readily apparent, accountability and participation measures are fragmented in their application and predictability/ transparency are subject to the shortfalls of procedural continuity discussed in relation to the transport sector at the national level.

## **2.4 Financing Mechanisms**

**58. Investment Mechanisms.** Given the range of potential projects and the limited resources available, it is critical to ensure that institutional responsibility is clearly vested in an appropriate entity, to evaluate the full range of investment mechanisms that might be used. Currently, this is undertaken on a case by case basis or through the auspices of demand-led initiatives, with reliance on the state budget, development partner loans or private sector initiatives.

**59. Evaluation Procedures.** Need to be developed to ensure that the full range of such alternatives is evaluated on a structured basis relative to the sector development, rather than simply in relation to individual projects. Evaluation within that form of consistent deliberative framework will not merely ensure optimal mechanisms are consistently evaluated, but will further provide the opportunity for developing the required enabling environment to facilitate the growth and sustainability of innovative mechanisms in circumstances where traditional funding sources are expected to become increasingly constrained.

**60. Investment Financing Unit.** A unit should be established in either the Ministry of Finance or Economic Development, with appropriate representation from public/private sectors, NGO and other stakeholders in civil society, to address these issues on a consistent and routine basis.

61. In order to finance the strategy, it will be necessary to mobilize resources beyond the traditional national budget/concessional debt model by keenly focusing on PSP and other forms of innovative financing. The capital market is not well developed, with the stock exchange being very small (and focusing primarily on banking stocks) with the investment capacity of pension funds and insurance companies being severely constrained by both legislation and liquidity needs.

62. Under these circumstances, bridging the funding gap will demand a concerted effort to mobilize private sector resources and/or adopt other forms of innovative financing mechanisms. Table 2-2 provides an overview of opportunities which may be available, in addition to that of a Road Fund.

63. These instruments and approaches typically need to be finely tuned to the requirements of specific projects and initiatives and as such need to be considered in depth during project formulation. The establishment of a Project Financing Unit is therefore a matter of urgency.

**Table 2-2: Financing Mechanisms**

Instrument	Remarks
1. Core equity investment	Such financing mechanisms focus on raising an initial core investment from a prime sponsor with subsequent tranches from other sources. The primary benefit here is that by securing the initial investment, subsequent commitments can be accessed from other parties by reducing perceived risk and demonstrably evidencing commitment
2. Mezzanine finance	Adoption of this instrument or structure introduces debt structuring where risk is directly related to return. Junior debt for instance, might be structured to receive a higher return than senior debt, in exchange for a lower claim priority in the event of project distress.
3. Government guarantees	There are a range of guarantees Governments can offer potential investors and lenders covering such elements as political and regulatory risks, revenues, bulk service procurements etc. Clearly however, such guarantees have budget and risk allocation implications and as such can rarely be effectively deployed in isolation but rather need to be considered as part of a PSP promotion 'package'.
4. IFI guarantees	Guarantees from IFIs which provide potential investors with protection against specific risks can also be useful in structuring PSP mechanisms but it should be born in mind that while this form of IFI support is weaker than traditional concessionary financing, it introduces contingent liabilities and as such has implications for overall funds availability.
5. Government 'vertical' equity participation	With the application of these instruments, Government takes an equity interest in a project company which is in sharp contrast with the more 'normal' arrangement of Government and the private sector assuming different roles and responsibilities. Such arrangements are however typically adopted only at the outset of a project with the Government's interest subsequently being transferred to the private sector on agreed terms once the initial risks and uncertainties have been overcome.
6. Diaspora investment	Diaspora investment has been an important element in Armenia's recent infrastructure development experience with the various Diaspora foundations having played an important role in contributing both financial resources and management capacity. The involvement of the Diaspora hinges on the 'patriotism premium' but the availability of such funds may be expected to be more limited in future. In that event, more innovative mechanism such as those mentioned below, may be of increasing relevance
7. Diaspora bonds	A Diaspora bond <sup>1</sup> is a debt instrument issued by a country—or even by a sub-sovereign body or a private corporation—to raise financing from the Diaspora. This relatively unexploited instrument can raise investments from international migrants for economic development in the home country. Members of the Diaspora are more likely to invest in their country of origin not only for patriotic reasons, but also because their country risk perception is likely to be weaker than that of international investors. The Diaspora of India and Israel have raised \$11bn and \$25bn respectively in recent decades. The Philippines has announced that it will sell a Diaspora bond to overseas Filipino workers this year to raise funds for development projects. Ghana has begun marketing the Golden Jubilee Savings Bond to the Ghanaian Diaspora in Europe and the United States.

<sup>1</sup> Beyond Aid: New Sources and Innovative Mechanisms for Financing Development in Sub-Saharan Africa

Instrument	Remarks
8. Future flow securitization	<p>Armenia can potentially raise significant bond financing by using securitization of future-flows, such as remittances, tourism receipts and export receivables. Securitization of future hard-currency receivables is a potential means of improving access to international capital markets. In a typical future-flow transaction, the borrower pledges its future foreign-currency receivables—for example, oil, remittances, credit card receivables, airline ticket receivables—as collateral to a special purpose vehicle. The special purpose vehicle issues the debt. By a legal arrangement between the borrowing entity and major international customers or correspondent banks, the future receivables are deposited directly in an offshore collection account managed by a trustee. The debt is serviced from this account, and excess collections would be forwarded to the local borrowing entity.</p> <p>This future flow securitization mitigates sovereign transfer and convertibility risks and allows the securities to be rated better than the sovereign credit rating. These securities are typically structured to obtain an investment grade rating. Minimization of remittance cost can also have a significant impact.</p>
9. Windfall gains	<p>The use of windfall gain instruments devolves on capturing indirect economic benefits associated with infrastructure development such as increments in real estate value and cost savings accruing to businesses located close to the focus asset. Such instruments have been adopted effectively in the international context, but applicability under current conditions may be limited by the relatively small population and business base. Such approaches do however have direct potential for funding urban transport projects in Yerevan.</p>
10. Sovereign ratings	<p>Sovereign risk ratings not only affect investment decisions in the international bond and loan markets, but they also affect allocation of FDI and portfolio equity flows. The allocation of performance-based official aid is also increasingly being linked to sovereign rating. The foreign currency rating of the sovereign typically acts as a ceiling for the foreign currency rating of sub-sovereign entities. Even when the sovereign is not issuing bonds, a sovereign rating provides a benchmark for the capital market activities of the private sector. Borrowing costs rise exponentially with a lowering of the credit rating. There is also a threshold effect when borrowing spreads jump up as the rating slides below the investment grade. A borrowing entity with a low credit rating, therefore, can significantly improve borrowing terms (that is, lower interest spread and increase maturity) by paying up front for a better credit rating.</p> <p>There are relatively large remittance inflows and can leverage those inflows for raising the sovereign rating. The securitization of future receivables, including trade payments and future remittances, can further improve the rating of the transaction.</p>

### 3. INTERNATIONAL CONTEXT AND STRATEGY

#### 3.1 Cross-Border or International Links

64. **Pre-independence.** There was unrestricted access to other areas of the Caucasus within the former USSR. Routes to Turkey and Iran were less developed. The transport-intensive supply network disintegrated after independence. Border issues and the Nagorno Karabakh conflict with Azerbaijan compounded the impact of the economic decline, leading to the closure of all routes to Turkey and Azerbaijan, including: (i) the main road/rail links through Azerbaijan/Nakhijevan to Iran, (ii) the main highway from Yerevan to Tbilisi and the Russian Federation through Azerbaijan, (iii) the railway to Turkey, Gyumri-Kars, and (iv) the road to Turkey, Yerevan-Karakala.

65. **Existing Borders.** International road connections are restricted to Georgia and the Black Sea ports/Turkey by road, Yerevan–Gyumri–Bavra–Akhalkalak–Batumi and Yerevan–Vanadzor–Bagratashen–Tbilisi–Poti, and by rail Ayrum/Sadakhlo; and to Iran, by road via Meghri. The open border crossings are:

- (i) Georgia: Bavra (the road on the Georgian side of the border is in very poor condition, but agreement has been reached with Georgia for improvement), Dzoramut, Bagratashen
- (ii) Iran: Agarak/Meghri.

66. **Train Ferries.** Poti-Ilyishevsk/Odessa, Ukraine, serves the Ukraine and Russian Federation. It is operated by two large capacity vessels (400+ wagons on three decks). A Poti-Kavkaz, Russian Federation rail ferry service was operated for a short period, but ferry capacity is limited to 36 wagons due to draught limitations at the Russian Federation port. The route to Iranian ports is much longer (2000km from Yerevan) and more expensive than to Black Sea ports (about 650km), passing through difficult mountainous terrain.

67. **International Coach Services.** Yerevan-Istanbul is operated by Turkish companies (modern coaches, 36 hours via Georgia, single fare \$80). These services are operated in contravention of Armenian legislation, as competitive tendering is not possible due to the lack of diplomatic relations between Armenia and Turkey. Bus services Yerevan-Tbilisi and other destinations in Georgia are operated by Armenian companies and there are coach services Yerevan-Tehran. There is a rail passenger service Yerevan-Tbilisi and a summer seasonal service Yerevan-Poti. International air services are described in chapter 6.

68. **Freight Transport.** Freight transport through Georgia is primarily to Russian Federation and other Commonwealth of Independent States (CIS) countries, as well as to Europe (by sea) and to Turkey. Traffic through Iran is to the Central and Middle East, Arab and other countries. Turkish trucks working on the Transports Internationaux Routiers (TIR) system are authorized to enter from Georgia, but Armenian trucks are not able to enter Turkey. There is an intermodal terminal at Yerevan Karmin Belure station for container transshipment. The number of trucks entering the country in 2007 was 30,485 via Meghri and 41,540 via Bagratashen.

69. **Asian Highways.** The Intergovernmental Agreement on the Asian Highway Network entered into force on 4 July 2005, under the auspices of UNESCAP. Contracting Parties are obliged to develop designated Asian Highways (AH) to conform with AH classification and design standards. The AH network in Armenia comprises 966km (Table 3-1). These routes together constitute the principal international links between Iran, Georgia and Azerbaijan (currently non-operational) through Armenia.

70. As part of the Promotion and Development of the AH: Upgrading of AH Priority Routes project, UNESCAP undertook a *Prefeasibility Study of AH82: Goris-Kapan Road* in 2007, one of four international routes studied. This 60km section is currently below minimum AH Class III standard and crosses peaks of 1,519 m and 1,704 m. Daily traffic volume end-2006 was 1,320, with a high proportion of trucks and truck-trailers. In 2006 there were five fatalities on the section. (The Government has requested ADB support to upgrade the parallel Route H-45– chapter 1.)

**Table 3-1: Asian Highway Routes**

<u>AH No.</u>	<u>Route</u>	<u>Kilometer</u>
AH81	Bagratashen (Georgia Border)-Yerevan-Eraskh Agarak-Meghri	271 61
AH82	Bavra (Georgian Border)-Gyumri-Ashtarak Eraskh-Goris-Kapan-Meghri	158 324
AH83	Aigehovit (Azerbaijan Border)-Sevan-Yerevan	152

Source: UNESCAP, 2003, Asian Highway Handbook.

### 3.2 Tourism

71. **Tourism Development.** This depends on efficient air transport. Tourism is emerging as one of the most important economic sectors, with prospects of continued strong growth. The average annual increase in arrivals 2001-2006 was 25%, with growth of 34% in 2007. Continued development is heavily dependent on improving supporting infrastructure, including transport. The quasi-monopoly in international air services, which limits frequency and choice of carrier and supports high fare levels, and the airport monopoly's high charges were both identified as major impediments to tourism development in a study by McKinsey and Co. (*Armenia2020 Armenia's Tourism Sector 2005*). The study recommended that accessibility be increased by: (i) giving permission on request to foreign carriers to open/increase the number of flights; (ii) selecting 5-10 strategic foreign gateways with a target of 3-7 direct flights per week; (iii) obliging Armavia to operate a set minimum frequency to gateways or lose its rights to foreign carriers; (iv) encouraging foreign carriers in key markets to serve Armenia; and (v) negotiating quota increases and redistribution of quotas with Russian Federation authorities. It also recommended that fees at Zvartnots airport be regulated in line with other natural monopolies, to ensure a regionally competitive service price/quality combination.

72. **High Growth Rates.** The *Tourism Development Concept Paper* (USAID/CAPS 2007) forecasts growth potential to 2030. The central scenario is for compound annual growth of 7%, with a best case growth rate of 9%. In 2006, tourism is estimated to have contributed 4.7% of GDP. International arrivals totaled 381,000, of which 35% were from Russian Federation, 28% from Georgia and 8% from Iran. Some 62% were Diaspora. The Paper notes critical transport requirements to support tourism development: (i) expanded air service network; (ii) open skies policy; (iii) improved air connections and schedules; (iv) domestic air services to tourist areas, including helicopter services; (v) relaxation of visa requirements and reform of departure tax (AMD10,000); (vi) improved land border processing; (vii) upgraded public transport and roads to tourist areas, including signage in English and provision of rest stops; and (viii) improved transport safety. The Paper estimates the cost of upgrading 700km of main roads and 400 km of links to tourist areas at \$250-300 million. In the best case scenario, international arrivals would increase to 0.6 million in 2010 and to 1.5 million in 2020. Under the central forecast arrivals in 2020 would be 1.0 million.



**73. Tourism Transport Strategy.** Transport strategy for tourism is multi-faceted: infrastructure development, service development and cross-border facilitation. There are few industries with such good prospects, and a coordinated approach to development is necessary. Responsibility is now divided between ministries and there is no planning coordination mechanism and no transport plan. Tourism marketing at national level is underfunded and has no budget for infrastructure development. The first priority is for a Tourism Promotion Committee under the Prime Minister's Department. An infrastructure and services plan for tourism needs to be formulated (with its own budget), drawing on the McKinsey and CAPS recommendations. A prioritized program of transport projects would be part of the plan. Many priority tourist projects will be common with domestic requirements: for example, upgrading of north-south corridors and improved public transport. Improving air services will benefit all users.

### 3.3 Logistics

**74. Trade Facilitation.** There has been significant progress in resolving cross-border issues and facilitating trade and transport with/through Georgia in (i) facilitating coordination between the Government, industry, the private sector and civil society; (ii) eliminating barriers to international and regional trade; (iii) bringing trade and transport procedures into line with international standards; and (iv) promoting the harmonization of trade and transport procedures in the South Caucasus. Issues related to custom procedures have been streamlined and other reforms made to facilitate private sector freight transporters.

75. The World Bank recently ranked Armenia 131<sup>st</sup> out of 150 countries in its *Logistics Performance Index*. Component rankings were 118th for customs, 142nd for infrastructure and 140th for international shipments (*Connecting to Compete: Trade Logistics in the Global Economy, The Logistics Performance Index and Its Indicators*, 2007, p. 30). Nevertheless, the location of the country is potentially advantageous for both north-south and east-west transit operations.

**76. Remaining Issues.** Country-specific trade and transport sector reviews (e.g., Karine Simonyan, World Bank Consultant, Workshop on Corridor Development for Caucasus Countries, Background Paper, *Trade and Transport Facilitation, Armenia*, May 2004, pp. 17-18) as well as the current study have found a number of issues/problems, e.g., unresolved political and border disputes, weak local and regional legal framework for the transport sector (e.g., a lack of facilitation for driver visas, a lack of a national law on freight forwarding, a requirement of up to five days for issuance of road transport permits), the highest logistical costs in the region and twice the world average (transport cost plus official and unofficial facilitation costs), infrastructure constraints at borders (e.g., the narrow bridge linking Bagratashen with Sadakhlo, Georgia) and underdeveloped multimodal transport

### 3.4 International Transport Facilitation Conventions/Agreements

**77. Ratified Conventions.** Of the 57 land transport facilitation conventions endorsed by the United Nations Economic Commission for Europe (UNECE), Armenia has ratified eight:

- (i) the *European Agreement on Main International Traffic Arteries (AGR)*, 1985, which provides the international and technical framework for the development of a coherent road network in the UNECE region;
- (ii) the *Convention on Road Traffic*, 1968, which aims at facilitating international road traffic and increasing road safety through the adoption of uniform road traffic rules;

- (iii) the *European Agreement Concerning the Work of Crews of Vehicles Engaged in International Road Transport* (AETR), 1970, which aims at preventing drivers and the crew of commercial vehicles of more 3.5 tons or those transporting more than nine people, engaged in international road transport, from driving excessive hours, as this increases the risk of serious road accidents and may create disparities in competition conditions;
- (iv) the *Convention on the Contract for the International Carriage of Goods by Road* (CMR, from the French acronym), 1956, which facilitates international road transport by providing a common transport contract, including a common consignment note and harmonized liability limits;
- (v) the Protocol to the CMR Convention, 1978, which modifies the provisions of the CMR Convention concerning the liability of the carrier regarding the loss of goods;
- (vi) the *Customs Convention on the International Transport of Goods under Cover of TIR Carnets*, 1975, which establishes a procedure that permits the international carriage of good by road vehicles or containers from one customs office of departure to a customs office of arrival, through as many countries as necessary, without intermediate inspection of the goods carried and without the deposit of a financial guarantee at each border;
- (vii) the *International Convention to Facilitate the Crossing of Frontiers for Goods Carried by Rail*, 1952, which facilitates the crossing of rail by providing procedures and conditions for harmonizing and ensuring a high level of efficiency in the control of goods carried by rail at borders between two adjoining countries on a railway line; and
- (viii) the *International Convention on the Harmonization of Frontier Controls of Goods*, 1982, which aims at facilitating border crossing in the international transport of goods through harmonization and reduction of the requirements for completing the number and duration of border controls.

78. These eight UNECE conventions acceded to by Armenia include four of the seven “core” land transport facilitation conventions endorsed by UNESCAP Resolution 48/11 on Road and Rail Modes in Relation to Facilitation Measures (i.e., ii, iv/v, vi, viii). As categorized by UNECE, all but one of these eight conventions is categorized as Priority 1 (vii is categorized as Priority 3). All except one (viii) are included in the list of conventions tracked by Transport Corridor Europe Caucasus Asia/TRACECA (see: Dornier Consulting and KLC Consortium, Trade Facilitation and Institutional Support Project, Progress Report III, February 2006).

79. In addition, accession to another four UNECE land transport facilitation conventions is in process: (i) the *Customs Convention on Containers*, 1972 (it is reported in the UNECE database that Armenia has also ratified this convention, but the State Customs Committee confirmed that ratification is still in process; this convention is considered Priority 1 by UNECE and it is one of the seven conventions endorsed in UNESCAP Resolution 48/11); (ii) the *Convention on Road Signs and Signals*, 1968 (also UNECE Priority 1 and endorsed by UNESCAP 48/11); (iii) the *Convention on Temporary Importation of Private Road Vehicles*, 1954 (UNECE Priority 1); and (iv) the *International Convention to Facilitate the Crossing of Frontiers for Passengers and Baggage Carried by Rail*, 1952 (UNECE Priority 3). [Although not a UNECE convention, ratification is also in process for the *Convention Concerning International Carriage by Rail* (COTIF), 1980, which includes the Uniform Rules Concerning

the Contract for International Carriage of Passengers and Luggage by Rail (CIV), and the Uniform Rules Concerning the Contract for International Carriage of Goods by Rail (CIM).]

**80. Unratified Conventions.** Of the other UNECE conventions not yet ratified, the Government has put a priority on the *Agreement Concerning the International Carriage of Dangerous Goods by Road* (ADR from the French acronym), 1957. This convention aims at ensuring the highest possible level of safety in the transport of dangerous goods at an economically acceptable cost. UNECE considers the convention “Priority 1” and the consultants concur. However, the annexes to this convention are complex and voluminous (some 1,200 pages), creating translation issues since current interpretations of the Law on Language require an Armenian translation before consideration by the Ministry of Justice, the Constitutional Court, the National Assembly, and the President. Current practice in Bulgaria and Romania, two countries that recently joined the European Union and which permit reference to English legal texts in their respective national laws, may provide a good example for Armenia, although the country may first need to address its lack of personnel skilled in both Armenian law/international law and the English language.

81. Additional Priority 1 UNECE conventions that may be considered for ratification include: (i) the *Customs Convention on the Temporary Importation of Commercial Road Vehicles*, 1956 (endorsed by UNESCAP 48/11); and (ii) the *Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment used for Such Carriage* (ATP, from the French acronym), 1970. Other conventions that may be considered as a matter of priority include the *Convention on Transit Trade of Landlocked States* (the so-called New York Convention), 1965, and the *Convention and Statute on Freedom of Transit* (the so-called Barcelona Convention), 1921, both promoted by UNESCAP; not having ratified the New York Convention considerably impedes its ability in legal forums to defend its interests vis-à-vis Turkey regarding access to the sea.

82. In addition to the UNECE conventions, customs conventions ratified include: (i) the *International Convention on the Simplification and Harmonization of Customs Procedures* [Revised Kyoto Convention] (1999, entered into force in 2006)(a convention of the World Customs Organization, recommended by UNESCAP); (ii) the *Convention on the Harmonized Commodity Description and Coding System* (the so-called HS Convention)(1983; another convention of the World Customs Organization); and (iii) the *Customs Convention on the ATA Carnet for the Temporary Admission of Goods* (1961; ATA is from a combination of French and English terms).

### 83. Membership of International Organizations

- (i) World Trade Organization (since 2003). WTO strategy has been in the direction of opening the transport market;
- (ii) International Transport Forum, formerly the European Conference of Ministers of Transport (ECMT), which issues international road transport permits/licenses;
- (iii) Signatory of the Basic Multilateral Agreement on International Transport for Development of the Europe-the Caucasus-Asia Corridor and its Technical Annexes, completed in the context of TRACEA;
- (iv) Organization of the Black Sea Economic Cooperation (BSEC), which has entered into force a Memorandum of Understanding on the Facilitation of Road Transport of Goods in the BSEC Region, although with objections by Armenia;
- (v) Trans-European Railway (TER) and Trans-European Motor Highway (TEM) projects;

- (vi) Treaty of Economic Union, a framework agreement signed by nine CIS countries including Armenia in 1993; the ultimate goal of this treaty is establishment of a customs union and common market among its members;
- (vii) Adherent to (though not a member of) the Warsaw-based Organization for Railways Cooperation (OSShD/OSZhD/OSJD), including the SMGS/SMPS agreements, analogous to the CIV/CIM rules under the COTIF convention;
- (viii) Party to number of CIS conventions on international passenger and freight transportation by road (1995 and 1997) and a convention on railway transport between Azerbaijan, Georgia, Turkmenistan, and Uzbekistan (1996), as well as a member of the Coordination Transport Meeting of the Ministers of Transport of the Commonwealth of Independent States;
- (ix) Member of a large number of CIS customs agreements; and
- (x) Party to the United Nations Convention on Law of the Sea (UNCLOS), which in Article 125 expresses the principle of freedom of transit.

**84. Bilateral Agreements with Georgia.** Armenia has signed a number of bilateral agreements with Georgia related to transport cooperation and customs, e.g., most recently in 2007 on mutual assistance in customs matters and in 2006 on road transport, although there is also a draft agreement with Georgia on cooperation related to stable railway-ferry communication with CIS and European countries through ports of Georgia.. However, Armenia still experiences some transit bottlenecks via Georgia (e.g., Georgia not providing most favored nation and national treatment status to Armenia; lack of respect for TIR carnets; excessive paperwork for phytosanitary and veterinary control procedures; special permission for transit of double-purpose goods; unclear approach in identification of overloaded trucks, which can lead to substantial additional payments). (See, e.g. Gagik Aghadjanyan, Armenia: *Transit and Multimodal Transport Integration, Workshop on Corridor Development for Caucasus Countries*, Tblisi, Georgia, May 2004), although have lessened in the last few years. With respect to Iran, the most recent bilateral road transport agreement dates back to 1992, while an agreement on cooperation and mutual administrative assistance on customs matters was ratified in 2003.

#### **85. International Aviation Organization Membership.**

- (i) International Civil Aviation Organization (ICAO), since 1992.
- (ii) Joint Aviation Authorities (JAA) candidate member since 2004. The main goal of JAA is developing and implementing common safety regulatory standards and procedures in the territory of Europe, and raising the level of aviation production in the European countries. The European Union is planning to transfer all JAA tasks to European Aviation Safety Agency (EASA), ensuring the involvement of the non-EU countries in EASA.
- (iii) European Civil Aviation Conference (ECAC) since 1996. The main objective of ECAC is to promote development of a safe, efficient and sustainable European air transport system.
- (iv) Interstate Aviation Committee (MAK/IAC) since 1992, an executive body coordinating the use and management of airspace and the sphere of civil aviation of member states.

- (v) EUROCONTROL since 2006, the European organization for the safety of air navigation, with an objective to develop a uniform pan-European Air Traffic Management (ATM) system.

### 3.5 Recent Developments and Measures to be Taken

86. **Positive Steps.** In recent years positive steps have been (and are being) taken. Armenia has been seeking to introduce integrated border management, a global best practice, e.g., by considering measures on procedures harmonization at the border crossing points elaborated within the TRACECA initiative. Governance (corruption) problems at Armenia's borders reportedly ceased in May 2008. ArmPro, a national trade and transport facilitation committee, was established in 2002, with membership including the National Assembly, MOTC, staff of the President, the Union of Manufacturers and Businessmen, the Association of Armenian Freight Forwarders, the Ministry of Trade and Industry, the Customs Committee and Transparency International; however, it stopped functioning in 2007 as certain key personnel moved on to other positions.

87. Specifically, significant progress has been made in resolving cross-border issues and facilitating trade and transport with/through Georgia in: (i) facilitating coordination among the Government, industry, the private sector and civil society; (ii) eliminating barriers to international and regional trade; (iii) bringing trade and transport procedures into line with international standards; and (iv) promoting the harmonization of trade and transport procedures in the South Caucasus. Issues related to customs procedures have been streamlined and other reforms made to facilitate private sector freight transporters

88. **Logistics/Cross border.** To reinforce recent positive developments possible solutions to remaining problems might include: (i) accession to further international and regional land transport facilitation conventions, as well as measures to better implement such conventions; (ii) further development of bilateral agreements with neighboring countries (e.g., to allow for mutual recognition of documents); (iii) changes in the national legal framework (e.g., to facilitate the operations of freight forwarders; to improve dispute resolution between Customs and traders; to coordinate and streamline border operations; to facilitate transit operations; to ensure that fees collected at the border reflect the costs of the control agencies, as required by Article VIII of the *General Agreement on Tariffs and Trade*); (iv) improvements in facilities/infrastructure at border crossing points and training of the staff of border control agencies; and (v) the establishment of logistics/distribution centers (perhaps at Zvartnots, which may be linked with Karmir Blur rail terminal via a 12 km railway) and other improvements in the logistics chain, to monitor and facilitate international and transit traffic, promote international trade and improve the movement of vehicles and goods, in accordance with international practice.

89. **Priority Actions.** Prioritize accession to international transport conventions not yet ratified (or not yet in process) assigned "Priority 1" by the UNECE (See UN Work on Transport Corridors and Conventions, Organization for Security and Co-operation in Europe Fourteenth Economic Forum, Vienna, 23-23 January 2006), and/or have been identified as "core" conventions by UNESCAP Resolution 48/11 on Road and Rail Modes in Relation to Facilitation Measures, and/or included in the list of conventions tracked by Transport Corridor Europe Caucasus Asia/TRACECA (see: Dornier Consulting and KLC Consortium, Trade Facilitation and Institutional Support Project, Progress Report III, February 2006).

90. Key conventions include:

- (i) *Agreement Concerning the International Carriage of Dangerous Goods by Road* (ADR - French acronym), 1957, which aims at ensuring the highest possible level of safety in the transport of dangerous goods at an

economically acceptable cost (translation of the complex and voluminous (1,200+ pages) annexes to this convention are being assisted by this TA) (UNECE Priority 1 and tracked by TRACECA);

- (ii) *Customs Convention on the Temporary Importation of Commercial Road Vehicles*, 1956, which facilitates the temporary admission into a country Party to the Convention without payment of import duties and taxes for the vehicle (UNECE Priority 1, endorsed by UNESCAP 48/11, and tracked by TRACECA); and
- (iii) *Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment used for Such Carriage (ATP - French acronym)*, 1970 (UNECE Priority 1 and tracked by TRACECA), which establishes uniform prescriptions for the preservation of the quality of perishable foodstuffs during international transport.

91. Other conventions that may be considered as a matter of priority include the *Convention on Transit Trade of Landlocked States* (the so-called New York Convention), 1965, and the *Convention and Statute on Freedom of Transit* (the so-called Barcelona Convention), 1921, both promoted by UNESCAP; as mentioned before, not having ratified the New York Convention considerably impedes Armenia's ability in legal forums to defend its interests vis-à-vis Turkey regarding access to the sea.

**92. Implement Conventions Fully.** Implement well conventions already acceded to or for which accession is in process. While certain international conventions are prescriptive, imposing rules that may be effective, they often require training and a well-developed enforcement capacity to achieve the benefits intended. For example, the ADR Convention requires considerable training to apply; the ATP Convention is also a complicated convention to apply. Training should involve transport ministry officials, enforcement agencies such as traffic police and customs, and the private sector.

**93. Improve effectiveness of bilateral agreements:** bilateral agreements should be made more effective, with implementation in the spirit of mutual cooperation and detailed annexes/protocols clearly specifying implementation procedures. (See checklist of items to be addressed in Annex 10.) There are a number of bilateral agreements with Georgia related to transport cooperation and customs, e.g., most recently in 2007 on mutual assistance in customs matters and in 2006 on road transport, although there is also a draft agreement on cooperation related to stable railway-ferry communication with CIS and European countries through Georgian ports. These bilateral agreements are largely general in scope and non-prescriptive on the practicalities of implementation. There are some transit bottlenecks, although these bottlenecks have lessened in the last few years (e.g., Georgia not providing most favored nation and national treatment status; lack of respect for TIR carnets; excessive paperwork for phytosanitary and veterinary control procedures; special permission for transit of double-purpose goods; unclear approach in identification of overloaded trucks, which can lead to substantial additional payments). (see, e.g., Gagik Aghadjanyan, Armenia: Transit and Multimodal Transport Integration, Workshop on Corridor Development for Caucasus Countries, Tblisi, May 2004). With Iran, the most recent bilateral road transport agreement dates back to 1992, while an agreement on cooperation and mutual administrative assistance on customs matters was ratified in 2003. The bilateral agreements with Iran are largely general in scope and non-prescriptive on the practicalities of implementation.

**94. Forwarding legislation:** would encourage intermodal development, although care must be taken that it does not actually constrain development by overregulation. The law drafted in 2007 under a Eurasian Foundation grant should be re-examined from this basis. Generally, however, it is understood that the draft law was prepared based on international practice (FIATA, Fédération Internationale des Associations de Transitaires et Assimiliés, the

International Federation of Freight Forwarders Associations) with minor changes to reflect the local situation.

95. With respect to international conventions, the UN Convention on Multimodal Transport of 1980 has not received a sufficient number of ratifications to enter into force, despite the global growth of containerization and multimodal transport. The UNCTAD/ICC Rules for Multimodal Transport Documents of 1992 are of a contractual nature and therefore not an effective means of assuring international uniformity. A regional solution may be found in the *Agreement of the IGC TRACECA on the Development of Multimodal Transport*, drafted on 17 July 2008 in Bishkek, which is to be applied to the multimodal transport of goods between and among parties to the *TRACECA Multilateral Agreement for International Transport for the Development of the Europe-the Caucasus-Asia Corridor* (Article 1.2), and which covers documents (Article 4), Insurance (Article 5), Responsibilities of the Multimodal Transport Operator (MTO)(Article 6), Grounds for Liability of the MTO (Article 7), Limitation of Liability of the MTO (Article 8), Right of Lien (Article 9) and Liability of Consignor (Article 10).

## **4. ROADS AND ROAD TRANSPORT**

### **4.1 Vehicle Fleet**

96. Vehicle registrations by province by end-2006 are given in Table 4-1. Nearly 80% are cars/light passenger vehicles. There is little variation in car ownership level between provinces, ranging from 45 per 1,000 population in Gegharkunik to 79 in Vayots Dzor. Yerevan is an exception, with 120 per 1,000, reflecting its higher income. The average age of the fleet is estimated to be 12 years.

### **4.2 Traffic Growth**

97. Since 2005, automatic traffic counters have been installed at ten locations on six M-routes. Annual recorded traffic volumes for 2005-2007 are given in Table 4-2. In 2005-2006 there was rapid growth in truck traffic at 32%, more modest growth in light vehicles at 7%, and overall growth of 12%. In 2006-2007 truck traffic grew by 37%, light vehicle volume fell by 1%, and total traffic increased by 7%.

98. There has been little work on traffic forecasting. A Millennium Challenge Corporation (MCC) study (SWECO International, February 2007) classified traffic counts in November/December 2006: 12-hour and sample 24-hour counts. The average 12 to 24-hour expansion factor was 1.06. Seasonal adjustment factors are not available for rural roads, only quarterly data from the roads in Table 4-2. Expansion factors to Annual Average Daily Traffic (AADT) were based on the primary function of each link: (i) serving summer residences – factor of 1.5; (ii) serving areas of recreation/leisure interest – 2.0; (iii) serving primary tourist/cultural interest areas – 1.5; and (iv) others – 1.25.

99. The MCC study used GDP per capita elasticities to forecast growth in car ownership, which was taken as a proxy for traffic growth for all vehicles types, cars being the dominant vehicle on the rural MCC project roads. Elasticities of 1.1-1.2 were assumed. The forecasts for GDP per capita and traffic growth are given in Table 4-3. Car ownership of 80 per 1,000 population would increase to 344 by 2026 under the MCC scenario.

100. ARD typically assumes an annual traffic growth rate of 4% for its economic analysis.

### **4.3 Road Network**

101. In 2006, route lengths by mode were non-town roads 7,704 km (interstate 1,686 km, republican 4,056 km and local 1,962 km), rail 732 km, trolleybus 72 km and metro 12 km. In 2001, there had been 43 km of tramway and a trolleybus network of 17 4km.

102. In March 2008, roads were reclassified, with 2,224 km of local roads redesignated as republican. Lengths by province and category are given in Table 4-4. Including city and town roads, the total network length is estimated to be 10,819 km, with a non-town network of 7,704 km. In addition there are an estimated 2,500km of unadapted roads and tracks.

### **4.4 Road Construction and Maintenance**

#### **A. Overview**

103. Key issues include: (i) to avoid further deterioration and to minimize the future cost of maintenance, further road rehabilitation and/or reconstruction is required immediately; (ii) project prioritization for rehabilitation/reconstruction needs to be rationalized, taking account of traffic volume, project cost and socio-economic requirements, to meet the rising demand



under financial constraints; (iii) urban roads, which are deteriorating rapidly, need to be considered adequately in the allocation of resources; (iv) further consideration should be given to establishing a Road Maintenance Fund and its administrative structure, to implement sustainable road maintenance, subsequent to the road rehabilitation/reconstruction program; (v) a set of road maintenance standards (a manual), to be applied to all roads, for use of supervision and contractors staff, needs to be developed. The manual should consist of inspection, evaluation and implementation for emergency, routine and periodic maintenance, with an emphasis on contracting out to the private sector; (vi) road construction and rehabilitation should be designed in accordance with current design criteria to minimize traffic accidents and to avoid an increase in future maintenance cost, vehicle operating cost and travel time, and to provide for comfortable driving.

104. Further attention needs to be given to the following:

- (i) road geometry, such as horizontal and vertical curve. Transition curve and super elevation should be considered on critical road sections;
- (ii) at major intersections, grade separation or roundabouts or traffic signals are required;
- (iii) traffic signs or road marking, especially for sharp horizontal curve, long/steep slope, pedestrian crossing and speed limits;
- (iv) longitudinal slope should not exceed 9-10%. Otherwise countermeasures, such as a climbing lane or widening of the road shoulder should be taken;
- (v) on mountain sides and sag sections, roadside ditches with sufficient cross drainage are required. One of the major reasons for road deterioration is the generally poor drainage system; and
- (vi) road shoulders passing through villages or towns need to be widened for pedestrian use.

105. Other measures required include:

- (i) establishment of a construction equipment pool for timely maintenance needs, taking into account the capacity of existing maintenance equipment; and
- (ii) an axle load control program. This should include provision of permanent and mobile vehicle weighing facilities and imposition of fines on overloaded vehicles.

## **B. Funding**

106. After independence, government budgetary expenditure on roads was significantly reduced and was insufficient to finance essential maintenance and rehabilitation. As a result, road condition deteriorated significantly.

107. Much of recent sector funding has been from international sources (detailed in section 1.8). Provision for domestic funding was made under legislation requiring 10% of fuel tax revenue to be earmarked for routine maintenance. However, as of the time of this writing, it seemed that this legislation is not effectively implemented. No one at the ARD or the MOTC was able to give details on this legislation. One person mentioned that the tax only applies to gas and diesel while CNG is excluded from this tax. It is clear that this legislation, with the inclusion of CNG, will be an essential element for sustainable funding of Armenia's road sector. Nevertheless, the Government has continued to increase its budgetary allocation for rehabilitation, repair of infrastructure (tunnels and bridges) and for winter

maintenance. For interstate and republican roads, budgetary support is approaching that required for long-term sustainability. Due to the range of funding sources: grant, soft loan, and Government budget, program development and coordination has been complex. In 2005, for the first time, a 3-year maintenance program for 2006-2008 was adopted (Decision No. 2412-N, *Endorsement of 3-Year Development and Annual Work Plan for State Roads 29* December 2005). MOTC introduced performance-based maintenance contracts on the main and secondary roads 2006–2008.

108. **Road Budget.** The road maintenance budget for 2007 was AMD20.0 billion, 68% of it for rehabilitation. The budget is set at expected outturn prices. In 2007-2008 higher than expected inflation eroded its real value. MOTC expenditures on roads for 2006-2007, the budget allocation for 2008 and expenditure planned under *MTEF 2009-2011* are given in Table 4-6. A major increase in the budget allocation for capital repairs is included up to 2011.

109. Funding for local roads transferred to MOTC responsibility under the 10 January 2008 Decree is also necessary. Some 2,277km was transferred, most of the length redesignated as republican road, but without additional budgetary funding for maintenance and upgrading. The 2007 budget allocated an average of \$5,600/km for routine maintenance. Some \$12 million is needed for routine maintenance of the transferred roads to republican road standard.

110. More dialogue within Government on resource allocation and use is essential. MOTC, MOF and other agencies concerned need to achieve a consensus, to ensure that funds are being applied efficiently (and used effectively by contractors) to support strategic goals. MOF cannot allocate additional resources until an effective case for them is presented.

111. Road maintenance is an issue of asset management. There is currently no defined objective or consideration of long-term maintenance strategy. Having transferred maintenance work to contractors, ARD is limited to monitoring. MOTC must promote asset management and foster contractor efficiency (in close cooperation with ARD). MOTC also need to develop its long term network planning and programming capability.

112. A second round of 3-year routine maintenance contracts started in 2008, with 34 contracts under ARD supervision. These cover 2,892 km, with winter maintenance of 3,127 km.

113. **Periodic Maintenance Program.** The cost of an overlay program (30-50mm) ranges from \$20 million to 46 million a year, depending on its scope. This should be budget funded initially, with consideration given to a Road Fund, financed through a supplementary tax on fuel (Annex 3). Existing legislation requires that 10% of fuel tax revenue be used for routine maintenance, but this has not been implemented. For sustainable, transparent, and accountable Road Fund management an autonomous committee or board is advisable, consisting of representatives of Government, road administration, road users, etc.

### C. Maintenance

114. The public road network is 78% paved, 19% gravel, and 3% earth. The interstate network is fully paved and about 90% of roads designated as republican (prior to 2008 additions) were paved. ARD then estimated interstate/republican surface condition to be 15% good, 75% fair, and 10% bad. The local road network and many roads redesignated as republican in 2008 are in relatively poor shape: a World Bank study (September 2004) survey estimated that in 2003 61% of local roads were in poor/very poor condition, 28% in fair and only 11% in good condition. Some 20% of rural roads were completely impassable in winter. Conditions vary widely between provinces, with Ararat and Vayots Dzor having over 90% of their local roads in good/fair condition, while in Tavush 85% of roads were in

poor/very poor condition. The poor condition of rural roads results in agricultural losses in over 40% of rural communities, with losses ranging up to 80% of the harvest for the worst served communities, due to difficulties in getting crops to market on time.

115. Highway design standards are given in Table 4-5. The axleload limit on interstate roads is 11.5 tons and on all other roads it is 10.0 tons (Ministry of Urban Development 2000 – clause 5.2).

116. One of the primary causes of pavement deterioration is poor drainage. Damage resulting from poor drainage could be reduced if snow removal maintenance units pushed the snow beyond the drainage invert, so that the melting water could run off, rather than seep into the pavement layers. One solution discussed to overcome the problem was to award performance based maintenance contracts, so that contractors would have to rebuild a road if they failed to do proper winter maintenance or perform normal repair and maintenance.

117. **MCC Routine Maintenance Study (Finnroad).** (September 2007-May 2008). The study addressed routine maintenance issues, focusing on (i) legal documents such as procurement law; (ii) methodology and performance of maintenance, including winter maintenance; and (iii) contract documents.

118. The study notes that 42% of interstate roads and 89% of republican roads are currently classified as in 'poor' or 'bad' condition and routine maintenance is helping temporarily with pothole patching. Although there is support from MCC and ADB for road rehabilitation, subsequent deterioration cannot be prevented without adequate maintenance, both routine and periodic.

119. The report pointed out that the poor quality of the current maintenance is a result of shortage of funds and absence of supervision. The quality of current maintenance performance including winter maintenance depends on the contract amounts and the contractor's ability. The level of competition between contractors is extremely low. Supervision staff of the road administrator mainly measure quantities of work done, but not the quality of the work.

120. The report provides detailed recommendations on legal documents, methodology and performance, and contract documents as well as road safety and technology transfer, which would improve the current maintenance situation.

121. Also, the report recommends introducing and upgrading existing road user information systems, such as weather information system, road condition cameras and other road user information. The report recommends a strategic study for both periodic and routine maintenance, taking account of both target level of service and funding.

122. **Good Governance and Asset Management.** These are priorities, using available resources for asset management to extend lifetimes through cost-effective programming. The focus on rehabilitation and reconstruction to overcome the maintenance backlog, and on routine maintenance, disregards periodic maintenance. A more balanced program is required, applying improved technology and encouraging contractors to improve performance.

123. **Management Database.** MOTC does not have a computerized road database for maintenance. Information is currently stored in documents, which makes its further usage difficult and inappropriate for current needs. A road technical database should be developed, with description by section, current issues and the scheduling of current and past maintenance. This requires a specific database program, which could be developed by a local programming company.

124. The system preferably will be in the form of a website, which will have a server and relevant software installed in the users' computers, which will make it possible to access the database (both locally and through the Internet), to print the information needed, input new data and have a warning of critical road sections for maintenance.

125. The database could subsequently be expanded to include intra-provincial and city roads, as well as other transport modes. The database program must be secure, with three levels of internal access: (i) user/collector, a specialist responsible for gathering information, investigating the site and inputting data; (ii) senior specialist, responsible for data verification; and (iii) database controller with overall responsibility. The database may function either within the MOTC website or on the Ministry's local area network (LAN) system. The development cost is estimated at \$30,000.

126. **Maintenance Program Governance.** Effective monitoring of contractors by ARD will extend pavement life and minimize the need for rehabilitation/reconstruction. A Road Maintenance Manual (provided separately to ARD) is essential to perform technically qualified maintenance, including judgment of maintenance intervention levels. The manual would be used by ARD site staff and contractors for inspection and evaluation of damage and for maintenance supervision. The proposed approach to maintenance is given in Annex 5.

127. Maintenance should use performance-based contracts, evaluated yearly. Contracts should be awarded based on technical and performance ability, not simply company size and financial position.

128. **Condition Surveys.** Inventory and condition surveys for all roads, bridges and structures need to be carried out and to be updated frequently to provide a computerized database for intervention programming. Inventory, condition, contract documents, unit prices of contracts and available funds databases, need to be shared by headquarters and branch offices through a LAN system, minimizing the cost and manpower for administration.

129. **Overloading.** Permanent weigh scales need to be set up on interstate roads, with fines imposed for overloading. A 33% increase in axleload from 15,000 kg to 20,000 kg is equivalent to a 350% increase in ESA (Equivalent Standard Axle), from 15.5 to 55.5. Damage-causation is related to ESA.

#### **D. Construction Program**

130. **Project Priorities.** While the final decision will be political, more effective project preparation, systematic analysis, and the development of the transport strategy will enable decisions to be better based. The long-term program will include: (i) routine and periodic maintenance, including bridges and structures; (ii) completing the LRNP and upgrading north-south corridors; (iii) improving rural and urban roads; (iv) missing links, bypasses and other new construction projects; and (v) Yerevan and other urban projects. The program needs to be balanced between provinces. With a limited budget and a focus on essential maintenance and remedial rehabilitation/reconstruction, MOTC has given little consideration to medium and long term network development. As the emphasis switches to asset management, network improvement and development, a strengthened planning capability will be required.

131. **Whole Network Planning.** The network is currently under the responsibility of MOTC, 49 urban areas and 1,000 rural areas. Priorities and resource allocation need, however, to be considered as a whole. The requirements of heavily-trafficked urban roads need to be considered at national level: they also form part of the strategic network. Such

routes should be redesignated, included in the national network and transferred to MOTC responsibility, at least for strategic planning. Work on other roads should also be evaluated to a common standard of analysis, even where funding remains local.

132. **Design Standards Review.** These are a combination of former USSR and other standards. International standards, especially for geometry and pavement structure, need to be adopted to achieve technically and economically sound construction, promote safe driving and to make the best use of investment (Annex 4 details the review).

133. **Prioritize Construction and Upgrading Program.** North-south corridors between Georgia and Iran (Asian Highways AH81/82/83) need to be upgraded. Trade facilitation requires upgrading both corridors, and crucially, onward cross-border links. At a meeting of the presidents of Armenia and Georgia in October 2008, Georgia undertook to reconstruct the Bavra-Batumi route, 26 km of which is currently impassable. This will reduce the road distance to Black Sea ports by 250 km. Bavra will become the main border crossing, increasing the importance of upgrading the M-1 Yerevan-Gyumri-Bavra.

134. An ADB TA in 2009 will review north-south corridor priorities and funding modalities. There are a number of issues: (i) Yerevan can be bypassed west or east – in the long term both bypasses will be necessary, part of a Yerevan Outer Ring Road; (ii) the priority route to the Georgian border, M-1 (via Gyumri) or M-2 (via Sevan). Given the commitment of Georgia, this is likely to be the M-1; and (iii) confirming H-45 as the secure second route Goris-Kapan.

135. These issues are considered further in Appendix 2, with profiles of key projects given in Appendix 3.

136. **Construction Industry.** In a free and open market, the best incentive to strengthen and improve the performance of the construction industry is to provide an assurance that there will be a continuing market for road construction. It is the kind of incentive that will give competitive companies confidence to invest in new equipment.

137. At independence, there were large road construction companies well equipped with plant and machinery. This plant and equipment is now (on average) 20 years old and operating inefficiently. However, as long as it can be maintained, it gives the local construction industry an insurmountable advantage keeping out foreign competition. The key element is the bid prices, which reflect the increasing maintenance cost, but do not include an equipment depreciation cost element. Eventually, the cost of equipment maintenance will become so high that it will make new equipment purchase viable.

138. Replacement of plant and equipment would require contractors to borrow money, depreciate the new fleet, and quote unit prices including this cost item. Their competitive edge would slowly erode. However, all contractors would have to agree to replacement to establish a level playing field.

## **E. Bridges**

139. **Investigate Structural Condition.** There are about 4,000 bridges, mostly 30-40 years old. A full condition survey/inspection has not been performed and data to prioritize a maintenance program is not available. A bridge renovation project covering 11 bridges was undertaken from 2002-2004, with the assistance of the World Bank. There is an annual allocation of \$1.5-2.0 million from the state budget for capital repair of bridges/structures (with repair based on visual inspection). A bridge asset management program will extend structural life, avoid major investment in reconstruction following component failure and

enable cost effective maintenance to be undertaken. In general, a bridge life of 50-70 years should be achieved.

140. Detailed bridge surveys/inspections need to be carried out to develop a computerized database for bridge asset management and maintenance programming. This includes:

- (i) inventorying all structures and selecting and ranking priority bridges based on socio-economic requirements and the extent of damage;
- (ii) reviewing design data, as available;
- (iii) measuring all bridge elements (beam, slab, pier, abutment and river bank protection);
- (iv) collecting data on strength of main structural materials, using non-destructive inspection; and
- (v) measuring bearing capacity of main structures through static and dynamic tests.

#### 4.5 Lifeline Roads Network Program

141. **LRNP Completion.** This is a social priority. The Government program will provide secure access to the national network for all rural communities. LRNP was originally planned to be completed by 2012, but this is no longer achievable.

142. The LRNP is targeted at stimulating economic growth and poverty reduction by lowering transport costs and stimulating the development of markets. This encourages farmers to increase production by making it easier to obtain inputs and sell outputs. Improved road transport also makes it simpler to go to school, visit health facilities and travel to jobs in non-agricultural sectors. Road improvements bring about social equity and political unity by helping to integrate the poor and other vulnerable groups. Appendix 2 details implementation progress and prospects.

143. **Extended Scope of LRNP.** Initially the program covered 2,702 km. It has been increased to 3014 km (No.112-N of 10 January 2008). Road sections of length 1-59km and daily traffic volumes of 50-2,500 are covered. About 60% of the route length has asphalt/bitumen surface. Improvement standards reflect traffic volume. Improvement of culverts, bridges, retaining walls and drainage is a key component.

144. Some 1,400 km of interstate and republican road and dozens of bridges were rehabilitated during 1995-2004, mainly through international support. The average roughness index was reduced from 7.8 to 3.5, with large savings in vehicle operating costs.

#### 4.6 Rural Roads and Poverty Alleviation

145. About one-third of the population lives in rural areas. Of 934 communities, 871 are classified as rural. The most recent poverty assessment suggests that the poor performance of the rural economy is associated with a number of factors, including:

- (i) small, relatively unproductive land holdings;
- (ii) unfavorable farm input and output price structures;
- (iii) volatile weather conditions;
- (iv) lack of land consolidation;
- (v) lack of mechanization; and
- (vi) absence of employment opportunities outside the agriculture sector.

146. While in many cases the economic infrastructure to support communities is in place, it is severely degraded and in many cases inoperative. The breakup of the former USSR imposed a more than 15 year halt in infrastructure maintenance. The economy suffered a loss of its assured input and output markets for industry and agriculture. Agriculture subsequently served largely as a safety net for those displaced by the collapse of industry. It employed three times as many as before independence. The privatization of agricultural land led to holdings that were dispersed and of variable quality. In many instances, those granted land returned it as they could neither afford to cultivate it or pay the taxes required. Sector activity increasingly focused on subsistence, with less than 50% of output being marketed. An increase in agricultural production is the key to income growth in rural communities.

147. **Importance of Rural Roads.** These are extremely important for agriculture. The delivery of products to market is more efficient with good quality roads, reducing transport cost and hence the cost of goods, with less damage to vehicles from potholes and flooded roads. Road condition is an important factor in social development and in the quality of rural life: roads provide access to the outside world, including hospitals, as well as to other settlements and the regional center.

148. A World Bank survey found that the poor condition of rural roads resulted in significant losses of produce in 42% of rural communities, with 18% of communities reporting output losses of 40% or more, a further 24% reporting losses above 30%. In a small proportion of the communities, these losses, which result from the inability to get crops to market in time, accounted for 70-80% of the total harvest.

149. World Bank surveys reveal that over a quarter of rural communities do not have public bus or minibus service. The distance to the nearest bus station was over 3 km for one third of rural communities and 20 km for some of the most remote and isolated ones. The benefits of investment in rural roads include:

- (i) development of agricultural business;
- (ii) increased access to markets;
- (iii) lower transport cost;
- (iv) access to social services;
- (v) access to emergency and protection services;
- (vi) better living conditions;
- (vii) reduction in vehicle damage;
- (viii) more employment opportunities;
- (ix) better investment environment (good roads will attract investors); and
- (x) tourism development.

150. With the partial exception of areas close to Yerevan (mainly in Ararat and Kotayk), the problem of rural road degradation is among the most important in a complex mix of factors that hold back the development of rural areas (World Bank, 2004). Road condition is closely linked to the profitability of farming. Continued viability of many rural settlements is a strategic and economic imperative if the continued drift of the population to Yerevan (or emigration) is to be contained. Among others, worsened access has adversely affected fertility rates in the countryside, risking the development of a vicious circle of rural depopulation, loss of social services and further stagnation.

151. A number of rural areas have been affected by the collapse of industrial or agro-processing facilities established in the former USSR. Then, the countryside was a mix of

large mechanized farms and company towns (for the employees of a nearby industrial facility). The collapse of this structure meant that many former local industry (or kolkhoz/sovkhoz narrow specialists) had to turn to farming almost overnight, without the necessary skills and support. Deteriorating roads made the newly acquired livelihoods even more precarious, among other things encouraging out-migration and contributing to bad environmental practices (such as use of land degrading farm practices, unorganized local waste disposal etc.). Functioning of local schools and health services faced—and continues to face—considerable odds since here, too, access plays a major role (e.g., it is common for many rural teachers to commute to rural schools daily from the nearest town, a difficult task, especially in winter). The pattern of land ownership in which many individuals own several separated plots exacerbates the impact of poor transport.

#### 4.7 Road Safety

152. National Road Safety Council (NRSC). NRSC was established in 2005 as a nongovernmental organization (NGO). It has sponsored a number of campaigns including *Think Before You Drive* in 2006 and was largely responsible for the introduction of the mandatory seatbelt law in 2007. A permanent working group of concerned agencies has been established, including the traffic police and other NGOs. A program of school visits is in progress. A road safety program, which identifies accident black spots, has been initiated. NRSC and others note that traffic accident rates are very much under-reported. Accidents involving the many uninsured vehicles are generally not reported to police. Fatalities include deaths within 7 days of an accident, while the international norm is within 30 days. Self-financing of the traffic police has led to an improvement in enforcement, in particular concerning wearing of seatbelts and drink-driving.

153. The World Bank noted that the road safety situation is serious and deteriorating. The Report (Appendix 4 - September 2006) defines a short, medium and long term safety strategy, together with a short term action and investment plan. The World Bank is to hold a workshop on road safety in September 2008 and strategies for interventions at national level and for Yerevan will be developed by end-2008. A supporting study on *National Road Safety Strategy* is in progress.

154. Table 4-7 shows that there was a 28% increase in fatalities 2004-2006. The death rate per 10,000 vehicles is eight times as high as in the safest European countries. Of particular concern is the large number of pedestrian fatalities.

155. Within five years, with road network condition in general returned to a fair state, incentives should be introduced to accelerate the replacement of the oldest vehicles: this would improve fuel consumption, reduce pollution, improve safety and increase network capacity. Old vehicles have poor acceleration and hill climbing capabilities, delaying other vehicles. Annual testing of older vehicles against increasingly strict criteria, with possibly a trade-in bonus for scrapping, would yield large economic benefits.

156. **Prioritizing Safety.** Traffic accidents, fatalities and injuries are increasing. Workshops in September/October 2008 reviewed World Bank consultants' proposed road safety strategy. A broad consensus was achieved that initially a \$10 million program 2009-2013 is required, targeting a 10% reduction in fatalities (saving around 50 lives annually). The World Bank undertook to finance such a program, if requested by the Government. A Road Safety Board chaired by the Prime Minister would be set up, to which a permanent Secretariat would report. The Secretariat (expected to be within ARD) would monitor Working Groups for: (i) data management; (ii) safety engineering; (iii) vulnerable road users; and (iv) other matters. A draft action plan includes measures on seat belt enforcement (\$2 million), speed management (\$2 million), drink driving (\$2 million) and vulnerable road users (\$1.5 million).



157. If the initial program achieves its objective, there should be a follow-on program 2014-2020 targeting at least a further 10% reduction in fatalities, with a similar investment. The second phase program should attract grant support from international bodies. The proposed strategy focuses on improving driver behavior and needs to be complemented by the following measures:

158. **New Direction for Road Signs.** Signage and road marking requires significant improvement. Following signs in Yerevan inevitably ends at one or another hotel. A new design to international standard but with local characteristics should be developed, possibly through a high profile design competition. Signage should be generally bilingual – Armenian/English, and for key sections and on tourist routes/sites trilingual - with Russian Federation. A long term implementation program is required, first on M- routes and through routes in Yerevan, followed by republican roads. Implementation should not be piecemeal – a section should be comprehensively resigned and remarked. Initial candidates would be the M-1/M-2 Yerevan-Georgian Border. Signage must be road-user friendly, signs located correctly, providing necessary advance notice of routes and distances to major destinations, hazards and safety indications. All signs should show route numbers, with Asian Highway numbers also shown at key locations.

159. **Compromise on Speed Limits.** Successful (enforceable) limits are always a compromise between what is desirable on safety grounds and what is acceptable to a large majority of road users. Drivers in Armenia are spirited and this must be taken into account in setting the limits. Many existing limits are far too low and are in consequence completely ignored. Once new limits have been agreed for a route (again, M- routes should be addressed first) they should be much more prominently displayed, at fixed intervals on the route and at all access points. For dual carriageways, a limit of 120kph would be reasonable on unrestricted sections, with 80kph for long descents. Single carriageway sections in rural areas would be limited to 100kph or 110kph where there is good sight distance. Once new limits have been posted, they should be enforced with a range of measures, including consideration of speed cameras (although this requires general public acceptance). Penalties should be graduated, depending on the degree of excess speed, with heavy sanctions, including withdrawal of license for the worst offenders.

160. **U-turn on U-turns.** There are many unprotected U-turns on high speed dual carriageways, unlit and particularly dangerous at night. Each should be reviewed and either closed or protected, with through lanes slewed and lights installed.

161. **Dangerous Descents.** These will inevitably occur on long uninterrupted descents, for example on the M-2 and M-3 towards Yerevan. The only mitigating measures are median crash barriers and the provision of run-offs (turnouts) at regular intervals, clearly signposted. These relatively inexpensive initiatives should be a priority.

162. **Clean but Deadly Natural Gas.** The low import price of gas has encouraged vehicle conversions, resulting in a very high usage share. Inspection of filling stations and in-vehicle equipment is vital to avoid major incidents. These can be extremely costly – an explosion at a filling station in Tashkent in 2006 resulted in over 100 fatalities. A dedicated inspection section should be set up in MOTC, with appropriate enforcement powers, tasked with improving the safety of natural gas usage in the sector.

#### 4.8 Road Transport

163. Road transport (both passenger and freight) is largely privatized and is developing rapidly as roads improve, and to meet the demand for higher service quality. There has been significant progress in private sector involvement in urban transport. The Government has

removed most of the subsidies to public transport companies and privatized bus and taxi companies.

164. The number of bus and minibus routes and the number of vehicles operating them are given in Table 4-8, by type of service. Inter-provincial services are operated by some 100 companies, with 1-10 vehicles each. The services are tendered. MOTC is seeking to consolidate such operations, with the objective of encouraging an eventual few operators, able to finance investment in better vehicles.

165. **Growing but Aging Vehicle Fleet.** The fleet composition for end-2006 (see Annex 1) shows Yerevan to have twice the number of cars registered per 1,000 population as the rest of the country. A large part of the commercial vehicle fleet is aged and of low performance. Upgrading the fleet is a long term objective to improve safety, lower fuel consumption and increase road capacity through better acceleration and hill climbing performance. This can be encouraged by special measures: for example, exemption of import duties (on new and used vehicles) for a limited period (one or two years) for buses and trucks, and possibly cars. More rigorous inspection standards could be introduced to encourage scrapping of old vehicles, perhaps with a bounty paid for each scrapped vehicle.

166. **Inter-Provincial Bus Services.** Responsibility for bus services is fragmented, with many small operators competing for concessions. There is illegal minibus competition on some routes out of Yerevan. There is no bus service on some routes, only long-distance taxis. The bus fleet is generally old and in poor condition. Operators do not have the financial resources for fleet modernization. Service can only be improved by encouraging operator consolidation and removing illegal competition, the latter by no means a simple proposition. The objective should be to have developed and let within five years three or four long term regional franchises, with a franchise commitment to improved service quality (fleet replacement, timetabled services). Existing operators would be encouraged to form bidding consortia for the franchises. The updated bus fleet could be introduced on a leasing basis. Each franchise should have a dedicated terminal in Yerevan; currently most of the many bus terminals are poorly sited.

167. **International Bus Services.** These are developing, with services to Istanbul (operated by Turkish companies, via Georgia) and to Georgia and Iran. With a limited rail passenger service (to Tbilisi, and summer-only to Batumi), further development of bus services needs to be encouraged.

168. **International Road Freight.** Road transport is permitted between Armenia and Turkey, via Georgia, using Turkish or Georgian trucks.

**Table 4-1: Vehicle Fleet End-2006**

Province	Cars	Buses	Light Truck	Medium Truck	Heavy Truck	Total	% of Total	Cars /'000
Yerevan	132,668	8,458	9,641	8,326	412	159,505	48.4	120
Aragatsotn	8,478	395	663	1,800	62	11,398	3.5	61
Ararat	16,726	746	1,526	2,555	601	22,154	6.7	61
Armavir	21,981	720	1,327	2,039	100	26,167	7.9	78
Gegharkunik	10,869	492	1,282	3,005	59	15,707	4.8	45
Lori	15,244	926	863	3,135	354	20,522	6.2	54
Kotayk	16,852	1,479	1,648	3,707	197	23,883	7.2	61
Shirak	16,538	867	786	2,924	421	21,536	6.5	59
Syunik	8,165	373	599	3,037	73	12,247	3.7	53

Vayots Dzor	4,400	129	370	1,113	71	6,083	1.8	79
Tavush	7,319	345	752	2,209	28	10,653	3.2	55
(Non-Yerevan)	(126,572)	(6,472)	(9,816)	(25,524)	(1,966)	(179,350)	(51.6)	(59)
<b>Total</b>	<b>259,240</b>	<b>14,930</b>	<b>19,457</b>	<b>33,850</b>	<b>2,378</b>	<b>329,855</b>	<b>100.0</b>	<b>80</b>
% of Total	78.6	4.5	5.9	10.3	0.7	100.0		

Source: Ministry of Interior

**Table 4-2: Traffic Volume on M-Routes 2005-2007**

Counter Location	Light Vehicles	Trucks	Truck Trailers	Total
M1 Yerevan-Gyumri-Georgia border, 20+700meters (m)	8,316	1,351	71	9,738
M2 Yerevan-Meghri-Iran border, 9+380m	17,032	4,963	630	22,625
M2 Yerevan-Meghri-Iran border, 200+320m	560	185	15	760
M2 Yerevan-Meghri-Iran border, 367+250m	340	271	59	670
M3 Margara-Vanadzor-Georgia border, 125+830m	1,900	290	20	2,210
M3 Margara-Vanadzor-Georgia border, 135+160m	569	282	10	861
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 80+300m	1,338	104	13	1,455
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 10+320m	15,110	4,288	86	19,484
M5 Yerevan-Armavir-Ijevan-Turkish border, 9+400m	17,572	1,425	49	19,046
M6 Vanadzor-Alaverdi-Georgia border, 59+050m	532	141	48	721
<b>Total 2005</b>	<b>63,269</b>	<b>13,300</b>	<b>1,001</b>	<b>77,570</b>
M1 Yerevan-Gyumri-Georgia border, 20+700m	8,813	1,428	82	10,323
M2 Yerevan-Meghri-Iran border, 9+380m	17,586	5,389	624	23,599
M2 Yerevan-Meghri-Iran border, 200+320m	726	238	38	1,002
M2 Yerevan-Meghri-Iran border, 367+250m	400	325	79	804
M3 Margara-Vanadzor-Georgia border, 125+830m	2,251	985	112	3,348
M3 Margara-Vanadzor-Georgia border, 135+160m	487	877	53	1,417
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 80+300m	2,126	144	31	2,301
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 10+320m	17,933	4,833	111	22,877
M5 Yerevan-Armavir-Ijevan-Turkish border, 9+400m	16,946	2,829	40	19,815
M6 Vanadzor-Alaverdi-Georgia border, 59+050m	702	571	92	1,365
<b>Total 2006</b>	<b>67,970</b>	<b>17,619</b>	<b>1,262</b>	<b>86,851</b>
M1 Yerevan-Gyumri-Georgia border, 20+700m	6,195	3,441	317	9,953
M2 Yerevan-Meghri-Iran border, 9+380m	18,352	5,673	526	24,551
M2 Yerevan-Meghri-Iran border, 200+320m	N/A	N/A	N/A	N/A
M2 Yerevan-Meghri-Iran border, 367+250m	495	221	124	840
M3 Margara-Vanadzor-Georgia border, 125+830m	2,372	1,578	245	4,195
M3 Margara-Vanadzor-Georgia border, 135+160m	903	416	62	1,381
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 80+300m	825	103	33	961
M4 Yerevan-Sevan-Ijevan-Azerbaijan border, 10+320m	17,605	6,853	928	25,386
M5 Yerevan-Armavir-Ijevan-Turkish border, 9+400m	18,863	3,477	862	23,202
M6 Vanadzor-Alaverdi-Georgia border, 59+050m	670	504	123	1,297
<b>Total 2007</b>	<b>66,280</b>	<b>22,266</b>	<b>3,220</b>	<b>91,766</b>

Source: Armenian Roads Directorate

**Table 4-3: Growth Rates MCC Study**

Item	2006-2010	2010-2015	2015-2026	Index 2026 2006=100
<b>GDP/Capita % pa:</b>				
Low	7.0	6.0	4.0	
Central	9.0	7.0	5.0	338
High	10.0	8.0	6.0	
<b>Traffic Volume % pa:</b>				
Low	7.7	6.6	4.4	
Central	10.8	8.4	6.0	430
High	12.0	9.6	7.2	
ARD	*	4.0	4.0	223
ADB Rural Roads PPTA	6.0	6.0	6.0	320

ADB = Asian Development Bank, ARD = Armenian Roads Directorate, GDP = gross domestic product, PPTA = Project Preparatory Technical Assistance.

Source: SWECO International

**Table 4-4: Road Length by Province 2008**

Province	Length of Road Km				Area sq.km	Road Density m/sq km
	Interstate	Republican	Local	Total		
Aragatsotn	178.2	427.0	150.0	755.2	2,753	274
Ararat	103.6	294.3	238.1	636.0	2,096	303
Armavir	167.3	274.7	209.4	651.4	1,242	525
Gegharkunik	224.5	350.3	211.8	786.6	3,300	238
Lori	213.4	471.4	223.1	907.9	3,789	240
Kotayk	49.0	442.8	118.8	610.6	2,089	292
Shirak	112.9	469.9	283.4	866.2	2,681	323
Syunik	373.0	470.7	220.4	1,064.1	4,506	236
Vayots Dzor	113.3	394.3	116.2	723.8	2,308	314
Tavush	150.8	460.9	190.8	802.5	2,704	297
<b>Total Above</b>	<b>1,686.0</b>	<b>4,056.3</b>	<b>1,962.0</b>	<b>7,704.3</b>	<b>27,468</b>	<b>280</b>
Yerevan				725.0		
Gyumri				265.0		
Vanadzor				162.0		
Other towns				1,962.7		
<b>Total</b>				<b>10,818.8</b>		

Sources: Government Decree 1 March 2008, Consultants' estimates.

**Table 4-5: Highway Design Standard (m)**

Class	I	II	III	IV
Class by status		Republican		
	Interstate		Local	
Right of Way (ROW) including drainage	26.4	13.2-13.8	10.8-11.4	9.0-9.6
Design speed (km/h)	<120	<100	<90	<80
- Moderately mountainous terrain	<100	<90	<80	<70
- Mountainous terrain	<80	<60	<50	<40
Carriageway width	2 x 7.2	6.6	4.8	3.6
Surface type	Asphalt concrete			Gravel or earth
Shoulder width	3.6	3.3	2.4	1.8
Width of storm water drainage ditches	1.6	1.6	1.6	1.6

Note: This road specification (IV-11.05.02-99) replaces former USSR norms that distinguished five road classes.

**Table 4-6: MOTC Road Budget 2006-2011 (AMD billion)**

Item	2006	2007	2008	2009*	2010*	2011*
Capital repair of roads	11.93	13.60	12.66	15.97	17.95	19.95
Operation and maintenance	5.02	5.99	6.19	6.90	7.36	7.36
Capital repair of structures	0.55	0.45	1.10	0.50	0.50	0.50
<b>Total AMD billion</b>	<b>17.50</b>	<b>20.04</b>	<b>19.95</b>	<b>23.37</b>	<b>25.81</b>	<b>27.81</b>
Total USD million	42.07	56.12	66.06	77.38	85.46	92.09

Source: Ministry of Transport and Communication

Note: \* Medium-Term Expenditure Framework 2009-2011.

**Table 4-7: Road Accidents 2001-2006**

Item	2001	2002	2003	2004	2005	2006
No. of accidents	1,021	1,002	1,025	1,164	1,312	1,574
Deaths	237	235	252	259	310	332
Injuries	1,258	1,213	1,294	1,492	1,774	2,089

Source: *Statistical Yearbook of Armenia 2007*

**Table 4-8: Bus and Minibus Operations**

Service	Bus		Minibus		Total	
	Routes	Vehicles	Routes	Vehicles	Routes	Vehicles
Inter-Province	87	259	126	749	213	1,008
Intra-Province	235	446	119	338	354	784
City	50	337	184	3,633	234	3,970
Total Domestic	<b>372</b>	<b>1,042</b>	<b>429</b>	<b>4,721</b>	<b>801</b>	<b>5,762</b>
International	N/A	26	N/A	71	20	97

Source: MOTC

**Table 4-9: Periodic Road Maintenance Program**

Option	Overlay Length (km over 10 years)	Cost/sqm \$	Annual Cost (\$ million)
I	30% of Interstate (1,686*0.3=500)	30	500,000m*8m*30/10=12.0
	15% of Republican (4,056*0.15 =600)	20	600,000m*7m*20/10= 8.4
II	30% of Interstate (1,686*0.3=500)	30	500,000m*8m*30/10=12.0
	30% of Republican (4,056*0.3=1,200)	20	1,200,000*7*20/10=16.8
III	30% of Interstate (1,686*0.3=500)	30	500,000m*8m*30/10=12.0
	30% of Republican (4,056*0.3=1,200)	20	1,200,000*7*20/10=16.8
	30% of Local (1,962*0.3=600)	20	600,000*6*20/10=7.2

Source: Consultants' estimate

## 5. RAIL TRANSPORT

### 5.1 International Developments

169. **Change in the Caucasus.** Lines in other countries are being upgraded and new lines are being constructed in Iran, Georgia and Turkey, and the Georgian railway will possibly be privatized. The port of Poti has been concessioned and a duty free zone is being constructed. While some border closures may continue for decades, others may be removed at short notice. These factors create a state of change and uncertainty, the outcome of which is difficult to predict.

170. There are a number of rail investment projects that are currently being undertaken in Azerbaijan, Iran, Georgia, and Turkey that, if completed, will have a significant negative impact on SCR. Essentially, even with reopened borders, they will eliminate almost all potential transit traffic. Without transit traffic from Azerbaijan, reopening of the Turkish border, while it would have a significant positive impact on Armenia, might have a negative impact on SCR. Much of the bulk freight traffic such as oil and grain will be imported through Turkey, reducing SCR ton kilometers (tkm) had the traffic continued to come through Georgia. Given that little of the Turkish Railway is electrified, the possibility exists of using double stack container trains for transporting containers to and from the Mediterranean. Given that double stack will not be likely on the SCR and given the track gauge change, most containers may be trucked to the Turkish border, further reducing volume.

171. Reopening of the rail link through Abkhazia to Russian Federation would transfer much of the existing rail ferry traffic to rail only. In itself, it will not create any significant new traffic unless new business is created. Even then the tkm within Armenia will be limited. According to some of the shippers and freight forwarders, much of the current and potential rail traffic will, with reopening of the Lars Pass highway to Russian Federation, be transferred to road unless the railway is able to offer special purpose wagons and improved transit times.

172. **New KATB Railway.** On 7 February 2007 a tripartite agreement was signed by Turkey, Georgia, and Azerbaijan to construct/rehabilitate the east-west Kars-Akhalkalaki-Tbilisi-Baku (KATB) line. The construction cost is estimated to be \$440 million. Azerbaijan is providing a soft loan of \$220 million for 30 km of new construction and 160 km of rehabilitation in Georgia. Turkey will construct the 68km Kars-Georgia border line. Completion of the KATB is expected by 2010. The line bypasses Armenia and would replace - due to border closure - the non-operational Kars-Gyumri-Tbilisi line for international and transit traffic. According to a recent news release, contracts have been awarded to an Azerbaijan company for the work in Georgia and construction is scheduled to start on 24 July 2008. (Given that this line will bypass the SCR, some believe that the line will not be completed. In addition, should the Armenian - Azerbaijan border be reopened, there could be a much shorter connection between Azerbaijan and Turkey.)

173. The line between Armenia and Turkey was constructed in 1898 when the area as far as Kars was part of the Russian Federation Empire. Partly due the gauge change, it has never carried much traffic, and in the late 1980s there was only one daily train of 16 wagons across the border.

174. **New North-South Line via Azerbaijan.** An article in the 21 June 2008 *Tehran Times* states that Iran, Azerbaijan, and the Russian Federation have finalized a contract for the construction of the north-south corridor from the Persian Gulf to the Russian Federation. This includes the construction of a rail line Ghazvin (Iran) to Astara (Azerbaijan), the first section of which is currently under construction. The line is expected to be completed by 2012. As part of this agreement Azerbaijan is required to upgrade the Yalama-Astara line to further improve the direct connection between Russian Federation and Iran. This will be a slightly

longer route between Iran and the Russian Federation than the one that currently exists. But the current line is not usable because of the geo-political situation. It will be a lower cost route to operate since it essentially by-passes the Caucasus mountains.

175. The World Bank is currently negotiating a loan for the modernization of the Azerbaijan line from Baku to Tbilisi (Georgia), with direct connection to Black Sea ports. This includes conversion from 3,000v DC to 25 kV AC and the purchase of 50 new locomotives.

176. A north-south line connecting Russian Federation with Iran through Azerbaijan would bypass Armenia, so a new 470 km Armenia-Iran line is also under consideration. The current estimated cost is \$1.33 billion; however, given the mountainous terrain, this could easily be underestimated. This line will duplicate and, essentially, parallel the currently closed line through Nakhchivan, which would probably make it difficult to attract international funding.

177. **Concessions of Georgian Railway.** The Georgian government has made several attempts to sell/concession its railway to provide private capital to renovate and modernize the system. The government is advertising on the internet for sale or lease of a limited number of locomotives and a number of fixed facilities, including the Tbilisi station and the railway's headquarters office building. The day before Russian Railways (RZD) assumed the Armenian Railways concession, 300 Russian Federation army railway engineers entered Abkhazia to repair the southern section of the railway. RZD would be very interested in the Georgian Railway concession. SCR contracted, prior to the South Ossetia conflict, Georgian Railways workshops to overhaul SCR locomotives and rolling stock.

178. The Government of Georgia has recently sold a 51% stake in Poti port to the Investment Authority of the United Arab Emirates, to develop the port and create a free trade zone. (In the currently unlikely event of reopening the Abkhazia border, much of the current Armenian traffic through the port will be able to transit directly to/from Russian Federation. Should the border not be reopened, a duty free zone in Poti would make it viable as a distribution center for Armenia.)

179. The Russian Federation railway website officially announced the assumption of the concession of the Armenian railways and stated that SCR plans to assist with construction of new railway lines in Georgia between Yerevan and Batumi and Yerevan and Poti.

## 5.2 Armenian Railways

180. Armenian Railways was established in 1991 as a closed joint stock company. Prior to independence it was part of the Trans-Caucasus Railway, headquartered in Tbilisi, Georgia, which also included the Azerbaijani and Georgian networks. The majority of AR was constructed during the Soviet era. Central planning dictated that rail was the primary transport mode and little emphasis was placed on transport costs. The system was designed to handle large traffic volumes and to service, in some cases, remote areas.

181. **A 1960s Railway.** Without the need to consider road competition, the former USSR largely standardized on the technology of the 1960s. The network has 23.5-ton axle loads, is wholly electrified (3 kV-DC) and rolling stock is of a basic design, with very heavy (tare) weight.

182. **Traffic Collapse.** After independence annual traffic within the former USSR of around 30 million tons and 5 million passengers collapsed by 1999 to 1.5 million tons and 1.3 million passengers. By 2007, freight traffic had recovered to 3 million tons, but passenger traffic continued its decline, to 700,000. The decline in freight reflected a loss of transit traffic, a dramatic decline in rail-based industries, an improving road network and strong competition from the trucking industry. An increase in private car ownership and the introduction of



minibuses contributed to the passenger decline. As an example of the decline in rail-based industries, in Maralik, south of Gyumri, Soviet central planners constructed an enormous cotton-spinning factory far from the cotton sources of Uzbekistan and Tajikistan and far from the market for the cloth, western former USSR. The facility was so large that a 25km line was constructed to the factory. Today only a very small proportion of the factory is being used and its transport needs are easily serviced by the adjacent intercity highway. There are numerous similar examples, particularly in Yerevan. The railway 'inherited' locomotives and rolling stock based on its pre-independence traffic volumes.

183. **Transit Traffic.** This important traffic was completely lost with border closures, and direct rail connection with the largest single trading partner, Russian Federation, was lost. New lines in neighboring countries are under construction and, on completion, would significantly reduce the likelihood of recovering transit traffic, even with reopening of borders.

184. **Infrastructure and Rolling Stock Fleet.** This is old, with most of the electric locomotives around 35 years old, many needing repair or replacement. There are numerous speed restrictions to 30 kph, with rehabilitated sections operating at 60 kph. Some of the infrastructure was damaged during the conflict with Azerbaijan and by the 1998 earthquake. Due to the terrain, there are numerous bridges and some tunnels. Some large bridges need major repairs. Some lines are little used because of border closures or loss of traffic. Only about 370 km of the 732 route km network is fully operational: Yerevan-Georgian border, the passenger line Yerevan-Yerask and sections of the Yerevan-Azerbaijan/Vardenis lines. Much of the main Yerevan-Gyumri-Airum (Georgian border) line is in poor condition, but 72 km has been rehabilitated by the World Bank and rehabilitation of the remaining 107 km is necessary. In addition, 41 bridges (8 large) are in need of rehabilitation.

185. **World Bank Restructuring Study.** In 2006 the World Bank commissioned a report on future options for the railway. A detailed description of AR, its potential, and its problems is provided in this *Restructuring Project Final Report* (Harral, Winner, Thompson, Sharp and Klein, October 2006). The background for concession bids, largely based on the report, is provided in the *Preliminary Information Memorandum Armenian Railway Concession* (MOTC/PIU 2007).

186. The *Restructuring Project Report* sees only a modest recovery in freight traffic, to around 4 million tons by 2020. With reopening of the Turkish border, this could increase to 9 million tons, provided that the Kars-Tbilisi-Baku line is not built and that the Azerbaijan border is reopened. Passenger services will need to be subsidized indefinitely. Annual renewal of existing assets is estimated to cost AMD4 billion (\$13 million), with outstanding deferred investment of AMD55 billion (\$182 million). In addition, investment for traffic growth and asset replacement is necessary, including AMD11 billion (\$36 million) for new electric multiple units. This is a challenging program, with annual revenue at about \$30 million.

### 5.3 Reorganization of Armenian Railways

187. AR was restructured in 1998 into a Railway Department under MOTC, with closed joint stock companies for freight, rolling stock, and infrastructure. Lack of coordination between these companies and high operating costs saw AR revert to vertical integration in 2002 under a government-appointed Supervisory Board that reported to MOTC. Deputy Directors responsible for infrastructure, rolling stock, transport, safety and administration reported to the Director General.

188. After 2001, progress was made in eliminating cross-subsidization of passenger services by freight with revised tariff structure, discontinuance of the highest loss making services, privatization of non-core activities, and some reduction in number of staff. AR stated that it was 'profitable' after tax, but that did not reflect the needs of a continuing

railway. Most assets were fully depreciated and there was little investment and large arrears of maintenance. AR was seriously overstaffed for its traffic volume. It had poor productivity, with traffic units per employee (ton km plus passenger km) low by international standards.

#### 5.4 Concessioneering of Armenian Railways

189. In September 2007, the Government tendered a concession to operate the railway as a vertically-integrated system. The tender was won by RZD, which has set up a wholly-owned operating company, SCR. The Concession Agreement was signed on 13 February 2008 and entered into effect on 1 June 2008. The concession runs for 30 years, with an option exercisable at any time after 20 years for a further 20 years. The fee paid was an initial \$5.5 million, plus 2% of annual gross revenue. SCR is obligated to invest \$572 million by 2035, two-thirds on infrastructure. SCR has, separately, purchased the locomotive fleet and other rolling stock. The concessionaire has also agreed to keep the 4,300 staff for at least three years. Under the Concession Agreement, RZD has essentially agreed to subsidize the railway. Experience of other concessioned railways has often been that concessions have been renegotiated or abrogated.

190. The concessionaire's plans are under development, as it assumed possession on 1 June 2008 and there are a number of aspects to the concession agreement that are subject to interpretation. SCR indicated in July that it was focusing on system renovation, to take advantage of any border reopening to develop traffic.

191. The main points in the concession agreement are, that

- (i) the Government retains ownership of all fixed assets;
- (ii) SCR is responsible for accidents, but in case of *force majeure* the Government is responsible;
- (iii) the Concessionaire will purchase existing locomotives and will own any rolling stock that it acquires;
- (iv) open access will be permitted;
- (v) Concessionaire can set its own tariffs except for access charges, during a state of emergency declared by the Republic and rates governed by international treaty;
- (vi) the current labor force will be maintained for at least three years;
- (vii) labor agreements will be honored;
- (viii) minimum passenger services are subject to agreement between MOA and SCR;
- (ix) Concessionaire is not liable for the existing debt of the railway;
- (x) a portion of the passenger train losses will be paid from the 2% of gross revenue that is to be paid to the Government, but will not exceed the annual payment by SCR;
- (xi) in the event that the concessionaire fails to perform as specified under the agreement, they are liable for a penalty not to exceed \$57 million;
- (xii) Railway Authority has the right of inspection of assets, documents, etc, with 15 days advanced notice;
- (xiii) Concessionaire must submit audited accounts quarterly to the Railway Authority;
- (xiv) failure of power supply precluded the concessionaire from penalty for failure to perform; and

(xv) track condition will be improved to permit a minimum of 50kph.

192. An article in the February 2008 RZD-Partner magazine (a Russian Federation Railway magazine) outlines the concessionaire's plans. The agreed investment under the agreement is \$572 million over 28 years, \$84 million to 2020 (Table 5.1). This could increase to \$2.15 billion under favorable development scenarios. The cost of rehabilitating the connecting line to Turkey is \$32.8 million; reopening the connection to Azerbaijan would cost \$1.17 billion and restoring the rail connection through Abkhazia would cost \$380 million.

193. Investment committed to 2009-2020 (in total \$282 million) in the Concession Agreement is given in Table 5-1. This near double the estimated requirement in the Harral Winner Thompson Sharp Klein (HWTSK) study. Implementation scheduling will be subject to geopolitical developments, in particular with reference to borders. Opening of both borders would increase traffic and add projects. Investment committed to in the Concession Agreement is adequate for the improvement of the existing system.

194. A significant proportion of RZD's traffic in Russian Federation is operated by third parties, under access charge arrangements. Access charges to SCR are, however, set by the Railway Authority, not the concessionaire.

**Table 5-1: SCR Concession Investment 2009-2020 (AMD million)**

Item	2009	2010	2011	2012	2013-2015	2016-2020
<b>Infrastructure:</b>						
Track replacement	-	100	-	43	71	22
Track repair	813	292	926	574	943	287
Other infrastructure (bridges etc.)	3,525	4,295	3,766	3,216	5,282	1,608
Stations (including station track)	407	527	441	430	707	215
Other buildings and equipment (locomotive and wagon depots etc.)	3,525	1,216	1,910	1,099	1,805	549
Signaling and communications	1,356	988	2,446	1,161	1,908	581
Electric power facilities	3,931	4,444	4,915	5,339	8,771	2,670
<b>Sub-Total</b>	<b>13,557</b>	<b>11,862</b>	<b>14,404</b>	<b>11,862</b>	<b>19,487</b>	<b>5,932</b>
<b>Rolling stock:</b>						
Electric locomotives		685			343	
Diesel shunters				212	1,480	
EMUs		208	139	69	69	69
Wagons		143	117	365	1,294	1,523
Coaches	508				111	885
<b>Sub-Total</b>	<b>508</b>	<b>1,036</b>	<b>256</b>	<b>646</b>	<b>3,297</b>	<b>2,477</b>
<b>Total (AMD million)</b>	<b>14,065</b>	<b>12,898</b>	<b>14,660</b>	<b>12,508</b>	<b>22,784</b>	<b>8,409</b>
<b>Total (\$ million)</b>	<b>46.6</b>	<b>42.7</b>	<b>48.5</b>	<b>41.4</b>	<b>75.4</b>	<b>27.8</b>

AMD = Armenian Dram.

Source: South Caucasian Railways

195. **Non-concession Projects.** These projects are also planned, which would need to be funded by the Government or IFIs (Appendix 2). These include three new lines. To financially justify construction based on freight traffic potential will be very difficult, although

the economic and security benefits could be significant, especially with borders closed (Annex 7).

196. The largest proposed project is a new Gavar-Iran railway (a Government commitment) at an estimated cost of \$1.33 billion. This has, however, serious risks – it would not be financially or economically viable, its rationale is entirely strategic. Reopening of the Azerbaijan borders would make it redundant – the closed line through Nakhijevan is more economic to operate as it does not pass through mountainous terrain. The project can likely only proceed if largely financed by grants.

197. A modern intermodal terminal and distribution center would cost about \$10 million. Where it would be located and when constructed depends on the geopolitical situation: the options are Yerevan or Gyumri. This will be considered by the TACIS study. Funding will either be by SCR, the airport concessionaire, another company, or possibly by freight forwarders.

## **5.5 Monitoring the Concession**

198. **Railway Monitoring Agency.** To monitor SCR, a Railway Monitoring Agency (RMA) within MOTC is being set up under a new Railway Law and an existing agency, the Public Service Regulatory Commission (PSRC), will be given additional responsibilities. Monitoring is a new role for Government and there is little knowledge and experience to undertake it. SCR may not be financially self-supporting and, in addition to monitoring, it is critical that these Government agencies take a proactive approach to traffic development to maximize economic benefits. RMA needs to be staffed with people with the necessary expertise. These functions include: infrastructure condition assessment, safety inspections, tariff review, setting access charges, passenger service requirement and financial review. Technical assistance and training is essential to develop an effective organization.

199. Safety will be a primary RMA concern. SCR is a commercial organization and will seek to minimize maintenance cost through risk management. Inspection to ensure adherence to minimum safety standards will be necessary, with appropriate responses imposed should it not meet these standards. RMA must have the capability to investigate accidents and assign responsibility.

200. RMA will review the SCR accounts and needs the necessary accounting skills. SCR is to pay a royalty based on gross revenue, not profit, but the RMA should ensure that sustainable maintenance of assets is in place.

201. RMA should independently assess the economic benefits that would be generated by additional rail traffic to determine the need to subsidize new lines or sidings, or for the Government to sponsor such industrial development.

202. The Public Service Regulatory Commission (PSRC) is required to set access charges for train operation by companies other than SCR. To determine that charges cover all the relevant costs is a very complex task requiring specialized knowledge. This knowledge should be developed within the RMA which should then provide it to the PSRC, when required.

203. SCR is facing many problems and it is important that the Government through the RMA and the PRSC acts in a cooperative and constructive manner to increase the chance of its success.

204. **RMA Task/Skill Requirements:**

- (i) detailed knowledge of railway maintenance, operations, accounting, safety, and marketing;
- (ii) transport and social economics;
- (iii) reviewing railway's financial performance;
- (iv) understanding of international agreements;
- (v) develop appropriate track access charges;
- (vi) authority to hire, with funding, appropriate expertise, (may have to be foreign) to ensure expertise and independence;
- (vii) analysis of accidents;
- (viii) safety standards for infrastructure, locomotives and rolling stock;
- (ix) organization of emergency response;
- (x) determining the role of passenger services;
- (xi) proactive role in creating new business for the railway;
- (xii) appeal authority for monopoly tariffs; and
- (xiii) infrastructure costing.

205. **RMA and Other Training.** This is required to support RMA development and in logistics and marketing to develop rail traffic. RMA staffing and training is of critical importance to the future of the railway. A comprehensive staff development and training program is necessary. The role of the RMA needs to be clearly defined (Annex 8). A consultant should be retained to undertake a workshop to define the RMA role and to develop terms of reference for a training program (one month estimated cost \$30,000, including expenses). Investment in training should be undertaken as soon as possible. The estimated cost of the training program is \$1.2 million, depending on the knowledge level of monitoring agency staff.

206. **SCR Restructuring.** This is necessary for it to be effective and financially viable. SCR also requires substantial investment to renovate and update the infrastructure and to modernize the rolling stock fleet. Investment committed under the concession Agreement is considered sufficient for these purposes.

207. **Government Objectives.** The primary Government objectives should be to (i) support the concessionaire; (ii) support the freight forwarding industry; (iii) set up a proactive railway monitoring agency; and (iv) train staff in marketing and logistics. Access to markets and particularly access to the sea is critical for a landlocked country. Providing efficient long distance transport should be the primary objective for rail. Unfortunately this is subject to the severe current (and possibly continuing) geopolitical constraints.

## 5.6 Concession and Non-Concession Investment

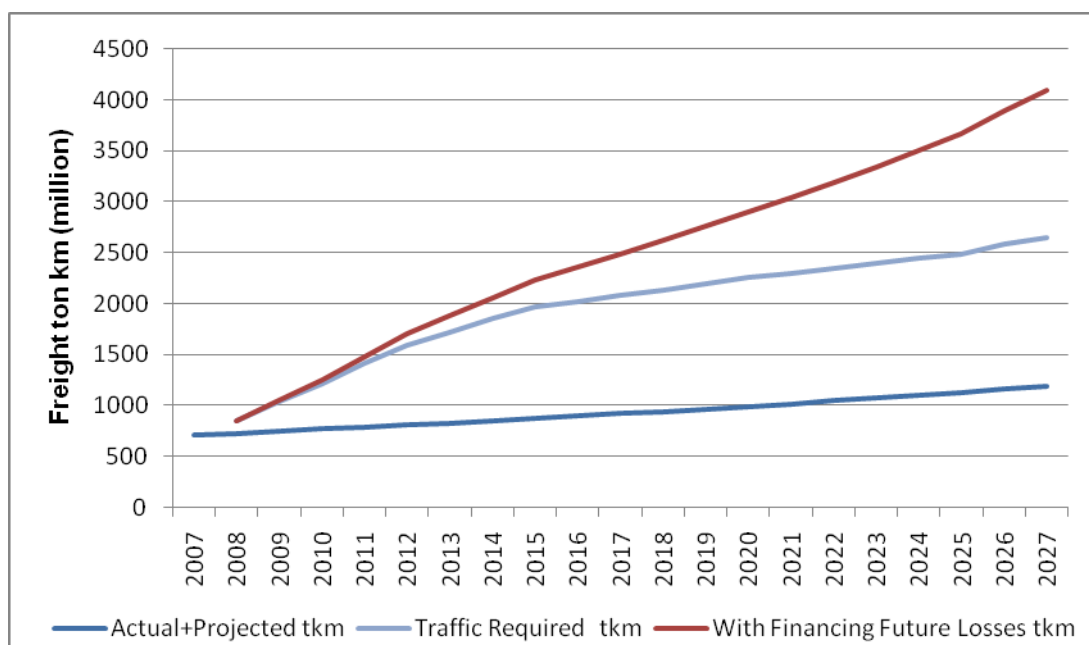
208. **Concession Commitment.** SCR is committed to investing \$572 million over 28 years. Over the next 20 years about 82% will be for infrastructure, electrification, signaling and communications, with 18% for locomotives and other rolling stock, a relatively low share for the latter, because of the availability of second hand equipment. The contracted investment is unlikely to generate revenue close to covering expenditure. Therefore the goal and objectives are to develop a cooperative relationship between Government and SCR to ensure success of the concession. As a fundamental component of this cooperation is the need to develop modern logistics practices, and to develop industries and markets that could benefit from availability of the railway, and in so doing, to create agriculture and industrial employment. A cost effective and modern railway would also reduce the cost of critical imported goods such as fuel and grain, and so benefit the population as a whole.

209. **Yerevan-Poti.** International traffic is predominantly to the port of Poti in Georgia. The first priority is to complete the bridge reconstruction program on this line – at least four bridges are in deteriorated condition. The World Bank may finance reconstruction (\$20 million). A TACIS study (programmed for 2009) is to develop a line rehabilitation program.

210. There are two route options for a new line to reduce the rail distance Yerevan-Poti: (i) Fioletovo-Vanadzor (47 km - \$90 million) and (ii) Gyumri-Bagdanovka (80 km, including 21 km in Georgia - \$140 million). The former project is included in PRSP-2. These projects are outside the Concession Agreement investment and either would need international financial support. A new route would reduce operating costs and improve rail's competitive position, but would generate insufficient revenue to service the investment.

211. **Financing Concession Commitments.** The additional traffic required to finance investment is compared with likely traffic growth in Figure 5-1 (the additional traffic to finance the accumulating losses is also shown).

**Figure 5-1: Freight Traffic Growth to Finance Concession Investment**



Sources: SCR, Russian Federation Central Bank, HWTSK Report, Concession Agreement.

Assumptions for Fig.5-1 are:

(i) In 2007 the railway basically broke even, with little or no provision for depreciation, replacement, and/or investment. Future investment will need to be covered by increased revenue or reduced operating costs.

(ii) Infrastructure is depreciated (capital recovery) over 30 years and locomotives and rolling stock over 25.

(iii) Since the railway is unlikely to generate sufficient revenue to cover its investment, capital will be borrowed at an annual interest rate of 4.5%.

(iv) To maintain or improve market share the revenue per ton km will decline by 1% per year.

(v) Based on the *Armenian Railway Restructuring Project* (HWTSK report, World Bank, October 2005) the most likely growth rate in ton km is 2.6% per year.

(vi) Passenger service losses are ignored.

(vii) Of the additional freight traffic required to cover the capital recovery, 60% of the associated revenue will be required to cover operating, running, maintenance and overhead cost, and 40% would be available to pay for capital recovery of investment and debt financing.

(viii) Borders currently closed remain so.

(ix) No major restructuring of the rail network, labor force and operations.

(x) Accumulated losses financed at 4.5% interest.

(xi) Impact of any new lines ignored.

212. Without major restructuring, the annual loss by 2020 will be about \$20 million (with an additional \$9 million to cover debt financing). Cumulative loss by 2020 would be about \$200 million. For SCR to be reasonably financially viable and profitable after 2020, annual traffic growth of 15% is required. Such growth is only possible with opening of both borders and significant transit traffic.

213. SCR has scope to restructure, reducing the network to financially viable routes and significantly improving labor and equipment utilization and efficiency, operating with the efficiency of a short line US railway. The appropriate strategy for SCR is to increase freight revenue through the development of rail-based industry, through improved service and via a major reduction in operating costs. Development of intermodal services should be the primary target.

214. It is to be noted that the HWTSK study determined that financial viability would be achievable with a 2.6% annual growth in freight traffic and restructuring, but with an investment program about half that required under the concession.

## 5.7 Freight Services

(Freight traffic potential is reviewed in Annex 6.)

215. **Rail Objective.** The objective is to develop traffic to support the asset base. For low volumes, road transport is more cost effective. Railways are ideal for handling large volumes of basic bulk traffic at low cost, but there is little opportunity to develop such traffic. Armenia is a small country with a relatively low population density, except around Yerevan. Most of the industry that existed at independence no longer does. The majority of local production was before independence destined for other areas of the former USSR, long distance, bulk hauls.

216. **Loss of Traffic Potential.** Since independence, competition and transport problems, exacerbated by the closing of international borders, have resulted in the loss of most of the export market. Prior to independence one canning factory was producing 30,000 tons of canned and bottled fruit and vegetables annually for the former USSR market. It now produces 1,000 tons, the majority for the domestic market. Armenia could export large amounts of fruit and vegetables, but it has not been able to find markets.

217. The railway used to play a major role, with half of its traffic in transit between Azerbaijan and Iran onward to central regions of the former USSR. At one point, 10 60-wagon trains a day used the southern line to Iran. Former USSR central planners located a substantial amount of heavy industry in Armenia. There is now little domestic freight and it may be difficult to justify the continued existence of some lines. With new, competing lines under construction in Georgia and Iran, transit traffic may never be recovered.

218. Agriculture and manufacturing generate only a limited amount of suitable freight. The Government needs to take a pro-active role in creating new business, forming cooperatives (particularly in the agriculture sector), to exploit rail strengths. The size of the population limits import requirements to volumes marginal for rail.

219. **Heavy Haul.** Some industries are rail-dependent and pay a high enough tariff to ensure that the railway is financially viable. There are currently few industries or import/export traffic volumes that justify significant capital expenditure. Exports of polished stone, marble and cement, grain and oil imports depend on the railway, however, on a strictly financial basis, volumes do not justify its continued existence.

220. In 2007, freight traffic was only 3 million tons. Of 1.6 million tons of imports, only four commodities: grain, oil, sugar and steel are carried in rail significant volumes. For domestic traffic of 0.8 million tons, only three are significant: sand (65% of total), cement and stone (Table 5-2). For exports, cement, stone and copper concentrate accounted for 76%.

**Table 5-2: Rail Freight Traffic 2007**

Commodity	Tons '000				Ton km million	Haul Km	Revenue AMD million	Revenue/ tkm AMD
	Import	Local	Export	Total				
Grain	480.9	5.0	0.0	485.9	128.6	264.7	2,034	15.8
Semi Processed metals	2.8	32.9	76.2	111.9	29.9	267.2	288	9.6
Petroleum Products	354.9	1.6	0.0	356.5	100.5	281.9	1,506	15
Building Material-Sand	10.9	520.8	21.9	553.6	45.7	82.6	483	10.6
Raw Materials Non- Metallic	18.1	68.2	116.5	202.9	51.5	253.8	511	9.9
Cement	0.2	50.1	331.2	381.3	112.8	295.8	992	8.8
Other	669.4	72.6	159.3	901.3	246	272.9	3,881	15.8
<b>Total</b>	<b>1,537.2</b>	<b>751.2</b>	<b>705.0</b>	<b>2,993.4</b>	<b>715</b>	<b>238.9</b>	<b>9,695</b>	<b>13.6</b>

AMD = Armenian Dram

Source: South Caucasian Railways

221. **Intermodal Terminals.** In the Yerevan area there are four rail-served terminals. One is owned by a closed joint stock company owned by MOTC and the other three are privately owned. The MOTC terminal was considered for privatization, but there is now indication that a 50% ownership will be purchased by RZD. There is significant congestion in the private terminals, due to the time required for customs clearance and the fact that the terminals were not specifically designed to handle containers. Arrival of a container in Yerevan to delivery to the shipper can take two to three days, instead of two or three hours.

222. Today it is the freight forwarders and the trucking companies that usually sell transport services and they are the customers of the intermodal services provided by a railway. If the railway is also involved in selling (retailing) these services, it is not possible for the railway to remain neutral when it comes to handling its competitor's containers. It is, therefore, common practice for either a railway not to retail intermodal services or to arrange for a neutral operator to own and/or manage the intermodal terminal.

223. The area around Zvartnots airport has been concessioned to the airport operator for the purposes of constructing a large intermodal handling facility and a distribution center. The land already has a rail connection.

224. Import freight is generally four times that of export for all modes, including air. In addition, as a result of the construction boom, there are an abnormally high proportion of import 20' containers that exceed maximum permissible highway loading weight limits, dictating transport by rail.

225. **Container Trains.** Conventional wagons and services require that the wagons be handled individually and wagons are subject to high impacts. Switching the individual wagons between trains is an expensive and time consuming process. To avoid damage to many types of freight it is necessary to either use expensive packaging or specialized wagons. To minimize switching delays it is usual to operate a unit or block train between origin and destination, but this requires train load volumes. An intermodal block train



overcomes the problems of conventional wagon operation. A fixed block of wagons is used in the form of a shuttle operation, and wagons are moved whether they are loaded or empty. This is possible because, if well designed, the tare weight of the wagons is low and, therefore, the transport cost on an empty wagon is low. Intermodal block trains are not shunted, reducing damage.

226. **Marketing.** In the former USSR, central planning dictated plant location, with little consideration of transport costs. For distances over 200km, rail had to be used, where available. The result was a railway that transported 48% of the world's railway tkm in a country that only had 5% of the world population. Its transport intensity (tkm/\$GDP) was about eight times that of a similar sized western country.

227. In the absence of competition, marketing was not necessary. Today, not only does SCR have to market its services, it has to understand the shipper's logistics chain and provide a service competitive with other modes. Russian Federation, with its long distances and high volumes, has been able to transition by allowing open access to its tracks. High volumes (and high value) long distance shippers have purchased new, or leased, RZD rolling stock, and are shipping train loads of freight under open access agreements. To date they have little traffic that requires marketing, especially for limited quantity or short distance shipments. Because of the open access agreements, RZD itself is left with low value products, such as coal and stone.

228. The planned focus on developing information technology, tourism and financial services will generate little, if any, new rail traffic. Efforts of the Government, NGOs, and various foundations to develop rail suitable exports are limited. Without significant improvements in technology and marketing to make the railway an integral component of a logistics chain for local industry, it will eventually need to be subsidized, even for freight. Strategy is to support industries that can make use of the railway, and to assist both the railway and the Government to ensure that the railway is an integral part of an improved logistics chain.

229. The need for railways to extensively market their services has evolved, internationally into the concept of the wholesale and retail railways. The retail railway works closely with the shipper or manufacturer to develop a service that meets their logistics chain requirements. This can be an expensive process and is often undertaken by a small railway with low overhead and close personal relationship between senior management's of the railway and shippers. The shipment is then handed over to a 'wholesale' railway that transports large volumes over long distance at low cost. RZD would be considered a wholesale railway, while SCR must be considered a retail railway.

230. SCR must create a retail railway operation to be successful. It is not known whether personnel with the necessary knowledge and experience are available in Armenia or from the concessionaire. The professional study of marketing or business development is new. While taught in universities, the concepts are undeveloped within the railway. (Such concepts take 10-15 years to fully develop in an organization.)

231. Armenian Railways, especially with the problems of border closures, failed to create the necessary marketing expertise. Marketing SCR transport services will be especially difficult for many reasons:

- (i) domestic haul distances are short. Removal of the border restrictions will permit longer distances, but then the majority of the revenue will go to a foreign railway;

- (ii) the population is 3 million and generates only a limited amount of production and consumption. Whether the volumes require rail transport is questionable. There are limited number minerals that could be exported, but again the distances are short;
- (iii) the primary SCR route to the Black Sea is a distance of 630km. By road the distances can be significantly shorter. Road improvements are expected to make the ports about 12 hours by road. By rail it can currently take 6 to 10 days. It will require a significant investment by Georgian Railways to make the distance competitive. Even then the likely traffic volumes will be such that the train frequency may be one per day. That will result in an average wait of 12 hours;
- (iv) given opening of the Turkish border, a major share of the international traffic will make use of the Mediterranean ports. Given the problem of the gauge change at the border, it is almost certain that container traffic will use an intermodal terminal at the border with little, if any, of the Armenian containers going by rail to this terminal;
- (v) even with the opening of the borders, there will be little traffic in train load volumes. As an illustration, grain used to be imported in train load volumes from the Ukraine. Today much of the grain comes from Canada in a diversity of types, thus promoting the use of containers; and
- (vi) the emphasis of manufacturing is on high value products, with low transport costs. These tend not to be railway orientated. It is likely that most that could be shipped by rail require a service specifically designed for the product.

232. SCR and its parent company have limited experience of what is required to make a financial success of what is essentially a short line railway. In addition, few in agriculture, manufacturing, or the freight forwarding industry have the necessary knowledge of how rail services can be updated to promote their businesses.

233. The railway marketing manager today must understand the potential shipper's entire production process, from raw material to customers' requirements. This understanding ranges from types of raw materials, volume, seasonal variations, packaging requirements, the likelihood of theft and damage, to the type of shipping docks the customers have. It is only through such knowledge that the railway can play a proactive role and participate in the logistics chain. A proactive approach is critical for SCR with a very aggressive market development program. It is equally important to aggressively market Armenian industry as a whole, to develop exports. Strategy includes technical assistance and training for this purpose (Annex 9).

234. **Tariff Structure.** After independence, a standard CIS freight tariff of 2.4 US cents/tkm was applied, plus insurance and premiums for hazardous materials. In 1999 the railway, on a macro basis, determined operating cost per tkm to be AMD10.2 /tkm and the standard tariff was set at AMD11/tkm, then equivalent to 2.4 cents, but today equivalent to 3.6 cents/tkm (if PPP is applied, this is one of the most expensive tariffs in the world). Freight forwarders commented that rail is more expensive than road. In 2007 the average tariff was AMD13.6 /tkm.

235. Former USSR railway tariffs were based on averages, with little consideration paid to the tare (empty) weight of the wagon. The result is that there has been little attempt to increase axle loads and to lower the tare weight of wagons. For rail to compete with road, it typically has to charge 75% of the road rate.

236. **Wagon Fleet Maintenance.** International and transit traffic requires a comprehensive system of wagon fleet management. The requirements include agreed standards for wagon design, maintenance, and repair, multi-railway billing procedures for use of wagons and repairs, and a central clearing house for payments. In addition, for efficient use of the wagons, a multi railway tracking and wagon assignment system is required. Currently most of these systems do not exist in RZD or between RZD, SCR and Georgia Railways.

237. **Fiber Optic Cable.** The EU has an aid project paid for the installation of a fiber optic cable along the railway right of way of Azerbaijan, Georgia and Armenia, with connections to Russian Federation and under the Black Sea to Bulgaria. The cable in Armenia is controlled by the railway. According to an Armenian internet communications expert, it is only used by the railway and only 20% of capacity (at most) is used.

## 5.8 Passenger Services

238. **Social Service.** Prior to independence there was little private passenger transport and intercity bus services were only available where there was no railway service. Increased car ownership and expanded bus services have had a major impact on rail passenger traffic. Despite the introduction of refurbished RDZ EMUs, a significant increase in ridership from the current 700,000 per year is unlikely. Politically there is a demand to continue passenger services at subsidized fares; however, consideration should be given to the cost to SCR and the country. The concession agreement permits a passenger subsidy to be deducted from the 2% of gross revenue paid to the Government, to cover 10% of the losses, rising to a maximum of 30% by 2015. There is no provision for capital subsidy. Only one route has sufficient traffic to warrant a frequent passenger service: Yerevan - Gyumri – Vanadzor.

239. **Passenger Services Study.** Commuter service into Yerevan is a possibility, but the rail routes and the central station location are not ideal. A comprehensive study should be made of market demand for rail passenger services (local and intercity) and of the full cost of provision to develop a long term plan.

240. **Intercity Market Share.** In developed countries this is under 12%, with the exception of Japan, where it is 28%. Switzerland, with a share of 12%, is in some respects similar to Armenia: both countries are mountainous, but there are significant differences:

- (i) the population density is almost twice that of Armenia;
- (ii) there are a number of major cities, between which there is extensive travel;
- (iii) Switzerland has about four times the route km, per unit area, the network is essentially an urban railway; and
- (iv) Switzerland is a major transit country.

241. The Yerevan area has 34% of the national population, there are only four other cities with a population of over 50,000. It is extremely unlikely that the rail intercity market share will exceed 3%. For Yerevan-Gyumri, the travel time by road is 2.25 hours and by train 3.5 hours: the rail route is 25% longer and does not pass through any sizable towns. The Yerevan-Gyumri road is part of the north-south corridor, likely to be upgraded to a 4-lane limited access highway, reducing the intercity bus time to about 1.25 hours.

242. Retaining intercity passenger trains will require a significant operating subsidy, possibly more than 30% of passenger revenue. Freight will have to subsidize passenger, raising freight tariffs in an already competitive market.

## 6. CIVIL AVIATION

### 6.1 Airports

#### A. Yerevan Zvartnots International Airport

243. Zvartnots International Airport (Yerevan) and Shirak Airport (near Gyumri) are used for civil aviation, while Erebuni is used for military operations. Prior to independence, there were 15 airports. Zvartnots is the primary international airport. It was opened in 1961 and is located 13km from the center of Yerevan. Shirak serves as a regional airport and as an alternate to Zvartnots during short periods when the latter is fogbound.

244. Both Zvartnots and Shirak are operated and maintained by Armenian International Airports (AIA) AIA's concession runs for 30 years, with a right to extend. The concession for Zvartnots commenced in 2001, with full operation from 2003 and was expanded to include Shirak in 2007.

245. Zvartnots has a single 3,850m runway capable of accommodating International Civil Aviation Organization (ICAO) Code 4E aircraft, such as B747-400, A340 and IL-96. The airport is equipped with lighting and navigational equipment to operate to Cat II Instrument Landing System (ILS) criteria. This provides adequate operational conditions for approximately 345 days per year. In winter, Zvartnots experiences on average 20 days of fog.

246. Currently 34 airlines fly from Zvartnots to more than 60 cities, including London, Frankfurt, Vienna, Dubai, Munich, Amsterdam, Paris, Beirut, Istanbul, Moscow and Prague. There are 23 daily international flights. Since 2002, Zvartnots has experienced an 11.4% growth from a low of 826,969 passengers to 1.39 million in 2007. Current forecasts expect a reduction in passenger traffic growth to approximately 6.5% per annum until 2013, when traffic volumes are forecast to reach 2 million. Despite the high growth rates experienced from the start of the concession, which is being attributed primarily to latent and pent up demand, AIA have not revised their 30 year traffic forecast of 3 million passengers in 2032. This represents an annual forecast growth in passenger volume 2013-2032 of 2.2%. This is below the regional passenger forecasts issued by organizations such as Boeing and Airbus. Boeing forecast world growth to be 5% up to 2026 and 3.9% for the European and CIS countries, while Airbus forecast the CIS countries in particular to experience 4.3-4.8% growth per annum.

247. Following the signing of the concession agreement, AIA proceeded to rehabilitate the runway, improve the airfield lighting, improved security facilities and, with financial support from EBRD, constructed a new passenger terminal building, opened in 2006. The terminal currently houses all arrivals processing and departure lounges and boarding gates and is designed to accommodate two million passengers per annum at IATA Level of Service 'B'. The second phase of terminal development comprises a new departures hall. The second phase of the terminal development is designed to remove the check-in process from the old terminal building, but will not increase passenger processing capacity.

248. The concessionaire is to invest in a 25,000 square meter (m<sup>2</sup>) terminal development, a three-storey car park for 800 cars, and a fire safety system and security. The Government has approved the program, which is planned to start in 2009. The need resulted from unexpectedly high traffic growth, which required the concessionaire to make changes to the Airport Master Plan approved in 2003. Passenger volume had increased by 0.5 million from 2003 to 1.4 million in 2007, a figure initially expected by 2015. Terminal investment will be financed out of operating profit. The number of check-in counters will increase from 12 to 42.

Terminal capacity will be 3,500 passengers per hour and comply with international standards of technical equipment and service level.

249. Runway capacity has been identified by the air navigation provider Armenian Air Traffic Service (ARMATS) as being 15 aircraft movements per hour for Runway 09 and 5 movements per hour for Runway 27. Runway capacity is normally highly dependant on the peaking characteristics of aircraft demand, as well as aircraft mix, airport infrastructure design, and the aerodrome obstacle environment; however the typical runway capacity for a single runway operating under instrument conditions should be in the order of 40 movements per hour. Therefore, the runway capacity identified by ARMATS is very low. Although not currently critical, investigation of the runway capacity is going to be important as aircraft demand increases. Extension of the parallel taxiway and the addition of properly located high speed exits would enable Zvartnots to increase its runway capacity.

250. Runway 09 is equipped with a CAT II ILS approach and is the preferred landing runway whereas instrument approaches for Runway 27 using the VOR/DME ZVR and NDB 496 ER are available. Runway 27 is the preferred departure runway. Instrument arrivals on Runway 27 are brought in over the VOR/DME on a heading of 085 degrees over the runway, then directed to circle back over the NDB for a final approach. This means an aircraft would be heading for Runway 09 but rather than land, turn back to land in the reciprocal direction. Therefore, it is not possible to have both departure and arrival instrument operations occurring at the same time. In addition, this does not permit multiple arrivals to be brought in with minimal separations as the possibility of a missed approach would result in two aircraft in the same piece of airspace heading directly at each other. The reasons for the instrument approach for Runway 27 being designed in this manner is not clear but may be a result of a 2000ft tower to the East of the airfield and/or noise abatement issues over the city. The published noise abatement procedures and the published Standard Instrument Departure (SID) routings restrict flights over the city from Runway 09. The combined effect of the Noise Abatement, obstacle environment and published SIDs and Standard Arrival Routes (STAR) limit the runway to approaches on Runway 09 and departures on Runway 27. Operations of this type will restrict capacity levels for the airport in the long term. Therefore, if aircraft demand increases, conceptual planning for a new airport capacity or even a new airport will be required. Such planning should be initiated 10 to 12 years prior to that capacity being needed.

## **B. Gyumri Shirak Airport**

251. Gyumri Shirak Airport is a regional airport serving destinations such as Moscow, Rostov-on-Don, Sochi, Ekaterinburg and Krasnodar. Originally constructed in 1961, it became part of the AIA concession in 2007.

252. The airport has a single runway of 3,220m with a CAT 1 ILS instrument landing system and lighting. As the only other civil airport, it is the primary alternate aerodrome for Zvartnots.

253. Shirak Airport has limited flight demand primarily due to the repressed economy of the region as a result of independence and the lingering effects of the 1988 earthquake. In 2007, it handled 46,000 passengers. Passenger demand is not expected to grow considerably as facilities are limited, the geographic catchment area is small and with improved roads, it will be in direct competition with Zvartnots. Despite the same operator at the two airports, it will be difficult for AIA to attract carriers to operate from Gyumri providing either lower fares than Zvartnots or better convenience for passengers. AIA is currently trying to attract Charter operations and Low Cost Carriers to fly to Gyumri.

254. Considerable work has been carried out at the airport following AIA taking over as the airport operator in 2007 including: (i) navigational equipment upgrades; (ii) reconstructed runway structure and runway overlay; (iii) new approach and runway lighting; and (iv) additional check-in counter in the passenger terminal. Further work is being considered to build a new passenger terminal. The existing passenger terminal is old and only capable of accommodating one aircraft at a time. When multiple flights arrive, it is not possible to separate arrival and departure passenger flows or to accommodate larger passenger numbers.

255. The airport is currently serving aircraft that fall into the ICAO Code 4C such as the B737, A320 and TU-154. However, the airport is able to accommodate larger aircraft ICAO Code 4D aircraft. The narrow runway strip (165m), however, should limit aircraft size to either Code 1 or 2 aircraft, or be designated as a non-instrument runway. To permit instrument operations, as are currently being conducted, the runway strip must be widened to 300m as required by ICAO Annex 14. This means that the airport may not currently be in compliance with ICAO Standards and Recommended Practices for the type of aircraft using the airport due to the narrow runway strip.

### **C. Erebuni Airport**

256. Erebuni is the third operating airport, located approximately 3km from Zvartnots. This airport is primarily a military airport, but is available for civil traffic. Passenger services must operate from Zvartnots as a condition of the concession agreement with AIA. Therefore, the only civil traffic that can operate at Erebuni is helicopter services and general aviation.

### **D. Other Airports**

257. In addition to Zvartnots, Shirak, and Erebuni airports, there are nine other airports. Currently, none of these is operational. All of the airports would require considerable investment to be brought up to the standards of the GDCA or ICAO. As the country is, geographically, quite small, air services from these airports may not be viable, particularly when the condition of the roads improves. Stepanavan would require the least amount of investment to enable it to reach the standards necessary for civil aviation certification. However, Stepanavan is only 28 nautical miles from Shirak Airport and 54 nautical miles from Zvartnots and, therefore, it is unlikely that commercial domestic services would be viable. The primary use of the airfield would therefore be for general aviation.

## **6.2 Armenian Air Traffic Service (ARMATS)**

258. Air navigation services are provided by ARMATS, a state owned company, separate from the General Department of Aviation (GDCA), to operate the air traffic control and air navigation services for civil aviation. This arrangement ensures that ARMATS is independent of Government, but is still responsible to, and regulated by, GDCA, resulting in a clear separation of regulation and operation.

259. ARMATS provides approach control to both Zvartnots and Shirak from the ARMATS facility at Zvartnots. Aerodrome control is provided from the Avia Training Center (ATC) Towers at Zvartnots, and Gyumri Airports, and when needed at Erebuni Airport as well. Area control is provided from the Area Control Facility at Zvartnots Airport.

260. Despite having a small Flight Information Region (FIR), ARMATS earns 55% of its revenue from overflights. This is, in part, due to the competitive enroute navigation charges compared to neighboring countries. With growing traffic from East Asia, Central Asia and South East Asia and Europe, ARMATS is in a good position to increase revenue.

261. ARMATS operates two VOR/DME stations, one at Zvartnots Airport (ZVR) and one at Shirak Airport (GRM). ARMATS also operates a number of NDBs. Over the next 2-3 years, ARMATS will phase out all NDBs and replace them with DME systems. Implementation of satellite communications and navigation with CNS/ATM will require new equipment.

### 6.3 Armavia and Other Carriers

262. The companies licensed for flight operations are

- |                                  |                            |
|----------------------------------|----------------------------|
| 1. Armavia Air Company LLC       | 8. Blue Airways LLC        |
| 2. Atlantis European Airways LLC | 9. Miapet-Avia LLC         |
| 3. South Airlines LLC            | 10. Click Airways Intl LLC |
| 4. Hayk Avia Air Company CJSC    | 11. Mega Airlines CJSC     |
| 5. Air Armenia CJSC              | 12. Taron-Avia LLC         |
| 6. Arm-Aero CJSC                 | 13. Vertir LLC             |
| 7. Fenics Avia LLC               | 14. Air Haynesses LLC      |

263. Prior to independence, the then state carrier Armenian Airlines carried almost three million passengers annually, encouraged by the former USSR's low fares policy. It was founded in 1996 by the Armenian organizations Aviafin Ltd and Mika Armenia Trading Ltd. and sold to Russian Federation-owned Siberian Airlines in 2003. Subsequently, an Armenian company purchased the majority of the shares.

264. Under an investment agreement, Armavia Air Company LLC has the exclusive right for 10 years (until 2013) to all domestic traffic and to international traffic by an Armenian carrier. In exchange, Armavia took on the burden of paying off the debt left by the defunct Armenian Airlines and of serving destinations requested by Government, cross-subsidizing loss making routes.

265. A major expansion of the route network is planned, with flights to the People's Republic of China, the US, the UK, India, Italy and Spain. Armavia, prior to the international recession, was planning to double passenger volume by 2010, exploiting Yerevan's location as a hub for transit traffic. Armavia carried 456,000 passengers in 2006 and 573,000 in 2007. For January-September 2008, traffic was 13% higher than for the corresponding period of 2007.

266. The Armavia fleet is nine: two A320, two A319, one B737-300, one CRJ-300, one Yak 42, one Tu-134 and one Il-86. Delivery of A320 and A319 is scheduled together with two Ski Superjet 100s. Also on order is an A340-500 for the Yerevan – Los Angeles route, to start in 2011. On delivery of the A320 and A319, the B737, CRJ and Yak currently on wet-lease will be returned.

267. Freight volume is very low because of high operating cost. Recently, Armavia changed its services and tariffs to improve the freight business. The major air cargoes comprise agricultural products, fish, dried fruit and brandy.

268. The World Bank's Poverty Reduction Support Credit includes policy reforms for civil aviation: policy liberalization and simplified procedures to improve air services. These are generally accepted by the Government, where they do not conflict with commercial agreements. The Government is pursuing an open skies policy on a step-by-step basis, with an agreement with the USA expected to be concluded soon. However, Armavia the carrier is in general opposed to the open skies approach, which it considers places it at a commercial disadvantage.

#### 6.4 Avia Training Center

269. The Avia Training Center was founded more than 60 years ago and has been a college for the last 4 years. As a government educational institute, it falls under the jurisdiction of the Ministry of Education, but also under GDCA, as it is involved in the training of aviation personnel. There are 19 teaching staff covering the following:

- (i) Commercial Pilots – *ab initio* up to Commercial Pilot
- (ii) A-319, A-320 cabin attendants
- (iii) Air traffic controllers
- (iv) Aviation Security Personnel
- (v) Check-in personnel
- (vi) Air Travel agents
- (vii) Maintenance Staff (first year offered)
- (viii) English for aviation specialists

270. The Center usually accommodates 14 students in the ATC program and six in the Commercial Pilot program each year. The Government funds five places for the Commercial Pilot program. The campus is at the east end of Zvartnots airport, near the cargo terminal. Two Diamond Katana light training aircraft are to be provided by the Government, one of which is on order. The CJSC ensures the funding sources of the company's development itself.

271. The Center would like to further improve training programs, as funding permits, particularly the Commercial Pilot program. The Center needs more light aircraft, as well as aircraft simulators and cabin training facilities. The Center director has identified the need for a short study of the facility and requirements for its development. This proposal remains to be funded.



## 7. URBAN TRANSPORT

### 7.1 Yerevan

272. Yerevan (founded 28 years before Rome) has an area of 260 square kilometer (km<sup>2</sup>), extending 18km north-south and 16km east-west. It is at an altitude of 865-1390m, with the center and south of the city at the lower levels. It is a Province. Yerevan's economic dominance is increasing. Rapid development has resulted in: (i) growing car ownership and increasing congestion; (ii) outdated public transport; (iii) more safety issues; and (iv) air quality impact of vehicle emissions. Key issues include: addressing congestion and parking, integrating public transport and improving service quality, and mitigating transport costs.

273. Urban transport strategy must accommodate, and if necessary control, demand to increase operating efficiency. (Strategy for other cities is to stimulate their economic development.) Infrastructure and service provision needs to keep pace with mobility requirements, while supporting efficient city planning, including high quality central area transit. Other issues include:

- (i) addressing high rich-poor inequalities;
- (ii) providing for trips generated by new commercial/residential developments in the city center, with a more concentrated CBD;
- (iii) overcoming natural (topographic) barriers, which limit connectivity and ring road and bypass development;
- (iv) addressing unequal distribution of the network among districts;
- (v) efficient use of the street network;
- (vi) reversing declining public transport use; and
- (vii) regulating and rationalizing minibus services.

274. A detailed Yerevan 2020 physical plan was prepared in 2004, including the transport network. A *Yerevan Urban Transport Study* was carried out in 2002-2004 (SWECO International, March 2005) as part of the World Bank *Transport Project*. An EMME2 model was calibrated and used for scenario testing. A *Policy Development of Yerevan Public Transport* paper was prepared 2005-2006 (under Open Society Institute/Local Government and Public Service Reform Initiative grant).

275. The *Assistance to Yerevan Municipality for Passenger Transport* study 2007-2008 updated the EMME2/3 model with traffic counts in late-2007 and used it as a database for a Transcad model. This model will be transferred to YerevanTrans for further development. This study is assisting in the development of the World Bank's *Yerevan Urban Transport Project* (YUTP). Technical Reports issued are detailed in the reference section, including a proposed reshaping of the bus/minibus network into an express/feeder system. Three routes for bus rapid transit (BRT) have been defined.

276. YUTP is planned as a two-phase project, 2009-2011: Phase 1 to include traffic signals at 150-200 intersections and assistance in rationalizing car parking. Phase 2, contingent on the establishment of a financial authority for urban transport, to include one BRT line to serve the northern suburbs, with improved bus/metro interchange.

### 7.2 Transport Corridors/Road Network

277. The central area network is a rectangular grid, with radials to the suburbs. Peripherals connect some suburbs, but topography limits connectivity. There is no functioning bypass:

the eastern bypass (M-15) is impassable due to landslides. North-south and inter-suburban traffic has to transit the city center.

278. Khanjian St. east of the city center is being upgraded with three underpasses and a new east-west link is under construction north of the center, partially on an abandoned railway line. These will provide some relief to the central area.

279. Four corridors connect with the surrounding region. South, the Artashat highway (M-2) leads to Iran via Mt. Karabagh, Syuniq, Vayots Dzor, Ararat. The Arshakunyats and Bagratunyats arterials connect with this highway.

280. West, the corridor from Isakov's Avenue leads to the Echmiatsin highway (M-5), via the Central Bus Station, Araratyan Customs House Building, the US Embassy, Zvartnots Airport and Argavand. North-east to Sevan (M-4), the route leads to Georgia and Azerbaijan (border closed), via Tavush, Gegharaquniqi and Kotajq. North, the Ashtarak highway (M-1) leads to Georgia via Ashotsq, Shirak, Lori and Aragatsotn.

281. Strategy must limit traffic in the city center by improving inter-district links and by ring road development, providing new axes for urban development by separating local and long distance traffic; and linking suburban areas, isolated by natural barriers, so that inter-suburban trips bypass the city center.

282. While half the workplaces are in Central, Shengavit and Erebuni, nearly two-thirds of the working population lives in northern and north-western areas. Only one fifth of trips, however, are for work and education. Work trips have decreased by 60% since 1987, with a halving of employment.

### **7.3 Public Transport**

283. Public transport is by bus, trolleybus, minibus, and metro. A survey of 62,000 households in 2004 showed a daily trip rate of 2.6/capita, 2.26 million trips (excluding trips by those aged 0-7 and 70+). Of these 31% were walking, 19% private car/taxi and 50% by public transport. For public transport trips, there was an average interchange factor of 1.14, with a total of 1.29 million trips on all modes. Since 2004, the private car/taxi share has increased, possibly to over 25%.

284. Table 7-1 shows the modal split for public transport trips during 2006-2007. There are plans to reshape services over the next few years, replacing many minibuses with medium-sized buses. Forecast public transport trips in 2008 and 2011 (excluding metro) are given in Table 7-2. With estimated daily metro usage of 57,000 in 2008 and 68,000 in 2011, public transport trip volume fell by 19% in 2004-2008 to 1.05 million/day and is forecast to recover slightly to 1.06 million/day by 2011. Including taxi trips as a public transport mode, the fall in share is 10% in 2004-2008.

285. Public transport will have to become more attractive if it is to compete with private car use, by

- (i) improving the quality of minibus, bus and trolleybus services;
- (ii) introducing an integrated ticketing system
- (iii) regenerating the metro;
- (iv) strengthening the financial base of public transport; and
- (v) improving the regulatory framework.

## A. Buses and Minibuses

286. Minibus services are tendered by route, with selection based on quality and price, and 3-4 year concessions are awarded. The tendering process commenced in 2002. The initial operator has usually won the tender for the subsequent franchise. There are 67 operators.

287. The 10-14 seat minibuses offer relatively high frequency and wide coverage. Competitive private sector participation reduces cost. These advantages should be maintained, but with a more integrated network: medium/large buses and trolleybuses on high density corridors, a revitalized metro, and a rationalization of minibus routes, focused on lower density corridors. This would improve traffic flow and reduce congestion at stops. It cannot occur without an integrated ticketing system, to encourage interchange between trunk and feeder routes and modes.

288. During rush-hours, minibuses are full from origin, resulting in congestion up-route and uncomfortable travel. In the city center minibuses can be overloaded throughout the day. A rationalized bus system will improve traffic flow, decrease congestion at stops, and improve safety and the environment.

## B. Metro

289. The metro, which opened in 1981, is constructed to high technical standards - cars have all-powered axles, giving rapid acceleration and a high top speed - and marble-lined stations. It received little funding for about 15 years and was in very poor condition, until 2008 when a special budget of \$3.5 million was allocated for train and station refurbishment. Annual revenue is about \$4 million. Little revenue is obtained from associated activities, such as advertising and property rental. The annual subsidy from the state budget is about \$3 million.

290. Allowing for the deferral of maintenance, revenue may cover less than 50% of sustainable operating cost. Given the high operating cost and need for capital equipment replacement, effort is needed to significantly increase ridership. Metro management has had little exposure to international operating or marketing practices. It needs to be more user-friendly. Some stations should have entrances at both ends of the platform, although the metro cannot finance such investment. There is a need to investigate low cost initiatives to promote ridership, including conversion of little or unused railway routes in the south of the city into a metro service. In addition, the possibility of joint site development with property companies needs to be considered.

291. **Routing.** The single north-south line of 12.1km runs from Barekamutyun-Garegin Nzhdehi Hraparak, with a shuttle service from Shengavit to Charbakh. There are 10 stations, eight underground, at deep level at the northern end. The metro was constructed when people primarily lived to the north side of the city and worked in the industries located to the south. The system was designed for high capacity, with stations designed to handle 5-car trains.

292. **Traffic Volume.** In 1993, traffic volume was 74 million passengers, 281 million passenger kilometers (pkm). This fell to an average of 16 million passengers, 60 million pkm 2001-2005. The fall in ridership resulted from the decline in industry, introduction of minibuses and increasing car ownership. In 2007, traffic increased by 12% to 17.3 million passengers and in the first half of 2008 traffic was up by 20% on 2007. The recovery may be a combination of the impact of refurbishment and of severe traffic congestion in the central area, due to the many road improvement projects currently in progress.

293. The flat fare of AMD50 (unchanged since 2003) is half the minibus fare, but this advantage is offset by access time penalties and a relatively low five-minute or more service interval, double that once operated. All stations are single-ended and with average distance between stations of 1300m, the metro is inconvenient for most journeys. However, it represents the largest single transport investment and every effort should be made to increase traffic. The marginal operating cost of carrying an extra passenger is near zero. Train length was reduced from 4- to 2-car in 2000, requiring only 28 of the 70 car fleet to be in service. Cars are currently being refurbished and it is planned to increase trains to 3-cars from October 2008.

294. **Ambience and Refurbishment.** The ambience is poor: the system appears older than it is. Stations have low visible impact, with little frontage or signage. A staged recovery program should be implemented. This would involve modest short term investment: (i) replacing on-train lighting and refurbishing metro cars (this is in progress); (ii) renovating the architecturally impressive stations, installing modern lighting, possibly through commercial sponsorship; (iii) developing through metro/minibus ticketing to encourage modal interchange; and (iv) re-routing minibuses to encourage interchange.

295. **Medium-term Development:** In the medium term, if these measures prove successful in increasing ridership, major investment should be considered: (i) double-ending of stations where appropriate to improve their accessibility (the first priority being at Yeritasardakan, to provide an entrance at Abovian St./Sayat-Nova Avenue – the estimated cost of this project is \$30 million) and (ii) full refurbishment of 45 cars, at an estimated cost of \$400,000 per car. There are a number of safety concerns, including water seepage and safety of escalators. A World Bank consultant reviewed and prioritized work to address them.

296. The *Yerevan Master Plan* provides for short and long term system development. It proposes the opening of four stations by 2020, with Ajapnyak by 2010. Work on the Barekamutyun-Ajapnyak section (running west across the River Hrazdan) was halted due to lack of funds after 700m of tunnel had been completed. There are also plans for two new routes.

297. The metro is proposing to introduce electronic ticketing. The proposed BRT should have a common ticketing system to promote interchange, which could be extended to other buses.

### C. Bus/Trolleybus/Tram

298. The tram network, 43 route km in 2001, was abandoned in 2005. The trolleybus network was run down from 174 route km in 2001 to 72km in 2005. It is in poor shape, with low service frequency and maintenance problems, although 18 new trolleybuses were acquired in September 2007 and 20 per year are to be added up to 2010. The public bus network (non-minibus) is also in poor shape and is unable to finance fleet renewal and maintenance. There are 190 medium-sized buses, including 50 yellow Bogdan buses of 23-seats. A further 150 medium buses are being purchased in 2008 and a fleet of 750 is expected to be operating by 2011 (Table 7-2). Many of these buses are being used by minibuses operators, purchased from the Municipality with payment over 6 years.

### D. Taxis

299. As of mid-July 2008, 348 taxi companies were licensed to operate nationally (a license permits operation in any area), with 4,850 taxis. Individual operators are not licensed – a proposal for their licensing is to be submitted to the National Assembly later in 2008. The number of taxis plying for hire in Yerevan is not known: estimates range up to 10,000.

300. Most company taxis have radio control via dispatchers. Taximeters are being introduced progressively. The fare is AMD500/600 for 5km, plus AMD100/km.

## 7.4 Other Issues

### A. Parking

301. Growth in car ownership has increased demand for parking, which is mostly on-street, exacerbating congestion. Roadspace is not being used effectively and a parking strategy is necessary. Parking restrictions and payment would use road space more effectively. Short-term paid parking would benefit businesses by increasing turnover and, with some spaces set aside for residential parking, increase property values. The development of park and ride facilities may also be effective, in conjunction with improved public transport. In the medium to long term, road pricing could be introduced in the city center.

### B. Traffic Management and Road Safety

302. Safety is a primary concern, particularly the protection of pedestrians. There is widespread disregard of speed limits and traffic regulations. Traffic signals dangerously indicate simultaneous green phases for pedestrian crossing and left turns. It is necessary to:

- (i) increase the level and effectiveness of enforcement,
- (ii) implement effective and enforced parking measures, and
- (iii) segregate vehicle and pedestrian movements where possible.

303. The Municipality is constructing pedestrian underpasses and YUTP is expected to considerably improve traffic flow and safety.

**Table 7-1: Modal Split**

Mode	Share (2006 %)	Share (May 2007 %)	Ownership
Metro	7.4	7.8	Public
Trolleybus	2.0	2.0	Public
Bus	5.6	7.6	Public/Private
Minibus	85.0	82.6	Private

Source: Advanced Logistics Group. *Assistance to Yerevan Municipality for Passenger Transport: Inception Report*. World Bank, 2007

**Table 7-2: Public Transport by Mode 2008-2011**

Item	Minibus		Bus		Trolleybus		Total	
	2008	2011	2008	2011	2008	2011	2008	2011
Routes (no.)	125	78	47(23)	69	7	10	179(155)	157
Length (km)	3,920	2,421	815	2,246	209	253	4,945	4,920
Vehicles (no.)	2,701	1,185	190	753	50	108	2,941	2,046
Passengers/Day ('000)	832	316	82	518	27	91	990	994

Source: *Yerevan Transport Network Plan 2008-2011* (Draft)

**Table 7-3: Yerevan Public Transport Fleet**

Bus Type	Capacity (Pass.)	Existing	2011	2015	2019
Mini/Micro	14	3,130	1,452	1,150	845
Medium/Large	28	467	921	1,100	1,290
Trolleybus	116	60	120	260	400

<b>Total</b>	-	<b>3,657</b>	<b>2,493</b>	<b>2,510</b>	<b>2,535</b>
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Source: Yerevan Transport Network Plan 2008-2011 (Draft)

## 8. INFORMATION TECHNOLOGY

### 8.1 Application of Information Technology

304. The use of IT and management information systems (MIS) by MOTC is limited and uncoordinated. MOTC does not have a centralized database or an overall MIS. MOTC information is not comprehensive for the transport sector, covering only its direct responsibilities. It does not include data on Yerevan (under municipal responsibility) and on the provinces, or civil aviation. For interstate roads there is a Microsoft Access database (in Armenian) of road condition and facilities. At 10 locations on six interstate roads 28 automatic traffic counters have been installed (German SMART counters). The data, however, has to be manually extracted and is not linked to MOTC computers. It is stored in an Excel spreadsheet. MOTC has since 2005 maintained an Excel database of traffic accidents, but this is limited to republican roads. There is also an Excel database of freight and passenger traffic by interstate and republican roads. There is an Excel database of information related to technical examinations, which covers the entire country. ARD has a database of HDM-4 analyzes for road feasibility studies. All the databases are single station, for the use of relevant departments only. They are not connected to servers.

### 8.2 Transport Websites

305. Transport sector websites reviewed are described below:

#### 1. The official MOTC website - [www.mtc.am](http://www.mtc.am)

**Description.** Generally the website provides information on MOTC activity and is updated periodically. A map of Armenia is available at the web site in Flash format which allows for zooming, location names, rivers and lakes, railways, roads of interstate, republic and local importance and etc. The list of motor roads generally used in Armenia and the number of passenger carriages per vehicle types are also presented at the site.

**Issues.** (i) It was planned to construct the site in three languages, there are links for the site to Russian Federation and English versions, but these are under construction; (ii) Generally the site needs to be updated from technical and design viewpoints; (iii) The map available at the site is outdated and is not very convenient for navigation and contains unnecessary sound effects that cannot be switched off; and (iv) The list of roads used in Armenia is presented in Excel; it would be better if this information was better presented and with easier accessibility.

#### 2. The official website of Yerevan Municipality - [www.yerevan.am](http://www.yerevan.am)

**Description.** Related to transport sector there is information on trolleybus, bus and minibus routes, Yerevan renamed streets, avenues, side streets, blind-alleys, passageways, squares, parks and districts (starting from 1990) presented in PDF files. Yerevan city map is also available at the site (by divisions on streets, communities etc) in PDF file.

**Issues.** (i) The site design is moderately good; (ii) navigation is not quite trouble-free and convenient; and (iii) It would be preferable to present trolleybus, bus and minibus routes more clearly and with easier access.

### 3. Armenian Company Register - [www.spyur.am](http://www.spyur.am)

**Description.** “Spyur” gathers information on companies in Armenia and processes and distributes it. This website has a rather large database of information, which ensures a high level of visits. This site has information on almost all participants/representatives of transport sector (those being distributor companies, aviation-dispatching services, air companies and their representatives, cargo carriers, taxi services, passenger carriers etc.). All the information is available in Armenian, Russian Federation, and English.

**Issues.** The site needs to be updated in terms of technical capacity and design, work on which is in progress.

### 4. Public transport directory of Yerevan city - [www.marshrut.info](http://www.marshrut.info)

**Description.** This site has a search tab which is used for finding the routes of taxis, mini vans, buses and trolleybuses of Yerevan city. Here also can be found the map of subway, as well as routes of interstate buses/mini buses. The web-site navigation is very comfortable; the design is very simple and convenient.

**Issues.** (i) BETA version of the website is available on the internet; it would be useful to provide necessary information and financial resources to ensure website formation and availability; and (ii) It would be better to have the website in more languages.



## 9. ENVIRONMENTAL AND SOCIAL IMPACT

### 9.1 Environmental Issues

306. **Environmental issues are manifold.** There are many problems connected with transport development, in particular:

- (i) inappropriate study and monitoring of transport impact on environment and human health;
- (ii) insufficient legal framework and lack of intergovernmental cooperation and coordination for transport development trends as a part of country social and economic development;
- (iii) lack of financial mechanisms for incentive financing;
- (iv) poor management of traffic, low level of car maintenance and technical services;
- (v) low level of public awareness and knowledge on sustainable transport and transport effects on environment and human health.

307. **Noise impact is severe.** In particular from car alarms triggered by random events which disturb sleep in urban areas. Alarm noise levels should be limited and alarms tested for sensitivity during vehicle inspections.

308. **Sustainable transport is the aim.** To achieve it, it is necessary to implement the following:

- (i) carry out studies and advanced monitoring for determination of negative impact of air, water and noise pollution by transport on health and environment in Yerevan and other cities;
- (ii) improve the legal framework, developing strategies or action plans for transport development in compliance with environmental and health requirements;
- (iii) create financial incentives to support development of preferable means of transport;
- (iv) improve traffic control and management system; provide qualified technical and maintenance services; and
- (v) educate and raise awareness in the field of sustainable transport, improve driver's behavior with integration of Environmentally Reasonable Driving project and training.

309. Mitigating the environmental impact is a serious issue, while transport plays an essential role in economic and social development, its continuing expansion, heavily dominated by road transport, raises serious concerns about the long-term sustainability of present mobility trends. The environmental effects of transport are diverse and wide-ranging, and can extend to air, water and land.

310. Air pollution can adversely affect human health, and has been shown to lead to increased mortality and morbidity. Transport and in particular road transport, is a primary source of noise pollution. The health effects of noise include stress, insomnia, high blood pressure and increased risk of heart attack.

311. Transport infrastructure has impacts on landscapes and nature, as transport infrastructure not only uses up large areas of land but the impacts on land-use also go well beyond the area directly covered by the infrastructure.

312. Transport, in particular its infrastructure and emissions of nitrogen oxide (NO<sub>x</sub>) and hydrocarbons, has a considerable impact on wild flora and fauna. Construction of transport infrastructure results in traffic mortality of wildlife species, loss and degradation of their natural habitats, microclimate and hydrological environments changed by transport pollution, and an increased human activity in the adjacent areas.

313. Transport has a considerable impact on natural heritage through air, water and noise pollution and extensive land use for its infrastructure (roads, railways, waterways and airports).

314. Road traffic injuries have been recognized by the UN as a worldwide epidemic. Urban and transport planners have a crucial role in making cycling and walking obvious and realistic options for urban dwellers, and should consider the health impacts of their decisions when planning or redeveloping urban areas.

## **9.2 Air Pollution**

315. The PRSP makes specific reference to the negative impact of vehicle emissions on human health. It identifies actions within Yerevan's Master Plan to develop public transport, including increasing the number of large buses as well as the development of electric public transport. Prohibition of leaded petrol has been in effect since 2000. The negative impact of vehicle emissions on human health is an increasing concern and pollutants also mix with construction particles to create a hazardous atmosphere. The challenge is to accommodate high trip demand while maintaining acceptable air quality.

316. Transport is the principle contributor to air pollution. In 2005, it was responsible for three-quarters of hazardous substances emitted into the atmosphere in the whole country and for nearly all the emissions in Yerevan (see Table 9-1). Although total emissions have fallen sharply since independence, with the loss of heavy industry and a corresponding decline in transport intensity, emissions remain a problem, particularly in Yerevan which is subject to many winter days of temperature inversion as a result of the local topography. Increased use of CNG and a ban on the import of vehicles without catalytic converters (effective 1 January 2007) are ameliorating the situation, in spite of the rapid growth in the vehicle fleet. In 2005 81% of vehicle emissions were by petrol driven vehicles, 12% by diesel and only 7% by CNG. Fuel consumption by vehicle type is given in Table 9-2. The share of natural gas continues to rise, reaching 42% in 2007. The increase in share has resulted from the low import price for gas. In April 2009 the price per 1,000 m<sup>3</sup> (including VAT) will rise from the current \$110 to \$154, with a further increase to \$200 in April 2010. This may slow down conversion of vehicles to CNG use. Total fuel consumption for transport has increased sharply, growing 74% 2001-2007.

## **9.3 Water Resources**

### **A. Lake Sevan**

317. Lake Sevan is one of the largest high altitude freshwater lakes in the world. It is surrounded by high volcanic mountains, which rise to over 3,500 m. About 30 rivers and streams flow into the lake and the River Hrazdan flows out, through a gorge, falling down by 1,000m from the level of the lake. Since the intensive use of the river began in 1930s, the level of the lake dropped by about 19 m). Hydroelectric power stations were built on Hrazdan, collectively known as the Sevan-Hrazdan cascade, routing the water for irrigation

of fields in the valley, while producing electricity during the irrigation season. The drop in the lake's water level necessitated building the 48 km Arpa-Sevan tunnel, which, after many years of construction through the mountains, began supplying water to the lake in 1981 the River Arpa. Another tunnel, Vorotan, has been built recently.

1.

318. Water flows into the lake through the tunnels and 410 hectares (ha) have been flooded. By the time the lake reaches its target water level, 10 times that amount will be under water, of which 3,130 ha are forest and the rest resorts, private mansions and arable land. Some 30km of road will be flooded.

319. The Government ended the energy use of Lake Sevan in 1999 and two years later parliament passed the *Law on Lake Sevan* regulating issues connected with protection, restoration, reproduction, natural progress and consumption of the ecosystem of the Lake, its catchment area and economic zone of economic activities. The Law states that Lake Sevan is a treasury of freshwater, having an environmental, strategic, economic, social, scientific, health, cultural, aesthetic and spiritual value.

320. The water should be raised to 1903 m, the height at which experts say it will be possible to regulate the temperature and oxygen levels and restore the ecological balance.

321. Concerning transport, the relevant legal documents and decrees are

- (i) Law on Lake Sevan 15 May 2001, No. 190

*Article 29. Protection of the landscape in the zone of direct influence*

Definition of general requirements for policy development of town planning, civil engineering and transport infrastructure, as well as regulation and supervision of design documents and construction works.

- (ii) Law on Approval of Annual and Integrated Plans for Lake Sevan Ecosystem Restoration, Protection, Reproduction and Consumption Activities 27 December 2001, No. 276

*2. Purpose and Tasks of Integrated Plan for Restoration, Protection, Reproduction and Consumption of Ecosystem of Lake Sevan*

Implementation of integrated measures to prevent a drop and ensure a rising of Lake Sevan water level by at least 6m, as a precondition for restoration of previous quantitative and qualitative characteristics of the water in the lake and prevention of further atrophication.

- (iii) Decree Approval of Master Plan Sevan City, Gegharqunik province 9 August 2007, N 1033-U

Future development of republican roads M-4 Yerevan - Sevan – Ijevan - Azerbaijan Border and M-10 Sevan – Martuni - Getap described in section 5.2 *External Transport Development Long-term Plan* to solve the problem of flooding of sections below 1904m.

## **B. River Flooding**

322. There are 9,480 small and large rivers with an overall length of 23,000 km, 14 are of more than 35 km and 379 are more than 10km. Some of the small rivers have intermittent

flow. As, typically for mountain rivers, floodwater flow exceeds low water flow by 50-120 times. For example: River Araks min/max flows 15/1800 cubic meter per second ( $\text{m}^3/\text{sec}$ ); River Azat River 1.8/131  $\text{m}^3/\text{sec}$ ; and Rivers Akhuryan and Vorotan 6/600  $\text{m}^3/\text{sec}$ . In a number of cases bridges, aqueducts etc. have been destroyed during spring flooding. It is essential to take into consideration maximum river flows during preparation of design documents.

#### **9.4 Environmental Protection**

323. The 1991 Law on the Principles of Environmental Protection makes a number of government agencies responsible for ensuring the environmental soundness of their activities. MOTC is responsible for the rehabilitation and maintenance of all inter-state, republican and Lifeline local roads.

324. The mechanism used by MOTC to ensure environmental compliance rests on the functions of ARD. ARD is best thought of as a PIU of investment projects in the road sector, its responsibilities typical of road sector projects' PIUs, i.e. supervision of detailed design, preparation of contract documents, organization of bidding and contractor selection, supervision of construction, monitoring and reporting. Environmental duties are an integral part of ARD's activities and are discharged by Environmental Officers, in ARD's practice appointed on a renewable basis in support of major foreign funded projects. ARD's EOs are responsible for ensuring that road construction or rehabilitation activities under MOTC's jurisdiction complies with environmental and social legislation. Even where investment activities require no Government funding (e.g. in the case of the road rehabilitation component of the MCC Project), ARD may perform that function.

325. ARD's Environmental Officers' more detailed duties include, among others, organization of public consultations that may be required under new projects, preparation of the documentation on environmental and social impacts of new projects (such as the present IEE) for submission to the Ministry for Nature Protection (MNP) and for "piloting" the documentation through the environmental clearance process, ensuring that the environmental and social mitigation measures identified at the stage of environmental and social assessment are adequately incorporated in the design and contract documentation, periodically visiting construction sites to check on compliance with design and contract provisions, and for dealing with any complaints or questions relating to environmental and social impacts of the projects.

326. MOTC has only a marginal presence at the local level. Here, too, ARD performs the implementation and supervision roles through either secondment of staff during construction or through periodic visits. Armenia's small size facilitates the latter.

327. The current workload of the Environmental Officers of ARD is rapidly growing. Both the MCC Project and RRSP are sizeable and are being implemented at the same time. Despite the environmental experience gained by ARD during the implementation of World Bank-financed projects the capacity of ARD needs to be strengthened. Furthermore, the ARD EO(s) is relatively new to the road infrastructure sector and therefore ARD will require support by a technical supervision consultant team that has the requisite environmental expertise.

328. ARD contracts with road design institutes for all detailed design work. The road design organizations, the privatized successors to former state design institutes, have had increasing exposure to environmental concerns of international donors and lenders (World Bank, Lincy Foundation) besides inheriting engineering-centered environmental expertise that existed before independence. Some of them have environmental staff. Similarly, following the privatization of road building-and-maintenance state enterprises starting in mid-

1990s, there are a dozen or so road rehabilitation contractors some of whom have implemented World Bank or Lincy Foundation projects (besides implementing road repair financed by the Government).

329. MNP occupies a central place in policy setting and protecting the country's environment but several other Government agencies play important related roles. Environmental management in Armenia rests on a fairly complete legislative and regulatory basis.

330. Within MNP, Department of State Environmental Expertise Commission (SEEC), a state non-commercial organization, is in charge of implementing the (1995) Law on Environmental Impact Assessment (EIA), in particular evaluating the adequacy of environmental documentation prepared by other state bodies and the private sector in support of development projects or policies/strategies. The Ministry's Bioresources Management Agency is responsible for all protected areas, management of several state reserves or reservations and for SNP. The Armenian Forest Service manages 14 other state reservations. Other departments formulate policies and exercise control over all forms of pollution. The State Environmental Inspectorate (SEI) with 11 regional branches is a semi-independent body that oversees compliance with environmental laws and regulations.

331. The EIA process together with SEI's power to inspect is the principal tool that MNP possesses to achieve compliance by other Government entities. At the local level, the influence of MNP is limited. Province-level specialized staff reporting to marzpet (Province Governor) rather than MNP while at the local level, any environment-related responsibilities are usually merged with other responsibilities such as public health with no contacts with MNP. At the local level, therefore, the capacity of technical agencies to implement "their" development activities in an environmentally sound manner is particularly important as is local authorities' capacity to perform duties delegated to them by various decentralizing provisions (most importantly, the 2002 Law on Local Government).

332. The Ministry of Territorial Administration (MTA), created in 2004, has various coordination and implementation responsibilities at the local level. Among other things, MTA oversees provincial administrations. Its units include the State Committee on Water Economy and the Emergency Management Directorate both affected to varying degrees or at various times by the conditions of road infrastructure.

333. Under ongoing decentralization supported by an updated (2002) Law on Local Self-Government, local elected bodies are acquiring greater say in a number of domains including environmental management. Among other things, local administrations' approval is now legally mandated for several environmentally important elements of road rehabilitation such as the siting of work camps and earth borrow pits. These powers of local government are expected to apply to RRSP.

334. There are a large number of environmental and other NGOs (e.g. Environmental Protection Advocacy Center, Environmental Survival, Sustainable Water Environment, Armenia Tree Project, and a number of others) which have actively participated in the public debate even if none specialize in road-related issues. Internationally, Armenia has been active. So far, the Government has ratified 12 international environmental conventions; including the United Nations Convention on Biological Diversity (UNCBD), the Ramsar Convention, United Nations Framework Convention on Climate Change (UNFCCC) and Aarhus Convention. Ratification of several other conventions is under consideration.

335. The Law on EIA contains an internationally accepted structure of tasks to be undertaken (identification and assessment of impacts, consideration of alternatives including a zero alternative, identification of mitigation measures, review requirements, public

participation). All new transport infrastructure projects above prescribed limits, and related strategies and policies, fall under the purview of the Law. Projects falling below the assessment limits can still be subjected to the Law's provision at the request of local bodies. While road rehabilitation projects are not specifically mentioned in the Law, previous road rehabilitation projects financed by the World Bank and MCC did apply for (and obtained) environmental clearance by MNP at the level of IEE (or a similar level—that of a “concept”—in the case of MCC). The environmental clearance may require submission of detail design to MNP for a check of compliance with IEE recommendations.

## **9.5 Social Impact**

**336. Incorporating Social Dimensions.** This involves furthering a pro-poor policy framework, including greater transparency and accountability. Selection of the areas for investment projects should take into consideration the needs and capacities of the poor and other vulnerable groups, focusing on the vulnerable population, poor and disadvantage people, living in remote areas. Investment should build their capacities for economic development, for travel and access to services, employment and social networks.

337. This involves (i) choosing appropriate transport in a specific cultural and social context and for specific social groups; (ii) targeting more poor and underserved areas; (iii) using local labor for infrastructure projects; (iv) increasing income generation opportunities for the local population by using local labor and labor intensive modalities for local infrastructure projects; (v) engaging local stakeholders, organizations and institutions in planning; and (vi) managing monitoring and evaluation of services and operations, especially at community and inter-community level projects.

338. It is also necessary to (i) increase access to transport services for poor and vulnerable people and to improve access for vulnerable (poor) people to social and health services, employment, social networks to maximize their capabilities; (ii) apply pro-poor pricing policy, reducing public transport costs for the poor and vulnerable (including children and women) to promote mobility and access to services; and (iii) minimize the negative effect of transport development on patterns of inequality, on social and economic differentiation.

339. Steps to address social issues in policy and projects, include:

340. Stakeholder analysis and participation – identify key stakeholders of the policy and projects, potential impact of suggested activities/measures. Anticipate potential social tensions and risks to projects, stakeholder conflicts and participation in the policy and projects.

- (i) Social cost-benefit analysis – use for any project together with economic cost-benefit analysis. Social objectives, costs and benefits should be taken into consideration in investment decisions.
- (ii) Management, monitoring and evaluation - incorporate social monitoring and evaluation procedures into a wider mode for policy and projects M&E system.
- (iii) Maintenance of close coordination and regular consultations with the National Program on the Response to HIV Epidemic (2007-2011) being implemented by the Government with assistance from the Joint United Nations Programme on HIV/AIDS, and the United Nations Development Programme's programs on anti-human trafficking.

**Table 9-1: Emission of Hazardous Substances 1987-2005**

Source	1988	1998	2003	2004	2005
<b>Armenia:</b>					
Transport	498.2	140.7	147.9	164.4	146.9
Industry	149.5	12.6	25.9	39.0	49.9
Energy	92.5	3.8	2.2	1.9	1.1
Total	731.2	157.1	174.5	205.2	197.9
Transport %	68	90	84	80	74
<b>Yerevan:</b>					
Transport	175.2	74.8	73.9	82.2	73.4
Industry	46.7	0.7	1.4	1.8	2.1
Energy	26.1	1.0	0.4	0.4	0.7
Total	248.0	76.5	75.7	84.4	76.2
Transport %	71	98	98	97	96

Source: *Sustainable Urban Transport in Yerevan*

**Table 9-2: Transport Fuel Use by Type (in %)**

Type	2001	2002	2003	2004	2005	2006	2007
Petrol	66	57	52	54	47	39	34
Diesel	24	28	30	26	29	26	24
CNG	10	15	17	20	24	35	42
Total '000 Tons	285	312	366	401	391	442	496

Source: *Sustainable Urban Transport in Yerevan*

## **ANNEX 1: MEDIUM TERM EXPENDITURE FRAMEWORK 2009-2011 TRANSPORT CHAPTER**

***(Note: translated by the Consultants. Some figures have been rounded.)***

### **A. OVERVIEW**

341. The main focus of *MTEF 2009-2011* for the transport sector is on the road network. In recent years significant work has been undertaken in the road sector. Population requirements, as well as those of organizations of other branches of the economy have been met in the fields of passenger and freight transport.

342. Roads are an important part of the national transport system. Stable economic growth of the country, increase of the welfare of the population, improvement of national defense and integration in the international transport system all depend on the state of development of the road network, which ensures links between regions and communities within the country and with neighboring countries.

343. The total length of the state road network is about 7,700 km, which in accordance with Government Decree No.112-N of 10 January 2008 is divided into: (i) Interstate roads 1,686km; (ii) Republican roads 4,056 km; and (iii) Local roads 1,962 km.

344. For repair and maintenance of the existing road network the following plans on the account of the state budget in the field of transport have been implemented: (i) renovation of roads of state importance; (ii) maintenance and operation of roads of state importance, and (iii) renovation of structures.

345. Implementation of these measures ensures:

- (i) Reduced transport cost, increased road traffic, relief of traffic congestion and time savings for passenger and freight.
- (ii) Ensuring all-year round transport with various communities, improved traffic safety and reduction in road accidents and in the negative impact of road traffic on the environment.

346. To increase efficiency in maintenance and operation of roads of state importance as well as the engineering construction standard of the roads, *Methodological Guidelines for Monitoring of the level of current and winter maintenance and operation of roads* were approved by Government Decree No. 1942-N of 9 December 2004 on current and winter maintenance and operation of roads. It has been established that contracts for maintenance and operation should be concluded for three years.

347. The Government pays special attention to the emergency reconstruction of bridges on interstate roads. The list of bridges which need emergency reconstruction was approved by Government Decree No. 591 of 2 July 2001. According to this, a Program of Capital Renovation of Transport Structures was launched in 2003 (within the plan, the rehabilitation of bridges is to be carried out over the following 3-4 years). In 2003-2006 bridges on interstate roads were repaired and in 2007 13 bridges were repaired, 10 interstate, 2 republican and 3 on local roads.



## **B. DEVELOPMENT SCENARIO FOR THE LAST TWO YEARS**

348. In 2006-2007, under direct state budget financing, interstate and republican roads were renovated and made safer. Some 95% of interstate roads have been totally rehabilitated in accordance with international standards.

349. In the light of the substandard condition of the republican road network as well as the necessity to improve it in order to meet the requirements of the population; improve economic and transport infrastructure as well as achieving the necessary technical parameters, accessibility and density of road network, road security and defense of the country, the Government substantially increased the state budget allocation for the republican road network from 2005. For comparison, it is noted that in 2004, state budget allocations for roads of state significance amounted to AMD2.60 billion, in 2005 to AMD11.32 billion, in 2006 to AMD12.06 billion and in 2007 to AMD14.14 billion. The planned budget for 2008 is AMD15.74 billion.

350. In 2006-2007 316km of road were renovated under the program of capital repair of roads of state importance, 114km in 2006 and 202 km in 2007 (45.5 km interstate, 20.9 km republican and 135.4 km-local). Two new roads of 97.1 km Meghri-Shvani Dzor-Tsav-Kapan and Voskepar-Baghamis were opened (19.2 km of the former route was constructed in 2006).

351. From 2005 the Government substantially increased state budget allocations for current and winter maintenance and operation of roads of state importance. In 2004 AMD2.85 billion was allocated for this purpose. In 2005 the allocation was AMD4.44 billion, in 2006 AMD4.86 billion and in 2007-AMD5.88. The planned budget for 2008 is AMD6.19 billion. In 2005-2007, current and winter maintenance and operation activities on 2,985 km, 3,047 km and 3,165 km of road were carried out, as well as the maintenance and operation of three tunnels and five bridges.

## **C. MAJOR ISSUES**

352. Continuous and coordinated repair and maintenance should be carried out to keep roads in fair condition. Hardly any work was carried out in the 1990s and roads deteriorated into poor condition. Due to investment since, there has been rapid progress in improving the condition of interstate roads, although not republican and local roads, given the poor condition of these roads and the amount of money required.

353. In accordance with the PRSP adopted by the Government in 2003, the rehabilitation and maintenance of the existing road network is the priority in the field of transport until 2015. This will ensure:

- (i) Interstate roads: maintenance of the network carriageway general condition in accordance with the standard in 2002-2006. Work should primarily focus on restoration of bridges and other structures, with by 2010 restoration of all bridges which need urgent repair. Within the next five years the focus will be on bridges built before 1969, which are not appropriate for current needs.
- (ii) Republican roads: maintenance of rehabilitated roads and planned restoration of the network (including bridges which need urgent repair). Repair of the republican road network and bridges should be completed by 2015.
- (iii) Local roads: the restoration of assured communication between communities. Rehabilitation of local roads and bridges which need urgent repair should be completed by 2015.

## D. OBJECTIVES, PRIORITIES AND EXPENDITURE DRIVERS FOR MTEF

### Objectives

354. To implement these tasks regulatory legal bodies of the transport sector will continue to develop and modernize, to make freight and passenger transport closer to international standards.

355. Investment will continue to be made to improve the road network, as roads are the most significant component of the transport network, with road transport responsible for 57% of freight and 91% of passenger transport.

356. State budget allocation is to be substantially increased for rural roads aiming at development of agriculture and tourism and access to social services. All communities are expected to have at least one road linked to a main road.

357. To prevent deterioration of the road network and to provide safer, faster and efficient transport, road engineering construction will be rehabilitated, state budget allocations for current maintenance and operation will increase. According to the PRSP adopted by the Government in 2003, the rehabilitation and maintenance of the existing road network is the main policy in the field of transport until 2015. This objective can be achieved within the format of the program of capital renovation, maintenance and operation of roads of republican importance and of transport objects. The above plans will ensure:

- (i) Development of the public road network, meeting the requirements of the population, improve transport and enhance economic activity in accordance with road density and possibility, improve security of transport and strengthen the defense of the Republic of Armenia.
- (ii) Reduce transport cost, increase road traffic, cut down of duration of excess traffic and duration of transport of people and goods,
- (iii) Ensuring whole-year transport with various communities, improve traffic safety, reduce road-traffic accidents and the negative impact of road-traffic on the environment.
- (iv) Implementation of additional works in road network
- (v) Establishment of scientific-technical achievements and development of road-construction sector in the country.

### Priorities

358. The policy for roads 2009-2011 will mainly aim at providing for the expected volume of transport and for efficient utilization of existing roads. State budget financing for the repair, maintenance and operation of state importance and strategic roads will continue. Road repair activities will continue on those sections of road which for many years have been in very poor condition and which have become critical and difficult to pass. As a result of road current and winter maintenance work, transport will become safer, quicker and more efficient.

359. Main priorities of transport expenditure policy for 2009-2011 are as follows:

Priority direction			Justification of Government economic and political projects, with relevant references.
2009	2010	2011	
State importance capital restoration plan			In accordance with PRSP, adopted by Government in 2003, road sector policy therein to 2015
State importance transport road maintenance and operation plan			

Capital repair of structures	According to list of bridges, which need urgent emergency repair/reconstruction, as approved by Government Decree No. 591 of 2 July 2001
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360. Investment priorities are road sections and structures connecting all communities with province centers by at least one adequate route, as well as routes attractive for tourism, which index list and priority will be approved in the inner-republic roads prospective development plan.

361. The Government intends to increase allocations from the state budget for local roads, it attaches much importance to the role of inter-community roads for social services, development of agriculture and tourism. To prevent deterioration of the road network and to provide faster, safer and more efficient transport, state allocations for road transport current maintenance and operation will increase.

### Expenditure Drivers

362. Factors affecting the planned MTEF sector program 2009-2011 are the growth of the volume of work to be implemented, as well as the number of state non-commercial organization employees, as determined by Government policy. Other factors affecting expenditure are the completion of a number of programs and an increase in costs.

## E. EXPENDITURE COMMITMENTS

363. The MTEF provision for the program **Capital Repair of State Importance Roads** amounts to AMD15.97 billion in 2009, AMD17.95 billion in 2010 and AMD19.95 billion in 2011.

364. Under MTEF 2009-2011 capital renovation of about 930km (285 km in 2009, 330 km in 2010 and 315 km in 2011) of interstate and republican roads is planned, including: surface rehabilitation; capital restoration and resurfacing; capital renovation of 400km of republican roads, under province and local communities.

365. Allocations for the program **Maintenance and Operation of State Importance Roads** will be AMD6.90 billion in 2009, AMD7.36 billion in 2010 and AMD7.36 billion in 2011.

- (i) Winter and current maintenance and operation activity carried out on 7,704 km of motor roads of common use, including 1,686 km interstate, 4,056 km republican and 1,962km local roads.
- (ii) Made-up constructions maintenance and operation activity, including 3 tunnels and 5 bridges maintenance and operation:
- (iii) Design of interstate and republican importance motor roads, and
- (iv) State order plan implementation by state non-commercial organizations.

366. Allocations for the program **Transport Structures Capital Renovation** will be AMD500 million in 2009, AMD500 million in 2010, AMD500 million in 2011. Under the program capital renovation of 7-8 bridges on interstate roads is planned each year.

367. The main outcome of implementing the above programs will be that Armenia will have a road network which will ensure efficient transport for decades. Construction and renovation of roads will ensure both transit and domestic freight and passenger regular and uninterrupted transport. The improvement of road infrastructure will ensure regular transport both to regional communities and to remote communities within the country. This will assist

development of remote and next-to-frontier communities, will reduce transport costs and will assist in poverty reduction.

368. The program **Subsidizing Yerevan Metro SCJSC** will help to finance its operating budget deficit. In view of the special importance of the Metro and its operating inflexibility, its operations are not expected to be profitable in the medium term and need to be subsidized. Under MTEF 2009-2011, an annual subsidy of AMD2.70 billion is planned.

369. The program **Subsidizing Yerevan Electrical Transport CJSC** will help to finance the operating budget deficit. Yerevan electric ground transport is urban transport and the only means of transport for a substantial part of the urban population. In view of its operating inflexibility, it is not expected to be profitable in the medium term and needs to be subsidized. Under MTEF 2009-2011, an annual subsidy of AMD276 million is planned.

## F. EXTERNALLY FUNDED PROGRAMS

370. The objective of railway renovation is to promote improvement of the railway section Gyumri- Airum infrastructure, as well as its financial life. Under *MTEF 2009-2011* a program of bridge repairs is planned, as well as consulting services (design and technical supervision).

371. The objective of traffic regulation and security program, supported by the World Bank, is to improve the operation of city traffic. In 2009-2011 it is planned to obtain traffic lights and implement consulting services (design and technical supervision).

372. The objective of the *Rural Roads Rehabilitation Program*, supported by ADB, is the renovation of Lifeline Roads, as well as providing assistance to the Government and consulting services to develop sub-programs, construction supervision and audit.

(Consultants' Note: Tables A1-1 and A1-2 are from MTEF 2008-2010. These tables were not updated in MTEF 2009-2011.)

**Table A1-1: Expenditure on Transport by Subgroups (AMD million)**

	Functional Classification Subgroup	2007		2008		2009		2010
		MTEF 2007-2009	Actual Budget	MTEF 2007-2009	MTEF 2008-2010	MTEF 2007-2009	MTEF 2008-2010	MTEF 2008-2010
12.01	Public administration in transportation and communications	283.6	403.0	291.5	293.6	323.7	323.2	329.2
12.02	01. Subsidizing of the "Yerevan Metro" SCJSC	870.4	909.4	870.4	909.4	870.4	909.4	909.4
12.02	02. Subsidizing of the "Yerevan Electro Transport" SCJSC	276.0	276.0	276.0	276.0	276.0	276.0	276.0
12.07	01. Capital repair of state importance motor roads	11,000.0	13,799.0	11,000.0	15,310.0	13,000.0	15,970.0	17,950.0
12.07	02. Maintenance and operation of state importance motor roads	4,694.7	5,990.0	4,694.7	6,290.0	4,694.7	6,900.0	7,360.0
12.07	03. Maintenance and operation (including winter maintenance) of local (regional) importance motor roads	469.4	469.4	469.4	0.0	469.4	0.0	0.0
12.07	04. Capital renovation of transportation infrastructure	1,181.4	645.0	681.4	1,100.0	500.0	500.0	500.0

**Table A1-2: State Budget Expenditure on Transport 2006-2010 (AMD million)**

Functional Classification Subgroup	2006	2007	% chng	2008	% chg	2009	% chg	2010	% chg
Share in GDP (percent)	0.9	0.8	x	0.7	x	0.7	X	0.7	X
Share in State Budget expenditure (percent)	5.2	3.9	x	3.7	x	3.6	X	3.7	X
Transport and communications, including:	20,637.0	22,962.0	7.3	24,649.0	7.3	25,349.0	2.8	27,795.0	9.6
Public administration in transport and communications	278.7	403.0	-27.1	293.6	-27.1	323.2	10.1	329.2	1.9
Share in total expenditure (percent)	1.4	1.8	x	1.2	x	1.3	x	1.2	X
Subsidizing of the "Yerevan Metro" SCJSC	870.4	909.4	0.0	909.4	0.0	909.4	0.0	909.4	0.0
Share in total expenditure (percent)	4.2	4.0	x	3.7	x	3.6	x	3.3	X
Subsidizing of the "Yerevan Electro Transport" SCJSC	276.0	276.0	0.0	276.0	0.0	276.0	0.0	276.0	0.0
Share in total expenditure (percent)	1.3	1.2	x	1.1	x	1.1	x	1.0	X
Capital repair of state importance motor roads	12,298.0	13,799.0	11.0	15,310	11.0	15,970.0	4.3	17,950.0	12.4
Share in total expenditure (percent)	59.6	60.1	x	62.1	x	63.0	x	64.6	X
Maintenance and operation of state importance motor roads	5,045.9	5,990.0	5.0	6,290.0	5.0	6,900.0	9.7	7,360.0	6.7
Share in total expenditure (percent)	24.5	26.1	x	25.5	x	27.2	X	26.5	X
Maintenance and operation (including winter maintenance) of local (regional) importance motor roads	465.2	469.4	-100.0	0.0	-100.0	0.0	0.0	0.0	0.0
Share in total expenditure (percent)	2.3	2.0	x	0.0	x	0.0	X	0.0	X
Capital renovation of transportation infrastructure	1,403.1	645.0	70.5	1,100.0	70.5	500.0	-54.5	500.0	0.0
Share in total expenditure (percent)	6.8	2.8	x	4.5	x	2.0	X	1.8	X

## ANNEX 2: ROAD TRANSPORT ADMINISTRATIVE STRUCTURE

373. Table A2-1 compares the road transport administrative structure with that prescribed by the EU. In March 2006, the Government adopted a National Plan 2006-2009 for the Partnership and Co-operation Agreement for integration with EU standards. The table accordingly is indicative of Government policy re sector institutional structuring reform.

**Table A2-1: Comparison of Road Transport Administrative Structure with EU Requirements**

EU Administrative Structural Requirements	Armenian Transport Administrative Structure	Notes
<p>1. <b>Ministry for Transport</b>, or a competent authority, which is in charge of policy-making and responsible for:</p> <ul style="list-style-type: none"> <li>• Issuing of certificates</li> <li>• Ensuring respect of safety rules</li> <li>• Access to the market and profession</li> <li>• Level playing field between the operators</li> </ul>	<p>1. <b>Ministry of Transport and Communication of Armenia</b> is responsible for transport policy formulation and monitoring tasks (e.g. internal regulation and transport):</p> <ul style="list-style-type: none"> <li>• Issuing of certificates</li> <li>• Ensuring respect of safety rules</li> <li>• It is not providing market for profession</li> <li>• It is involved in the market regulatory functions</li> </ul>	The Structure is partially matching
<p>2. <b>Authority responsible for Road Transport Sector</b> (social legislation, licensing and legislation related to technology and safety).</p> <ul style="list-style-type: none"> <li>• <b>Roadworthiness tests</b> for motor vehicles and their trailers (Dir. 95/96)</li> <li>• <b>Authorized companies or the traffic police</b> are to control applications (at road-side inspections) on the <b>tread depth of tires</b> of motor vehicles and their trailers</li> </ul>	<p>2. <b>Ministry of Transport and Communication of Armenia</b> (licensing, policy making, elaboration technology, and safety on transport).</p> <ul style="list-style-type: none"> <li>• <b>Roadworthiness tests</b></li> <li>• Until now, now authority was assigned to control (at road-side inspections) the <b>tread depth</b> of tires of motor vehicles and their trailers. Commercial vehicles circulating within the territory of Armenia do not run under this technical procedure.</li> </ul>	The structure is partially matching
<p>3. Roadside inspections to check the braking and exhaust systems, the lamps, lighting and signaling devices</p>	<p>3. Traffic police are responsible for checking the braking and exhaust systems, lamps, lighting and signaling devices in the operation of vehicles on the road as well as during roadworthiness tests.</p>	The structure does not match
<p>4. <b>Licensing system</b> for international transport.</p> <ul style="list-style-type: none"> <li>• <b>Road freight:</b> competent authorities of the Member States issue relevant “community authorization” and take appropriate sanctions in cases of infringements and verify regularly the conditions of issue.</li> <li>• <b>Road passenger transport</b> competent authorities of the member states issue relevant sanctions in cases of infringements and verify regularly whether the conditions of issue are still being met by the holder.</li> </ul>	<p>4. <b>Licensing system</b> for international transport: a special licensing system for international transportation in Armenia does not exist.</p> <ul style="list-style-type: none"> <li>• No licensing system in road freight transportation system in Armenia.</li> <li>• In Armenia, only road passenger transportation is a licensed activity.</li> </ul>	The structure is partially matching
<p>5. The State Agency for road transport operators is directly responsible for the enforcement of transport of dangerous goods</p>	<p>5. The State Agency for road transport operators directly responsible for the enforcement of and transport of</p>	The structure is not matching.

<p>by road.</p> <ul style="list-style-type: none"> <li>• Independent examination and certificate issuing bodies shall be set up for the purposes of training transport operators, safety advisers, and drivers of vehicles selling dangerous goods.</li> <li>• Tachographs and speed limitation devices shall be stalled by workshops approved by the member state authorities.</li> </ul>	<p>dangerous good does not exist.</p>	
<p>6. Appropriate member state authorities, in general, the Ministry of Transport, need to consider whether it is necessary to set up an administrative structure for the issuing of documents providing the environmental classification heavy goods vehicles (HGV).</p>	<p>6. Appropriate legislation classifying documentation related to environmental classification (e.g. Euro I, Euro II, etc.) of HGVs does not exist.</p>	<p>The structure is not matching.</p>
<p>7. Member states shall designate an administrative authority which shall have responsibility for ensuring that all aspects of the safety of a tunnel are assured and which shall take the necessary steps to ensure compliance with Directive 2004/54/EC.</p>	<p>7. The state authority for safety of tunnels is MOTC and the local authorities. Due to insufficient financing, the authority is not fully equipped to perform its duty.</p>	<p>The structure is matching.</p>
<p>8. It is necessary for an effective implementation of the new driving licenses that the equivalent between old drivers licenses before the new system was established and drivers licenses issued after the system was established is defined in order to make sure that valid licenses are recognized.</p>	<p>8. Responsible authority for issuing of driving licenses in Armenia is Police of Armenia. Driving licenses are valid only in CIS countries. Driving licenses in Armenia fall into six categories. No special purpose driving licenses are issued in Armenia (e.g. for vehicles transporting dangerous goods).</p>	<p>The structure is not matching.</p>

### ANNEX 3: REHABILITATION COST ESTIMATE AND FUEL LEVY

374. The cost of providing and maintaining roads is high, due to low traffic volume, adverse topography and the geopolitical situation. Government revenue from the transport sector is primarily from import duties on fuel: equivalent to \$222 per ton for petrol and \$65 per ton for diesel, including VAT equivalent to \$0.20 per liter for petrol and \$0.06 for diesel. Remedial road maintenance has been financed mainly by external resources: grants and IFI. Additional resources were earmarked in legislation requiring 10% of fuel tax to be used for routine maintenance. However, this has not been put into practice and the Government continues to allocate funds annually from the state budget.

375. The road network was developed mostly in the 1960s and 1970s and interstate roads have been largely rehabilitated in the past decade, again with grant and IFI support. Other roads have deteriorated badly since independence, with almost no maintenance for many years. The International Roughness Indices (IRI) for 2005-2007 are shown in Table A3-1. Typically, overlay or rehabilitation/reconstruction is required when the IRI exceeds 5 or 6.

**TableA3-1: IRIs 2005-2007**

Road Category	2005		2006		2007	
	Km Survey	IRI	Km Survey	IRI	Km Survey	IRI
Interstate	1228	5.42	1364	5.32	1568	4.28
Republican	505	10.58	562	12.11	387	8.01

Source: ARD

376. Currently, funds are used only for routine maintenance and nothing is available for periodic maintenance, which would minimize future rehabilitation and reconstruction. GTZ reported at the 15<sup>th</sup> IRF World Meeting 2005 that average annual maintenance for an asphalt road should be 1.5% p.a. of construction cost, comprising 0.5% for current and 1.0% for periodic maintenance. Ideally, investment in periodic maintenance should be twice that for routine maintenance (see Table A3-2 below).

**Table A3-2: Consequential Costs of Roads**

(In % of the actual new construction costs per year at an interest rate of 4%)

Road Typ	Financial Costs	Technical Costs			Total Consequential Costs
		Current Maintenance Costs	Periodic Maintenance Costs	Total Technical Costs	
per year in percent of the actual new construction costs (replacement costs)					
(1)	(2)	(3)	(4)	(5) = (3) + (4)	(6) = (2)+(5)
<b>Asphalt</b> 400,000 US \$ / km for > 120 veh./day	6.5 % 30 years	0.5 %	(every 10 years) 1.0 % p.a.	1.5 %**	8 % p.a.
<b>Gravel</b> 80,000 US \$ / km for > 60 veh/day	7.5 % 20 years	1.5 %	(every 7 years) 3.0 % p.a.	4.5 %	12 % p.a.
<b>Earth</b> 15,000 US \$ / km for > 15 veh/ day	9.0 % 15 years	4.5 %	(every 5 years) 6.5 % p.a.	(11.0 %)	20 % p.a.
<b>NOTE</b>	Interest 4 % + Repayment - Constant Annuity during total lifetime	Routine + Spot improvement	p.a. = yearly	to be earmarked in a 2 <sup>nd</sup> generation Road Fund	

Source: GTZ, 15<sup>th</sup> IRF World Meeting 2005



## Road Maintenance Activities

377. Maintenance work activities fall into three categories:

- (i) **Emergency:** indeterminate frequency, but requiring immediate action;
- (ii) **Routine:** undertaken each year either continually or at intervals; and
- (iii) **Periodic:** undertaken at intervals of several years.

378. Rehabilitation and reconstruction is not classified as maintenance. Table A3-3 shows typical work in each category.

**Table A3-3: Typical Maintenance Activity by Category**

Category	Activity
Emergency	Removal of debris or obstacles caused by accident or natural disaster to reopen road
	Temporary repair of road damage caused by natural disaster
Routine	Bush clearing
	Drain cleaning
	Road sign maintenance
	Pothole patching
	Crack sealing
	Winter season maintenance
	Grading (earth road)
Periodic	Overlay
	Resealing (resurfacing)
	Road marking
	Re-gravelling (gravel road)

379. Physical factors affect the frequency and nature of work. The combination of factors should determine maintenance expenditure. The key factors are:

- (i) Road Surface Type
- (ii) Traffic Flow and Composition
- (iii) Road Surface Condition (Road Maintenance Profiles)
- (iv) Climate
- (v) Terrain.

380. **Road Surface:** on paved roads, the rate of pavement deterioration is a complex function of pavement strength, material type, traffic volume and loading, climate and sub-grade type. Pavements deteriorate slowly at first and this can be almost imperceptible when pavements are well designed and constructed. Eventually, surface distress begins, through the simultaneous actions of weathering and traffic loading, in the form of cracking, raveling, rutting, potholes and an increase in roughness.

381. In order to minimize the money invested in road maintenance, it is important to detect defects as early as possible, through regular visual inspections of the surface. The maintenance engineer, not only of the contractor but also of the road administrator, must interpret the inspection results to decide when and where maintenance is needed and what form of activity is required. Intervention levels should be set to identify the point at which the

maintenance engineer should intervene and the action he should take to stop further deterioration.

382. **Traffic Flow and Composition:** heavy goods vehicles (HGVs) cause the most pavement damage. The availability of reliable traffic data is of great importance for both design and maintenance. The development of national average annual daily traffic volumes, vehicle-km parameters and HGV percentages are crucial for road network planning and for the design of maintenance programs.

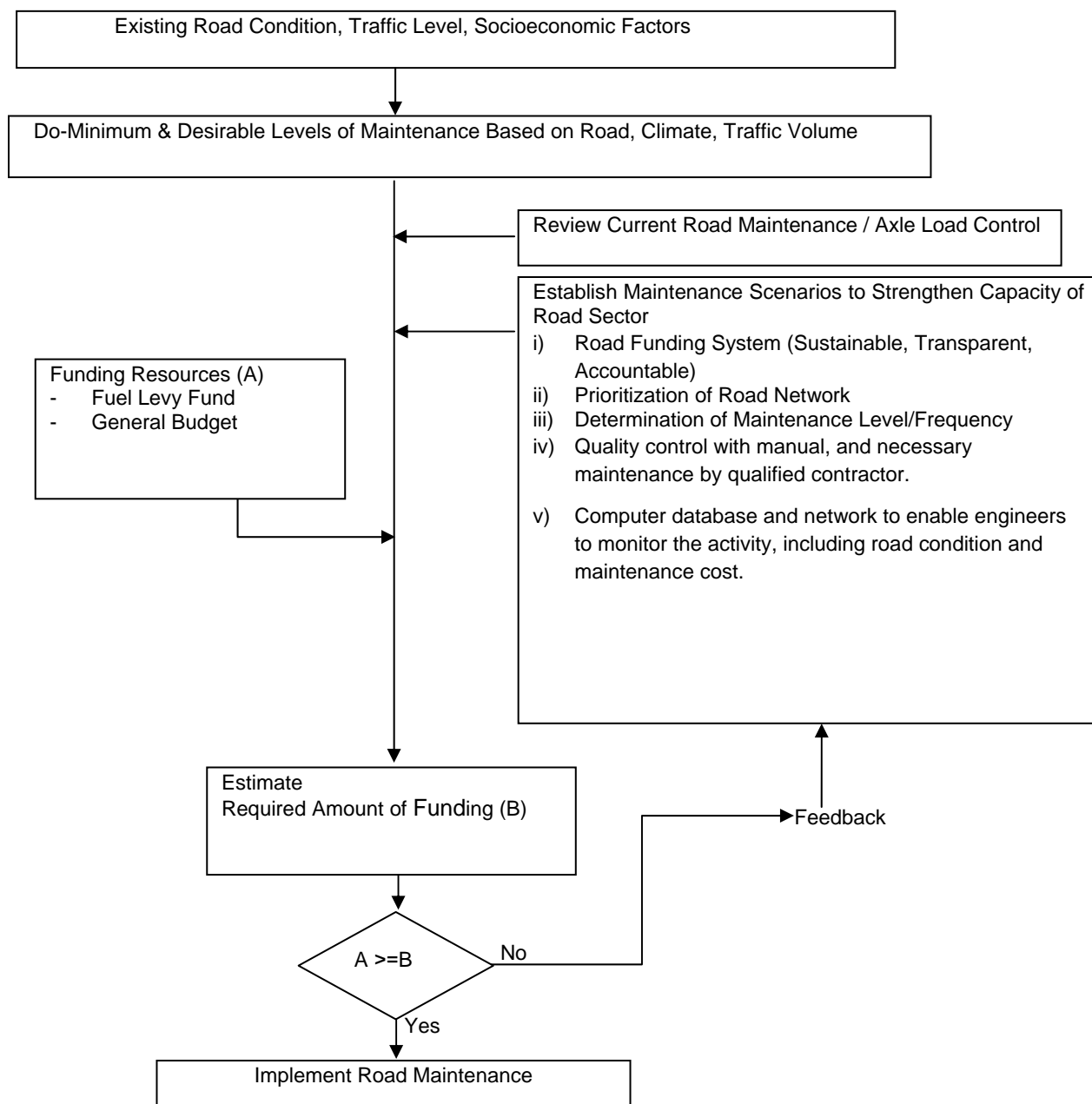
383. **Road Surface Condition:** for a pavement 5-10 years old, without proper periodic maintenance, the surface will need crack sealing, pothole patching, repairs to rutting etc. Obtaining recent or historic surface condition data is essential to understand the rate of deterioration, to establish likely future maintenance cost profiles, and to determine future life and an appropriate maintenance program. Maintenance evaluation models, such as the World Bank's Highway Development and Management Model (HDM4), require the existing road condition to be input and then apply empirically derived deterioration curves to assess the maintenance work and cost. Road condition data need to be updated urgently to enable sensible decisions to be made and to provide a basis for fund allocation. Further, maintenance records should be retained on a computer database for monitoring.

384. **Climate:** from many years of investigation worldwide, it has been shown that water is the most common cause of pavement failure: (i) penetrating the pavement through surface cracking; and (ii) in pavement layers due to inadequate drainage, wash out and erosion of slopes and many others. The common theme is water and this is a primary cause of local pavement problems. In winter, it is essential that the pavement and drainage design takes account of the climate condition and the maintenance regime should also pay particular attention to the sealing of cracks, repairing potholes and drainage problems before these defects develop into much more expensive repair items.

385. **Terrain:** in hilly or mountainous areas, the drag effect on the road surface from a vehicle tire is much more significant, particularly from HGVs. Drainage in hilly and mountainous areas also needs special care. Water travels at higher speeds and so the scour and erosion effects will be more noticeable.

### **Funding Needs and Scenarios**

386. To determine medium and/or long term funding needs and to develop road maintenance scenarios, a rational analysis is needed. The funding required is calculated for a do-minimum case and a desirable case based on defined minimum and desirable standards of maintenance. Then, the costs of the two cases are compared with present funding levels to assess any shortfall. Funding and the maintenance scenarios are then reexamined to eliminate the shortfall, increasing revenue or decreasing cost. The methodology is shown on in Figure A3-1 on the following page.

**Figure A3-1: Methodology to Determine Long Term Road Maintenance Needs**

### Funding Requirement

387. To estimate the costs and benefits of road maintenance for medium and long term planning, (funding needs and maintenance scenarios), HDM-4 is appropriate, as available in ARD. The main factors used for the analysis are:

- (i) Road Surface Type and Condition of Roads by Road Class and Length;
- (ii) Traffic Flows and Compositions;
- (iii) Road Surface Condition (Road Maintenance Profiles);
- (iv) Climate and Terrain;
- (v) Socio-economic Cost (Benefit), Vehicle Operating Cost; and
- (vi) Road Maintenance Cost.

## Maintenance Intervention Level and Frequency

388. To determine maintenance interventions and frequency of work, it is necessary to determine road serviceability level, for example roughness index. TRL's Overseas Road Note 5 includes a table of values for different serviceability levels (see Table A3-4). IRI (international roughness index) and BI (bump integrator) values for paved and unpaved roads. Table A3-5 presents maintenance intervention levels for paved roads.

**TableA3-4: Road Roughness Values for Levels of Road Serviceability**

Paved roads			Unpaved roads				
Serviceability description	M/km IRI	Mm/km BI	Serviceability description	M/km IRI	Mm/km BI		
Ride comfortable over 120km/h. Undulation barely perceptible at 80 km/h in range 1.3 to 1.8. No depressions, potholes, or corrugations are noticeable: depressions <2mm/3m. Typical high quality asphalt 1.4 to 2.3. High quality surface treatment 2.0 to 3.0.	1.5-2.5	1000-2000	Recently bladed surface of fine gravel, or soil surface with excellent longitudinal and transverse profile (usually found only in short lengths)	1.5-2.5	1000-2000		
			Ride comfortable up to 80-100km/h. Aware of gentle undulations or swaying. Negligible depressions (e.g., < 5mm/3m) and no potholes.			3.5 – 4.5	2500-3500
Ride comfortable up to 100-120 km/h. At 80km/h, moderately perceptible movements or large undulation may be felt. Defective surface: occasional depressions, patches or potholes (e.g., 5-15mm/3m or 10-20mm/5m with frequency 1-2 per 50m) or many shallow potholes (e.g., on surface treatment showing extensive raveling). Surface without defects: moderate corrugations or large undulations.	4.0-5.5	3000-4000	Ride comfortable up to 70-80 km/h but aware of sharp movements and some wheel bounce. Frequent shallow to moderate depressions or shallow pot-holes (e.g., 6-30mm/3m with frequency 5-10 per 50m). Moderate corrugations (e.g., 6-20/0.7-1.5m)	7.5-9.0	6000-7000		
			Ride comfortable up to 50 km/h (or 40-70 km/h on specific sections). Frequent moderate transverse depressions (e.g., 20-40mm/3-5m at frequency 10-20 per 50m) or occasional deep depressions or potholes (e.g., 40-80 mmm/3m with frequency less than 5 per 50m). Strong corrugations (e.g., <20 mm/ 0.7-1.5m).			11.5-13.5	9500-11500
			Ride comfortable at 30km-40km/h. Frequent deep transverse depression and/or pot- holes (e.g., 40-80mm/1-5m with frequency less than 5 per 50m) with other shallow depression .Not possible to avoid all			16.0-17.5	14000-15000
Ride comfortable up to 70-90 km/h, strongly perceptible movements and swaying. Usually associated with defects: frequent moderate and uneven depressions or patches (e.g., 15-20mm/3m or 20-40mm/5m with frequency 5-3 per 50m). Occasionally potholes (e.g., 1-3 per 50m). Surface without defects: strong undulations or corrugations	7.0-8.0	5500-6500					

Paved roads			Unpaved roads		
Serviceability description	M/km IRI	Mm/km BI	Serviceability description	M/km IRI	Mm/km BI
Ride comfortable up to 70-90 km/h, strongly perceptible movements and swaying. Usually associated with defects: frequent moderate and uneven depressions or patches (e.g., 15-20mm/3m or 20-40mm/5m with frequency 5-3 per 50m). Occasionally potholes (e.g., 1-3 per 50m). Surface without defects: strong undulations or corrugations	9.0-10.0	7000-8000	the depressions expect the worst.		
			Ride comfortable at 20-30km/h. Speed higher than 40-50 km/h would cause extreme discomfort and possible damage to the car. On the good general profile: frequent deep depression and/or pot-holes (e.g., 40-80 mm/1-5m and occasionally very deep depressions (e.g., <80mm/ 0.6-2m) On a poor general profile: frequent moderate defects and depression (e.g., poor earth surface).	20.0-22.0	18000-20000

389. It is recommended that intervention levels on the roughness index be generally determined as follows:

Roads require resurfacing when surface irregularity measured by a bump integrator (BI) exceeds 2800 mm/km (IRI = 4)

Roads require overlay or reconstruction when the surface irregularity exceeds 3400 mm/km (IRI = 5).

390. Equivalent IRI numbers in brackets are derived using the following conversion formula from the TRL *Overseas Road Note 5 (A Guide to Road Project Appraisal)*:

$$\text{m/km IRI} = 0.0032^{0.89} (\text{mm/km BI})$$

*Overseas Road Note 1 (ORN1)* gives recommended interventions for paved road, as below.

Table A3-5: Maintenance Intervention Levels: Paved Roads

Defect	Level	Extent (% of sub-section length)	Climate/traffic category	Defect	Extent (% of sub-section length)	Action	Program	Notes	
Stripping or fretting	Any	<10	All	–		Local sealing	Routine	A fog spray of emulsion may be sufficient to renew the surface	
		>20	All	–		Surface dress	Routine		
Fatting – up or bleeding	–	–	All	–		No action	–	Local sealing or surface dressing may be required if the lack of skid resistance is a problem. In this case, the excess binder must be burned off first. Sanding is appropriate when live (shiny) bitumen is on the surface.	
Pot-holes	Any	–	All	–		Patch	Routine	Extensive potholing may result from lack of effective maintenance or rapid deterioration of the road structure or surfacing. The cause must be determined and appropriate action taken	
Edge damage	Erosion from original edge >150mm	>20	All	–		Patch road Edge and repair shoulder	Routine	If the failure is severe or persists, reconstruct the shoulder	
Edge step	>50mm	>50	All	–		Reconstruct shoulder	Periodic		
Wheel track rutting (surface dressing on granular base)	<10mm	–	Rainfall > 1500mm/yr or Traffic <1000 vpd	Wheeltrack Cracking	<5	Seal cracks	Routine		
					>5	Surface dress	Periodic	Single seals are often insufficient for wide cracks.	
				Non-wheeltrack cracking	<10	Seal cracks	Routine		
					>10	Surface dress	Periodic	See note above	
	10-15mm	>10	All	Any cracking	Wheeltrack Cracking	<10	Seal cracks	Routine	
						>10	Surface dress	Periodic	See note above
					Non-wheeltrack cracking	<20			
						>20			
10-15mm	>10	All	Any cracking	–	Treat cracks depending on extent as above	Routine/periodic	If rate of change of rut depth is slow		
					Further investigation	–	If rate of change of rut depth is fast		

Defect	Level	Extent (% of sub-section length)	Climate/traffic category	Defect	Extent (% of sub-section length)	Action	Program	Notes		
	>15mm	<10	All	Cracking only associated with local ruts	–	Patch	Routine			
				Other cracking	–	Patch excess rutting and treat cracks depending on extent as above	Routine/periodic			
		>10		Any cracking	–	Further investigation	–			
				Other cracking	–	Patch excess rutting and treat cracks depending on extent as above	Routine/Periodic			
		>5		Any cracking	–	Treat cracks depending on the extent as above	Routine/Periodic		If rate of change of rut depth is slow	
				Further investigation	–	Further investigation	–		If rate of change of rut depth is fast	
Wheel track rutting (asphaltic concrete on granular base)	<10mm	-	Rainfall >mm/yr or Traffic>10 00 vpd	Any cracking	<5	Seal cracks	Routine	Single seal are often insufficient for wide cracks.		
					5-10	Surface dress	Periodic			
					>10	Further investigation	–			
			Rainfall <mm/yr and Traffic<10 00 vpd	Any cracking	<10	Seal cracks	Routine	See note above		
					10-20	Surface dress	Periodic			
					>20	Further investigation	–			
	>10mm	<5	All	Cracking only associated with local ruts	–	Patch	Routine			
					Other cracking	–	Patch excess rutting and treat cracks depending on extent as above		Routine/Periodic	
				>5	Any cracking	–	Treat cracks depending on the extent as above		Routine/Periodic	If rate of change of rut depth is slow
						Further investigation	–		Further investigation	–

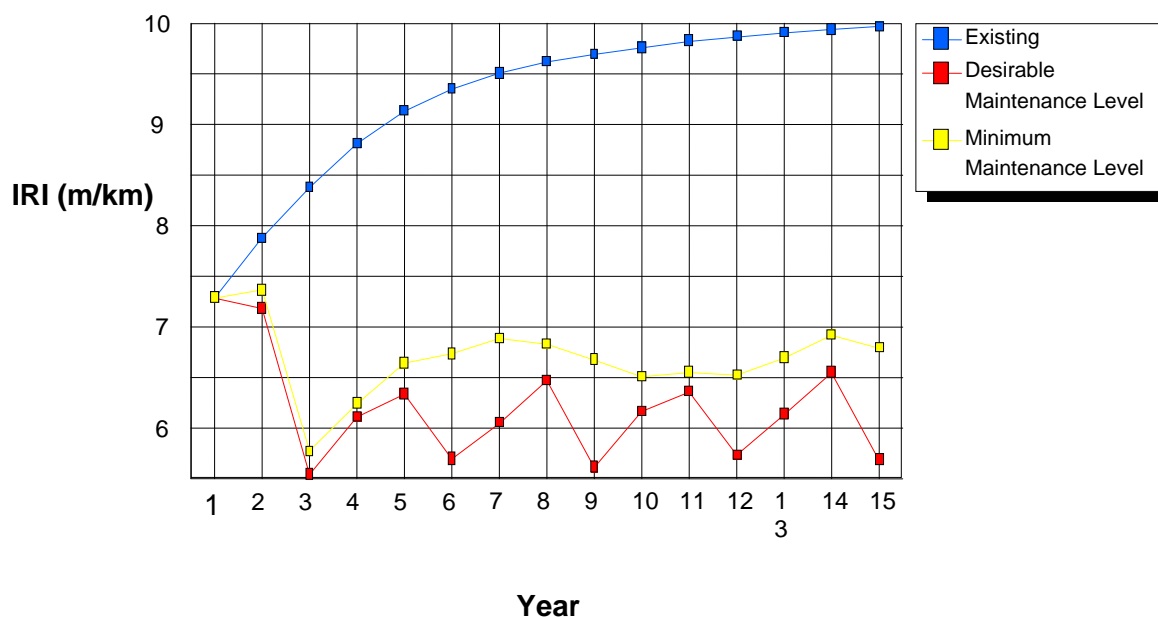
Defect	Level	Extent (% of sub-section length)	Climate/traffic category	Defect	Extent (% of sub-section length)	Action	Program	Notes
Wheel track rutting (asphaltic concrete or surface dressing on stabilized road base)	<5mm	-	Rainfall>1500mm/yr or Traffic>1000 vpd	Any cracking	<10	Seal cracks	Routine	Includes reflection
					>10	Seal crack and surface dress	Periodic	
			Rainfall<1500mm/yr or Traffic<1000 vpd	Any cracking	<20	Seal cracks	Routine	
	5-10mm	>10	All	Any cracking	-	Treats cracks depending on extent as above	Routine/Periodic	If rate of change of rut depth is slow
						Further investigation	-	If rate of change of rut depth is fast
	>10mm	<5	All	Cracking only associated with local ruts	-	Patch	Recurrent	
				Other cracking	-	Patch excess rutting and treat cracks depending on extent as above	Routine/Periodic	
	>5	All	Any cracking	-	Further investigation	-		

Source: TRL

391. The importance of maintaining roads is shown in Figure A3-2 below: roads not properly maintained will start to deteriorate and eventually fail. This is illustrated by “Existing”: roads that only receive routine maintenance, in an effort to cut costs, reach a point of non-maintainability and require large investment for reconstruction/rehabilitation. The application of proper maintenance profiles that include periodic maintenance (in either the Do-Minimum or Desirable Case) result in roads that remain in better condition much longer, with higher economic benefit.



Figure A3-2: Road Surface Condition and Maintenance Level



### Road Maintenance Funds (also see Annex 5)

392. Generally fuel taxation is the main source of transport sector revenue where fuel is taxed and full cost coverage of the road sector is based on the user pays principle. The following chart, developed by GTZ for the 15<sup>th</sup> IRF World Meeting 2005, shows categories of fuel taxation. The local retail price of fuel is above the price for crude oil on the world market, but below the price level in low income and middle income countries. There may be some margin for fuel taxation as a source of funding for road maintenance.

#### A. Crude Oil Price and Petrol/Diesel Price

393. Table A3-6 shows the relation between crude oil prices (world market) and the local petrol/diesel retail price 2004-2008.

**Table A3-6: Relation between Crude Oil Prices and Local Petrol/Diesel Prices**

Crude Oil Price (World Market) (1)	2004 \$43 / barrel	2006 \$78 / barrel	2007 \$90 / barrel	Jan 2008 \$100 / barrel	May 2008 \$135 / barrel
	\$0.27 / lit.	\$0.49 / lit.	\$0.56 / lit.	\$0.63 / lit.	\$0.84 / lit.
Petrol Retail Price* (2)	Oct. 2006 \$0.68 (AMD324)	Nov. 2006 \$0.85 (AMD324)	Jun. 2007 \$0.96 (AMD324)	Jan. 2008 \$1.05 (AMD316)	May. 2008 \$1.32 (AMD400)
Diesel Retail Price*	Oct. 2006 \$0.46 (AMD220)	Nov. 2006 \$0.76 (AMD288)	Jun. 2007 \$0.80 (AMD270)	Jan. 2008 \$1.02 (AMD305)	May. 2008 \$1.39 (AMD420)
Exchange Rate AMD per \$	476	380	338	300	303
Industry Margin, Import Tax, VAT, (Fuel Tax ?) for petrol: (2) – (1)=(3)	\$0.41 / lit.	\$0.36 / lit.	\$0.43 / lit.	\$0.42 / lit.	\$0.48 / lit.

Recommended Industry Margin etc. (4)					
(i) Industry Margin and VAT	\$0.17				
(ii) Fuel Tax under the non-subsidized Road Transport Policy	\$0.10				
(ii) Total	\$0.27				
(Source: GTZ 15 <sup>th</sup> IRF World Meeting and its website of International-Fuel-Prices)					

394. The retail price of petrol/diesel (2) needs to take into account the crude oil price (1) and the margin for tax and the industry (3). The margin for the last five years is about \$0.4 /lit.(3) which represents a bigger margin than recommended by GTZ, 15<sup>th</sup> IRF World Meeting. Therefore, a \$0.10 fuel levy might be applied for road maintenance, both routine and periodic.

## B. Revenue from Fuel Levy

395. Currently there is legislation in place to fund the road sector at 10% per liter of gas and diesel imported. In theory, this is supposed to be levied at the border, but in practice the ARD and MOTC have not been able to provide details about this legislation and the legislation is not being implemented. Even a \$0.10/lit. fuel levy, only about 8% of the retail price of fuel (with an amendment to include CNG) might help minimum required performance of both routine and periodic maintenance, given some measure of cost reduction in maintenance works. The capital repair work, undertaken mainly with external resources, needs to be completed as soon as possible and periodic maintenance put into practice. Both routine and periodic maintenance should be funded locally, with external funding reserved for upgrading and new construction.

396. In August 2008, the average fuel cost per 150 km was ARD7400 for a petrol car or ADR2000 for natural gas. The price of natural gas is low (20-30% of petrol/diesel prices) and many vehicles have been converted to natural gas for this reason (the share is one of the highest in the world). There is an opportunity to amend and implement the current legislation to include CNG while keeping in mind the benefits of a CNG-heavy transport infrastructure in terms of the environment and petroleum reliance.

397. The estimated annual revenue from the implementation of the current legislation including gasoline, diesel and CNG is:

- (i) Fuel consumption for transport sector: 450 million lit./year (including CNG)  
{Petrol: 209,681,570 + Diesel: 129,377,990 + CNG: 20,000,000 (20% of Petrol) \* 1.25=450,000,000}
- (ii) Fuel levy @ \$0.01/lit. (~1% price of liter of fuel) \$4.5 million/year
- (iii) Fuel levy @ \$0.05/lit. (~4% price of liter of fuel) \$22.5 million/year
- (iv) Fuel levy @ \$0.10/lit. (~8% price of liter of fuel) \$45.0 million/year

398. Table A3-7 presents data on fuel imports and consumption in Armenia.

**Table A3-7: Fuel Imports and Consumption in Armenia**

Oil Import (2004)*	41,240 bbl/day		
Oil Consumption (2005)*	40,000 bbl/day	6,400,000 lit./day	2,336,000,000 lit./year

		5,609 ton/day	2,047,285 ton/year
Natural gas consumption(2007)*			2.2 billion cu m/year
<b>Transport Fuel Use by Type (2005)**</b>			
Petrol	183,770 ton /year		183,770 ton /year
			209,681,570 lit /year
Diesel	113,390 ton /year		113,390 ton /year
			129,377,990 lit./year
CNG	93,840 ton /year		93,840 ton /year
Total	391,000 ton /year		391,000 ton /year

Sources: \*CIA World Fact book Armenia \*\* Sustainable Urban Transport in Yerevan  
Notes: 1 bbl =42 gallon, 1gallon=3.8 lit., 1bbl=160lit. Oil gravity: 0.8762 1 ton:1,141 lit.

399. The calculation of revenue from a fuel levy is as follows:

- (i) Transport sector fuel consumption: (0.45 million lit/year),
- (ii) For each \$0.01/lit. fuel tax, revenue is \$4.5 million/year, For \$0.10/lit.: \$45million/year, for \$0.15/lit.: \$67.5million/year.

400. Table A3-8 below shows the maintenance budget, actual and objective with a fuel levy.

**Table A3-8: Maintenance Budget – Actual and Objective**

Item	2006*		2007*		2008*		Objective	
	AMD	\$	AMD	\$	AMD	\$	AMD	\$
Capital repair: Roads/Structures(by external resources)	12.48	30.00	14.05	39.35	13.76	45.56	-	-
⇒ Periodic maintenance (by internal resources)	-	-	-	-	-	-	6.16	20.40
Maintenance (Routine):about 3,000km	5.02	12.07	5.99	16.77	6.19	20.50	6.19	20.50
Maintenance (Routine):about 2,200km	0.00	0.00	0.00	0.00	0.00	0.00	3.72	12.32
Total MOTC Road Budget AMD billion	17.50	-	20.04	-	19.95	-	16.07**	-
Total MOTC Road Budget: \$ million	-	42.07	-	56.12	-	66.06	-	53.22**
Road Maintenance Fund from Fuel Levy	-	-	-	-	-	-	13.59	45.00

AMD = Armenian Dram

Source: \*: MOTC,

Note: \*\*: cost reduction to match Road Fund revenue.

### C. Rehabilitation Cost Estimate

401. ARD provided unit costs for major work items for road construction and maintenance, as shown in Table A3-9. There was a sharp increase in unit costs 2006-2008. The major reason is the increase in the price of bitumen and oil.

**Table A3-9: Unit Costs for Major Work Items for Road Construction and Maintenance**

Work Code	Work Name	Description	Work Unit Cost (\$/sqm)			
			Nov. 2006 \$1=AMD380	Jun. 2007 \$1=AMD338	Mar. 2008 \$1=AMD300	Jul. 2008 \$1=AMD303
REC 16	Reconstruction	100mm thick at IRI 16	31.58	37.36*	49.10*	58.83
OL10	Overlay	AC100mm thick		25.09*	33.72*	
OL 2L	Overlay	AC 40+60mm	28.00			57.96

OL 5	Overlay	AC 50mm thick at IRI 8-12	15.00	17.47*	23.26*	29.58
RSL 40	Reseal	At 40% surface damage	10.00			12.84
SD40	Surface Dressing	Two Layers		10.81*	14.13*	
POTPAT	Patching	For Pothole	14.00	17.20*	23.02*	27.51
GRR	Gravelling	Gravelling road	48.00			
OER	Overlay on Earth Road	Overlay on earth road				350,000 / km

Source of Work Unit Price: ARD

\*Figure provided to JICA<sup>2</sup> in 2008 for *Supplementary Study on Rural Roads Rehabilitation*

402. ARD also provided a unit cost of construction of road for the feasibility study on Goris-Kapan Road conducted by UNESCAP in mid-2007, as shown in Table A3-10.

**Table A3-10: Unit Road Construction Costs**

Number	Work Item	Unit	Unit Cost (\$)	Remarks
1	Construction of new paved road	km	600,000	2 -lane
2	Construction of new concrete bridge	m2	3,000	2-lane
3	Rehabilitation of paved road	km	160,000	2 -lane
4	Rehabilitation of 1-lane concrete bridge	m2	1,400	1 -lane
5	Guard rail installation	m	36	
6	Construction of pipe or box culvert	location	420	2 -lane

Source: Armenian Road Directorate

403. JICA estimated in April 2008 the cost of the Rural Roads Rehabilitation Project for the supplementary study for feasibility study (Table A3-11). The estimate was made based on the work unit costs provided by ARD in March 2008.

**Table A3-11: Cost of the Rural Roads Rehabilitation Project for the Supplementary Study for Feasibility Study**

Number	Existing road surface conditions Rehabilitation of rural paved roads	Length Km	Length %	Total cost * of Rehabilitation (\$)	Cost per Km (\$/km)
1	Very bad (IRI: more than 16.0)	186.7	23	63,775,000	341,590
2	Bad (IRI: 16.0 - 12.0)	211.6	26	48,828,000	230,756
3	Bad (IRI 12.0 – 8.0)	242.6	30	43,895,000	180,935
4	Fair (IRI: 8.0 or less)	165.9	21	23,349,000	140,741
	Total	806.8	100	180,848,000*	224,154

Source: ARD and JICA

\*The total project cost (w/o VAT) including management, engineering and contingencies is \$229. 7 million (27% higher than the civil works cost).

404. MOU for the *Proposed Supplementary Loan 2351-ARM Rural Road Sector Project* provided an updated cost of works on 16-18 July 2008 (Table A3-12).

**Table A3-12: Updated Costs of Works for Loan 2351-ARM Rural Road Sector Project**

Number	Work Item	Unit	Length	Total Cost (US\$)*	Cost per km (US\$/km)
	Rehabilitation of Roads				
Package1	Contract Price 9 May 2008	km	109.27	21,213,000	194,133

<sup>2</sup> Concessional loan operations of the Japan Bank for International Cooperation (JBIC) were integrated into the operations of the Japan International Cooperation Agency (JICA) on 1 October 2008.

Package2	Estimated Cost 9 July 2008	km	117.80	33,641,000	285,577
Total			227.07	55,320,000	243,625

Source: ARD

\*The total costs (w/o VAT) includes management and engineering and contingencies 10%

405. Millennium Challenge Corporation (MCC) agreed a \$67.1 million grant for rehabilitation and improvement of rural roads to be completed by September 2011 (Table A3-13). Currently it is estimated that due to inflation and dollar depreciation the grant will be sufficient for 330km.

**Table A3-13: MCC Road Project Costs**

Number	Work Item	Unit	Length	Total Cost (US\$)*	Cost per km (US\$/km)
	Rehabilitation of Roads (original plan)	km	940	67,100,000	71,383
	Rehabilitation of Roads (reviewed in 2008)	km	330	67,100,000	203,333

Source: ARD

Note: The cost excludes VAT

406. The estimated cost (w/o VAT) of LRNP rehabilitation projects at August 2008 prices is given in Table A3-14 below:

**Table A3-14: LRNP Project Costs**

Number	Existing Surface Condition Rural Paved Road	Direct Cost of Civil Works (\$/km)	Management/Engineering (10%)	Contingencies (5%)	Total Project Cost (\$/km)
1	Very bad (IRI: more than 16.0)	350,000	35,000	17,500	400,500
2	Bad (IRI: 16.0 - 12.0)	250,000	25,000	12,500	287,500
3	Bad (IRI 12.0 – 8.0)	200,000	20,000	10,000	230,000
4	Fair (IRI: 8.0 or less)	150,000	15,000	7,500	172,500
	Average	235,500	23,750	11,875	272,625

Source: Armenian Road Directorate

## ANNEX 4: HIGHWAY DESIGN REVIEW

### 1. Overview

407. This Appendix provides material for further discussion with stakeholders to develop a new highway design standard. Existing design standards, in particular those inherited from USSR practice (SNIP: Construction Norms, VSN: Construction Regulation, GOST: General Standard), need to be reviewed in the light of international experience and economically/technically sustainable practices, as well as to promote efficient use of investment resources. The geometric design shall respond to traffic safety requirements, and the pavement structure design shall ensure long road life and economic construction, maintenance and operation. The Appendix provides both geometric and pavement structure design, taking account of these requirements.

408. The Armenian design standards, in particular those inherited from USSR practice (SNIP: Construction Norms, VSN: Construction Regulation, GOST: General Standard), need to be reviewed in the light of international experience and economically/technically sustainable practices as well as to promote efficient use of investment resources. The geometric design shall respond to traffic safety requirements, and the pavement structure design shall ensure long life of road and economical construction, maintenance and operation of road.

409. To develop the final design standard, it is recommended to hire an internationally experienced expert and to set up an *ad hoc* advisory committee, under MOTC, for implementation by ARD. The application and standardization procedure shall be executed in accordance with the *Law on Standardization* approved by the National Assembly on November 1999.

410. It is recommended to set up an ad hoc committee for finalizing the design standard. The executive committee would be administered under the leadership of MOTC, and the implementation committee will be managed by ARD. The application and standardization procedure shall be executed in accordance with the Law on Standardization approved by the National Assembly on November 1999.

411. It is also recommend that practical lessons learned in the field need to be applied whenever possible to on-going design including projects funded by international financiers to increase effectiveness. In complying with the design standard, note that there should be significant latitude in its interpretation to enable the different parties to use various approaches to achieve the objectives.

### 2. Existing Design Standard

#### Geometric Design

412. CNRA (Construction Norms of Republic of Armenia) IV-11.05.02-99, which came into effect in 2000, prevails as the standard to be applied for all roads: Interstate, Republican and Local, except city roads.

413. The major geometric standards are shown in Table A4-1 below.

Table A4-1: Major Highway Geometry

Class Parameters	I	II	III	IV
	International Interstate	Interstate/ Republican	Interstate/ Republican/ Local	Local
<b>Traffic Volume (vehicle/day)</b>	Over 9,000	4,500 – 9,000	1,500- 4,500	Below 1,500
<b>Design Speed (km/hr)</b>				
Flat	120	100	90	80
Rolling	100	90	80	70
Mountainous	80	60	50	40
<b>Formation Width (m)</b>				
Number of lanes	4 (6, 8)	2	2	2
Lane width (m)	3.6	3.6, 3.3	3.3, 3.0	3.0 , 2.7
Road Shoulder (m)	2 x 3.60	2 x 3.30	2 x 2.40	2 x 1.80
Median (m)	4.8	-	-	-
Corridor of Impact (m)	26.4 (33.6, 40.8)	13.8, 13.2	11.4, 10.8	9.6, 9.6
<b>Maximum Gradient (%)</b>				
Flat	4% with 120 km/hr 5% with 80 km/hr			
Rolling	5% with 100 km/hr 6% with 70 km/hr			
Mountainous	6% with 80 km/hr 9% with 40 km/hr			
<b>Minimum Horizontal Curve radius (m) with 0.6% super- elevation</b>	55m with 40 km/hr 250m with 80km/hr 670m with 120km/hr			
<b>Minimum Vertical Curve radius</b>				
crest (km)	12.5 (120 km/hr) 1.0 (40 km/hr)			
sag (km) flat	6.0 (120 km/hr) 0.9 (40 km/hr)			
sag (km) rolling / mountainous	1.80 (90 km/hr) 0.45 (40 km/hr)			
<b>Super-elevation (%)</b>	0.6 – 0.4	0.4 – 0.9	0.5 – 1.1	0.6 – 1.5

Note: \* Parameters in parentheses are used when the standard is not achievable

### Pavement Structural Design

414. The *Instruction on Design of Road Pavement (Non-rigid Type)*: BDH 46-83, which came into effect in 1985, prevails as the standard to be applied for all except city roads.

415. The pavement structure is designed based on an elastic deflection method, applying the load and materials. The method is rather complex and a conventional method needs to be adopted.

416. Highway design is a process whereby the road in the terrain is designated to meet the needs of road users. The principal design components are geometric features, such as horizontal alignment, vertical alignment and cross section, and pavement structure design. The design needs to satisfy the following: (i) ensure safety and comfort of drivers; (ii) ensure long road life; and (iii) ensure economic construction, maintenance and operation of the road,

## Geometric Design Standards

### General

417. The design needs to take account of each requirement of the driver, vehicle and road function as shown below. The standard needs to be developed taking account of local conditions, based on the worldwide AASHTO Standard.

**Table A4-2: Geometric Design Parameters**

Geometric Design Parameter	Driver's Requirement	Vehicle's Requirement	Road Function's Requirement
Minimum safe stopping distance	Perception – reaction time	Layout of controls, braking systems, type condition, tread pattern	Skid resistance of road surface, design speed
Minimum safe passing distance	Judge of gap availability and vehicle capability	Acceleration capability	Design speed
Driver eye height	Physiology	Dimensions	-
Object height	-	Dimensions for passing	-

### Horizontal geometry

Super elevation (e max)	Consistency of steering effort on successive curves	-	Urban/ rural environment, climatic conditions, open of curvature
Coefficient of friction (f max)	Comfort	-	Skid resistance of road surface, open highway/ intersection
Radius (R min)	-	-	Design speed, open highway/ intersection
Transition curves	Behavior on entering curves, comfort	-	Appearance of carriageway edges, design speed
Phasing	Response to visual defects and hazards	-	Appearance, creation of visual defects and hazards, design speed

### Vertical geometry

Crest curves	Speeds during night-time compared with day time comfort	Headlight height, proportion of stopping distance illuminated by headlights	Drainage, appearance of road, design speed
Sag curves	Comfort	Headlight height, beam divergence, distance illuminated by headlights	Drainage, appearance of road, design speed
Gradients	Behavior on approach to gradients	Passenger car and truck performance, power/ weight dimensions	Crawler lanes provide overtaking opportunity, design speed

### Cross-section

Number of lanes	Comfort , ability to maneuver in traffic stream and maintain desired speed	-	Urban rural environment design speed
Lane width	Sensitivity to restricted width	Dimensions of design vehicle	-



Lateral clearance	Sense of restriction	-	Nature of lateral obstruction
Shoulder width	Sense of restriction	Dimensions of design vehicle	Urban/ rural environment, type of facility
Median width	Sense of well-being	Vehicle / barrier collision	Type of facility, terrain. Urban/ rural environment, and appearance
Cross-fall	-	-	Drainage, type of facility
Vertical clearance	Sense of restriction	Dimensions of design vehicle	Future resurfacing

### **Class of Highway**

418. The class of highway is determined based on the design traffic volume (pcu) and level of service. The design traffic volume is determined based on traffic survey and forecast volume in the target year for highway design. The forecast traffic volume consists of normal, diverted, induced and generated traffic. Traffic volume is a basic parameter to establish the number of lanes.

### **Number of Lanes and Standard Design Volume**

419. The number of lanes is determined based on the standard design volume, developed taking account of highway design capacity and level of service.

### **Vehicle Size**

420. Vehicle dimensions determine geometric design. Road is the dominant passenger mode and important for freight. The design of geometric features shall take account of international standard vehicle sizes provided in AASHTO.

### **Design Speed and Geometric Features**

421. The design speed needs to be determined by class of highway taking account of terrain, especially horizontal curve radius and vertical gradient. Geometric features shall be designed for each design speed and terrain conditions to maintain safety and comfort drive. Where there are severe terrain sections in the mountains, such as sharp, steep and or precipitous, the geometric features are restrictive and a finite driving speed (30 km/hr, 20 km/hr) is required.

422. The horizontal curve radius shall be designed based on design speed. For example, 15m curve radius is accepted as minimum for a design speed of 20 km/hr.

423. The maximum horizontal gradient shall be 12% and desirable gradient below 9%. A climbing lane shall be designed for sections steeper than 10%, or exceeding 8% for more than 500m. A passing place or waiting lane needs to be provided on long downslopes for slow moving vehicles.

### **Cross Section Elements**

424. The cross section is composed of the following elements: (i) carriageway; (ii) central median; (iii) shoulder and verge; and (iv) side ditch. The carriageway width should take

account of highway function (international, interstate, republican or local), traffic volume and terrain conditions. A lane width of 3.65m is recommended for heavy traffic sections of interstate highway, with 3.0m on severe mountainous sections. For other highways 3.5m is recommended.

425. A median strip should be provided on 4-lane highways to separate traffic flows to prevent turning movements, improve traffic flow and safety. The standard width of the median is 3.0m and a minimum of 2.0m to provide for safety barriers.

426. A shoulder (paved) and verge (unpaved) are needed to protect the road and to provide space for pedestrians in urban areas and for breakdown/accident on busy routes. A width of 2.5m as minimum and 3m is desirable, with 1 m in mountainous sections.

427. A drainage system is important to maintain pavement life. Drainage should be designed based on catchment area, volume of water discharge (rainfall and meltwater). The bottom of the drainage shall be placed below the level of the roadbed. Concrete or stone drainage shall be applied on sections with gradient over 7%.

428. The geometric standards are summarized in Tables A4-3 and A4-4.

**Table A4-3: Geometric Standards**

Class	I	II	III	IV	V
	Inter National / Interstate	Interstate / Republican	Interstate / Republican / Local	Local	Local
Design Traffic Volume (vehicle / day)	Over 12,000	9,000-12,000	4,500-9,000	1,500-4,500	Below 1,500
Number of Lane	Over 4	2	2	2	2
Lane Width	3.65	3.65	3.5 / 3.0	3.5 / 3.0	3.5 / 3.0
Center Median Strip (m)	2m / 3m	-	-	-	-
Design Speed (km/ hr)					
Flat	100	100	80	80	80
Rolling	80	80	60	60	60
Mountainous	-	-	40	40	40
Severe Mountainous	-	-	30 / 20	30 / 20	30 / 20

**Table A4-4: Design Speed, Geometric Features and Cross Section Elements**

Design Speed (Km / hr)	100	80	60	40	30 -20
Maximum Gradient (%)	4	6	8	9	9-12
Minimum Horizontal Curve (m)	400	250	130	50	30 - 15
Minimum Vertical Curve (m)					
Crest (km)	6	5	2.5	1	0.5
Sag (km)	3	2	1.5	0.6	0.4
Minimum Length of Transition Curve (m)	70	70	50	35	25
Stopping Sight Distance (m)	90	70	50	35	25
Super-elevation (%)	3-10	3-10	3-10	3-10	3-10
Cross fall (%)	2.5	2.5	2.5	2.5	2.5

**Table A4-5: Shoulder and Verge**

<b>Terrain</b>	<b>Flat/Semi-urban/Village</b>	<b>Rolling / Mountainous</b>	<b>Sever Mountainous</b>
Shoulder (paved) m	2.0 – 2.5	1.0	0.5
Verge (unpaved) m	0.5	0.5	0.5

### **Pavement Structure Design**

#### **General**

429. The three most important factors affecting pavement thickness are traffic loading, sub-grade (roadbed) strength and pavement materials, including surface, base course and sub-base.

430. The design of pavement structure shall be performed in accordance with the UK *Transport Research Laboratory's Overseas Road Note (RN) 31*, which is utilized worldwide and the conventional method.

#### **Traffic Forecast and Traffic Loading**

431. To determine traffic loading, which is expressed in cumulative equivalent standard axle load (ESA) according to RN31, it is necessary to know the average daily traffic and its composition. Then, ESA can be derived via the application of appropriate conversion factors.

432. Normally the cumulative volume over 20 years is used for highway design of highway. Note that cars, pick-ups and motorcycles are not considered, as they have a minimal impact on pavement deterioration. The general equation applied is as follows:

$$\text{Cum. ESA}_t^y = HV_t \times 365 \times \text{Lane Factor} \times HV_t \text{ Factor} \times ((1 + r)^y - 1) / r$$

Where,

$\text{Cum. ESA}_t^y$  = cumulative ESALs per direction for heavy vehicles of type t after y years.

$HV_t^{y_0}$  = number of vehicles of type t in the initial year  $y_0$  (includes large buses, 6 axle trucks, 10 axle trucks, and 18 axle trucks)

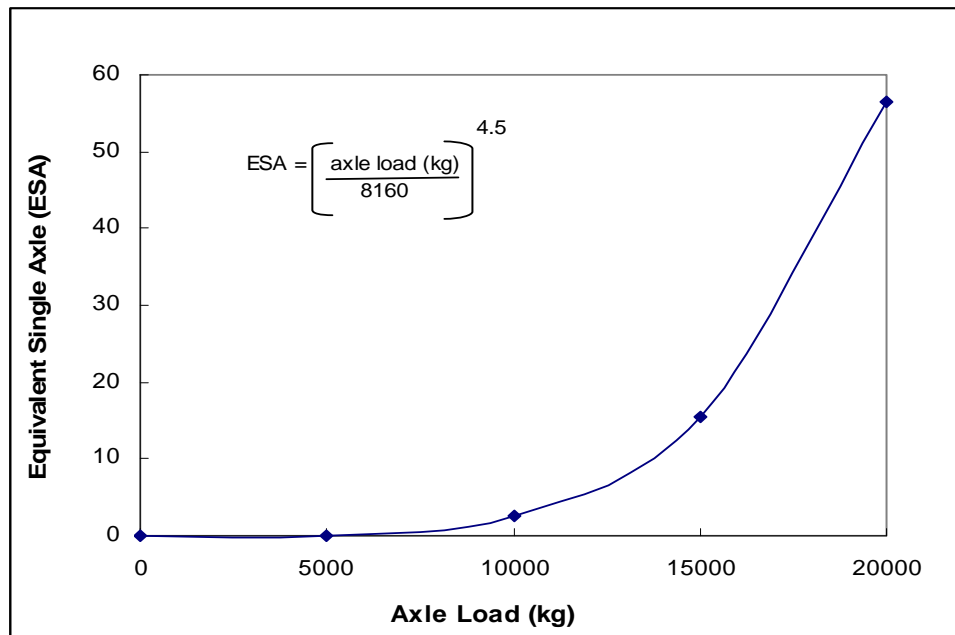
$r$  = annual average growth rate

$y$  = number of years (21 with starting year as 1 to represent pavement life)

$HV_t \text{ Factor}$ : a rate for heavy vehicle type t for converting into ESA.

$\text{Lane Factor}$ : The percentage of heavy vehicles operating in the design lane.

433. If the is not controlled, design would be inadequate and the road severely damaged in a short time. As shown in Figure A4-1, the relationship between axleload and ESA is exponential. For a 60% increase in axleload from 15,000 to 24,000kg there would be more than a 700% increase in ESA from 15.5 to 128.3, indicating the importance of strictly enforcing loading regulations.

**Figure A4-1: Relationship between Axle Load & ESA**

Source: Overseas Road Note 31, A Guide to the Structural Design of Bitumen-Surfaced Roads in Tropical and Sub-tropical Countries, Transport and Road Research Laboratory, UK, 1993.

### Pavement Structure Design

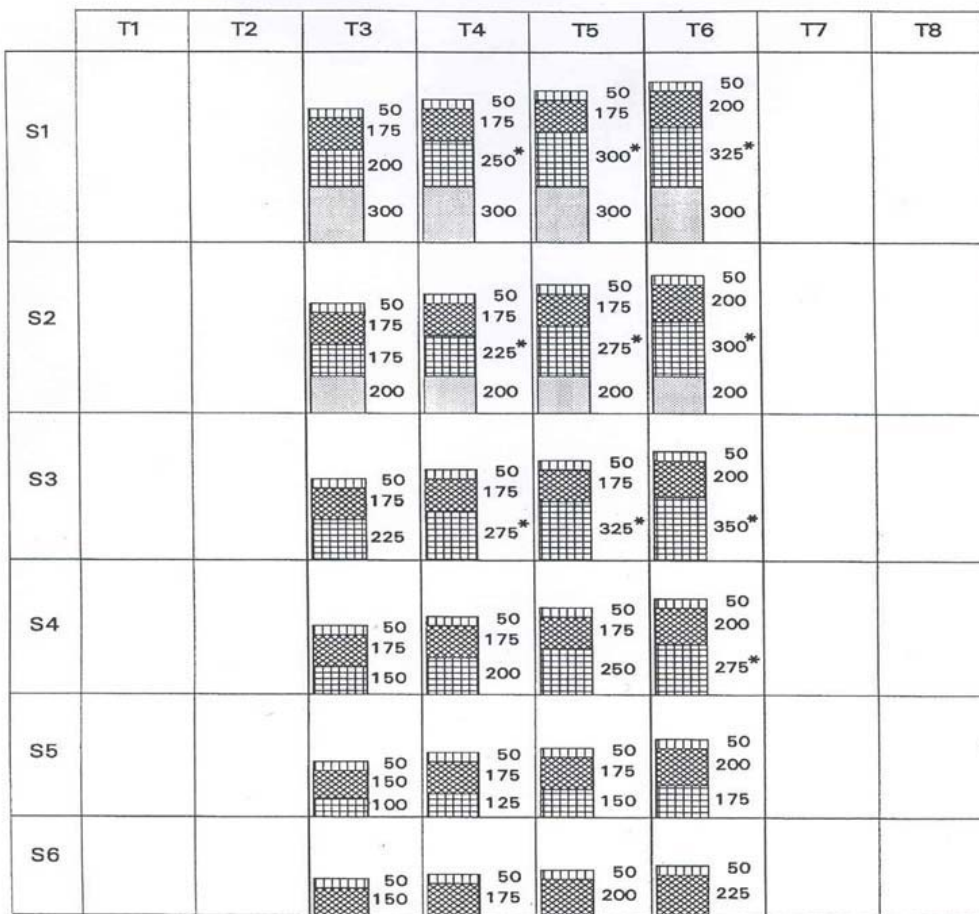
434. The design life is 20 years. For the pavement with semi-structural AC surface on granular road base, the pavement design is performed using Chart 2 of RN31 as shown in Table A4-5 and Figure A4-2.

**Table A4-5: Pavement Structure Design**

Traffic Class (10 million ESA)	Subgrade Strength Class (CBR%)
T1 = < 0.3	S1=2
T2 = 0.3 – 0.7	S2=3, 4
T3 = 0.7 – 1.5	S3=5-7
T4 = 1.5 – 3.0	S4=8-14
T5 = 3.0 – 6.0	S5=15-29
T6 = 6.0 – 10	S6=30+
T7 = 10 – 17	
T8 = 17 – 30	











**Figure A4-2: Pavement Structure Design**

CHART 3 GRANULAR ROADBASE / SEMI-STRUCTURAL SURFACE



Note: 1 \* Up to 100mm of sub-base may be substituted with selected fill provided the sub-base is not reduced to less than the roadbase thickness or 200mm whichever is the greater. The substitution ratio of sub-base to selected fill is 25mm : 32mm.  
 2 A cement or lime-stabilised sub-base may also be used.

Material Definitions

-  Double surface dressing
-  Flexible bituminous surface
-  Bituminous surface  
(Usually a wearing course, WC, and a basecourse, BC)
-  Bituminous roadbase, RB
-  Granular roadbase, GB1 - GB3
-  Granular sub-base, GS
-  Granular capping layer or selected subgrade fill, GC
-  Cement or lime-stabilised roadbase 1, CB1
-  Cement or lime-stabilised roadbase 2, CB2
-  Cement or lime-stabilised sub-base, CS

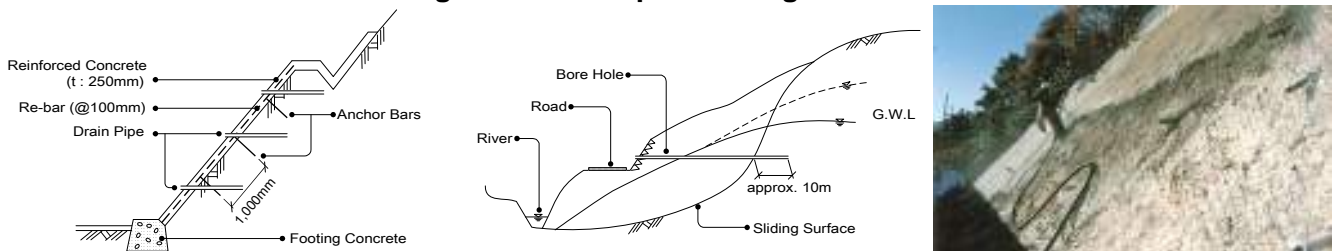
435. Both sub base and base course shall be granular material and the CBR shall be over 35% and 80% respectively. Sub-grade strength (CBR) where frost heave is observed, shall be reduced, based on the contents of fine fraction. The asphalt (bituminous) surface where low temperature cracks are observed, shall be covered with an additional asphalt cover of 30-50mm.

**Slope Protection**

436. Soil, rock or loose debris are visible at the toe of slope on both sides or each side located in mountainous sections, indicating the occurrence of slides (especially during the winter and rainy season) that could eventually result in disaster. Therefore, slope protection shall be emphasized in order to prevent pavement damage and to ensure traffic safety.

437. In locations where the cut is through weathered rock and boulders may fall due to erosion of surrounding material, it is desirable to provide support to prevent slippage and erosion. Several methods may be considered, depending on the physical characteristics. The photograph on the right shows concrete spray with a reinforcing steel wire net. Furthermore, proper drainage methods shall be provided with appropriate support to prevent landslides generated by ground water (see Figure A4-3 below). Alternately, rock-bolts, dowels, or reinforced shotcrete may be used.

**Figure A4-3: Proper Drainage Methods**



## ANNEX 5: ROAD MAINTENANCE MANAGEMENT

### Overview

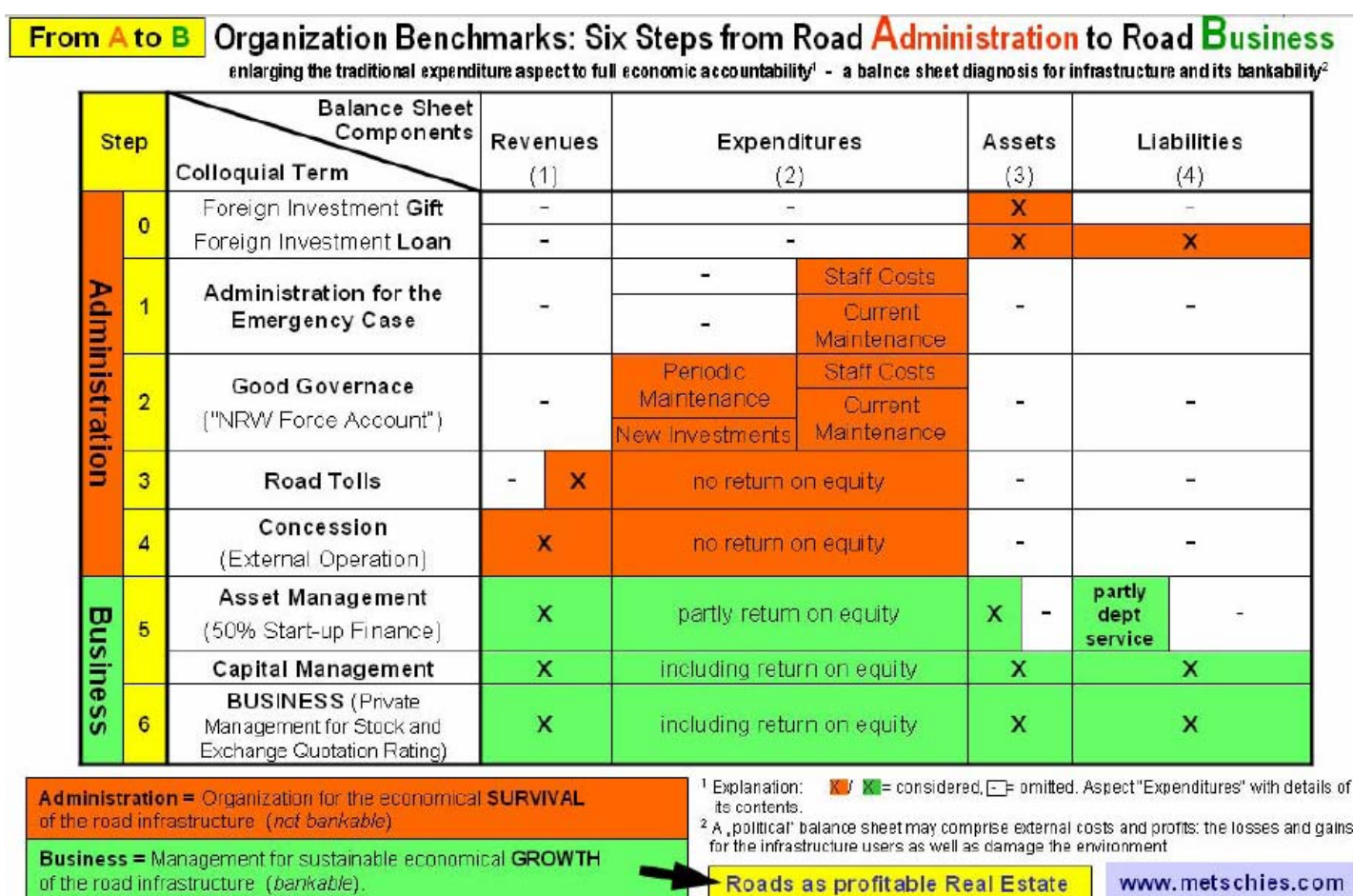
438. This Annex discusses road maintenance management scenarios.

### Establishment of Maintenance Scenarios

#### A. Improving Capacity

439. Figure A5-1 sets out organizational benchmarks from road administration to a road business.

**Figure A5-1: Organizational Benchmarks from Road Administration to a Road Business**



Source: GTZ, 15<sup>th</sup> IRF World Meeting

#### B. Road Fund Management

440. For sustainable, transparent and accountable Road Fund management, the following structure is recommended: (i) autonomous road agency on a performance-based regimen under clear budgetary constraints; (ii) agency needs legal executive powers and to be user-dominated; (iii) governance free from political interference; (iv) participation of persons and representative of stakeholder including road users, transporter, and contractors; and (v) operation on sound business principles.

441. The existing capacity of road administration is categorized as “Step 1” in Figure A5-1: a road institution with qualified staff is in place, but funds are limited to the payment of salaries or for routine) road maintenance only. This “Step 1” may be called “administration for the emergency case”. Achieving “level 2” is crucial “good governance” as the necessary amounts of routine and periodic maintenance are available and some new investment is carried out. Some taxation of road sector may have stated.

### **C. Prioritization of Road Network**

442. To match funding with road maintenance work, the network needs to be prioritized into core and non-core components. The former would be funded, while the latter would either have to be removed from the priority network or funded from other sources. The core network should be defined rationally as roads that have a significant effect on the national economy, roads involved with tourism, and important agricultural access roads that have an impact on local and export market. Another definition of core network is interconnected urban and rural principal arterial roads which serve major population centers, international border crossing, ports, airports, public transport facilities, other inter-modal transport facilities and other major travel destinations; meet defense requirements and function at interstate and interregional level.

### **D. Determination of Maintenance Level and Frequency**

443. It is not cost-effective to maintain low traffic roads at a high service level, maintenance level and frequency need to be evaluated separately. The following factors need to be taken into account:

- (i) Traffic and mobility levels;
- (ii) Proximity to health, social and educational facilities;
- (iii) Population served by the road;
- (iv) Employment creation potential including agriculture; and
- (v) Future development projects.

### **E. Quality Control - Road Maintenance Manual and Computer Database**

444. Quality control is essential measure to extend road life and to minimize the cost of construction and maintenance. Costs locally are very high because of the geographic and geopolitical situation. A Road Maintenance Manual for use of both road administration staff and contractors for inspection, evaluation and supervision, is an essential toll to perform technically qualified maintenance, including judgment of intervention level.

445. Road inventory and condition surveys of all roads need to be carried out and to be updated frequently. All data, such as inventory, condition records from routine inspection activity, contract documents, unit contract prices and available funds, need to be kept in a computer database, to enable engineers to monitor it for maintenance purposes. Databases can be shared between headquarters and branch offices through a wide-area network (WAN) system, to minimize administration cost.

### **F. Qualified Contractor and Work Performance**

446. Maintenance should be executed by performance-based contracts, with contractors evaluated by an engineer of the road administrator yearly and given a score based on technical and work achievement performance. Contractors should be selected and contracts awarded based on technical and performance ability score, not just on company size and

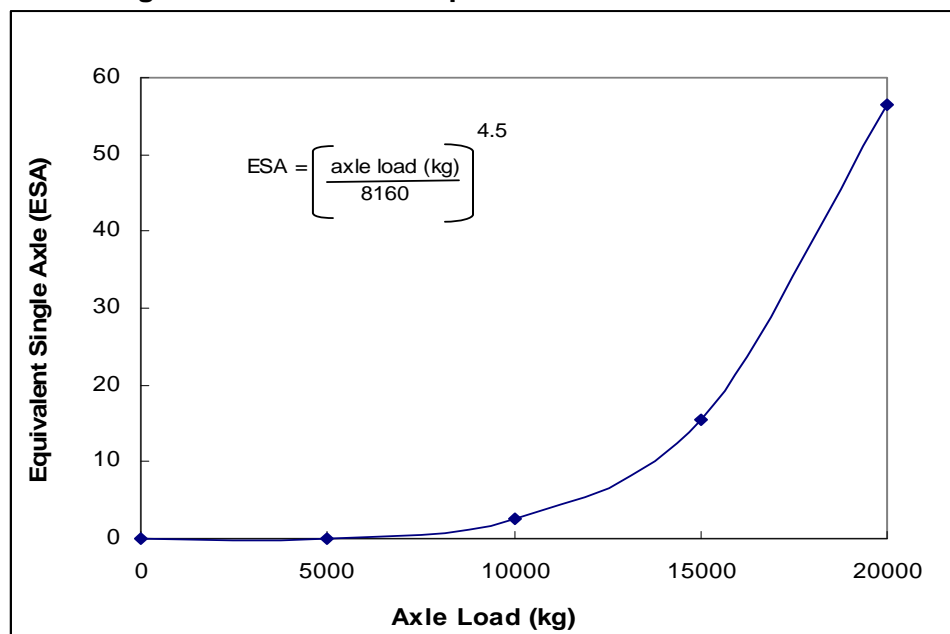


financial ability.

### G. Axle Load Control

447. Figure A5-2 shows the relationship between axle loads and (cumulative) equivalent standard axles (ESAs).

**Figure A5-2: Relationship between Axle Load and ESA**



Source: Overseas Road Note 31, A Guide to the Structural Design of Bitumen-Surfaced Roads in Tropical and Sub-tropical Countries, Transport and Road Research Laboratory, UK, 1993.

448. As indicated, the relationship between axle load and ESA is exponential. A 33% increase in axle load from 15,000 to 20,000 kg results in a 350% increase in ESA (from 15.5 to 55.5), indicating the importance of strictly enforcing loading regulations. Permanent weigh scales need to be set up on at least heavily trafficked interstate roads, with fines imposed on overloaded vehicles.

## ANNEX 6: POTENTIAL TO INCREASE RAIL FREIGHT TRAFFIC

449. Armenian Railways statistics identify 58 commodities, plus “others”. Table A6-1 shows 2007 traffic classified into imports, local/domestic and exports. In terms of tonnage, imports are by far the largest category.

**Table A6-1: Rail Freight by Commodity 2007**

Commodity	Imports	Domestic	Exports	Total
Grain	480,881	4,995		485,876
Timber	14,494		110	14,604
Sawn products	33,904	488		34,392
Timber goods	14,946	67	56	15,069
Paper	15,387		37	15,425
Semi-processed copper, molybdenum, gold	2,786	32,909	76,156	111,851
Oil (light)	354,932	1,628		356,561
Mineral ore (clay)	10,884	520,839	21,850	553,573
Raw material mineral (stone)	18,098	68,283	116,468	202,849
Wall material	57,403	-	5,735	63,138
Pit-granulated slag		29,255	13,914	43,169
Cement	188	50,053	331,216	381,458
Ferrous metal	1,381	279	47,000	48,661
Ferrous metal coils	76,141	431	803	77,374
Non-ferrous metal alloy	52,961	7	21,256	74,223
Transport, military	1,896	9,504	7,632	19,032
Metal products	37,855	1,133	342	39,331
Mineral fertilizer	24,722	125		24,846
Natural resin	11,477		4	11,481
Inorganic chemicals	11,429	1,627	4,584	17,641
Flour-grinding industry product	16,376	17,441		33,817
Food industry product	20,760		405	21,164
Combined feed product	26,474			26,474
Dairy products	26,703			26,703
Meat products	13,864			13,864
Fruit	29,531	4	10,189	39,725
Alcohol, drinks	20,398	1,878	26,173	48,449
Other freight	9,938	2,320	1,006	13,264
Sugar	85,945	-		85,945
31 Products of less than 10,000 tons	65,269	28,238		93,507
<b>Total</b>	<b>1,537,021</b>	<b>771,505</b>	<b>684,938</b>	<b>2,993,465</b>

Source: Armenian Railways.

## **Potential Rail Freight:**

450. The potential for developing rail freight traffic is considered below:

### **Gold Ore**

451. In the 2006 HWTSK report, a third of the railway's tkm was gold ore from a gold mine in Zod to a processing plant in Ararat, 260km. Since that time, the mining operation has been sold to an Indian company, which later ceased operation over a dispute with the Government over royalty and environmental issues. The operation was purchased by a Russian company that has yet to resume production as they wish to construct a processing plant at Zod and so eliminate a transport cost that is more than 25% of the current value of the gold extracted. Environmental issues are given for the delay in constructing the processing plant, but there are examples of gold processing plants operating in similar sensitive areas in other countries. The option exists for the railway to lower its costs by creating a heavy haul operation (higher axle loads and modern lightweight wagons), but this is unlikely to be justified for the limited amount of traffic.

452. There is a further complication in that Azerbaijan is claiming that some of the gold deposit is in disputed territory.

### **Cement**

453. The railway is currently transporting cement both domestically and for export. There are two cement plants: in Ararat and in Hrazdan. Both are close to the primary domestic market of Yerevan. There is some domestic transport of cement and the clinker needed for cement production, but this is limited. The finished product is subject to increasing highway competition. The export quantities will be subject to increasing domestic Georgian competition and, possibly, highway competition. Rail carriage of cement is expensive because of the weight and the need for special purpose bulk wagons that have a relatively short life. Rail shipment of cement will be limited without such wagons; it is unlikely the cement producers will purchase them unless they give them a commercial advantage. To economically handle cement, specialized cement wagons are required; currently the railway only has enough to handle about 20% of the tonnage.

### **Copper**

454. There is a copper mine in Alaverdi, close to the Georgian border. All of the mine's production is exported in containers. The weight per container is such that it is shipped by rail. Currently it only goes a short distance on SCR to the border. If the border with Turkey is reopened, it is expected that it will be transported to Gyumri, for export through Mediterranean ports. The mining company has plans to increase production to about 150,000 tons per year.

### **Bottled and Frozen Food Products**

455. Currently bottled products that are exported include brandy, wine, beer, mineral water, and various fruit and food products. Most of those going to CIS countries are shipped in conventional closed wagons. As a result, there is a need for extra packaging to prevent damage. Unless refrigerated wagons are available, these products cannot be shipped during the winter. It also takes several days longer by rail than road. One of the larger shippers stated that as soon as the road connection is reopened, the company will no longer use the railway because of service quality and lack of suitable freight wagons.

456. Containerized goods being imported or exported through Poti have the problem of a much longer distance by rail, with a transit time Yerevan-Poti of 6-10 days. By road, the current transit time is 1 day. According to freight forwarders, when all the handling and transport charges are considered, it costs less to transport the products by road.

### **Grain**

457. Currently almost all grain is imported in bulk through the port of Batumi, and an increasing proportion is from Canada and Europe. Almost all of it is transported to Armenia by rail in covered hopper wagons. In addition, there is an increasing variety of grains being imported. Internationally, grain is increasingly being handled in containers. At present, only 2% is in containers, so this trend will have an impact on the transport of grain for Armenia. While it is not yet as prevalent as grain, sugar (the other bulk import product) is starting to be shipped in containers.

### **Oil**

458. Almost all oil products are currently imported through Batumi and carried by rail. The volume is such that it will continue by rail, but the growth of demand will be tempered by the use of compressed natural gas (CNG). Currently 45% of road vehicles are powered by CNG, one of the highest percentages in the world.

### **Agricultural Products**

459. With the dissolution of collective farms, individuals were given small sections of land and possibly a few animals. Individually, farmers have had little success and have either sold the land (Armenia has one of the most liberal land sales policy) to companies that are assembling the necessary acreage to have economical production or have started to see the necessity to cooperate with other farmers. Either way there is increasing production in exportable agricultural products. However, to fully take advantage of this export potential, specialized wagons, particularly refrigerated and those suitable for boxed products, will be required.

### **Containers**

460. The ability of the railway to handle containers that are too heavy for road will ensure a certain percentage of railway traffic. Export of cut and polished stone and marble is expected to continue and expand. Conversely, import of construction materials, such as reinforcing steel, may continue at current levels for the next few years.

461. There are currently about 30,000 containers (70% 40ft) imported through Poti annually, of these about 2,000 are from the Russian Federation. 30% are currently carried by rail. Imports currently exceed exports by about 3 to 1, so about 3 containers out of 4 are being backhauled empty. Given that trucks are traveling to Poti to pick up loads and the railway charges \$300 to transport an empty container, most of the empty containers are transferred back by truck.

## **ANNEX 7: NON-CONCESSION RAILWAY PROJECTS**

462. The concessionaire has contracted to expenditures over the next 30 years totaling \$572 million to renovate, and (where necessary) to replace infrastructure, locomotives and rolling stock. Other investments are being considered to be funded from other sources. The Government would have to request, and probably guarantee, loans from international financial organizations. A request may be made to IFIs and governments for concessional loans and grants to assist in the funding of a new rail route from Gavar to Iran. The combined capital cost amounts to at least \$2 billion and, according to data obtained, the investment would be made 2010-2015. A listing of these investments is shown in Table A7-1 on the following page. A review of these projects follows:

### **A. Gavar-Jermuk-Sician-Kapan-Meghri-Iran Line**

463. Under the present geopolitical situation a rail connection to Iran could have a positive impact on the economy since it would provide some competition to the Black Sea ports for international import and export traffic. This could reduce the cost of trade with East Asia and improve trade with Iran. It would also serve some molybdenum and facing stone deposits.

464. Unfortunately the railway will have to traverse a range of mountains and will require the construction of about 120 km of track in Iran. There would be 7 tunnels, totaling 23.6 km and 54 bridges. The cost, excluding the Iranian section, is currently estimated at \$1.6 billion (including VAT at 20%). Given that there are several long tunnels, the cost could increase significantly with more detailed engineering. (The World Bank has estimated the cost of the line at about \$2 billion.) As currently planned, the line will have a ruling grade of 3.2% and a curvature of 180m. Combined, these will make the railway very expensive to operate. There is discussion that the line will be financed by a Russian/Armenian/Iranian joint venture. Given the current rail construction priorities and problems in Iran, its participation is unlikely.

465. Assuming that the Turkish border is opened in the foreseeable future, most of the non- CIS international traffic, even to East Asia, will go through Turkish ports, which are closer to major global shipping routes. Compared to Black Sea ports, this is a lower cost route (more competition and bigger ships). Given the longer rail distance to the Iranian ports and the need for cost recovery for the new line, there will be little cost saving, if any. However a time saving of a few days may be possible.

466. The ability to finance the line will very much depend on a judgment as to the geopolitical situation. Opening of the Azerbaijan borders would make available the existing, closed, rail connection to Iran. Since this route is almost level, it will be significantly cheaper to operate. The day the line reopens, the Gavar – Iran line would essentially be abandoned.

467. Any further consideration of this line should include a comprehensive financial and economic analysis.

### **B. Fioletovo-Vanadzor Line**

468. This 47km line would reduce the Yerevan-Tbilisi rail distance by 70km, cutting the transport cost for imports/exports to the CIS or through Black Sea ports by about \$2 per ton. The construction cost is estimated at \$91 million.

**Table A7-1: Non-Concession Railway Projects**

Program	Parameters		Program Objectives	Year	Cost Estimate	Possible Fund
	Unit	Quantity			\$ million *	Source
Construction of new railway Gavar-Jermuk-Sician-Kapan-Meghri-Iran	km	449.6	Development of international railway connections and transit freight transportation organization.	2011-2015	1,600	Russian, Armenia and Iran Funds, International Financial Organizations
Construction of new railway Fioletovo-Vanadzor	km	47	Support for interior and exterior transport-economic organizations demands of Armenia, shortening of transportation length between Armenia regions.	2011-2013	90.5	Armenia Fund, International Financial Organizations
Construction of new railway Gyumri-Bagdanovka (Georgia), including 21km in Georgia	km	80.3	Development of international connections, transit freight transportation organization, by passing congested Tbilisi network and making less congested Ajroum-Sadakhlo-Tbilisi, direct exit to 2 lane Tbilisi-Samtredia and to Black Sea ports of Georgia.	2012-2015	140.0	Armenia and Georgia Funds, International Financial Organizations
Expand Akhouryan border station yard			Entrance of wagons to Turkey without additional loading and offloading.	2010-2011	6.0	Armenia Fund, International Financial Organizations
Installation of optical fiber cable along Masis-Nournous-Sevan-Zod	km	205	Improvement of communications and signaling	2014-2015	25.0	Armenia Fund, International Financial Organizations
Installation of optical fiber cable along Yeraskh-Masis	km	60	Improvement of communications and signaling	2014-2015	8.0	Armenia Fund, International Financial Organizations
Purchase sophisticated small machines for operating works			To increase efficiency of works on railway tracks.	2010-2011	3.0	Armenia Fund, International Financial Organizations
Purchase tamping machine	unit	1	To increase efficiency in capital repair and current maintenance of tracks.	2011-2012	10.0	Armenia Fund, International Financial Organizations
Develop a network	system	1	Improvement of communications and signaling	2014-2015	4.0	Armenia Fund, International Financial Organizations

Note: \* includes VAT.

469. Assuming a capital recovery interest rate of 7% and a 30-year life, it would require about \$7.2 million a year in savings. At the same time the railway will lose 70 tkm/ton of revenue. The line may make economic sense if the railway can capture additional traffic from road. However, with the proposed road program, the distance to Poti will be reduced to significantly below that of the road unless the Gyumri – Bagdanovika line is constructed (see below). The only way that this line will become financially feasible is with substantial trade with CIS or significant traffic between Azerbaijan and the Black Sea and/or Turkey. If the line to Iran were constructed, it could also probably be viable.

### **C. Gyumri-Bagdanovka (Georgia) Line**

470. As currently planned, this line will be 80.3km and cost \$140 million. To be effective it will need to extend to the Tbilisi-Poti railway. This will be over very difficult terrain and will be far more expensive than indicated. Given reopening of the Turkish border, it will require substantial trade with CISI countries to justify construction. The line is an alternative to Fioletovo – Vanadzor, unless there is transit traffic between Azerbaijan and Turkey.

### **D. Enlarging Akhouryan Station (Turkish Border)**

471. This project would avoid having to unload and reload wagons to accommodate the change of gauge between Armenia and Turkey. It is possible to change bogies, but this only works for dedicated trains and even then is difficult and expensive. The rail distances within Armenia are such that most freight will be trucked to and from the border station. The need for this investment will depend heavily on a comprehensive market study once the border is reopened. It is also possible that there should be a duty free zone and distribution center at this location, financed by SCR.

### **E. Fiber Optic Cables on Masis-Nournous-Sevan-Zod and Yeraskh-Macis Routes**

472. The railway already has a fiber optic cable on its main line (a TACIS project), but only about 15% of the capacity is used. It has as yet to organize marketing of the surplus capacity. Given that the cable is now controlled by the concessionaire; any further investment in this type of telecommunication should wait for the railway to sell the majority of the cable's capacity. In addition, on routes being considered for installation, the alternative of train control by radio block signals, eliminating the need for any fixed installations, might be considered.

### **F. Track Machines**

473. Given the size and traffic level of the railway, a limited number of new machines may be required.

### **G. Developing a Communications Network**

474. This is investment in a network that integrates all rail communications facilities. Given likely traffic, it is questionable whether an own network is necessary. Allowing a third party, such as a telephone or mobile phone company, access to the railway's communications cables on condition that the railway has free access would make financial sense. Conversely, the railway could create its own public competitive system to generate revenue.

### **H. International Projects Impacting SCR:**

- (i) Conversion of Azerbaijan main line between Baku and Tbilisi from 3000v dc to 25,000v ac and replacement of 50 locomotives. This will be partially funded by the World Bank.
- (ii) A new line between Akhalkalaki (Georgia) and Kars (Turkey) at the cost of \$440 million). Fifty percent of the cost is funded by a very low interest loan from Azerbaijan.
- (iii) A new line under construction between Tehran (Iran) and Astara (Azerbaijan). While this is a slightly longer route to Russia than through Armenia, it will not have to cross the Caucasus Mountains. Currently Iran has about 7000km of new route under construction or development, with an estimated expenditure of \$6 billion. Overall construction is delayed due to the rising cost of raw materials, a scarcity of engineering resources and pressure from sanctions. It is not known to what extent this will delay line completion.



## ANNEX 8: MOTC RAILWAY MONITORING AGENCY TRAINING

### A. Background

475. The restructuring of Armenian Railways has resulted in the concessioning of the infrastructure and sale of the movable assets to Russian Railways (RZD). Using these assets, the concessionaire has created a new railway company - South Caucasus Railway (SCR). To be able to interact and monitor the railway it is necessary for the Government to create a new specific agency and to strengthen an existing agency, the Public Service Regulatory Authority. This will be a totally new role for the Government and unfortunately, even within the existing staff of the railway, there is little knowledge and experience to undertake type of responsibility. This problem is magnified by the fact that it is unlikely that the railway will be financially viable (revenue covering the operating and investment cost). It is, therefore, critical that these Government agencies take a proactive approach to assist in developing railway traffic to ensure that the country gets the maximum economic benefit from the existence of the railway.

476. Safety will be a primary concern of this new organization. Given that the railway is a for profit company, there will be the tendency to minimize maintenance cost by accepting the risk of an accident. It will be necessary for there to be inspections to ensure adherence to minimum safety standards and to have the ability to apply a financial penalty and stop the operation of a rail line or train should it deviate from these standards. The ability to investigate accidents and assign fault is essential.

477. A railway has the ability, especially without very detailed and complex, legally enforced, depreciation standards, to manipulate its accounts, almost at will, to show a profit or loss for a given period of time. This is demonstrated by the fact that Armenian Railways in 2007 was able to show a 'profit'. It is important that the Railway Monitoring Agency have the technical ability to comprehensively review the railway's accounts. In the short term it may not be that important as the concessionaire will be paying a royalty based on gross revenue. However, they could be not be replacing or maintaining infrastructure assets and the overall condition of the government's infrastructure assets would then be declining.

478. A railway may not be financially viable, but could be economically beneficial to a city or the country. It could well be in the interest of the government to, for example, offer grants for the construction of a factory railway siding to reduce highway traffic. This will be one of the key roles of the Railway Monitoring Agency.

479. The railways of the USSR were not required to market their services. They were given directives to how freight was to be transported. Today railways have very strong competition from highway and marine transportation. There needs to be cooperation between the railway and the government for developing traffic for the railway. The railway has a financial interest in the development of new traffic and the government has an interest in the railway being able to create industrial and agricultural jobs, and encourage the transfer of highway traffic to the railway. This will have an economic benefit to the country.

480. The railway logically should be looking at the financial benefit that it can gain by gaining new traffic, and the Railway Monitoring Agency should play an active role in determining what these economic benefits are. The agency would have the data to justify, for example, some form of subsidy to construct new railways routes, sidings, or act as a catalyst in creating relevant new industry.

481. To make best use of the railway asset, it will be necessary to be proactive in developing railway freight and, where logical, develop or improve passenger service. Many

investments in the SCR have training in how to create transport services that the shipper will use. The Railway Monitoring Agency must encourage and support this training.

482. In addition, the Public Service Regulatory Commission is the organization that is required to set access charges should a company wish to operate its own train. To determine what this charge should be to cover all the relevant costs is a very complex task and requires specialized knowledge. It is recommended that this knowledge should be in the Railway Monitoring Agency which will, when required, be available to supply the necessary data to the Public Service Regulatory Commission.

## **B. Basic Tasks for Authority**

483. Ideally the following tasks or skills will be necessary within the Railway Monitoring Agency:

- (i) Detailed knowledge of railway maintenance, operations, accounting, safety, and marketing
- (ii) Transport and social economics
- (iii) Reviewing railway's financial performance
- (iv) Understanding of international agreements
- (v) Develop appropriate track access charges.
- (vi) Authority to hire, with funding, appropriate expertise, (may have to be foreign) to ensure expertise and independence.
- (vii) Analysis of accidents
- (viii) Safety Standards for infrastructure, locomotives and rolling stock
- (ix) Organization of emergency response
- (x) Determining the role of passenger services
- (xi) Proactive role in creating new business for the railway
- (xii) Appeal authority for monopoly tariffs
- (xiii) Infrastructure costing

## **C. Possible Department Staffing**

484. To undertake these tasks the agency should be headed by a Director of the Railway Monitoring Agency and have a staff with expertise in the following:

- (i) Track, electrification, signaling and communications
- (ii) Locomotives and rolling stock
- (iii) Train operation
- (iv) Transport economics
- (v) Safety regulation and inspection
- (vi) Financial/Auditing
- (vii) Industrial development.

485. One of the problems is that the railway is small, making it difficult to justify a large staff, yet many specialties are required. Traditionally railways seldom have people that have knowledge of more than one field. It may be possible to combine expertise in single individuals, but this can only be determined during the detailed development phase of this program. There will also be difficulty in filling these positions unless they are well paid

because once staff leave the railway to join the Agency, they will not be able to return. There will be very limited opportunity for promotion.

486. The cost of this staff will require specific funding from the Ministry of Finance. It will be necessary to develop a cost benefit of this department. Besides the safety issues and accounting aspects of the agency, its proactive role in assisting in the creation of new freight traffic should justify this additional cost of this agency.

#### **D. Development and Training of Staff**

487. The World Bank commissioned CPCS to act as a Transaction Advisor and has recommended a framework for monitoring the performance of the concessionaire. MOTC has drafted a *Charter of Road Directorate Department on Railway Issues*. These documents are limited in their detail, particularly with respect to legal definitions and listing of staff skills. They do not take into consideration the need to be proactive in developing the use of the railway and problems associated with open access.

488. Most of the staff assigned to the Railway Monitoring Agency will undoubtedly be from SCR and will have very limited knowledge of regulatory, as opposed to technical responsibility. A comprehensive training program will be required. The recommended approach to developing this program is outlined below.

489. An expert in a government's role in regulating a concessioned railway should be retained to hold a workshop in which all interested parties are invited to participate. During this workshop the role of the Agency will be discussed and the tasks and staffing will be developed. The documentation and standards required for the Agency will be identified. The consultant will then develop training modules that will include the development of the necessary documentation, such as standards, rules, etc, draft job descriptions and the terms of reference for a training program to be undertaken by an appropriate contracted consulting company.

490. The recommended training program format follows.

491. The consultant for a specific module will visit the railway for long enough to assess the present situation and the improvements and training needed. He/she will then specify the basic knowledge and skills required by the trainees and, if appropriate, finalize the job descriptions. MOTC will select a number of candidates for training, allowing the consultant the right of final choice. It is recommended that trainees will be, primarily, officers of the railway in their mid-40s.

492. One of the important components of the training program will be marketing of the railway's services or logistics chain development so that the Railway Monitoring Agency can be proactive in developing railway transport to the financial and economic benefit of Armenia.

493. In conjunction with the consultant's team leader, the consultants will tailor a training program for each trainee. This can include education in a technical subject such as economics or an engineering specialty to be studied at home or abroad. Language proficiency should also be improved, if required, before departure for overseas training.

494. Depending on the module and the trainee's needs, the technical training might consist of a period working in the consultant's own office, or in an organization similar to the Railway Monitoring Agency, where suitable experience can be gained. The period in the consultant's office or in a Railway Monitoring Agency office, depending on the module, is expected to be in the range of 1 to 3 months.

495. It is possible that similar Agencies in other countries will be willing to have trainees working in staff positions; in some cases, they may be even willing to supplement the trainee's income. If appropriate, visits to several other relevant organizations to observe alternative methods should be arranged.

496. Prior to the trainee returning home, the consultant will assist in developing a work plan for the task assigned to the trainee to be implemented on his return. Ideally, the trainee starts working on his project before his return.

497. After the trainee has returned, the consultant pays periodic visits to MOTC to check on the trainee's progress, carry out further training, and assist the trainee in overcoming any political problems that might have arisen. The number, frequency, and duration of visits will depend on the module, the skill level of the trainees, their progress, and any problems that the trainee may encounter.

498. It may be logical that, before the return of the trainees, appropriate management of MOTC undertakes a study tour. Then the trainees can explain the relevant methods to their own management with all the language nuances that are often required.

499. There should be a degree of overlap of the training so that there is reasonable assurance of continuation of the knowledge if one trainee leaves.

## ANNEX 9: LOGISTICS AND MARKET DEVELOPMENT TRAINING

### A. Background

500. The railways of the former USSR were considered a national necessity, with similar status to that of the military. Central planning dictated transport requirements with little consideration of cost. The use of the railway for transport was based on an arbitrary distance and there was no competition from road. Today in Russia, because of the distances and also a limited quality road network, the railway still can operate without intensive marketing and creation of more competitive transport services. SCR and its parent company have limited experience in what is required to make a financial success of what is essentially a short line railway. In addition few in the agriculture, manufacturing and the freight forwarding industries have the knowledge of how the railway's equipment and services can be updated to promote their businesses. Therefore, from a strategic prospective it is important that there be some form of technical assistance and training program to overcome these shortcomings.

501. For the railway to play an effective role as a transport mode it will be necessary for its staff to improve their knowledge of logistics and supply chain development, marketing, and their approach to railway operations and management. This knowledge, particularly the understanding of how the railway can play a major role in developing industry or industries is critically important to the economic future of Armenia and to the financial viability of the railway.

502. The agriculture and manufacturing industry has little, if any experience of the positive role the railway can have in developing their businesses. For the most part, they view the railway negatively. While it can be argued that the railway should take a proactive role in developing its business, it is also important that the shippers and potential shippers know what the technology, service quality, and cost structure could be to enable them to better be able to develop their own businesses.

503. There are few, if any, large shippers who have their own transport and logistics experts and those that do have little experience outside Armenia. It is the freight forwarders that play a major role in organizing freight transport. Accordingly, it is important that this industry be aware of the railway technology, the possibility of service quality improvement and the variables associated with the railway's costs and pricing.

504. Finally it is in the interest of the Government that the railway concession be successful and that the railway plays a positive role in economic development. Key to the financial success of the railway is for it to increase its freight market share and to significantly increase its overall freight traffic. For this to happen it is almost certain that the Government will have to take a proactive role and to assist potential shippers in developing their businesses. The Government has an additional interest in promoting the railway, in that freight carried by the railway will reduce highway maintenance and congestion.

505. One group of organizations that could be most effective in assisting industry and the railway in improving the logistics or supply chain is the freight forwarders. It is recommended that they be invited to participate, largely at their expense, in a training program. As part of the overall training program the consultants will review the capabilities of a selection of freight forwarding companies and then develop components of the program where they can be invited to participate.

506. Currently imports are more than twice exports, creating an imbalance in railway traffic. It is important that industries aggressively develop exports. Besides transport, the key to this is marketing. Prior to independence there was little need for marketing, but today it is

all important, yet there is little knowledge and skill. There are several organizations attempting to develop marketing expertise, but there seems to be a lack of success. There are many reasons for this, not the least of which is that many companies are financially marginal and are unwilling to risk the investment in marketing. It is also interesting to note that, with the possible exception of products that are suitable for air freight, there is little interest by multinationals in having products manufactured locally. Transport and marketing are important to attract multinational corporations that could be active in developing industry. Specific emphasis will be paid to significantly improving the intermodal services.

507. Based on a brief survey of current and potential (railway) shippers and various organizations associated with industrial development, there is a critical need to develop industry and especially export-oriented industry. This is also important for the railway. Without a significant increase in freight traffic the railway will not be able to justify its investment program or even the existing network.

508. This logistics and marketing knowledge is also important to obtain the maximum financial and economic benefit from other modes.

## **B. Training Approach**

509. An expert/s will be contracted to develop a detailed approach to logistics and relevant marketing training. To undertake this approach they will meet with the railway to develop the level of their current knowledge and their proposed approach to develop railway-specific technology necessary to operate successfully a short line railway. They will also meet with representatives of various relevant industries and freight forwarders to develop an understanding of their level of knowledge of the sort of technology and services that a railway can offer. From this the expert/s will organize a series of roundtable workshops in which they will briefly present the roles and typical tariffs that the modern short line railway can offer. This would be followed by joint discussions on how this expertise and technology can be brought to Armenia. Developing from these sessions it is expected that a training program will be defined. This could include classroom training, internships on appropriate foreign railways, and study tours. The expert/s will develop an agreement with MOTC as to how the training will be funded. One approach would be that the Ministry will cover the cost of organizing the training, but individual companies would cover the actual cost for each of their participating employees.

## ANNEX 10: BILATERAL TRANSPORT AGREEMENTS CHECKLIST

1. **Scope:**
  - Transit and/or interstate?
  - Only for cargo/operation that start and end beyond national territory?
  - Goods – passengers?
  - Modes: land (road-rail), air, maritime, inland navigation, multi-modal?
  - Transport – trade only transport operations to be facilitated in addition?
  - Own account and/or for hire and reward transportation?
2. **Transit charges:** Either cost-related or not?
3. **Aspects:**
  - Passengers?:
    - *Visas?*
    - *Health inspection?*
    - *Personal belongings (effects) customs duty exemption?*
  - Goods?:
    - *Customs transit and inland clearance regime?*
    - *Quality, sanitary and phytosanitary inspection?*
    - *Dangerous goods regime?*
    - *Perishable goods regime?*
  - Vehicles?:
    - *Registration?*
    - *Technical requirements (equipment, dimensions, weights and axle loads, environmental standards)?*
    - *Roadworthiness inspection?*
    - *Motor insurance / third party liability insurance?*
    - *Traffic rules?*
    - *Driving time restrictions (see European Agreement concerning the work of Crews of Vehicles engaged in International Road Transport AETR – Geneva 1 July 1970)?*
    - *Driving permits?*
    - *Driver visas?*
    - *Customs temporary importation regime?*
  - Containers: customs temporary importation regime?
  - Transport operators: licensing (see e.g. the ECMT consolidated resolution concerning the rules to be applied for international freight transport by road, CEMT/CM (2000)10 final):
    - *Right to establish representative offices?*
    - *Exchange of traffic rights (freedoms: transit, cabotage, interstate)?*
    - *Frequency and capacity?*
    - *Entry/exit and routes <sup>(1)</sup>?*
    - *Transport conditions (transport price, carrier liability)?*
    - *Insurance?*
  - Infrastructure?:
    - *Road and bridge construction standards?*
    - *Road signs and signals?*
    - *Border crossing infrastructure and equipment?*
  - Institutional framework: joint committee to assess and improve the functioning of the agreement?:
  - Miscellaneous facilitation measures? :
    - *Single stop/window border crossing inspection?*
    - *Risk analysis and selectivity techniques instead of customs routine exhaustive inspection?*
    - *Advance exchange of information and clearance?*
    - *Transparent legislation and regulation?*
    - *Non-discrimination and national treatment?*
    - *Automation of document readers?*
    - *Streamline and harmonize documentation?*
    - *English translation?*
    - *Multi-modal carrier licensing and liability regimes?*
    - *Payment and currency exchange facilities?*

Source: The Consultants

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## APPENDIX 2: ACTION PLAN

### 1. PRIORITIES

1. The Strategy Action Plan (the Action Plan) includes policy and management reform and investment and technical assistance projects. Preliminary assessment of project priorities has been carried out, but much further work is needed on the basis of objectives for: (i) national security; (ii) cost benefit performance; (iii) regional balance; and (iv) social and environmental concerns. There are difficult trade-offs to be made: selection is at the expense of alternatives. The objective is efficient investment with the best available trade offs. For instance, balancing rehabilitation of local roads with upgrading of the North-South Corridor and the main highways is a key consideration. The former has a direct impact on poverty reduction and social needs, but only for the immediate area concerned, while the latter generates national benefits. Selecting local roads which feed into the North-South Corridor and the main highways and connecting them with other local roads servicing local communities will be ideal for the overall benefits and road network integrity.

2. A review of the Action Plan is recommended every two or three years. The impact of three economic growth scenarios should be considered: (i) annual GDP growth to 2020 below 4% “worst case scenario”; (ii) growth in the range of 4-6%; and (iii) growth over 6%.

3. The current very poor short term and uncertain medium to long term outlook for the world economy must be taken into consideration. It will slow domestic economic growth and may make external financial support more difficult to obtain (although some pump-priming infrastructure support may be forthcoming). The investment program will be different from that with the growth rate expected before the downturn. Traffic growth will be much lower and the priority may need to switch from comprehensive network upgrading to piecemeal improvements. High yielding projects – safety measures and minor infrastructure works (road signage, safe U-turns, action on speed limits, protection measures on long descents etc.) – should, however, be implemented in all circumstances, as should asset management, rebalancing maintenance programs towards long term sustainability. The first priority for investment is work on the LRNP and on national security-related projects, such as an alternative route through the southern mountains to Iran (reconstruction of H-45).

4. **Megaprojects:** these include (i) upgrading/expressway on north-south road corridors; (ii) construction of new railways; and (iii) airport development. These cannot be financed solely by the Government and are unlikely to attract private sector funding without parallel support from IFIs or other governments. Given the uncertain economic outlook, fiscal prudence suggests that following full feasibility studies, including consideration of low cost alternatives, a staged program of megaproject work should be prepared tailored to achieving the long term objectives. For example, for the north-south corridor, the final standard and alignment should be defined with a staged upgrading where possible of the existing alignment proceeding before any new construction sections. This would maximize the return on investment. For the railway, which is a strategic project, the key consideration is how much of the funding will be grant and whether the project would attract resourcing not available for other transport projects, making it more attractive for the domestic economy. Political risk will play a large part in the decision. Large scale airport investment may not be required before 2020, with traffic growth in the short term at least likely to be more modest than previously expected. Investment in new aircraft is essentially a commercial decision for Armavia, with the strategic issue being that the traffic case for them should be robust.

5. **Project evaluation:** there is no common framework for transport project evaluation. A framework should be developed to improve the selection process, both at sector and subsector level. Projects should typically be selected from the basket in the long term program. For each, a summary analysis should detail: (i) project definition and specification; (ii) alternatives considered to achieve the project objective; (iii) project rationale; (iv) project

benefits, costs and risks (using common evaluation criteria and assumptions: for example specifying a minimum economic and financial internal rate of return); (v) national and Province level impact; and (vi) environmental and social impacts.

## 2. ACTION PLAN

6. General subsector action plans are presented below. Individual projects and their costs and priorities are given in the next section, section 3.

### A. Overall Transport Sector Policy and Management Reform Action Plan

#	Item	Responsibility	Remarks	Timing
1	Institutional Restructuring Delineate GDCA and MOTC responsibilities	Cabinet	Administrative decision	2009-2011
	Enhance MOTC liaison re Urban Transport	(To be established) working group MOTC & YM	Administrative decision	2009-2011
	Enhance MOTC liaison re Traffic Police	MOTC/TP	Administrative decision	2009-2011
	ARD capacity development • Contractor performance	MOTC/ARD	Internal development program that could benefit from small scale technical assistance	2009-2011
	• Introduce road fund strategy	ARD/MOTC	Prepare proposals for Government consideration	2009-2011
	• Enhanced design standards	ARD	See Appendix 1-Annex 4	2010-2011
2	Separation of regulation and service delivery responsibilities	MOTC	Establish a regulatory function in MOTC	2009-2011
3	Development of Urban Transport travel data base	YM	Internal initiative	2009-2012
4	Establishment of unified (urban) transport traffic authority	YM	Internal initiative	2009-2011
5	Development of national aviation system plan	DGCA	Internal initiative	2009-2011
6	Establishment of Tourism Promotion Committee	Cabinet	Administrative decision	2009-2011
7	Capacity enhancements Financial Management	MOTC	(Appendix1 Annex 8)	2009-2014
	Effective monitoring of concessions	MOTC	(Appendix1 Annex 8)	2009-2011
	Railways marketing and logistics capacities	MOTC	(Appendix 1 Annex 9)	2010-2012
8	More Effective Bilateral Agreements	MOTC, Customs, MOFA, and other concerned authorities	See Appendix 1, Sections 3.4 and 3.5	2009-2012
9	Adoption of Additional	MOTC/ MOFA	See Appendix 1,	2009-2015



#	Item	Responsibility	Remarks	Timing
	International Transport Conventions		Section 3.4	
10	Better Implementation of International Transport Facilitation Conventions	MOTC, Customs, Traffic Police, and other concerned authorities	See Appendix 1, Section 3.5	2009-2020
11	Revision of Domestic Laws/Regulations Related to Transport Facilitation	MOTC, Customs, and other concerned authorities	See Appendix 1, Section 3.5	2009-2020
12	Building Key PSP Capacities	Ministry of Economy	Establishment of a PSP/PPP task force	2010-2012
13	Enhancement of regulatory and oversight capacities	MOTC	Establish oversight function in the regulatory authority	2010-2012
14	Enhancement of MOTC support systems	MOTC	Develop computer based LAN and intranet systems	2010-2012
15	Governance enhancement activities	Technical assistance to MOTC	Undertake a detailed review of existing procedures and formulate action proposals / implementation schedules	2010-2011
16	Investment mechanisms	Ministry of Finance / Economic Development	Establishment of an Investment Financing Unit	2010-2012

ARD = Armenian Roads Directorate, MOTC = Ministry of Transport and Communication, GDCA = General Department of Civil Aviation, YM = Yerevan Municipality, MOFA = Ministry of Foreign Affairs, DGCA = Directorate General of Civil Aviation, TP = Traffic Police, PSP = Private Sector Participation.

Note: This table is reflected in Table 6 for project prioritization.

Source: the Consultants

## **B. Roads Action Plan**

No.	Item	Responsibility	Remarks
1	Develop/fund periodic maintenance program	MOTC/ARD	Road survey to define overlay program. Establishment of earmarked fund (see 10).
2	Strengthen supervision and monitoring of routine maintenance contracts. Introduce more competitive tendering.	MOTC/ARD	Increase efficiency, with more competition for contracts, longer contracts, pooling of equipment.
3	Complete LRNP rehabilitation and reconstruction.	MOTC/Cabinet	Prioritize and cost uncommitted program. Develop with IFIs a funding plan to complete within revised and achievable target date and with appropriate standards for lowest volume sections.
4	Upgrade north-south corridor	MOTC/Cabinet	Review/endorse results of ADB TA 2009 and establish prioritized long term program and develop financing program. Carefully address impact should a low

No.	Item	Responsibility	Remarks
			growth economic scenario be realized.
5	Implement and closely monitor Road Safety Strategy 2009-2013. Develop 5-year follow-on program of similar scope based on experience of initial program in 2013.	MOTC/Other agencies	Scope of program was agreed at Road Safety Workshops 2008.
6	Develop program of complementary safety measures.	MOTC	Minor but high yielding engineering work.
7	Strengthen MOTC/ARD planning capability.	MOTC/ARD	Commitment to medium and long term planning. Development of forecasting scenarios, specifically, impact of lower growth rates.
8	Prepare long term network development plan.	MOTC	Horizon year 2030, flexible plan, implementation timing subject to availability of funds. To define priorities and ensure integrated needs assessment. The Strategy provides a starting point for analysis.
9	Allocate specific budget for maintenance/upgrading of roads transferred to MOTC responsibility on 10 January 2008.	MOF/MOTC/ARD	MOTC and ARD to define needs, priorities and cost following survey of the roads.
10	Establish Road Fund	MOF/Cabinet/MOTC	For periodic maintenance initially, later for other projects.
11	Upgrade IT/MOTC Website	MOTC/NSS	Strengthen database, make data more widely accessible.
	<b>Road transport:</b>		
1	Introduce measures to encourage vehicle fleet modernization – all vehicle types.	MOTC/Customs	Scrapping bonus, more rigorous inspection of older vehicles, incentives for a limited period – lower rate of import duty etc.
2	Consolidate operation of inter-Province bus services.	MOTC	Regional tendering, encouraging operators to combine. Improved terminal facilities in Yerevan. Website for service information.
3	Expand international bus route network.	MOTC	Foster bilateral cooperation and service operation. Provide start-up assistance to operators. Improve terminal facilities. Develop website, providing service information and online booking.
4	Develop logistics and intermodal capacity.	MOTC	Promote training.
5	Introduce freight forwarding legislation.	MOTC/Cabinet	

ARD = Armenian Roads Directorate, MOTC = Ministry of Transport and Communication, IFI = International Financial Institution, MOF = Ministry of Finance, NSS = National Statistics Service.

Source: the Consultants.

### C. Railway Action Plan

No.	Item	Responsibility	Remarks
1	Set up concession monitoring agency within MOTC	MOTC	Proactive remit focusing on safety and issues that will ensure the success of the concession.
2	Train monitoring agency staff in requisite skills – safety, accounting, marketing and logistics.	MOTC	
3	Monitor concession as proactive partner.	MOTC	Requires flexible interpretation of Concession Agreement in the light of any change in circumstances.
4	Evaluate non-concession projects.	MOTC/Cabinet	Develop long term investment plan considering national strategic interest, cost benefit analysis and financing constraints.
5	Develop intermodal terminal at Yerevan or Gyumri	MOTC/SCR/Others	To facilitate containerization and improved logistics.

MOTC = Ministry of Transport and Communication, SCR = South Caucasian Railways. Source: the Consultants.

### D. Urban Transport Action Plan

No.	Item	Responsibility	Remarks
1	Upgrade urban road network	YM / MOTC	Including options for constructing eastern bypass and missing links on western axis, as well as road surfacing and maintenance in all cities.
2	Regulate and rationalize bus services	YM, YerevanTrans	Develop a strategic network with larger buses operating on high demand routes and supporting role for minibuses. Concessioning arrangements will be a key consideration.
3	Introduce priority treatment and improved infrastructure for buses	YM	Provide a competitive advantage to PT over private vehicle modes, with an option for bus rapid transit (BRT) on selected routes.
4	Introduce integrated services and common ticketing system	YM	Requires fare collection operator, fare inspection, and clearing house to distribute revenues among operators.
5	Refurbish metro stations and carriages	Yerevan Metro	Improve station access and interior comfort to encourage metro ridership.
6	Expand metro system	Yerevan Metro	Including options for extending line across the river to the NW area and southward to airport.
7	Provide electronic ticketing and passenger information for metro	Yerevan Metro	To reduce fraud, improve passenger data collection, and increase service level.
8	Modernize traffic signal equipment and pedestrian crossings	YM	To improve traffic movements and pedestrian safety.

9	Introduce comprehensive parking scheme	YM	On-street parking controls can restrict vehicle demand while off street parking lots provide regulated capacity. Requires adequate enforcement.
10	Provide cycle network and parking facilities	YM	Encourage non motorized travel to reduce congestion and pollution including cycle parking facilities at key locations.
11	Establish mechanisms for traffic data collection and analysis	YM	Provide adequate equipment and modeling software to store data, analyze and forecast traffic for investment decisions. Training may be required.

MOTC = Ministry of Transport and Communication, YM = Yerevan Municipality, BRT = Bus Rapid Transit, International Financial Institution, MOF = Ministry of Finance, NSS = National Statistics Service.

Source: the Consultants.

## E. Civil Aviation Action Plan

Action	Responsibility	Remarks
1. Prepare National Aviation System Plan	DGCA	Identify air transport infrastructure needs, priorities and costs. Review traffic forecasts and assess implications particularly in relation to the need for additional operators, ANS equipment, airports, terminal and runway facilities. <ul style="list-style-type: none"> <li>• assess Zvartnots capacity to handle demand forecast;</li> <li>• determine feasibility of replacing Shirak passenger terminal;</li> <li>• establish the need, feasibility and cost of reopening other airports;</li> <li>• determine the feasibility of establishing a new Armenian passenger carrier for either domestic services or for both domestic and international services.</li> </ul>
2. Separate service regulation, procurement and supply responsibilities	DGCA	Establish independent regulatory authority – divorced from policy making and service delivery responsibilities.
3. Develop National Policy for Air Transport	DGCA	Specify sub-sector objectives for promotion of travel, tourism and trade identifying implications in terms of institutional and operational considerations. Specify enabling environment where carriers compete, passengers have transport options and investors have assurance as to the sustainability of their commitment.
4. Liberalize Market	DGCA/Cabinet	A liberalized operating environment is needed to encourage improved connectivity and lower fares - incorporate into Policy for Air Transport (see 3).
5. Review fees and charges	DGCA/Cabinet	Fees and charges reflect monopoly supply. Effective regulatory measures needed to achieve liberalization - incorporate in National Policy for Air Transport.
6. Assess needs for ANS equipment and technical training	DGCA	<ul style="list-style-type: none"> <li>• identify and establish air navigation and telecoms equipment requirements for procurement, installation and commissioning.</li> <li>• develop terms of reference and tender for a Needs Assessment to determine the facility requirements of</li> </ul>

		<p>the Avia Training College.</p> <ul style="list-style-type: none"> <li>from the assessment of the needs of the Avia Training College, initiate procurement of equipment including additional light aircraft, ATC and aircraft simulators.</li> </ul>
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DGCA = Directorate General of Civil Aviation, ANS = Air Navigation System, ATC = Avia Training Centre  
Source: the Consultants.

## F. Institutional and Governance Action Plan

No.	Item	Responsibility	Remarks
1	Incorporate GDCA in MOTC	Cabinet	Policy decision
2	Enhance Urban Transport integration processes	MOTC/Municipality	Procedural enhancement
3	Enhance liaison with traffic police	MOTC/TP	Procedural enhancement
4	Establish independent regulatory authorities	MOTC	Action which could be supported by TA – (see Appendix 3)
5	Establish Oversight Unit	MOTC	Action which could be supported by TA – (see Appendix 3)
6	Enhance support systems	MOTC	
7	Establish PSP Unit	MOED&T	Action which could be supported by TA – (see Appendix 3)
8	Enhance Governance Issues	MOTC and all other Government entities	Will be addressed partially by TA's I&G-1 & -2 but also requires consistent action by Government
9	Sustainable Urban Transport	MOTC/Municipality	Action dependent on outcome of proposed WB Project
10	Establish Investment Financing Unit	MOTC/MOF/MOED&T	Action which could be supported by TA – (see Appendix 3)
11	Training	MOTC	See Project Profiles for technical training requirements. Training in Financial Management as applied to commercial considerations and IFRS available locally.

MOTC = Ministry of Transport and Communication, GDCA = General Department of Civil Aviation, TP = Traffic Police, TA = Technical Assistance, PSP = Private Sector Participation, MOF = Ministry of Finance, MOED&T = Ministry of Economic Development and Trade, IFRS = International Financial Reporting Standards  
Source: the Consultants.

7. Technical assistance for institutional and governance (Appendix 3) is primarily directed towards capacity enhancement to realize PSP benefits. I&G-1 for a Regulatory Authorities and Oversight Unit could usefully be combined with assistance for the establishment of the RMA in MOTC. I&G-2 covers PSP Initiatives. There is a need to address financial management capacity, particularly in the public sector in the commercial context and in response to the introduction of IFRS. These skills are urgently needed to support the diversification of investment structuring, enhance governance and to facilitate the required regulation and oversight responsibilities.

### 3. INVESTMENT PROGRAM

8. It is impossible in the current international crisis to be overly prescriptive about investment programs for a 12-year period. While the crisis is unfolding and until it is resolved, the main emphasis should be on soft works – especially training programs and feasibility studies. It may well be 2011 before a clear view can emerge of the priorities and projects for investment over the medium to long term. The following sections detail projects that should

be considered further. Table 7 gives an overview of the entire transport sector strategy with timings and costs.

#### A. Overall Transport Sector

9. Identified projects are given in Table 1, with indicative timing: A 2009-2012, B 2013-2016, C 2017-2020 and D after 2020. The overall transport sector strategy accounts for 23 projects in total. All projects are policy and management reform.

**Table 1: Overall Transport Sector**

Ref:	Project	Estimated Cost (\$ million)			Timing
		Foreign	Domestic	Total	
<b>Policy and Management Reform</b>					
OTS-1	Delineate GDCA and MOTC responsibilities	0.0	0.0	0.0	A
OTS-2	Enhance MOTC liaison in Urban Transport	0.0	0.0	0.0	A
OTS-3	Enhance MOTC liaison in Traffic Police	0.0	0.0	0.0	A
OTS-4	Contractor Performance	0.0	0.0	0.0	A
OTS-5	Introduce road fund strategy	0.1	0.3	0.4	A
OTS-6	Enhance design standards	0.5	0.3	0.8	A
OTS-7	Separation of regulation and service delivery responsibilities	0.0	0.0	0.0	A
OTS-8	Development of urban transport travel database	0.2	0.3	0.5	A
OTS-9	Establishment of unified (urban) transport traffic authority	0.0	0.0	0.0	A
OTS-10	Establishment of national aviation system plan (MOTC)	0.5	0.1	0.6	A
OTS-11	Establishment of tourism promotion committee	0.0	0.0	0.0	A
OTS-12	Financial management	0.4	0.2	0.6	A/B
OTS-13	Effective monitoring of concessions	0.3	0.2	0.5	A
OTS-14	Railway marketing and logistics capacities	0.3	0.1	0.4	A
OTS-15	More effective bilateral agreements	0.25	0.25	0.5	A
OTS-16	Adoption of additional international transport conventions	0.25	0.25	0.5	A/B
OTS-17	Better implementation of international transport facilitation conventions	0.25	0.25	0.5	A/B
OTS-18	Revision of domestic laws/regulations related to transport facilitation	0.25	0.25	0.5	A/B
OTS-19	Establishment of Key PSP Capacities	0.3	0.1	0.4	A
OTS-20	Enhancement of regulatory and oversight capacities	0.3	0.2	0.5	A
OTS-21	Enhancement of MOTC support systems	0.2	0.1	0.3	A
OTS-22	Governance enhancement activities	0.2	0.1	0.3	A
OTS-23	Investment Mechanisms	0.3	0.1	0.4	A
	<b>Total</b>	<b>4.6</b>	<b>3.1</b>	<b>7.7</b>	

Source: the Consultants.

A = 2009-2012, B = 2013-2016, C = 2017-2020

## B. Long-Term Road Program

10. There is no existing new works program. The LRNP has been defined in detail and MOTC/ARD has a database and economic analysis (HDM-4) of the projects, together with some upgrading projects on interstate roads outside of the LRNP. MOE and the Government have defined the need for a north-south expressway for strategic purposes. Other road projects (bypasses and short cuts) were identified by studies in the 1990s.

### LRNP

11. The total cost of the 3,014 km LRNP is estimated at \$855 million (including work done), of which \$439 million may be provided from known sources (Table 1), leaving 1,234 km, at an estimated cost of \$337 million to be funded. A lower standard of rehabilitation on lowest traffic sections would reduce this. The LRNP (then 2,702 km) was initially planned for completion by 2012.

12. **Reconstructing H-45:** part of the LRNP, an alternative route to Goris-Kapan, 75 km, 2-lane 3.5m carriageway, \$55 million for the first priority section, in total \$79 million. H-45 runs parallel to and to the west of the difficult and dangerous M-2 Goris-Kapan section, but is currently impassable for most vehicles over the Tatev-Syunik section. Goris-Kapan is vulnerable to landslides and severe weather and passes through adverse terrain. An alternative route is needed for security of connection to Iran. H-45 also serves the important tourist destination of Tatev.

**Table 2: LRNP Source of Funds**

Source of Funds		Amount (excluding VAT)		Length km	Cost (\$'000/km)
		(\$ million)	Status		
Millennium Challenge Account Grant (2007-2011)	MCC	67	24.5km of H17 commenced 2007, 273km tendered 2008, Release of funds in abeyance.	330	203
	Govt.	145	Agreed with MCC March 2006 rehabilitation by Government	532	273
Rural Road Sector Project	ADB Loan	55	Initial loan of \$30.6 million approved 28 September 2007. Supplementary loan of \$17.3 million approved 7 November 2008.	227	243
World Bank Rural Roads	WB Loan	72	Approval expected early- 2009.	250	288
JICA Rural Roads Project	JICA	100	Under review	366	273
H-45	ADB	79	Under review	75	1,053
Unfunded		337		1,234	273
<b>Total</b>		<b>855</b>		<b>3,014</b>	<b>284</b>

MCC = Millennium Challenge Corporation, ADB = Asian Development Bank, JICA = Japan International Cooperation Agency.

Source: Consultants' estimate of cost/km of unfunded work (Appendix 1 Annex 3).

### Other Programs

13. The period to 2020 is too short for the consideration of an investment program, which needs a 20-year planning horizon. The Strategy has identified most of the projects which might be included in a 20-year program (Table 2). They are:

**North - South Corridors:** upgrading the principal north – south routes from Yerevan to the north and the single route to the south: (i) M2/M6: Bagratashen-Vanadzor, Vanadzor-Dilidjan, Yerevan-Ararat, \$100 million, (ii) Yerevan - Sevan - Dilijan (M-4), rehabilitation/widening 118km, 4-lane 3.65 carriageway, grade separation, \$131.5 million; (iii) Yerevan-Gyumri (M-1), rehabilitation/widening 125km, 4-lane 3.65 carriageway, grade separation, \$150 million; and (iv) Yerevan - Yeraskhavan (M-2), rehabilitation 70km, 4-lane 3.65 carriageway, grade separation, \$56 million. Daily traffic volumes are up to 20,000 vehicles, but geometry and surface pavement condition require improvement.

**Yerevan Western Bypass:** north-south traffic from the southern end of the M-1 to the northern end of the M-2 has to pass through the centre of Yerevan. A reasonable standard Western Bypass can be developed by construction a few missing links. A missing link eastwards from the M-1 for traffic to northern Yerevan areas should also be built. The project would provide a more coherent road network for the whole of western and northern Yerevan. It should form part of the north-south corridor upgrade.

The missing sections are: Halabyan (Davitashen Bridge) – Ashtarak (2 km - \$26 million); Argavand Intersection – Shirak St. (2 km - \$10 million); Raffi St.- Ashtarak Highway (\$27 million); Heraci St. – Khorenaci (\$9 million); Shirak St. – Ashtarak Highway (\$7 million); Shirak St./Arshakunyac Crossing- Tamanciner Highway (\$13 million). Upgrading existing sections to bypass standard would cost an additional \$28 million. The total cost is \$121 million, much higher than that for restoring the M-15 Eastern Bypass (below), but the benefits are much greater.

**Yerevan Eastern Bypass M-15:** the estimated cost of reopening/upgrading the 22 km to 4-lane 3.65 m carriageway is \$31 million for the northern section (now closed due to landslides) and \$12 million for the open, southern section. This project is part of the north-south corridor upgrade. The addition of an M-15 to M-1 link, at Astarak or between Yerevan and Astarak, would together with the Western Bypass complete a Yerevan Outer Ring Road.

**Other Bypasses:** a program of bypass construction should start by 2020. Bypasses are environmentally sound, reduce traffic accidents and greatly improve quality of life in affected towns. Subject to confirmation in a prioritization study, which should be undertaken in 2009, the first priority is likely to be the Gyumri Eastern Bypass (20 km - \$43 million) part of the north-south corridor upgrade. Other bypasses include: Aparan (M-3 8 km - \$24 million); Yeghegnadzor (M-2 6 km \$23 million); Vaik (M-2 3.6 km - \$9 million); and Alagiaz (M-3 4 km - \$10 million).

**New routes (short-cuts):** in the 1990s, studies were made a number of short-cuts: Noubarashen-Bagratashen-Sovetashen (62 km - \$38 million), this saves up to 28 km for heavy freight traffic; Gorhaik-Gndevaz (17 km - \$13 million); Artashat-Martuni (72 km - \$52 million); and Geghard-Martuni (37 km - \$28 million).

14. **2020 Program:** after definition and prioritization of a 2020 Program following feasibility studies, implementation should proceed as resources permit. The estimated total cost for the projects 2009-2020 in Table 2 is \$1,274.8 million, of which \$451 million may be funded by IFIs under committed/planned loans. The balance represents an annual program of \$55 million. This is considered fundable and sufficient to complete the LRNP and \$323 million of other projects 2009-2020. The M1 upgrade to Bavra (\$132 million) is likely to be of high priority for inclusion in this period and ADB financing is planned.



Table 3: Road Projects 2009-2030

Ref.	Project	Estimated Cost (\$ million)			
		Foreign	Domestic	Total	Timing
RD-1	<b>Policy and Management Reform</b> ARD Capacity Development	0.9	2.7	3.6	A
RD-2	Road Maintenance Database and Condition Survey	0.2	0.6	0.8	A
	<b>Sub-Total (2009-2020)</b>	<b>1.1</b>	<b>3.3</b>	<b>4.4</b>	
RD-3	<b>North-South Corridor:</b> M2/M6: Bagratashen-Vanadzor, Vanadzor-Dilidjan, Yerevan-Ararat	60.0	40.0	100.0	A/B
RD-4	M1: Gyumri-Yerevan	76.0	55.5	131.5	A/B
RD-5	Yerevan Western Bypass/Links	84.6	71.3	155.9	B
	<b>Sub-Total (2009-2020)</b>	<b>231.0</b>	<b>155.5</b>	<b>387.4</b>	
RD-6	<b>LRNP:</b> MCC 2009-11 - Balance of 330km	27.5	22.5	50.0	A
RD-7	World Bank - 250km	39.0	33.0	72.0	A/B
RD-8	Govt. - Balance of 532km	55.0	45.0	100.0	A
RD-9	ADB Rural Roads SP - Balance of 227km	27.5	22.5	50.0	A
RD-10	H45: M2-Tatev-Syunik 75km	42.0	37.0	79.0	A/B
RD-11	JICA Rural Roads - 366km	60.0	40.0	100.0	A/B
RD-12	Completion of LRNP	170.0	167.0	337.0	B/C
	<b>Sub-Total (2009-2020)</b>	<b>426.0</b>	<b>362.0</b>	<b>788.0</b>	
RD-13	<b>Other Investment Projects:</b> Other Interstate Rehabilitation (M3, M5, and M14 - 151 km)	27.5	22.5	50.0	B/C
RD-14	Other bypasses: Aparan Western link to M3	11.0	9.0	20.0	C
	<b>Sub-Total (2009-2020)</b>	<b>38.5</b>	<b>31.5</b>	<b>70.0</b>	
RD-15	<b>Other Projects:</b> Road Safety Strategy	10.0	12.0	22.0	A/B/C
RD-16	Road Maintenance Financing	0.1	0.3	0.4	A
RD-17	Highway Design Standards	0.2	0.6	0.8	A
RD-18	Road Maintenance Manual	0.2	0.6	0.8	A
RD-19	Axleload Control	0.6	0.4	1.0	A
	<b>Sub-Total (2009-2020)</b>	<b>11.1</b>	<b>13.9</b>	<b>25.0</b>	
	<b>Total</b>	<b>707.9</b>	<b>566.2</b>	<b>1,274.8</b>	

Source: the Consultants.

A = 2009-2012, B = 2013-2016, C = 2017-2020

### C. Rail

15. A 2020 horizon is also too short for prioritizing railway investment. The Concession Agreement Program extends for 30-years, with SCR expected to invest \$282.4 million of the \$572 million total commitment by 2020. Other small scale projects for consideration by 2020 are given in Table 3, in total \$73.7 million. No new line construction is required under the concession, but a number of projects are under consideration, primarily a new route to Iran and the Fioletovo-Vanadzor link. These are discussed in Appendix 1 Annex 7.

**Table 4: Railway Projects**

Ref.	Project	Estimated Cost (\$ million)			
		Foreign	Domestic	Total	Timing
	<b>SCR – Concession Agreement 2009-2020:</b>				
RL-1	Rehabilitation/Repairs	60.0	195.2	255.2	A/B/C
RL-2	Rolling stock	21.2	6.0	27.2	A/B/C
	<b>Sub-Total SCR (2009-2020)</b>	<b>81.2</b>	<b>201.2</b>	<b>282.4</b>	
	<b>Other Projects/TAs:</b>				
RL-3	Bridge renovation Gyumri-Georgia Border	15.6	10.4	26.0	A
RL-4	Tamping machine	5.0	3.3	8.3	A
RL-5	Akhouryan check point	3.0	2.0	5.0	B
RL-6	Optic fiber cable Macis-Nournous-Sevan-Zod	12.5	8.3	20.8	B/C
RL-7	Optic fiber cable Yeraskh-Macis	4.0	2.7	6.7	C
RL-8	Small P&E for operating works	1.5	1.0	2.5	A
RL-9	Network development	2.0	1.3	3.3	A
RL-10	Logistics & market development training	0.1	0.3	0.4	A
RL-11	Railway Monitoring	0.5	0.2	0.7	A
	<b>Sub-Total Other Projects (2009-2020)</b>	<b>44.2</b>	<b>29.5</b>	<b>73.7</b>	
	<b>Total</b>	<b>127.4</b>	<b>228.7</b>	<b>356.1</b>	

Source: the Consultants/SCR

A = 2009-2012, B = 2013-2016, C = 2017-2020

## D. Urban Transport

16. Identified projects are given in Table 4, with indicative timing: A 2009-2012, B 2013-2016, C 2017-2020 and D after 2020. The Metro accounts for much of the work, due to the high cost of the western extension. UT-2 is urgent, with work to extend the ancient church close to the proposed new Metro entrance already in progress. This could form part of the proposed EBRD project for the Metro. Projects UT-22 and UT-23 although urban, also have inter-urban implications and could be part-financed as part of a national road program.

**Table 5: Urban Transport Projects**

Ref:	Project	Estimated Cost (\$ million)			Timing
		Foreign	Domestic	Total	
UT-1	Refurbish Metro cars (30)	2.0	3.0	5.0	A
UT-2	Refurbish stations	3.0	7.0	10.0	A
UT-3	Training Program	0.6	0.2	0.8	A
UT-4	New entrance at Yeritasardakan	10.0	20.0	30.0	A
UT-5	Safety improvements	0.3	1.0	1.3	A
UT-6	Smart card ticketing	4.0	1.0	5.0	A
UT-7	Passenger information (real time)	2.0	3.0	5.0	B
UT-8	New Metro cars (24)	20.0	4.0	24.0	B
	<b>Sub-Total Metro (2009-2020)</b>	<b>41.9</b>	<b>39.2</b>	<b>81.1</b>	
UT-9	Medium/large buses	61.6	15.4	77.0	A/B/C
UT-10	Trolleybuses	31.5	3.5	35.0	A/B
UT-11	Passenger information etc.	0.0	0.2	0.2	A
UT-12	Bus interchanges with hub facilities	0.0	1.0	1.0	A
UT-13	Bus Maintenance Depots	0.0	15.0	15.0	A
UT-14	Suburban dispatch centers	0.0	2.0	2.0	A
UT-15	Inter-Province bus terminals	2.0	3.0	5.0	B
UT-16	BRT Line Komitas Avenue	12.0	12.0	24.0	B
	<b>Sub-Total Bus/Trolleybus (2009-2020)</b>	<b>107.1</b>	<b>52.1</b>	<b>159.2</b>	
UT-17	Traffic signals, traffic management	14.9	1.7	16.6	A
UT-18	Underground car parks	30.1	7.5	37.6	A
UT-19	On-street parking & cycling <sup>1</sup>	0.0	6.5	6.5	A
	<b>Sub-Total Traffic Manage/Parking (2009-2020)</b>	<b>45.0</b>	<b>15.7</b>	<b>60.7</b>	
UT-20	Road surfacing and maintenance	5.0	25.0	30.0	A/B/C
	<b>Sub-Total Roads (2009-2020)</b>	<b>5.0</b>	<b>25.0</b>	<b>30.0</b>	
	<b>Total</b>	<b>199.0</b>	<b>132.0</b>	<b>331.0</b>	

Source: the Consultants.

A = 2009-2012, B = 2013-2016, C = 2017-2020

<sup>1</sup> Parking space is being constructed by the private sector under Northern Avenue (between Opera house and Republic Square) and around the Opera house. In addition, other underground parking spaces are planned by the private sector at Shahumian Square (near Hotel Congress), Sakharov Square, and near the Circus/Yerevan Cycle Track.

## E. Civil Aviation

17. Projects and indicative timing are given in Table 5. The largest investment will be for the renewal and expansion of the aircraft fleet (not included in the table).

**Table 6: Aviation Projects**

Ref:	Project	Estimated Cost (\$ million)			Timing
		Foreign	Domestic	Total	
	<b>Airport Operations</b>				
AV-1	Zvartnots Terminal Phase 2	60.0	30.0	90.0	A
AV-2	ARMATS Telecom & Nav. Equip	0.5	4.5	5.0	B
AV-3	Avia TC A/craft & simulators	4.3	0.7	5.0	B
	<b>Sub-Total Airport Operations (2009-2020)</b>	<b>64.8</b>	<b>35.2</b>	<b>100.0</b>	
	<b>Other Aviation</b>				
AV-4	National Aviation Strategy study	0.2	0.4	0.6	A
AV-5	Avia TC needs assessment	0.1	0.0	0.1	A
AV-6	Broaden fuel supply base	0.1	0.2	0.3	A
AV-7	Stepanavan, Goris, Sisian study	0.0	0.3	0.3	B
AV-8	Enhance small airlines	0.6	2.4	3.0	B
	<b>Sub-Total Other Aviation (2009-2020)</b>	<b>1.0</b>	<b>3.3</b>	<b>4.3</b>	
	<b>Total</b>	<b>65.8</b>	<b>38.5</b>	<b>104.3</b>	

Source: the Consultants.

A = 2009-2012, B = 2013-2016, C = 2017-2020

## 4. FINANCING

18. Funding from IFIs and the Diaspora has been largely responsible for financing sector investment since independence. This will continue to be the case for at least the next few years, plus investment by the concession holders SCR and AIA, and by Armavia. Budget contributions will need to play an increasing role, however, and grant aid and concessional financing will necessarily decline in importance as the economy moves towards middle income level. Around \$1.09 billion is likely under committed loans and those under consideration, sources for which are detailed below. Some funding may also be available from the Lincy Foundation and the Diaspora.

19. The amounts exclude disbursements up to end-2008:

**ADB:** North-south corridor including H45 (Goris-Kapan) - \$300 million is preliminarily planned.

**EBRD:** Metro Euro15 million (\$20 million), including associated concessional funding. Zvartnots development \$20 million.

**Government budget:** Commitment under the MCC Program \$100 million.

**JICA:** Rural Roads Project arranged in parallel to ADB Rural Road Sector Project (\$100 million is preliminarily planned)

**MCC:** Remaining balance of Rural Roads Rehabilitation Project (\$50 million)

**Nomura/Others:** Zvartnots development \$70 million.

**SCR:** commitment under Concession Agreement \$282.4 million to 2020 (see Table 3).

**World Bank:** Rural roads \$72 million (this project is being fast-tracked to start in 2009), north-south corridor \$100 million, railway bridges \$20 million, road safety \$10 million, Yerevan urban transport \$60 million (project currently on hold).

## 5. SUMMARY

20. Table 7 presents a project implementation timetable.



Sector	Action	Note	Responsibility	Amount until 2020 (\$ million)	Short Term (A)				Medium Term (B)				Long Term (C)				
					2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
<b>III</b>	<b>Railway and Railway Transport</b>			<b>356.1</b>													
	<b>A. Investment Project</b>			<b>349.2</b>													
	1 SCR - Concession Agreement 2009-2020			282.4													
	RL-1 Rehabilitation/ Repairs		SCR	255.2													
	RL-2 Rolling Stock		SCR	27.2													
	2 Other Projects			66.8													
	RL-3 Bridge Renovation Gyumri-Georgia Border		SCR	26.0													
	RL-4 Tamping Machine		SCR	8.3													
	RL-5 Akhouryan Check Point		SCR	5.0													
	RL-6 Optic Fiber Cable Macis-Nounous-Sevan-Zod		SCR/MOTC	20.8													
	RL-7 Optic Fiber Cable Yeraskh-Macis		SCR/MOTC	6.7													
	<b>B. Technical Assistance Project</b>			<b>6.9</b>													
	1 Other Projects			6.9													
	RL-8 Small P&E for Operating Works		SCR	2.5													
	RL-9 Network Development		MOTC/SCR	3.3													
	RL-10 Logistics & Market Development Training		MOTC/SCR	0.4													
	RL-11 Railway Monitoring		MOTC	0.7													
<b>IV</b>	<b>Urban Transport</b>			<b>331.0</b>													
	<b>A. Investment Project</b>			<b>331.0</b>													
	1 Metro			81.1													
	UT-1 Refurbish Metro cars (30)		YM/Metro	5.0													
	UT-2 Refurbish stations		YM/Metro	10.0													
	UT-3 Training Program		YM/Metro	0.8													
	UT-4 New entrance at Yeritasardakan		YM/Metro	30.0													
	UT-5 Safety improvements		YM/Metro	1.3													
	UT-6 Smart card ticketing		YM/Metro	5.0													
	UT-7 Passenger information (real time)		YM/Metro	5.0													
	UT-8 New Metro cars (24)		YM/Metro	24.0													
	2 Bus/Trolleybus			159.2													
	UT-9 Medium/large buses		YM	77.0													
	UT-10 Trolleybuses		YM	35.0													
	UT-11 Passenger information etc.		YM	0.2													
	UT-12 Bus interchanges with hub facilities		YM	1.0													
	UT-13 Bus Maintenance Depots		YM	15.0													
	UT-14 Suburban dispatch centers		YM	2.0													
	UT-15 Inter-Marz bus terminals		YM	5.0													
	UT-16 BRT Line Komitas Avenue		YM	24.0													
	3 Traffic Management/Parking			60.7													
	UT-17 Traffic signals, traffic management		YM	16.6													
	UT-18 Underground car parks		YM	37.6													
		Parking space is being constructed by the private sector under Northern Avenue (between Opera house and Republic Square) and around the Opera house. In addition, other underground parking spaces are planned by the private sector at Shahumian Square (near Hotel Congress), Sakharov Square, and near the Circus/Yerevan Cycle Track.		6.5													
	UT-19 On-street parking & cycling		YM														
	4 Roads			30.0													
	UT-20 Road Surfacing and Maintenance		YM	30.0													
<b>V</b>	<b>Civil Aviation</b>			<b>104.3</b>													
	<b>A. Investment Project</b>			<b>100.0</b>													
	1 Airport Operations			100.0													
	AV-1 Zvartnots Terminal Phase 2		AIA	90.0													
	AV-2 ARMATS Telecom & Nav. Equip		GDCA	5.0													
	AV-3 Avia TC A/craft & simulators		GDCA	5.0													
	<b>B. Technical Assistance Project</b>			<b>4.3</b>													
	1 Other Projects			4.3													
	AV-4 National Aviation Strategy study		GDCA	0.6													
	AV-5 Avia TC needs assess		GDCA	0.1													
	AV-6 Broaden fuel supply base		GDCA	0.3													
	AV-7 Stepanavan, Goris, Sisian study		GDCA	0.3													
	AV-8 Enhance small airlines		GDCA	3.0													

**Total Investment Projects 2,025.6**

**Total TA 36.2**

**Institutional/ Policy and Management Reform Projects 10.1**

**Grand Total 2,071.9**

### APPENDIX 3: PROJECT PROFILES

This Appendix details technical assistance (TA) projects (TA1-TA9) and provides profiles of north-south corridor projects (IP1-IP6). The table below gives a summary of the project profiles. Detailed profiles for each listed project follow.

No.	Project Title
<b>Technical Assistance Projects</b>	
TA – 1	Adoption of Additional International Transport Facilitation Conventions
TA – 2	Better Implementation of International Transport Facilitation Conventions
TA – 3	More Effective Bilateral Agreements
TA – 4	Revision of Domestic Laws/Regulations Related to Transport Facilitation
TA – 5	Small-Scale TA to Support Telecommunications Sector Development
TA – 6	Detailed Bridge Survey and Diagnosis
TA – 7	Establishment of Regulatory and Oversight Authorities in the Transport Sector
TA – 8	PSP Initiatives
TA – 9	Survey of Road Transport
<b>Investment Projects</b>	
IP – 1	Upgraded Border Facilities/Services
IP – 2	Construction/Rehabilitation of Route H-45 Alternative to M-2 Goris – Kapan
IP – 3	M-1 Rehabilitation North-South Corridor
IP – 4	Construction/Rehabilitation of Highway M-15: Yerevan Eastern Bypass – North-South Corridor
IP – 5	Rehabilitation of M-4 North-South Corridor
IP – 6	M-2 Rehabilitation North-South Corridor



## TA 1 - ADOPTION OF CONVENTIONS

<b>TITLE</b>	<b>Adoption of Additional International Transport Facilitation Conventions</b>
<b>LOCATION</b>	Countrywide
<b>SCOPE</b>	Armenia should seek to accede to conventions not yet ratified (or not yet in process) that have been assigned "Priority 1" by the United Nations Economic Commission for Europe, and/or have been identified as "core" conventions by UNESCAP Resolution 48/11 on Road and Rail Modes in Relation to Facilitation Measures, and/or included in the list of conventions tracked by Transport Corridor Europe Caucasus Asia/TRACECA. These include: (i) the <i>Agreement Concerning the International Carriage of Dangerous Goods by Road</i> (ADR from the French acronym), 1957; (ii) the <i>Customs Convention on the Temporary Importation of Commercial Road Vehicles</i> , 1956; and (iii) the <i>Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment used for Such Carriage</i> (ATP, from the French acronym), 1970 (UNECE Priority 1 and tracked by TRACECA), which establishes uniform prescriptions for the preservation of the quality of perishable foodstuffs during international transport. Other conventions that may be considered as a matter of priority include the <i>Convention on Transit Trade of Landlocked States</i> (the so-called New York Convention), 1965, and the <i>Convention and Statute on Freedom of Transit</i> (the so-called Barcelona Convention), 1921, both promoted by UNESCAP;
<b>RATIONALE</b>	Not having ratified the New York Convention considerably impedes Armenia's ability in legal forums to defend its interests vis-à-vis Turkey regarding access to the sea.
<b>CONDITION</b>	Unratified
<b>TIMING</b>	2009-2015
<b>COST</b>	To be determined
<b>PRIORITY</b>	High
<b>RESPONSIBILITY</b>	MOTC and Ministry of Foreign Affairs

## **TA 2 - IMPLEMENTATION OF CONVENTIONS**

<b>TITLE</b>	<b>Better Implementation of International Transport Facilitation Conventions</b>
<b>LOCATION</b>	Countrywide
<b>SCOPE</b>	It is important that Armenia implement well the conventions that it accedes to, including conventions already acceded to and the conventions for which accession is in process.
<b>RATIONALE</b>	While certain international conventions are prescriptive, imposing rules that may be effective, they often require training and a well-developed enforcement capacity to achieve the benefits intended. For example, the ADR Convention requires considerable training to apply; the ATP Convention is also a complicated convention to apply. Training should involve transport ministry officials, enforcement agencies such as traffic police and customs, and the private sector.
<b>CONDITION</b>	Waiting for ratification of conventions in TA 1
<b>TIMING</b>	2009-2020
<b>COST</b>	To be determined
<b>PRIORITY</b>	High
<b>RESPONSIBILITY</b>	MOTC, Customs, Traffic Police, and other concerned authorities

### **TA 3 - BILATERAL AGREEMENTS**

<b>TITLE</b>	<b>More Effective Bilateral Agreements</b>
LOCATION	Countrywide (with specific reference to Iran, Georgia, Turkey and Azerbaijan)
SCOPE	Going forward, Armenia's bilateral agreements should be made more effective, with implementation in the spirit of mutual cooperation and detailed annexes/protocols clearly specifying implementation procedures. A checklist of items to be addressed is provided in Annex 10.
RATIONALE	Armenia's bilateral agreements, with Georgia and Iran, are largely general in scope and non-prescriptive on the practicalities of implementation. Over the longer run, it will of course be helpful if such agreements can be fashioned with Turkey and Azerbaijan, as well as with Georgia and Iran, to maximize the country's options through unhindered, reliable, and efficient alternative routes to the sea, thereby avoiding "captive shipper" status.
CONDITION	Ongoing
TIMING	2009-2012 (and beyond with respect to Turkey and Azerbaijan) If low priority, timing should be 2015-2020.
COST	To be determined
PRIORITY	Low
RESPONSIBILITY	MOTC, Customs, Ministry of Foreign Affairs, and other concerned authorities

## TA 4 - LAWS AND REGULATIONS

<b>TITLE</b>	<b>Revision of Domestic Laws/Regulations Related to Transport Facilitation</b>
<b>LOCATION</b>	Countrywide
<b>SCOPE</b>	Changes in the national legal framework under this heading will include measures to: (i) facilitate the operations of freight forwarders; (ii) make improvements in dispute resolution procedures between Customs and traders; (iii) coordination and streamlining of border operations, e.g., to allow for a one-stop system for vehicles/passengers; (iv) facilitation of transit operations; and (v) ensure that fees collected at the border reflect the costs of the control agencies, as required by Article VIII of the <i>General Agreement on Tariffs and Trade</i> . With regard to Customs matters, work will proceed according to Decree No 99-A of the President of the State Revenue Committee of the Republic of Armenia, dated 28 July 2008.
<b>RATIONALE</b>	To improve the efficiency of domestic transport.
<b>CONDITION</b>	Incomplete
<b>TIMING</b>	2009-2020
<b>COST</b>	To be determined
<b>PRIORITY</b>	Medium
<b>RESPONSIBILITY</b>	MOTC, Customs, and other concerned authorities

## **TA 5 - TELECOMMUNICATIONS**

<b>TITLE</b>	<b>Small-Scale TA to Support Telecommunications Sector Development</b>
<b>LOCATION</b>	Countrywide
<b>SCOPE</b>	This TA would include three elements: (i) necessary amendments to the 1 January 2006 Telecommunications Law so that MOTC can effectively carry out its responsibilities for strategy development; (ii) definition of any new legislation required; (iii) identification of an investment project suitable for ADB support.
<b>RATIONALE</b>	MOTC lacks authority under the existing law to obtain information, data and the like to support strategy development. Making matters worse, an MOTC-led working group has no international experience to draw on. Under the Law, all reporting is to an independent regulatory commission. MOTC has effectively no control over the private concession holders.
<b>CONDITION</b>	Incomplete
<b>REQUIRED TIME INPUT</b>	Three months in 2009
<b>COST</b>	\$100,000
<b>PRIORITY</b>	High
<b>RESPONSIBILITY</b>	MOTC

## TA 6 - BRIDGES

<b>TITLE</b>	<b>Detailed Bridge Survey and Diagnosis</b>
LOCATION	<ul style="list-style-type: none"> <li>(i) Bridges selected as priority one which have important socio-economic requirements and extent of damage.</li> <li>(ii) The potential bridges are located on 17 Interstate roads and Republican roads which connect two interstate roads.</li> <li>(iii) Estimated number of bridges is about 200.</li> </ul>
SCOPE	<ol style="list-style-type: none"> <li>1. The following detailed survey or inspection needs to be carried out, and the data needs to be kept in a computer database to enable engineers to monitor it for maintenance activities: <ul style="list-style-type: none"> <li>(i) Develop inventory data of all bridge structures, and select and rank the priority bridges based on socio-economic requirements and extent of the damages, for carrying out the detailed survey ,</li> <li>(ii) Review design data and the result of the bridges if those exist,</li> <li>(iii) Measure all element of the bridges (beam, slab, pier, abutment and river bank protection)</li> <li>(iv) Collect data of strength of the substances of the main structures using non-destructive inspection,</li> <li>(v) Measure bearing capacity of the main structures through static and dynamic tests.</li> </ul> </li> <li>2. Based on the detailed survey, an analysis and diagnosis of the structure of each bridge need to be carried out for developing the sound maintenance or renovation plan. This is an objective of the asset management.</li> </ol>
RATIONALE	This is an objective of asset management.
CONDITION	<ul style="list-style-type: none"> <li>(i) There are about 4000 bridges and most of them were built some 30-40 years ago and a detailed survey or inspection has not been performed. The project <i>Renovation of Bridges</i> was implemented for renovating 11 bridges with assistance of the World Bank 2002-2004.</li> <li>(ii) In addition, about \$1.5-2.0 million from the state budget was allocated annually for capital repair of bridges and structures. Repair has been carried out based on a visual inspection only. There is insufficient technical data on bridges available to implement sound maintenance works.</li> </ul>
TIMING	2009
COST	\$25,000/bridge
	For survey of 200 bridges total is \$5.0 million
PRIORITY	High
RISK	Number of bridges is rough and it might change during survey works.

**TA 7 - I&G-1**

<b>TITLE</b>	<b>Establishment of Regulatory and Oversight Authorities in the Transport Sector</b>
<b>LOCATION</b>	MOTC
<b>SCOPE</b>	<ol style="list-style-type: none"> <li>1. To establish independent Regulatory Authorities for the Transport Sector</li> <li>2. To consolidate Oversight and Monitoring systems and capacities in the Transport Sector</li> </ol>
<b>RATIONALE</b>	<ul style="list-style-type: none"> <li>• Regulatory procedures in the transport sector are currently fragmented and in some instances lack independence from both Government and regulated entities.</li> <li>• Oversight and monitoring procedures are not consistently applied in the transport sector as a result of both inadequate system development and rapidly changing concessionary status.</li> <li>• Both regulation and oversight activities call for similar implementation processes although at policy and working levels, respectively. Combining the two capacity development needs will generate resource economies and implementation streamlining.</li> </ul>
<b>REQUIRED TIME INPUT</b>	2 person months international services, 6 person months local
<b>COST</b>	\$300,000: International \$160,000, Domestic \$140,000
<b>PRIORITY</b>	Medium
<b>RISK</b>	Institutional resistance and sustainability after completion. Political will to establish independent regulatory authorities in the medium term.

## TA 8 - I&G-2

<b>TITLE</b>	<b>PSP Initiatives</b>
<b>LOCATION</b>	MOED&T
<b>SCOPE</b>	<ol style="list-style-type: none"> <li>1. To establish a national level unit for the promotion and streamlining of private sector participation initiatives</li> <li>2. To develop and implement systems for the identification, financing, processing, analysis and monitoring of PSP initiatives</li> <li>3. To facilitate enhancement of the existing legal and administrative framework within which PSP initiatives are managed.</li> </ol>
<b>RATIONALE</b>	<ol style="list-style-type: none"> <li>(i) Armenia has fairly extensive experience of PSP initiatives but procedures and responsibility allocation has developed on a piecemeal basis and now needs to be consolidated to realize full potential</li> <li>(ii) The legal and administrative framework within which PSP initiatives are managed needs to be rationalized and streamlined</li> <li>(iii) Structured examination of financing mechanisms is required as at the present time focus is limited to established models.</li> <li>(iv) Processing at all stages of PSP activities needs to be streamlined</li> <li>(v) Integration with the work of the proposed regulatory and oversight unit is desirable</li> </ol>
<b>REQUIRED TIME INPUT</b>	1.5 person months international 3 person months local
<b>COST</b>	\$200,000: International \$80,000, Domestic \$120,000
<b>PRIORITY</b>	Medium
<b>RISK</b>	Lack of commitment from Government. Private sector reluctance to invest due to economic or regional uncertainties. Constraints on the development of the local capital market



## **TA 9 – STATISTICS SURVEY**

<b>TITLE</b>	<b>Survey of Road Transport</b>
<b>LOCATION</b>	National Statistical Service
<b>SCOPE</b>	<p>The main objective of the project is improvement of the statistics of road passenger transport by region (province) by intra-province and inter-provincial routes.</p> <p>The specific objectives are:</p> <ol style="list-style-type: none"> <li>1. Ensuring conformity of transport statistics with international methodology, practice and criteria;</li> <li>2. Application of sample survey methods in transport statistics and improvement of methodology;</li> <li>3. Ensuring comprehensive road transport registration by region (provinces).</li> </ol>
<b>RATIONALE</b>	<p>Road transport is an important sub-sector of the economy and plays a key role in support of the population. Road transport plays an important role, in many urban and rural areas it is the only mode. Passenger road transport is by public and private transport. Public transport is passenger transport of economy branches and population by public routes. Private transport undertakes passenger transport of the given organization by own-account (hire) road transport.</p> <p>Given this, it is paramount for this project to aim for:</p> <ol style="list-style-type: none"> <li>a) Improvement of calculation methodology of main indicators on road transport (freight transport, freight turnover, passenger transport, passenger turnover);</li> <li>b) Regular implementation of sample observations with a purpose to complete main indicators (passenger transport, passenger turnover, run implemented by cars) of organizations implementing passenger transport by public road transport; and</li> <li>c) Publication of statistical handbooks (bulletins) reflecting a picture of transport and communications statistics.</li> </ol>
<b>REQUIRED TIME INPUT</b>	2010
<b>COST</b>	Euro 65,000
<b>PRIORITY</b>	Medium
<b>RISK</b>	Low

## IP 1 - BORDER FACILITIES

<b>TITLE</b>	<b>Upgraded Border Facilities/Services</b>
<b>LOCATION</b>	Border post areas
<b>SCOPE</b>	Regarding infrastructure/facilities, this intervention will include (i) implementation of red/green channeling/lane systems, with direction signs in several languages to clearly delineate the processes required to be completed by people crossing the borders (to be implemented pursuant to the RA Government Decision No 707-N, dated 3 July 2008); (ii) upgrading of information technology to support Customs risk management to focus on transactions that are most likely to pose a threat, coupled with post-release checks, (iii) and widening of the narrow Bagratashen-Sadakhlo bridge. "Soft" interventions will include: (i) the legal/regulatory changes noted in section 4.2.5, (ii) further improvements in integrated border management (e.g., so that procedures could be applied so that people would not need to leave their vehicles) and state-of-the-art Customs practices such as direct trader input systems (which require importers or their agents to directly enter data into the Customs system and obtain a validation without the intervention of Customs officials), (iii) training of staff of border control agencies; and (iv) eventual implementation of a one-stop system for all vehicles and people.
<b>RATIONALE</b>	To improve the efficiency of border posts by increasing the number of daily transactions while reducing the incidence of smuggling, evasion or other regulatory/law circumventions.
<b>CONDITION</b>	Incomplete
<b>COST</b>	To be determined
<b>PRIORITY</b>	Medium-High
<b>TIMING</b>	2009-2014
<b>RESPONSIBILITY</b>	Customs, Immigration, and other concerned authorities

## IP 2 – Route H-45

<b>TITLE</b>	<b>Construction/Rehabilitation of Route H-45 Alternative to M-2 Goris – Kapan.</b>
<b>LOCATION</b>	M-2 (6km from Goris) Goris - Tatev – Kapan (3km from Kapan) on M-2
<b>SCOPE</b>	2-lane 3.5m carriageway, AC Length: 75 km
<b>RATIONALE</b>	H-45 runs parallel to and the west of the difficult and dangerous Goris-Kapan section of M-2, but it is impassible by passenger vehicle on most of the section Tatev-Syunik. M-2 is a part of Asian Highway connecting Georgian border to Iranian border, but only one passable route Goris-Kapan and the route is insecure during severe weather and difficult terrain and an alternative route is needed to secure the route. H-45 also serves the important tourist destination of Tatev.
<b>CONDITION</b>	1 <sup>st</sup> section, M-2-Halidzor-Devil's Bridge 18.7 km, needs rehabilitation and improvement; 2 <sup>nd</sup> section, Devil's Bridge – Tatev 4.3km, needs improvement; and 3 <sup>rd</sup> section, Tatev – Aghvani - Syunik 52km, needs new construction and reconstruction (missing link).
<b>TRAFFIC</b>	M-2 (Goris-Kapan):1,320 AADT 2006
<b>COST</b>	<p>First priority section ( 3rd section)</p> <p>Earth work: <math>2m \times 20m \times 3 \times 1,000 = \\$120,000/km</math>  Foundation: <math>10m \times 7 \times 1,000 = \\$70,000 / km</math>  Asphalt (AC 100mm thick): <math>10m \times 58 \times 1,000 = 580,000 / km</math>  Bridge: <math>0.1 \text{ nos} \times 10m \times 50m \times 3,000 = \\$150,000 / km</math></p> <p>Construction Total <math>\\$920,000/km \times 52 = \\$48 \text{ million}</math>  Management and Engineering 10%  Contingencies 5%  Total \$55 million</p> <p>(International Cost, 90% of Asphalt and 3% for Management / Engineering: \$28.5 million)  (Domestic Cost: \$26.5 million)</p> <p>Second priority section ( 1st section)</p> <p>Earthwork: <math>0.5m \times 15m \times 3 \times 1,000 = \\$22,500/km</math>  Rock excavation: <math>5m \times 10m \times 8 \times 500 = \\$200,000/km</math>  Foundation: <math>10m \times 7 \times 1,000 = \\$70,000/km</math>  Asphalt (AC 100mm thick): <math>10m \times 58 \times 1000 = \\$580,000/ km</math>  Bridge:</p> <p>Construction Total <math>\\$872,500/km \times 18.7km = \\$16.3 \text{ million}</math>  Management and Engineering 10%  Contingencies 5%  Total \$19 million</p> <p>(International Cost, 90% of Asphalt and 3% for Management / Engineering: \$10.8 million)  (Domestic Cost: \$8.2 million)</p> <p>Third priority section ( 2<sup>nd</sup> section)</p> <p>Earth work: <math>0.5m \times 15m \times 3 \times 1000 = \\$22,500/km</math>  Rock excavation: <math>5m \times 10m \times 8 \times 1000 = \\$400,000/km</math>  Foundation: <math>10m \times 7 \times 1000 = \\$70,000/km</math>  Asphalt (AC 100mm thick): <math>10m \times 58 \times 1000 = \\$580,000/km</math>  Bridge:</p>

	<p>Construction Total \$1,072,500/km *4.3km=\$4.6 million  Management and Engineering 10%  Contingencies 5%  Total \$5 million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$2.3 million)  (Domestic Cost: \$2.3 million)  Grand total: \$79 million w/o VAT  (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$42 million)  (Domestic Cost: \$37 million)</p>
PRIORITY	High for the 3 <sup>rd</sup> section (missing link) and 2 <sup>nd</sup> and 3 <sup>rd</sup> sections, with priority given to the 3 <sup>rd</sup> section.
RISK	Cost estimate subject to oil and asphalt price fluctuation.

### IP 3 - Route M-1

<b>TITLE</b>	<b>M-1 Rehabilitation North-South Corridor</b>
<b>LOCATION</b>	M-4 Yerevan- Gyumri
<b>SCOPE</b>	Grade separation 4-lane 3.65m carriageway AC Length: 125 km
<b>RATIONALE</b>	<p>(i) Upgrading of this north – south route has a high priority due to heavy traffic volume and traffic safety requirements, and to improve logistics. Route will become main link between Yerevan-Black Sea ports after improvement of 26km section in Georgia.</p> <p>(ii) The route is part of Asian Highway, AH82.</p> <p>(iii) Traffic volume is over 20,000 vehicles a day, but geometry and pavement condition are not appropriate for traffic safety and comfortable driving.</p>
<b>CONDITION</b>	<p>1<sup>st</sup> section, Yerevan – suburbs 9km (2-lane) overlay of asphalt and an additional lane for climbing or waiting, proper safety measures. Yerevan suburbs - Ashtarak 20km (4-lane), overlay of asphalt surface, proper safety measures, such as guard rail and signage, and additional structures for under or overpass.</p> <p>2<sup>nd</sup> section, Ashtarak- Gyumuri 96km, additional carriageway to widen from 2-lane to 4-lane and other work as for the first section.</p>
<b>TRAFFIC</b>	M-1 Km20 (Yerevan-Gyumri): 9783 AADT 2005, 9953 AADT 2007
<b>COST</b>	<p>1<sup>st</sup> section - 1: 9km</p> <p>Additional lane, Earthwork:  <math>5m \times 10.5m \times \\$3 \times 1000m \times 0.5 = \\$78,750/km</math>  Additional lane, Foundation: <math>15.5m \times \\$7 \times 1000m \times 0.5 = \\$7,750/ km</math>  Asphalt (AC 100mm thick):  <math>4m \times \\$58 \times 1000m \times 0.5 = \\$116,000/km</math>  Overlay Asphalt (AC 50mm thick):  <math>7.5.0m \times \\$30 \times 1000m = \\$225,000/km</math>  Crossing Structures:  <math>750m^3 \times \\$300 \times 0.1No = \\$22,500/km</math>  Safety measures:  <math>\\$40 \times 1000m \times 0.3 = \\$12,000/km</math>  Others: \$100,000/km  Construction Total <math>\\$562,000/km \times 9km = \\$5.1 million</math>  Management and Engineering 10%  Contingencies 5%  Total of 1-1 \$5.9 million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$3.0 million  (Domestic Cost: \$2.9 million)</p> <p>1<sup>st</sup> section - 2: 20km</p> <p>Re-alignment (10%), Earth work:  <math>5m \times 25m \times \\$3 \times 1000m \times 0.1 = \\$37,500/km</math>  Re-alignment (5%), Foundation:  <math>16.3m \times \\$7 \times 1000m \times 0.1 = \\$11,410/km</math>  Asphalt (AC 100mm thick):  <math>16.3m \times \\$58 \times 1000m \times 0.1 = \\$94,540/km</math>  Overlay Asphalt (AC 50mm thick):  <math>16.0m \times \\$30 \times 1000m \times 0.9 = \\$432,000/km</math>  Crossing Structures:  <math>750m^3 \times \\$300 \times 0.1No = \\$22,500/km</math></p>

	<p>Safety measures:  <math>\\$40 \times 1000\text{m} \times 0.1 = \\$4000/\text{km}</math>  Others: <math>\\$100,000/\text{km}</math>  Construction Total <math>\\$701,950/\text{km} \times 20\text{km} = \\$14.0</math> million  Management and Engineering 10%  Contingencies 5%  Total of 1-2 <math>\\$16.1</math> million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: <math>\\$10.0</math> million  (Domestic Cost: <math>\\$6.1</math> million)  Total <math>\\$22.0</math> million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: <math>\\$13.0</math> million  (Domestic Cost: <math>\\$9.0</math> million)</p>
	<p>2<sup>nd</sup> section 96km  Widening (flat/hilly section), Earth work:  <math>5\text{m} \times 15\text{m} \times \\$3 \times 1,000\text{m} = \\$225,000</math>  Widening (flat/hilly section), Foundation:  <math>8.5\text{m} \times \\$7 \times 1,000\text{m} = \\$59,500</math>  Widening (flat/hilly section) Asphalt (AC 100mm thick):  <math>8.5\text{m} \times \\$58 \times 1,000\text{m} = \\$493,000</math>  Widening (flat/hilly section) Overlay Asphalt (AC 50mm thick):  <math>8.5\text{m} \times \\$30 \times 1,000\text{m} = \\$255,000</math>  Crossing Structures:  <math>750\text{m}^3 \times \\$300 \times 0.1\text{No} = \\$22,500/\text{km}</math>  Safety measures:  <math>\\$40 \times 1,000\text{m} \times 0.1 = \\$4000</math>  Others (including drainage): <math>\\$100,000/\text{km}</math></p> <p>Construction Total <math>\\$1,159,000/\text{km} \times 96\text{km} = \\$111.3</math>million  Management and Engineering 10%  Contingencies 5%  Total <math>\\$128.0</math> million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: <math>\\$68.4</math> million (Domestic Cost: <math>\\$59.6</math> million)</p>
	<p>Grand Total: <math>\\$155.9</math> million w/o VAT (International Cost: <math>\\$84.6</math> million. Domestic Cost: <math>\\$71.3</math> million)</p>
PRIORITY	High
RISK	Cost estimate subject to oil and asphalt price fluctuation.

### IP 4 – Route M-15

<b>TITLE</b>	<b>Construction/Rehabilitation of Highway M-15: Yerevan Eastern Bypass – North-South Corridor</b>
<b>LOCATION</b>	M-2 (6km from Yerevan) - Jrvej – M-4 Ptghni (2km from town on M2)
<b>SCOPE</b>	4-lane 3.65m carriageway AC Length: 22 km
<b>RATIONALE</b>	All arterial routes pass through Yerevan and traffic congestion is becoming critical. M-15 runs on the outskirts east of Yerevan, but it is not passable throughout at the moment. Reopening it would mitigate traffic congestion, pollution and the high levels of accidents in Yerevan. Heavy vehicles from the south to Sevan and the Georgian border would bypass Yerevan.
<b>CONDITION</b>	1 <sup>st</sup> section, M-2-Jrvej 13 km, reconstruction. This section is impassable because of defects of the embankment and landslides (missing link), 2 <sup>nd</sup> section, Jrvej – M-4 9km, improvement.
<b>TRAFFIC</b>	M-2 9km (Yerevan-Iran border):22,625 AADT 2005, 24,551 AADT 2007 M-4 10km (Yerevan-Sevan): 19,484 AADT i2005, 25,386 AADT 2007
<b>COST</b>	<p>1<sup>st</sup> section</p> <p>Earthwork: 5m*25m*\$3*1000=\$375,000/km Soil Improvement 35m*3*\$5*1000=\$525,000/km Foundation: 16.3m*\$7*1000m=\$114,100/km Asphalt (AC 100mm thick): 16.3m*58USD*1000=945,500 / km Others: 5% \$100,000/km</p> <p>Construction Total \$2,059,600/km *13km=\$26.7 million Management and Engineering 10% Contingencies 5% Total \$31.0 million (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$12.0 million (Domestic Cost: \$19.0 million)</p> <p>2<sup>nd</sup> section</p> <p>Earthwork: 1m*18m*\$3*1000=\$54,000/km Foundation: 16.3m*\$7*100m=\$114,100/ km Asphalt (AC 100mm thick): 16.3m*\$58*1000=\$945,500 / km Others: 5% \$55,000/km</p> <p>Construction Total \$1,168,600/km *9km=\$10.5 million Management and Engineering 10% Contingencies 5% Total \$12 million (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$8.0 million (Domestic Cost: \$4.0 million)</p> <p>Grand Total: \$43 million w/o VAT (International Cost, 90% of Asphalt and 3% for Management/ Engineering: \$20 million (Domestic Cost: \$23 million)</p>
<b>PRIORITY</b>	Low
<b>RISK</b>	Cost estimate subject to oil and asphalt price fluctuation.

### IP 5 – Route M-4

<b>TITLE</b>	<b>Rehabilitation of M-4 North-South Corridor</b>
<b>LOCATION</b>	M-4 Yerevan- Sevan- Dilijan
<b>SCOPE</b>	Grade separation 4-lane 3.65m carriageway AC Length: 118 km (The 3km tunnel section between Sevan and Dilijan remains 2-lane.)
<b>RATIONALE</b>	(iv) Upgrading of this north – south route has a high priority due to heavy traffic volume and traffic safety requirements, and to improve logistics. (v) The route is part of Asian Highway, AH83. (vi) Daily traffic volume is over 20,000 vehicles a day, but road geometry and pavement condition are not appropriate for traffic safety and comfortable driving.
<b>CONDITION</b>	1 <sup>st</sup> section, Yerevan-Sevan 77 km, realignment of some unsafe sections (both horizontal and vertical), and overlay of asphalt surface, proper safety measures such as guard rail and signage, and additional structures for under or overpass. 2 <sup>nd</sup> section, Sevan- Dilijan 41km, needs additional carriageway to widen from 2-lane to 4-lane except for the tunnel section plus work as for the first section.
<b>TRAFFIC</b>	M-4 10km (Yerevan-Sevan): 19,484 AADT 2005, 25,386 AADT 2007
<b>COST</b>	<p>1<sup>st</sup> section: 77km</p> <p>Re-alignment (10%), Earthwork:  <math>5m \times 25m \times \\$3 \times 1000m \times 0.1 = \\$37,500/km</math>  Re-alignment (5%), Foundation:  <math>16.3m \times \\$7 \times 1000m \times 0.1 = \\$11,410/km</math>  Asphalt (AC 100mm thick):  <math>16.3m \times \\$58 \times 1000m \times 0.1 = \\$94,540/km</math>  Overlay Asphalt (AC 50mm thick):  <math>16.0m \times \\$30 \times 1000m \times 0.9 = \\$432,000/km</math>  Crossing Structures:  <math>750m^3 \times \\$300 \times 0.1 No = \\$22,500/km</math>  Safety measures including slope protection:  <math>\\$40 \times 1000m = \\$40,000/km</math>  Others: \$100,000/km</p> <p>Construction Total <math>\\$737,950/km \times 77km = \\$56.8</math> million  Management and Engineering 10%  Contingencies 5%  Total \$65.3 million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$38.2 million  (Domestic Cost: \$27.1 million)</p> <p>2<sup>nd</sup> section 41km (tunnel 3km, flat/hilly 10km, mountainous 28km)</p> <p>Widening (10km flat/hilly section), Earthwork:  <math>5m \times 15m \times \\$3 \times 10,000m = \\$2,250,000</math>  Widening (10km flat/hilly section), Foundation:  <math>8.5m \times \\$7 \times 10,000m = \\$595,000</math>  Widening (10km flat/hilly section) Asphalt (AC 100mm thick):  <math>8.5m \times \\$58 \times 10,000m = \\$4,930,000</math>  Widening (10km flat/hilly section) Overlay Asphalt (AC 50mm thick):  <math>8.5m \times \\$30 \times 10,000m = \\$2,550,000</math>  Tunnel section (3km), Overlay Asphalt (AC 50mm thick):  <math>7.5m \times \\$30 \times 3,000m = \\$675,000</math></p>



	<p>Widening (28km mountainous section), Earth work:  <math>5m \times 15m \times \\$3 \times 28,000m = \\$6,300,000</math>  Widening (28km mountainous section), Rock Excavation:  <math>10m \times 15m \times \\$8 \times 28,000m \times 0.3 = \\$10,080,000</math>  Widening (28km mountainous section), Foundation:  <math>16.3m \times \\$7 \times 28,000m = \\$3,194,800</math>  Widening (28km mountainous section) Asphalt (AC 100mm thick):  <math>16.3m \times \\$58 \times 28,000m = \\$26,471,200</math>  Crossing Structures:  Unnecessary  Safety measures:  <math>\\$40 \times 41,000m \times 0.1 = \\$164,000</math>  Others (including drainage): <math>\\$100,000/km \times 41km = \\$4,100,000</math></p> <p>Construction Total \$57.6 million  Management and Engineering 10%  Contingencies 5%  Total \$66.2 million  (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$33.0 million  (Domestic Cost:\$ 33.2 million)</p> <p>Grand Total: \$131.5 million w/o VAT (International Cost: \$71.2 million.  Domestic Cost: \$60.3 million)</p>
PRIORITY	Low
RISK	Cost estimate subject to oil and asphalt price fluctuation.

## IP 6 – Route M-2

<b>TITLE</b>	<b>M-2 Rehabilitation North-South Corridor</b>
<b>LOCATION</b>	M-2 Yerevan – Yeraskhvan
<b>SCOPE</b>	Grade separation 4-lane 3.65m carriageway AC
	Length: 70 km
<b>RATIONALE</b>	Upgrading of this north – south route has a high priority due to heavy traffic volume and traffic safety requirement and to improve logistics. The route is a part of Asian Highway, AH82. Traffic volume is over 20,000 vehicles a day, but the geometry and surface pavement condition are not appropriate for traffic safety and comfortable driving.
<b>CONDITION</b>	Yerevan-Yeraskhavan 70km, overlay of asphalt surface, safety measures such as guard rail and signage, and additional structures for under or overpass.
<b>TRAFFIC</b>	M-2 Km9: 22,625 AADT 2005, 24,551 AADT 2007
<b>COST</b>	70km Re-alignment (10%), Earth work: $5m * 25m * \$3 * 1000m * 0.1 = \$37,500/km$ Re-alignment (5%), Foundation: $16.3m * \$7 * 1000m * 0.1 = \$11,410/km$ Asphalt (AC 100mm thick): $16.3m * \$58 * 1000m * 0.1 = \$94,540/km$ Overlay Asphalt (AC 50mm thick): $16.0m * \$30 * 1000m * 0.9 = \$432,000/km$ Crossing Structures: $750m^3 * \$300 * 0.1 No = \$22,500/km$ Safety measures: $\$40 * 1000m * 0.1 = \$4,000/km$ Others: \$100,000/km Construction Total $\$701,950/km * 70km = \$49.1$ million Management and Engineering 10% Contingencies 5% Total \$56.5 million (International Cost, 90% of Asphalt and 3% for Management / Engineering: \$34.6 million (Domestic Cost: \$21.9 million)
<b>PRIORITY</b>	Low
<b>RISK</b>	Cost estimate subject to oil and asphalt price fluctuation.