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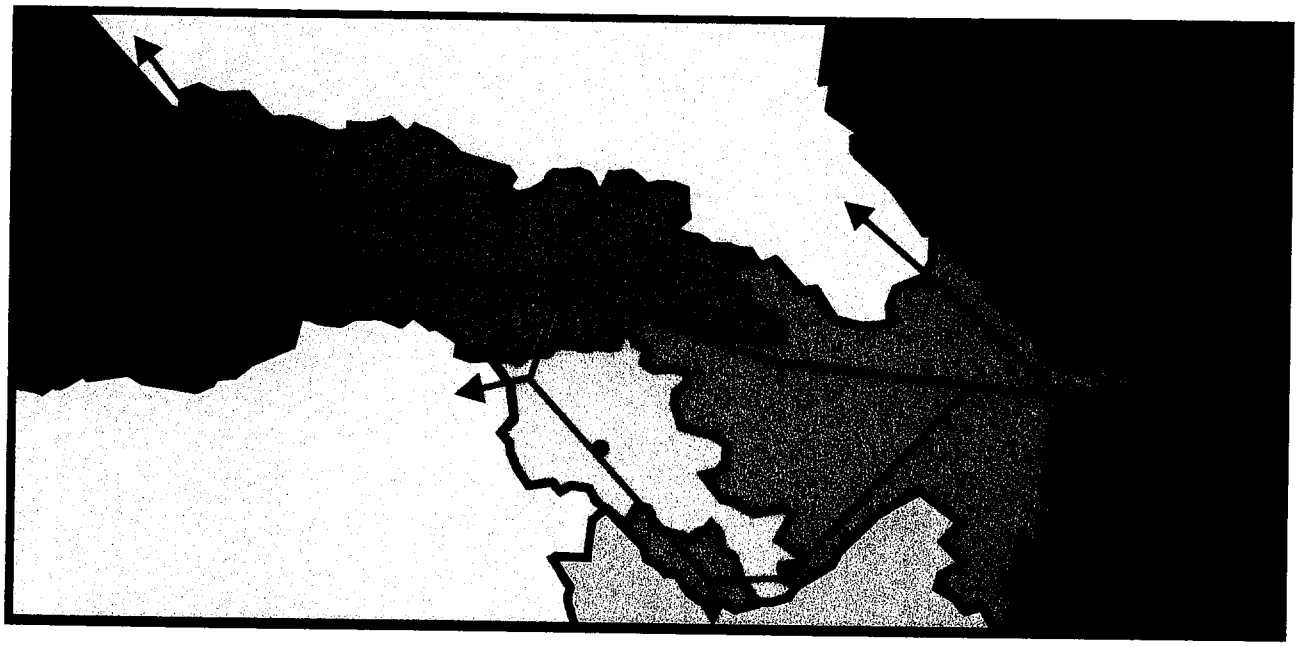
Joint Venture(s) for the Caucasian Railways



FINAL REPORT

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Contents

Abbreviation list:

AC	Alternating Current of electrical power
AGC	European Agreement on Main International Railway Lines
AGTC	European Agreement on Important International Combined Transport Lines and Related Installations
AGZD	Azerbaijan State Railways
AICCF	International Railway Congress Association
AIM	Agreements for the International Carriage of Goods
AIOC	Azerbaijan International Operating Company (Oil production)
AIV	Agreements for the International Carriage of Passengers and Luggage
ARM	Agreement for the Communication of Traffic Restrictions for the International Carriage of Goods by Rail
ARM	Armenian Railway
ATP	Agreement on the international carriage of perishable foodstuffs and on the special equipment to be used for such carriage
BIS	Baku International Seaport
BOLT	Build - Operate - Lease - Transfer
BOT	Build - Operate - Transfer
BUS	Transformer station of railway power supply
BWRS	Baku Wagon Repair Plant
CECA	European Community for coal and steel
CEH	European Timetable Conference for Passenger Trains
CEM	European Timetable Conference for Goods Trains
CEV	European Passenger Tariffs Conference
CFS	Container Freight Station
CIM	Contracts for International Carriage of Goods by Rail
CIS	Commonwealth of Independent States
CIT	International Rail Transport Committee
CIV	Contracts for International Carriage of Passengers by Rail
COTIF	Convention for the International Carriage by Rail
CSC	Caspian Shipping Company
DB AG	Deutsche Bahn AG (German Railways)
DC	Direct current of electrical power
DCU	Uniform Regulations for Rail Transport
DEG	Deutsche Investitions- und Entwicklungsgesellschaft mbH (German Society for Investment and Development Ltd.), Cologne, Germany
DEM	Deutsche Mark (= German currency)
DIN	German Regulations of Standardisation in the Industry
DM	Deutsche Mark (= German currency)
DMU	Diesel Motor Unit
Dpt.	Department
DR	type of inspections of locomotives, wagons, coaches and EMU/DMU
DSA	European Prestressed Concrete Sleepers (type of sleepers)
DSS	Decision Support System
EBRD	European Bank for Reconstruction and Development, London, UK

EC	European Community
ECE	Economic Commission of the UN for Europe
EDI	Electronic Data Interchange
EDIFACT	Electronic Data Interchange for Administration Commerce and Transport
EDP	Electronic Data Processing
EEC	European Economic Community
EMU	Electric Multiple Unit
ESCAP	Economic and Social Commission for Asia and the Pacific
EUROP	Agreement for the Common use of Wagons
FADA	Traffic controller installations
FESA	Permanent line-side radio installations
FSU	Former Soviet Union
FTOS	Freight Transport Operation System
FZ	Financial co-operation programme (in Germany)
GDP	Gross Domestic Product
GDR	former German Democratic Republic
GOST	State Organisation of Standardisation of the former Soviet Union
GRID®	American management training system
GRZD	Georgian Railways
HERMES	German State Guarantees for Suppliers
HQ	Headquarters
HV	High Voltage
ICC	Information and Computer Centre
ICE	Inter-City-Express(-Train)
IMF	International Monetary Found
IRR	Internal Rates of Return (of investments)
ISO	International Organisation of Standardisation
JV	Joint Venture
KfW	Kreditanstalt für Wiederaufbau (= German Bank for Reconstruction), Frankfurt/Main, Germany
KR	type of repairs of locomotives, wagons, coaches and EMU/DMU
LIF	General List of Frontier Points for Rail Transport
LOI	Letter of Interest
LOU	Letter of Understanding
LV	Low Voltage
MBC	Motorised coaches
MESA	Mobile railway radio installations
MIS	Management Information System
MPS	Ministry of Railway Transport of the former Soviet Union
MTT	Uniform Transit Tariff of the OSShD
MV	Medium Voltage
nm	nautical miles
OCC	Operations Control Centre (of the railways)
OCS	Overheadline catenary system of power supply
OCTI	Central Office for International Carriage by Rail (in Bern, Switzerland)
OR	type of overhauls of wagons, coaches and EMU
OSShD	Organisation for the Co-operation of Railways
PC	Personal Computer

PCM	Personal Computer assisted Management
PFCCS	Processing and Freight Cost Calculation System
PIEx	Common Regulations for the International Carriage of Express Parcels
PIM	Common Regulations for the International Carriage of Goods
PIV	Common Regulations for the International Carriage of Passengers and Luggage
Pkm	Passenger-kilometre
POD	Port of Discharge
POL	Port of Loading
PPW	Regulation for the Use of Wagons in International Rail Transport
resp.	respective
RIC	Regulations for the International Carriage of Containers by Rail
RIC	Regulations for the Reciprocal use of railway carriages and luggage vans for International Transport
RID	Regulations for the International Carriage of Dangerous Goods by Rail
RIEx	Regulations for the International Carriage of Express Parcels by Rail
RIP	Regulations for the International Carriage of Private Wagons by Rail
RIV	Regulations for the Reciprocal use of Wagons for International Transport
RoRo	Roll-on-Roll-off
RSM	General Summary of Special Regulations for the International Goods Traffic
SBB	Swiss Federal Railway
SCADA	Supervisory, Control and Data Acquisition System
SMGS	Conventions to International Railway Transport of Goods
SMPS	Conventions to International Railway Transport of Passengers
SNCB	Belgian Rail
SNCF	French National Railway Society
SZD	former Soviet Railways
TCLE	Trans-Caucasian-Logistic-Express
TECF	Tbilisi Electro-Locomotive Construction Factory
TEU	Twenty feet container Equivalent Unit
TEWRS	Tbilisi Electro-Wagon Repair Plant
TEWS	Tbilisi Electro-Wagon Repair Plant
TIEx	Agreements for the International Carriage of Express Parcels
Tkm	Ton-kilometre
TO	type of overhauls of locomotives, wagons, coaches and EMU/DMU
TQM	Total Quality Management
TR	type of repairs of locomotives, wagons, coaches and EMU/DMU
UIC	International Union of Railways
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UTI	International Transportation Units
VAT	Value Added Tax
ZÜV	System for the supervision of train running

Chapter 4

Business strategy of the railways

Contents:

List of tables:

List of annexes:

4.1 General

The planning of infrastructure and of particular projects must be prepared based on cost-benefit analyses. Therefore, the most important pre-condition for any further investment (other than in an emergency) must be to set up a central planning unit responsible for

- restriction of rehabilitation/maintenance on core activities being carried out only on a part of the network
- evaluation of traffic forecasts, at a later stage also of confined orders of the commercial department for conversion into operational parameters (number of wagons and trains)
- defining and optimising permissible speed, traction and train formation
- setting up a comprehensive operating programme including number, speed and load of trains
- overall design of the network (including number of stations and their layout scheme, abandoning stations/posts, number of running lines and turnouts) on the basis of the operating programme
- defining the demand for signalling, telecommunications, motive power and rolling stock
- providing inputs for re-deployment schemes for permanent way, signalling and other technical fields

Where a line has an overelaborated infrastructure, this should be rationalised to match the service on offer in order to reduce the associated costs. In each case, reclaimed materials can be reused at other locations if their physical condition is satisfactory.

This can be summarised as follows:

- **Tracks:**

  Remove unwanted passing loops, sidings into goods stations (where no longer required); rationalise terminal layouts by reducing number of platform roads, locomotive depot access roads, turntables, etc. Where a line is double track, determine whether the level of traffic can justify both tracks and convert the line to single track if not. Where 'push-pull' or multiple unit operation has been introduced, eliminate all trackwork previously required for loco run-round.

- **Signalling:**

  Depending upon traffic levels, remove unwanted/unneeded signalling equipment. Where a branch line is operated by a shuttle train only (i.e. only one train is allowed on the branch at any one time), remove all signalling and work the branch on the 'one engine in steam' principle, with a single controlled access point at the entry to the branch.

- **Electrification:**

Determine the costs of the electrification equipment on branch lines and consider whether it is really justified; if not, remove it and install it in a location where it can be justified.

- **Buildings:**

Where station buildings, goods sheds etc. are unoccupied, the railways should seek to lease them to private organisations, as shops, factories, warehouses etc. If no further use can be found, or if the building is in very poor condition, it should be demolished. If only a small number of passengers is using the station, simple 'bus-stop' shelters can be erected to protect waiting passengers.

4.2 Investment plan for infrastructure

The investment plan for infrastructure was prepared for the fields

- Track and bridges,
- Signalling, telecommunication
- Power supply,
- Freight and passenger stations,
- Container terminals,
- Rolling stock,
- Maintenance shops.

4.2.1 Track and bridges business strategy

Chapter 1.1 contains the detailed analysis of the technical condition of tracks and bridges. Apart from this analysis, repair work to tracks and bridges required and investment cost estimations are presented in detail in Annexes 4.2.1-1 to 4.2.1-9. Therefore, only a summary will be given in the following sections.

4.2.1.1 Armenian Railway (ARM)

The funds required to finance backlog work on the lines, renewal of the bridges, equipment of the permanent-way districts and the permanent-way workshops is documented individually in Annexes 4.2.1-2 to 4.2.1-4 .

The following table provides a summary of required investments, together with the priorities for proceeding with the investments.

Tab. 4.2.1-1: Overview of necessary investment for rehabilitation of the ARM track network

no.	description	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Yerevan - Airum line	36,156		
2	Masis - Yerask line		8,356	
3	Masis - Ijevan line			31,384
5	bridges and tunnels	3,350		
6	permanent-way districts	3,000	2,000	
7	permanent-way workshop	14,500		
8	training	500		
	total	**57,506**	**10,356**	**31,384**

Track renewal of the 3rd priority should then be followed by consistent regular track renewal of 40 km per year. On the basis of this annual renewal scope, it will take 15 years to renew ARM's entire track network. Subsequent further renewal work will be necessary at a volume of 30 km per year. The service life of the new track structure is estimated to be 25 years on account of the better quality of material used - this value is standard for European railways.

In Armenia, work can be carried out on the track only in the period from March to October every year. Longer renewal periods are not possible because of the early start of winter. Should the track repair machinery be replaced, it is possible to work on the basis of a maximum possible renewal scope of 50 km per year. The following table indicates a possible schedule which refers to work being performed by ARM's own staff and technical possibilities.

Tab. 4.2.1-2: Schedule for renewal work on the ARM track network

no.	description	first year of project = x			
1	procurement of machinery	x + 2			
2	procurement of equipment and tools	x + 2			
3	procurement of materials; preparation of the building sites	x + 2			
4	track renewal priorities 1 + 2 + 3 50 km/year, total renewal 240 km, switch renewal		x + 5		
5	regular track and switch renewal after completion of the backlog work.			x + 6	x + 7 + ff.
6	bridges and engineering structures, planning, tendering by the administration, execution by contractors	x + 2	x + 3	x + 4	
7	training	x			

It is of great importance for ARM that the necessary renewal work is carried out by its own staff. According to the table above, 5 years will be required just to complete all backlog work for renewal of the tracks and switches. Regular track renewal will not start until year 6. Bridge construction will start with planning year x, with a construction period of around 4 years.

4.2.1.2 Azerbaijan State Railways (AGZD)

The funds required to finance backlog work on the lines, renewal of the bridges, equipment of the permanent-way districts and the permanent-way workshop is documented individually in Annexes 4.2.1-5 to 4.2.1-6 . The following table provides a summary of required investments, together with the priorities for proceeding with the investments.

Tab. 4.2.1-3: Overview of necessary investment for rehabilitation of the AGZD track network

no.	description	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Baku - Beyuk - Kyassik line	97,240		
2	Baladshary - Yalama line		20,080	
3	Aliat - Sadarak line			110,960
4	Osmanly - Astara line			34,560
5	bridges and tunnels	5,970		4,545
6	15 permanent-way districts	15,000	15,000	7,500
7	permanent-way workshop	10,744	10,744	
8	training	500		
	total	**129,454**	**45,824**	**157,565**

The following schedule is suggested for proceeding with renewal work for AGZD on the basis of an annual renewal scope of 150 km line track:

Tab. 4.2.1-4: Schedule for renewal of the AGZD track network

no.	description	first year of project = x			
1	procurement of machinery	**x + 2**			
2	procurement of equipment and tools	**x + 2**			
3	procurement of materials; preparation of the building sites	**x + 2**			
4	track renewal priorities 1 + 2 + 3 150 km/year, total renewal 902 km, switch renewal	**x + 6**			
5	regular track and switch renewal after completion of the backlog work.			**x + 7**	
6	bridges and engineering structures, planning, tendering and execution by contractors	**x + 2**	**x +3**	**x + 4**	
7	training	**x**			

It is of great importance for AGZD that the necessary renewal work is carried out by its own staff. According to the table above, 6 years will be required just to complete all backlog work for renewal of the tracks and switches. Regular track renewal will not start until year 7.

4.2.1.3 Georgian Railways (GRZD)

The funds required to finance backlog work on the lines, renewal of the bridges, equipment of the permanent-way districts and the permanent-way workshop is documented individually in Annexes 4.2.1-7 to 4.2.1-9. The following table provides a summary of required investments, together with the priorities for proceeding with the investments.

Tab. 4.2.1-5: Overview of necessary investment for rehabilitation of the GRZD track network

no.	description	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Poti - Senaki - Tbilisi - border to AGZD line	152,860		
2	Tbilisi - Sadakhlo - line		11,339	
3	Batumi - Samtredia line			10,840
4	Veseloe - Ingiri - Senaki line			10,360
5	bridges and tunnels	14,365		
6	11 permanent-way districts	12,000	10,000	
7	permanent-way workshop	13,500	13,500	
8	training	500		
	total	**193,225**	**34,839**	**21,200**

The following schedule is suggested for proceeding with renewal work for GRZD on the basis of an annual renewal scope of 120 km line track:

Tab. 4.2.1-6: Schedule for renewal work on the GRZD track network

no.	description	first year of the project = x			
1	procurement of machinery	x + 2			
2	procurement of equipment and tools	x + 2			
3	procurement of materials; preparation of the building sites	x + 2			
4	track renewal priorities 1+ 2 + 3 120 km/year, total renewal 672 km, switch renewal	x + 6			
5	regular track and switch renewal after completion of the backlog work			x + 7	
6	bridges and engineering structures, planning, tendering and execution by contractor	x + 2	x +3	x + 4	x + 5
8	training	x			

It is of great importance for GRZD that the necessary renewal work is carried out by its own staff. According to the table above, 6 years will be required just to complete all backlog work for renewal of the tracks and switches. Regular track renewal will not start until year 7.

4.2.1.4 Summary of the investment volume for track and bridges of the Caucasian railways

The investment volume for track and bridges covers the costs for track renewal, bridges and tunnels, permanent-way districts, permanent-way workshops and staff training.

Tab. 4.2.1-7:Investment volume for track and bridges for the Caucasian railways.

measures	investment costs in mill. US$			
	ARM	AGZD	GRZD	total
track renewal	75.9	262.8	185.4	**524.1**
bridges and tunnels	3.4	10.5	14.4	**28.3**
permanent-way districts	5.0	37.5	22.0	**64.5**
permanent-way workshop	14.5	21.5	27.0	**63.0**
training	0.5	0.5	0.5	**1.5**
total	**99.3**	**332.8**	**249.3**	**681.4**

The total investment volume required for track and bridges for the Caucasian railways amounts to **US$ 681.4 million.**

4.2.2 Signalling and telecommunication business strategy

Chapter 1.2 contains the detailed analysis of the technical condition of signalling and telecommunication. Apart from this analysis, repair work of signalling and telecommunication required and investment cost estimations are presented in Annexes 4.2.2-1 to 4.2.2-15. Therefore, only a summary will be given in the following sections.

A proposal for fitting the Baku-Tbilisi-Poti/Yerevan main line with modern communication and computer technology as a priority ("Pilot Project Communication") was drawn up within the framework of the project. The document is attached as Annex 4.2.2-16.

4.2.2.1 Armenian Railway (ARM)

4.2.2.1.1 Signalling installations

The financial funds required for signalling systems are detailed in Annexes 4.2.2-1 to 4.2.2-4, quoting unit prices and single items. The survey of the investment costs of the signalling installations in Table 4.2.2-1 contains the prices of the equipment of stations, axle counters, gate installations, the replacement of the provisional buildings in stations, the equipment for maintenance, the spare parts for repair measures and engineering costs, assigning them to the priorities.

Tab. 4.2.2-1: Investment costs of ARM signalling installations

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	double track equipment of the stations	838.0	-	-
2	complete equipment of the stations	-	775.4	-
3	axle counters	3,000.0	4,000.0	4,000.0
4	gate installations	1,000.0	1,500.0	5,000.0
5	replacement of provisional buildings in stations	-	-	14,500.0
6	equipment for maintenance	700.0	700.0	423.6
7	spare parts for repair measures	300.0	300.0	300.0
8	engineering costs[1]	730.0	940.0	3,500.0
	total	**6,568.0**	**8,215.4**	**27,723.6**

[1] sum of ancillary construction costs such as planning, supervision and construction site organisation

4.2.2.1.2 Telecommunication installations

The financial funds required for telecommunication installations are documented in Annexes 4.2.2-5 to 4.2.2-7, quoting single items and unit prices.

Tab. 4.2.2-2: Investment costs for ARM telecommunication installations

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	laying optical fibre cable	1,950	2,535	4,830
2	transmission equipment	660	560	300
3	exchanges	-	-	1,220
4	train radio installations	-	4,500	4,332
5	other installations	250	300	350
6	engineering costs[3]	430	1,180	1,650
	total	**3,290**	**9,075**	**12,682**

4.2.2.2 Azerbaijan State Railways (AGZD)

4.2.2.2.1 Signalling installations

The financial funds required for signalling equipment are documented in Annex 4.2.2-8 for the most important spare parts, quoting single items and unit prices. The survey of the investment costs for signalling installations in Table 4.2.2-3 details the prices for the equipment of stations, the axle counter, the gate installations, the replacement of complete stations, equipment for maintenance work, spare parts for repair works and engineering costs, assigning them to the priorities.

Tab. 4.2.2-3: Investment costs concerning signalling equipment of AGZD

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Baku - Beyuk Kyassik[2] main line	5,000.0	4,500.0	4,100.0
2	other lines[2]	2,000.0	2,000.0	1,800.0
3	axle-counter equipment	1,000.0	3,000.0	4,200.0
4	barrier installations	2,000.0	6,000.0	7,000.0
5	replacement of complete stations	-	32,000.0	58,000.0
6	equipment for maintenance work	1,500.0	1,000.0	1,000.0
7	spare parts for repair measures	1,000.0	1,000.0	1,000.0
8	engineering costs[3]	950.0	3,000.0	5,000.0
	total	**13,450.0**	**52,500.0**	**82,100.0**

[2] light signals, switch drives, impedance bonds with secondary winding and signal cable
[3] sum of ancillary construction costs such as planning, supervision and construction site organisation

4.2.2.2.2 Telecommunication installations

The financial funds required for telecommunication installations are documented in Annexes 4.2.2-9 to 4.2.2-11, quoting single items and unit prices.

Tab. 4.2.2-4: Investment costs for AGZD telecommunication installations

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	laying optical fibre cable	3,269.5	5,655.0	8,190.0
2	transmission equipment	960.0	1,700.0	260.0
3	exchanges	-	0	4,138.0
4	train radio installations	-	3,900.0	5,636.0
5	other installations	250.0	300.0	350.0
6	engineering costs	500.0	1,200.0	2,200.0
	total	**4,979.5**	**12,755.0**	**20,774.0**

4.2.2.3 Georgian Railways (GRZD)

4.2.2.3.1 Signalling installations

The financial funds required for signalling equipment are documented in Annex 4.2.2-12 for the most important spare parts, quoting single items and unit prices. The survey of the investment costs for signalling installations in Table 4.2.2-5 details the prices for the equipment of stations, the axle-counter equipment, the barrier installations, the replacement of complete stations, equipment for maintenance work, spare parts for repair works and engineering costs, assigning them to the priorities.

Tab. 4.2.2-5: Investment costs for signalling equipment of the GRZD

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Gardabani-Tbilisi-Poti/Batumi section[4]	8,000.0	7,000.0	6,000.0
2	other lines[4]	3,200.0	3,100.0	3,000.0
3	axle-counter equipment	3,000.0	4,000.0	4,200.0
4	barrier installations	5,000.0	8,000.0	8,000.0
5	replacement of the provisional stations	-	24,000.0	33,000.0
6	equipment for maintenance work	1,500.0	1,000.0	1,000.0
7	spare parts for repair measures	1,000.0	1,000.0	1,000.0
8	engineering costs[5]	950.0	3,000.0	5,000.0
	total	**22,650.0**	**51,100.0**	**61,200.0**

[4] light signals, switch drives, impedance bonds with secondary winding and signal cable
[5] sum of ancillary construction costs such as planning, supervision and construction site organisation

4.2.2.3.2 Telecommunication installations

The financial funds required for telecommunication installations are documented in Annexes 4.2.2-13 to 4.2.2-15, quoting single items and unit prices.

Tab. 4.2.2-6: Investment costs for GRZD telecommunications installations

no.	installation complex	1st priority	2nd priority	3rd priority
		in '000 US$		
1	laying optical fibre cable	3,133	910	7,154
2	transmission equipment	980	240	760
3	exchanges	-	-	3,700
4	train radio installations	-	4,560	3,396
5	other installations	750	800	850
6	engineering costs[6]	720	950	2,400
	total	**5,583**	**7,460**	**18,260**

4.2.2.4 Summary of investment demands for signalling and telecommunication for the Caucasian railways

Tab. 4.2.2-7: Investment demands for signalling and telecommunication for the Caucasian railways

description	investment costs in US$ mill.			
	ARM	AGZD	GRZD	total
signalling installations	42.5	148.0	135.0	325.5
telecommunication installations	25.0	38.5	31.4	94.9
total	**67.5**	**186.5**	**166.4**	**420.4**

For the signalling, telecommunication and information services of the Caucasian railways, there is a total investment requirement of **US$ 420.4 mill.**

4.2.3 Power supply business strategy

Chapter 1.3 contains the detailed analysis of the technical condition of power supply. Apart from this analysis, repair work to power supply required and investment cost estimations are presented in detail in Annexes 4.2.3-1 to 4.2.3-5. Therefore, only a summary will be given in the following sections.

[6] sum of ancillary construction costs such as planning, supervision and construction site organisation

4.2.3.1 Armenian Railway (ARM)

Taking into account the information about investment costs estimation given in Annex 4.2.3-1, the following investment costs have been planned:

Tab. 4.2.3-1: Investment costs concerning power supply of ARM

no	Equipment	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Replacement of rectifier units	75.0	75.0	-
2	Rehabilitation of invertor units	60.0	180.0	60.0
3	Replacement of corroded supports	50.0	75.0	25.0
4	Replacement of contact wires	220.0	380.0	130.0
5	Amplification and replacement of line and supply feeders	60.0	90.0	30.0
	total	**465.0**	**800.0**	**245.0**

4.2.3.2 Azerbaijan State Railways (AGZD)

A list of investment costs for equipment and materials has been prepared. Please refer to Annex 4.2.3-2. A summary is given in the table below:

Tab. 4.2.3-2:Investment costs concerning power supply of AGZD

Nr.	Equipment	1st priority	2nd priority	3rd priority
		in '000 US$		
1	Overheadline catenary system (OCS)	1,181.8	3,174.2	7,480.3
2	Autoblocking system	896.4	1,761.6	3,274.2
3	Traction power substation	6,013.2	11,835.9	24,719,5
4	Energy section	848.2	1,185.6	2,493.8
5	Transport section	4,100.0	4,200.0	4,750.0
	total	**13,039.6**	**22,157.3**	**42,722.3**

4.2.3.3 Georgian Railways (GRZD)

A list of investment costs for equipment and materials has been prepared. Please refer to Annexes 4.2.3-3 to 4.2.3-5. A summary is given in the table below.

Tab. 4.2.3-3:Investment costs concerning power supply of the GRZD

Nr.	Equipment	1st priority	2nd priority	3rd priority
		in '000 US$		
1	First segment	6,043.9	812.5	195.3
2	Second segment	4,695.4	3,195.4	2,800.8
3	supplementary equipment	134.5	72.4	111.2
	total	**10,873.8**	**4,080.3**	**3,107.3**

4.2.3.4 Summary of investment costs for power supply of the Caucasian railways

The investment costs for power supply include the total costs of equipment, materials and vehicles.

Tab. 4.2.3-4:Investment costs power supply of the Caucasian railways

priority	Investment costs in mill. US$			
	ARM	AGZD	GRZD	total
1st priority	0.5	13.0	10.9	**24.4**
2nd priority	0.8	22.2	4.1	**27.1**
3rd priority	0.2	42.7	3.1	**46.0**
total	**1.5**	**77.9**	**18.1**	**97.5**

Investment costs for power supply of the Caucasian railways amount to a total of **97.5 Mio US$**.

4.2.4 Freight and passenger stations business strategy

Chapter 1.4 contains the detailed analysis of the technical condition of the main stations selected. Apart from this analysis, repair work to tracks and structures required and investment cost estimations are presented in detail in Annexes 4.2.4-1 to 4.2.4-6. Therefore, only a summary will be given in the following sections.

4.2.4.1 Armenian Railway (ARM)

The following investment and repair costs are required for selected main stations of ARM.

First priority should be given to the main line Ayrum - Gyumri - Masis - Yerevan with the stations Ayrum, Sanain, Vanadzor, Gyumri, Masis, Karmir Blur and Yerevan. Furthermore track relaying work on the intermediate stations Dalarik, Armavir and Etshmiadzin should be carried out in order to increase permissible speed.
The total costs would be about 4.7 million US$.

Second priority should be given to the branch line to Turkey with the border station Akhuryan, the section Masis - Yeraskh and the remaining measures on the main line. The total costs amount to about 0.8 million US$.

Third priority (further requirements) involves the branch lines to Sotk and Maralik. For the above measures about US$ 1,650,000 would be needed.

For all three stages about 10 million US$ (including planning effort and contingencies) are needed.

The rehabilitation of the Razdan - Ijevan line cannot be recommended by the Consultant. Due to land slippage and rock slides, the section from Dilijan to Ijevan has been closed for some years. Therefore, the measures suggested by ARM for Kakavadsor, Dilijan and Ijevan are not included in this investment plan.

Tab. 4.2.4-1:Investment costs for stations of ARM

no.	measures	1. priority	2. priority	3. priority
		in '000 US$		
1	station tracks	4,278.6	670.3	1,508.9
2	Facilities for freight loading and unloading	195.0	53.8	51.0
3	Buildings, platforms and other facilities for passenger traffic	205.5	47.9	85.3
	total costs	**4,679.1**	**772.0**	**1,645.2**

4.2.4.2 Azerbaijan State Railways (AGZD)

The following investment and repair costs are required for the selected main stations of AGZD.

The cost estimations for track relaying work are based on the following unit cost calculations:

- Renewal of 1 km track US$ 240,000
- Replacement of one turnout US$ 40,000
- Replacement of one set of switch and crossing sleepers US$ 10,000
- Replacement of turnout incl. sleepers US$ 50,000
- Replacement of 1 km sleepers (1,600 sleepers) US$ 64,000
- Replacement of 1 km ballast US$ 10,850
- Replacement of 1 km sleepers incl. ballast US$ 74,850

In accordance with the present number of trains per section, the priorities have been determined:

First priority is given to the transit line (Poti - Tbilisi) - Beyuk-Kyassik - Baku, especially to the section Yevlakh - Kasi Magomed - Aliat - Baladshary. Furthermore the facilities for passenger traffic of Baku Pass. (passenger station) are included. The total costs would be about 13.9 million US$.

In the second phase the rehabilitation measures on the transit line should be finished and the stations of the line to the Russian border with the border station Yalama rehabilitated. The total costs amount to about 8.3 million US$.

Third priority (further requirements) involves the branch lines to Nakhichevan (at present, the line is interrupted at Goradis.) and the line to Astara. For the above measures about 9.3 million US$ would be needed. Furthermore, there is a need for the rehabilitation of the railway stations between Goradis and Dshulfa. However, the measures and the costs required cannot be estimated at this time.

Tab. 4.2.4-2:Investment costs for stations of AGZD

no.	measures	1. priority	2. priority	3. priority
		in '000 US$		
1	station tracks	13,630.4	8,160.6	9,172.5
2	Facilities for freight loading and unloading	64.8	2.0	16.8
3	Buildings, platforms and other facilities for passenger traffic	218.7	134.5	85.0
	total costs	**13,913.9**	**8,297.1**	**9,274.3**

4.2.4.3 Georgian Railway

The following repair and investment costs are required for the selected main stations of GRZD. In line with the priority determined for the Azerbaijani State Railways, priority is also given to the transit line Poti / Batumi - Tbilisi - Gardabani - (Baku).

In the first phase, the stations Batumi (without track renewing work) Poti, Samtredia, Gori, Tbilisi Tov., Tbilisi Pass. (only station building, platforms and other facilities for passenger traffic) and the border station Gardabani as well as the border station to Armenia, Sadakhlo, should be rehabilitated. The total costs would be about 10.9 million US$.

In the second phase, the rehabilitation measures should be concentrated on the stations in Tbilisi as well as track renewing work at Batumi station. The total costs amount to about 15.1 million US$.

Third priority (further requirements) involves the remaining stations on the main line (Zestafoni and Khashuri) and Marneuli on the line to Yerevan. For the above measures about 3.7 million US$ would be needed. Furthermore, there might be a need for the rehabilitation of the railway stations on the line to Russia. Due to the Abkhasia conflict, the section between Ingiri and Gantiadi (border station to Russia) is occupied. Therefore, the measures and the costs required cannot be estimated at this time.

Tab. 4.2.4-3:Investment costs for stations of GRZD

no.	measures	1. priority	2. priority	3. priority
		in '000 US$		
1	station tracks	10,618.7	15,000.0	3,590.0
2	Facilities for freight loading and unloading	30.0	0	23.5
3	Building, platforms and other facilities for passenger traffic	267.0	84.0	49.0
	total costs	**10,915.7**	**15,084.0**	**3,662.5**

4.2.4.4 Summary of investment costs for freight and passenger stations of the Caucasian railways

Taking into account rationalisation measures and adaptation of the railway network and its facilities to the projected traffic volume needs, the required investments and repair costs for the stations selected can be summarised as follows:

Tab. 4.2.4-4: Investment costs concerning freight and passenger stations of the Caucasian railways

measures	investment costs in mill. US$			
	ARM	AGZD	GRZD	total
tracks	4.7	13.9	10.9	29.5
facilities for freight loading and unloading	0.8	8.3	15.1	24.2
buildings, platforms and other facilities for passenger traffic	1.6	9.3	3.7	14.6
total[1)]	**7.1**	**31.5**	**29.7**	**68.3**

[1)] including planning effort and contingencies (10 %)

For rehabilitation measures concerning freight and passenger stations of the Caucasian railways a total volume of investment costs of about **68.3 mill. US$** will be needed.

However, it must be clearly pointed out that only the selected main stations are included in this investment plan.

4.2.5 Container terminals business strategy

Based on available figures, the analysis of container traffic as well as the traffic forecast presented in Chapter 3, Annexes 1.5-1 to 1.5-10 contain the volume of container traffic/number of containers handled by the existing container terminals as well as the analysis of their technical condition.

Section 1.5 contains conclusions and recommendations for the future network. Taking into account the projected container traffic level, as presented in Chapter 3, the following core network should be developed:

Armenia

- Karmir Blur (near Yerevan)

Azerbaijan

- Kishli-Baku
- Baku Sea Port
- Gyandsha

Georgia

- Tbilisi Tov. (Freight Station)
- Samtredia
- Poti Sea Port

According to the project "Development of the Port of Baku - Port Master Plan", the existing terminals Kishli-Baku and Baku Port shall by replaced by a new container terminal at the port. This terminal will be able to handle 40' containers. Costs for the container terminal in Baku are not included here.

Furthermore, new areas for handling 20' and 40' containers shall be set up at the railway stations of Poti and Batumi.

The existing terminals at Gyumri, Vanadzor and Gori are not part of the future core network. Nevertheless, the required investments and repair costs are included in Phase 1 of the investment plan, but the final decision depends on future traffic development.

In addition, it might be necessary to build up a new container terminal at Ararat. A further option is the installation of a new container terminal at Dshulfa. However, the construction of this container terminal depends on the future development (traffic level and political situation) and is not included in this plan. The estimated costs would be about 1.2 million US$ each.

4.2.5.1 Armenian Railway (ARM)

The investment costs contain measures of general overhaul of gantry cranes, rehabilitation of lighting installation and electrical supply system, repairs to storage area and others (see Annex 4.2.5-1).

Tab. 4.2.5-1:Investment costs for container terminals of ARM

no.	container terminal	1. priority	2. priority	3. priority
		in '000 US$		
1	Karmir Blur	141.3	-	-
2	Gyumri	30.0	-	-
3	Vanadzor	40.0	-	-
	total	**211.3**	**-**	**-**

4.2.5.2 Azerbaijan State Railways (AGZD)

The investment costs contain measures of general overhaul of gantry cranes, rehabilitation of lighting installation and electrical supply system, repairs to storage area and others (see Annex 4.2.5-2).

Tab. 4.2.5-2:Investment costs for container terminals of AGZD

no.	container terminal	1. priority	2. priority	3. priority
		in '000 US$		
1	Kishli Baku	10.0	-	-
2	Gyandsha	400.0	-	-
	total costs	**410.0**	**-**	**-**

4.2.5.3 Georgian Railways (GRZD)

The investment costs contain measures of general overhaul of gantry cranes, rehabilitation of lighting installation and electrical supply system, repairs to storage area and others (see Annex 4.2.5-3).

Tab. 4.2.5-3:Investment costs for container terminals of GRZD

no.	container terminal	1. priority	2. priority	3. priority
		in '000 US$		
1	Tbilisi Tov.	65.0	-	-
2	Samtredia	18.0	-	-
3	Poti	400.0	-	-
4	Gori	4.0	-	-
	total costs	**487.0**	**-**	**-**

4.2.5.4 Summary of investment costs for container terminals of the Caucasian railways

Tab. 4.2.5-4:Investment costs concerning container terminals of the Caucasian railways

container terminals	investment costs in mill. US$		
	ARM	AGZD	GRZD
Karmir Blur	0.141	-	-
Gyumri	0.030	-	-
Vanadzor	0.040	-	-
Kishli-Baku	-	0.010	-
Gyandsha	-	0.440	-
Tbilisi Tov.	-	-	0.065
Samtredia	-	-	0.018
Poti	-	-	0.400
Gori	-	-	0.004
total	**0.211**	**0.450**	**0.487**

For rehabilitation measures concerning container terminals of the Caucasian railways a total volume of investment costs of about **1.1 mill. US$** will be needed.

4.2.6 Rolling stock business strategy

4.2.6.1 ARM business strategy for the future rolling stock

The future needed rolling stock resulting from the forecasted traffic development is explained in section 1.7.6. A subsummary for the ARM can be found in the table below.

Tab. 4.2.6-1: Future ARM rolling stock

rolling stock means / horizons		2000/2005	2010	2015
line-locomotives	opt	48	71	88
	pess	30	45	56
wagons	opt	2,559	3,080	3,620
	pess	1,492	1,987	2,436
coaches	opt	20	42	46
	pess	9	22	25
EMU	opt	8	10	11
	pess	7	8	8

Locomotives

The actual inventory of ARM is a total of 91 electric locomotives (units) of which 31 of VL-8 type are older than 30 years. In order to ensure the necessary locomotive stock development the following business strategy is recommended to the ARM management. The proposed steps reflect the different demands for the optimistic and for the pessimistic case of traffic development. The overview can be found in the following table.

Tab. 4.2.6-2: Business strategy for electric locomotives

step	measure	*optimistic case*		*pessimistic case*	
		locomotives	period	locomotives	period
1	scrap	35 VL-8	1998-2001	35 VL-8	1998-2000
2	main overhaul	12 VL-8	1998-2001	12 VL-8	1998-2001
3	regular maintain	12 VL-8	2002-2005	12 VL-8	2000-2005
4	re-equip	22 VL-10	2000-2005	22 VL-10	2000-2005
5	regular maintain	44 VL-10	2000-2005	44 VL-10	2002-2005
6	re-equip	22 VL-10	2005-2010	22 VL-10	2005-2010
7	procure	15 new	2005-2010		
8	regular maintain	12 VL-8	2005-2010	12 VL-8	2005-2010
9	regular maintain	44 VL-10	2005-2010	44 VL-10	2005-2010
10	regular maintain	15 new	2005-2010		
11	scrap	12 VL-8	2010-2015	12 VL-8	2010-2015
12	procure	29 new	2010-2015	12 new	2010-2015
13	regular maintain	44 VL-10	2010-2015	44 VL-10	2010-2015
14	regular maintain	44 new	2010-2015	12 new	2010-2015

Diesel locomotives

The ARM inventory of diesel-locomotives includes 119 shunters. According to the decreased volume of freight traffic the volume of diesel-shunters is estimated as decreasing, too. For the elaboration of accurate figures the experience gained by the changes in Germany's rail transport was used. Thus, the result is that in the optimistic case the demand of diesel-shunters will be 60 in 2015 whereas in the pessimistic case 40 units will be cover the need in 2015.

Wagons

The actual inventory of ARM is a total of 5,236 wagons. A part of more than 46 % is actually damaged and cannot be used. In order to ensure the wagon stock development the following business strategy is recommended. The proposed steps reflect the different levels of demand for the optimistic case and for the pessimistic case of the traffic development. The overview is given by the following table.

Tab. 4.2.6-3: Business strategy for wagons

step	measure	*optimistic case*		*pessimistic case*	
		wagons	period	wagons	period
1	scrap	1,616	1998-2000	2,800	1998-2005
2	regular maintain	2,827	1998-2005	2,436	1998-2005
3	main overhaul	253	2005-2010		
4	regular maintain	3,080	2005-2010	2,436	2005-2010
5	main overhaul	540	2010-2015		
6	regular maintain	3,620	2010-2015	2,436	2010-2015

Coaches

The actual inventory of ARM is a total of 238 coaches. In order to ensure the coach stock development the following business strategy is recommended. The proposed steps reflect the two different traffic scenarios. The respective overview is given in the following table.

Tab. 4.2.6-4: Business strategy for coaches

step	measure	*optimistic case*		*pessimistic case*	
		coaches	period	coaches	period
1	scrap	192	1998-2005	213	1998-2005
2	regular maintain	46	1998-2015	25	1998-2015

EMU

The actual inventory of ARM is a total of 11 EMU with a part of 4 actually under operation. In order to ensure the EMU stock development the following business strategy is recommended which was worked out for both cases of traffic development. The overview is given by the table below.

Tab. 4.2.6-5: Business strategy for EMU

step	measure	*optimistic case*		*pessimistic case*	
		EMU	period	EMU	period
1	scrap	7	1998-2000	7	1998-2000
2	regular maintain	4	1998-2000	4	1998-2000
3	procure	4	2000-2005	3	2000-2005
4	regular maintain	8	2000-2005	7	2000-2005
5	procure	2	2005-2010	1	2005-2010
6	regular maintain	10	2005-2010	8	2005-2010
7	scrap	4	2010-2015	4	2010-2015
8	procure	5	2010-2015	4	2010-2015
9	regular maintain	11	2010-2015	8	2010-2015

The total investment costs for the ARM rolling stock amount to **200,200,000 US$** (optimistic case) and **69,200,000 US$** (pessimistic case) from 1997 until 2015. The overview of these costs can be found under Table 4.2.6-6 and Annexes 4.2.6-1a / 4.2.6-1b.

Tab. 4.2.2-6:Investment costs estimation concerning rolling stock of ARM

no.	subject	costs in '000 US$	
		optimistic scenario	pessimistic scenario
1	Electric locomotive fleet	189,200.0	61,200.0
2	Diesel locomotive fleet	-	-
3	Wagon stock	-	-
4	Coach fleet	-	-
5	EMU fleet	11,000.0	8,000.0
	total	**200,200.0**	**69,200.0**

The respective cost distribution into running costs and investments is to be found in the overview given by the table below. Running costs here include maintenance and scrapping costs whereas investments summarise re-equipping and procuring costs.

Tab. 4.2.6-7: Costs scheme for ARM rolling stock adapting and maintenance in the period 1998 - 2015

costs in mill. US$	running costs	investments	total
optimistic traffic scenario	95,33	200,20	**295,53**
pessimistic traffic scenario	68,14	69,20	**137,34**

4.2.6.2 AGZD business strategy for the future rolling stock

The overall future needed rolling stock resulting from the forecasted traffic development was explained in section 1.7.6. A subsummary for the AGZD can be found under the table below.

Tab. 4.2.6-8: Future AGZD rolling stock

rolling stock means / horizons		2000/2005	2010	2015
line-locomotives	opt	227	222	261
	pess	134	145	166
wagons	opt	15,068	20,873	21,234
	pess	8,068	12,087	12,206
coaches	opt	70	229	329
	pess	38	92	117
EMU/DMU	opt	42	83	94
	pess	29	43	45

Locomotives

Using the experience of the experts inside the AGZD locomotive department the future modal-split of the overall line-locomotives into electric locomotives and diesel-line-locomotives was worked out under the precondition of no changes of the electrified rail net. The result was that about 6/10 electric locomotives are needed while less than 4/10 diesel-line-locomotives are to be planned. Furthermore, following the decreased volume of freight traffic the volume of diesel-shunters was estimated as decreasing, too. For the elaboration of accurate figures the experience gained by the changes in Germany´s rail transport was used. It was estimated for the optimistic case that at least 157 electric locomotives, 104 diesel-line locomotives and 119 diesel-shunters are needed in 2015. The overview about the detailed figures can be found in the table below.

Tab. 4.2.6-9: Future split of the locomotive fleet

locomotives	Total line locos	Electric locos	Diesel line-locos	Diesel shunters	Total Diesel-locos
optimistic case					
2005	227	136	91	69	160
2010	222	133	89	99	188
2015	261	157	104	119	223
pessimistic case					
2005	134	80	54	41	94
2010	145	87	58	65	123
2015	166	100	66	76	142

The actual inventory of AGZD electric locomotives is a total of 226 (units) of which 183 of VL-8 type are older than 30 years. The actual inventory of AGZD diesels is a total of 279 which is split into 100 line-locomotives and 179 shunters.
In order to ensure the locomotive stock development the following business strategy is recommended to the AGZD management.

a) Electric locomotives
For electric locomotives the proposed steps concerning the business strategy were derived from the above explained demand of electric locomotives for both the optimistic and the pessimistic case of traffic development. The respective overview is to be found in the following table.

Tab. 4.2.6-10: Business strategy for electric locomotives

step	measure	*optimistic case*		*pessimistic case*	
		locomotives	period	locomotives	period
1	scrap	90 VL-8	1998-2000	139 VL-8	1998-2000
2	maintain by main overhaul	93 VL-8	1998-2001	44 VL-8	1998-2001
3	regular maintain	93 VL-8	2000-2010	44 VL-8	2002-2010
4	re-equip	16 VL-11	2000-2005	16 VL-11	2000-2005
5	re-equip	27 VL-11	2005-2010	27 VL-11	2005-2010
6	regular maintain	43 VL-11	2000-2010	43 VL-11	2000-2010
7	procure	114 new	2010-2015	57 new	2010-2015
8	scrap	93 VL-8	after 2010	44 VL-8	after 2010
9	regular maintain	157	2010-2015	100	2010-2015

b) Diesel-locomotives
For diesel-locomotives the proposed steps concerning the business strategy were derivedfrom the above explained demand of diesel-locomotives for both the optimistic and the pessimistic case of traffic development. The respective overview is to be found in the following table.

Tab. 4.2.6-11: Business strategy for diesel-locomotives

step	measure	*optimistic case*		*pessimistic case*	
		locomotives	period	locomotives	period
1	scrap	90	1998-2000	137	1998-2000
2	regular maintain	189	2000-2005	142	1998-2015
3	procure	10	2005-2010		
4	regular maintain	199	2005-2010		
5	procure	24	2010-2015		
6	regular maintain	223	2010-2015		

Wagons

The actual wagon inventory of AGZD is a total of 29,118 cars. More than 65% are at present damaged and cannot be used. In order to ensure the wagon stock development the following business strategy is recommended.
The proposed steps were derived from the above explained demand of wagons for both the optimistic and the pessimistic case of traffic development. The problem of the tank wagon stock should be explained here a little deeper. In the opposite to the development of all other wagon types the tank wagon stock should grow in the future. Therefore, the consultant used the derived results of the study „Trans-Caucasian Railways Pre-investment Study" concerning the future tank wagon demand. The respective overview is to be found in the following table.

Tab. 4.2.6-12: Business strategy for wagons

step	measure	*optimistic case*		*pessimistic case*	
		wagons	period	wagons	period
1	scrap	10,458	1998-2005	16,912	1998-2005
2	regular maintain	18,660	1998-2000	12,206	1998-2015
3	procure	62 tanks	2000-2005		
4	regular maintain	18,722	2000-2005		
5	procure	1,531 tanks	2005-2010		
6	regular maintain	20,253	2005-2010		
7	procure	981 tanks	2010-2015		
8	regular maintain	21,234	2010-2015		

Coaches

The actual inventory of AGZD is a total of 853 coaches. In order to ensure the coach stock development the following business strategy is recommended. For coaches the proposed steps were derived from the above explained demand of coaches for both the optimistic and the pessimistic case of traffic development. The respective overview is to be found in the following table.

Tab. 4.2.6-13: Business strategy for coaches

step	measure	*optimistic case*		*pessimistic case*	
		coaches	period	coaches	period
1	scrap	524	1998-2002	736	1998-2005
2	regular maintain	329	1998-2015	117	1998-2015

EMU/DMU

The actual inventory of AGZD is a total of 76 EMU with 68 actually under operation. In order to ensure the EMU/DMU stock development the following business strategy is recommended. For EMU/DMU the proposed steps were derived from the above explained demand of EMU/DMU for both the optimistic and the pessimistic case of traffic development. The respective overview is to be found in the following table. The general need of DMU results from the domestic passenger traffic on non-electrified lines.

Tab. 4.2.6-14: Business strategy for EMU/DMU[7]

step	measure	*optimistic case*		*pessimistic case*	
		EMU/DMU /Total	period	EMU/DMU /Total	period
1	scrap	34/0/34	1998-2000	33/0/33	1998-2005
2	regular maintain	42/0/42	1998-2000	43/0/43	1998-2005
3	procure	10/10/20	2000-2005		
4	scrap	20/0/20	2000-2005		
5	regular maintain	42/0/42	2000-2005		
6	procure	38/25/63	2005-2010	24/19/43	2005-2010
7	scrap	22/0/22	2005-2010	43/0/43	2005-2010
8	regular maintain	83/0/83	2005-2010	43/0/43	2005-2010
9	procure	11/0/11	2010-2015	2/0/2	2010-2015
10	regular maintain	94/0/94	2010-2015	45/0/45	2010-2015

Cost estimation

The total investment costs for the AGZD rolling stock in order to cover the needs for the optimistic scenario of the traffic development amounts to **716,860,000 US$** from 1998 until 2015. An overview of these costs can be found under Annex 4.2.6-2a. The costs for maintaining the rolling stock in the case of developing the traffic in accordance with the pessimistic scenario amount to **285,900,000** US$. The overview of these costs can be found under Annex 4.2.6-2b.

Tab. 4.2.2-15: Investment costs estimation concerning rolling stock of AGZD

no.	subject	costs in '000 US$	
		optimistic scenario	pessimistic scenario
1	Electric locomotive fleet	468,900.0	240,900.0
2	Diesel locomotive fleet	51,000.0	-
3	Wagon stock	102,960.0	-
4	Coach fleet	-	-
5	EMU fleet	94,000.0	45,000.0
	total	**716,860.0**	**285,900.0**

The respective cost distribution into running costs and investments is to be found in the overview given by the table below. Running costs here include maintenance and scrapping costs whereas investments summarise re-equipping and procuring costs.

Tab. 4.2.6-16: Costs scheme for AGZD rolling stock in the period 1998 - 2015

costs in mill. US$	running costs	investments	total
optimistic traffic scenario	450,46	716,86	**1,167.32**
pessimistic traffic scenario	244.99	285,90	**530,89**

[7] The relation EMU to DMU for domestic traffic was estimated with 1:1.

4.2.6.3 GRZD programme for the future rolling stock

The future needed rolling stock resulting from the forecasted traffic development was explained in section 1.7.6. A summary for the GRZD can be found in the table below.

Tab. 4.2.6-17: Future GRZD rolling stock

rolling stock means / horizons		2000/2005	2010	2015
line-locomotives	opt	193	216	247
	pess	91	111	132
wagons	opt	6,397	9,018	9,601
	pess	3,224	4,704	5,232
coaches	opt	98	202	256
	pess	44	123	139
EMU	opt	36	62	79
	pess	17	27	30

Electric locomotives

The actual inventory of GRZD is a total of 230.5 electric locomotives (units) of which 77 of VL-8 type are older than 30 years. In order to ensure the locomotive stock development the following business strategy is recommended to the GRZD management. The proposed steps were derived from the above explained demand of electric locomotives for both the optimistic and the pessimistic case of traffic development. The respective overview is to be found in the following table.

Tab. 4.2.6-18: Business strategy for electric locomotives

step	measure	*optimistic case*		*pessimistic case*	
		locomotives	period	locomotives	period
1	scrap	37 VL-8	1998-2000	85 VL-8 6 VL-10	1998-2000
2	main overhaul	48 VL-8	1998-2001		
3	regular maintain	48 VL-8	2002-2005		
4	re-equip	65 VL-10	2000-2005	55 VL-10	2000-2005
5	regular maintain	103 VL-10	2000-2005	97 VL-10	2000-2005
6	regular maintain	42.5 VL-11	2000-2005	42.5 VL-11	2002-2005
7	scrap	20 VL-8	2005-2010	7 VL-10	2005-2010
8	re-equip	20 VL-10	2005-2010	20 VL-10	2005-2010
9	procure	43 new	2005-2010		
10	regular maintain	28 VL-8	2005-2010		
11	regular maintain	145.5 VL-10/11	2005-2010	132.5 VL-10/11	2005-2010
12	regular maintain	43 new	2005-2010		
13	scrap	28 VL-8	2010-2015		
14	re-equip	18 VL-10	2010-2015	22 VL-10	2010-2015
15	procure	59 new	2010-2015		
16	regular maintain	145.5 VL-10/11	2010-2015	132.5 VL-10/11	
17	regular maintain	102 new	2010-2015		

Diesel-locomotives

The GRZD inventory of diesel-locomotives is 159 shunters. Following the decreased volume of freight traffic the number of diesel-shunters was estimated as decreasing too. For the elaboration of accurate figures the experience gained by the changes in Germany´s rail transport was used. Thus, the result is that in optimistic case the demand of diesel-shunters will be 80 in 2015 whereas for the pessimistic case 60 units will cover the need in 2015.

Wagons

The actual inventory of GRZD is a total of 21,095 wagons. More than 78 % are actually damaged and cannot be used. In order to ensure the wagon stock development the proposal is to go ahead by using the following business strategy is recommended, explained for both the optimistic and the pessimistic traffic development cases.

Tab. 4.2.6-19: Business strategy for wagons

step	measure	*optimistic case*		*pessimistic case*	
		wagons	period	wagons	period
1	scrap	11,494	1998-2005	15,863	1998-2005
2	main overhaul	1,756	1998-2005		
3	regular maintain	4,641	1998-2005	4,641	1998-2005
4	main overhaul	2,621	2005-2010	63	2005-2010
5	regular maintain	6,397	2005-2010	4,641	2005-2010
6	main overhaul	583	2010-2015	528	2010-2015
7	regular maintain	9,018	2010-2015	4,704	2010-2015

Coaches

The actual inventory of GRZD is a total of 1,085 coaches. In order to ensure the coach stock development the following business strategy is recommended. The proposed steps were derived for both the optimistic and the pessimistic traffic development. The respective overview is to be found in the table below.

Tab. 4.2.6-20: Business strategy for coaches

step	measure	*optimistic case*		*pessimistic case*	
		coaches	period	coaches	period
1	scrap	829	1998-2005	946	1998-2005
2	regular maintain	256	1998-2015	139	1998-2015

EMU

The actual inventory of GRZD is a total of 32 EMU with 28 actually under operation. In order to ensure the EMU stock development the following business strategy is recommended.

Tab. 4.2.6-21: Business strategy for EMU

step	measure	*optimistic case*		*pessimistic case*	
		EMU	period	EMU	period
1	scrap	10	1998-2000	10	1998-2000
2	regular maintain	22	1998-2000	22	1998-2000
3	procure	14	2000-2005		
4	regular maintain	36	2000-2005	22	2000-2005
5	procure	26	2005-2010	5	2005-2010
6	regular maintain	62	2005-2010	27	2005-2010
7	scrap	22	2010-2015	22	2005-2010
8	procure	39	2010-2015	25	2010-2015
9	regular maintain	79	2010-2015	30	2010-2015

The total investment costs for the GRZD rolling stock in order to cover the needs for the optimistic scenario of the traffic development amounts to **517,900.0 US$** from 1998 until 2015. An overview of these costs can be found under Annex 4.2.6-3a.

The costs for maintaining the rolling stock in the case of developing the traffic in accordance with the pessimistic scenario amounts to **59,100.0 US$**. The overview of these costs can be found under Annex 4.2.3-3b.

Tab. 4.2.2-22: Investment costs estimation concerning rolling stock of GRZD

no.	subject	costs in '000 US$	
		optimistic scenario	pessimistic scenario
1	Electric locomotive fleet	438,900.0	29,100.0
2	Diesel locomotive fleet	-	-
3	Wagon stock	-	-
4	Coach fleet	-	-
5	EMU fleet	79,000.0	30,000.0
	total	**517,900.0**	**59,100.0**

The respective cost distribution into running costs and investments is to be found in the overview given by the tabel below. Running costs here include maintenance and scrapping costs whereas investments summarise re-equipping and procuring costs.

Tab. 4.2.6-23: Costs scheme for GRZD rolling stock adapting and maintenance in the period 1998 - 2015

costs in mill. US$	running costs	investments	Total
optimistic traffic scenario	285,11	517,90	**803,01**
pessimistic traffic scenario	161,44	59,10	**220.54**

4.2.6.4 Summary of investment costs for rolling stock rehabilitation of the Caucasian railways

Tab. 4.2.6-24: Investment costs concerning rolling stock rehabilitation of the Caucasian railways

rolling stock	investment costs in US$ mill.			
	ARM	AGZD	GRZD	total
Electric locomotive fleet	189.2 61.2	468.9 240.9	438.9 29.1	1,097.0 331.2
Diesel locomotive fleet		51.0		51.0
Wagon stock		103.0		103.0
Coach fleet				
EMU fleet	11.0 8.0	94.0 45.2	79.0 30.0	184.0 83.0
total	**200.2 69.2**	**716,9 285,9**	**517.9 59.1**	**1,435.0 414.2**

For rehabilitation measures concerning the rolling stock of the Caucasian railways total investment costs amount to **1,435.0 mill. US$** (optimistic scenario) and **414.2 mill. US$** (pessimistic scenario).

The price of an electric locomotive is put at US$ 4 million. The prices of electric locomotives have significantly changed during the last few years. First, there was a strong competition among the producing companies. This process led to a concentration of at least three big trusts in Europe. The process of concentration allows to produce more cheaper. On the other hand, the new generation of asynchron-machines reduces the quantity of components and allows to create more varieties based on one technical conception. Second, the decrease in freight transport volume on all European railway systems caused a reduction of the locomotive market with a principle tendency of pressure on prices. Presently the price reached a level of about 3.8 ... 4.2 million US$. For instance, the Polish State Railways signed a contract for the purchase of 50 electric locomotives at a price of 210 million US$ in October 1997. The relatively high volume of locomotives to be replaced by the Caucasian railways would allow to reduce the price for one locomotive to US$ 4 million.

4.2.6.5 Alternative for locomotive procurement

In case of a general traction-system change from electrical traction to a diesel locomotive one the costs for overhead wire system could be economised.

This question seems to be limited more or less to the AGZD because of their geographical and national-economic conditions and exceeds the limit of this study.

The proposal is that a technical-economic investigation concerning a general AGZD traction-system change should be a subject of a separate study.

4.2.7 Rolling stock maintenance shops

The framework of quantities, developed in section 1.7.6, served as the basis for the determination of the future needed maintenance capabilities. The main task in the field of rolling stock is the maintenance of locomotives. The most important weakness focus on the absence of capabilities for performing the heavy levels of locomotive repair as middle, main and general overhauls. Thus, the essential proposal of the project concerning rolling stock is to develop the Tbilisi Electro-Locomotive Construction Factory partly to a locomotive repair shop (compare section 6.5.2).

In order to estimate the necessary maintenance capabilities a needed procurement programme was developed which bases on the inventory of the actual rolling stock and its age structure. Afterwards the needed maintenance capabilities were accounted and compared with the actual situation in repair shops and plants. In a last step the needed changes concerning the existing capabilities were outworked. In section 1.7.6 the future needed maintenance volumes per year were explained. Taking into acount the differences between the needed facilities and equipment for inspections, overhauls and main repairs the maintenance should be divided and carried out both by local capabilities and by centralized capabilities. It is proposed to organize the inspections and overhauls by the railway organisations themselves, that means by the respective depots. Nevertheless, in order to carry out the main and capital repairs (KR, KR-1, KR-2) in an economic manner, these onces should be carried out by well equipped centralized repair plants.

4.2.7.1 ARM rolling stock maintenance shops

Locomotives local maintenance capabilities

Following the proposal in the preface the development of the needed TO-3, TR-1, TR-2 and TR-3 for the locomotives is reflected in the following table.

Tab. 4.2.7-1: Needed ARM locomotive inspections and repair places

locomotives		TO-3	TR-1	TR-2	TR-3
optimistic case					
2000/2005	48	284	224	16	8
2010	71	420	331	24	12
2015	88	521	411	29	15
	needed h	6	14	16	32
repair places					
2000/2005	**3**	1	2	0.13	0.13
2010	**4**	1	2	0.18	0.18
2015	**5**	2	3	0.23	0.23
pessimistic case					
2000/2005	30	178	140	10	5
2010	45	266	210	15	8
2015	56	331	261	19	9
	needed h	6	14	16	32
repair places					
2000/2005	**2**	1	1	0.08	0.08
2010	**2**	1	1	0.12	0.12
2015	**3**	1	2	0.15	0.15

As shown in the table above for the optimistic case the need of repair places for all TO-3, TR-1, TR-2 and TR-3 will increase from 3 in 2000/2005/2010 to 5 in 2015. With respect to the pessimistic case the amount of repair places will grow from 2 to 3 repair places. ARM capacities of repair places is actually limited with 6, 3 of them in Giumri locomotive depot and 3 in Yerevan locomotive depot.

Tab. 4.2.7-2: Needed maintenance for diesel-locomotives and repair places

diesel-locomotives	TO-3	TR-1	TR-2	TR-3
optimistic case				
60	88	48	24	16
h	8	36	48	80
total h	704	1728	1152	1280
repair places	0.34	0.84	0.56	0.63
Total repair places				**2**
pessimistic case				
40	59	32	16	11
h	8	36	48	80
total h	469	1152	768	853
repair places	0.23	0.56	0.38	0.42
Total repair places				**2**

ARM possesses 119 shunting diesel-locomotives. The base need of 60 shunters in order to cover the future optimistic development combined with the valid maintenance scheme for diesels results to an overall need of 2 repair places. An overview can be found in the table above.

Coming to the summary the complete need of working places is 5+2 that already can covered by ARM Giumri and Yerevan locomotive depots.
However, there is an urgent need for upgrading the locomotive depots which is explained in details in Annex 4.2.7-1.

Wagons local maintenance capabilities
The development of the needed inspections for the wagons TR-2 and DR is reflected in the following table. The follow-up of the backlog for DR in the period 2000 - 2005 is already included.

Tab. 4.2.7-3: Needed ARM wagon inspections and repair places

wagons	2000/2005	2010	2015
optimistic case			
needed wagons	2,559	3,080	3,620
TR-2	2,303	2,772	3,258
needed h	8	8	8
repair places	**9**	**11**	**13**
DR	640	154	181
needed h	24	24	24
repair places	**7**	**2**	**2**
pessimistic case			
needed wagons	1,492	1,987	2,436
TR-2	1,343	1,788	2,192
needed h	8	8	8
repair places	**5**	**7**	**9**
DR	373	99	122
needed h	24	24	24
repair places	**4**	**1**	**1**

As shown above for the optimistic case 16 repair places are needed in 2000/2005, 13 repair places in 2010 and 15 places in 2015 as an overall for DR and TR.
This amount of places is actual not available because ARM only has a total of 13 (5+8) places in the Giumri and Yerevan wagon depots. As the actual and future need is not covered by the existing wagon repair places an urgent problem exists for re-constructing one of the wagon depots in order to create the additionally needed 3 repair places. Considering the allocation in railway´s network a suitable place should be the Giumri wagon depot.
Furthermore, there is an urgent need for upgrading the other wagon depots as explained in details under Annex 4.2.7-1.

Coaches local maintenance capabilities

The development of the needed TR-2 and DR for coaches is reflected in the following table.

Tab. 4.2.7-4: Needed ARM coach inspections and repair places

coaches	2000/2005	2010	2015
optimistic case			
needed coaches	20	42	46
TR-2	60	126	138
needed h	8	8	8
needed repair places	0.2	0.5	1
DR	17	35	38
needed h	40	40	40
needed repair places	0.3	1	1
pessimistic case			
needed coaches	9	22	25
TR-2	27	66	75
needed h	8	8	8
needed repair places	0.1	0.3	0
DR	8	18	21
needed h	40	40	40
needed repair places	0.1	0	0

As shown above for the optimistic case there are needed 1 repair-place for TR-2 and 1 repair-place for DR in order to maintain the prospected amount of coaches.
This amount of places is available in ARM Yerevan coach depot. It has a total of 10 (5+5) places of which only 2 places are used for coach maintenance.
Nevertheless there is an urgent need for upgrading the coach depot as explained in details under Annex 4.2.7-1.

EMU local maintenance capabilities

The development of the needed TO-3, TR-1, TR-2 and TR-3 for the EMU is reflected in the following table.

Tab. 4.2.7-5: Needed ARM EMU inspections and repair places

EMU	2000/2005	2010	2015
optimistic case			
needed EMU	8	10	11
TO-3	320	400	440
repair places	0.6	0.8	0.9
TR-1	40	50	55
repair places	0.18	0.22	0.24
TR-2	4	5	5.5
repair places	0.03	0.04	0.04
TR-3	2	2.5	2.75
repair places	0.05	0.07	0.08
Total repair places	0.9	1.1	1.2
pessimistic case			
needed EMU	7	8	8
TO-3	280	320	320
repair places	0.5	0.6	0.6
TR-1	35	40	40
repair places	0.15	0.18	0.18
TR-2	3.5	4	4
repair places	0.02	0.02	0.02
TR-3	1.75	2	2
repair places	0.05	0.05	0.05
Total repair places	318.5	364.1	364.1

As shown above for the optimistic case there are needed 1 repair-place for TO-3 / TR-1 and 1 repair-place for TR-2 / TR-3 in order to maintain the prospected amounts of EMU. This amount of places is available in ARM Yerevan locomotive depot as it has a total of 3 places for complete EMU sets on 3 lines. Furthermore, there is an urgent need for upgrading the locomotive depots as explained in details under Annex 4.2.7-1.

The total costs for upgrading the ARM rolling stock shops amount to **1,723,000 US$**. An overview of these costs can be found under Annex 4.2.7-1.

Tab. 4.2.7-6: Cost estimation for upgrading the ARM shops for rolling stock

no.	subject	costs in ´000 US$
1	Locomotive depots	800.0
2	Wagon depots	500.5
3	Coach depots	422.5
	total	**1,723.0**

4.2.7.2 AGZD rolling stock maintenance shops

Locomotives local maintenance capabilities

Following the proposals given before the development of the needed inspections for the locomotives TO-3, TR-1, TR-2 and TR-3 is reflected in the following table. Here the diesel-locomotives are included.

Tab. 4.2.7-7: Needed AGZD locomotive inspections and repair places

locomotives		TO-3	TR-1	TR-2	TR-3
optimistic case					
2000/2005	296	1,751	1,381	99	49
2010	321	1,899	1,498	107	54
2015	380	2,248	1,773	127	63
	needed h	6	14	18	42
repair places					
2000/2005	**12**	3	6	1	1
2010	**12**	4	7	1	1
2015	**14**	4	8	1	1
pessimistic case					
2000/2005	175	1,035	817	58	29
2010	210	1,243	980	70	35
2015	242	1,432	1,129	81	40
	needed h	6	14	18	42
repair places					
2000/2005	**8**	2	4	1	1
2010	**8**	2	4	0	0
2015	**9**	3	5	0	1

As found for the optimistic case the need of repair places in the locomotive repair shops of AGZD will increase from 12 in 2000/2005 to 14 in 2015. The respective pessimistic scenario shows a need of 9 replair-places. In Annexes 1.6-9 to 1.6-13 it is explained that 33 locomotive repair places are existing on AGZD.

However, there is an urgent need for upgrading the locomotive depots which is explained in details in Annex 4.2.7-2.

Wagons local maintenance capabilities

The development of the needed inspections for the wagons TR-2 and DR is reflected in the following table. This estimation considers the backlog of DR arised during the last 5 years to follow up in the period 2000/2005.

Tab. 4.2.7-8: Needed AGZD wagon inspections and repair places

wagons	2000/2005	2010	2015
optimistic case			
needed wagons	15,068	20,873	21,234
TR-2	13,185	18,264	18,580
needed h	8	6	6
repair places	**52**	**54**	**54**
DR	6,278	1,739	1,770
needed h	24	16	16
repair places	**74**	**14**	**14**
pessimistic case			
needed wagons	8,068	12,087	12,206
TR-2	7,060	10,576	10,680
needed h	8	6	6
repair places	**28**	**31**	**31**
DR	3,362	1,007	1,017
needed h	24	16	16
repair places	**39**	**8**	**8**

As shown above for the optimistic case 74 repair places are needed for DR in 2000/2005, 14 repair places in 2010 and 14 places in 2015. This amount of places is actual not available because AGZD only has a total of 47 places in the wagon depots Baladshary, Kasi-Magomed, Gyandsha, Aliat and Shirvan. Since not even the actual demand is covered by the existing wagon repair places an urgent problem exists for re-constructing one of the wagon depots in order to create the additionally needed 27 repair places. For the case of pessimistic traffic development the need will reach 38 repair places in 2000.

Concerning the allocation in railway´s netwerk the wagon depot Aliat should be a suitable place. Furthermore, there is an urgent need for upgrading the other wagon depots which is explained in details under Annex 4.2.7-2.

Coaches local maintenance capabilities

The development of the needed inspections for the coaches TR-2 and DR is reflected in the following table.

Tab. 4.2.7-9: Needed AGZD coach inspections and repair places

coaches	2000/2005	2010	2015
optimistic case			
needed coaches	70	229	329
TR-2	210	687	987
needed h	8	8	8
repair places	0.8	2.7	4
DR	58	191	274
needed h	40	40	40
repair places	1.1	4	5
pessimistic case			
needed coaches	38	92	117
TR-2	114	276	351
needed h	8	8	8
repair places	0.4	1.1	1
DR	32	77	98
needed h	40	40	40
repair places	0.6	1	2

As shown above for the optimistic case 5 repair places for DR and 4 repair places for TR-2 are needed in the future. The actual needed amount of 2 places is already available because AGZD has a total of 3 places in the coach depot Baku. As the future demand is not covered by the existing coach repair places the re-constructing of the coach depot Baku is necessary in order to create the needed adding volume of 2 repair places. Concerning the allocation a suitable place for extension should be the assembler hall of the Baku coach depot by changing the use of the 3rd track.
With the respect to the pessimistic case the need of repair places will grow from actual 1 place to 3 in 2015. For this case does not exist any need for changing the quantity of repair places. Nevertheless, the equipments and installations of the Baku coach depot are to be upgraded. The urgent need for upgrading the Baku coach depot is explained in details under Annex 4.2.7-2.

EMU local maintenance capabilities

The development of the needed inspections for the EMU TO, TR-1, TR-2 and TR-3 is reflected in the following table.

Tab. 4.2.7-10: Needed AGZD EMU inspections and repair places

EMU	2000/2005	2010	2015
optimistic case			
needed EMU	42	83	94
TO-3	1680	3320	3760
repair places	2.2	4.3	4.9
TR-1	210	415	470
repair places	0.62	1.22	1.38
TR-2	21	41.5	47
repair places	0.16	0.32	0.37
TR-3	10.5	20.75	23.5
repair places	0.29	0.57	0.64
Total repair places	**3.3**	**6.4**	**7.3**
pessimistic case			
needed EMU	29	43	45
TO-3	1160	1720	1800
repair places	1.5	2.2	2.3
TR-1	145	215	225
repair places	0.42	0.63	0.66
TR-2	14.5	21.5	22.5
repair places	0.11	0.17	0.18
TR-3	7.25	10.75	11.25
repair places	0.20	0.29	0.31
Total repair places	**2.2**	**3.3**	**3.5**

The need for EMU inspections for the optimistic case is growing from 3 to 7 repair places. This number of places already exists and will be sufficient even more for the pessimistic case with a volume of 4 places in 2015.

The total costs for upgrading the AGZD rolling stock shops amount to **2,507,500 US$**. The overview of these costs can be found under Annex 4.2.7-2.

Tab. 4.2.7-11: Cost estimation for upgrading the AGZD shops for rolling stock

no.	subject	costs in '000 US$
1	Locomotive depots	1,406.0
2	Wagon depots	742.5
3	Coach depots	615.0
4	Baku wagon repair factory	104.0
	total	**2,867.5**

4.2.7.3 GRZD rolling stock maintenance shops

Locomotives local maintenance capabilities

Following the proposal in the preface to this chapter the development of the needed inspections TO-3, TR-1, TR-2 and TR-3 for the locomotives is reflected in the following table. Here the diesel-locomotives are included.

Tab. 4.2.7-12: Needed GRZD locomotive inspections and repair places

locomotives	Total	TO-3	TR-1	TR-2	TR-3
optimistic case					
2000/2005	**273**	1,615	1,274	91	46
2010	**296**	1,751	1,381	99	49
2015	**327**	1,935	1,526	109	55
	needed h	6	14	18	42
	repair places				
2000/2005	**11**	3	6	1	1
2010	**11**	3	6	1	1
2015	**12**	4	7	1	1
pessimistic case					
2000/2005	**151**	893	705	50	25
2010	**171**	1,012	798	57	29
2015	**192**	1,136	896	64	32
	needed h	6	14	18	42
	repair places				
2000/2005	**7**	2	3	1	1
2010	**6**	2	4	0	0
2015	**7**	2	4	0	0

As found for the optimistic case the need of repair places in the locomotive repair shops of GRZD will increase from 11 in 2000/2005 and in 2010 to 12 in 2015. With respect to the pessimistic case the need of repair places will amount to 7 repair

places in 2015. In Annexes 1.6-14 to 1.6-18 it is shown that 32 locomotive repair places are existing on GRZD.

However, there is an urgent need for upgrading the locomotive depots as explained in details under Annex 4.2.7-3.

Wagons local maintenance capabilities

The development of the needed TR-2 and DR for the wagons is reflected in the following table. This estimation considers the backlog of DR arised during the last 5 years to follow up in the period 2000/2005.

Tab. 4.2.7-13: Needed GRZD wagon inspections and repair places

wagons	2000/2005	2010	2015
optimistic case			
needed wagons	6,397	9,018	9,601
TR-2	5,597	7,891	8,401
needed h	8	6	6
repair places	**22**	**23**	**25**
DR	2,665	752	800
needed h for DR	24	16	16
repair places	**31**	**6**	**6**
pessimistic case			
needed wagons	3,224	4,704	5,232
TR-2	2,821	4,116	4,578
needed h	8	6	6
repair places	**11**	**12**	**13**
DR	1,343	392	436
needed h	24	16	16
repair places	**16**	**3**	**3**

As shown above for the optimistic case 31 repair places are needed for DR in 2000/2005, 6 repair-places in 2010 and 6 places in 2015. This amount of places is available because GRZD has a total of 38 places in the wagon depots Tbilisi, Khashuri, Samtredia, Batumi and TEWRS. Nevertheless, there is an urgent need for upgrading the wagon depots as explained in detail in Annex 4.2.7-3.

Coaches local maintenance capabilities

The development of the needed TR-2 and DR for the coaches is reflected in the following table.

Tab. 4.2.7-14: Needed GRZD coach inspections and repair places

coaches	2000/2005	2010	2015
optimistic case			
needed coaches	98	202	256
TR-2	294	606	768
needed h	8	8	8
repair places	1.1	2.4	3
DR	82	169	214
needed h	40	40	40
repair places	1.6	3	4
pessimistic case			
needed coaches	44	123	139
TR-2	294	606	768
needed h	8	8	8
repair places	1.1	2.4	3
DR	82	169	214
needed h	40	40	40
repair places	1.6	3	4

As shown above for the optimistic case 4 repair places for DR and 3 repair places for TR-2 are needed in the future. With respect to the pessimistic case the demand will amount to 2 DR and 2 TR-2 places.

The actual needed amount of 3 places is already available because GRZD has a total of 3 places in the coach depot Tbilisi. As the future need is not covered in any case by the existing repair places the problem exists for re-constructing the Tbilisi coach depot in order to create the additonally needed optimistic 4 repair places or pessimistic 1 place. The need for upgrading the Tbilisi coach depot is explained in details in Annex 4.2.7-3.

EMU local maintenance capabilities

The development of the needed TO-3, TR-1, TR-2 and TR-3 for the EMU is reflected in the following table.

Tab. 4.2.7-15: Needed GRZD EMU inspections and repair places

EMU	2000/2005	2010	2015
optimistic case			
needed EMU	36	62	79
TO-3	1440	2480	3160
repair places	1.9	3.2	4.1
TR-1	180	310	395
repair places	0.53	0.91	1.16
TR-2	18	31	39.5
repair places	0.14	0.24	0.31
TR-3	9	15.5	19.75
repair places	0.25	0.42	0.54
Total repair places	2.8	4.8	6.1
pessimistic case			
needed EMU	17	27	30
TO-3	680	1080	1200
repair places	0.9	1.4	1.6
TR-1	85	135	150
repair places	0.25	0.40	0.44
TR-2	8.5	13.5	15
repair places	0.07	0.11	0.12
TR-3	4.25	6.75	7.5
repair places	0.12	0.18	0.21
Total repair places	1.3	2.1	2.3

For the optimistic case the need of EMU inspections is growing from 3 to 6 repair places. These number of places already exists. With respect to the pessimistic case the need will grow from 2 to 3 repair places.
The urgent need for upgrading the Tbilisi locomotive depot is explained in details in Annex 4.2.7-3.

The total costs for upgrading the GRZD rolling stock shops amount to **3,279,000 US$**. The overview of these costs can be found in Annex 4.2.7-3.

Tab. 4.2.7-16: Cost estimation for upgrading the GRZD shops for rolling stock

no.	subject	costs in '000 US$
1	Locomotive depots	775.0
2	Wagon depots	935.0
3	Coach depots	1,568.5
	total	**3,278.5**

4.2.7.4 Future needed capabilities for rolling stock capital maintenance

4.2.7.4.1 Volume of capital maintenance

The future needed rolling stock resulting from the forecasted traffic development was explained above. A summary for all three Railway organisations can be found in the table below.

Tab. 4.2.7-17: Future rolling stock in the Caucasus region

horizons		2000/2005	2010	2015
Electric	opt	377	420	492
line-locomotives	pess	201	243	288
Wagons	opt	24,024	32,971	34,455
	pess	12,784	18,778	19,874
Coaches	opt	188	473	631
	pess	91	257	302
EMU	opt	86	155	184
	pess	53	78	83

4.2.7.4.2 Capital maintenance capabilities for locomotives

The rolling stock capital maintenance is performanced normally by overhauls of different steps: main overhauls (KR or KR-1) and general overhauls (KR-2). The total volume of locomotives to be overhauled as a summary of backlog and regular maintenance, to be re-equipped and to be procured (new) is to be found completely in the Annex 4.2.7-4. An overview shows that the costs the railways have to pay to the TECF amount to 1,179.8 mill. US$ for the optimistic case whereas for the pessimistic case 395.4 mill. US$. The table below reflects a short extract of the respective volumes and costs.

Tab. 4.2.7-18: Volumes and costs of the renewing programme for electric locomotives of the Caucasian railways

optimistic case	1998 - 2000	2001 - 2005	2006 - 2010	2011 - 2015
KR-1	143	97	55	108
KR-2	33	54	55	108
re-equipping		103	69	18
procuring			58	202
Costs in '000 US$				**1,179,800**
pessimistic case	1998 - 2000	2001 - 2005	2006 - 2010	2011 - 2015
KR-1	34	70	56	71
KR-2	76	56	56	71
re-equipping		93	69	22
procuring				69
Costs in '000 US$				**395,390**

The overhaul volume for locomotives as a summary of the backlog and regular overhaul volume, the required re-equipping and constructing of new locomotives is to be carried out by the **Tbilisi Electro-Locomotive Construction Factory (TECF)**. The TECF does actually not posses capabilities for repairing locomotives. As the main overhauls (KR-1) and general overhauls (KR-2) of locomotives are the key problem concerning rolling stock in the framework of the given project it is necessary to pre-plan an upgrading of TECF in two directions.
The first direction is to implement a repairing section into the TECF. For this section the needed volume of repair places has to be estimated. And secondly a section for renewing (re-equipping) old locomotives is to be realized by re-constructing the different constructing shops. The upgrading of TECF is one of the topics for creating Joint Ventures (compare section 6.5.2).

As shown in **Annex 1.6-18** TECF possesses 12 repair places in hall 1. This capability should be used in the split of KR-1, KR-2 and Re-equipping (re-motorization) places.
The preview of locomotive construction shows a need of 58 new locomotives to be procured by AGZD, GRZD and ARM in the period 2006 / 2010 and 202 new locomotives in the period 2011 / 2015. The further explanations concerning TECF are developed under section 6.5.2.

4.2.7.4.3 Capital maintenance capabilities for wagons

The above mentioned overhaul volume particularly for tanks is to be carried out by the **Baku Wagon Repair Plant** (BWRS). For upgrading the BWRS a study was worked out by the Kharkov Railway-Project-Institute. The planned capacity is 200 KR of tanks per month on a whole volume of 20 repair places. As the needed main

overhaul of tanks is growing from 478 per year in 2000/2005 to 717 per year in 2015 the free capacity of BWRS repair places is decreasing from 16 to 14 in the optimistic case. In the pessimistic case it is falling from 18 free repair places to 17. The **Tbilisi Electro-Wagon Repair Plant** (TEWRS) offers 6 repair places for KR of wagons too. At least the need of repair places for KR in other plants or depots is increasing from 7 in 2000/2005 to 19 in 2015. The complete overview is to be found in the table below.

Tab. 4.2.7-19: Main overhaul of wagons and needed repair places

wagon maintenance	2000/2005	2010	2015
optimistic case			
wagons	24,024	32,971	34,455
Total of KR per year	2,147	2,946	3,079
KR of tanks needed per year	478	624	717
needed tank repair places in BWRS	4	5	6
free repair places in BWRS	16	15	14
KR of others needed per year	1,669	2,322	2,362
needed repair places for others	20	27	28
repair places in TEWRS	6	6	6
difference of repair places	3	-6	-7
needed repair places in other plants or depots	0	6	7
pessimistic case			
wagons	12,784	18,778	19,874
Total of KR per year	1,142	1,678	1,776
KR of tanks needed per year	292	392	435
needed tank repair places in BWRS	2	3	3
free repair places in BWRS	18	17	17
KR of others needed per year	850	1,286	1,341
needed repair places for others	10	15	16
repair places in TEWRS	6	6	6
difference of repair places	14	8	7
needed repair places in other plants or depots	0	0	0

The question of creating capabilities for the main overhauls of the other wagon types is one of the main topics of the TRACECA study „Rolling Stock Maintenance System" and therefore here no more explained. In the opinion of the project team, there is no sense to add the respective results for BWRS in the investment plan for the railways now as the tank wagon fleet and the required central maintenance capabilities are a good matter of privatisation as a whole. At least this way is used by the majority of European railways. Acting this way, the Caucasian railways can avoid the respective investment costs.

4.2.7.4.4 Capital maintenance capabilities for coaches

The above mentioned overhaul volume for coaches is to be carried out by the **Tbilisi Electro-Wagon Repair Plant** (TEWRS). The TEWRS possesses 6 repair places for coaches. The overall need of repair places for carrying out the main overhauls (KR-1) and the general overhauls (KR-2) of coaches is increasing from 3 places in 2000/2005 to 9 places in 2015 as to be seen in the following table for the optimistic case. For the pessimistic case the respective need is increasing from 2 repair places in 200/2005 to 4 repair places in 2015. After 2010 the amount of actual 6 repair places is not even able to cover the growing overhaul demand in optimistic case.

Tab. 4.2.7-20: Overhauls of coaches and needed repair places

coach maintenance	2000/2005	2010	2015
optimistic case			
KR-1	16	39	53
KR-2	16	39	53
needed repair places KR-1	1	2	3
needed repair places KR-2	2	5	6
total of repair places	3	7	9
pessimistic case			
KR-1	8	21	25
KR-2	8	21	25
needed repair places KR-1	1	1	1
needed repair places KR-2	1	2	3
total of repair places	2	4	4

The question of creating additional capabilities for coach overhauls for the optimistic case in 2010 with 1 place and in 2015 with further 2 places is not of first priority within this study. The capabilities existing in the whole region are to be taken into acount, especially as a coach repair plant exists in Kazakhstan. Therefore, this point should be one of the main topics of the TRACECA study „Rolling Stock Maintenance System" and is here no more explained.

4.2.7.4.5 Capital maintenance capabilities for EMU

The above mentioned overhaul volume for EMU is to be carried out by the **Tbilisi Electro-Wagon Repair Plant** (TEWRS). The TEWRS possesses repair places for 2 EMU sets. The overall need of repair places for carrying out the main overhauls (KR-1) and the general overhauls (KR-2) of EMU is increasing from 8 places in 2000/2005 to 16 places in 2015 as to be seen in the following table.

Tab. 4.2.7-21: Overhauls of EMU and needed repair places

coach maintenance	2000/2005	2010	2015
optimistic case			
KR-1	11	19	23
KR-2	11	19	23
needed repair places KR-1	4	7	8
needed repair places KR-2	4	7	8
total of repair places	**8**	**13**	**16**
pessimistic case			
KR-1	7	10	10
KR-2	7	10	10
needed repair places KR-1	2	4	4
needed repair places KR-2	2	4	4
total of repair places	**5**	**7**	**7**

The question of creating additional capabilities for the overhauls of EMU in 2010 should be regarded in the context of outsourcing the wagon and coach overhauls to other repair plants in the region and therefore be treated as one of the main topics within the TRACECA study „Rolling Stock Maintenance System".

Tab. 4.2.7-22: Cost estimation for upgrading the Caucasian shops for the rolling stock

no.	subject	costs in 1000 US$
1	Locomotive depots	2,981.0
2	Wagon depots	2,178.5
3	Coach depots	2,606.0
4	Baku wagon repair factory	104.0
	total	**7,869.5**

The total costs for upgrading the rolling stock shops amount to **7.9 US$ mill.**. The overview of these costs can be found under Annex 4.2.7-4.

4.2.8 Summary

The investments required to bring the three railways up to an acceptable operating level for the envisaged transport volumes have been determined.

Based on these findings the annual financial outlays have been calculated according to the time plan suggested in the technical sections of this report. The annual costs for the investments are contained in Annexes 4.2.8-1 to 4.2.8-15.

The total investment costs required for the rehabilitation of the three Caucasian railways can be summarised as follows:

Tab. 4.2.8-1: Investment costs required for rehabilitation in total

		ARM	AGZD	GRZD	total
		in mill. US$			
Track and Bridges		99.3	332.8	249.3	**681.4**
Signalling and Telecommunications		67.5	186.5	166.4	**420.4**
Power Supply		1.5	77.9	18.1	**97.5**
Stations		7.3	31.9	30.0	**69.2**
Rolling Stock	opt	200.2	716.9	517.9	**1,435.0**
	pess	69.2	285.9	59.1	**414.2**
Workshops		1.7	2.8	3.3	**7.8**
total	**opt**	**377.5**	**1,348.8**	**985.0**	**2,711.3**
	pess	**246.5**	**917.8**	**526.2**	**1,690.5**

The annual maintenance expenses and depreciation charges have also been estimated. Historical data with regard to maintenance costs was generally lacking. In addition, it was obvious that normal maintenance in every sector had not been carried out for some time. Therefore, it was decided that calculations would be made to estimate the annual outlays required to maintain the proposed investments in a condition which would guarantee a normal useful life for the equipment involved. It was felt that the most appropriate method in this case would be to estimate maintenance as a percentage of the investment costs, in line with experience gained in Western Europe. The percentages used were the following:

Track renewal:

Permanent way - 10 %
Bridges and tunnels - 5 %
Machinery and equipment - 10 %

For the Permanent way an estimate of 10% was used, which is somewhat high compared to the maintenance costs for Western European railways. The reason for setting these costs so high is the particular conditions prevailing in the Caucasus region:

- Due to the security situation, as well as geographical conditions, it will be necessary to transport materials and manpower over considerable distances to properly maintain the track bed.

- A proper maintenance programme may eventually require the establishment of additional depots with the accompanying running costs involved.

- The present infrastructure is not so well established as in Western Europe, which means that the repairs and maintenance necessary to maintain the track will probably have to be carried out more often and more intensely than on a Western European railway.

- Along certain stretches of the line, particularly in Georgia, the track is extremely curvaceous and runs alongside river beds. This makes the line susceptible to landslides and flooding, with the corresponding necessary maintenance to prevent serious damage, or repair such damage should it occur. The measures required to contain the effects of such terrain are not within the scope of the Railway's jurisdiction.

- The Caucasus lies within a seismically sensitive zone, especially in Armenia earthquakes and earth tremors occur relatively often. The permanent way must therefore be intensely maintained to prevent any serious effects from such occurrences.

Signalling and telecommunication:

Here 20 % has been used. The equipment in question includes accumulators, transformers and cables, which require heavy maintenance to preserve in good working order.

Rolling stock:

The annual maintenance required for each type of rolling stock was calculated individually, depending on type of equipment. The calculation is therefore more complicated but more precise than for the other items.

Power supply:

An overall calculation of 10 % of the investment costs has been used.

Stations:

The percentages used were 10 % for tracks and equipment and 5 % for buildings. Due to shunting and interchanges it is considered that there is heavier use on tracks than on the open permanent way, and therefore tracks in the stations would require more maintenance. As the recommended investments are overwhelmingly for tracks and equipment the overall percentage is close to 10 %.

It must be emphasised that when estimating these costs the overriding principle was that the equipment must be maintained in good order in view of the heavy investments involved, and therefore it is better to calculate on the high side rather than underestimate the costs involved.

The annual requirements for maintenance once the measures are completed are estimated as follows:

Tab. 4.2.8-2: Annual costs required for maintenance

		ARM	AGZD	GRZD	total
		in mill. US$			
Track and Bridges		12.5	43.0	29.2	**84.7**
Signalling and Telecommunications		13.5	37.3	33.3	**84.1**
Power Supply		0.3	7.8	1.8	**9.9**
Stations		0.7	3.2	3.0	**6.9**
Rolling Stock	opt	4.7	26.8	17.2	**48.7**
	pess	3.8	13.8	9.3	**26.9**
Workshops		0.2	0.3	0.3	**0.8**
total	**opt**	**31.9**	**118.4**	**84.8**	**235.1**
	pess	**31.0**	**105.4**	**76.9**	**231.3**

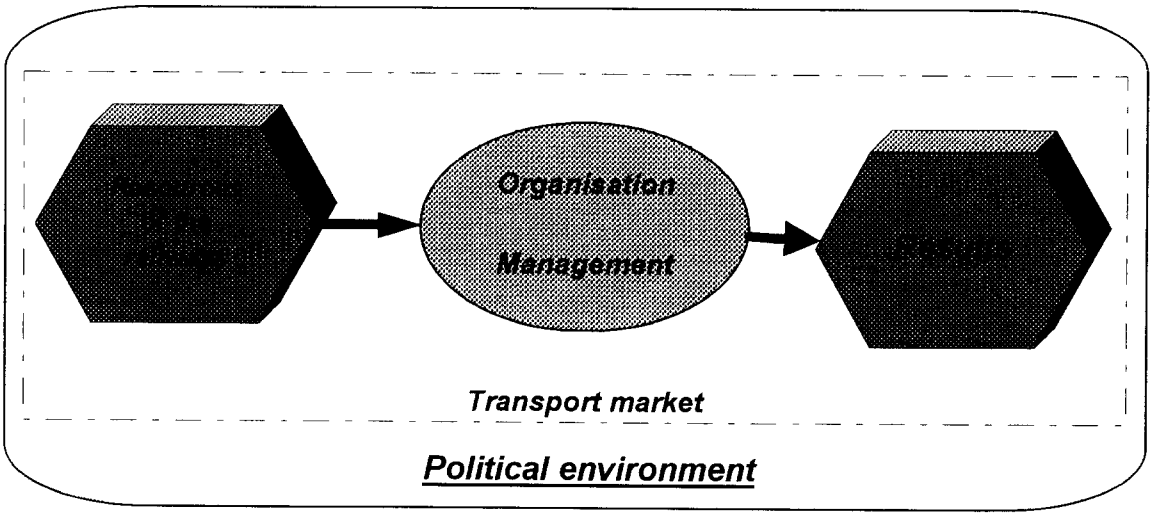
The corresponding charges to operations for depreciation are as follows:

Tab. 4.2.8-3: Annual costs required for depreciation

		ARM	AGZD	GRZD	total
		in mill. US$			
Track and Bridges		4.6	15.3	11.5	**31.4**
Signalling and Telecommunications		5.3	13.7	12.1	**31.1**
Power Supply		0.1	4.2	0.8	**5.1**
Stations		0.3	1.3	1.2	**2.8**
Rolling Stock	opt	6.1	22.0	15.8	**43.9**
	pess	2.1	8.8	1.8	**12.7**
Workshops		0.2	0.3	0.3	**0.8**
total	**opt**	**16.6**	**56.8**	**41.7**	**115.1**
	pess	**12.6**	**43.6**	**25.9**	**83.9**

4.3 Development of organisation

The 'Development of Organisation' for the railways ARM, AGZD and GRZD derives from the future profile of features, the demands of the transport market, the prognosticated transport volume in the freight and passenger traffic and the selected products/technologies. In this scope the objective of the enterprise "railway" must be to realise such a turnover by transport services, by which it is possible to achieve the highest possible yield for the invested capital within the scope of a realistic share of the transport market. The role of the organisation within the scope of the objecitve may be described as follows:



Analysing the organisational structure the material resources (infrastructure), the financial resources and the human resources have been investigated.

The development of an ideal strategic model for a more independent and market-orientated enterprise „railway" requires the investigation of the following key elements:

- transport market
- political environment
- financial environment
- characteristics of the enterprise
- structure
- need in development

Although a detailed analysis of the organisation and the development of a strategic model of the enterprise are not object of the project individual elements were at least touched. That especially concerns the development of products and the market (see section 6.1), the human resources (see section 2.3), the financial analysis (see section 2.4) and financial development (see section 5) and the analysis of the organisational structure.

In view of the deficits of the Transcaucasian railways detected during the work of the team and the experiences of the European railways as a result of these analyses are made the following first proposals with a general recommending character:

Generally it must be considered that little steps of organisational changes which at the moment are performed by the railways do lead to partial results but the general status quo, i.e. the organisational structure derived from the Soviet railways is not generally questioned by this. In comparison a future organisational structure should be orientated to the following changes:

- Clear difference between the competence of the administrations of the state (ministry of transport) and the competence of the railways to achieve a greater entrepreneurial liberty and flexibility of the railways.

- Decentralisation of the commercial competence and decision making processes to achieve a optimal purposeful reaction on the client and the needs of the market. Gradual liquidation of the railways offices and transfer of the tasks within the freight traffic to departments which are nearer to the customers (big freight stations).

- Centralisation of the management (dispatching circuits) in the headquarters - by the use of the corresponding communication and telemetric technologies.

- Concentration of the railways on the main business, i.e. transport of goods and passengers in profitable relations and offering the corresponding services.

- Avoiding double subordinations, i.e. realisation of a direct subordination of the locomotive and wagons depots, of the signalling and telecommunications services, of the departments for the maintenance of tracks, bridges and power supply under the corresponding administration of the headquarters.

- Realisation of a management structure consisting of two levels, where the levels of competence have to be clearly defined to achieve a reduction of the number of central decisions.

- Creation of unified production areas for the infrastructure, the freight traffic, the national and local passenger traffic, the operational services and the locomotives in the three railway administrations and subordination of the administrations and employees under the mentioned fields.
- This production areas must be managed like profit-centres and for a transparency of the costs the results must be able to reveal and credit to an account.

- Excluding of production plants, of plants for the production of tracks and bridges, repairing capacities, track building departments from the railways and foundation of private enterprises, if necessary as 100% subsidiary firm of the railway administrations.

- ❒ Reducing of the exploited railway network and of the freight stations and passenger stations depending on the transport volume and upon the basis of an cost/revenue analysis. Development of alternative offers for transport customers. In this area subsidiary firms of the railway should present offers for the road transport and bus services.

- ❒ Privatisation of the container terminals, which may act as the sub-contractor of the Operating Company. Foundation of Terminal Operating Companies.

- ❒ Decreasing the number of employees of the administration and the operating services to achieve a productivity level of approximately 200.000 Tkm/pers./a, while taking into account both the social factors and the share of the wages in comparison to the costs (between 18 and 24 per cent of the general costs of the Transcaucasian railways in comparison to appr. 65 per cent in Western Europe)

- ❒ Creation of marketing structures in the business areas and the local representations of the freight transport.

- ❒ Development of the information and computer centres to service companies of the railways offering information services to the railways forwarding agencies and other transport customers.

- ❒ Excluding services which are not typical for the railways and transferring them to other forms of property, e.g. to a independent enterprise for social tasks (holiday houses, kindergartens, hospitals etc.) analogously to the economically independent social facilities of european railways.

- ❒ Foundation of independent private service firms offering services like the cleaning of wagons and railway stations.

The structure of the railway should generally allow a high flexibility, e.g. it should be possible to rapidly change them without many influences by the administration.

These proposed measures should be developed within the scope of a step-by-step conception taking into account a integral business conception for the three railway administrations. Its basis is formed by the analysis of the processes, which compares the old and the new working method of every working routine and which will be discussed with all persons involved to achieve optimal results. Only decisions which are advantageous for the enterprise and the employee lead to an optimal development.

Apart from the development of the organisation the culture of an enterprise has a special importance. That means that both the outer presentation and the inner manners have to correspond to certain standards. It is necessary to avoid command structures.

It should be introduced a system of wages basing upon the achievement principle, which especially should reflect the competence and the achievement. The system of the organisation must flexible react on the development of the wages and the efficiency (wage agreements).

4.4 Establishment of international co-operation

4.4.1 General

Measured by their transport volumes, their line kilometres and the number of their employees, the Armenian, Azerbaijan, and Georgian Railways are relatively small. Exports/imports and transit transports mostly concern two railway administrations. The railways' economic situation calls for a co-operation so as to minimise the cost. At the same time care has to be taken that in terms of national economy and technology the railways do not drift apart. Financial and technical aid from abroad will eventually be successful only - especially as regards the TRACECA corridor - if the investments are co-ordinated in terms of time and performance parameters (technology, technique, availability).

The task description regarding the creation of a Railway Infrastructure Authority as set down in the Consultant's offer resulted to be not recommendable. The reasons for this are as follows:

- The political situation at present does not allow any three-party authorities.
- The most important technical/technological determinations as regards infrastructure are laid down in the regulations of the railways of the CIS states. All three states are parties to the Agreement and have recognised the railway regulations of the Soviet Railways (SZD) to be binding for their work in the fields: permanent way, signalling, train protection and communication technology, power supply, rolling stock, station facilities and data processing. The three states are also contributing regularly to the work of the work groups for the improvement of the SZD regulations or they finance, by way of assessments, technical projects being developed by Russian research and test institutes. At the same time the Armenian, Azerbaijan and Georgian Railways strive to gain more independence in those fields where Russian solutions do not meet the requirements of the Caucasian railway administrations.
- Because of the railway administrations' co-operation in the OSSHD and the UIC they receive these railway associations' leaflets which are of a recommending and binding nature. Currently in none of the three railway administrations these leaflets are expertly being evaluated and their contents translated into practice. For an active co-operation in the respective committees and the results of such work being applied according to national needs, the preconditions in terms of personnel and organisation remain to be created step by step, taking into account the financial possibilities.

Since technical "insular" solutions are not recommendable to TRACECA, an Infrastructure Authority for the three railway administrations only is not very appropriate, either.

The analysis in chapter 6 regarding the establishment of Joint Venture(s) shows that even in partial fields of the infrastructure at least a bilateral co-operation is possible and necessary. Therefore, the fields 'production of prestressed concrete sleepers',

'communication networks', and 'repair and building of locomotives' were looked at more closely.

4.4.2 International agreements

Armenia

Armenia is neither member of the OSShD (ARM participates to the meetings of the Council of OSShD in the frame of the Russian delegation) nor partner state of the treaties on corridor transports, dated 13.5.1996. ARM represents the government of Armenia in the Council for Rail Transport, but some decisions are not applied directly by ARM. In some cases the consent of the Armenian ministry of transport is required. Therefore, difficulties in international relations are not excluded, when the rule to be applied differs from the binding decision of the Council for Rail Transport.

The railway regulations of the FSU are applied habitually in Armenia. No arrangements with other states or railway administrations exist concerning the technology, the maintenance or the operation of the railway infrastructure.

ARM is an associated member of UIC.

Azerbaijan

Azerbaijan is member of OSShD and party to the treaties dated 13.5.1996 about the corridor transports. The AGZD represents the Azerbaijan government in the Council for Rail Transport and is associated member of the UIC. However, there are no conventions or agreements with states, governments or railways concerning the railway infrastructure.

The AGZD applies the international treaties, agreements and contracts without any reserves.

Georgia

Georgia is represented in the Council for rail Transport by its GRZD. It is member of the OSShD and party of the treaties on the corridor transports dated 13.5.1996. It applies these treaties, agreements and international contracts without any reserves.

GRZD is not yet member of UIC.

4.4.3 Aims of international co-operation

The aims of a co-operation in the development of the infrastructure have to take into account the above mentioned conditions. In particular the introduction of new technologies and techniques for best possible results calls for co-ordination between

the Railways of the TRACECA corridor. Co-ordination is of prime importance in the following fields:

- Elaboration of mutually agreed investment strategies for the main lines of international traffic, in accordance with the experience gained with European corridors (e.g. Paris-Berlin-Warsaw-Minsk-Moscow). It is suggested to create joint working parties which bindingly agree upon both technical aims (maximum speeds, signalling systems, communication, and others) and investment plans and which, if so needed, prepare specifications for the development of the corridor, to serve as a basis for invitations to tender. The chronological order of these works must be bindingly agreed upon. The corresponding invitations to tender are the responsibility of the Railway Administrations.
- For select, non-corridor-related complexes of tasks temporary working parties ('ad hoc groups') could be created which elaborate outline specifications. Here, one should first concentrate on the following aims:
  - development of the communication network;
  - co-ordination as regards new types of superstructure, especially with a view to types of sleepers and rail fastenings;
  - radio-aided train protection systems;
  - computer networks for international transport tasks;
  - further development of catenary system;
  - electronic data interchange.

  These ad hoc groups should also elaborate proposals for the Council of Railways of the CIS, in pursuance of sub-paragraph 10 of the Directive (local agreements).
- It is suggested to establish a joint secretariat with the railway administrations to co-ordinate the development of the technique to be used in the TRACECA corridor, the order of the investments to be necessary, and the assessment of the required equipment and materials, which will serve as a basis for assessing the production volume of the Joint Ventures to be created.
- Selection of partial strategies for the foundation of joint ventures, to be done by controlling committees composed of experts from the various fields, and of transport-offering and decision-making bodies of the respective countries.

  The controlling committees' work is aimed at preparing, monitoring, and enforcing the strategies regarding the foundation of joint ventures.

The TRACECA projects are to improve the transport conditions along the corridor. In that respect it is necessary to ensure also the safety and the monitoring of freight and passenger traffic. On the basis of the recommendations given in chapter 4.1.2 the EU is currently preparing a project proposal in the telecommunication sector of the three railways.

4.4.4 Multi-national communication project

A multi-national project in the communication sector might serve as an example for possible co-operation of the railways in the Caucasus region in the field of infrastructure.

Such a project should be aimed at

- directing investments for: the procurement of optical fibre cable, equipment for communication links, equipment for communication and computerisation, equipment for the connection with external telecommunication networks;
- improving and promoting the present railway traffic on the TRACECA corridor;
- ensuring the safety of freight and passenger traffic;
- ensuring the monitoring of freight and passenger traffic;
- ensuring the development of the regional co-operation in the transport sector;
- improving and promoting all railway traffic and speeding up the commercialisation of traffic;
- providing consultancy services for co-ordination and supervision.

For the co-ordination and supervision of the project implementation it is suggested to create a temporary work group (ad hoc group) under the leadership of a European Consultant.

The members of this ad hoc group are to be representatives of the ARM, AGZD and GRZD and of European consulting firms. The foundation and monetary support of the work should be financed particularly by the EU.

❒ The main aims of co-ordination are as follows:
- co-ordination of tenders for the communication network Poti, Tbilisi - Baku, Tbilisi - Yerevan;
- scheduling of works;
- receipt and evaluation of bids;
- assistance to negotiations;
- monitoring in the implementation phase;
- determination of the financing body;
- approval of progress reports.

❒ The supervisory tasks are as follows:
- preparation of test programmes and evaluation of test results;
- inspection and control of works during pre-delivery, take-over, periodic and final warranty inspection;
- issuing of certificates;
- monitoring of project performance and progress:

- The set-up and training for maintenance and operation implies:
  - establishment of maintenance departments/service centres in the three countries;
  - preparation of maintenance contracts with telecommunication companies;
  - organisation of training activities;
  - establishment of an operations control centre (OCC);
  - agreements regarding the leasing of communication channels;
  - preparation of a proposal for national joint ventures for planning companies in the three countries (see 6.4.3).

Annexes

Annex 4.2.1-1

Cost estimates for track renewal

The cost estimate for one km of track renewal is based on the following calculation for all Caucasian railways; this calculation originates from the AGZD Track Division:

Tab. 1: Calculation for one km of track renewal

item	designation	unit	quantity	price/unit in US$	total in US$
1	labour costs	km		1,022	1,022
	material costs				
2	R 65 rails	t	129.3	870	112,491
3	fish plates	t	4.6	883	4,062
4	bearing plates	t	28.21	873	24,627
5	fish plate bolts	t	0.32	993	318
6	T-head bolt	t	5.3	1,141	6,047
7	locking bolt	t	3.49	1,299	4,534
8	clamp	t	4.86	1,041	5,059
9	joint plates	t	0.044	4,445	196
10	double spring washer	t	1.77	1,594	2,821
11	flat plates	piece	7,361		1,619
12	iso bushes	piece	7,361		1,987
13	KB 10 pads	piece	3,680		2,539
14	PB 65-1 pads	piece	3,680		1,546
15	iso-fish-plates	set	2		22
16	set of iso-joints	set	2		5
17	concrete sleepers	piece	1,840		49,680
18	ballast	m	1,500		12,450
19	track engines				133
	direct costs				**231,158**
	extra charges				
20	overhead costs	%	13	annulled	
21	severance pay	%	20	1,022	204
22	allowances	%	30	1,022	307
23	loco-costs				3,333
24	unforeseen	%	0.5	235,002	1,175
	total				**236,177**

The costs ascertained in the above table for 1 km of track renewal seem to be rather too low as compared to the European price level. A price calculation for 1 km of track renewal requested in August 1997 differed only very slightly from the calculation

produced in June 1996. The direct costs are shown below for comparison, without surcharges.

- direct costs of the calculation from June 1996 = **231, 158 US$**
- direct costs of the calculation from August 1997 = **231, 220 US$**

One item of note which changed were the wages which increased from US$ 1,022 per km of track renewal in June 1996 to US$ 2,125 per km in August 1997, whereas the material prices differed only slightly. The overhead costs amounting to 13% of the direct costs appear to be too high as compared to the overall calculation and are therefore not justified. Overhead costs are already contained in the material costs, so that these are not taken into account in the total sum. The following price comparison indicates that the items of material are quite comparable between DB AG/AGZD; however, the sums paid by DB AG for wages, ballast and machine costs for 1 km of track renewal are not comparable with AGZD costs. It has to be added that all surcharges are already included both in the comparable items and in all other items of DB AG.

Tab. 2: Comparison of costs between DB AG and AGZD for one km of track renewal

no	designation	unit	DEM/km DB AG	US$/km DB AG	US$/km AGZD
1	wages for 1 km of track renewal		120,000	80,000	1,022
2	UIC 60/ R 65 tracks with transport and welding	t/km	169,000	112,667	112,491
3	sleepers complete with bracket fixing and transport	1,667/km 1,840/km	166,700	111,133	105,062
4	ballast with transport	t	156,000	104,000	12,450
5	track construction machines	per km	180,000	120,000	133
	total		**791,700**	**527,800**	**231,158**

The unit prices of the above mentioned track materials do not correspond with western price levels in all items. However, the calculated cost/km of track renewal will be rounded up to US$ 240,000 per km when entered in the financial pre-feasibility assessment.

In order to make the sum of US$ 240,000 per km more transparent, it has to be said that the above cost estimate includes the following services:

- pulling the long-welded rails into position at the building site
- stacking the concrete sleepers in the permanent-way workshops
- distributing the sleepers at the building site
- installing the assister bars on the positioned sleepers to produce 25 m long track sections
- loading the track sections onto the track section wagon, 5 sections each on pairs of transport wagons coupled together
- converting the piece of track concerned with 25 m long track sections, creating severance points
- raising and loading the old track sections onto transport wagons in 25 m long track sections
- transporting the old track sections to the permanent-way workshop, dismantling the track sections
- sorting and stacking the recovered materials for further use in subordinated tracks
- taking up and loading the old ballast, or covering from the side in line with the clearance gauge, or ballast cleaning up to 1.00 m under the upper level of the rail with the RM 80 ballast cleaning machine, to be procured
- laying the pre-mounted new track sections, lashing the rail joints for building site operation
- laying ballast for the new track
- levelling and filling the new track with the high performance ballast regulating machine
- first and second compacting phase with the high performance Unimat 08 - 475 4 S compacting machine, to be procured
- replacement of the assister bars with the long-welded rails distributed in the building site, using the MPR type hydraulic threater , to be procured
- compacting and aligning with above-mentioned 08 - 475 - 4 S
- Joint welding of the long-welded rails
- levelling, final filling and sweeping of the new track and producing the ballast shoulder in front of the sleepers, in line with the clearance gauge
- acceptance and completion report by the site supervisor
- costs for operating measures such as the operating track, temporary single-track operation for two-track lines, difficult train conveying conditions.

All the above-mentioned measures are included within the US$ 240.000 for **one km of track renewal**.

Annex 4.2.1-2

Cost estimation for track rehabilitation measures of the ARM railway network

No.	Designation	Unit	Quantity	Price/Unit US$	Total Price US$	Remarks
1	Backlog track line Yerevan-Masis-Gyumri-Ayrum					
2	general track renewal including partial underground improvements	km	120	240,000	28,800,000	
3	sleeper changing with prestressed concrete sleepers and W-fastenings	piece	41,400	40	1,656,000	
4	depth drainage	km	30	20,000	600,000	
5	switch renewal R 65 1:11 complete	piece	85	40,000	3,400,000	
6	crossing timber set	set	170	10,000	1,700,000	
	subtotal 1				**36,156,000**	
7	Backlog track line Masis-Yeraskh					
8	general track renewal including partial underground improvements	km	20	240,000	4,800,000	Rehabilitation-measures only
9	sleeper changing with prestressed concrete sleepers and W-fastenings	piece	41,400	40	1,656,000	calculated till Yeraskh
10	depth drainage	km	10	20,000	200,000	
11	subsoil improvements	km	10	80,000	800,000	
12	switch renewal R 65 1:11 complete	piece	15	40,000	600,000	
13	crossing timber set	set	30	10,000	300,000	
	subtotal 2				**8,356,000**	

No.	Designation	Unit	Quantity	Price/Unit US$	Total Price US$	Remarks
14	Backlog track line Masis-Razdan-Ijevan-Border to AGZD					
15	general track renewal including partial underground improvements	km	100.00	240,000	24,000,000	
16	sleeper changing with prestressed concrete sleepers and W-fastenings	piece	27,600	40	1,104,000	
17	depth drainage	km	25	20,000	500,000	
18	subsoil improvements	km	25	80,000	2,000,000	
19	rock protection measures	km	15	40,000	600,000	
20	switch renewal R 65 1:11 complete	piece	52	40,000	2,080,000	
21	crossing timber set	set	110	10,000	1,100,000	
	subtotal 3				**31,384,000**	
22	Bridges and tunnels					
23	Bridge NR 2, year of construction 1898	piece	1	lump-sum	320,000	
24	Bridge NR 4, year of construction 1898	piece	1	lump-sum	580,000	
25	Bridge NR 5, year of construction 1899	piece	1	lump-sum	430,000	
26	Bridge NR 6, year of construction nn	piece	1	lump-sum	1,460,000	
27	Bridge NR 7, year of construction 1898	piece	1	lump-sum	320,000	
28	Bridge NR 8, year of construction 1898	piece	1	lump-sum	240,000	
	subtotal bridges and tunnels				**3,350,000**	
	total				**79,246,000**	

Annex 4.2.1-3

Costs estimation to replenish the equipment of ARM districts

No.	Designation	Unit	Quantity	Price/Unit US$	Total Price US$
	Small track maintenance engines and tools for ARM-Districts				
1	tamping or packing units, type GB4 with Briggs and Stratton engine	piece	60	16,717	1,003,020
2	Rail saws, type SRN-E with electrical engine 220/380 V DC, 50 Hz	piece	30	3,443	103,290
3	Supplement for hydraulically device	lump-sum			5,898
4	Rail drilling machines, type PR 8- E-2V	piece	30	3,933	117,990
5	Rail grinding machines, type MP 12-E	piece	30	4,033	120,990
6	Coach screwing machines, type T52-E	piece	30	6,097	182,910
7	Coach screwing machines, type TS2 with gasoline engine Bernhard	piece	30	6,490	194,700
8	Supplement for torque limiter			260	260
9	Track lifting and slewing machines, type RV 100 for track 1520 mm	piece	5	39,333	196,665
10	Hydraulic jacks, type CH 65	piece	240	930	223,200
11	Wooden sleeper carrying tongues	piece	300	88	26,400
12	Concrete sleeper carrying tongues	piece	300	106	31,800
13	Hand operated rail pullers with chain	piece	30	1, 733	51,990
14	Generators, type CR 2500 with Briggs and Stratton gasoline engine	piece	120	847	101,640
15	Generators, type RG 4500 T with Briggs & Stratton gasoline engine mounted on a hand pushed one wheel trolley, power 4 KW/220/380 V/50 Hz	piece	60	1,733	103,980
16	Signalling lamps, 3 colour lights	piece	300	243	72,900
17	Brigade carriers	piece	20	40,000	800,000
18	Four wheel drive cars, two per district	piece	10	40,000	400,000
19	Hammer for sleeper spice	piece	300	32	9,600
20	Slewing bars different kinds	piece	480	30	14,400
21	Adjustable wrenches	piece	120	45	5,400
22	Wrench sets for track works	piece	240	40	9,600
23	Abrasive discs	piece	10,000	12	120,000
24	Rail thermometer	piece	120	60	7,200
25	Rail pulling rollers	piece	120	180	21,600
26	Tamping pick	piece	1,200	35	42,000
27	Wooden sleeper drilling machine	piece	60	4,700	282,000
28	Ballast forks	piece	1,200	35	42,000
	direct costs				4,291,433
	taxes, dispatch, insurance, unforeseen				708,567
	Total districts equipment				5,000,000

Annex 4.2.1-4

Costs estimation for essential machinery of the Permanent way workshop ARM

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$
	Overhauling of the existing track renewal engines System UK 9 / 25 of the Permanent Way Work Shop.				
1	Changing of the Russian Diesel-motors by new caterpillar motors type 3306 Di - TA.	piece	4	44,100	176,400
2	Crane bridge, disassembling of defect installation, assembling of new service cabinet, control board complete with all accessories.	piece	5	117,000	585,000
3	New installation of compressor equipment with generator contactor, new contactor - controller and all accessories.	piece	5	104,400	522,000
4	Electric motors for crab, trolley, travelling winch complete with installation and accessories.	piece	7	11,700	81,900
5	Hydraulic equipment, examination of pumps, pipes, oil - hydraulic control and renewal of defected main parts.	piece	4	11,700	46,800
6	Check of running gear, chassis, brakes and bogies	lump sum			30,000
7	Rail / road loader excavator KGT / V, track gauge 1520 mm and accessories like weed and brushwood cutter, rail grab, fork for wooden and concrete sleepers and others more.	piece	3	335,000	1,005,000
8	RM 80, ballast cleaning machine for switches, crossings and plain track, uni-versal application. Length over buffers = 31.80 m, excavating width standard = 4.00 m, excavating depth below top rail = 1.00 m	piece	1	4,380,000	4,380,000
9	Unimat 08 - 475 - 4 S, Perfect maintenance of switches, crossings and plain track. Technical data: length over buffers = 33.99 m width = 3.00 m total weight = 100. t	piece	1	2,860,000	2,860,000
10	High performance ballast regulating machine SSP 110, technical data:	piece	1	1,240,000	1,240,000

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$
	length over buffers = 17.75 m width = 3.00 m weight = 36 t				
11	Hydraulic rail threater type MPR with hydraulic controlled turntable and off tracking equipment, power 6 t	piece	1	550,000	550,000
12	Spare parts to No. 8 - 12 10 % of total price of 10,035,000 =	lump sum			1,003,500
13	Bridge inspection vehicle, type 970 10 A for track gauge 1520 mm, also to use as tunnel and overhead line inspection. Vehicle.	Piece	1	1,170,000	1,170,000
14	Sleeper changing machine for track gauge 1520 mm, type MRT. Fast renewal of wooden and concrete sleepers.	piece	1	250,000	250,000
15	Combined track gauges for points, crossings, track gauge and cant measuring device	pieces	10	450	4,500
16	Brigade carriers	piece	5	40,000	200,000
17	Four wheel drive cars	piece	2	40,000	80,000
18	Generators, type RG 4500 T with Briggs & Stratton gasoline engine mounted on a hand pushed one wheel trolley, power 4 KW/220/380 V/50 Hz	piece	4	1,733	6,932
	subtotal Permanent Way Work Shop				14,192,032
	taxes, dispatch, unforeseen				307,968
	total Permanent Way Work Shop				**14,500,000**

Annex 4.2.1-5

Costs estimation for rehabilitation measures of the AGZD railway network

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$	Remarks
1	Backlog track line Baku-Beyuk-Kyassik- border to GRZD					
2	general track renewal including partial underground improvements	km	366	240,000	87,840,000	
3	switch renewals R65, 1:11	piece	200	40,000	8,000,000	
4	crossing timber sets	set	140	10,000	1,400,000	
	subtotal 1				97,240,000	
5	Backlog track line Baladshary - Yalama					
6	general track renewal including partial underground improvements	km	55	240,000	13,200,000	
7	switch renewal, R 65, 1:11	piece	147	40,000	5,880,000	
8	crossing timber sets	set	100	10,000	1,000,000	
	subtotal 2				20,080,000	
9	Backlog track line Aliat - Sadarak					
10	general track renewal including partial underground improvements	km	401	240,000	96,240,000	
11	switch renewal, R65, 1:11	piece	368	40,000	14,720,000	
	subtotal 3				110,960,000	
12	Backlog track line Osmanly - Astara					
13	track renewal including partial underground improvements	km	80	240,000	19,200,000	
14	switch renewal R 65 1:11 complete	piece	84	40,000	3,360,000	
15	raise an embankment (10 m3 / m)	km	80	150,000	12,000,000	
	subtotal 4				34,560,000	
16	Bridges					
17	Bridge NR 56, km 541+500	piece	1	1,000,000	1,000,000	
18	Bridge NR 19 + 20, km 157+700	piece	2	433,000	866,000	
19	Bridge NR 10+11,km 111+200	piece	2	477,000	954,000	
20	Bridge NR 31,km 204+600	piece	1	100,000	100,000	costs estimation
21	Bridge NR 33+34, km 252+800	piece	2	1,475,000	2,950,000	confirmed by planning
22	Bridge NR 41+42, km 360+200	piece	1	100,000	100,000	department of AGZD
23	Bridge NR 5, km 72+300	piece	1	4,545,000	4,545,000	
	subtotal Bridges				10,515,000	
	total				273,355,000	

Annex 4.2.1-6

Costs estimation to replenish the equipment of AGZD districts

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$
	Small track maintenance engines and tools for AGZD districts.				
1	tamping or packing units, type GB4 with Briggs and Stratton engine	piece	34	16,717	568,378
2	Rail saws, type SRN-E with electrical engine 220/380 V DC, 50 Hz	piece	5	3,443	17,215
3	Supplement for hydraulically device	lump-sum			983
4	Rail drilling machines, type PR 8- E-2V	piece	2	3,933	7,886
5	Rail grinding machines, type MP 12-E	piece	15	4,033	60,495
6	Coachscrewing machines, type T52-E	piece	31	6,097	189,007
7	Coachscrewing machines, type TS2 with gasoline engine Bernhard	piece	34	6,490	220,660
8	Supplement for torque limiter			295	295
9	Track lifting and slewing machines, type RV 100 for track 1520 mm	piece	2	39,333	78,666
10	Hydraulic jacks, type CH 65	piece	35	930	32,550
11	Wooden sleeper carrying tongues	piece	34	88	2,992
12	Concrete sleeper carrying tongues	piece	34	106	3,604
13	Hand operated rail pullers with chain	piece	10	1,733	17,330
14	Generators, type CR 2500 with Briggs and Stratton gasoline engine	piece	8	847	6,776
15	Generators, type RG 4500 T with Briggs & Stratton gasoline engine mounted on a hand pushed one wheel trolley, power 4 KW/220/380 V/50 Hz	piece	2	1,733	3,466
16	Signalling lamps, 3 colour lights	piece	129	243	31,347
17	Brigade carriers	piece	12	40,000	480,000
18	Four wheel drive cars, two per district	piece	2	40,000	80,000
19	Hammer for sleeper spice	piece	50	32	1,600
20	Slewing bars different kinds	piece	50	30	1,500
21	Adjustable wrenches	piece	10	45	450
22	Wrench sets for track works	piece	50	40	2,000
23	Abrasive discs	piece	5,000	12	60,000
24	Rail thermometer	piece	24	60	1,440
25	Rail pulling rollers	piece	24	180	4,320
26	Tamping pick	piece	120	35	4,200
27	Wooden sleeper drilling machine	piece	12	4,700	56,400
28	Ballast forks	piece	240	35	8,400
	direct costs				1,941,960
	taxes, dispatch, insurance, unforeseen				558,040
	Total equipment for one district				2,500,000

Annex 4.2.1-7

Costs estimation for rehabilitation measures of the GRZD railway network

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$	Remarks
	Backlog track line Poti - Tbilisi - border AGZD					
1	general track renewal including partial underground improvements, first priority	km	261	240,000	62,640,000	
2	general track renewal as before, second priority.	km	303	240,000	72,720,000	
3	switch renewals R 65, 1:11	piece	400	40,000	16,000,000	.
4	crossing timber sets	sets	150	10,000	1,500,000	
	subtotal 1				152,860,000	
	Backlog track line Tbilisi-Sadakhlo-border to ARM					
5	general track renewal including partial underground improvements	km	24	240,000	5,760,000	
6	exchanging prestressed concrete sleepers	piece	60,720	40	2,428,800	
7	switch renewal, R 65, 1:11	piece	70	40,000	2,800,000	
8	crossing timber sets	set	35	10,000	350,000	
	subtotal 2				11,339,000	
	Backlog track line Batumi - Samtredia					
9	general track renewal including partial underground improvements	km	45	240,000	10,800,000	
10	bridge sleeper renewal	piece	1000	40	40,000	
	subtotal 3				10,840,000	
	Backlog track line border Russia - Veseloe - Ingiri - Senaki					
11	track renewal including partial underground improvements	km	39	240,000	9,360,000	
12	switch renewal R 65 1:11 complete	piece	25	40,000	1,000,000	
	subtotal 4				10,360,000	
	Bridges					
	bridge No. 18 km 2289 + 216	piece	1	9,526,000	9,526,000	Costs estimation
	bridge No. 27 km 2324 + 239	piece	1	1,106,000	1,106,000	for bridges
	bridge No. 56 km 2404 + 790	piece	1	1,483,000	1,483,000	confirmed in 1997
	bridge No. 65,km 2472 + 759	piece	1	1,110,000	1,110,000	by Planning
	Bridge No. 79,km 10 + 144	piece	1	1,000,000	1,000,000	Department of
	bridge No. 1 - 4, 10, 11and 13	piece		140,000	140,000	GRZD
	total Bridges				14,365,000	
	Total				199,763,800	

Annex 4.2.1-8

Costs estimation to replenish the equipment of GRZD districts

No.	Designation	Unit	Quantity	Price / Unit US$	Total Price US$
	Small track maintenance engines and tools for GRZD districts.				
1	tamping or packing units, type GB4 with Briggs and Stratton engine	piece	25	16,717	417,925
2	Rail saws, type SRN-E with electrical engine 220/380 V DC, 50 Hz	piece	5	3,443	17,215
3	Supplement for hydraulically device	lump-sum			983
4	Rail drilling machines, type PR 8- E-2V	piece	2	3,933	7,866
5	Rail grinding machines, type MP 12-E	piece	11	4,033	44,363
6	Coachscrewing machines, type T52-E	piece	20	6,097	121,940
7	Coachscrewing machines, type TS2 with gasoline engine Bernhard	piece	20	6,490	129,800
8	Supplement for torque limiter			295	295
9	Track lifting and slewing machines, type RV 100 for track 1520 mm	piece	2	39,333	78,666
10	Hydraulic jacks, type CH 65	piece	20	930	18,600
11	Wooden sleeper carrying tongues	piece	20	88	1,760
12	Concrete sleeper carrying tongues	piece	20	106	2,120
13	Hand operated rail pullers with chain	piece	10	1,733	17,330
14	Generators, type CR 2500 with Briggs and Stratton gasoline engine	piece	8	847	6,776
15	Generators, type RG 4500 T with Briggs & Stratton gasoline engine mounted on hand pushed one wheel trolley, power 4 KW/220/380 V/50 Hz	piece	2	1,733	3,466
16	Signalling lamps, 3 colour lights	piece	130	243	31,590
17	Brigade carriers	piece	12	40,000	480,000
18	Four wheel drive cars, two per district	piece	2	40,000	80,000
19	Hammer for sleeper spice	piece	50	32	1,600
20	Slewing bars different kinds	piece	50	30	1,500
21	Adjustable wrenches	piece	10	45	450
22	Wrench sets for track works	piece	50	40	2,000
23	Abrasive discs	piece	5,000	12	60,000
24	Rail thermometer	piece	24	60	1,440
25	Rail pulling rollers	piece	24	180	4,320
26	Tamping pick	piece	120	35	4,200
27	Wooden sleeper drilling machine	piece	12	4,700	56,400
28	Ballast forks	piece	240	35	8,400
	direct costs				1,601,005
	taxes, dispatch, insurance, unforeseen				398,995
	Total equipment for one district				2,000,000

Annex 4.2.1-9

Costs estimation for essential machinery of the Permanent way workshop of GRZD

No.	Designation	Unit	Quantity	Price / Unit USD	Total Price USD
	Overhauling of the existing track renewal engines System UK 9 / 25 of the permanent way workshop.				
1	Changing of the Russian Diesel motors by new caterpillar motors type 3306 Di - TA.	piece	12	44,100	529,200
2	Crane bridge, disassembling of defect installation, assembling of new service cabinet, control board complete with all accessories.	piece	5	117,000	585,000
3	New installation of compressor equipment with generator contactor, new contactor - controller and all accessories.	piece	10	104,400	1,044,000
4	Electric motors for crab, trolley, travelling winch complete with installation and accessories.	piece	6	11,700	70,200
5	Hydraulic equipment, examination of pumps, pipes, oil - hydraulic control and renewal of defected main parts.	piece	15	11,700	175,500
6	Check of running gear, chassis, brakes and bogies	lump sum			30,000
7	Rail / road loader excavator KGT / V, track gauge 1520 mm and accessories like weed and brushwood cutter, rail grab, fork for wooden and concrete sleepers and others more.	piece	3	335,000	1,005,000
8	RM 80, ballast cleaning machine for switches, crossings and plain track., universal application. Length over buffers = 31.80 m, excavating width standard = 4.00 m, excavating depth below top rail = 1.00 m	piece	2	4,380,000	8,760,000
9	Unimat 08 - 475 - 4 S, Perfect maintenance of switches, crossings and plain track Technical data: length over buffers = 3399 m width = 300 m total weight = 100 T	piece	2	2,860,000	5,720,000
10	High performance ballast regulating machine SSP 110, technical data: length over buffers = 1775 m width = 300 m weight = 36 t	piece	2	1,240,000	2,480,000

No.	Designation	Unit	Quantity	Price / Unit USD	Total Price USD
11	Hydraulic rail threater type MPR with hydraulic controlled turntable and off tracking equipment, power 6 t	piece	2	550,000	1,100,000
12	Spare parts to NR 8 - 12 10 % of total price of 19,065,000 =	lump sum			1,906,500
13	Bridge inspection vehicle, type 970 10 A for track gauge 1520 mm, also to use as tunnel and overhead line inspection Vehicle	Piece	1	1,170,000	1,170,000
14	Sleeper changing machine for track gauge 1520 mm, type MRT Fast renewal of wooden and concrete sleepers	piece	2	250,000	500,000
15	Combined track gauges for points, crossings, track gauge and cant measuring device	pieces	20	450	9,000
16	Brigade carriers	piece	10	40,000	400,000
17	Four wheel drive cars	piece	4	40,000	160,000
18	Generators, type RG 4500 T with Briggs & Stratton gasoline engine mounted on a hand pushed one wheel trolley, power 4 KW/220/380 V/50 Hz	piece	8	1,733	13,864
	Total Permanent Way Work Shop				25,658,264
	taxes, dispatch, unforeseen				1,341,736
	Total Permanent Way Work Shop				27,000,000

Annex 4.2.2-1

Costs of double-track equipment with signalling facilities on ARM stations

no.	item	unit	number	unit price	costs in US $
1	impedance bonds with secondary winding 0.2-1000	piece	206	590	121,540
2	impedance bonds with secondary winding 0.6-1000	piece	69	1100	75,900
3	joining pieces for chokes	piece	159	30	4,770
4	connection ropes for impedance bonds with secondary winding	piece	388	120	46,560
5	transformers POWS - 2A	piece	26	25	650
6	transformers PRT	piece	30	10	300
7	transformers RTE	piece	22	10	220
8	transformers ST-4	piece	811	12	9,732
9	transformers SOBS	piece	27	20	540
10	switch relay PPRE-5000	piece	39	33	1,287
11	selenium rectifier BWC	piece	10	2	20
12	resistors 2,2 Ω	piece	61	1	61
13	signal lenses pole signals - green	piece	52	60	3,120
14	signal lenses pole signals - yellow	piece	72	60	4,320
15	signal lenses pole signals - red	piece	60	60	3,600
16	signal lenses pole signals - white	piece	67	60	4,020
17	signal lenses dwarf signals - green	piece	53	60	3,180
18	signal lense dwarf signals - yellow	piece	24	60	1,440
19	signal lenses dwarf signals - red	piece	57	60	3,420
20	signal lenses dwarf signals - bleu	piece	67	60	4,020
21	signal lenses dwarf signal - moon white	piece	103	60	6,180
22	assembly line PMWG - 0.75 mm	m	9,200	1	9,200
23	assembly line PMWG - 2.50 mm	m	4,000	1	4,000
24	rectifier WAK 13	piece	44	35	1,540
25	accumulators ABN - 72	piece	1,444	360	519,840
26	cable SPPB 3 x 1	m	450	2	900
27	cable SPPB 7 x 1	m	900	2	1,800
28	cable SPPB 16 x 1	m	700	2	1,400
29	cable SPPB 24 x 1	m	950	2	1,900
30	cable SPPB 38 x 1	m	510	2	1,020
31	relay OMW - 2 / 40	piece	98	15	1,470
	total				**837,950**

Annex 4.2.2-2

Costs of the complete equipment of ARM stations with signalling facilities

no.	item	unit	number	unit price	costs in US $
1	impedance bonds with secondary winding 0.2 - 1000	piece	137	590	80,830
2	impedance bonds with secondary winding 0,6-1000	piece	100	1100	110,000
3	joining pieces for chokes	piece	120	30	3,600
4	connection ropes for impedance bonds with secondary winding	piece	217	120	26,040
5	transformers POWS - 2A	piece	106	25	2,650
6	transformers PRT	piece	65	10	650
7	transformers RTE	piece	60	10	600
8	transformers ST-4	piece	435	12	5,220
9	transformers SOBS-„	piece	83	20	1,660
10	switch relay PPRE-5000	piece	33	33	1,089
11	selenium rectifier BWC	piece	38	2	76
12	point mechanisms SP - 6	piece	4	4	8,000
13	signal lenses pole signals - green	piece	103	60	6,180
14	signal lenses pole signals - yellow	piece	90	60	5,400
15	signal lenses pole signals - red	piece	103	60	6,180
16	signal lenses pole signals - white	piece	103	60	6,180
17	signal lenses dwarf signals - green	piece	523	60	31,380
18	signal lenses dwarf signals - yellow	piece	360	60	21,600
19	signal lenses dwarf signals - red	piece	538	60	32,280
20	signal lenses dwarf signals - bleu	piece	359	60	21,540
21	signal lenses dwarf signals - moon white	piece	434	60	26,040
22	assembly line PMWG - 0.75 mm	m	4,000	1	4,000
23	assembly line PMWG - 2.50 mm	m	3,000	1	3,000
24	rectifier WAK 13	piece	32	35	1,120
25	accumulators ABN - 72	piece	984	360	354,240
26	cable SPPB 3 x 1	m	1,500	2	3,000
27	cable SPPB 7 x 1	m	1,500	2	3,000
28	cable SPPB 16 x 1	m	1,500	2	3,000
29	cable SPPB 24 x 1	m	1,450	2	2,900
30	cable SPPB 38 x 1	m	1,350	2	2,700
31	relay OMW - 2 / 40	piece	80	15	1,200
	total				**775,355**

Annex 4.2.2-3

Renewal costs of signalling installations on ARM stations

no.	name of the station	km	switches [1]	signals [2]	presence-of-trains indicating equipment [3]	costs in US $
1	Archut	2662	4	19	6	1,024,000
2	Spitak	2673	15	22	18	1,780,000
3	Nalband	2683	6	17	12	1,136,000
4	Kaltakhchi	2693	7	18	11	1,192,000
5	Dshadshur	2702	11	19	13	1,416,000
6	Maisyan	2712	5	18	10	1,100,000
7	Gyumri	2723	67	80	62	6,852,000
	total					**14,500,000**

[1] unit price of a switch US $ 36
[2] unit price of a signal US $ 40
[3] unit price of a presence-of-trains indicating equipment US $ 20

Annex 4.2.2-4

Costs of maintenance of ARM signalling and telecommunication installations

no.	item	unity	number	unit price	costs in US $
1	measuring instruments for signalling installations	piece	70	300	21,000
2	measuring instruments for exchanges	piece	5	500	2,500
3	measuring instruments for telecommunication installations	piece	30	300	9,000
4	ohmmeter	piece	22	200	4,400
5	cable measuring instruments	piece	4	2,500	10,000
6	cable detectors	piece	4	5,000	20,000
7	equipment for cable assembly work	piece	10	30	300
8	pole climbers	pair	32	100	3,200
9	safety belts	piece	32	100	3,200
10	tool box, complete	piece	20	3,000	60,000
11	truckster	piece	12	50,000	600,000
12	truck with lifting gear	piece	3	300,000	900,000
13	small excavator	piece	2	50,000	100,000
14	cable trailer for cable laying	piece	2	20,000	40,000
15	costs of maintenance of repair shops and surveying centres	lump sum	2	25,000	50,000
	total				**1,823,600**

Annex 4.2.2-5

Laying of cables on the ARM lines

line	number	price/unit in US $	cost in US $
laying of the 1st cable on the main line Yerevan - Ayrum (stages 1 - 3)			
• glass-fibre cable	300 km	6.500	1.950.000
• transmission equipment (equipment)	33 stations	20.000	660.000
subtotal 1			2.610.000
laying of the 1st cable on the remaining lines (stages 4 - 6)			
• glass-fibre cable	390 km	6.500	2.535.000
• transmission equipment (equipment)	28 stations	20.000	560.000
subtotal 2			3.095.000
laying of the 2nd cable on the section Yerevan - Ayrum (measures of 3rd priority)			
• glass-fibre cable	300 km	7,000	2,100,000
• transmission equipment (equipment)	9 stations	20,000	180,000
subtotal 3			2,280,000
laying of the 2nd cable on the remaining lines (measures of 3rd priority)			
• glass-fibre cable	390 km	7000 US$/km	2730000 USD
• transmission equipment (equipment)	6 stations	20000 US$/st.	120000 USD
subtotal 4			2,850,000
total			**10,835,000**

Annex 4.2.2-6

Costs of ARM exchanges

no.	name of the station	subscribers (connections)	costs [1] in US $
1	Yerevan	2,000	400,000
2	Gyumri	2,000	400,000
3	Sanain	400	80,000
4	Vanadzor	500	100,000
5	Ayrum	100	20,000
6	Masis	500	100,000
7	Razdan	200	40,000
8	Sevan	200	40,000
9	Charentsavan	200	40,000
	total		**1,220,000**

[1] US $ 200 were estimated for the individual subscriber's connection in calculating the sums.

Annex 4.2.2-7

Costs of ARM train radio installations

no.	equipment	unit	number	unit price	costs in US $
1	FESA	piece	34	40,000	1,360,000
2	FADA	piece	74	20,000	1,480,000
3	aerials	piece	34	8,000	272,000
4	poles	piece	34	40,000	1,360,000
5	switching buildings	piece	34	20,000	680,000
6	equipment of locomotives	piece	92	40,000	3,680,000
	total				**8,832,000**

Annex 4.2.2-8

Costs of the complete equipment of AGZD stations with signalling facilities

no.	item	unit	number	unit price	costs in US $
1	complete light signals	pieces	113	14,000	1,582,000
2	complete ground signals	pieces	180	5,000	900,000
3	signal lenses	pieces	1,500	1,750	2,625,000
4	signal panel	pieces	200	5,000	1,000,000
5	assembly equipment for light signals	lump sum	1	1,200,000	1,200,000
6	complete switches drives	pieces	490	7,050	3,454,500
7	assembly equipment for switches drives	lump sum	1	1,192,500	1,192,500
8	impedance bonds with secondary winding	pieces	656	3,500	2,296,000
9	connection ropes	pieces	800	2,400	1,920,000
10	barrier motors	pieces	150	1,400	210,000
11	signalling cable	lump sum	1	3,000,000	3,000,000
12	axle-counter equipment	pieces	1,370	6,000	8,220,000
	total				**27,600,000**

Annex 4.2.2-9

Laying of cables on AGZD lines

line	number	price/unit in US $	costs in US $
laying of the 1st cable on the main line Baku - Beyuk-Kyassik (stages 1 - 5)			
• glass-fibre cable	503 km	6,500	3,269,500
• transmission equipment (equipment)	48 stations	20,000	960,000
subtotal 1			4,229,500
laying of the 1st cable on the remaining lines (stages 6 - 9)			
• glass-fibre cable	870 km	6,500	5,655,000
• transmission equipment (equipment)	85 stations	20,000	1,700,000
subtotal 2			7,355,000
laying of the 2nd cable on the main line Baku - Beyuk-Kyassik (measures of 3rd priority)			
• glass-fibre cable	503 km	7,000	2,100,000
• transmission equipment (equipment)	5 stations	20,000	100,000
subtotal 3			2,200,000
laying of the 2nd cable on the remaining lines (measures of 3rd priority)			
• glass-fibre cable	870 km	7,000	6,090,000
• transmission equipment (equipment)	8 stations	20,000	160,000
subtotal 4			6,250,000
total			20,034,500

Annex 4.2.2-10

Costs of AGZD exchanges

no.	name of the station	subscribers (connections)	costs[1] in US $
1	Baku administration	3,000	600,000
2	Baladshary	2,000	400,000
3	Baladshary settlement	1,500	300,000
4	Eybat	30	6,000
5	Puta	30	6,000
6	Karadag	100	20,000
7	Songachali	100	20,000
8	Duvanni	30	6,000
9	Aliat main station	500	100,000
10	Navagi	30	6,000
11	Kasi-Magomed	1,000	200,000
12	Padar	30	6,000
13	Sagiri	100	20,000
14	Kyrdamir	500	100,000
15	Udshary	300	60,000
16	Yaki	100	20,000
17	Yevlakh	1,000	200,000
18	Geran	30	6,000
19	Dalimamedly	30	6,000
20	Gyandsha	3,000	600,000
21	Gyandsha settlement	400	80,000
22	Alabashli	30	6,000
23	Dollyar	50	10,000
24	Taus	50	10,000
25	Akstafa	500	100,000
26	Beyuk-Kyassik	300	60,000
27	line to Yalama	1,300	260,000
28	line to Astara	800	160,000
29	line to Sadarak	3,850	770,000
	total		**4,138,000**

[1] US $ 200 were estimated for the individual subscriber's connection in calculating the sums.

Annex 4.2.2-11

Costs of AGZD train radio installations

no.	equipment	unit	number	unit price	costs in US $
1	FESA	pieces	37	40,000	1,480,000
2	FADA	pieces	77	20,000	1,540,000
3	aerials	pieces	37	8,000	296,000
4	poles	pieces	37	40,000	1,480,000
5	switching buildings	pieces	37	20,000	740,000
6	equipment of locomotives	pieces	100	40,000	4,000,000
	total				**9,536,000**

Annex 4.2.2-12

Costs of the complete equipment of GRZD stations with signalling facilities

no.	item	unit	number	unit price	costs in US $
1	complete light signals	pieces	375	14,00	5,250,00
2	complete ground signals	pieces	152	5,00	760,00
3	signal lenses	pieces	1,700	1,75	2,975,00
4	signal shade	pieces	350	5,00	1,750,00
5	assembly equipment for light signals	lump sum	1	1,600,00	1,600,00
6	complete switches drives	pieces	400	7,05	2,820,00
7	assembly equipment for switches drives	lump sum	1	1,636,00	1,636,00
8	impedance bonds with secondary winding	pieces	1,750	3,50	6,125,00
9	connection ropes	pieces	1,600	2,40	3,840,00
10	barrier motors	pieces	60	1,40	84,00
11	signalling cable	lump sum	1	3,500,00	3,500,00
12	axle-counter equipment	pieces	1,860	6,00	11,160,00
	total				**41,500,00**

Annex 4.2.2-13

Laying of cables on GRZD lines

line	number	price/unit in US $	costs in US $
Laying of the 1st cable on the main line Gardabani - Tbilisi - Poti/Batumi (stages 1 - 5)			
• glass-fibre cable	482 km	6,500	3,133,000
• transmission equipment	49 stations	20,000	980,000
subtotal 1			**4,113,000**
laying of the 1st cable on the remaining lines (stages 6 - 9)			
• glass-fibre cable	140 km	6,500	910,000
• transmission equipment	12 stations	20,000	240,000
subtotal 2			**1,150,000**
laying of the 2nd cable on the section Gardabani - Tbilisi - Poti/Batumi (measures of 3rd priority)			
• glass-fibre cable	482 km	7,000	3,374,000
• transmission equipment	11 stations	20,000	220,000
subtotal 3			**3,594,000**
laying of the 2nd cable on the remaining lines (measures of 3rd priority)			
• glass-fibre cable	140 km	7,000	980,000
• transmission equipment	4 stations	20,000	80,000
subtotal 4			**1,060,000**
laying of the 1st cable on the section Ingiri - Gachiani (included in the measures of 3rd priority)			
• glass-fibre cable	200 km		1,400,000
• transmission equipment	19 stations		380,000
subtotal 5			**1,780,000**
laying of the 2nd cable on the section Ingiri - Gachiani (measure of 3rd priority)			
• glass-fibre cable	200 km	7,000	1,400,000
• transmission equipment	4 stations	20,000	80,000
subtotal 6			**1,480,000**
total			**13,177,000**

Annex 4.2.2-14

Costs of GRZD exchanges

no.	name of station	subscribers (connections)	costs [1] in US $
1	Batumi	1,000	200,000
2	Poti	1,000	200,000
3	Senaki	400	80,000
4	Samtredia	3,000	600,000
5	Kutaissi	1,000	200,000
6	Zestafoni	500	100,000
7	Khashuri	3,000	600,000
8	Gori	500	100,000
9	Tbilisi	7,000	1,400,000
10	Rustavi	200	40,000
11	Gurdshani	500	100,000
12	Marneuli	200	40,000
13	Borshomi	200	40,000
	total		**3,700,000**

[1] US $ 200 were estimated for the individual subscriber's connection in calculating the sums.

Annex 4.2.2-15

Costs of GRZD train radio installations

no.	equipment	unit	number	unit price	costs in US $
1	FESA	piece	22	40,000	880,000
2	FADA	piece	79	20,000	1,580,000
3	aerials	piece	22	8,000	176,000
4	poles	piece	22	40,000	880,000
5	switching buildings	piece	22	20,000	440,000
6	equipment of locomotives	piece	100	40,000	4,000,000
	total				**7,956,000**

Annex 4.2.2-16

Proposal for the priority equipment of the main lines Baku-Tbilisi-Poti and Tbilisi-Yerevan with modern communication and computer technology (pilot project communication)

1 Introduction

The analysis of the conditions of the signalling and communication technology performed within the scope of the project „Joint Venture(s) for the Caucasian Railways" shows unambiguously that the technical condition and the functioning of the communication installations do not allow a secure operation of the train traffic at the three railways. Approximately 50 per cent of the cable and overhead cable network were dismantled, buildings were destroyed by military conflicts and earthquakes. Due to the lack of maintenance during many years the condition of the facilities were aggravated and they can only partly be used. This can especially be expressed by the following facts:

- the secure operation of the train traffic within the passenger and freight transport cannot be guaranteed due to the missing or desolate telecommunication infrastructure between the stations and the operating centres
- the data and voice services required for the operation of the railway transport cannot be realised neither with the required quality nor in time.
- the information interchange between the railways administrations of the three countries cannot or can only be realised through the network of the Russian railways
- the interchange of digital data for operating and logistic systems cannot be realised in real time.
- An interchange of information and data between the railways on one side and the corresponding means of transport like ports, shipping companies, forwarding companies and so on the other side is not possible
- the implementation of information systems on the basis of databases for transport clients is not possible due to the lack of missing communication facilities.

This brings significant competitive disadvantages, economical losses and negative influences on the railways transport to the railway administrations of Armenia, Azerbaijan and Georgia.

The three railway administrations have already expressed the priority of a working communication network during the TRACECA meeting (Fourth Working Group Meeting, Athens, October 17th - 18th 1996).

2 Task description

2.1 Overall tasks

On the basis of the above-mentioned conditions of the communication network the strategy purposed within the above-mentioned project plans the equipping of 5 main lines (2470 km) of the ARM, the AGZD and the GRZD with modern fibre optical cables and transmission technology in three phases.

The need in investments for the realisation of all three phases for the three railways administrations was calculated as follows:

	ARM	AGZD	GRZD	SUM
Mill. US$	25.1	38.5	31.4	94.9

Two cables are used along the line to guarantee the full reliability of the cable installation. An optical fibre cable with 12 fibres (cable A) and another cable with 6 fibres (cable B) will be laid. Both cables will be laid separately. Cable A will be connected with every station and cable B with every node. Both cables form a ring together with the corresponding transmission technology and consequently guarantee the required high redundancy for the transmission quality.

Cable A should be laid during the **first phase**. After the construction measures 30 stable channels per fibre are at the railways' disposal to satisfy their basic needs.
Cable B follows at the **second phase** and will allow the formation of a ring. Due to the use of modern communication technology 1920 channels per fibre will be at the railways' disposal which are sufficient to guarantee a secure train operation (see Annex 1).

The reconstruction of the **switching technology** is planned to be realised at a **third phase**.

2.2 Pilot project

By a short term provision of financial means of approximately 15 Mill. ECU by the EU the basic preparations, which already have practical influence, for the project can be realised as a first step of 1st phase and will lead to practical results for improving the communication system of the railways concerned. The technology obtained by these means is part of the whole task and offers necessary interfaces required for the signalling system. The proposed solution can be expanded to the final state without major technical and financial requirements. The interfaces for the voice and data communication required and the access to third networks can then be integrated at a later moment.

Territorially, it is proposed to concentrate this pilot project on the TRACECA corridor on the lines **Baku - Tbilisi - Poti** and **Tbilisi - Yerevan.** The lines will be equipped with optical fibre cables (12 fibres) and a transmission technology providing at the moment 30 channels (2 Megabit).

3 Project idea

3.1 Technical description of the pilot project

The idea of the project is to create the basis for a step-by-step innovation of the train control and signalling systems, of the communication technology and the data processing for the communication infrastructure on the TRACECA corridor with a limited expenditure. Therefore it is proposed to lay an optical fibre cable along the line Baku - Tbilisi - Poti as well as along the line Tbilisi - Yerevan. This cable should be realised as an self-supporting aerial cable with 12 fibres which will be mounted at the pylons of the catenary sytem. The cable will be connected with every station. For this reason at every station transmission devices (communicators, multiplexers) will be installed. Annex 2 shows an overall view. 1225 km of overhead optical fibre cable are to be laid.

	ARM	AGZD	GRZD
km	300	503	422

It is assumed that the existing pylons principally allow the mounting of the optical fibre cables (static and dynamic load). The concrete type of cable has to be determined during the projecting. Due to the faster and cheaper realisation an aerial cable is preferred in comparison with a cable laid in the ground.

The proposed cable with 12 fibres corresponds to the calculated need of the railways at the moment and and can be used for other communication purposes in a limited way in the future. The Annexes 3, 4 and 5 contain an overall view of the cables to be laid within the pilot project as well as graphs showing the share in the proposed total network. The Annexes 6, 7 and 8 show the locations for the installation of the required transmission facilities. To satisfy the basic need at the first time transmission technology for 30 channels (pulse code modulation - PCM) will be installed.

The following table provides an overview over the required transmission equipment:

Number of transmission stations

	ARM	AGZD	GRZD
• communicators	33	39	54
• PCM devices	33	39	54

The proposed transmission technology guarantees the use of the existing signalling and communication equipment and computers without additional technical requirements. The modal structure allows the access to external networks as well as internal expansions.

It is necessary to create a network management centre in Tbilisi for the management of the whole transmission network technology of the three countries. The equipment should consist of a server PC, decentralised connecting devices, spare parts, special software tools and measurement technology.

At the moment the real need in PC's and modems cannot be calculated due to the insufficient progress of the data-processing project. This need has been included into the „Contingencies".

3.2 Cost requirements

The cost calculating was performed on the basis of two budget offers resulting in the expected following cost requirements

costs for the optical fibre cable per km 7,500 US$

costs per transmission station 20,000 US$

This results to the following general cost requirements (in million US$)

	Cable	Stations	SUM
ARM	2.25	0.66	2.91
AGZD	3.77	0.78	4.55
GRZD	3.17	1.08	4.25
network management centres			0.88
Sum of investments			12.59
preparation 15%			1.89
Total			**14.48**

4 Project preparation and implementation

For the co-ordination and supervision of the project implementation it is suggested to create a temporary working group (ad hoc group) under the leadership of an European Consultant. Representatives of the ARM, AGZD and GRZD and of the European consulting firms should be members of this ad hoc group.

❒ The main aims of co-ordination are as follows:
- co-ordination of tenders for the communication network Poti, Tbilisi - Baku, Tbilisi - Yerevan;
- scheduling of works;
- receipt and evaluation of bids;
- assistance to negotiations;
- monitoring in the implementation phase;
- determination of the financing body;
- approval of the progress reports.

❒ The supervisory tasks are as follows:
- preparation of test programmes and evaluation of test results;
- inspection and control of works during pre-delivery, take-over, periodic and final warranty inspection;
- issuing of certification
- monitoring of project performance and progress;

❒ The set-up and training and operation implies:
- establishment of maintenance department/service centres in the three countries;
- preparation of maintenance contracts with telecommunication companies;
- organisation of training activities;
- establishment of an operations control centre (OCC);
- agreements regarding the leasing of communication channels;

The requirement for the project management is approximately 650,000 US$.

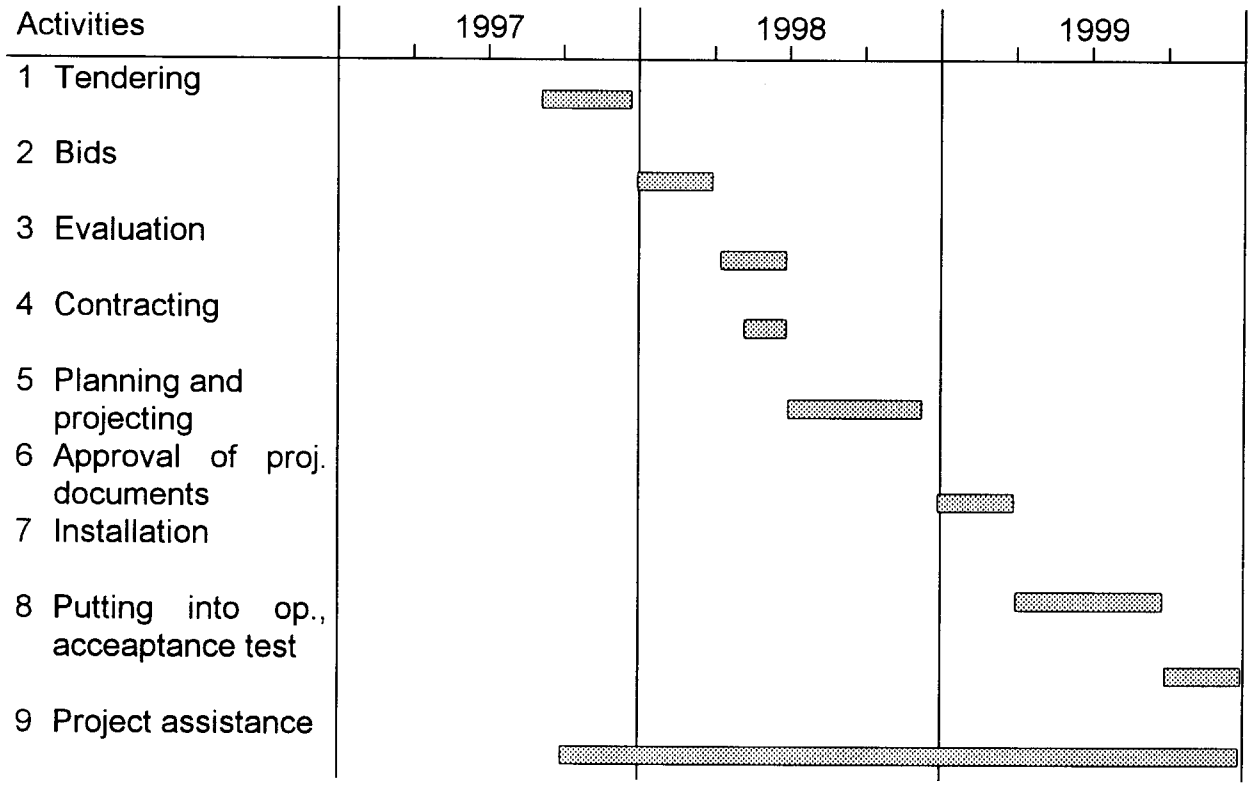
5 Training

For the realisation of the project the training of 17 experts is required.
Because the installation is planned under the leadership of a supervisor the training of the installation, maintenance and operating staff should be performed be the supplier.

Overview of training costs

	Costs
staff for the cable installation	25,000 US$
staff of the network management centre	106,000 US$
technicians of the main stations	72,000 US$
	203,000 US$

6 Masterplan



7 Summary

The presented proposal for the pilot project communication contents:

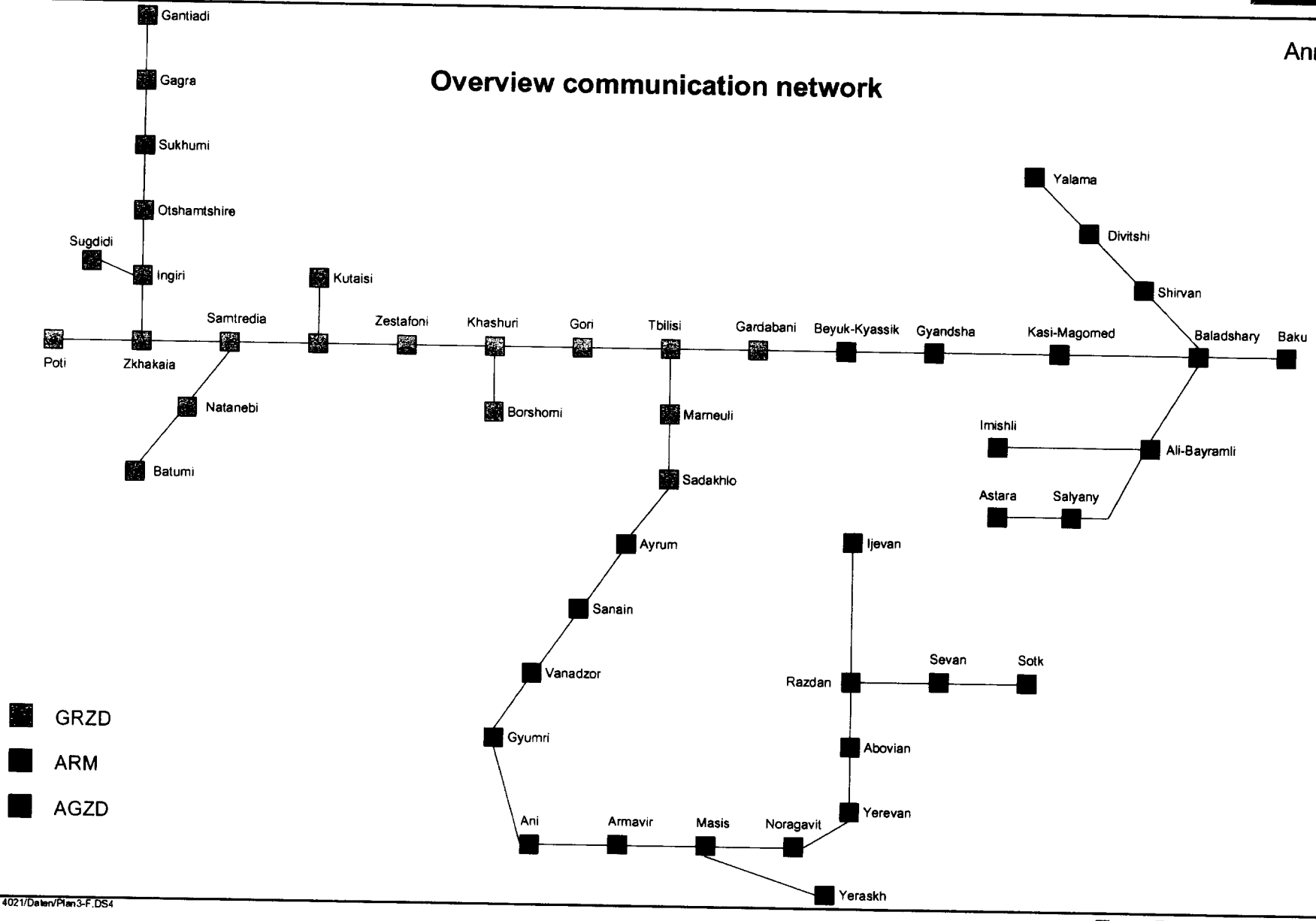
	Million US$	Million ECU
total cost volume	14,480	
project management	650	
training	203	
	15,333	13,939
Contingencies		1,061
		15,000

It is possible to realise the project till the end of 1999, if the decision concerning the provision of means and the tender is carried out until 12/97.

It is recommended to form the ad-hoc-group assisting the project implementation immediately after the approval of the means to make sure that the group can start tendering.

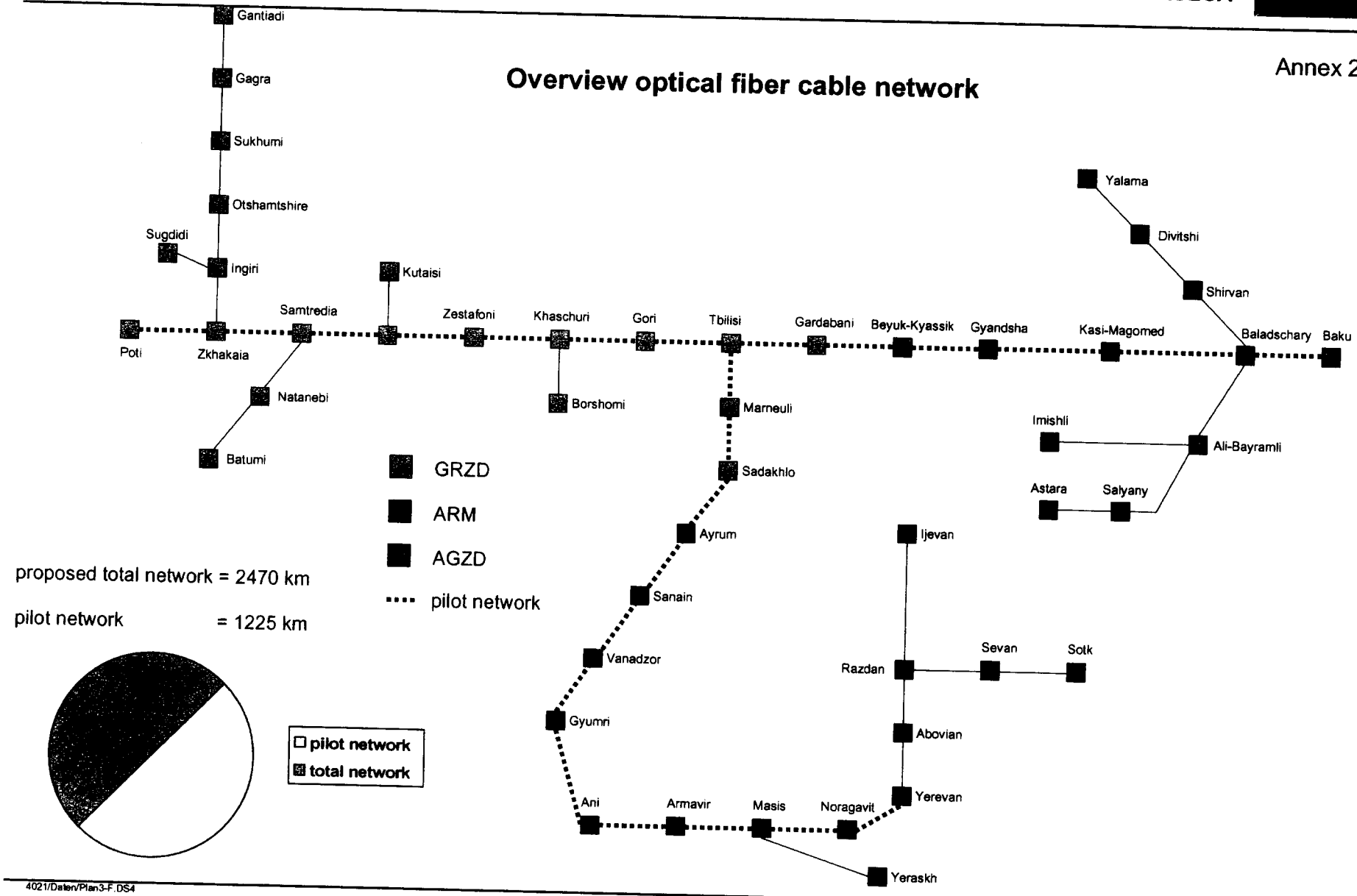
Annex 1

Overview communication network



Annex 2

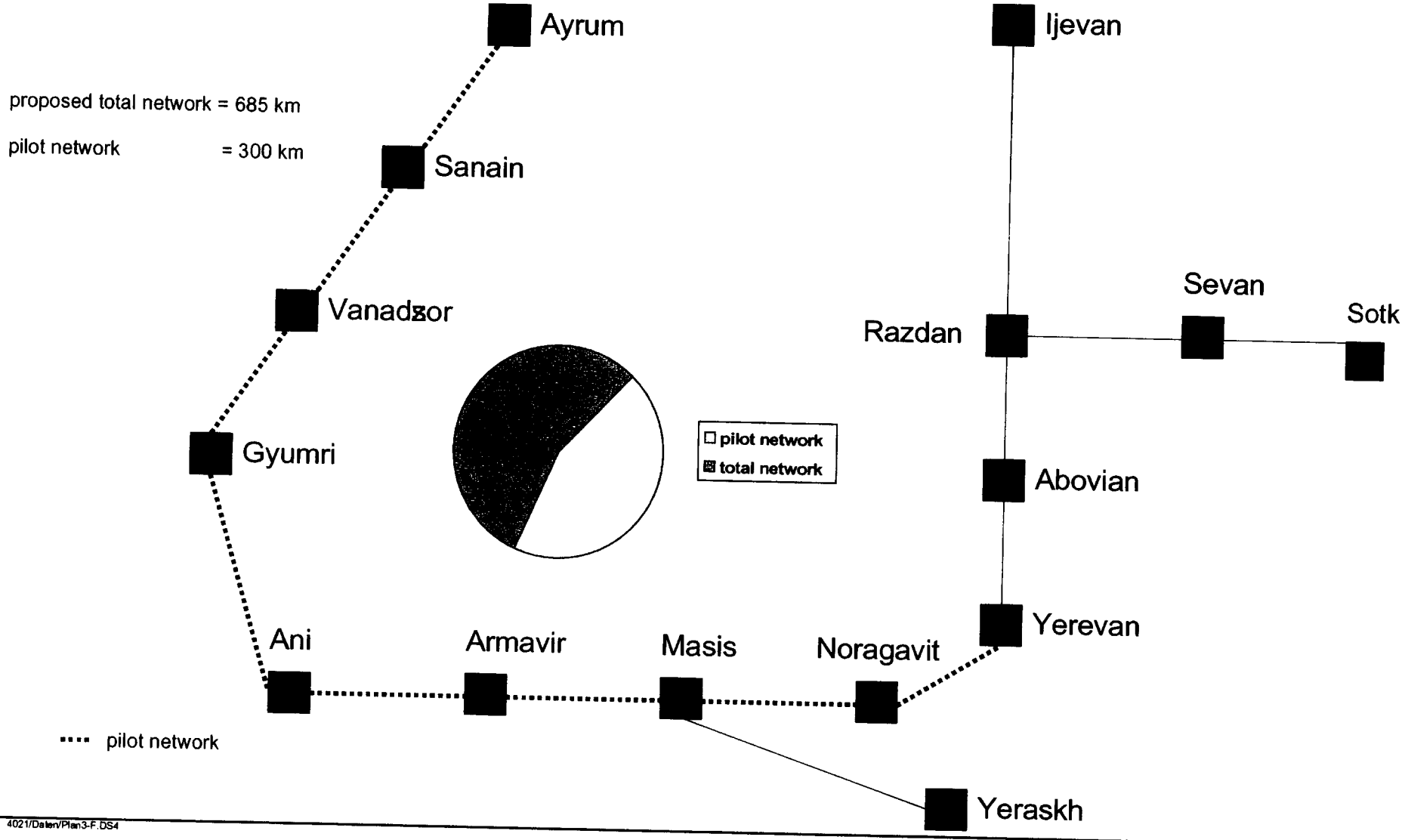
Overview optical fiber cable network



4021/Daten/Plan3-F.DS4

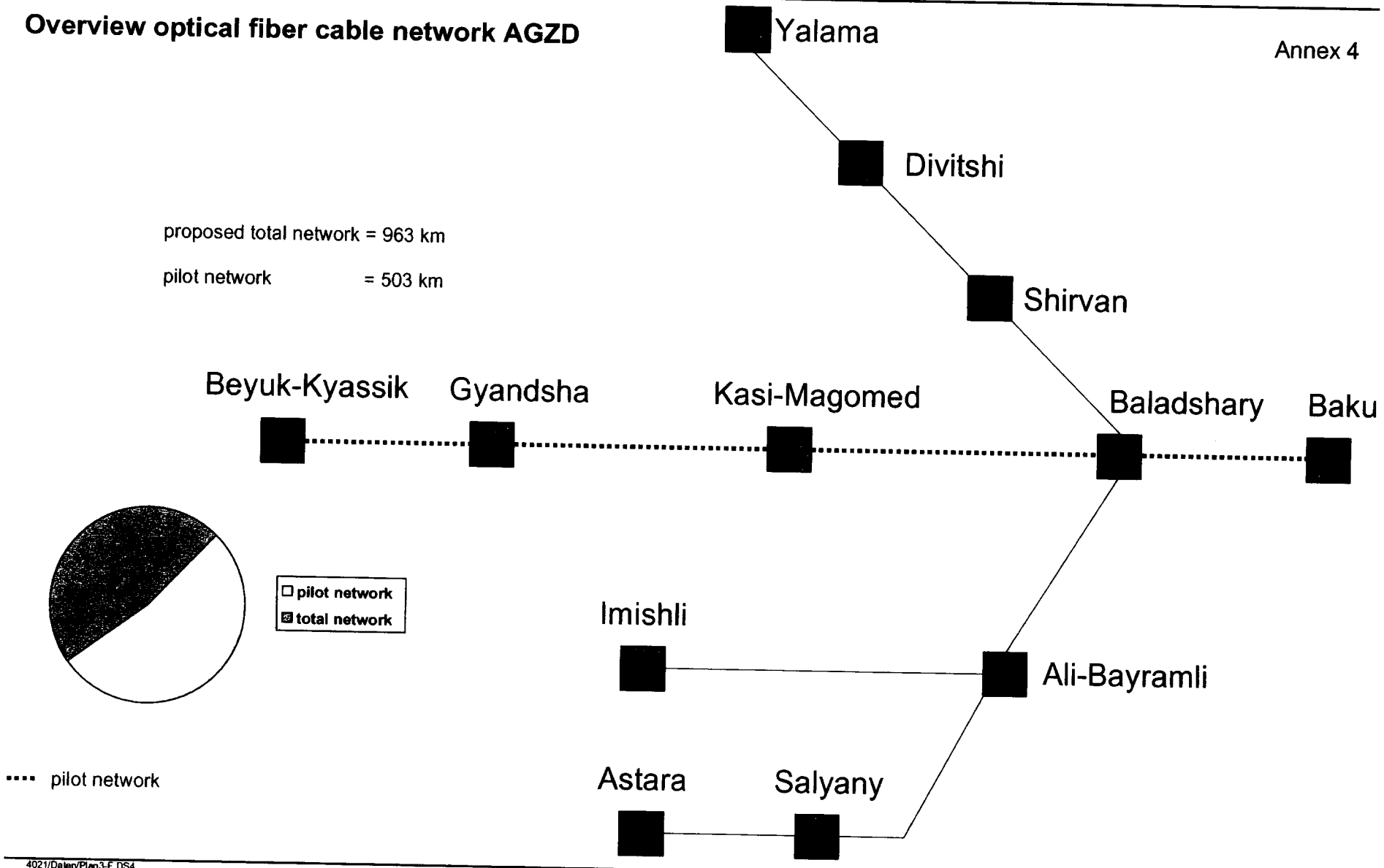
Overview optical fiber cable network ARM

Annex 3



Overview optical fiber cable network AGZD

Annex 4

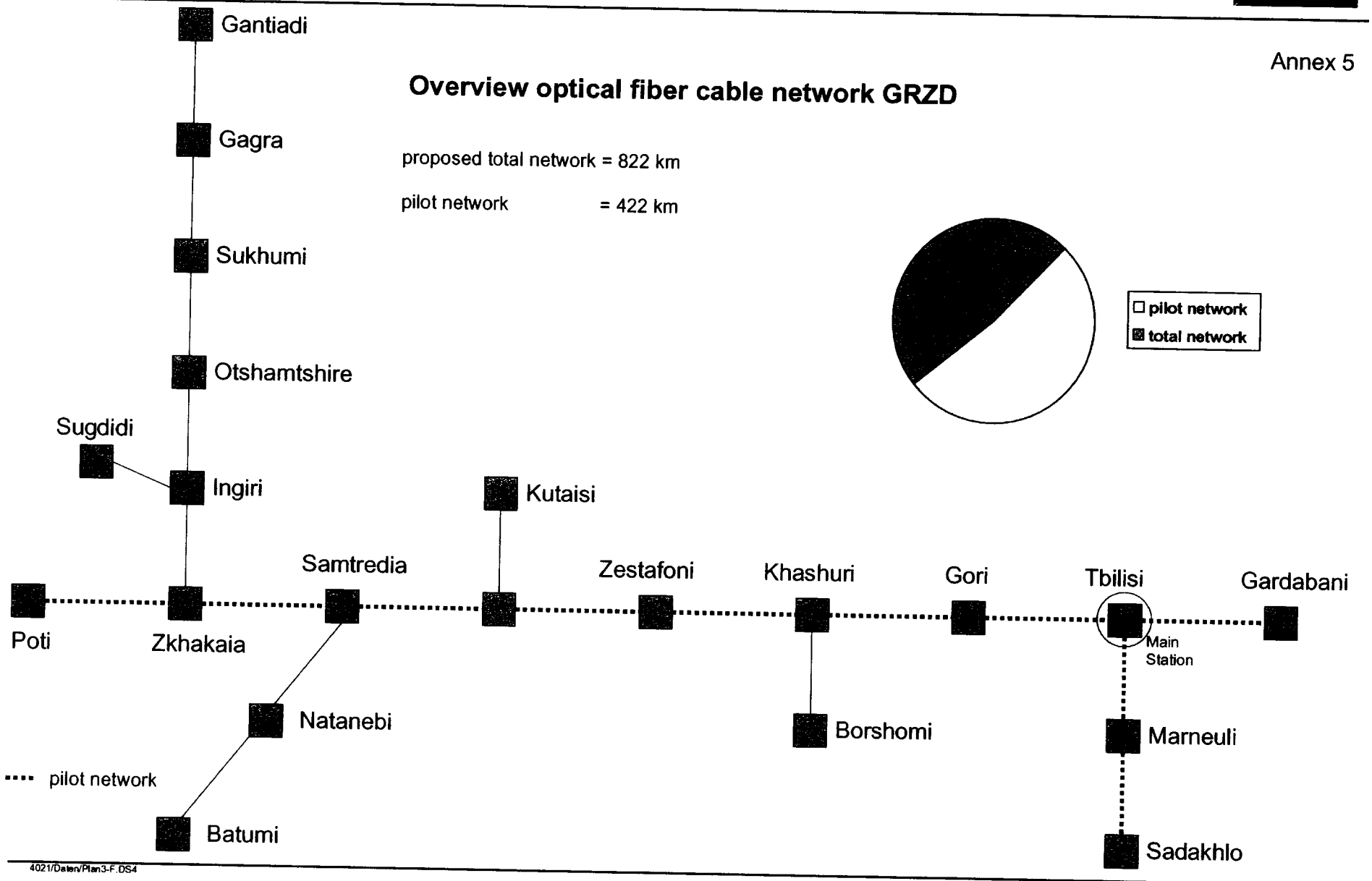


Annex 5

Overview optical fiber cable network GRZD

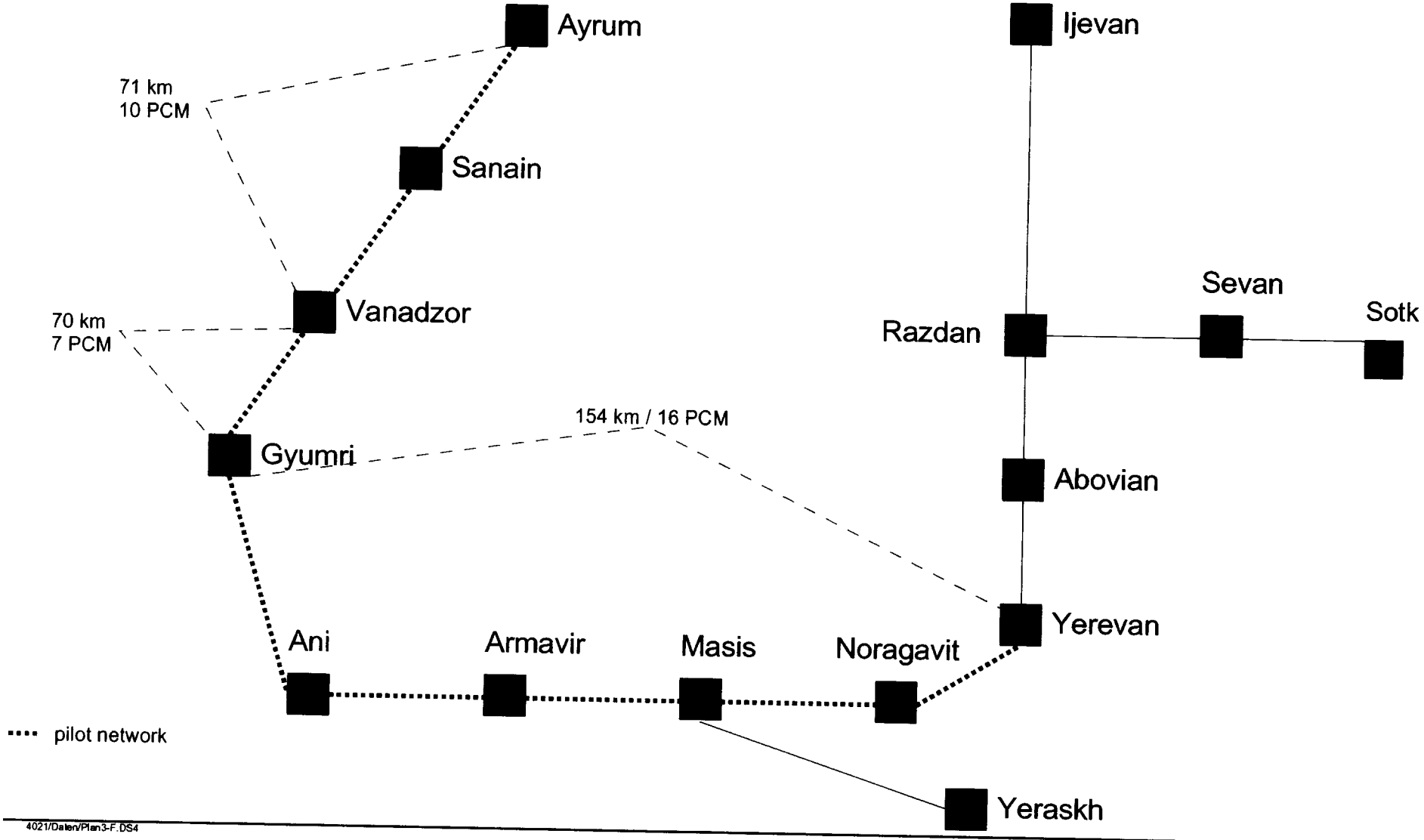
proposed total network = 822 km

pilot network = 422 km



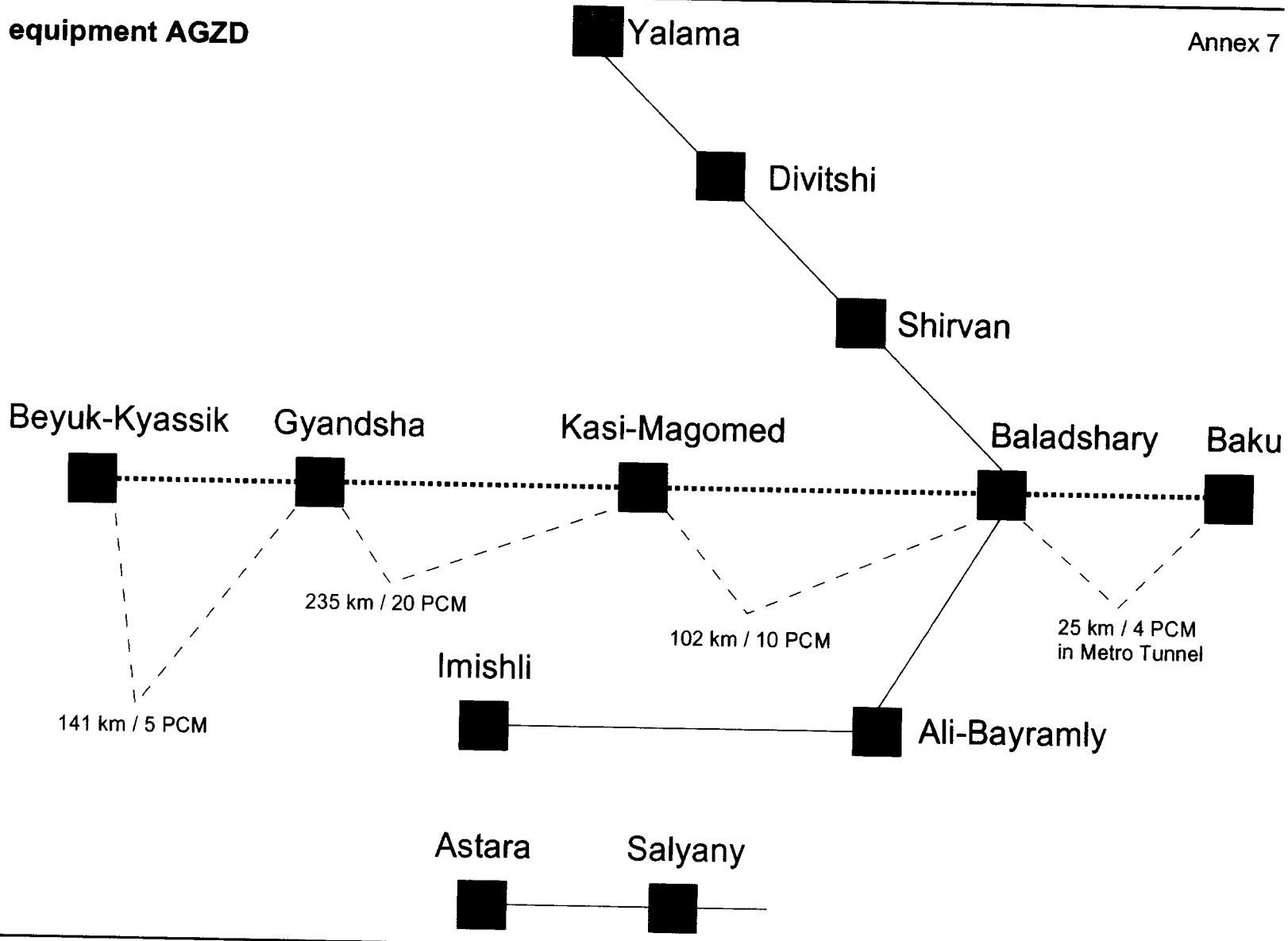
Transmission equipment ARM

Annex 6



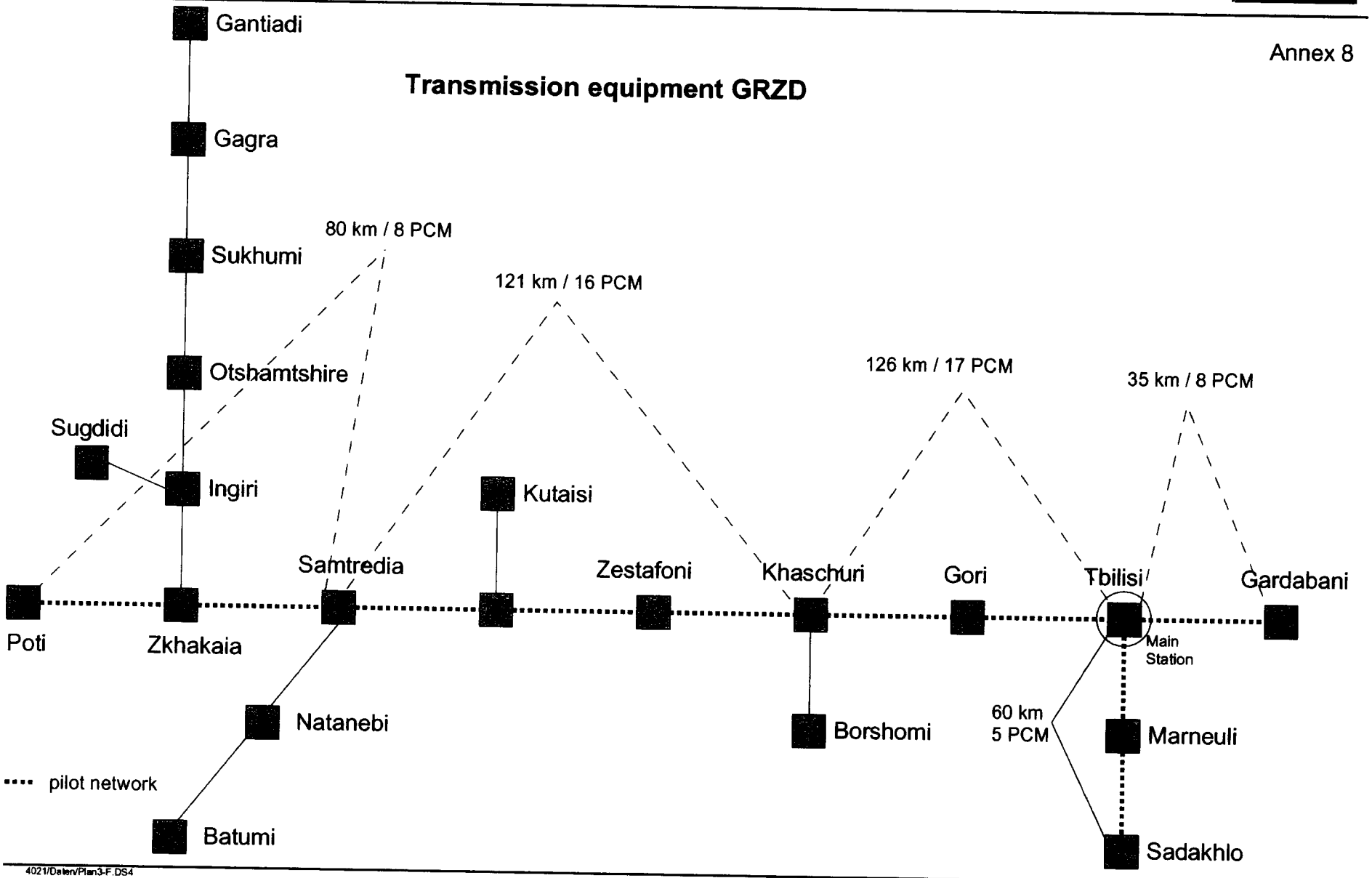
Transmission equipment AGZD

Annex 7



Annex 8

Transmission equipment GRZD



Annex 4.2.3-1

Investment costs for power supply equipment of the ARM

No.	Equipment	Unit	Quantity	Price/Unit in US$	Costs in US$
1	Replacement of rectifier units	piece	30	5,000	150,000
2	Rehabilitation of invertor units	piece	60	5,000	300,000
3	Replacement of corroded supports	piece	1927		150,000
4	Replacement of contact wires	km	310.5		750,000
5	Amplification and replacement of line feeder and supply feeder	piece	315		200,000
	total				**1,550,000**

Annex 4.2.3-2

Investment costs for power supply equipment of the AGZD

No	Equipment/ Material	Price/Unit in US$	Investment costs in US$			Total in US$
			1. priority	2. priority	3. priority	
	OCS System					
1	Reinforced concrete supports SO-136,6	207	103,500	310,500	517,500	931,500
2	Contact wire MF-100	3,310	66,200	331,000	1,059,200	1,456,400
3	Carrying cable M-120	3,793	75,860	379,300	1,213,760	1,668,920
4	Copper cable MGG- 95 (95 mm^2)	3,448	34,480	68,960	172,400	275,840
5	Copper cable MGG- 120 (120 mm^2)	3,793	37,930	75,860	189,650	303,440
6	OCS insulators IKSU- 27,5 kV	13	13,000	65,000	130,000	208,000
7	Section isolators SI-2	362	36,200	72,400	72,400	181,000
8	Isolators					
-	Type 1500/PF60-B , disk isolator	8	16,000	40,000	12,000	68,000
-	Type PTF 70	8	16,000	40,000	80,000	136,000
1	Safety shield equipment	17	1,700	1,700	1,700	5,100
2	Circuit insulators RKS- 3,3/400	477	23,850	47,700	95,400	166,950
3	Steel-cored cable AS- 70	2,965	148,250	593,000	1,482,500	2,223,750
4	Earthing diodes DS	172	17,200	34,400	51,600	103,200
5	Arc horn IMP-62	86	43,000	43,000	86,000	172,000
6	Post bracket non-isolated	258	129,000	258,000	516,000	903,000
7	Post bracket galvanised	345	172,500	345,000	690,000	1,207,500
8	Additional bracket	86	86,000	172,000	258,000	516,000
9	Motor drive UMP-P	345	17,250	17,250	34,500	69,000
1	OCS Insulators	86	8,600	8,600	8,600	25,800
2	Details for catenary system					
-	KS- 008-76	13	6,500	13,000	39,000	58,500
-	KS- 009- 76	13	6,500	13,000	39,000	58,500
-	KS- 011- 76	13	6,500	13,000	39,000	58,500
-	KS- 013- 76	13	6,500	13,000	39,000	58,500
-	KS- 040- 76	13	6,500	13,000	39,000	58,500
-	KS- 041- 76	13	6,500	13,000	39,000	58,500
-	KS- 043- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 046- 76	8.6	4,300	8,600	25,800	38,700

No	Equipment/ Material	Price/Unit in US$	Investment costs in US$			Total in US$
			1. priority	2. priority	3. priority	
-	KS- 049- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 053- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 054- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 055- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 059- 76	13	6,500	13,000	39,000	58,500
-	KS- 061- 76	13	6,500	13,000	39,000	58,500
-	KS- 063- 76	13	6,500	13,000	39,000	58,500
-	KS- 066- 76	13	6,500	13,000	39,000	58,500
-	KS- 069- 76	13	6,500	13,000	39,000	58,500
-	KS- 075- 76	13	6,500	13,000	39,000	58,500
-	KS- 0106- 76	13	6,500	13,000	39,000	58,500
-	KS- 109- 76	13	6,500	13,000	39,000	58,500
-	KS- 108- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 124- 76	8.6	4,300	8,600	25,800	38,700
-	KS- 126- 76	8,6	4,300	8,600	25,800	38,700
-	KS- 161- 76	8,6	4,300	8,600	25,800	38,700
1	OCS moving iron	8,6	430	860	1,720	3,010
2	Employee tool pack	17	850	1,700	3,400	5,950
	subtotal 1		1,181,800	3,174,230	7,480,330	11,836,360
	Autoblocking System					
1	Supports for autoblocking system 102	172	86,000	258,000	430,000	774,000
2	Porcelain isolator ShF- 20	4	4,000	8,000	20,000	32,000
3	Steel-cored cable AS-35	2,586	258,600	517,200	1,034,400	1,810,200
4	Insulating switch 3-pol RLND	473	23,650	47,300	141,900	212,850
5	Auxiliary transformer					
-	OM-125- 10/023 kV	690	138,000	207,000	207,000	552,000
-	OM-125- 60/023 kV	690	138,000	207,000	207,000	552,000
1	Wooden bracket (2 step)	35	3,500	7,000	14,000	24,500
2	Wooden bracket (4 step)	35	3,500	7,000	14,000	24,500
3	Wooden pole 85 m	172	34,400	86,000	172,000	292,400
4	Armoured cable 10 kV					
-	ASB-3 x 70	4,200	42,000	84,000	210,000	336,000
-	ASB 3 x 95	4,500	45,000	90,000	225,000	360,000
-	ASB 3 x 50	4,000	40,000	80,000	200,000	320,000

No	Equipment/ Material	Price/Unit in US$	Investment costs in US$			Total in US$
			1. priority	2. priority	3. priority	
1	Combined isolating switch PKN- 10	35	7,000	17,500	35,000	59,500
2	LV cable 3 x 70 + 1 x 25	7,278	72,780	145,560	363,900	582,240
	subtotal 2		896,430	1,761,560	3,274,200	5,932,190
	Traction Power Substation					
1	Rectifier unit 12-pulse TPED or TPDP	344,827	3,448,270	6,896,540	17,241,350	27,586,160
2	Traction power transformer TDN-10,000/110/10	206,900	2,069,000	4,138,000	6,207,000	12,414,000
3	High speed circuit breaker VAB 43	3,931	157,240	314,480	314,480	786,200
4	Circuit breaker 10 kV, VMP- 10	5,260	52,600	105,200	263,000	420,800
5	Circuit breaker 35 kV, MKP- 35	7,760	77,600	155,200	155,200	388,000
6	Oil circuit breaker VMT- 110	18,000	36,000	54,000	90,000	180,000
7	Voltage transformer NTMI- 10	690	34,500	34,500	69,000	138,000
8	Short circuit device KS- 110	1,725	34,500	34,500	69,000	138,000
9	Disconnecting switch OD- 110	5,175	103,500	103,500	310,500	517,500
	subtotal 3		6,013,210	11,835,920	24,719,530	42,568,660
	Energy Section					
1	Wooden poles 85 m	172	34,400	86,000	172,000	292,400
2	Steel- cored cable					
-	AS- 35	2,586	258,600	258,600	517,200	1,034,400
-	AS- 50	2,724	272,400	272,400	544,800	1,089,600
-	AS- 70	2,965	148,250	296,500	593,000	1,037,750
3	Isolators					
-	Sh- 20	4	2,000	8,000	8,000	18,000
-	TF- 20	0.5	1,000	1,000	1,000	3,000
4	HV cable 10 kV					
-	AAB 3 x 50	4,000	40,000	80,000	200,000	320,000
-	AAB 3 x 95	4,500	45,000	90,000	225,000	360,000
-	ABB 3 x 120	4,655	46,550	93,100	232,750	372,400
	subtotal 4		848,200	1,185,600	2,493,750	4,527,550
	Transport Section					
1	Motor inspection vehicle ADM	250,000	1,250,000	1,250,000	1,250,000	3,750,000

No	Equipment/ Material	Price/Unit in US$	Investment costs in US$			Total in US$
			1. priority	2. priority	3. priority	
2	Motor inspection vehicle AGV	250,000	1,250,000	1,250,000	1,250,000	3,750,000
3	Motor vehicle on base GAS 66	50,000	250,000	250,000	500,000	1,000,000
4	Driller for foundations	300,000	600,000	600,000	600,000	1,800,000
5	Motor driving crane	70,000	350,000	350,000	350,000	1,050,000
6	Support installation crane	100,000	100,000	200,000	500,000	800,000
7	Railway driving crane	300,000	300,000	300,000	300,000	900,000
	subtotal 5		4,100,000	4,200,000	4,750,000	13,050,000
	TOTAL		13,039,640	22,157,310	42,717,810	77,914,760

Annex 4.2.3-3

Investment costs for power supply equipment of the GRZD

No.	Rehabilitation Work	Investment costs in US$			
		1997	1998	1999	2000
	First Segment				
1	Reconstruction of feeding cable in station Ingiri (2 x 0.8 km)	14.06	0.00	0.00	0.00
2	Reconstruction of main transformer in station Cheta Dsalovani	0.00	117.19	0.00	0.00
3	Reconstruction of 2 traction aggregates in station Senaki	15.63	0.00	0.00	0.00
4	Reconstruction and amplification of 2 incoming feeders in station Samtredia	46.88	0.00	0.00	0.00
5	Reconstruction of substation Supsa	195.31	0.00	0.00	0.00
6	Reconstruction of the 2. traction aggregate in station Rioni	11.72	0.00	0.00	0.00
7	Reconstruction of the 2. traction aggregate in station Sestafoni	7.81	0.00	0.00	0.00
8	Changing of auxiliary transformer in station Marelis	2.34	0.00	0.00	0.00
9	Reconstruction of main transformer in station Zipa Dsalovani	117.19	0.00	0.00	0.00
10	Reconstruction of main transformer in station Lichi Dsalovani	0.00	0.00	117.19	0.00
11	Changing of auxiliary transformer in station Lichi Dsalovani	2.34	0.00	0.00	0.00
12	Changing of auxiliary transformer in station Metechi	2.34	0.00	0.00	0.00
13	Reconstruction of feeding input cable in station Tbilisi	19.53	0.00	0.00	0.00
14	Changing of about 50 battery sets	234.38	117.19	117.19	117.19
15	Changing of about 80 high speed circuit breakers	78.13	78.13	78.13	78.13
16	Reconstruction of OCS contact wire	0.00	0.00	0.00	0.00
	• Poti-Samtredia (21 km)	78.13	85.94	0.00	0.00
	• Batumi- Samtredia (59 km)	226.56	234.38	0.00	0.00
	• Sestafoni- Khashuri (4 km)	31.25	0.00	0.00	0.00
	• Khashuri- Tbilisi (41 km)	156.25	164.06	0.00	0.00
	• Tbilisi - Beyuk-Kyassik (7 km)	54.69	0.00	0.00	0.00

No.	Rehabilitation Work	Investment costs in US$			
		1997	1998	1999	2000
	• Tbilisi- Sadakhlo (20 km)	78.13	78.13	0.00	0.00
17	Reconstruction of carrying cables	0.00	0.00	0.00	0.00
	• Senak- Samtredia (30 km)	117.19	117.19	117.19	0.00
	• Samtredia- Sestafoni (25 km)	140.63	46.88	46.88	0.00
	• Sestafoni- Khashuri (5 km)	46.88	0.00	0.00	0.00
	• Khashuri- Tbilisi (18 km)	46.88	117.19	23.44	0.00
18	Reconstruction and amplification of feeding cables	0.00	0.00	0.00	0.00
	• Ingiri- Samtredia (20 km)	62.50	0.00	0.00	0.00
	• Samtredia- Sestafoni (10 km)	31.25	0.00	0.00	0.00
	• Sestafoni- Khashuri (8 km)	23.44	0.00	0.00	0.00
	• Khashuri- Tbilisi (20 km)	0.00	62.50	0.00	0.00
	• Tbilisi- Sadakhlo (10 km)	0.00	31.25	0.00	0.00
19	Reconstruction of OCS and feeding lines for SCADA	0.00	0.00	0.00	0.00
	• Samtredia- Sestafoni (5 km)	11.72	7.81	0.00	0.00
	• Sestafoni- Khashuri (11 km)	15.63	27.34	0.00	0.00
	• Khashuri- Tbilisi (10 km)	19.53	19.53	0.00	0.00
	• Tbilisi- Beyuk Kyassik (3 km)	11.72	0.00	0.00	0.00
20	Changing of corroded supports	0.00	0.00	0.00	0.00
	• Poti-Senaki (200 pcs.)	234.38	234.38	0.00	0.00
	• Senaki- Samtredia (100 pcs)	234.38	0.00	0.00	0.00
	• Samtredia- Batumi (400 pcs.)	234.38	468.75	78.13	0.00
	• Brozeuli- Rioni (100 pcs.)	0.00	234.38	0.00	0.00
	• Tbilisi- Sadakhlo (250 pcs.)	117.19	234.38	78.13	0.00
21	Reconstruction of traction power supplying lines	0.00	0.00	0.00	0.00
-	• Ingiri- Senaki (39 km)	39.06	39.06	0.00	0.00
-	• Poti- Senaki (39 km)	39.06	39.06	0.00	0.00
22	Reconstruction HV lines for autoblocking signalling systems	0.00	0.00	0.00	0.00
	• Poti- Chaladidi (15 km)	46.88	0.00	0.00	0.00
	• Senaki- Abasha (15 km)	46.88	0.00	0.00	0.00
	• Natanebi- Ureki (8 km)	25.00	0.00	0.00	0.00
	• Ureki- Supsa (7 km)	21.88	0.00	0.00	0.00
	• Samtredia- Kopidnari (9 km)	28.13	0.00	0.00	0.00

No.	Rehabilitation Work	Investment costs in US$			
		1997	1998	1999	2000
	• Rioni- Adshmeti (8 km)	25.00	0.00	0.00	0.00
	• Adshmeti- Sviri (9 km)	28.13	0.00	0.00	0.00
23	Reconstruction of HV lines (12 km)	39.06	39.06	0.00	0.00
24	Reconstruction of HV open- wire lines (6 km)	31.25	0.00	0.00	0.00
25	Reconstruction of LV lines (36 km)	15.63	31.25	0.00	0.00
26	Reconstruction of traction power supply substations (12 substations)	156.25	156.25	156.25	0.00
	subtotal	3262.58	2781.28	812.53	195.32
	Second Segment	0.00	0.00	0.00	0.00
1	Reconstruction of substations	0.00	0.00	0.00	0.00
	• Poti	0.00	0.00	156.25	156.25
	• Senaki	0.00	156.25	0.00	0.00
	• Supsa	234.38	0.00	0.00	0.00
	• Kopitnari	0.00	234.38	0.00	0.00
	• Rioni	156.25	0.00	0.00	0.00
	• Sestafoni	0.00	0.00	156.25	234.38
	• Grakali	0.00	0.00	117.19	78.13
	• Zipa	0.00	78.13	156.25	0.00
	• Agara	0.00	78.13	156.25	156.25
	• Barneuli	78.13	156.25	0.00	0.00
	• Sadakhlo	0.00	117.19	156.25	0.00
2	Building of new power supply substations	0.00	0.00	0.00	0.00
	• Chaladidi	0.00	234.38	312.50	0.00
	• Batumi	0.00	234.38	312.50	0.00
	• Tshakva	0.00	0.00	156.25	312.50
	• Tshapana	0.00	0.00	156.25	312.50
	• Kharagauli	0.00	156.25	312.50	0.00
	• Tbilisi- Marshalling Yard	0.00	0.00	0.00	468.75
3	Building and Reconstruction of 5 section posts in Tsadsvi, Chobi, Brozuela, Gomi and Skra	93.75	93.75	46.88	0.00
4	Reconstruction of OCS	0.00	0.00	0.00	0.00
	• Senaki- Poti (40 km)	97.66	97.66	97.66	97.66

No.	Rehabilitation Work	Investment costs in US$			
		1997	1998	1999	2000
	• Senaki- Samtredia (24 km)	78.13	78.13	117.19	0.00
	• Batumi- Samtredia (85 km)	125.00	281.25	125.00	171.88
	• Station Samtredia (1 station)	78.13	78.13	0.00	0.00
	• Brozeula- Rioni (4 km)	39.06	0.00	0.00	0.00
	• Station Zereteli (1 station)	39.06	39.06	0.00	0.00
	• Station Gomi (1 station)	58.59	0.00	0.00	0.00
	• Tbilisi- Rustavi (50 km)	0.00	0.00	234.38	351.56
	• Tbilisi- Sadakhlo (50 km)	117.19	117.19	117.19	234.38
5	Changing of corroded supports	0.00	0.00	0.00	0.00
	• Poti-Samtredia (100 pcs.)	39.06	0.00	0.00	0.00
	• Samtredia- Batumi (300 pcs.)	78.13	39.06	0.00	0.00
	• Kharagauli- Tbilisi (100 pcs.)	39.06	0.00	0.00	0.00
	• Tbilisi- Sadakhlo (100 pcs.)	39.06	0.00	0.00	0.00
6	Reconstruction and amplification of feeding cables	0.00	0.00	0.00	0.00
	• Ingiri- Samtredia (30 km)	31.25	31.25	31.25	0.00
	• Samtredia- Batumi (40 km)	31.25	31.25	31.25	31.25
	• Tbilisi- Samtredia (25 km)	31.25	31.25	15.63	0.00
	• Kharagauli- Tbilisi (15 km)	15.63	15.63	0.00	0.00
	• Tbilisi- Sadakhlo (10 km)	15.63	15.63	0.00	0.00
7	New building of feeding lines	0.00	0.00	0.00	0.00
	• Senaki- Samtredia (27 km)	35.16	35.16	0.00	0.00
	• Sestafoni- Choropani (3 km)	7.81	0.00	0.00	0.00
8	Modernisation of OCS frogs (500 pcs.)	46.88	35.16	35.16	0.00
9	Reconstruction of substation buildings in	0.00	0.00	0.00	0.00
	• Poti	117.19	0.00	0.00	0.00
	• Natanebi	0.00	117.19	0.00	0.00
10	Reconstruction of HV- LV energy section (40)	78.13	78.13	78.13	78.13
11	Reconstruction of traction transformers (12)	117.19	117.19	117.19	117.19
	subtotal 2	1918.01	2777.41	3195.35	2800.81
	total	**5180.59**	**5558.69**	**4007.88**	**2996.13**

Annex 4.2.3-4

Investment costs for power supply equipment of the GRZD

No.	Equipment	Type	Unit	Required Volume	Price/Unit in US$	Investment costs in US$
1	Contact wire	MF- 100	t/km	60	6,000	360,000
2	Carrying cable	M-120	t/km	5	6,000	30,000
3	Carrying cable (bimetal.)	PBSM-70	t/km	20	3,500	70,000
4	Steel-cored cable 70 mm^2	AS- 70	t/km	30	3,500	105,000
5	Steel-cored cable 50 mm^2	AS- 50	t/km	30	3,000	90,000
6	Aluminium cable 185 mm^2	A- 185	t/km	20	5,000	100,000
7	Copper cable	MGG -95	t/km	5	6,000	30,000
8	Control cable	AKPSVT	t/km	10	6,000	60,000
9	Auxiliary transformer 6 and 10 kV	OM- 1.25 to 2,5 kVA	pcs.	60	400	24,000
10	Auxiliary transformer 6 and 10 kV	OM- 4.0 to 10.0 kVA	pcs.	20	600	12,000
11	OCS disconnecting switch	PS-3000	pcs.	30	1,000	30,000
12	Motor drives for 11.	UMP-II	pcs.	30	500	15,000
13	OCS Isolators	PF- 70-A	pcs.	4,000	30	120,000
14	OCS Isolators	SF- 70-A	pcs.	2,000	30	60,000
15	Isolators for 10 kV	ShF- 20	pcs.	4,000	25	100,000
16	Disconnecting switch	RLND-10	pcs.	30	1,000	30,000
17	Transformer 6 and 10 kV	KTP 25 to 100 kVA	pcs.	30	1,500	45,000
18	OCS inspection car	Murot	pcs.	6	180,000	1,080,000
19	Motor cars	GAS 66	pcs.	6	30,000	180,000
	total					**2,541,000**

Annex 4.2.3-5:

Investment costs for power supply equipment of the GRZD

No.	Equipment	Type	Required Volume	Price/Unit in US$	Required investment costs in US$			
					now	1. Priority	2. Priority	3. Priority
1	Traction power transformer	TDN-10,000/ 100	13	450	1,350	900	900	2,700
2	Auxiliary transformer	TM- 250-35/0.23	2	10	20	0	0	0
3	Auxiliary transformer	TM-250-10/0.4	10	10	20	40	40	0
4	Auxiliary transformer	TM-250-10/0.4	6	5	5	15	10	0
5	Circuit breaker	MKP- 110 M	16	20	120	40	60	100
6	Circuit breaker	VMD- 35	1	3	3	0	0	0
7	Circuit breaker	VMD- 10	36	26	338	260	260	0
8	Disconnecting switch	RLND- 110	120	80	4,800	1,600	1,600	1,600
9	Disconnecting switch	RLN- 35	20	20	400	0	0	0
10	Voltage transformer	NKF- 110	18	20	360	0	0	0
11	Voltage transformer	SNOM- 35	5	5	25	0	0	0
12	Voltage transformer	NTMI- 10	20	1.5	30	0	0	0
13	Voltage transformer	NTMI- 6	15	1.5	22.5	0	0	0
14	Disconnectors	RVS- 110	4	2	8	0	0	0
15	Circuit breaker RU- 10 kV	VMG -133	20	40	800	0	0	0
16	Circuit breaker RU- 10 kV	VMP- 10	30	60	1,800	0	0	0
17	Circuit breaker RU- 3.3 kV		40	40	800	400	400	0
18	Rectifier units	UVKE, PVE-3.5 VIPE	22	150	600	600	600	1,500
19	High speed circuit breaker	VAB 28	30	120	3,600	0	0	0

No.	Equipment	Type	Required Volume	Price/Unit in US$	Required investment costs in US$			
					now	1. Priority	2. Priority	3. Priority
20	High speed circuit breaker	VAB 43- 4000	10	60	600	0	0	0
21	Battery sets	SK 6-12	35	300	6,000	1,500	3,000	0
22	Charger units	VU-24, VASP	20	10	100	50	50	0
23	Filter units	FU	10	3	6	12	12	0
24	Signalling lamps 110V, 8W	SZ-21	8000	0.4	800	800	800	800
25	Signalling lamps 220V, 15W	RNZ	3500	0.2	200	100	200	200
26	Measurement equipment Kilo- Ammeter DC	M-1611/ 4 kV	300	0.5	50	25	25	50
27	Measurement equipment Kilo- Voltmeter DC	M1611/ 4 kV	300	0.5	50	25	25	50
28	Relay units	PT, RNT, RP, RU	600	1	200	100	100	100
29	HV cables	3 x 240 mm^2	1.5 km	15	22.5	0	0	0
30	HV cables	AS- 120	10 km	35	350	0	0	0
31	Diodes	VL-200-10B	10,000	20	40,000	40,000	40,000	80,000
32	Transformer oil		720 t	100	12,000	12,000	24,000	24,000
33	Transformer acid		25 t	5	25	25	25	50
34	OCS inspection vehicle	LIK 10 M	6	130	390	130	260	0
	total				**75,895**	**58,622**	**72,367**	**111,150**

Annex 4.2.4-1

Investment and repair costs for stations of ARM

No.	Investment costs for stations in US$				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms and other facilities for passenger traffic	total
1	Ayrum	120,820	n/a	10,500	131,320
2	Sanain	178,400	n/a	15,000	193,400
3	Vanadzor	402,254	23,000	27,000	452,254
4	Gyumri	54,196	89,000	40,000	183,196
5	Akhuryan	164,422	21,500	15,000	200,922
6	Artik	16,408	6,500	5,300	28,208
7	Dalarik	256,606	4,300	3,000	263,906
8	Armavir	417,380	20,000	8,400	445,780
9	Etshmiadzin	379,437	8,000	6,500	393,937
10	Masis	1,200,000	-	15,000	1,215,000
11	Ararat	505,916	-	15,000	520,916
12	Karmir Blur	309,549	5,000	8,000	322,549
13	Yerevan	960,000	78,000	90,000	1,128,000
14	Abovian	354,141	8,000	12,000	374,141
15	Charentsavan	455,324	4,300	38,000	497,624
16	Razdan	303,549	10,700	20,000	334,249
17	Sevan	379,437	21,500	10,000	410,937
18	Kakavadsor	505,916	-	5,000	510,916
19	Dilijan	not available	25,800	5,000	30,800
20	Ijevan	not available	-	30,000	30,000
	total	**6,963,755**	**325,600**	**378,700**	**7,668,055**

Annex 4.2.4-2

Investment costs for stations of ARM by priorities

No.	Investment costs for stations by 1. priority in USD				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms, other facilities for pass. traffic	total
1	2	3	4	5	6
1	Ayrum	120,820	n/a	10,500	131,320
2	Sanain	178,400	n/a	15,000	193,400
3	Vanadzor	402,254	23,000	27,000	452,254
4	Gyumri	54,196	89,000	40,000	183,196
5	Dalarik	256,606	-	-	256,606
6	Armavir	417,380	-	-	417,380
7	Etshmiadzin	379,437	-	-	379,437
8	Masis	1,200,000	-	15,000	1,215,000
9	Karmir Blur	309,549	5,000	8,000	322,549
10	Yerevan	960,000	78,000	90,000	1,128,000
	total	**4,278,642**	**195,000**	**205,500**	**4,679,142**

No.	Investment costs for stations by 2. priority in USD				
1	2	3	4	5	6
1	Akhuryan	164,422	21,500	15,000	200,922
2	Dalarik	-	4,300	3,000	7,300
3	Armavir	-	20,000	8,400	28,400
4	Etshmiadzin	-	8,000	6,500	14,500
5	Ararat	505,916	-	15,000	520,916
	in total	**670,338**	**53,800**	**47,900**	**772,038**

No.	Investment costs for stations by 3. priority in USD				
1	2	3	4	5	6
1	Artik	16,408	6,500	5,300	28,208
2	Abovian	354,141	8,000	12,000	374,141
3	Charentsavan	455,324	4,300	38,000	497,624
4	Razdan	303,549	10,700	20,000	334,249
5	Sevan	379,437	21,500	10,000	410,937
	total	**1,508,859**	**51,000**	**85,300**	**1,645,159**

Annex 4.2.4-3

Investment and repair costs for stations of AGZD

No.	Investment costs for stations in US$				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms and other facilities for passenger traffic	total
1	Baku Pass.	2,173,760	n/a	120,000	2,293,760
2	Baku Tov.	842,000	2,000	n/a	844,000
3	Kishli-Baku	3,776,396	20,500	27,000	3,823,896
4	Baladshary	4,649,600	9,800	40,000	4,699,400
5	Aliat	896,149	n/a	15,000	911,149
6	Kasi-Magomed	2,649,615	n/a	5,300	2,654,915
7	Yevlakh	1,158,600	16,000	3,000	1,177,600
8	Gyandsha	500,000	18,500	8,400	526,900
9	Akstafa	745,620	n/a	6,500	752,120
10	Beyuk-Kyassik	1,429,200	n/a	15,000	1,444,200
11	Yalama	430,000	n/a	15,000	445,000
12	Divitshi	790,000	n/a	8,000	798,000
13	Shirvan	1,750,000	n/a	90,000	1,840,000
14	Ali-Bairamly	2,049,700	n/a	12,000	2,061,700
15	Imishli	2,880,600	n/a	38,000	2,918,600
16	Goradis	220,000	12,000	20,000	252,000
17	Salyany	741,500	4,800	10,000	756,300
18	Astara	3,280,700	n/a	5,000	3,285,700
	total	**30,963,440**	**83,600**	**438,200**	**31,485,240**

Annex 4.2.4-4

Investment costs for stations of AGZD by priorities

No.	Investment costs for stations by 1. priority in USD				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms and other facilities for passenger traffic	total
1	2	3	4	5	6
1	Baku Pass.	0	n/a	120,000	120,000
2	Kishli-Baku	3,776,396	20,500	27,000	3,823,896
3	Baladshary	4,649,600	9,800	40,000	4,699,400
4	Aliat	896,149	n/a	15,000	911,149
5	Kasi-Magomed	2,649,615	n/a	5,300	2,654,915
6	Yevlakh	1,158,600	16,000	3,000	1,177,600
7	Gyandsha	500,000	18,500	8,400	526,900
	total	**13,630,360**	**64,800**	**218,700**	**13,913,860**

No.	Investment costs for stations by 2. priority in USD				
1	2	3	4	5	6
1	Baku Pass.	2,173,760	n/a	0	2,173,760
2	Baku Tov.	842,000	2,000	n/a	844,000
3	Akstafa	745,620	n/a	6,500	752,120
4	Beyuk-Kyasik	1,429,200	n/a	15,000	1,444,200
5	Yalama	430,000	n/a	15,000	445,000
6	Divitshi	790,000	n/a	8,000	798,000
7	Shirvan	1,750,000	n/a	90,000	1,840,000
	total	**8,160,580**	**2,000**	**134,500**	**8,297,080**

No.	Investment costs for stations by 3. priority in USD				
1	2	3	4	5	6
1	Ali-Bairamly S.	2,049,700	n/a	12,000	2,061,700
2	Imishli	2,880,600	n/a	38,000	2,918,600
3	Goradis	220,000	12,000	20,000	252,000
4	Salyany	741,500	4,800	10,000	756,300
5	Astara	3,280,700	n/a	5,000	3,285,700
	total	**9,172,500**	**16,800**	**85,000**	**9,274,300**

Annex 4.2.4-5

Investment and repair costs for stations of GRZD

No.	Investment costs for stations in US$				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms and other facilities for passenger traffic	total
1	Poti	48,700	-	40,000	88,700
2	Samtredia	2,500,000	-	55,000	2,555,000
3	Zestafoni	1,650,000	5,400	25,000	1,680,400
4	Khashuri	40,000	18,100	16,000	74,100
5	Gori	2,300,000	3,000	16,000	2,319,000
6	Tbilisi Tov.	2,100,000	5,000	4,000	2,109,000
7	Tbilisi Pass.	2,200,000	n/a	120,000	2,320,000
8	Tbilisi Usl.	4,200,000	n/a	80,000	4,280,000
9	Tbilisi Sort.	4,500,000	n/a	4,000	4,504,000
10	Gardabani	1,850,000	n/a	8,000	1,858,000
11	Batumi	4,100,000	22,000	16,000	4,138,000
12	Marneuli	1,900,000	-	8,000	1,908,000
13	Sadakhlo	1,820,000	n/a	8,000	1,828,000
	total	**29,208,700**	**53,500**	**400,000**	**29,662,200**

Annex 4.2.4-6

Investment costs for stations of GRZD by priorities

No.	Investment costs for stations by 1. priority in US$				
	Name	Tracks (not including transport of materials)	Facilities for freight loading and unloading	Building, platforms and other facilities for passenger traffic	total
1	2	3	4	5	6
1	Poti	48,700	-	40,000	88,700
2	Samtredia	2,500,000	-	55,000	2,555,000
3	Gori	2,300,000	3,000	16,000	2,319,000
4	Tbilisi Tov.	2,100,000	5,000	4,000	2,109,000
5	Tbilisi Pass.	0	n/a	120,000	120,000
6	Gardabani	1,850,000	n/a	8,000	1,858,000
7	Batumi	0	22,000	16,000	38,000
8	Sadakhlo	1,820,000	n/a	8,000	1,828,000
	total	**10,618,700**	**30,000**	**267,000**	**10,915,700**

No.	Investment costs for stations by 2. priority in USD				
1	2	3	4	5	6
1	Tbilisi Pass.	2,200,000	n/a	0	2,200,000
2	Tbilisi Usl.	4,200,000	n/a	80,000	4,280,000
3	Tbilisi Sort.	4,500,000	n/a	4,000	4,504,000
4	Batumi	4,100,000	0	0	4,100,000
	total	**15,000,000**	**0**	**84,000**	**15,084,000**

No.	Investment costs for stations by 3. priority in USD				
1	2	3	4	5	6
1	Zestafoni	1,650,000	5,400	25,000	1,680,400
2	Khashuri	40,000	18,100	16,000	74,100
3	Marneuli	1,900,000	-	8,000	1,908,000
	total	**3,590,000**	**23,500**	**49,000**	**3,662,500**

Annex 4.2.5-1

Investment costs concerning equipment and facilities for container handling of ARM

No.	Name of terminal	Measures	Investment costs in US$
1	Karmir Blur	general overhaul of the gantry crane mechanical part	23,000
		electrical part	30,000
		procurement of a 40' spreader	14,000
		rehabilitation of lighting installation and electrical supply system (wires, transformer, overhead line, lamps, spots, etc.)	74,300
	subtotal 1		141,300
2	Gyumri	repairs to fencing and road access	10,000
		general overhaul of the gantry crane	20,000
	subtotal 2		30,000
3	Vanadzor	general overhaul of the gantry crane	5,000
		repairs to storage area and fencing	35,000
	subtotal 3		40,000
	total		**211,300**

Annex 4.2.5-2

Investment costs concerning equipment and facilities for container handling of AGZD

No.	Name of terminal	Measures	Investment costs in US$
1	Kishli-Baku	various repairs to fencing, lighting installation and equipment	10,000
2	Gyandsha	procurement of a 40' reach stacker (high-capacity fork lift truck) and various light repairs	440,000
	total		**450,000**

Annex 4.2.5-3

Investment costs concerning equipment and facilities for container handling of GRZD

No.	Name of terminal	Measures	Investment costs in US$
1	Tbilisi Tov.	• repairs to three cranes	40,000
		• repairs to the craneways	15,000
		• repair and paint of the gantry crane	10,000
	subtotal 1		65,000
2	Samtredia	• repairs to the craneway	7,000
		• repairs to the contact wire	1,800
		• purchase of 300 m of wire	9,200
	subtotal 2		18,000
	Poti (Railway station)	• construction of an area for handling 20' and 40' (no specification has been provided by GRZD)	200,000
	subtotal 3		200,000
	Batumi (Railway station)	construction of a new area for handling 20' and 40' (no specification has been provided by GRZD, project already exists)	200,000
	subtotal 4		200,000
	Gori	• repairs to the crane	2,000
		• repairs to the crane-way	2,000
	subtotal 5	•	4,000
	total		**487,000**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998	VL-8	8	250	2,000
1.1.2	1999	VL-8	8	250	2,000
1.1.3	2000	VL-8	9	250	2,250
1.1.4	2001	VL-8	10	250	2,500
1.1.5	2011 - 2015	VL-8	12	250	3,000
	subtotal		47		**11,750**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	3	100,000	300,000
1.2.2	1999	VL-8	3	100,000	300,000
1.2.3	2000	VL-8	3	100,000	300,000
1.2.4	2001	VL-8	3	100,000	300,000
1.2.5	2002 - 2005	VL-8	12	2,170	104,176
1.2.6	2006 - 2010	VL-8	12	2,170	130,220
	subtotal				**1,434,396**
1.3	**Maintaining programme (VL-10)**				
1.3.1	1998 - 2000	VL-10	44	25,000	3,300,000
1.3.2	2001 - 2005	VL-10	44	25,000	5,500,000
1.3.3	2006 - 2010	VL-10	44	25,000	5,500,000
1.3.4	2006 - 2010	new	15	12,500	937,500
1.3.5	2011 - 2015	VL-10	44	25,000	5,500,000
1.3.6	2011 - 2015	new	44	12,500	2,750,000
	subtotal				**23,487,500**
1.4	**Renewing programme**				
1.4.1	**re-equipping**				
1.4.1.1	2001 - 2005	VL-10	22	300,000	6,600,000
1.4.1.2	2006 - 2010	VL-10	22	300,000	6,600,000
1.4.2	**procuring**				
1.4.2.1	2006 - 2010	new	15	4,000,000	60,000,000
1.4.2.2	2011 - 2015	new	29	4,000,000	116,000,000
	subtotal		88		**189,200,000**
	Electric locomotive fleet costs				**214,133,646**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		10	250	2,500
2.1.2	1999		10	250	2,500
2.1.3	2000		20	250	5,000
2.1.4	2001		19	250	4,750
	subtotal		59		**14,750**
2.2	**Maintaining programme**				
2.2.1	1998 - 2000		60	12,500	2,250,000
2.2.2	2001 - 2005		60	12,500	3,750,000
2.2.3	2006 - 2010		60	12,500	3,750,000
2.2.4	2011 - 2015		60	12,500	3,750,000
	subtotal				**13,500,000**
				Diesel-locomotive fleet costs	**13,514,750**
				Locomotive fleet total costs	**227,648,396**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998		400	100	40,000
3.1.2	1999		400	100	40,000
3.1.3	2000		400	100	40,000
3.1.4	2001		416	100	41,600
	subtotal		1,616		**161,600**
3.2	**Maintaining programme**				
3.2.1	1998		2,827	500	1,413,500
3.2.2	1999		2,827	500	1,413,500
3.2.3	2000		2,827	500	1,413,500
3.2.4	2001		2,827	500	1,413,500
3.2.5	2002 - 2005		2,827	500	5,654,000
3.2.6	2006 - 2010		253	5,000	1,265,000
3.2.7	2006 - 2010		3,080	500	7,700,000
3.2.8	2011 - 2015		540	5,000	2,700,000
3.2.9	2011 - 2015		3,080	500	7,700,000
	subtotal				**30,673,000**
3.3	**Procurement programme**				
3.3.1	2000 - 2005		0	40,000	0
3.3.2	2006 - 2010		0	40,000	0
3.3.3	2011 - 2015		0	40,000	0
	subtotal		0		**0**
			Wagon stock total costs		**30,834,600**

4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		24	150	3,600
4.1.2	1999		48	150	7,200
4.1.3	2000		72	150	10,800
4.1.4	2001		48	150	7,200
	subtotal		192		**28,800**
4.2	**Maintaining programme**				
4.2.1	1998 - 2000		46	28,000	3,864,000
4.2.2	2001 - 2005		46	28,000	6,440,000
4.2.3	2006 - 2010		46	28,000	6,440,000
4.2.4	2011 - 2015		46	28,000	6,440,000
	subtotal				**23,184,000**
			Coach fleet total costs		**23,212,800**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		1	500	500
5.1.2	1999		2	500	1,000
5.1.3	2000		3	500	1,500
5.1.4	2001		1	500	500
5.1.5	2002 - 2010		4	500	2,000
5.1.6	2011 - 2015		0	500	0
	subtotal		11		**5,500**
5.2	**Maintaining programme**				
5.2.1	1998 -2000		4	18,000	216,000
5.2.2	2001 - 2005		8	18,000	720,000
5.2.3	2006 - 2010		10	18,000	900,000
5.2.4	2011 - 2015		11	18,000	990,000
	subtotal				**2,826,000**
5.3	**Procurement programme**				
5.3.1	2001 - 2005		4	1,000,000	4,000,000
5.3.2	2006 - 2010		2	1,000,000	2,000,000
5.3.3	2011 - 2015		5	1,000,000	5,000,000
	subtotal		11		**11,000,000**
				EMU fleet total costs	**13,831,500**

Running costs	**95,327,296**
Investments	**200,200,000**

ARM rolling stock total costs (1)	**295,527,296**

(1) without train traction costs

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998	VL-8	8	250	2,000
1.1.2	1999	VL-8	8	250	2,000
1.1.3	2000	VL-8	9	250	2,250
1.1.4	2001	VL-8	10	250	2,500
1.1.5	2011 - 2015	VL-8	12	250	3,000
	subtotal		47		**11,750**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	3	100,000	300,000
1.2.2	1999	VL-8	3	100,000	300,000
1.2.3	2000	VL-8	3	100,000	300,000
1.2.4	2001	VL-8	3	100,000	300,000
1.2.5	2002 - 2005	VL-8	12	2,170	104,176
1.2.6	2006 - 2010	VL-8	12	2,170	130,220
	subtotal				**1,434,396**
1.3	**Maintaining programme (VL-10)**				
1.3.1	1998 - 2000	VL-10	44	25,000	3,300,000
1.3.2	2001 - 2005	VL-10	44	25,000	5,500,000
1.3.3	2006 - 2010	VL-10	44	25,000	5,500,000
1.3.4	2006 - 2010	new	0	12,500	0
1.3.5	2011 - 2015	VL-10	44	25,000	5,500,000
1.3.6	2011 - 2015	new	12	12,500	750,000
	subtotal				**20,550,000**
1.4	**Renewing programme**				
1.4.1	**re-equipping**				
1.4.1.1	2001 - 2005	VL-10	22	300,000	6,600,000
1.4.1.2	2006 - 2010	VL-10	22	300,000	6,600,000
1.4.2	**procuring**				
1.4.2.1	2006 - 2010	new	0	4,000,000	0
1.4.2.2	2011 - 2015	new	12	4,000,000	48,000,000
	subtotal		56		**61,200,000**
	Electric locomotive fleet costs				**83,196,146**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		15	250	3,750
2.1.2	1999		15	250	3,750
2.1.3	2000		25	250	6,250
2.1.4	2001		24	250	6,000
	subtotal		79		**19,750**
2.2	**Maintaining programme**				
2.2.1	1988 - 2000		40	12,500	1,500,000
2.2.2	2001 - 2005		40	12,500	2,500,000
2.2.3	2006 - 2010		40	12,500	2,500,000
2.2.4	2011 - 2015		40	12,500	2,500,000
	subtotal				**9,000,000**
				Diesel-locomotive fleet costs	**9,019,750**
				Locomotive fleet total costs	**92,215,896**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998		700	100	70,000
3.1.2	1999		700	100	70,000
3.1.3	2000		700	100	70,000
3.1.4	2001		700	100	70,000
	subtotal		2,800		**280,000**
3.2	**Maintaining programme**				
3.2.1	1998		2,436	500	1,218,000
3.2.2	1999		2,436	500	1,218,000
3.2.3	2000		2,436	500	1,218,000
3.2.4	2001		2,436	500	1,218,000
3.2.5	2002 - 2005		2,436	500	4,872,000
3.2.6	2006 - 2010		2,436	500	6,090,000
3.2.7	2011 - 2015		2,436	500	6,090,000
	subtotal				**21,924,000**
3.3	**Procurement programme**				
3.3.1	2001 - 2005		0	40,000	0
3.3.2	2006 - 2010		0	40,000	0
3.3.3	2011 - 2015		0	40,000	0
	subtotal		0		**0**
			Wagon stock total costs		**22,204,000**

4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		24	150	3,600
4.1.2	1999		48	150	7,200
4.1.3	2000		72	150	10,800
4.1.4	2001		69	150	10,350
	subtotal		213		**31,950**
4.2	**Maintaining programme**				
4.2.1	1998 -2000		25	28,000	2,100,000
4.2.2	2001 - 2005		25	28,000	3,500,000
4.2.3	2006 - 2010		25	28,000	3,500,000
4.2.4	2011 - 2015		25	28,000	3,500,000
	subtotal				**12,600,000**
			Coach fleet total costs		**12,631,950**

Cost estimation for adapting and maintaining the ARM rolling stock

Annex 4.2.6-1b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		1	500	500
5.1.2	1999		2	500	1,000
5.1.3	2000		3	500	1,500
5.1.4	2001		1	500	500
5.1.5	2002 - 2010		4	500	2,000
5.1.6	2011 - 2015		0	500	0
	subtotal		11		**5,500**
5.2	**Maintaining programme**				
5.2.1	1998 -2000		4	18,000	216,000
5.2.2	2001 - 2005		7	18,000	630,000
5.2.3	2006 - 2010		8	18,000	720,000
5.2.4	2011 - 2015		8	18,000	720,000
	subtotal				**2,286,000**
5.3	**Procurement programme**				
5.3.1	2001 - 2005		3	1,000,000	3,000,000
5.3.2	2006 - 2010		1	1,000,000	1,000,000
5.3.3	2011 - 2015		4	1,000,000	4,000,000
	subtotal		8		**8,000,000**
				EMU fleet total costs	**10,291,500**

Running costs	**68,143,346**
Investments	**69,200,000**

ARM rolling stock total costs (1)	**137,343,346**

(1) without train traction costs

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998	VL-8	15	250	3,750
1.1.2	1999	VL-8	23	250	5,750
1.1.3	2000	VL-8	25	250	6,250
1.1.4	2001	VL-8	27	250	6,750
1.1.5	2011 - 2015	VL-8	93	250	23,250
	subtotal		183		**45,750**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	16	100,000	1,600,000
1.2.2	1999	VL-8	23	100,000	2,300,000
1.2.3	2000	VL-8	26	100,000	2,600,000
1.2.4	2001	VL-8	28	100,000	2,800,000
1.2.5	2002 - 2005	VL-8	93	2,200	818,400
1.2.6	2006 - 2010	VL-8	93	2,200	1,023,000
	subtotal				**11,141,400**
1.3	**Maintaining programme (VL-11)**				
1.3.1	1998 - 2000	VL-11	43	25,000	3,225,000
1.3.2	2001 - 2005	VL-11	43	25,000	5,375,000
1.3.3	2006 - 2010	VL-11	43	25,000	5,375,000
1.3.4	2011 - 2015	VL-11	43	25,000	5,375,000
1.3.5	2011 - 2015	new	114	12,500	7,125,000
	subtotal				**26,475,000**
1.4	**Re-equipping (1+2) and procuring (3) programme**				
1.4.1	2001 - 2005	VL-11	16	300,000	4,800,000
1.4.2	2006 - 2010	VL-11	27	300,000	8,100,000
1.4.3	2011 - 2015	new	114	4,000,000	456,000,000
	subtotal		157		**468,900,000**
				subtotal electric locomotives	**506,562,150**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		22	250	5,500
2.1.2	1999		22	250	5,500
2.1.3	2000		23	250	5,750
2.1.4	2001		23	250	5,750
	subtotal		90		**22,500**
2.2	**Maintaining programme**				
2.2.1	1998 - 2000		189	12,500	7,087,500
2.2.2	2001 - 2005		189	12,500	11,812,500
2.2.3	2006 - 2010		199	12,500	12,437,500
2.2.4	2011 - 2015		223	12,500	13,937,500
				subtotal	**45,275,000**
2.3	**Procuring programme**				
2.3.1	2006 - 2010		10	1,500,000	15,000,000
2.3.2	2011 - 2015		24	1,500,000	36,000,000
				subtotal	**51,000,000**
				subtotal diesel-locomotives	**96,297,500**
				Locomotive fleet total costs	**602,859,650**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998 - 2005		10,458	100	1,045,800
	subtotal		10,458		**1,045,800**
3.2	**Maintaining programme**				
3.2.1	1998		18,660	500	9,330,000
3.2.2	1999		18,660	500	9,330,000
3.2.3	2000 - 2005		18,722	500	56,166,000
3.2.4	2006 - 2010		20,253	500	50,632,500
3.2.5	2011 - 2015		21,234	500	53,085,000
	subtotal				**178,543,500**
3.3	**Procurement programme**				
3.3.1	2001 - 2005		62	40,000	2,480,000
3.3.2	2006 - 2010		1,531	40,000	61,240,000
3.3.3	2011 - 2015		981	40,000	39,240,000
	subtotal		2,574		**102,960,000**
				Wagon stock total costs	**282,549,300**

4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		125	150	18,750
4.1.2	1999		125	150	18,750
4.1.3	2000		137	150	20,550
4.1.4	2001		137	150	20,550
	subtotal		524		**78,600**
4.2	**Maintaining programme**				
4.2.1	1998 - 2000		329	28,000	27,636,000
4.2.2	2001 - 2005		329	28,000	46,060,000
4.2.3	2006 - 2010		329	28,000	46,060,000
4.2.4	2011 - 2015		329	28,000	46,060,000
	subtotal				**165,816,000**
				Coach fleet total costs	**165,894,600**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU/DMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		11	500	5,500
5.1.2	1999		11	500	5,500
5.1.3	2000		12	500	6,000
5.1.4	2001 - 2005		20	500	10,000
5.1.5	2006 - 2010		22	500	11,000
	subtotal		76		**38,000**
5.2	**Maintaining programme**				
5.2.1	1998 - 2000		42	18,000	2,268,000
5.2.2	2001 - 2005		42	18,000	3,780,000
5.2.3	2006 - 2010		83	18,000	7,470,000
5.2.4	2011 - 2015		94	18,000	8,460,000
	subtotal				**21,978,000**
5.3	**Procurement programme**				
5.3.1	2001 - 2005		20	1,000,000	20,000,000
5.3.2	2006 - 2010		63	1,000,000	63,000,000
5.3.3	2011 - 2015		11	1,000,000	11,000,000
	subtotal		94		**94,000,000**
				EMU/DMU fleet total costs	**116,016,000**

Running costs	**450,459,550**
Investments	**716,860,000**

AGZD rolling stock total costs (1)	**1,167,319,550**

(1) without train traction costs

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998	VL-8	30	250	7,500
1.1.2	1999	VL-8	35	250	8,750
1.1.3	2000	VL-8	35	250	8,750
1.1.4	2001	VL-8	39	250	9,750
1.1.5	2011 - 2015	VL-8	44	250	11,000
	subtotal		183		**45,750**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	11	100,000	1,100,000
1.2.2	1999	VL-8	11	100,000	1,100,000
1.2.3	2000	VL-8	11	100,000	1,100,000
1.2.4	2001	VL-8	11	100,000	1,100,000
1.2.5	2002 - 2005	VL-8	44	2,200	387,200
1.2.6	2006 - 2010	VL-8	44	2,200	484,000
	subtotal				**5,271,200**
1.3	**Maintaining programme (VL-11)**				
1.3.1	1998 - 2000	VL-11	43	25,000	3,225,000
1.3.2	2001 - 2005	VL-11	43	25,000	5,375,000
1.3.3	2006 - 2010	VL-11	43	25,000	5,375,000
1.3.4	2011 - 2015	VL-11	43	25,000	5,375,000
1.3.5	2011 - 2015	new	57	12,500	3,562,500
	subtotal		100		**22,912,500**
1.4	**Re-equipping (1+2) and procuring (3) programme**				
1.4.1	2001 - 2005	VL-11	16	300,000	4,800,000
1.4.2	2006 - 2010	VL-11	27	300,000	8,100,000
1.4.3	2011 - 2015	new	57	4,000,000	228,000,000
	subtotal		100		**240,900,000**
				subtotal electric locomotives	**269,129,450**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		22	250	5,500
2.1.2	1999		33	250	8,250
2.1.3	2000		39	250	9,750
2.1.4	2001		43	250	10,750
	subtotal		137		**34,250**
2.2	**Maintaining programme**				
2.2.1	1998 - 2000		142	12,500	5,325,000
2.2.2	2001 - 2005		142	12,500	8,875,000
2.2.3	2006 - 2010		142	12,500	8,875,000
2.2.4	2011 - 2015		142	12,500	8,875,000
				subtotal	**31,950,000**
2.3	**Procuring programme**				
2.3.1	2006 - 2010		0	1,500,000	0
2.3.2	2011 - 2015		0	1,500,000	0
				subtotal	**0**
				subtotal diesel-locomotives	**31,984,250**
				Locomotive fleet total costs	**301,113,700**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998 - 2005		16,912	100	1,691,200
	subtotal		16,912		**1,691,200**
3.2	**Maintaining programme**				
3.2.1	1998		12,206	500	6,103,000
3.2.2	1999		12,206	500	6,103,000
3.2.3	2000 - 2005		12,206	500	36,618,000
3.2.4	2006 - 2010		12,206	500	30,515,000
3.2.5	2011 - 2015		12,206	500	30,515,000
	subtotal				**109,854,000**
3.3	**Procurement programme**				
3.3.1	2001 - 2005		0	40,000	0
3.3.2	2006 - 2010		0	40,000	0
3.3.3	2011 - 2015		0	40,000	0
	subtotal		0		**0**
			Wagon stock total costs		**111,545,200**

4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		179	150	26,850
4.1.2	1999		179	150	26,850
4.1.3	2000		189	150	28,350
4.1.4	2001		189	150	28,350
	subtotal		736		**110,400**
4.2	**Maintaining programme**				
4.2.1	1998 - 2000		117	28,000	9,828,000
4.2.2	2001 - 2005		117	28,000	16,380,000
4.2.3	2006 - 2010		117	28,000	16,380,000
4.2.4	2011 - 2015		117	28,000	16,380,000
	subtotal				**58,968,000**
			Coach fleet total costs		**59,078,400**

Cost estimation for adapting and maintaining the AGZD rolling stock

Annex 4.2.6-2b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU/DMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		11	500	5,500
5.1.2	1999		11	500	5,500
5.1.3	2000		11	500	5,500
5.1.4	2001 - 2005		21	500	10,500
5.1.5	2006 - 2010		22	500	11,000
	subtotal		76		**38,000**
5.2	**Maintaining programme**				
5.2.1	1998 - 2000		43	18,000	2,322,000
5.2.2	2001 - 2005		43	18,000	3,870,000
5.2.3	2006 - 2010		43	18,000	3,870,000
5.2.4	2011 - 2015		45	18,000	4,050,000
	subtotal				**14,112,000**
5.3	**Procurement programme**				
5.3.1	2001 - 2005		0	1,000,000	0
5.3.2	2006 - 2010		43	1,000,000	43,000,000
5.3.3	2011 - 2015		2	1,000,000	2,000,000
	subtotal		45		**45,000,000**
				EMU/DMU fleet total costs	**59,150,000**

Running costs	**244,987,300**
Investments	**285,900,000**

AGZD rolling stock total costs (1)	**530,887,300**

(1) without train traction costs

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998-2000	VL-8	37	250	9,250
1.1.2	2006-2010	VL-8	20	250	5,000
1.1.3	2011 - 2015	VL-8	28	250	7,000
	subtotal		85		**21,250**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	12	100,000	1,200,000
1.2.2	1999	VL-8	12	100,000	1,200,000
1.2.3	2000	VL-8	12	100,000	1,200,000
1.2.4	2001	VL-8	12	100,000	1,200,000
1.2.5	2002 - 2005	VL-8	48	2,170	416,640
1.2.6	2006 - 2010	VL-8	28	2,170	303,800
	subtotal				**5,520,440**
1.3	**Maintaining programme (VL-10/11)**				
1.3.1	1998-2000	VL-10	103	2,170	670,530
1.3.2	2001 - 2005	VL-10	103	2,170	1,117,550
1.3.3	2006 - 2010	VL-10	103	2,170	1,117,550
1.3.4	2011-2015	VL-10	103	2,170	1,117,550
1.3.5	1998-2000	VL-11	42.5	25,000	3,187,500
1.3.6	2001 - 2005	VL-11	42.5	25,000	5,312,500
1.3.7	2006 - 2010	VL-11	42.5	25,000	5,312,500
1.3.8	2006 - 2010	new	43.0	12,500	2,687,500
1.3.9	2011 - 2015	VL-11	42.5	25,000	5,312,500
1.3.10	2011 - 2015	new	102	12,500	6,375,000
	subtotal				**32,210,680**
1.4	**Renewing programme**				
1.4.1	**re-equipping**				
1.4.1.1	2001 - 2005	VL-10	65	300,000	19,500,000
1.4.1.2	2006 - 2010	VL-10	20	300,000	6,000,000
1.4.1.3	2011 - 2015	VL-10	18	300,000	5,400,000
		subtotal	103		
1.4.2	**procuring**				
1.4.2.1	2006 - 2010	new	43	4,000,000	172,000,000
1.4.2.2	2011 - 2015	new	59	4,000,000	236,000,000
	subtotal		102		**438,900,000**
			Electric locomotive fleet costs		**476,652,370**

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		10	250	2,500
2.1.2	1999		20	250	5,000
2.1.3	2000		30	250	7,500
2.1.4	2001		19	250	4,750
	subtotal		79		**19,750**
2.2	**Maintaining programme**				
2.2.1	1988 - 2000		80	12,500	3,000,000
2.2.2	2001 - 2005		80	12,500	5,000,000
2.2.3	2006 - 2010		80	12,500	5,000,000
2.2.4	2011 - 2015		80	12,500	5,000,000
	subtotal				**18,000,000**
				Diesel locomotive fleet costs	**18,019,750**
				Locomotive fleet total costs	**494,672,120**

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3a

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998		2,000	100	200,000
3.1.2	1999		2,000	100	200,000
3.1.3	2000		2,500	100	250,000
3.1.4	2001		2,500	100	250,000
3.1.5	2002		2,494	100	249,400
	subtotal		11,494		**1,149,400**
3.2	**Maintaining programme**				
3.2.1	1998-2005		1,756	5,000	8,780,000
3.2.2	1998-2005		4,641	500	18,564,000
3.2.3	2006-2010		2,621	5,000	13,105,000
3.2.4	2006-2010		6,397	500	15,992,500
3.2.5	2011 - 2015		583	5,000	2,915,000
3.2.6	2011 - 2015		9,018	500	22,545,000
	subtotal				**81,901,500**
			Wagon stock total costs		**83,050,900**
4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		200	150	30,000
4.1.2	1999		200	150	30,000
4.1.3	2000		200	150	30,000
4.1.4	2001		229	150	34,350
	subtotal		829		**124,350**
4.2	**Maintaining programme**				
4.2.1	1998 - 2000		256	28,000	21,504,000
4.2.2	2001 - 2005		256	28,000	35,840,000
4.2.3	2006 - 2010		256	28,000	35,840,000
4.2.4	2011 - 2015		256	28,000	35,840,000
	subtotal				**129,024,000**
			Coach fleet total costs		**129,148,350**

Annex 4.2.6-3a

Cost estimation for adapting and maintaining the GRZD rolling stock

Optimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		2	500	1,000
5.1.2	1999		2	500	1,000
5.1.3	2000		3	500	1,500
5.1.4	2001		3	500	1,500
5.1.5	2006 - 2010		22	500	11,000
5.1.6	2011 - 2015		0	500	0
	subtotal		32		**16,000**
5.2	**Maintaining programme**				
5.2.1	1998 - 2000		22	18,000	1,188,000
5.2.2	2001 - 2005		36	18,000	3,240,000
5.2.3	2006 - 2010		62	18,000	5,580,000
5.2.4	2011 - 2015		79	18,000	7,110,000
	subtotal				**17,118,000**
5.3	**Procurement programme**				
5.3.1	2001 - 2005		14	1,000,000	14,000,000
5.3.2	2006 - 2010		26	1,000,000	26,000,000
5.3.3	2011 - 2015		39	1,000,000	39,000,000
	subtotal		79		**79,000,000**
				EMU fleet total costs	**96,134,000**

Running cost	**285,105,370**
Investments	**517,900,000**

GRZD rolling stock total costs (1)	**803,005,370**

(1) without train traction costs

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
1	**Electric locomotive fleet**				
1.1	**Scrapping programme**				
1.1.1	1998-2000	VL-8	85	250	21,250
1.1.2	1998-2000	VL-10	6	250	1,500
	subtotal		91		**22,750**
1.2	**Maintaining programme (VL-8)**				
1.2.1	1998	VL-8	0	100,000	0
1.2.2	1999	VL-8	0	100,000	0
1.2.3	2000	VL-8	0	100,000	0
1.2.4	2001	VL-8	0	100,000	0
1.2.5	2002 - 2005	VL-8	0	2,170	0
1.2.6	2006 - 2010	VL-8	0	2,170	0
	subtotal				**0**
1.3	**Maintaining programme (VL-10/11)**				
1.3.1	1998-2000	VL-10	97	2,170	631,470
1.3.2	2001 - 2005	VL-10	97	2,170	1,052,450
1.3.3	2006 - 2010	VL-10	97	2,170	1,052,450
1.3.4	2011 - 2015	VL-10	97	2,170	1,052,450
1.3.5	1998 - 2000	VL-11	42.5	25,000	3,187,500
1.3.6	2001 - 2005	VL-11	42.5	25,000	5,312,500
1.3.7	2006 - 2010	VL-11	42.5	25,000	5,312,500
1.3.8	2006 - 2010	new	0.0	12,500	0
1.3.9	2011 - 2015	VL-11	42.5	25,000	5,312,500
1.3.10	2011 - 2015	new	0	12,500	0
	subtotal				**22,913,820**
1.4	**Renewing programme**				
1.4.1	**re-equipping**				
1.4.1.1	2001 - 2005	VL-10	55	300,000	16,500,000
1.4.1.2	2006 - 2010	VL-10	20	300,000	6,000,000
1.4.1.3	2011 - 2015	VL-10	22	300,000	6,600,000
		subtotal	97		
1.4.2	**procuring**				
1.4.2.1	2006 - 2010	new	0	4,000,000	0
1.4.2.2	2011 - 2015	new	0	4,000,000	0
	subtotal		0		**29,100,000**
				Electric locomotive fleet costs	**52,036,570**

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
2	**Diesel locomotive fleet**				
2.1	**Scrapping programme**				
2.1.1	1998		15	250	3,750
2.1.2	1999		25	250	6,250
2.1.3	2000		35	250	8,750
2.1.4	2001		24	250	6,000
	subtotal		99		**24,750**
2.2	**Maintaining programme**				
2.2.1	1998 - 2000		60	12,500	2,250,000
2.2.2	2001 - 2005		60	12,500	3,750,000
2.2.3	2006 - 2010		60	12,500	3,750,000
2.2.4	2011 - 2015		60	12,500	3,750,000
	subtotal				**13,500,000**
				Diesel locomotive fleet costs	**13,524,750**
				Locomotive fleet total costs	**65,561,320**

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
3	**Wagon stock**				
3.1	**Scrapping programme**				
3.1.1	1998		3,000	100	300,000
3.1.2	1999		3,000	100	300,000
3.1.3	2000		3,500	100	350,000
3.1.4	2001		3,500	100	350,000
3.1.5	2002		2,863	100	286,300
	subtotal		15,863		**1,586,300**
3.2	**Maintaining programme**				
3.2.1	1998 - 2005		0	5,000	0
3.2.2	1998 - 2005		4,641	500	18,564,000
3.2.3	2006 - 2010		63	5,000	315,000
3.2.4	2006 - 2010		4,641	500	11,602,500
3.2.5	2011 - 2015		528	5,000	2,640,000
3.2.6	2011 - 2015		4,704	500	11,760,000
	subtotal				**44,881,500**
				Wagon stock total costs	**46,467,800**
4	**Coach fleet**				
4.1	**Scrapping programme**				
4.1.1	1998		200	150	30,000
4.1.2	1999		200	150	30,000
4.1.3	2000		300	150	45,000
4.1.4	2001		246	150	36,900
	subtotal		946		**141,900**
4.2	**Maintaining programme**				
4.2.1	1998 - 2000		139	28,000	11,676,000
4.2.2	2001 - 2005		139	28,000	19,460,000
4.2.3	2006 - 2010		139	28,000	19,460,000
4.2.4	2011 - 2015		139	28,000	19,460,000
	subtotal				**70,056,000**
				Coach fleet total costs	**70,197,900**

Cost estimation for adapting and maintaining the GRZD rolling stock

Annex 4.2.6-3b

Pessimistic scenario

No.	subject	type	units	costs per unit (US$)	costs (US$)
5	**EMU fleet**				
5.1	**Scrapping programme**				
5.1.1	1998		2	500	1,000
5.1.2	1999		2	500	1,000
5.1.3	2000		3	500	1,500
5.1.4	2001		3	500	1,500
5.1.5	2006 - 2010		22	500	11,000
5.1.6	2011 - 2015		0	500	0
	subtotal		32		**16,000**
5.2	**Maintaining programme**				
5.2.1	1998-2000		22	18,000	1,188,000
5.2.2	2001 - 2005		22	18,000	1,980,000
5.2.3	2006 - 2010		27	18,000	2,430,000
5.2.4	2011 - 2015		30	18,000	2,700,000
	subtotal				**8,298,000**
5.3	**Procurement programme**				
5.3.1	2006 - 2010		5	1,000,000	5,000,000
5.3.2	2011 - 2015		25	1,000,000	25,000,000
5.3.3	2011 - 2015		0	1,000,000	0
	subtotal		30		**30,000,000**
				EMU fleet total costs	**38,314,000**

Running cost	**161,441,020**
Investments	**59,100,000**

GRZD rolling stock total costs(1)	**220,541,020**

(1) without train traction costs

Cost estimation for upgrading the ARM shops for the rolling stock

Annex 4.2.7-1

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
1	**Locomotive depots**					
1.1	**Yerevan**					
1.1.1	compressor 10 cqm/h	replace	1999	2	70,000	140,000
1.1.2	flaw detector	replace	1998/1999	2	4,000	8,000
1.1.3	distilling apparatus	replace	1998	2	3,000	6,000
1.1.4	bridge crane 10 tons	cap. repair	1999/2000	2	35,000	70,000
1.1.5	electric welding transformer	replace	1999	1	4,500	4,500
1.1.6	electric welding rectifier	replace	1998	1	4,500	4,500
1.1.7	electric lifting jacks 25 tons	cap. repair	1998/2000	8	4,500	36,000
1.1.8	electric welding station	procure	1999	1	90,000	90,000
	for shroud rings					
		subtotal				**359,000**
1.2	**Gyumri**					
1.2.1	compressor 10 cqm/h	replace	1999	2	70,000	140,000
1.2.2	flaw detector	replace	1998/1999	2	4,000	8,000
1.2.3	distilling apparatus	replace	1998	1	3,000	3,000
1.2.4	electric welding transformer	replace	1998	1	4,500	4,500
1.2.5	electric welding rectifier	replace	1998	1	4,500	4,500
1.2.6	bridge crane 20 tons, 10 ton	cap. repair	1998	2	35,000	70,000
1.2.7	electric lifting jacks 25 tons	cap. repair	1998/2000	8	4,500	36,000
1.2.8	wheel-set lathe KZTS	replace	1999	1	175,000	175,000
		subtotal				**441,000**
	Locomotive depots total					**800,000**

2	**Wagon depots**					
2.1	**Yerevan**					
2.1.1	portal crane 5 tons	replace	1999	3	30,000	90,000
2.1.2	wheel-set lathe Rafamet	cap. repair	1999	1	90,000	90,000
2.1.3	slewing crane 5 tons	procure	2000	1	4,000	4,000
2.1.4	electric lifting jacks 5 tons	procure	1998	8	3,000	24,000
2.1.5	hydraulic lifting jack 25 tons	procure	1998	8	1,000	8,000
2.1.6	compressor 10 cqm/h	replace	2002	1	70,000	70,000
2.1.7	four-side-planing mashine	procure	2002	1	25,000	25,000
		subtotal				**311,000**
2.2	**Gyumri**					
2.2.1	bridge crane 10 tons	cap. repair	1999	1	30,000	30,000
2.2.2	electric welding equipment	replace	1998	1	30,000	30,000
2.2.3	bridge crane 5 tons	cap. repair	1999	1	30,000	30,000
2.2.4	four-side-planing mashine	replace	2002	1	25,000	25,000
2.2.5	compressor 10 cqm/h	replace	1998	1	70,000	70,000
2.2.6	electric welding transformer	replace	1998	1	4,500	4,500
		subtotal				**189,500**
	Wagon depots total					**500,500**

Cost estimation for upgrading the ARM shops for the rolling stock

Annex 4.2.7-1

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
3	**Coach depots**					
3.1	**Yerevan**					
3.1.1	main assembler building	cap.repair	2000	1	250,000	250,000
3.1.2	bridge cranes 10 tons	cap. repair	2000	1	7,500	7,500
3.1.3	welding transformer	replace	1999	3	4,500	13,500
3.1.4	bogie washing plant	renewing	1999	1	35,000	35,000
3.1.5	coach washing plant	cap. repair	2000	1	70,000	70,000
3.1.6	test stand for air brake valve	replace	1998	1	46,500	46,500
		subtotal				**422,500**
	Coach depots total					**422,500**

ARM total costs for shop upgrading 1,723,000

Annex 4.2.7-2

Cost estimation for upgrading the AGZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
1	**Locomotive depots**					
1.1	**Baku-Baladshary**					
1.1.1	wheel-set lathe KZTS	replace	1998	1	175,000	175,000
1.1.2	wheel-set lathe K<-20M	replace	1999, 2000	2	175,000	350,000
1.1.3	grinding mashine	replace	1998	1	15,000	15,000
1.1.4	drilling lathe	cap. repair	1999	1	15,000	15,000
1.1.5	turning lathe DIP 300	replace	2001	1	20,000	20,000
1.1.6	axle catch pit	cap. repair	2002	1	30,000	30,000
1.1.7	bridge crane 30 tons	cap. repair	1998	1	35,000	35,000
1.1.8	mechanic lifting jacks	new	1998	16	16,000	256,000
		subtotal				**896,000**
1.2	**Baku-Beyuk-Shtshor**					
1.2.1	wheel-set lathe K<-20M	cap. repair	1999	1	90,000	90,000
1.2.2	wheel-set lathe KZTS	replace	1999	1	175,000	175,000
1.2.3	grinding mashine	replace	1999	1	15,000	15,000
1.2.4	axle catch pit	cap. repair	2002	1	30,000	30,000
1.2.5	turning lathe DIP 300	replace	2001	1	20,000	20,000
1.2.6	drilling lathe	cap. repair	1998	1	15,000	15,000
1.2.7	planing mashine	replace	1999	1	15,000	15,000
		subtotal				**360,000**
1.2	**Gyandsha**					
1.2.1	wheel-set lathe K<-20M	cap. repair	2000	1	90,000	90,000
1.2.2	turning lathe Kuson	cap. repair	2001	1	10,000	10,000
1.2.3	turning lathe DIP 300	replace	1999	1	20,000	20,000
1.2.4	axle catch pit	cap. repair	2002	1	30,000	30,000
		subtotal				**150,000**
	Locomotive depots total					**1,406,000**

Annex 4.2.7-2

Cost estimation for upgrading the AGZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
2	**Wagon depots**					
2.1	**Baladshary**					
2.1.1	bridge crane 10 tons	replace	1998	1	50,000	50,000
2.1.2	bridge crane 10 tons	cap. repair	2000	1	10,000	10,000
2.1.3	pneumatic hammer	replace	1997, 1999	2	15,000	30,000
2.1.4	compressor	cap. repair	1998	1	5,000	5,000
		subtotal				**95,000**
2.2	**Gyandsha**					
2.2.1	wheel-set lathe Rafamet	cap. repair	1998	1	90,000	90,000
2.2.2	wheel-set lathe Rafamet	cap. repair	2002	1	90,000	90,000
2.2.3	lifting jack 40 tons	cap. repair	1998	2	4,000	8,000
2.2.4	lifting jack 30 tons	cap. repair	1998	2	3,000	6,000
2.2.5	bridge crane 10 tons	replace	1999	1	50,000	50,000
2.2.6	bridge crane 10 tons	cap. repair	2001	1	7,500	7,500
		subtotal				**251,500**
2.3	**Kasi-Magomed**					
2.3.1	wheel-set lathe Rafamet	replace	1999	1	175,000	175,000
2.3.2	drilling lathe	replace	1999	1	37,500	37,500
2.3.3	welding transformer	replace	1998	2	4,500	9,000
2.3.4	flaw detector	replace	1998	1	4,000	4,000
2.3.5	lifting jack 30 tons	cap. repair	1998	3	3,000	9,000
2.3.6	compressor	cap. repair	1998	1	5,000	5,000
		subtotal				**239,500**
2.4	**Aliat**					
2.4.1	portal crane	cap. repair	1998	1	12,500	12,500
2.4.2	bridge cranes	cap. repair	1998	2	7,500	15,000
2.4.3	wheel-set lathe Rafamet	cap. repair	1998	1	90,000	90,000
		subtotal				**117,500**
2.5	**Shirvan**					
2.5.1	portal crane	cap. repair	1999	1	12,500	12,500
2.5.2	slewing crane	cap. repair	1999	1	5,500	5,500
2.5.3	electric lifting jack 35 tons	cap. repair	2000	6	3,500	21,000
		subtotal				**39,000**
	Wagon depots total					**742,500**

Annex 4.2.7-2

Cost estimation for upgrading the AGZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
3	**Coach depots**					
3.1	**Baku**					
3.1.1	wheel-set lathe Rafamet	cap. repair	1998	1	90,000	90,000
3.1.2	wheel-set lathe Rafamet	replace	2000	1	175,000	175,000
3.1.3	drilling lathe	replace	1999	2	37,500	75,000
3.1.4	drilling lathe	cap. repair	1999	2	15,000	30,000
3.1.5	bridge cranes 10 tons	replace	1998	1	50,000	50,000
3.1.6	bridge cranes 10 tons	cap. repair	2000	1	7,500	7,500
3.1.7	planing mashine	replace	2001	1	15,000	15,000
3.1.8	planing mashine	cap. repair	1998	1	7,500	7,500
3.1.9	welding transformer	replace	1999	3	4,500	13,500
3.1.10	bogie washing plant	renewing	1999	1	35,000	35,000
3.1.11	coach washing plant	cap. repair	2000	1	70,000	70,000
3.1.12	test stand for air brake valve	replace	1998	1	46,500	46,500
		subtotal				**615,000**
	Coach depots total					**615,000**

4	**Baku wagon repair factory**					
4.1	wheel-set lathe Rafamet	cap. repair	1998	1	90,000	90,000
4.2	rivet stove	replace	1998	1	14,000	14,000
		subtotal				**104,000**

AGZD total costs for shop upgrading 2,867,500

Annex 4.2.7-3

Cost estimation for upgrading the GRZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
1	**Locomotive depots**					
1.1	**Tbilisi-pass**					
1.1.1	turning lathe DIP 200	replace	1999	1	20,000	20,000
1.1.2	axle catch pit	cap. repair	1998	1	30,000	30,000
1.1.3	bridge crane 20 tons	cap. repair	2000	1	35,000	35,000
		subtotal				**85,000**
1.2	**Tbilisi-sortir**					
1.2.1	wheel-set lathe K-SH-20M	cap. repair	1999	1	90,000	90,000
1.2.2	wheel-set lathe KZTS	replace	1999	1	175,000	175,000
1.2.3	grinding mashine	replace	1999	1	15,000	15,000
1.2.4	axle catch pit	cap. repair	2002	1	30,000	30,000
1.2.5	turning lathe DIP 300	replace	2001	1	20,000	20,000
1.2.6	drilling lathe	cap. repair	1998	1	15,000	15,000
1.2.7	planing mashine	replace	1999	1	15,000	15,000
1.2.8	bridge crane 30 tons	cap. repair	1998	1	35,000	35,000
		subtotal				**395,000**
1.3	**Khashuri**					
1.3.1	wheel-set lathe K-Sh 1836	cap. repair	1998	1	25,000	25,000
1.3.2	axle catch pit	cap. repair	1999	1	30,000	30,000
1.3.3	turning lathe DIP 300	replace	2001	1	20,000	20,000
1.3.4	bridge crane 30 tons	cap. repair	2000	1	35,000	35,000
		subtotal				**110,000**
1.4	**Samtredia**					
1.4.1	axle catch pit	replace	1998	1	60,000	60,000
1.4.2	wheel-set lathe A 41	cap. repair	2000	1	90,000	90,000
1.4.3	bridge crane 20 tons	cap. repair	1999	1	35,000	35,000
		subtotal				**185,000**
	Locomotive depots total					**775,000**

Annex 4.2.7-3

Cost estimation for upgrading the GRZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
2	**Wagon depots**					
2.1	**Tbilisi Grus**					
2.1.1	portal crane 10 tons	replace	1999	1	30,000	30,000
2.1.2	slewing crane 10 tons	procure	2000	1	5,500	5,500
2.1.3	slewing crane 5 tons	procure	2000	1	4,000	4,000
2.1.4	electric lifting jacks 35 tons	procure	1998	4	4,500	18,000
2.1.5	hydraulic lifting jack 25 tons	procure	1998	8	1,000	8,000
2.1.6	compressor 10 cqm/h	replace	2002	1	70,000	70,000
2.1.7	four-side-planing mashine	procure	2002	1	25,000	25,000
		subtotal				**160,500**
2.2	**Khashuri**					
2.2.1	wheel-set lathe Rafamet	cap. repair	1999	1	90,000	90,000
2.2.2	bridge crane 10 tons	cap. repair	1999	1	30,000	30,000
2.2.3	electric welding transformer	replace	1998	2	4,500	9,000
2.2.4	conveyor for roller bearings	procure	1998	1	50,000	50,000
2.2.5	four-side-planing mashine	replace	2002	1	25,000	25,000
2.2.6	compressor 10 cqm/h	replace	1998	1	70,000	70,000
2.2.7	lifting jacks 35 tons	procure	1998	12	4,500	54,000
		subtotal				**328,000**
2.3	**Samtredia**					
2.3.1	wheel-set lathe Rafamet	cap. repair	1999	1	90,000	90,000
2.3.2	bridge crane 10 tons	replace	1999	1	40,000	40,000
2.3.3	welding transformer	replace	1998	2	4,500	9,000
2.3.4	conveyor for roller bearings	procure	1998	1	50,000	50,000
2.3.5	four-side-planing mashine	replace	1998	1	25,000	25,000
2.3.6	lifting jacks 35 tons	procure	1999	12	4,500	54,000
2.3.7	compressor 10 cqm/h	replace	1998	1	70,000	70,000
2.3.8	lifting jacks 35 tons	procure	1998	4	4,500	18,000
		subtotal				**356,000**
2.4	**Batumi**					
2.4.1	welding transformer	replace	1998	2	4,500	9,000
2.4.2	bridge crane 10 tons	replace	1998	1	30,000	30,000
2.4.3	electric lifting jacks	procure	1998	4	4,500	18,000
2.4.4	welding transformer	replace	1998	2	4,500	9,000
2.4.5	four-side-planing mashine	replace	1998	1	25,000	25,000
		subtotal				**91,000**
	Wagon depots total					**935,500**

Annex 4.2.7-3

Cost estimation for upgrading the GRZD shops for the rolling stock

No.	subject	kind of proposal	year	units or squares m²	costs per unit (US$)	costs (US$)
3	**Coach depots and plants**					
3.1	**Tbilisi-pass**					
3.1.1	wheel-set lathe Rafamet	replace	2002	1	175,000	175,000
3.1.2	portal crane 5 tons	cap. repair	2000	1	20,000	20,000
3.1.3	bridge cranes 5 tons	replace	1998	1	45,000	45,000
3.1.4	bridge cranes 10 tons	cap. repair	2000	1	7,500	7,500
3.1.5	planing mashine	replace	2001	1	15,000	15,000
3.1.6	welding transformer	replace	1999	3	4,500	13,500
3.1.7	bogie washing plant	renewing	1999	1	35,000	35,000
3.1.8	coach washing plant	cap. repair	2000	1	70,000	70,000
3.1.9	test stand for air brake valve	replace	1998	1	46,500	46,500
		subtotal				**427,500**
3.2	**Tbilisi EWRS**					
3.2.1	traverser	cap. repair	1999	1	50,000	50,000
3.2.2	tech. equipm. for motors ov.	cap. repair	1998	1	100,000	100,000
3.2.3	cranes	inspection	1998/1999	22	5,000	110,000
3.2.4	flaw detector	replace	2000	2	4,000	8,000
3.2.5	wheel-set lathe Rafamet	cap. repair	2002	1	90,000	90,000
3.2.6	bogie washing plant	renewing	1999	1	35,000	35,000
3.2.7	coach washing plant	cap. repair	2000	1	70,000	70,000
3.2.8	coach assembler hall	cap. repair	1998	27,000	15	405,000
3.2.9	wheelset shop hall	cap. repair	1998	6,500	15	97,500
3.2.10	electric mashine hall	cap. repair	1998	11,700	15	175,500
		subtotal				**1,141,000**
	Coach depots total					**1,568,500**

GRZD total costs for shop upgrading 3,279,000

Costs of the Renewing programme for electric locomotives of the Caucasian railways

Annex 4.2.7-4

Optimistic scenario

	1998 - 2000	2001 - 2005	2006 - 2010	2011 - 2015	costs per unit ,000 US$	total costs in ,000 US$
Overhauls						
ARM/KR-1	9	3			100	1,200
ARM/KR-1	11	18	20	27	120	9,120
ARM/KR-2					100	0
ARM/KR-2	11	18	20	27	150	11,400
AGZD/KR-1	65	28			100	9,300
AGZD/KR-1	11	18	18	42	120	10,680
AGZD/KR-2					100	0
AGZD/KR-2	11	18	18	42	150	13,350
GRZD/KR-1	36	12			100	4,800
GRZD/KR-1	11	18	17	39	120	10,200
GRZD/KR-2					100	0
GRZD/KR-2	11	18	17	39	150	12,750
Total KR-1	**143**	**97**	**55**	**108**		
Total KR-2	**33**	**54**	**55**	**108**		**82,800**
Re-equipping						
ARM		22	22		300	13,200
AGZD		16	27		300	12,900
GRZD		65	20	18	300	30,900
Total		**103**	**69**	**18**		**57,000**
Procuring						
ARM			15	29	4,000	176,000
AGZD				114	4,000	456,000
GRZD			43	59	4,000	408,000
Total			**58**	**202**		**1,040,000.00**

optimistic prospection:

Total costs of the electric locomotive renewing programme **1,179,800**

Costs of the Renewing programme for electric locomotives of the Caucasian railways

Annex 4.2.7-4

Pessimistic scenario

Overhauls	1998 - 2000	2001 - 2005	2006 - 2010	2011 - 2015	costs per unit ,000 US$	total costs in ,000 US$
ARM/KR-1	9	3			100	1,200
ARM/KR-1	11	18	18	21	120	8,160
ARM/KR-2					100	0
ARM/KR-2	11	18	18	21	150	10,200
AGZD/KR-1	33	11			100	4,400
AGZD/KR-1	11	18	18	30	120	9,240
AGZD/KR-2					100	0
AGZD/KR-2	11	18	18	30	150	11,550
GRZD/KR-1	0	0	0	0	100	0
GRZD/KR-1	12	20	20	20	120	8,640
GRZD/KR-2	0	0	0	0	100	0
GRZD/KR-2	12	20	20	20	150	10,800
Total KR-1	**76**	**70**	**56**	**71**		
Total KR-2	**34**	**56**	**56**	**71**		**64,190**
Re-equipping						
ARM		22	22		300	13,200
AGZD		16	27		300	12,900
GRZD		55	20	22	300	29,100
Total		**93**	**69**	**22**		**55,200**
Procuring						
ARM			0	12	4,000	48,000
AGZD				57	4,000	228,000
GRZD			0	0	4,000	0
Total			**0**	**69**		**276,000.00**

pessimistic prospection:

Total costs of the electric locomotive renewing programme **395,390**

Annex 4.2.8-1

Track and bridges investment requirements - Armenian Railway

Investment Costs - (US$ '000s)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Permanent Way	18,078	18,078	2,785	2,785	2,785	6,277	6,277	6,277	6,277	6,277									75,896
Bridges and Tunnels	1,675	1,675																	3,350
Machinery and Equipment	8,750	8,750	667	667	667														19,500
Training	500																		500
Total	29,003	28,503	3,452	3,452	3,452	6,277	6,277	6,277	6,277	6,277	0	0	0	0	0	0	0	0	99,246
Maintenance																			
Permanent Way	1,808	3,616	3,894	4,173	4,451	5,079	5,707	6,334	6,962	7,590	7,590	7,590	7,590	7,590	7,590	7,590	7,590	7,590	110,329
Bridges and Tunnels	84	988	1,127	1,266	1,405	1,719	2,033	2,347	2,661	2,975	2,975	2,975	2,975	2,975	2,975	2,975	2,975	2,975	40,402
Machinery and Equipment	875	1,750	1,817	1,883	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950	33,625
Total	2,767	6,353	6,838	7,322	7,807	8,748	9,690	10,631	11,573	12,514	12,514	12,514	12,514	12,514	12,514	12,514	12,514	12,514	184,356
Depreciation																			
Permanent Way	723	1,446	1,558	1,669	1,780	2,032	2,283	2,534	2,785	3,036	3,036	3,036	3,036	3,036	3,036	3,036	3,036	3,036	44,132
Bridges and Tunnels	34	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	1,173
Machinery and Equipment	673	1,346	1,397	1,449	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	25,865
Total	1,430	2,859	3,022	3,185	3,347	3,599	3,850	4,101	4,352	4,603	4,603	4,603	4,603	4,603	4,603	4,603	4,603	4,603	71,170

Annex 4.2.8-2

Track and bridges investment requirements - Azerbaijan State Railways

Investment Costs - (US$ '000s)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Permanent Way	48,620	48,620	6,693	6,693	6,693	29,104	29,104	29,104	29,104	29,104									262,840
Bridges and Tunnels	2,985	2,985				909	909	909	909	909									10,515
Machinery and Equipment	12,872	12,872	8,581	8,581	8,581	1,500	1,500	1,500	1,500	1,500									58,988
Training	500																		500
Total	64,977	64,477	15,275	15,275	15,275	31,513	31,513	31,513	31,513	31,513	0	0	0	0	0	0	0	0	332,843
Maintenance																			
Permanent Way	4,862	9,724	10,393	11,063	11,732	14,642	17,553	20,463	23,374	26,284	26,284	26,284	26,284	26,284	26,284	26,284	26,284	26,284	360,362
Bridges and Tunnels	149	2,580	2,915	3,250	3,584	5,039	6,495	7,950	9,405	10,860	10,860	10,860	10,860	10,860	10,860	10,860	10,860	10,860	139,110
Machinery and Equipment	1,287	2,574	3,433	4,291	5,149	5,299	5,449	5,599	5,749	5,899	5,899	5,899	5,899	5,899	5,899	5,899	5,899	5,899	91,918
Total	6,298	14,879	16,741	18,603	20,465	24,981	29,496	34,012	38,527	43,043	43,043	43,043	43,043	43,043	43,043	43,043	43,043	43,043	591,390
Depreciation																			
Permanent Way	1,945	3,890	4,157	4,425	4,693	5,857	7,021	8,185	9,349	10,514	10,514	10,514	10,514	10,514	10,514	10,514	10,514	10,514	144,145
Bridges and Tunnels	60	119	119	119	119	138	156	174	192	210	210	210	210	210	210	210	210	210	3,089
Machinery and Equipment	990	1,980	2,640	3,301	3,961	4,076	4,191	4,307	4,422	4,538	4,538	4,538	4,538	4,538	4,538	4,538	4,538	4,538	70,706
Total	2,995	5,989	6,917	7,845	8,773	10,071	11,368	12,666	13,964	15,261	15,261	15,261	15,261	15,261	15,261	15,261	15,261	15,261	217,940

Annex 4.2.8-3

Track and bridges investment requirements - Georgian Railways

Investment Costs - (US$ '000s)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Permanent Way	76,430	76,430	3,780	3,780	3,780	4,240	4,240	4,240	4,240	4,240									185,399
Bridges and Tunnels	7,183	7,183																	14,365
Machinery and Equipment	12,750	12,750	7,833	7,833	7,833														49,000
Training	500																		500
Total	96,863	96,363	11,613	11,613	11,613	4,240	4,240	4,240	4,240	4,240	0	0	0	0	0	0	0	0	249,264
Maintenance																			
Permanent Way	7,643	15,286	15,664	16,042	16,420	16,844	17,268	17,692	18,116	18,540	18,540	18,540	18,540	18,540	18,540	18,540	18,540	18,540	307,834
Bridges and Tunnels	359	4,181	4,370	4,559	4,748	4,960	5,172	5,384	5,596	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	5,808	91,594
Machinery and Equipment	1,275	2,550	3,333	4,117	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900	79,875
Total	9,277	22,017	23,367	24,717	26,067	26,703	27,339	27,975	28,611	29,247	29,247	29,247	29,247	29,247	29,247	29,247	29,247	29,247	479,303
Depreciation																			
Permanent Way	3,057	6,114	6,266	6,417	6,568	6,738	6,907	7,077	7,246	7,416	7,416	7,416	7,416	7,416	7,416	7,416	7,416	7,416	123,133
Bridges and Tunnels	144	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	5,028
Machinery and Equipment	981	1,962	2,564	3,167	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	3,769	61,442
Total	4,182	8,363	9,117	9,871	10,624	10,794	10,964	11,133	11,303	11,472	11,472	11,472	11,472	11,472	11,472	11,472	11,472	11,472	189,603

Annex 4.2.8-4

Signalling and telecommunication investment requirements - Armenian Railway

Investment Costs - (US$ '000s)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Required Investments:											
Signalling	3,283,975	3,283,975	2,738,452	2,738,452	2,738,452	5,544,720	5,544,720	5,544,720	5,544,720	5,544,720	42,506,905
Telecommunications	1,645,000	1,645,000	3,025,000	3,025,000	3,025,000	2,536,400	2,536,400	2,536,400	2,536,400	2,536,400	25,047,000
Total	4,928,975	4,928,975	5,763,452	5,763,452	5,763,452	8,081,120	8,081,120	8,081,120	8,081,120	8,081,120	67,553,905
Annual Maintenance Costs:											
Signalling	656,795	1,313,590	1,861,280	2,408,971	2,956,661	4,065,605	5,174,549	6,283,493	7,392,437	8,501,381	40,614,762
Telecommunications	329,000	658,000	1,263,000	1,868,000	2,473,000	2,980,280	3,487,560	3,994,840	4,502,120	5,009,400	26,565,200
Total	985,795	1,971,590	3,124,280	4,276,971	5,429,661	7,045,885	8,662,109	10,278,333	11,894,557	13,510,781	67,179,962
Annual Depreciation											
Signalling	218,932	437,863	620,427	802,990	985,554	1,355,202	1,724,850	2,094,498	2,464,146	2,833,794	13,538,254
Telecommunications	164,500	329,000	631,500	934,000	1,236,500	1,490,140	1,743,780	1,997,420	2,251,060	2,504,700	13,282,600
Total	383,432	766,863	1,251,927	1,736,990	2,222,054	2,845,342	3,468,630	4,091,918	4,715,206	5,338,494	26,820,854

Annex 4.2.8-5

Signalling and telecommunication investment requirements - Azerbaijan State Railways

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Required Investments:											
Signalling	6,725	6,725	17,500	17,500	17,500	16,420	16,420	16,420	16,420	16,420	148,050
Telecommunications	2,490	2,490	4,252	4,252	4,252	4,155	4,155	4,155	4,155	4,155	38,509
Total	9,215	9,215	21,752	21,752	21,752	20,575	20,575	20,575	20,575	20,575	186,559
Annual Maintenance Costs:											
Signalling	1,345	2,690	6,190	9,690	13,190	16,474	19,758	23,042	26,326	29,610	148,315
Telecommunications	498	996	1,846	2,697	3,547	4,378	5,209	6,040	6,871	7,702	39,782
Total	1,843	3,686	8,036	12,387	16,737	20,852	24,967	29,082	33,197	37,312	188,097
Annual Depreciation											
Signalling	448	897	2,063	3,230	4,397	5,491	6,586	7,681	8,775	9,870	49,438
Telecommunications	249	498	923	1,348	1,773	2,189	2,604	3,020	3,435	3,851	19,891
Total	697	1,395	2,986	4,578	6,170	7,680	9,190	10,701	12,211	13,721	69,330

Annex 4.2.8-6

Signalling and telecommunication investment requirements - Georgian Railways

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Required Investments:											
Signalling	11,325	11,325	17,033	17,033	17,033	12,240	12,240	12,240	12,240	12,240	134,950
Telecommunications	2,792	2,792	2,487	2,487	2,487	3,652	3,652	3,652	3,652	3,652	31,303
Total	14,117	14,117	19,520	19,520	19,520	15,892	15,892	15,892	15,892	15,892	166,253
Annual Maintenance Costs:											
Signalling	2,265	4,530	7,937	11,343	14,750	17,198	19,646	22,094	24,542	26,990	151,295
Telecommunication	558	1,117	1,614	2,111	2,609	3,339	4,069	4,800	5,530	6,261	32,008
Total	2,823	5,647	9,551	13,455	17,359	20,537	23,715	26,894	30,072	33,251	183,303
Annual Depreciation											
Signalling	755	1,510	2,646	3,781	4,917	5,733	6,549	7,365	8,181	8,997	50,432
Telecommunication	279	558	807	1,056	1,304	1,670	2,035	2,400	2,765	3,130	16,004
Total	1,034	2,068	3,453	4,837	6,221	7,402	8,583	9,765	10,946	12,127	66,436

Annex 4.2.8-7

Power supply investment requirements - Armenian Railway

Investment Costs - (US$ '000)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Rectifier Units	37,500	37,500	37,500	37,500																150,000
Invertor Units	75,000	75,000	75,000	75,000																300,000
Supports	37,500	37,500	37,500	37,500																150,000
Contact Wires	187,500	187,500	187,500	187,500																750,000
Line & Supply Feeders	50,000	50,000	50,000	50,000																200,000
Total	387,500	387,500	387,500	387,500																1,550,000
Maintenance	77,500	155,000	232,500	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310,000	310 000	310,000	310,000	310,000	310,000	5,425,000
Depreciation	19,375	38,750	58,125	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	77,500	1,356,250

Annex 4.2.8-8

Power supply investment requirements - Georgian Railways

Investment Costs - (US$ '000)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Rehabilitation Requirem	5,180	5,559	4,008	2,996																17,743
Supplementary Equipm	76	29	29	24	24	24	22	22	22	22	22									318
Total	5,256	5,588	4,037	3,020																18,061
Maintenance	526	1,084	1,488	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	31,741
Depreciation	263	542	744	895	895	895	895	895	895	895	895	895	895	895	895	895	895	895	895	15,870

Annex 4.2.8-9

Power supply investment requirements - Azerbaijan State Railways

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Equipment	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486									64,864
Vehicles and Cranes	1,910	1,910	1,326	1,326	1,326	1,050	1,050	1,050	1,050	1,050									13,050
Total	8,396	8,396	7,813	7,813	7,813	7,537	7,537	7,537	7,537	7,537	0	0	0	0	0	0	0	0	77,914
Maintenance																			
Equipment	649	1,297	1,946	2,595	3,243	3,892	4,540	5,189	5,838	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486	87,566
Vehicles and Cranes	191	382	515	647	780	885	990	1,095	1,200	1,305	1,305	1,305	1,305	1,305	1,305	1,305	1,305	1,305	18,429
Total	840	1,679	2,460	3,242	4,023	4,777	5,530	6,284	7,038	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	7,791	105,996
Depreciation																			
Equipment	324	649	973	1,297	1,622	1,946	2,270	2,595	2,919	3,243	3,243	3,243	3,243	3,243	3,243	3,243	3,243	3,243	43,783
Vehicles and Cranes	147	294	396	498	600	681	761	842	923	1,004	1,004	1,004	1,004	1,004	1,004	1,004	1,004	1,004	14,176
Total	471	942	1,369	1,795	2,221	2,627	3,032	3,437	3,842	4,247	4,247	4,247	4,247	4,247	4,247	4,247	4,247	4,247	57,959

Annex 4.2.8-10

Investment requirements for stations and container terminals - Armenian Railway

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Tracks	2,139,321	2,139,321	223,446	223,446	223,446	301,772	301,772	301,772	301,772	301,772									6,457,839
Buildings	102,750	102,750	15,967	15,967	15,967	17,060	17,060	17,060	17,060	17,060									338,700
Equipment	203,150	203,150	17,933	17,933	17,933	10,200	10,200	10,200	10,200	10,200									511,100
Total	2,445,221	2,445,221	257,346	257,346	257,346	329,032	329,032	329,032	329,032	329,032	0	0	0	0	0	0	0	0	7,307,639
Maintenance																			
Tracks	213,932	427,864	450,209	472,553	494,898	525,075	555,252	585,430	615,607	645,784	645,784	645,784	645,784	645,784	645,784	645,784	645,784	645,784	10,152,875
Buildings	5,138	10,275	11,073	11,872	12,670	13,523	14,376	15,229	16,082	16,935	16,935	16,935	16,935	16,935	16,935	16,935	16,935	16,935	262,653
Equipment	20,315	40,630	42,423	44,217	46,010	47,030	48,050	49,070	50,090	51,110	51,110	51,110	51,110	51,110	51,110	51,110	51,110	51,110	847,825
Total	239,385	478,769	503,705	528,642	553,578	585,628	617,678	649,729	681,779	713,829	713,829	713,829	713,829	713,829	713,829	713,829	713,829	713,829	11,263,353
Depreciation																			
Tracks	85,573	171,146	180,084	189,021	197,959	210,030	222,101	234,172	246,243	258,314	258,314	258,314	258,314	258,314	258,314	258,314	258,314	258,314	4,061,150
Buildings	2,055	4,110	4,429	4,749	5,068	5,409	5,750	6,092	6,433	6,774	6,774	6,774	6,774	6,774	6,774	6,774	6,774	6,774	105,061
Equipment	16,929	33,858	35,353	36,847	38,342	39,192	40,042	40,892	41,742	42,592	42,592	42,592	42,592	42,592	42,592	42,592	42,592	42,592	706,521
Total	104,557	209,114	219,866	230,617	241,369	254,631	267,893	281,155	294,417	307,679	307,679	307,679	307,679	307,679	307,679	307,679	307,679	307,679	4,872,732

Annex 4.2.8-11

Investment requirements for stations and container terminals - Azerbaijan State Railways

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Tracks	6,815,180	6,815,180	2,720,193	2,720,193	2,720,193	1,834,500	1,834,500	1,834,500	1,834,500	1,834,500									30,963,440
Buildings	109,350	109,350	44,833	44,833	44,833	17,000	17,000	17,000	17,000	17,000									438,200
Equipment	237,400	237,400	667	667	667	3,360	3,360	3,360	3,360	3,360									493,600
Total	7,161,930	7,161,930	2,765,693	2,765,693	2,765,693	1,854,860	1,854,860	1,854,860	1,854,860	1,854,860	0	0	0	0	0	0	0	0	31,895,240
Maintenance																			
Tracks	681,518	1,363,036	1,635,055	1,907,075	2,179,094	2,362,544	2,545,994	2,729,444	2,912,894	3,096,344	3,096,344	3,096,344	3,096,344	3,096,344	3,096,344	3,096,344	3,096,344	3,096,344	46,183,750
Buildings	5,468	10,935	13,177	15,418	17,660	18,510	19,360	20,210	21,060	21,910	21,910	21,910	21,910	21,910	21,910	21,910	21,910	21,910	338,988
Equipment	23,740	47,480	47,547	47,613	47,680	48,016	48,352	48,688	49,024	49,360	49,360	49,360	49,360	49,360	49,360	49,360	49,360	49,360	852,380
Total	710,726	1,421,451	1,695,779	1,970,106	2,244,434	2,429,070	2,613,706	2,798,342	2,982,978	3,167,614	3,167,614	3,167,614	3,167,614	3,167,614	3,167,614	3,167,614	3,167,614	3,167,614	47,375,118
Depreciation																			
Tracks	272,607	545,214	654,022	762,830	871,638	945,018	1,018,398	1,091,778	1,165,158	1,238,538	1,238,538	1,238,538	1,238,538	1,238,538	1,238,538	1,238,538	1,238,538	1,238,538	18,473,500
Buildings	2,187	4,374	5,271	6,167	7,064	7,404	7,744	8,084	8,424	8,764	8,764	8,764	8,764	8,764	8,764	8,764	8,764	8,764	135,595
Equipment	19,783	39,567	39,622	39,678	39,733	40,013	40,293	40,573	40,853	41,133	41,133	41,133	41,133	41,133	41,133	41,133	41,133	41,133	710,317
Total	294,578	589,155	698,915	808,675	918,435	992,435	1,066,435	1,140,435	1,214,435	1,288,435	1,288,435	1,288,435	1,288,435	1,288,435	1,288,435	1,288,435	1,288,435	1,288,435	19,319,412

Annex 4.2.8-12

Investment requirements for stations and container terminals - Georgian Railways

Investment Costs - (US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Tracks	5,309,350	5,309,350	5,000,000	5,000,000	5,000,000	718,000	718,000	718,000	718,000	718,000									29,208,700
Buildings	133,500	133,500	28,000	28,000	28,000	9,800	9,800	9,800	9,800	9,800									400,000
Equipment	193,900	193,900	0	0	0	4,700	4,700	4,700	4,700	4,700									411,300
Total	5,636,750	5,636,750	5,028,000	5,028,000	5,028,000	732,500	732,500	732,500	732,500	732,500	0	0	0	0	0	0	0	0	30,020,000
Maintenance																			
Tracks	530,935	1,061,870	1,561,870	2,061,870	2,561,870	2,633,670	2,705,470	2,777,270	2,849,070	2,920,870	2,920,870	2,920,870	2,920,870	2,920,870	2,920,870	2,920,870	2,920,870	2,920,870	45,031,725
Buildings	6,675	13,350	14,750	16,150	17,550	18,040	18,530	19,020	19,510	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	323,575
Equipment	19,390	38,780	38,780	38,780	38,780	39,250	39,720	40,190	40,660	41,130	41,130	41,130	41,130	41,130	41,130	41,130	41,130	41,130	704,500
Total	557,000	1,114,000	1,615,400	2,116,800	2,618,200	2,690,960	2,763,720	2,836,480	2,909,240	2,982,000	2,982,000	2,982,000	2,982,000	2,982,000	2,982,000	2,982,000	2,982,000	2,982,000	46,059,800
Depreciation																			
Tracks	212,374	424,748	624,748	824,748	1,024,748	1,053,468	1,082,188	1,110,908	1,139,628	1,168,348	1,168,348	1,168,348	1,168,348	1,168,348	1,168,348	1,168,348	1,168,348	1,168,348	18,012,690
Buildings	2,670	5,340	5,900	6,460	7,020	7,216	7,412	7,608	7,804	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	129,430
Equipment	16,158	32,317	32,317	32,317	32,317	32,708	33,100	33,492	33,883	34,275	34,275	34,275	34,275	34,275	34,275	34,275	34,275	34,275	587,083
Total	231,202	462,405	662,965	863,525	1,064,085	1,093,392	1,122,700	1,152,008	1,181,315	1,210,623	1,210,623	1,210,623	1,210,623	1,210,623	1,210,623	1,210,623	1,210,623	1,210,623	18,729,203

Investments rolling stock: Armenian Railway

Annex 4.2.8-13

Optimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	5.100	1.100	1.100	1.100	1.100	1.100	15.320	13.320	13.320	13.320	13.320	28.200	23.200	23.200	23.200	23.200	200.200
Main Overhauls	300	300	300	300															1.200
Scrapping Costs	49	53	60	57	2	0	0	0	0	0	0	0	3	0	0	0	0	0	222
Purchase of wagons + coaches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	349	353	5.460	1.457	1.102	1.100	1.100	1.100	15.320	13.320	13.320	13.320	13.323	28.200	23.200	23.200	23.200	23.200	201.622
Regular Maintenance																			
Locomotives and EMU	1.922	1.922	1.922	1.994	2.020	2.020	2.020	2.020	2.244	2.244	2.244	2.244	2.244	2.598	2.598	2.598	2.598	2.598	40.048
Wagons and coaches	2.702	2.702	2.702	2.702	2.702	2.702	2.702	2.702	3.081	3.081	3.081	3.081	3.081	3.368	3.368	3.368	3.368	3.368	53.857
Total	4.624	4.624	4.624	4.696	4.722	4.722	4.722	4.722	5.325	5.325	5.325	5.325	5.325	5.966	5.966	5.966	5.966	5.966	93.905
Depreciation																			
Locomotives and EMU	9	18	182	224	258	291	324	358	822	1.225	1.629	2.033	2.436	3.291	3.994	4.697	5.400	6.103	33.294
Wagons and coaches			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	18	182	224	258	291	324	358	822	1.225	1.629	2.033	2.436	3.291	3.994	4.697	5.400	6.103	33.294
Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	292	874	438	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	1.723
Total	292	874	438	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	1.723
Maintenance of workshops	29	117	160	160	172	172	172	172	172	172	172	172	172	172	172	172	172	172	2.879
Depreciation for workshops	29	117	160	160	172	172	172	172	172	172	172	172	172	172	172	172	172	172	2.879

Investments rolling stock: Armenian Railway

Annex 4.2.8-13

Pessimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	4.100	1.100	1.100	1.100	1.100	1.100	2.320	1.320	1.320	1.320	1.320	13.600	9.600	9.600	9.600	9.600	69.200
Main Overhauls	300	300	300	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.200
Scrapping Costs	80	84	91	89	2	0	0	0	0	0	0	0	3	0	0	0	0	0	349
Purchase of wagons + coaches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	380	384	4.491	1.489	1.102	1.100	1.100	1.100	2.320	1.320	1.320	1.320	1.323	13.600	9.600	9.600	9.600	9.600	70.749
Regular Maintenance																			
Locomotives and EMU	1.672	1.672	1.672	1.726	1.752	1.752	1.752	1.752	1.770	1.770	1.770	1.770	1.770	1.894	1.894	1.894	1.894	1.894	32.070
Wagons and coaches	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	1.918	34.524
Total	3.590	3.590	3.590	3.644	3.670	3.670	3.670	3.670	3.688	3.688	3.688	3.688	3.688	3.812	3.812	3.812	3.812	3.812	66.594
Depreciation																			
Locomotives and EMU	9	18	152	194	227	261	294	327	398	438	478	518	558	970	1.261	1.552	1.842	2.133	11.627
Wagons and coaches			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	9	18	152	194	227	261	294	327	398	438	478	518	558	970	1.261	1.552	1.842	2.133	11.627
Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	292	874	438	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	1.723
Total	292	874	438	0	120	0	0	0	0	0	0	0	0	0	0	0	0	0	1.723
Maintenance of workshops	29	117	160	160	172	172	172	172	172	172	172	172	172	172	172	172	172	172	2.879
Depreciation for workshops	29	117	160	160	172	172	172	172	172	172	172	172	172	172	172	172	172	172	2.879

Investments rolling stock: Azerbaijan State Railways

Annex 4.2.8-14

Optimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	0	4,960	4,960	4,960	4,960	4,960	17,220	17,220	17,220	17,220	17,220	100,600	100,600	100,600	100,600	100,600	613,900
Main Overhauls	1,600	2,300	2,600	2,800															9,300
Scrapping Costs	164	166	169	166	133	133	133	133	2	2	2	2	2	5	5	5	5	5	1,231
Purchase of wagons + coaches	0	0	0	496	496	496	496	496	12,248	12,248	12,248	12,248	12,248	7,848	7,848	7,848	7,848	7,848	102,960
Total	1,764	2,466	2,769	8,422	5,589	5,589	5,589	5,589	29,470	29,470	29,470	29,470	29,470	108,453	108,453	108,453	108,453	108,453	727,391
Regular Maintenance																			
Locomotives and EMU	4,194	4,194	4,194	4,194	4,398	4,398	4,398	4,398	5,261	5,261	5,261	5,261	5,261	6,980	6,980	6,980	6,980	6,980	95,569
Wagons and coaches	18,542	18,542	18,573	18,573	18,573	18,573	18,573	18,573	19,339	19,339	19,339	19,339	19,339	19,829	19,829	19,829	19,829	19,829	344,360
Total	22,736	22,736	22,767	22,767	22,971	22,971	22,971	22,971	24,600	24,600	24,600	24,600	24,600	26,809	26,809	26,809	26,809	26,809	439,929
Depreciation																			
Locomotives and EMU	48	118	197	432	582	733	883	1,033	1,555	2,077	2,599	3,121	3,642	6,691	9,739	12,788	15,836	18,885	80,961
Wagons and coaches			0	15	30	45	60	75	446	817	1,189	1,560	1,931	2,169	2,407	2,644	2,882	3,120	19,390
Total	48	118	197	447	612	778	943	1,108	2,001	2,894	3,787	4,680	5,573	8,860	12,146	15,432	18,719	22,005	100,351

Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	1,113	954	549	73	180	0	0	0	0	0	0	0	0	0	0	0	0	0	2,868
Total	1,113	954	549	73	180	0	0	0	0	0	0	0	0	0	0	0	0	0	2,868
Maintenance of workshops	111	207	262	269	287	287	287	287	287	287	287	287	287	287	287	287	287	287	4,863
Depreciation for workshops	111	207	262	269	287	287	287	287	287	287	287	287	287	287	287	287	287	287	4,863

Investments rolling stock: Azerbaijan State Railways

Annex 4.2.8-14

Pessimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	0	960	960	960	960	960	10,220	10,220	10,220	10,220	10,220	46,000	46,000	46,000	46,000	46,000	285,900
Main Overhauls	1,100	1,100	1,100	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,400
Scrapping Costs	257	261	264	262	214	214	214	214	2	2	2	2	2	2	2	2	2	2	1,920
Purchase of wagons + coaches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,357	1,361	1,364	2,322	1,174	1,174	1,174	1,174	10,222	10,222	10,222	10,222	10,222	46,002	46,002	46,002	46,002	46,002	292,220
Regular Maintenance																			
Locomotives and EMU	3,624	3,624	3,624	3,624	3,721	3,721	3,721	3,721	3,721	3,721	3,721	3,721	3,721	4,373	4,373	4,373	4,373	4,373	69,846
Wagons and coaches	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	9,379	168,822
Total	13,003	13,003	13,003	13,003	13,100	13,100	13,100	13,100	13,100	13,100	13,100	13,100	13,100	13,752	13,752	13,752	13,752	13,752	238,668
Depreciation																			
Locomotives and EMU	33	67	100	162	192	221	250	279	588	898	1,208	1,518	1,827	3,221	4,615	6,009	7,403	8,797	37,388
Wagons and coaches			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	33	67	100	162	192	221	250	279	588	898	1,208	1,518	1,827	3,221	4,615	6,009	7,403	8,797	37,388
Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	1,113	954	549	73	180	0	0	0	0	0	0	0	0	0	0	0	0	0	2,868
Total	1,113	954	549	73	180	0	0	0	0	0	0	0	0	0	0	0	0	0	2,868
Maintenance of workshops	111	207	262	269	287	287	287	287	287	287	287	287	287	287	287	287	287	287	4,863
Depreciation for workshops	111	207	262	269	287	287	287	287	287	287	287	287	287	287	287	287	287	287	4,863

Investments rolling stock: Georgian Railways

Annex 4.2.8-15

Optimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	0	6,700	6,700	6,700	6,700	6,700	40,800	40,800	40,800	40,800	40,800	56,080	56,080	56,080	56,080	56,080	517,900
Main Overhauls	1,200	1,200	1,200	1,200															4,800
Scrapping Costs	237	239	292	291	249	0	0	0	3	3	3	3	3	1	1	1	1	1	1,331
Purchase of wagons + coaches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,437	1,439	1,492	8,191	6,949	6,700	6,700	6,700	40,803	40,803	40,803	40,803	40,803	56,081	56,081	56,081	56,081	56,081	524,031
Regular Maintenance																			
Locomotives and EMU	2,682	2,682	2,682	2,934	3,038	3,038	3,038	3,038	4,000	4,000	4,000	4,000	4,000	4,983	4,983	4,983	4,983	4,983	68,049
Wagons and coaches	10,586	10,586	10,586	10,586	10,586	10,586	10,586	10,586	12,988	12,988	12,988	12,988	12,988	12,260	12,260	12,260	12,260	12,260	210,926
Total	13,268	13,268	13,268	13,520	13,624	13,624	13,624	13,624	16,988	16,988	16,988	16,988	16,988	17,243	17,243	17,243	17,243	17,243	278,975
Depreciation																			
Locomotives and EMU	36	73	109	348	552	755	958	1,161	2,397	3,633	4,870	6,106	7,342	9,042	10,741	12,441	14,140	15,839	90,542
Wagons and coaches			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	36	73	109	348	552	755	958	1,161	2,397	3,633	4,870	6,106	7,342	9,042	10,741	12,441	14,140	15,839	90,542
Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	1,562	903	345	55	415	0	0	0	0	0	0	0	0	0	0	0	0	0	3,279
Total	1,562	903	345	55	415	0	0	0	0	0	0	0	0	0	0	0	0	0	3,279
Maintenance of workshops	156	246	281	286	328	328	328	328	328	328	328	328	328	328	328	328	328	328	5,560
Depreciation for workshops	156	246	281	286	328	328	328	328	328	328	328	328	328	328	328	328	328	328	5,560

Investments rolling stock: Georgian Railways

Annex 4.2.8-15

Pessimistic scenario (in US$ '000)

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Investments																			
Purchase of Locomotives + EMU	0	0	0	3,300	3,300	3,300	3,300	3,300	2,200	2,200	2,200	2,200	2,200	6,320	6,320	6,320	6,320	6,320	59,100
Main Overhauls	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scrapping Costs	342	345	413	394	286	0	0	0	2	2	2	2	2	0	0	0	0	0	1,792
Purchase of wagons + coaches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	342	345	413	3,694	3,586	3,300	3,300	3,300	2,202	2,202	2,202	2,202	2,202	6,320	6,320	6,320	6,320	6,320	60,892
Regular Maintenance																			
Locomotives and EMU	2,419	2,419	2,419	2,419	2,419	2,419	2,419	2,419	2,509	2,509	2,509	2,509	2,509	2,563	2,563	2,563	2,563	2,563	44,712
Wagons and coaches	6,213	6,213	6,213	6,213	6,213	6,213	6,213	6,213	6,276	6,276	6,276	6,276	6,276	6,772	6,772	6,772	6,772	6,772	114,938
Total	8,631	8,631	8,631	8,631	8,631	8,631	8,631	8,631	8,784	8,784	8,784	8,784	8,784	9,335	9,335	9,335	9,335	9,335	159,649
Depreciation																			
Locomotives and EMU	0	0	0	100	200	300	400	500	567	633	700	767	833	1,025	1,216	1,408	1,599	1,791	12,039
Wagons and coaches			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	100	200	300	400	500	567	633	700	767	833	1,025	1,216	1,408	1,599	1,791	12,039
Workshops																			
Investments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	1,562	903	345	55	415	0	0	0	0	0	0	0	0	0	0	0	0	0	3,279
Total	1,562	903	345	55	415	0	0	0	0	0	0	0	0	0	0	0	0	0	3,279
Maintenance of workshops	156	246	281	286	328	328	328	328	328	328	328	328	328	328	328	328	328	328	5,560
Depreciation for workshops	156	246	281	286	328	328	328	328	328	328	328	328	328	328	328	328	328	328	5,560

Chapter 5

Financial forecast

Contents:

List of Tables:

List of Annexes:

5. Financial forecast

5.1 Financial forecast of Armenian Railway

5.1.1 Calculation basis, assumptions

The cost figures received from the Armenian Railway for 1995, as presented in section 2.4.1, are the point of departure of calculations. The cost tables of Annex 5.1-1 are directly derived from them. The changes and variations which these costs undergo are indicated at the bottom of the cost tables.

The following corrections and evaluations need some explanation:

- Not considering the effects of the variation of traffic performance, personnel costs (salaries and social costs) are increased by 2.5 times up to 2000. It was stated under section 2.4.1 that the salary level should be about 13 times the present one. This does however not apply to the entire present staff. Despite strong personnel reductions operated in the past, there is still a need for an increase of productivity. Salary increases, combined with productivity increases, result in the above factor, which seems realistic for the Armenian Railway. In addition to that, 50% of personnel costs are proportional to variations in traffic performance;
- Costs of materials, which are supposed to be others than for normal maintenance, have been increased by 50% against the present level and left fixed with respect to variations in traffic performance;
- The 1995 price of electric energy has been multiplied by 2;
- Depreciation and maintenance costs have been completely reestimated as percentages of the acquisition value of the fixed assets according to the investment tables in the Annexes 5.4-1 and 5.4-2. The annual averages of these costs as calculated in the Annexes 4.2.8-1 to 4.2.8-12 have been used in the calculations, where they are kept fixed over the whole period 1997 - 2015 (for the maintenance costs pertaining to the rolling stock see below). However, the new maintenance costs of the permanent ways have been adjusted in the first years in order to take account of the fact that they are much lower at the beginning of the period: 1/5 of the average has been taken for 1997 and ½ of the average for 2000.

The costs for the maintenance of the rolling stock, which have been worked out under section 4.2.6, have been introduced in the relevant tables of the Annexes 5.4-1 and 5.4-2. Part of the work on the locomotives is performed in the Tbilisi locomotive plant, for which a business plan exists under chapter 6.

The evolution of traffic performance, which influences the variable components of the costs, corresponds with the traffic forecast under chapter 3, average figures between the optimistic and the pessimistic traffic scenarios having been used. Traffic performance is expressed as the number of "tonne-kilometre equivalents (tkm equiv.)", where, for simplification, passenger-km have been counted as tkm.

5.1.2 Prices

The calculation model examines three scenarios regarding the price level:

- **Scenario 1:** The existing price level remains unchanged until 2015;
- **Scenario 2:** The Armenian Railway change their tariffs in such a way that for half of its performance, prices are raised by 50% by 2000 and then, progressively the prices of this half are further increased to reach double the present level by 2010;
- **Scenario 3:** Tariffs are subject to strong increases so that on average for all transports, they are about three times as high as they are now.

The last scenario corresponds with price levels which the Revenue Forecast of the TRACECA Pilot Train Study has supposed for the Georgian and the Azerbaijan Railways. It is the only one bringing some returns on investment on medium term. However, given the present reluctance of the managers of the Caucasian Railway administrations in considering at all price increases, it is not sure that this scenario can be realised.

The first scenario corresponds with the opinion of most of the persons in charge met at the Caucasian Railway administrations.

The second one is a policy which is strongly recommended in order to ensure the viability of the railways and of the proposed rehabilitation measures. Increasing moderately the prices for those transports for which the railway has a clear advantage against the road (such as for example oil products and other goods in bulk) or for which extreme underpricing is being practised, seems indispensable and realistic. The condition is of course that, at the same time, the railway improves the quality of its service. Some attempts in this direction are being undertaken in Azerbaijan for passenger trains.

Improved marketing, along with cost accounting, shall help the managers to strengthen the sales efforts on profitable activities and to reduce or skip loss-making ones. If the railway is to provide social services, such as cheap passenger transport, it has to get a compensation for the corresponding deficits from government.

As for passenger traffic, it may seem that raising prices would inevitably have a negative impact on the growth of the number of passengers. It is reminded in this context that in 1996, passenger service of Armenian Railway counted for 19.3% of total business regarding performance (passenger-km being counted as equivalent to tkm), but only for 2.4% regarding revenue (see Annex 2.4.1-4). The following remarks seem useful for judging the passenger business globally:

- The passenger market analysis under sections 6.1.4 to 6.1.6 makes clear that, on some connections and market segments, the railway can offer advantages against the bus or can usefully be combined with the latter;

- It is therefore possible, on these connections and market segments, to raise the prices up to a certain level without losing business, and even by gaining additional passengers;
- On the other side, hopelessly uncompetitive passenger services should be stopped;
- If above strategy is applied consequently, it can be avoided that, globally, increased prices go along with an exodus of passengers.

5.1.3 Investments

Adding together the costs of all rehabilitation measures proposed gives, for Armenia, a total amount of 327 million $US (see chapter 4)[1]. The table at page 4 of the Annex 5.4-1 summarises these costs. It includes the figures of the following partial investment tables. These tables correspond with those of the Annexes 4.2.8-1 to 4.2.8-12.

Investments in the telecommunication system have been taken out from the railway's investment account. Instead, they are part of the separate calculations for the "communication network" under chapter 6. These investments can be used commercially and are financially self-sustaining.

The full investment programme represents a heavy burden for the cash flow and it brings a very negative profitability for scenario 2. For that reason, a "reduced investment programme" has been proposed, which comes, for Armenia, to a total amount of only 174 million $US[1]. In this programme, investments for permanent ways and stations are limited to the first and second priorities, the ones for signalling only to the first priority; for the rolling stock, part of the electric locomotives has been replaced by diesel engine ones. The calculation tables of Annex 5.4-2 are analogous to those of the full investment programme.

5.1.4 Method of calculation

There are two calculation models working with the same basic figures and assumptions, one for the full investment programme (Annex 5.1-1) and one for the reduced investment programme (Annex 5.1-2). In the latter, only the second price scenario has been calculated (called scenario 2A).

For each model, two sets of tables are presented. The first set shows the costs of the transport activities in 1995 and also the ones of 2015 (the costs of the years 1997, 2000 and 2010 have also been calculated). The second set shows the receipts (paid revenue) of the three scenarios and the costs (including depreciation, excluding profit tax). All figures are in constant 1997 $US.

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[1] In this figure, investments for the rolling stock as given in the Annexes 4.2.6-7a to 4.2.6-9b are counted with their medium values between the "optimistic scenario" (regarding traffic) and the "pessimistic" one; in the calculation tables of the Annexes 5.4-1 and 5.4-2, these scenarios are called "high case" and "low case" respectively, in order to avoid confusion with the financial scenarios.

5.1.5 Results

The results of the financial calculations are summarised below. The total costs include interests for the bank loans to be provided for financing the new interests, because at this stage, the financing structure has not been agreed upon sufficiently in detail.

Table 5.1-1: Receipts, costs and profits of Armenian Railway, from 1997 to 2015, in 1,000 $US

	1997	2000	2010	2015
Full investment programme				
Receipts scenario 1	5,922	9,355	13,685	16,771
Receipts scenario 2	5,922	11,694	20,527	25,156
Receipts scenario 3	7,698	16,839	35,581	50,312
Costs	31,835	38,860	46,928	49,029
Profit before tax scen. 1	-25,913	-29,505	-33,243	-32,258
Profit before tax scen. 2	-25,913	-27,166	-26,401	-23,873
Profit before tax scen. 3	-24,137	-22,021	-11,347	1,283
Reduced investment programme				
Receipts scenario 2A	5,922	11,694	20,527	25,156
Costs	21,545	27,707	34,337	36,437
Profit before tax	-15,623	-16,013	-13,810	-11,281

The profitability is negative up to 2015 except for scenario 3. The reason is that at the forecast traffic development, Armenian Railway do not yet reach their break-even point. The entire operation should be adapted to the restricted market through the limitation of loss making services, the concentration on relatively profitable ones and the cutting down of overheads.

5. Financial forecast

5.2 Financial forecast of Azerbaijan State Railways

5.2.1 Calculation basis, assumptions

The cost figures received from Azerbaijan State Railways for 1996, as presented in section 2.4.2, are the point of departure of calculations. The cost tables of Annex 5.2-1 are directly derived from them. The changes and variations which these costs undergo are indicated at the bottom of the cost tables.

The following corrections and evaluations need some explanation:

- Not considering the effects of the variation of traffic performance, personnel costs (salaries and social costs) are increased by 2 times up to 2000. It was stated under section 2.4.2 that the salary level should be about 13 times the present one. This does however not apply to the entire present staff. Despite strong personnel reductions operated in the past, there is still a need for an increase of productivity. Salary increases, combined with productivity increases, result in the above factor, which seems realistic for the Azerbaijan State Railways. In addition to that, 50% of personnel costs are proportional to variations in traffic performance;
- Costs of materials, which are supposed to be others than for normal maintenance, have been increased to the triple of the present level and left fixed with respect to variations in traffic performance;
- The 1995 price of electric energy has been multiplied by 1.5;
- Depreciation and maintenance costs have been completely reestimated as percentages of the acquisition value of the fixed assets according to the investment tables in the Annexes 5.4-1 and 5.4-2. The annual averages of these costs as calculated in the Annexes 4.2.8-1 to 4.2.8-12 have been used in the calculations, where they are kept fixed over the whole period 1997 - 2015 (for the maintenance costs pertaining to the rolling stock see below). However, the level of the new maintenance costs of the permanent ways has been adjusted for 1997, where only 1/3 of the average has been taken, in order to take account of the fact that these costs are lower in the first years.

The costs for the maintenance of the rolling stock, which have been worked out under section 4.2.6, have been introduced in the relevant tables of the Annexes 5.4-1 and 5.4-2. Part of the work on the locomotives is performed in the Tbilisi locomotive plant, for which a business plan exists under chapter 6.

The evolution of traffic performance, which influences the variable components of the costs, corresponds with the traffic forecast under chapter 3, average figures between the optimistic and the pessimistic traffic scenarios having been used. Traffic performance is expressed as the number of "tonne-kilometre equivalents (tkm equiv.)", where, for simplification, passenger-km have been counted as tkm.

5.2.2 Prices

The calculation model examines three scenarios regarding the price level:

- **Scenario 1:** The existing price level remains unchanged until 2015;
- **Scenario 2:** The Azerbaijan State Railways change their tariffs in such a way that for half of its performance, prices are raised by 50% by 2000 and then, progressively the prices of this half are further increased to reach double the present level by 2010;
- **Scenario 3:** Tariffs are subject to strong increases so that on average for all transports, they are about three times as high as they are now.

The last scenario corresponds to price levels which the Revenue Forecast of the TRACECA Pilot Train Study has supposed. It is the only one bringing satisfactory returns on investment on medium term. However, given the present reluctance of the managers of the Caucasian railway administrations in considering at all price increases, it is not sure that this scenario can be realised.

The first scenario corresponds with the opinion of most of the persons in charge met at the Caucasian railway administrations.

The second one is a policy which is strongly recommended in order to ensure the viability of the railways and of the proposed rehabilitation measures. Increasing moderately the prices for those transports for which the railway has a clear advantage against the road (such as for example oil products and other goods in bulk) or for which extreme underpricing is being practised, seems indispensable and realistic. The condition is of course that, at the same time, the railway improves the quality of its service. Some attempts in this direction are being undertaken in Azerbaijan for passenger trains.

Improved marketing, along with cost accounting, shall help the managers to strengthen the sales efforts on profitable activities and to reduce or skip loss-making ones. If the railway is to provide social services, such as cheap passenger transport, it has to get a compensation for the corresponding deficits from government.

As for passenger traffic, it may seem that raising prices would inevitably have a negative impact on the growth of the number of passengers. It is reminded in this context that in 1996, passenger service of Azerbaijan State Railways counted for 14.2% of total business regarding performance (passenger-km being counted as equivalent to tkm), but only for 2.9% regarding revenue (see Annex 2.4.2-4). The following remarks seem useful for judging the passenger business globally:

- The passenger market analysis under sections 6.1.4 to 6.1.6 makes clear that, on some connections and market segments, the railway can offer advantages against the bus or can usefully be combined with the latter;
- It is therefore possible, on these connections and market segments, to raise the prices up to a certain level without losing business, and even by gaining additional passengers;

- On the other side, hopelessly uncompetitive passenger services should be stopped;
- If above strategy is applied consequently, it can be avoided that, globally, increased prices go along with an exodus of passengers.

5.2.3 Investments

Adding together the costs of all rehabilitation measures proposed gives, for Azerbaijan, a total amount of 1,325 million $US (see chapter 4)[2]. The table at page 4 of Annex 5.4-1 summarises these costs. It includes the figures of the following partial investment tables. These tables correspond with those of the Annexes 4.2.8-1 to 4.2.8-12.

Investments in the telecommunication system have been taken out from the railway's investment account. Instead, they are part of the separate calculations for the "communication network" under chapter 6. These investments can be used commercially and are financially self-sustaining.

The full investment programme represents a heavy burden for the cash flow and it brings a very low profitability for scenario 2. For that reason, a "reduced investment programme" has been proposed, which comes, for Azerbaijan, to a total amount of only 739 million $US[2]. In this programme, investments for permanent ways and stations are limited to the first and second priorities, the ones for signalling only to the first priority; for the rolling stock, part of the electric locomotives has been replaced by diesel engine ones. The calculation tables of Annex 5.4-2 are analogous to those of the full investment programme.

5.2.4 Method of calculation

There are two calculation models working with the same basic figures and assumptions, one for the full investment programme (Annex 5.2-1) and one for the reduced investment programme (Annex 5.2-2). In the latter, only the second price scenario has been calculated (called scenario 2A).

For each model, two sets of tables are presented. The first set shows the costs of the transport activities in 1995 and also the ones of 2015 (the costs of the years 1997, 2000 and 2010 have also been calculated). The second set shows the receipts (paid revenue) of the three scenarios and the costs (including depreciation, excluding profit tax). All figures are in constant 1997 $US.

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[2] In this figure, investments for the rolling stock as given in the Annexes 4.2.6-7a to 4.2.6-9b are counted with their medium values between the "optimistic scenario" (regarding traffic) and the "pessimistic" one; in the calculation tables of the Annexes 5.4-1 and 5.4-2, these scenarios are called "high case" and "low case" respectively, in order to avoid confusion with the financial scenarios.

5.2.5 Results

The results of the financial calculations are summarised below. The total costs include interests for the bank loans to be provided for financing the new interests, because at this stage, the financing structure has not been agreed upon sufficiently in detail.

Table 5.2-1: Receipts, costs and profits of Azerbaijan State Railways, from 1997 to 2015, in 1,000 $US

	1997	2000	2010	2015
Full investment programme				
Receipts scenario 1	38,851	138,678	213,111	247,713
Receipts scenario 2	38,851	173,348	319,667	371,569
Receipts scenario 3	49,272	260,821	566,347	768,316
Costs	161,878	251,682	298,935	320,901
Profit before tax scen. 1	-123,027	-113,004	-85,824	-73,188
Profit before tax scen. 2	-123,027	-78,334	20,732	50,668
Profit before tax scen. 3	-112,606	9,139	267,412	447,415
Reduced investment programme				
Receipts scenario 2A	38,851	173,348	319,667	371,569
Costs	120,066	200,671	247,925	269,891
Profit before tax	-81,215	-27,323	71,742	101,678

The profitability is marginal for scenario 2, fairly positive for scenario 2A and, of course, excellent for scenario 3. The result for the scenario 2A is encouraging as it shows that the Azerbaijan State Railways are able to cover their costs before 2010. It is however not entirely satisfactory and discloses that more should still be done for reducing costs through the limitation of loss making services and, related to that, further reduction of investments.

5. Financial forecast

5.3 Financial forecast of Georgian Railways

5.3.1 Calculation basis, assumptions

The cost figures received from Georgian Railways for 1996, as presented in section 2.4.3, are the point of departure of calculations. The cost tables of Annex 5.3-1 are directly derived from them. The changes and variations which these costs undergo are indicated at the bottom of the cost tables.

The following corrections and evaluations need some explanation:

- Not considering the effects of the variation of traffic performance, personnel costs (salaries and social costs) are increased by 2 times up to 2000. It was stated under section 2.4.3 that the salary level should be about 10 times the present one. This does however not apply to the entire present staff. Despite strong personnel reductions operated in the past, there is still a need for an increase of productivity. Salary increases, combined with productivity increases, result in the above factor, which seems realistic for the Georgian Railways. In addition to that, 50% of personnel costs are proportional to variations in traffic performance;
- Costs of materials, which are supposed to be others than for normal maintenance, have been increased by 50% and then left fixed with respect to variations in traffic performance;
- The 1995 price of electric energy has been multiplied by 2;
- Depreciation and maintenance costs have been completely reestimated as percentages of the acquisition value of the fixed assets according to the investment tables in the Annexes 5.4-1 and 5.4-2. The annual averages of these costs as calculated in the Annexes 4.2.8-1 to 4.2.8-12 have been used in the calculations, where they are kept fixed over the whole period 1997 - 2015 (for the maintenance costs pertaining to the rolling stock see below). However, the level of the new maintenance costs of the permanent ways has been adjusted for 1997, where only 1/3 of the average has been taken, in order to take account of the fact that these costs are lower in the first years.

The costs for the maintenance of the rolling stock, which have been worked out under section 4.2.6, have been introduced in the relevant tables of the Annexes 5.4-1 and 5.4-2. Part of the work on the locomotives is performed in the Tbilisi locomotive plant, for which a business plan exists under chapter 6.

The evolution of traffic performance, which influences the variable components of the costs, corresponds with the traffic forecast under chapter 3, average figures between the optimistic and the pessimistic traffic scenarios having been used. Traffic performance is expressed as the number of "tonne-kilometre equivalents (tkm equiv.)", where, for simplification, passenger-km have been counted as tkm.

5.3.2 Prices

The calculation model examines three scenarios regarding the price level:

- **Scenario 1:** The existing price level remains unchanged until 2015;
- **Scenario 2:** The Georgian Railways change their tariffs in such a way that for half of its performance, prices are raised by 50% by 2000 and then, progressively the prices of this half are further increased to reach double the present level by 2010;
- **Scenario 3:** Tariffs are subject to strong increases so that on average for all transports, they are about three times as high as they are now.

The last scenario corresponds to price levels which the Revenue Forecast of the TRACECA Pilot Train Study has supposed. It is the only one bringing satisfactory returns on investment on medium term. However, given the present reluctance of the managers of the Caucasian railway administrations in considering at all price increases, it is not sure that this scenario can be realised.

The first scenario corresponds with the opinion of most of the persons in charge met at the Caucasian railway administrations.

The second one is a policy which is strongly recommended in order to ensure the viability of the railways and of the proposed rehabilitation measures. Increasing moderately the prices for those transports for which the railway has a clear advantage against the road (such as for example oil products and other goods in bulk) or for which extreme underpricing is being practised, seems indispensable and realistic. The condition is of course that, at the same time, the railway improves the quality of its service. Some attempts in this direction are being undertaken in Azerbaijan for passenger trains.

Improved marketing, along with cost accounting, shall help the managers to strengthen the sales efforts on profitable activities and to reduce or skip loss-making ones. If the railway is to provide social services, such as cheap passenger transport, it has to get a compensation for the corresponding deficits from government.

As for passenger traffic, it may seem that raising prices would inevitably have a negative impact on the growth of the number of passengers. It is reminded in this context that in 1996, passenger service of Georgian Railways counted for 25.0% of total business regarding performance (passenger-km being counted as equivalent to tkm), but only for 5.3% regarding revenue (see Annex 2.4.3-4). The following remarks seem useful for judging the passenger business globally:

- The passenger market analysis under sections 6.1.4 to 6.1.6 makes clear that, on some connections and market segments, the railway can offer advantages against the bus or can usefully be combined with the latter;
- It is therefore possible, on these connections and market segments, to raise the prices up to a certain level without losing business, and even by gaining additional passengers;

- On the other side, hopelessly uncompetitive passenger services should be stopped;
- If above strategy is applied consequently, it can be avoided that, globally, increased prices go along with an exodus of passengers.

5.3.3 Investments

Adding together the costs of all rehabilitation measures proposed gives, for Georgia, a total amount of 859 million $US (see chapter 4)[3]. The table at page 4 of Annex 5.4-1 summarises these costs. It includes the figures of the following partial investment tables. These tables correspond with those of the Annexes 4.2.8-1 to 4.2.8-12.

Investments in the telecommunication system have been taken out from the railway's investment account. Instead, they are part of the separate calculations for the "communication network" under chapter 6. These investments can be used commercially and are financially self-sustaining.

The full investment programme represents a heavy burden for the cash flow and it brings a negative profitability for scenario 2. For that reason, a "reduced investment programme" has been proposed, which comes, for Georgia, to a total amount of only 531 million $US[3]. In this programme, investments for permanent ways and stations are limited to the first and second priorities, the ones for signalling only to the first priority; for the rolling stock, part of the electric locomotives has been replaced by diesel engine ones. The calculation tables of Annex 5.4-2 are analogous to those of the full investment programme.

5.3.4 Method of calculation

There are two calculation models working with the same basic figures and assumptions, one for the full investment programme (Annex 5.3-1) and one for the reduced investment programme (Annex 5.3-2). In the latter, only the second price scenario has been calculated (called scenario 2A).

For each model, two sets of tables are presented. The first set shows the costs of the transport activities in 1995 and also the ones of 2015 (the costs of the years 1997, 2000 and 2010 have also been calculated). The second set shows the receipts (paid revenue) of the three scenarios and the costs (including depreciation, excluding profit tax). All figures are in constant 1997 $US.

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[3] In this figure, investments for the rolling stock as given in the Annexes 4.2.6-7a to 4.2.6-9b are counted with their medium values between the "optimistic scenario" (regarding traffic) and the "pessimistic" one; in the calculation tables of the Annexes 5.4-1 and 5.4-2, these scenarios are called "high case" and "low case" respectively, in order to avoid confusion with the financial scenarios.

5.3.5 Results

The results of the financial calculations are summarised below. The total costs include interests for the bank loans to be provided for financing the new interests, because at this stage, the financing structure has not been agreed upon sufficiently in detail.

Table 5.3-1: Receipts, costs and profits of Georgian Railways, from 1997 to 2015, in 1,000 $US

	1997	2000	2010	2015
Full investment programme				
Receipts scenario 1	34,306	59,072	97,271	113,596
Receipts scenario 2	34,306	73,840	145,906	170,393
Receipts scenario 3	44,765	110,836	305,752	420,310
Costs	103,674	143,064	163,466	172,186
Profit before tax scen. 1	-69,368	-83,992	-66,195	-58,590
Profit before tax scen. 2	-69,368	-69,224	-17,560	-1,793
Profit before tax scen. 3	-58,909	-32,228	142,286	248,124
Reduced investment programme				
Receipts scenario 2A	34,306	73,840	145,906	170,393
Costs	76,383	114,478	134,880	143,599
Profit before tax	-42,077	-40,638	11,026	26,794

The profitability is negative for scenario 2, marginal for scenario 2A and, of course, excellent for scenario 3.

5.4 Consolidated forecast three railways

The financial calculations for the three railways have been consolidated to

- a global comparison of receipts (under 3 scenarios) with costs, for the years 1997 to 2015 and
- a global cash flow with the calculation of the internal rates of return.

The results are shown both for the full investment programme (Annex 5.4-1) and for the reduced one (Annex 5.4-2). These two annexes also include the investment tables. The "overall recapitulation" table includes the figures of the following partial tables. These tables correspond with those of the Annexes 4.2.8-1 to 4.2.8-12.

The following internal rates of return (IRR) have been found:

Full investment programme, total amount		2,511 million $US[4]
Scenario 1	(unchanged price level)	IRR = -16.9%
Scenario 2	(moderate price increases)	IRR = -5.3%
Reduced investment programme, total amount		1,443 million $US[4]
Scenario 2A	(moderate price increases)	IRR = 2.5%

The conclusions which can be drawn from these results are:

- The overall profitability is clearly negative if the present price level is kept unchanged, and the break-even point is far away;
- The railway system as a whole is able to become fairly profitable if reasonable price increases are introduced, along with an improved marketing policy and an improved service;
- A reduction of the investment programme by eliminating the components which are not indispensable for keeping the essential assets in safe working condition is necessary.

[4] In this figure, investments for the rolling stock as given in the Annexes 4.2.6-7a to 4.2.6-9b are counted with their medium values between the "optimistic scenario" (regarding traffic) and the "pessimistic" one; in the calculation tables of the Annexes 5.4-1 and 5.4-2, these scenarios are called "high case" and "low case" respectively, in order to avoid confusion with the financial scenarios.

5.5 Financing of infrastructure

5.5.1 Model for financing

In the Annexes 5.4-1 and 5.4-2 is shown that the three Caucasian railways seen as a whole are able to cover their costs if they practise an improved marketing policy involving moderate price increases (scenarios 2 and 2A). If the railways keep being reluctant on revising their tariffs in a positive direction (scenario 1), there is little hope for reaching a break-even of the receipts with the costs in the foreseeable future.

Price increases are therefore necessary and scenario 2 is taken as a realistic assumption.

Still then, it appears that the full investment programme with a total amount of 2,511 million $US[5] represents a heavy burden for the cash flow and that it leads to a global profitability which is near zero. For that reason, a "reduced investment programme" has been proposed, which comes to a total amount of only 1,443 million $US[1] In this programme, investments for permanent ways and stations are limited to the first and second priorities, the ones for signalling only to the first priority; for the rolling stock, part of the electric locomotives has been replaced by diesel engine ones (see Annex 4.2.7-5).

The combination of this reduced investment programme with the price policy of scenario 2, which is called "scenario 2A", yields a positive rate of return. By judging the rather low rate of IRR = 2.5%, it has to be kept in mind that railways in Western Europe are generally not highly profitable, if not chronically loss making.

Investments in the telecommunication system have been taken out from the Railway's investment account. Instead, they are part of the separate calculations for the "communication network" under section 6.4.3. These investments can be used commercially and are financially self-sustaining.

Calculations carried out in the Annexes 5.4-1 and 5.4-2 led to the following cash flows:

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5 In this figure, investments for the rolling stock as given in the Annexes 4.2.6-7a to 4.2.6-9b are counted with their medium values between the "optimistic scenario" (regarding traffic) and the "pessimistic" one; in the calculation tables of the Annexes 5.4-1 and 5.4-2, these scenarios are called "high case" and "low case" respectively, in order to avoid confusion with the financial scenarios.

Tab. 5.5-1: Consolidated cash flows of the three railways, in 1,000 $US, excl. profit tax and interests

	Full investment programme		Reduced investment programme	
Year	Scenario 2		Scenario 2A	
	Cash flow	Cash flow cumulat.	Cash flow	Cash flow cumulat.
1997	-134,014	-134,014	-87,080	-87,080
1998	-370,261	-504,276	-319,542	-406,622
1999	-346,125	-850,400	-291,619	-698,241
2000	-187,097	-1,037,497	-91,534	-789,775
2001	-167,435	-1,204,932	-71,728	-861,504
2002	-152,875	-1,357,807	-57,024	-918,528
2003	-140,215	-1,498,022	-2,341	-920,869
2004	-125,066	-1,623,088	12,952	-907,917
2005	-134,683	-1,757,751	15,659	-892,258
2006	-134,754	-1,892,505	15,712	-876,546
2007	-119,583	-2,012,088	31,027	-845,519
2008	-17,748	-2,029,836	53,861	-791,658
2009	-2,599	-2,032,435	69,154	-722,504
2010	-43,155	-2,075,591	28,741	-693,763
2011	-125,119	-2,200,709	2,511	-691,252
2012	-114,119	-2,314,829	50,783	-640,469
2013	-104,473	-2,419,301	60,429	-580,040
2014	-94,826	-2,514,128	70,075	-509,965
2015*	1,386,848	-1,127,279	899,066	389,101

* The amounts in 2015 include the residual values of the investments

The cash flows are precarious and they would not be compatible with investment loans at commercial conditions, and also not with heavy profit taxation. The respective Governments should contribute to the programme by refraining from imposing profit taxes or at least by admitting a fair profit calculation. It is reminded that at present, profit taxation takes as basis a wrongly calculated and exaggerated profit.

Assuming an exemption from profit tax, the following financing needs are stated:

Project alternative	Financing needs, million $US approx.	Building up	Financing conditions
Full investment programme:	1,500	from 1998 to 2003	soft
Reduced investment programme:	1,000	from 1998 to 2001	soft

5.5.2 Financing sources

Considering the state owned structure of all three respective railway organisations with the state as the supervising authority and regarding the enormous financial volume for the required investments in order to rehabilitate the railways, only bilateral or even better multi-lateral financing organisations are in a position to be approached. As long as clear commitments towards privatisation and commercialisation are not foreseeable, definitely potential private investors cannot be found.

The following possible donor agencies were selected and interviewed:

1. KfW - Kreditanstalt fuer Wiederaufbau, Frankfurt/Main, Germany
2. EBRD - European Bank for Reconstruction and Development, London, United Kingdom

KfW

The financial programme of KfW contains soft loan programmes - so called "financial co-operation (FZ - programme)" operating on yearly ceilings agreed between Germany and the respective countries as well as commercial credits. At present KfW is active in all three countries Armenia, Azerbaijan and Georgia, but in infrastructure projects other than transport (with the exception of Baku Airport). Since the initiative to start the appraisal procedure for KfW financing within the soft loan FZ-program has to come from the loan seeking country, implication for the respective investment volumes for all three railway companies cannot be considered during the course of this Study. Besides the present limits of KfW's financial agreements (FZ-programme) with the three Caucasus countries, which are set in 1997 for Armenia by DM 20 Mil, for Azerbaijan by DM 20 Mil, and for Georgia by DM 30 Mil.

EBRD

The EBRD provides project-specific direct financing for private sector activities, restructuring and privatisation or financing of infrastructure that supports these activities. In addition joint ventures have been major beneficiaries of EBRD lending, particularly those with foreign sponsors.

The financial programme of EBRD contains

- loans
- equity
- quarantees

The loan programme has the greatest relevance with respect to the investment requirements of the three railway companies. For loan agreements with EBRD, the standard minimum involvement is around ECU 5 Mil, the average amount is around ECU 18 Mil. In spite of the much larger investment requirements for the three railway companies as stated in this Study, EBRD is seriously considering financing activities in the transport sector for Georgia and Azerbaijan. Areas of interest are railway and port infrastructure. For Georgia and Azerbaijan railways, EBRD is anticipating a loan of up to $US 20 Mil for each country subject to the appraisal procedures. The investment plan is focusing on priority works such as track renewal, replacement of bridges and train control systems. One of the essential requirements of the envisaged loan is an element of commercialisation such as a new Railway Law which will enable the railways to operate as a commercial undertaking.

The timetable of the EBRD loan - assuming all goes well - considers signing the loan agreement by mid 1998. The timing is very much in line with this Study, since the start year for repair and reconstruction as well as new investments is set for 1998. Therefore this Study is a good basis to re-evaluate the priorities of investment programmes.

A general procedure in order to achieve a loan agreement should be established with the following steps:

Step 1	Initial Review: Selection of Priorities
Step 2	Selection of Participants: Letter of Understanding/Letter of Interest - LOU/LOI
Step 3	Final Review and Preparation for Approval
Step 4	Signed Documents

Annexes

Armenian Railway
Costs by sections (with major repairs as planned) US$ 1995

	Section	Salaries, wages	Social insurance	Materials	Fuels for traction	Fuels for other	Electricity for traction	Electricity for other	Depre-ciation	Maj.repairs (rep. fund)	Other costs	Total
	Traction	226.012	83.624	250.475	271.581	25.973	1.415.972	125.667	31.212	1.254.022	130.287	3.814.825
	Waggons	85.839	31.761	69.852		4.088		29.061	23.669	206.201	20.353	470.824
	Stations	34.762	12.663	5.438				7.131	1.439		27.067	88.500
	Permanent ways	135.558	49.201	380.274		37.931		27.755	96.469	1.124.730	51.937	1.903.855
	Electric lines, signal. & telecom.	165.434	60.376	68.349		7.449		132.717	30.714	61.630	20.900	547.569
	Overheads	262.356	92.056	87.640		70.429		586.949	72.511	346.924	342.796	1.861.661
	Total excluding auxiliary and service activities	909.961	329.681	862.029	271.581	145.870	1.415.972	909.279	256.014	2.993.507	593.340	8.687.234

Level of activity 1995 (estimated on the basis of 1996 figures, considering the revenues in US$)

	Unit	
Goods transport	10^3 t.km	425.900
Passenger transport	10^3 pass.km	164.900
Total performance	10^3 t.km equiv.*	590.800

* counting 1 pass.km = 1 t.km

Armenian Railway **Year 2015* 1235900 10^3 t.km equiv.**
Annual costs by sections 1.000 US$ = present traffic level times 2,0919

	Section	Salaries, wages 1)	Social in-surance 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depre-ciation 7)	Major repairs 8)	Other costs 9)	Total
	Traction	873,5	323,2	375,7	568,1	35,4	5.924,2	342,8	4.173,3	1.928,0	165,9	14.710,1
	Waggons	331,8	122,8	104,8		5,6		79,3	374,1	2.597,0	25,9	3.641,2
	Stations	134,4	48,9	8,2				19,5	270,7	624,3	34,5	1.140,3
	Permanent ways	523,9	190,2	570,4		51,7		75,7	3.965,1	10.242,4	66,1	15.685,6
	Electric lines, signal. & telecom.	639,4	233,3	102,5		10,2		362,0	2.086,9	6.336,2	26,6	9.797,2
	Overheads	1.014,0	355,8	131,5		96,1		1.601,2	72,5	346,9	436,4	4.054,3
	Total excluding auxiliary and service activities	3.516,9	1.274,2	1.293,0	568,1	199,0	5.924,2	2.480,5	10.942,7	22.074,8	755,3	49.028,6
	% of total	7,2%	2,6%	2,6%	1,2%	0,4%	12,1%	5,1%	22,3%	45,0%	1,5%	100,0%

1) 50% variable. Salaries raised progressively to 2,5 times the present level by 2000; further increases compensated by staff reduction
2) Portion not being spares and current replacemts.* (fixed) 1,5 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 2,0 to arrive at the cost price
6) 1/3 variable. Present price to be multiplied by 2,0 to arrive at the cost price
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997 (2000), correction factors 1/5 (1/2) for the maintenance of permanent ways. Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,3 times the amount calculated for 1995

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Assumed development of traffic performance
in 10^3 t.km, resp. pass.km

(Freight Traffic Forecast, mean between optimistic and pessimistic scenarios)

Year	Goods tr.	Pass. tr.	Total 10^3 t.km equiv.
1995	425.900	164.900	590.800
1996			507.765
1997	358.500	77.900	436.400
1998			508.253
1999			591.937
2000	589.500	99.900	689.400
2001			716.130
2002			743.896
2003			772.739
2004			802.700
2005			833.822
2006			866.152
2007			899.735
2008			934.620
2009			970.857
2010	868.000	140.500	1.008.500
2011			1.050.358
2012			1.093.954
2013			1.139.358
2014			1.186.648
2015	1.079.500	156.400	1.235.900

Forecast of the costs and revenues of Armenian Railway

Scenario 1: Development at present price level
Scenario 2: Development at fairly increased prices with improved marketing
Scenario 3: Development at increasing prices as assumed in Revenue Foreca

	Unit	Armenian R				
Level of activity		Present (1995)	1997	2000	2010	2015
10^3 t.km equiv.		590.800	436.400	689.400	1.008.500	1.235.900
Revenues if prices unchanged	1000 US$					
Revenues 2 with improved marketing	1000 US$					
Revenues if prices strongly increased*	1000 US$					
=price increase against present in %						
% of revenues actually received	%					
Receipts 1 if prices unchanged	1000 US$	8.016,9	5.921,8	9.354,9	13.685,0	16.770,7
Receipts 2 with improved marketing	1000 US$	8.016,9	5.921,8	11.693,6	20.527,4	25.156,0
Receipts 3 if prices strongly increased*	1000 US$	8.016,9	7.698,3	16.838,8	35.580,9	50.312,0
=price increase against present in %			30,0%	80,0%	160,0%	200,0%
Costs excl. interests	1000 US$		31.834,5	38.860,3	46.928,5	49.028,6

* = Revenue Forecast, mean between optimistic and pessimistic (Armenia derived from Azerbaijan and Georgia)

		Armenian R			
Year	10^6 t.km equ.	Receipts 1*	Receipts 2*	Receipts 3*	Costs*
1997	436,4	5.921,8	5.921,8	7.698,3	31.834,5
1998	520,7	7.066,1	7.845,7	10.745,1	34.176,5
1999	605,1	8.210,5	9.769,7	13.792,0	36.518,4
2000	689,4	9.354,9	11.693,6	16.838,8	38.860,3
2001	721,3	9.787,9	12.577,0	18.713,0	39.667,1
2002	753,2	10.220,9	13.460,4	20.587,2	40.473,9
2003	785,1	10.653,9	14.343,8	22.461,4	41.280,8
2004	817,0	11.086,9	15.227,1	24.335,6	42.087,6
2005	849,0	11.519,9	16.110,5	26.209,8	42.894,4
2006	880,9	11.952,9	16.993,9	28.084,0	43.701,2
2007	912,8	12.385,9	17.877,3	29.958,3	44.508,0
2008	944,7	12.818,9	18.760,7	31.832,5	45.314,9
2009	976,6	13.251,9	19.644,0	33.706,7	46.121,7
2010	1.008,5	13.685,0	20.527,4	35.580,9	46.928,5
2011	1.054,0	14.302,1	21.453,1	38.527,1	47.348,5
2012	1.099,5	14.919,2	22.378,9	41.473,3	47.768,5
2013	1.144,9	15.536,4	23.304,6	44.419,6	48.188,6
2014	1.190,4	16.153,5	24.230,3	47.365,8	48.608,6
2015	1.235,9	16.770,7	25.156,0	50.312,0	49.028,6

* in 1000 US$, excl. interests

Armenian Railway
Costs by sections (with major repairs as planned) **US$** **1995**

	Section	Salaries, wages	Social insurance	Materials	Fuels for traction	Fuels for other	Electricity for traction	Electricity for other	Depre-ciation	Maj.repairs (rep. fund)	Other costs	Total
	Traction	226.012	83.624	250.475	271.581	25.973	1.415.972	125.667	31.212	1.254.022	130.287	3.814.825
	Waggons	85.839	31.761	69.852		4.088		29.061	23.669	206.201	20.353	470.824
	Stations	34.762	12.663	5.438				7.131	1.439		27.067	88.500
	Permanent ways	135.558	49.201	380.274		37.931		27.755	96.469	1.124.730	51.937	1.903.855
	Electric lines, signal. & telecom.	165.434	60.376	68.349		7.449		132.717	30.714	61.630	20.900	547.569
	Overheads	262.356	92.056	87.640		70.429		586.949	72.511	346.924	342.796	1.861.661
	Total excluding auxiliary and service activities	909.961	329.681	862.029	271.581	145.870	1.415.972	909.279	256.014	2.993.507	593.340	8.687.234

Level of activity 1995 (estimated on the basis of 1996 figures, considering the revenues in US$)

	Unit	
Goods transport	10^3 t.km	425.900
Passenger transport	10^3 pass.km	164.900
Total performance	10^3 t.km equiv.*	590.800

* counting 1 pass.km = 1 t.km

Armenian Railway **Year 2015*** **1235900 10^3 t.km equiv.**
Annual costs by sections **1.000 US$** **= present traffic level times** **2,0919**

	Section	Salaries, wages 1)	Social in-surance 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depre-ciation 7)	Major repairs 8)	Other costs 9)	Total
	Traction	873,5	323,2	375,7	568,1	35,4	5.924,2	342,8	1.823,3	1.811,9	165,9	12.244,1
	Waggons	331,8	122,8	104,8		5,6		79,3	374,1	2.597,0	25,9	3.641,2
	Stations	134,4	48,9	8,2				19,5	230,2	527,8	34,5	1.003,4
	Permanent ways	523,9	190,2	570,4		51,7		75,7	3.197,4	7.364,7	66,1	12.040,2
	Electric lines, signal. & telecom.	639,4	233,3	102,5		10,2		362,0	501,0	1.578,5	26,6	3.453,6
	Overheads	1.014,0	355,8	131,5		96,1		1.601,2	72,5	346,9	436,4	4.054,3
	Total excluding auxiliary and service activities	3.516,9	1.274,2	1.293,0	568,1	199,0	5.924,2	2.480,5	6.198,6	14.226,9	755,3	36.436,7
	% of total	9,7%	3,5%	3,5%	1,6%	0,5%	16,3%	6,8%	17,0%	39,0%	2,1%	100,0%

1) 50% variable. Salaries raised progressively to 2,5 times the present level by 2000; further increases compensated by staff reduction
2) Portion not being spares and current replacemts.* (fixed) 1,5 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 2,0 to arrive at the cost price
6) 1/3 variable. Present price to be multiplied by 2,0 to arrive at the cost price
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997 (2000), correction factors 1/5 (1/2) for the maintenance of permanent ways Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,3 times the amount calculated for 1995

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Assumed development of traffic performance in 10^3 t.km, resp. pass.km	Year	Goods tr.	Pass. tr.	Total 10^3 t.km equiv.
	1995	425.900	164.900	590.800
	1996			507.765
(Freight Traffic Forecast, mean between optimistic	1997	358.500	77.900	436.400
and pessimistic scenarios)	1998			508.253
	1999			591.937
	2000	589.500	99.900	689.400
	2001			716.130
	2002			743.896
	2003			772.739
	2004			802.700
	2005			833.822
	2006			866.152
	2007			899.735
	2008			934.620
	2009			970.857
	2010	868.000	140.500	1.008.500
	2011			1.050.358
	2012			1.093.954
	2013			1.139.358
	2014			1.186.648
	2015	1.079.500	156.400	1.235.900

Forecast of the costs and revenues of Armenian Railway

Scenario 2A: Development at fairly increased prices with improved marketing, with reduced investments

Armenian R

	Unit	Present (1995)	1997	2000	2010	2015
Level of activity						
10^3 t.km equiv.		590.800	436.400	689.400	1.008.500	1.235.900
Revenues	1000 US$					
% of revenues actually received	%					
Receipts	1000 US$	8.016,9	5.921,8	11.693,6	20.527,4	25.156,0
Costs excl. interests	1000 US$		21.544,8	27.707,2	34.336,5	36.436,7

Armenian R

Year	10^6 t.km equ.	Receipts*	Costs*
1997	436,4	5.921,8	21.544,8
1998	520,7	7.845,7	23.598,9
1999	605,1	9.769,7	25.653,1
2000	689,4	11.693,6	27.707,2
2001	721,3	12.577,0	28.370,1
2002	753,2	13.460,4	29.033,1
2003	785,1	14.343,8	29.696,0
2004	817,0	15.227,1	30.358,9
2005	849,0	16.110,5	31.021,9
2006	880,9	16.993,9	31.684,8
2007	912,8	17.877,3	32.347,7
2008	944,7	18.760,7	33.010,7
2009	976,6	19.644,0	33.673,6
2010	1.008,5	20.527,4	34.336,5
2011	1.054,0	21.453,1	34.756,6
2012	1.099,5	22.378,9	35.176,6
2013	1.144,9	23.304,6	35.596,6
2014	1.190,4	24.230,3	36.016,6
2015	1.235,9	25.156,0	36.436,7

* in 1000 US$, excl. interests

Azerbaijan State Railways
Costs by sections **1.000 US$** **1996**

	Section	Salaries, wages	Social fund	Materials	Fuels * for traction	Fuels * other	Electricity* for traction	Electricity other *	Depreciation	Major repairs *	Other costs *	Total
	Traction	2.291,1	399,1	718,1	1.473,9	737,0	6.819,8	3.409,9	173,7	1.367,6	968,6	18.358,9
	Waggons	2.743,0	477,8	1.064,9	335,2	167,6	272,6	136,3	728,0	1.752,4	1.274,6	8.952,3
	Stations	1.509,8	263,0	146,6	56,8	28,4	616,4	308,2	24,1	450,4	187,4	3.591,1
	Permanent ways	2.173,4	378,6	478,8	144,3	72,1	145,6	72,8	369,3	2.702,8	2.324,2	8.861,9
	Electric lines, signal. & telecom.	1.972,8	343,6	469,1	72,2	36,1	697,6	348,8	172,5	752,9	409,2	5.274,9
	Overheads	3.662,0	637,9	415,1	118,5	59,3	592,4	296,2	270,3	1.671,7	1.033,8	8.757,2
	Total excluding auxiliary and service activities	14.352,0	2.500,0	3.292,7	2.200,9	1.100,5	9.144,5	4.572,2	1.738,1	8.697,7	6.197,7	53.796,3

* Subdivision of cost items of previous cost table (by cost centres) after additional information

Level of activity 1995

	Unit	
Goods transport sold	10^3 t.km	2.408.500
Passenger transport	10^3 pass.km	786.900
Total performance	10^3 t.km equiv.*	3.195.400

* counting 1 pass.km = 1 t.km

Azerbaijan State Railways **Year 2015* 13591500 10^3 t.km equiv.**
Annual costs by sections **1.000 US$** **= present traffic level times 4,2535**

	Section	Salaries, wages 1)	Social fund 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depreciation 7)	Major repairs 8)	Other costs 9)	Total
	Traction	12.036,0	2.096,6	2.154,4	6.269,3	1.536,2	43.511,9	10.661,9	15.830,0	3.972,9	1.756,4	99.825,5
	Waggons	14.410,1	2.510,1	3.194,7	1.426,0	349,4	1.739,1	426,1	4.128,3	14.828,0	2.311,2	45.323,0
	Stations	7.931,4	1.381,6	439,9	241,7	59,2	3.932,9	963,7	1.009,0	2.643,7	339,8	18.943,0
	Permanent ways	11.417,7	1.988,9	1.436,5	613,7	150,4	929,0	227,6	12.107,2	32.855,0	4.214,6	65.940,7
	Electric lines, signal. & telecom.	10.364,1	1.805,3	1.407,3	306,9	75,2	4.450,9	1.090,6	10.354,5	27.287,8	742,1	57.884,7
	Overheads	19.238,2	3.351,1	1.245,2	504,0	123,5	3.779,5	926,1	270,3	1.671,7	1.874,7	32.984,5
	Total excluding auxiliary and service activities	75.397,5	13.133,6	9.878,0	9.361,6	2.293,9	58.343,4	14.296,1	43.699,3	83.259,1	11.238,8	320.901,4
	% of total	23,5%	4,1%	3,1%	2,9%	0,7%	18,2%	4,5%	13,6%	25,9%	3,5%	100,0%

1) 50% variable. Salaries raised progressively to 2,0 times present total costs
2) Portion not being spares and current replacemts.* (fixed) 3 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 1,5
6) 1/3 variable; present price to be multiplied by 1,5
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997, correction factor 1/3 for maintenance of permanent ways
Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,8 times the amount calculated for 1996

Traffic performance:

tkm (equiv) 1997	3.197,5
tkm (equiv) 2000	7.609,0
tkm (equiv) 2010	11.693,0
tkm (equiv) 2015	13.591,5

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Forecast of the costs and revenues of Azerbaijan State Railways

Scenario 1: Development at present price level
Scenario 2: Development at fairly increased prices with improved marketing
Scenario 3: Development at increasing prices as assumed in Revenue Foreca

	Unit	Azerbaij. R.				
Level of activity		Present (1995)	1997	2000	2010	2015
10^3 t.km equiv.		3.195.400	3.197.500	7.609.000	11.693.000	13.591.500
Revenues if prices unchanged	1000 US$	64.708,8	64.751,3	154.086,9	236.790,4	275.236,1
Revenues 2 with improved marketing	1000 US$	64.708,8	64.751,3	192.608,6	355.185,6	412.854,2
Revenues if prices strongly increased*	1000 US$	64.708,8	82.119,3	289.801,3	629.275,0	853.685,0
=price increase against present in %			26,8%	88,1%	165,8%	210,2%
% of revenues actually received	%	45,6%	60,0%	90,0%	90,0%	90,0%
Receipts 1 if prices unchanged	1000 US$	29.527,3	38.850,8	138.678,2	213.111,3	247.712,5
Receipts 2 with improved marketing	1000 US$	29.527,3	38.850,8	173.347,7	319.667,0	371.568,8
Receipts 3 if prices strongly increased*	1000 US$	29.527,3	49.271,6	260.821,2	566.347,5	768.316,5
=price increase against present in %						
Costs excl. interests	1000 US$		161.878,0	251.681,6	298.935,0	320.901,4

* = Revenue Forecast, mean between optimistic and pessimistic (Armenia derived from Azerbaijan and Georgia)

		Azerbaij. R.			
Year	10^6 t.km equ.	Receipts 1*	Receipts 2*	Receipts 3*	Costs*
1997	3.197,5	38.850,8	38.850,8	49.271,6	161.878,0
1998	4.668,0	72.126,6	83.683,1	119.788,1	191.812,6
1999	6.138,5	105.402,4	128.515,4	190.304,6	221.747,1
2000	7.609,0	138.678,2	173.347,7	260.821,2	251.681,6
2001	8.017,4	146.121,5	187.979,7	291.373,8	256.406,9
2002	8.425,8	153.564,8	202.611,6	321.926,4	261.132,3
2003	8.834,2	161.008,1	217.243,5	352.479,1	265.857,6
2004	9.242,6	168.451,4	231.875,4	383.031,7	270.583,0
2005	9.651,0	175.894,8	246.507,4	413.584,3	275.308,3
2006	10.059,4	183.338,1	261.139,3	444.137,0	280.033,6
2007	10.467,8	190.781,4	275.771,2	474.689,6	284.759,0
2008	10.876,2	198.224,7	290.403,1	505.242,2	289.484,3
2009	11.284,6	205.668,0	305.035,1	535.794,9	294.209,7
2010	11.693,0	213.111,3	319.667,0	566.347,5	298.935,0
2011	12.072,7	220.031,6	330.047,4	606.741,3	303.328,3
2012	12.452,4	226.951,8	340.427,7	647.135,1	307.721,6
2013	12.832,1	233.872,1	350.808,1	687.528,9	312.114,8
2014	13.211,8	240.792,3	361.188,4	727.922,7	316.508,1
2015	13.591,5	247.712,5	371.568,8	768.316,5	320.901,4

* in 1000 US$, excl. interests

Azerbaijan State Railways
Costs by sections **1.000 US$** **1996**

Section	Salaries, wages	Social fund	Materials	Fuels * for traction	Fuels * other	Electricity* for traction	Electricity other *	Depreciation	Major repairs *	Other costs *	Total
Traction	2.291,1	399,1	718,1	1.473,9	737,0	6.819,8	3.409,9	173,7	1.367,6	968,6	18.358,9
Waggons	2.743,0	477,8	1.064,9	335,2	167,6	272,6	136,3	728,0	1.752,4	1.274,6	8.952,3
Stations	1.509,8	263,0	146,6	56,8	28,4	616,4	308,2	24,1	450,4	187,4	3.591,1
Permanent ways	2.173,4	378,6	478,8	144,3	72,1	145,6	72,8	369,3	2.702,8	2.324,2	8.861,9
Electric lines, signal. & telecom.	1.972,8	343,6	469,1	72,2	36,1	697,6	348,8	172,5	752,9	409,2	5.274,9
Overheads	3.662,0	637,9	415,1	118,5	59,3	592,4	296,2	270,3	1.671,7	1.033,8	8.757,2
Total excluding auxiliary and service activities	14.352,0	2.500,0	3.292,7	2.200,9	1.100,5	9.144,5	4.572,2	1.738,1	8.697,7	6.197,7	53.796,3

* Subdivision of cost items of previous cost table (by cost centres) after additional information

Level of activity 1995

	Unit	
Goods transport sold	10^3 t.km	2.408.500
Passenger transport	10^3 pass.km	786.900
Total performance	10^3 t.km equiv.*	3.195.400

* counting 1 pass.km = 1 t.km

Azerbaijan State Railways **Year 2015* 13591500 10^3 t.km equiv.**
Annual costs by sections **1.000 US$** **= present traffic level times** **4,2535**

Section	Salaries, wages 1)	Social fund 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depreciation 7)	Major repairs 8)	Other costs 9)	Total
Traction	12.036,0	2.096,6	2.154,4	6.269,3	1.536,2	43.511,9	10.661,9	8.696,7	3.641,5	1.756,4	92.360,8
Waggons	14.410,1	2.510,1	3.194,7	1.426,0	349,4	1.739,1	426,1	4.128,3	14.828,0	2.311,2	45.323,0
Stations	7.931,4	1.381,6	439,9	241,7	59,2	3.932,9	963,7	847,2	2.067,8	339,8	18.205,3
Permanent ways	11.417,7	1.988,9	1.436,5	613,7	150,4	929,0	227,6	8.142,6	19.057,3	4.214,6	48.178,4
Electric lines, signal. & telecom.	10.364,1	1.805,3	1.407,3	306,9	75,2	4.450,9	1.090,6	4.093,3	8.503,3	742,1	32.839,1
Overheads	19.238,2	3.351,1	1.245,2	504,0	123,5	3.779,5	926,1	270,3	1.671,7	1.874,7	32.984,5
Total excluding auxiliary and service activities	75.397,5	13.133,6	9.878,0	9.361,6	2.293,9	58.343,4	14.296,1	26.178,4	49.769,6	11.238,8	269.891,0
% of total	27,9%	4,9%	3,7%	3,5%	0,8%	21,6%	5,3%	9,7%	18,4%	4,2%	100,0%

1) 50% variable. Salaries raised progressively to 2,0 times present total costs
2) Portion not being spares and current replacemts.* (fixed) 3 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 1,5
6) 1/3 variable; present price to be multiplied by 1,5
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997, correction factor 1/3 for maintenance of permanent ways
Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,8 times the amount calculated for 1996

Traffic performance:

tkm (equiv) 1997	3.197,5
tkm (equiv) 2000	7.609,0
tkm (equiv) 2010	11.693,0
tkm (equiv) 2015	13.591,5

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Forecast of the costs and revenues of Azerbaijan State Railways

Scenario 2A: Development at fairly increased prices with improved marketing, with reduced investments

	Unit	Azerbaij. R.				
Level of activity		Present (1995)	1997	2000	2010	2015
10^3 t.km equiv.		3.195.400	3.197.500	7.609.000	11.693.000	13.591.500
Revenues 2 with improved marketing	1000 US$	64.708,8	64.751,3	192.608,6	355.185,6	412.854,2
% of revenues actually received	%	45,6%	60,0%	90,0%	90,0%	90,0%
Receipts 2 with improved marketing	1000 US$	29.527,3	38.850,8	173.347,7	319.667,0	371.568,8
Costs excl. interests	1000 US$		120.066,1	200.671,2	247.924,6	269.891,0

Azerbaij. R.

Year	10^6 t.km equ.	Receipts*	Costs*
1997	3.197,5	38.850,8	120.066,1
1998	4.668,0	83.683,1	146.934,5
1999	6.138,5	128.515,4	173.802,8
2000	7.609,0	173.347,7	200.671,2
2001	8.017,4	187.979,7	205.396,5
2002	8.425,8	202.611,6	210.121,9
2003	8.834,2	217.243,5	214.847,2
2004	9.242,6	231.875,4	219.572,6
2005	9.651,0	246.507,4	224.297,9
2006	10.059,4	261.139,3	229.023,2
2007	10.467,8	275.771,2	233.748,6
2008	10.876,2	290.403,1	238.473,9
2009	11.284,6	305.035,1	243.199,3
2010	11.693,0	319.667,0	247.924,6
2011	12.072,7	330.047,4	252.317,9
2012	12.452,4	340.427,7	256.711,2
2013	12.832,1	350.808,1	261.104,4
2014	13.211,8	361.188,4	265.497,7
2015	13.591,5	371.568,8	269.891,0

* in 1000 US$, excl. interests

Georgian Railways
Costs by sections **1.000 US$** **1996**

	Section	Salaries, wages	Social insurance	Materials	Fuels for traction	Fuels for other	Electricity for traction	Electricity for other	Depre-ciation	Repairs, repair fund	Other costs	Total
	Traction	1.553,0	450,4	723,3	1.320,3	82,5	3.126,3	89,2	891,2	768,7	601,6	9.606,4
	Waggons	842,1	244,2	416,0		123,5		49,7	1.227,5	722,7	654,1	4.279,9
	Stations	669,9	194,3	19,4		8,3		193,3	32,4	278,4	453,5	1.849,5
	Permanent ways	1.394,3	404,3	707,4		161,1		24,3	1.196,1	5.425,6	559,9	9.873,1
	Electric lines, signal. & telecom.	852,0	247,1	270,4		74,5		156,4	432,1	1.597,3	185,4	3.815,1
	Overheads	1.054,8	305,9	422,1		52,8		148,6	682,1	1.666,8	1.891,7	6.224,5
	Total excluding auxiliary and service activities	6.366,0	1.846,2	2.558,6	1.320,3	502,7	3.126,3	661,5	4.461,4	10.459,5	4.346,2	35.648,6

Level of activity 1996

	Unit	
Goods transport	10^3 t.km	1.141.381
Passenger transport	10^3 pass.km	380.261
Total performance	10^3 t.km equiv.*	1.521.642

* counting 1 pass.km = 1 t.km

Georgian Railways **Year 2015* 5281500 10^3 t.km equiv.**
Annual expenses by sections **1.000 US$** **= present traffic level times 3,4709**

	Section	Salaries, wages 1)	Social in-surance 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depre-ciation 7)	Major repairs 8)	Other costs 9)	Total
	Traction	6.943,4	2.013,6	1.084,9	4.582,8	150,5	21.702,1	325,2	7.800,0	2.559,6	973,2	48.135,3
	Waggons	3.765,0	1.091,8	624,1		225,2		181,3	1.926,0	9.757,8	1.058,2	18.629,3
	Stations	2.995,2	868,6	29,1		15,2		705,0	1.040,3	2.558,1	733,7	8.945,0
	Permanent ways	6.233,7	1.807,8	1.061,2		293,8		88,6	10.537,4	26.628,4	905,8	47.556,6
	Electric lines, signal. & telecom.	3.809,0	1.104,6	405,6		135,8		570,6	7.666,2	22.164,1	299,9	36.155,8
	Overheads	4.715,8	1.367,6	633,1		96,2		541,9	682,1	1.666,8	3.060,2	12.763,6
	Total excluding auxiliary and service activities	28.462,0	8.254,0	3.837,9	4.582,8	916,7	21.702,1	2.412,6	29.651,9	65.334,7	7.031,0	172.185,5
	% of total	16,5%	4,8%	2,2%	2,7%	0,5%	12,6%	1,4%	17,2%	37,9%	4,1%	100,0%

1) 50% variable. Present salary level times 2,0 ; further increases compensated by staff reduction
2) Portion not being spares and current replacemts.* (fixed) 1,5 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 2,0
6) 1/3 variable. Present price to be multiplied by 2,0
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997, correction factor 1/3 for maintenance of permanent ways
Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,6 times the amount calculated for 1995

Traffic performance:

tkm (equiv) 1997	1.595,0
tkm (equiv) 2000	2.746,5
tkm (equiv) 2010	4.522,5
tkm (equiv) 2015	5.281,5

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Forecast of the costs and revenues of Georgian Railways

Scenario 1: Development at present price level
Scenario 2: Development at fairly increased prices with improved marketing
Scenario 3: Development at increasing prices as assumed in Revenue Foreca

	Unit	Georgian R.				
Level of activity		Present (1996)	1997	2000	2010	2015
10^3 t.km equiv.		1.521.642	1.595.000	2.746.500	4.522.500	5.281.500
Revenues if prices unchanged	1000 US$	32.727,8	34.305,6	59.072,3	97.270,8	113.595,6
Revenues 2 with improved marketing	1000 US$	32.727,8	34.305,6	73.840,3	145.906,3	170.393,4
Revenues if prices strongly increased*	1000 US$	32.727,8	44.764,8	110.835,5	305.752,5	420.310,0
=price increase against present in %			30,5%	87,6%	214,3%	270,0%
% of revenues actually received	%	100,0%	100,0%	100,0%	100,0%	100,0%
Receipts 1 if prices unchanged	1000 US$	32.727,8	34.305,6	59.072,3	97.270,8	113.595,6
Receipts 2 with improved marketing	1000 US$	32.727,8	34.305,6	73.840,3	145.906,3	170.393,4
Receipts 3 if prices strongly increased*	1000 US$	32.727,8	44.764,8	110.835,5	305.752,5	420.310,0
=price increase against present in %						
Costs excl. interests	1000 US$		103.673,8	143.064,2	163.466,4	172.185,5

* = Revenue Forecast, mean between optimistic and pessimistic (Armenia derived from Azerbaijan and Georgia)

		Georgian R.			
Year	10^6 t.km equ.	Receipts 1*	Receipts 2*	Receipts 3*	Costs*
1997	1.595,0	34.305,6	34.305,6	44.764,8	103.673,8
1998	1.978,8	42.561,1	47.483,8	66.788,3	116.803,9
1999	2.362,7	50.816,7	60.662,1	88.811,9	129.934,1
2000	2.746,5	59.072,3	73.840,3	110.835,5	143.064,2
2001	2.924,1	62.892,1	81.046,9	130.327,2	145.104,4
2002	3.101,7	66.712,0	88.253,5	149.818,9	147.144,7
2003	3.279,3	70.531,8	95.460,1	169.310,6	149.184,9
2004	3.456,9	74.351,7	102.666,7	188.802,3	151.225,1
2005	3.634,5	78.171,6	109.873,3	208.294,0	153.265,3
2006	3.812,1	81.991,4	117.079,9	227.785,7	155.305,5
2007	3.989,7	85.811,3	124.286,5	247.277,4	157.345,7
2008	4.167,3	89.631,1	131.493,1	266.769,1	159.385,9
2009	4.344,9	93.451,0	138.699,7	286.260,8	161.426,1
2010	4.522,5	97.270,8	145.906,3	305.752,5	163.466,4
2011	4.674,3	100.535,8	150.803,7	328.664,0	165.210,2
2012	4.826,1	103.800,7	155.701,1	351.575,5	166.954,0
2013	4.977,9	107.065,7	160.598,5	374.487,0	168.697,9
2014	5.129,7	110.330,6	165.495,9	397.398,5	170.441,7
2015	5.281,5	113.595,6	170.393,4	420.310,0	172.185,5

* in 1000 US$, excl. interests

Georgian Railways
Costs by sections **1.000 US$** **1996**

	Section	Salaries, wages	Social insurance	Materials	Fuels for traction	Fuels for other	Electricity for traction	Electricity for other	Depre-ciation	Repairs, repair fund	Other costs	Total
	Traction	1.553,0	450,4	723,3	1.320,3	82,5	3.126,3	89,2	891,2	768,7	601,6	9.606,4
	Waggons	842,1	244,2	416,0		123,5		49,7	1.227,5	722,7	654,1	4.279,9
	Stations	669,9	194,3	19,4		8,3		193,3	32,4	278,4	453,5	1.849,5
	Permanent ways	1.394,3	404,3	707,4		161,1		24,3	1.196,1	5.425,6	559,9	9.873,1
	Electric lines, signal. & telecom.	852,0	247,1	270,4		74,5		156,4	432,1	1.597,3	185,4	3.815,1
	Overheads	1.054,8	305,9	422,1		52,8		148,6	682,1	1.666,8	1.891,7	6.224,5
	Total excluding auxiliary and service activities	6.366,0	1.846,2	2.558,6	1.320,3	502,7	3.126,3	661,5	4.461,4	10.459,5	4.346,2	35.648,6

Level of activity 1996

	Unit	
Goods transport	10^3 t.km	1.141.381
Passenger transport	10^3 pass.km	380.261
Total performance	10^3 t.km equiv.*	1.521.642

* counting 1 pass.km = 1 t.km

Georgian Railways **Year 2015* 5281500 10^3 t.km equiv.**
Annual expenses by sections **1.000 US$** **= present traffic level times 3,4709**

	Section	Salaries, wages 1)	Social in-surance 1)	Materials 2)	Fuels for traction 3)	Fuels other 4)	Electric.for traction 5)	Electricity other 6)	Depre-ciation 7)	Major repairs 8)	Other costs 9)	Total
	Traction	6.943,4	2.013,6	1.084,9	4.582,8	150,5	21.702,1	325,2	3.533,3	2.328,4		42.664,1
	Waggons	3.765,0	1.091,8	624,1		225,2		181,3	1.926,0	9.757,8		17.571,1
	Stations	2.995,2	868,6	29,1		15,2		705,0	951,0	2.336,6		7.900,4
	Permanent ways	6.233,7	1.807,8	1.061,2		293,8		88,6	10.032,1	24.685,1		44.202,2
	Electric lines, signal. & telecom.	3.809,0	1.104,6	405,6		135,8		570,6	2.333,7	6.167,4		14.526,7
	Overheads	4.715,8	1.367,6	633,1		96,2		541,9	682,1	1.666,8		9.703,4
	Total excluding auxiliary and service activities	28.462,0	8.254,0	3.837,9	4.582,8	916,7	21.702,1	2.412,6	19.458,0	46.941,9		136.567,9
	% of total	20,8%	6,0%	2,8%	3,4%	0,7%	15,9%	1,8%	14,2%	34,4%		100,0%

1) 50% variable. Present salary level times 2,0 ; further increases compensated by staff reduction
2) Portion not being spares and current replacemts.* (fixed) 1,5 times present total costs
3) 100% variable
4) 1/3 variable
5) 100% variable. Present price to be multiplied by 2,0
6) 1/3 variable. Present price to be multiplied by 2,0
7) See corresponding tables; for the rolling stock 3.33% of the total rehabilitation investment; fixed costs
8) See corresponding tables (the amount indicated is an annual average); fixed costs. For 1997, correction factor 1/3 for maintenance of permanent ways
Costs of "major repairs", wich are maintenance costs, are the averages of the corresponding cost details in the Annexes 5.4-1 and 5.4-2 (the same is true for depreciation; please refere to the cost detail tables, especially to the "annual averages" shown there); however, in order to take account of a lower level at the beginning, correcting factors have been introduced for the permanent ways for 1997 and 2000.
9) 25% variable; 1,6 times the amount calculated for 1995

Traffic performance:

tkm (equiv) 1997	1.595,0
tkm (equiv) 2000	2.746,5
tkm (equiv) 2010	4.522,5
tkm (equiv) 2015	5.281,5

* The calculation of annual costs as shown in this section has been carried out for each of the years 1997, 2000, 2010 and the totals copied to the table "forecast of costs and revenues ...". However, for reasons of convenience, only the calculation for 2015 is shown here.

Forecast of the costs and revenues of Georgian Railways

Scenario 2A: Development at fairly increased prices with improved marketing, with reduced investments

Georgian R.

	Unit	Present (1996)	1997	2000	2010	2015
Level of activity						
10^3 t.km equiv.		1.521.642	1.595.000	2.746.500	4.522.500	5.281.500
Revenues 2 with improved marketing	1000 US$	32.727,8	34.305,6	73.840,3	145.906,3	170.393,4
% of revenues actually received	%	100,0%	100,0%	100,0%	100,0%	100,0%
Receipts 2 with improved marketing	1000 US$	32.727,8	34.305,6	73.840,3	145.906,3	170.393,4
Costs excl. interests	1000 US$		76.382,7	114.477,6	134.879,8	143.598,9

Georgian R.

Year	10^6 t.km equ.	Receipts*	Costs*
1997	1.595,0	34.305,6	76.382,7
1998	1.978,8	47.483,8	89.081,0
1999	2.362,7	60.662,1	101.779,3
2000	2.746,5	73.840,3	114.477,6
2001	2.924,1	81.046,9	116.517,8
2002	3.101,7	88.253,5	118.558,1
2003	3.279,3	95.460,1	120.598,3
2004	3.456,9	102.666,7	122.638,5
2005	3.634,5	109.873,3	124.678,7
2006	3.812,1	117.079,9	126.718,9
2007	3.989,7	124.286,5	128.759,1
2008	4.167,3	131.493,1	130.799,3
2009	4.344,9	138.699,7	132.839,6
2010	4.522,5	145.906,3	134.879,8
2011	4.674,3	150.803,7	136.623,6
2012	4.826,1	155.701,1	138.367,4
2013	4.977,9	160.598,5	140.111,3
2014	5.129,7	165.495,9	141.855,1
2015	5.281,5	170.393,4	143.598,9

* in 1000 US$, excl. interests

Global forecast of the costs and revenues of the three railways

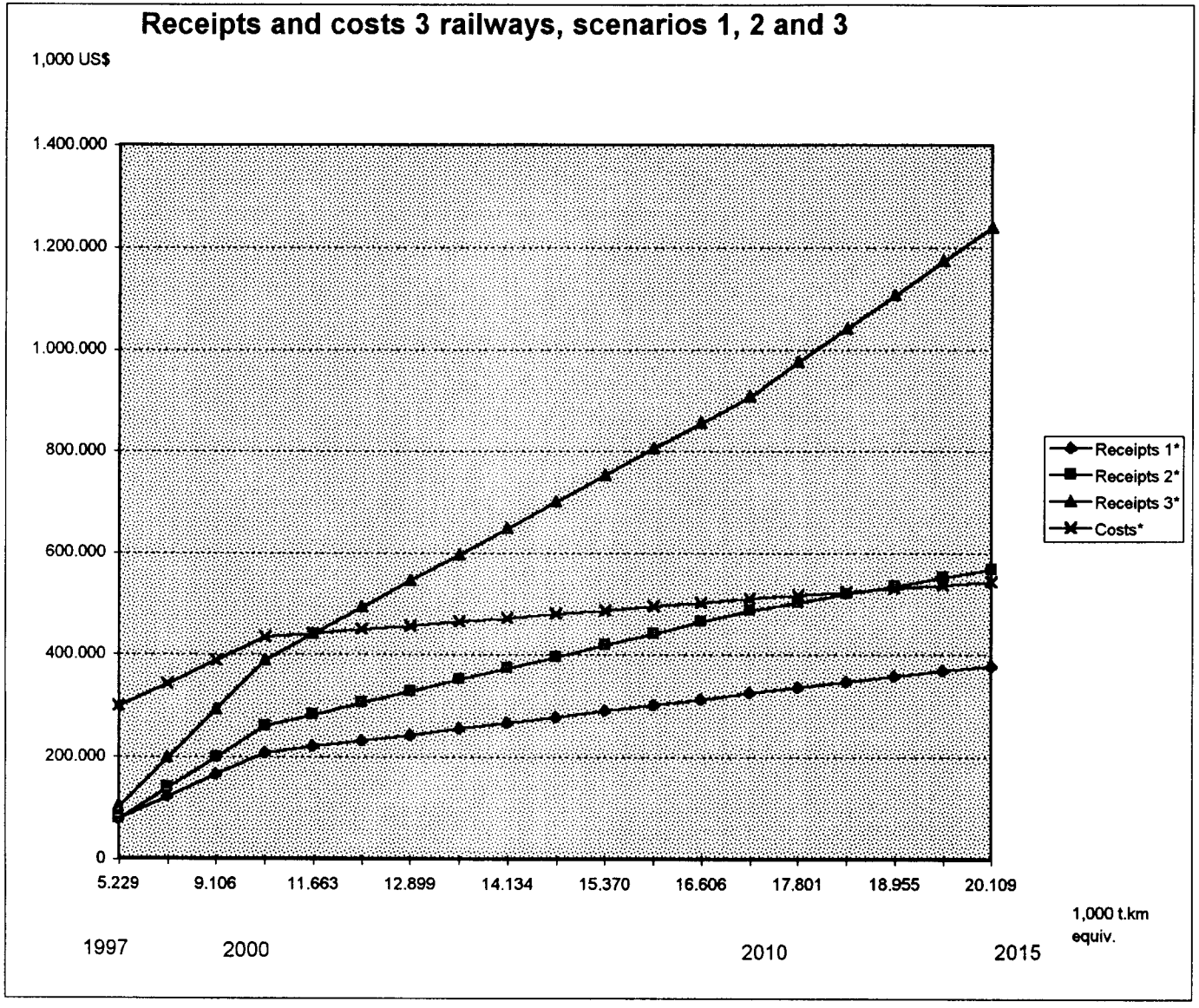
Scenario 1: Development at present price level
Scenario 2: Development at fairly increased prices with improved marketing
Scenario 3: Development at increasing prices as assumed in Revenue Forecast

	Unit	3 railways				
Level of activity		Present	1997	2000	2010	2015
10^3 t.km equiv.		5.307.842	5.228.900	11.044.900	17.224.000	20.108.900
Revenues if prices unchanged	1000 US$					
Revenues 2 with improved marketing	1000 US$					
Revenues if prices strongly increased*	1000 US$					
=price increase against present in %						
% of revenues actually received	%					
Receipts 1 if prices unchanged	1000 US$	70.272,0	79.078,2	207.105,4	324.067,1	378.078,8
Receipts 2 with improved marketing	1000 US$	70.272,0	79.078,2	258.881,7	486.100,7	567.118,2
Receipts 3 if prices strongly increased*	1000 US$	70.272,0	101.734,6	388.495,5	907.680,9	1.238.938,5
=price increase against present in %						
Costs excl. interests	1000 US$		297.386,3	433.606,1	509.329,9	542.115,5

* = Revenue Forecast, mean between optimistic and pessimistic (Armenia derived from Azerbaijan and Georgia)

		3 railways			
Year	10^6 t.km equ.	Receipts 1*	Receipts 2*	Receipts 3*	Costs*
1997	5.229	79.078	79.078	101.735	297.386
1998	7.168	121.754	139.013	197.322	342.793
1999	9.106	164.430	198.947	292.909	388.200
2000	11.045	207.105	258.882	388.495	433.606
2001	11.663	218.802	281.604	440.414	441.178
2002	12.281	230.498	304.325	492.333	448.751
2003	12.899	242.194	327.047	544.251	456.323
2004	13.517	253.890	349.769	596.170	463.896
2005	14.134	265.586	372.491	648.088	471.468
2006	14.752	277.282	395.213	700.007	479.040
2007	15.370	288.979	417.935	751.925	486.613
2008	15.988	300.675	440.657	803.844	494.185
2009	16.606	312.371	463.379	855.762	501.758
2010	17.224	324.067	486.101	907.681	509.330
2011	17.801	334.869	502.304	973.932	515.887
2012	18.378	345.672	518.508	1.040.184	522.444
2013	18.955	356.474	534.711	1.106.435	529.001
2014	19.532	367.276	550.915	1.172.687	535.558
2015	20.109	378.079	567.118	1.238.939	542.116

* in 1000 US$, excl. interests


Receipts and costs 3 railways, scenarios 1, 2 and 3
1,000 US$
1.400.000
1.200.000
1.000.000
800.000
600.000
400.000
200.000
0
5.229
9.106
11.663
12.899
14.134
15.370
16.606
17.801
18.955
20.109
1,000 t.km equiv.
1997
2000
2010
2015
Receipts 1*
Receipts 2*
Receipts 3*
Costs*

Global cash flows of the three railways

Scenario 1: Development at present price level
Scenario 2: Development at fairly increased prices with improved marketing
Scenario 3: Development at increasing prices as assumed in Revenue Forecast

	Unit	3 railways				
Level of activity		Present	1997	2000	2010	2015
10^3 t.km equiv.		5.307.842	5.228.900	11.044.900	17.224.000	20.108.900
Revenues if prices unchanged	1000 US$					
Revenues 2 with improved marketing	1000 US$					
Revenues if prices strongly increased*	1000 US$					
=price increase against present in %						
% of revenues actually received	%					
Receipts 1 if prices unchanged	1000 US$	70.272,0	79.078,2	207.105,4	324.067,1	378.078,8
Receipts 2 with improved marketing	1000 US$	70.272,0	79.078,2	258.881,7	486.100,7	567.118,2
Receipts 3 if prices strongly increased*	1000 US$	70.272,0	101.734,6	388.495,5	907.680,9	1.238.938,5
=price increase against present in %						
Curr. exp.** excl. interests	1000 US$		213.092,5	349.312,3	425.036,0	457.821,7

* = Revenue Forecast, mean between optimistic and pessimistic (Armenia derived from Azerbaijan and Georgia)

** = Current expenses = costs excluding depreciation

		3 railways				3 Railways, scenario 1		3 Railways, scenario 2	
Year	10^6 t.km equ.	Receipts 1*	Receipts 2*	Curr. exp.**	Investments*	Cash flow*	C.flow cum.*	Cash flow*	C.flow cum.*
1997	5.229	79.078	79.078	213.092	0	-134.014	-134.014	-134.014	-134.014
1998	7.168	121.754	139.013	258.499	250.775	-387.520	-521.534	-370.261	-504.276
1999	9.106	164.430	198.947	303.906	241.166	-380.642	-902.177	-346.125	-850.400
2000	11.045	207.105	258.882	349.312	96.666	-238.873	-1.141.050	-187.097	-1.037.497
2001	11.663	218.802	281.604	356.885	92.154	-230.237	-1.371.287	-167.435	-1.204.932
2002	12.281	230.498	304.325	364.457	92.743	-226.702	-1.597.989	-152.875	-1.357.807
2003	12.899	242.194	327.047	372.029	95.233	-225.069	-1.823.058	-140.215	-1.498.022
2004	13.517	253.890	349.769	379.602	95.233	-220.945	-2.044.003	-125.066	-1.623.088
2005	14.134	265.586	372.491	387.174	119.980	-241.568	-2.285.571	-134.663	-1.757.751
2006	14.752	277.282	395.213	394.747	135.221	-252.685	-2.538.256	-134.754	-1.892.505
2007	15.370	288.979	417.935	402.319	135.199	-248.539	-2.786.795	-119.583	-2.012.088
2008	15.988	300.675	440.657	409.891	48.514	-157.731	-2.944.526	-17.748	-2.029.836
2009	16.606	312.371	463.379	417.464	48.514	-153.607	-3.098.132	-2.599	-2.032.435
2010	17.224	324.067	486.101	425.036	104.220	-205.189	-3.303.321	-43.155	-2.075.591
2011	17.801	334.869	502.304	431.593	195.830	-292.554	-3.595.875	-125.119	-2.200.709
2012	18.378	345.672	518.508	438.150	194.476	-286.955	-3.882.830	-114.119	-2.314.829
2013	18.955	356.474	534.711	444.707	194.476	-282.710	-4.165.540	-104.473	-2.419.301
2014	19.532	367.276	550.915	451.265	194.476	-278.465	-4.444.004	-94.826	-2.514.128
2015	20.109	378.079	567.118	457.822	-1.277.552	1.197.809	-3.246.195	1.386.848	-1.127.279
						*in 1000 US$			
* in 1000 US$, excl. interests						IRR=	-16,9%	IRR=	-5,3%

Existing long term physical assets, rehabilitation investments, re-investments. Overall recapitulation (in million US$) **Full programme**

Railway administration of		Armenia					Azerbaijan					Georgia					3 railways
Items with depreciation period of ... years		5-15	15-30	30-50	Roll.stock (20 years)	Total	5-15	15-30	30-50	Roll.stock (20 years)	Total	5-15	15-30	30-50	Roll.stock (20 years)	Total	Total
Existing long term physical assets, resid. value																	
a) official figures of balance sheet of end 1996						16,28					578,40					123,30	
b) estimated present value						100,00					550,00					450,00	1.100,00
Rehabilitation investments and re-investments according to investment plans	1998-201	101,84	85,26	3,35	136,42	326,87	342,39	373,15	10,52	598,75	1.324,81	318,94	233,95	14,37	291,78	859,03	2.510,71
	Year																
	1998	12,03	21,80	1,68	0,59	36,10	19,60	64,68	2,99	1,13	88,39	24,08	93,41	7,18	1,62	126,29	250,77
	1999	12,03	20,91	1,68	0,62	35,24	19,60	64,18	2,99	0,96	87,72	24,08	86,10	7,18	0,85	118,21	241,17
	2000	3,41	3,43		2,07	8,91	26,08	17,27		3,20	46,55	24,87	11,83		4,51	41,20	96,67
	2001	3,41	3,04		1,68	8,13	26,08	17,28		2,75	46,10	24,87	8,83		4,22	37,92	92,15
	2002	3,41	3,04		1,80	8,25	26,08	17,28		2,85	46,21	24,87	8,83		4,58	38,28	92,74
	2003	5,54	6,61		1,68	13,83	17,92	38,50	0,91	2,67	60,00	12,24	4,99		4,17	21,40	95,23
	2004	5,54	6,61		1,68	13,83	17,92	38,50	0,91	2,67	60,00	12,24	4,99		4,17	21,40	95,23
	2005	5,54	6,61		6,68	18,84	17,92	38,49	0,91	7,67	65,00	12,24	4,99		18,92	36,15	119,98
	2006	5,54	6,61		6,62	18,77	17,92	38,49	0,91	23,34	80,67	12,24	4,99		18,55	35,78	135,22
	2007	5,54	6,61		6,62	18,77	17,92	38,49	0,91	23,34	80,67	12,24	4,97		18,55	35,76	135,20
	2008				6,62	6,62				23,34	23,34				18,55	18,55	48,51
	2009				6,62	6,62				23,34	23,34				18,55	18,55	48,51
	2010	12,03			6,62	18,65	19,60			23,34	42,94	24,08			18,55	42,63	104,22
	2011	12,03			17,30	29,33	19,60			91,62	111,22	24,08			31,20	55,28	195,83
	2012	3,41			17,30	20,71	26,08			91,62	117,71	24,87			31,20	56,07	194,48
	2013	3,41			17,30	20,71	26,08			91,62	117,71	24,87			31,20	56,07	194,48
	2014	3,41			17,30	20,71	26,08			91,62	117,71	24,87			31,20	56,07	194,48
	2015	5,54			17,30	22,84	17,92			91,62	109,54	12,24			31,20	43,44	175,83
	Res. val.	-33,26	-34,43	-2,24	-116,14	-186,08	-121,06	-165,47	-7,64	-531,09	-825,26	-113,68	-76,08	-9,63	-242,66	-442,04	-1.453,38
Actual average depreciation																	
Permanent ways						3,97					12,11					10,54	
Rolling stock, locomotives						4,17					15,83					7,80	
Rolling stock, waggons & PMU						0,37					4,13					1,93	
Signalling						2,01					7,13					6,80	
Power supply						0,08					3,22					0,87	
Stations & cont. terminals						0,27					1,01					1,04	
Total						10,87					43,43					28,97	
Actual average maintenance costs																	
Permanent ways						10,24					32,86					26,63	
Rolling stock, locomotives						1,93					3,97					2,56	
Rolling stock, waggons & PMU						2,60					14,83					9,76	
Signalling						6,03					21,40					20,40	
Power supply						0,30					5,89					1,76	
Stations & cont. terminals						0,62					2,64					2,56	
Total						21,73					81,59					63,67	

Permanent ways and maintenance equipment pertaining to them

Investment	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	Sum
Azerbaijan																			
Perm. ways	48,62	48,62	6,69	6,69	6,69	29,10	29,10	29,10	29,10	29,10									262,84
Bridges, tunn.	2,99	2,99				0,91	0,91	0,91	0,91	0,91									10,52
Mach.& equip.	12,87	12,87	8,58	8,58	8,58	1,50	1,50	1,50	1,50	1,50									58,99
Training	0,50																		0,50
Total	64,98	64,48	15,27	15,27	15,27	31,51	31,51	31,51	31,51	31,51									332,84
Georgia																			
Perm. ways	76,43	76,43	3,78	3,78	3,78	4,24	4,24	4,24	4,24	4,24									185,40
Bridges, tunn.	7,18	7,18																	14,37
Mach.& equip.	12,75	12,75	7,83	7,83	7,83														49,00
Training	0,50																		0,50
Total	96,86	96,36	11,61	11,61	11,61	4,24	4,24	4,24	4,24	4,24									249,27
Armenia																			
Perm. ways	18,08	18,08	2,79	2,79	2,79	6,28	6,28	6,28	6,28	6,28									75,90
Bridges, tunn.	1,68	1,68																	3,35
Mach.& equip.	8,75	8,75	0,67	0,67	0,67														19,50
Training	0,50																		0,50
Total	29,00	28,50	3,45	3,45	3,45	6,28	6,28	6,28	6,28	6,28									99,25

Maintenance	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Annual
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	average
Azerbaijan																			
Perm. ways	4,86	9,72	10,39	11,06	11,73	14,64	17,55	20,46	23,37	26,28	26,28	26,28	26,28	26,28	26,28	26,28	26,28	26,28	
Bridges, tunn.	0,15	2,58	2,92	3,25	3,58	5,04	6,50	7,95	9,41	10,86	10,86	10,86	10,86	10,86	10,86	10,86	10,86	10,86	
Mach.& equip.	1,29	2,57	3,43	4,29	5,15	5,30	5,45	5,60	5,75	5,90	5,90	5,90	5,90	5,90	5,90	5,90	5,90	5,90	
Total	6,30	14,88	16,74	18,60	20,47	24,98	29,50	34,01	38,53	43,04	43,04	43,04	43,04	43,04	43,04	43,04	43,04	43,04	32,86
Georgia																			
Perm. ways	7,64	15,29	15,66	16,04	16,42	16,84	17,27	17,69	18,12	18,54	18,54	18,54	18,54	18,54	18,54	18,54	18,54	18,54	
Bridges, tunn.	0,36	4,18	4,37	4,56	4,75	4,96	5,17	5,38	5,60	5,81	5,81	5,81	5,81	5,81	5,81	5,81	5,81	5,81	
Mach.& equip.	1,28	2,55	3,33	4,12	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	
Total	9,28	22,02	23,37	24,72	26,07	26,70	27,34	27,98	28,61	29,25	29,25	29,25	29,25	29,25	29,25	29,25	29,25	29,25	26,63
Armenia																			
Perm. ways	1,81	3,62	3,89	4,17	4,45	5,08	5,71	6,33	6,96	7,59	7,59	7,59	7,59	7,59	7,59	7,59	7,59	7,59	
Bridges, tunn.	0,08	0,99	1,13	1,27	1,41	1,72	2,03	2,35	2,66	2,98	2,98	2,98	2,98	2,98	2,98	2,98	2,98	2,98	
Mach.& equip.	0,88	1,75	1,82	1,88	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	
Total	2,77	6,35	6,84	7,32	7,81	8,75	9,69	10,63	11,57	12,52	12,52	12,52	12,52	12,52	12,52	12,52	12,52	12,52	10,24

Depreciation	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Annual
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	average
Azerbaijan																			
Perm. ways	1,95	3,89	4,16	4,43	4,69	5,86	7,02	8,19	9,35	10,51	10,51	10,51	10,51	10,51	10,51	10,51	10,51	10,51	
Bridges, tunn.	0,06	0,12	0,12	0,12	0,12	0,14	0,16	0,17	0,19	0,21	0,21	0,21	0,21	0,21	0,21	0,21	0,21	0,21	
Mach.& equip.	0,99	1,98	2,64	3,30	3,96	4,08	4,19	4,31	4,42	4,54	4,54	4,54	4,54	4,54	4,54	4,54	4,54	4,54	
Total	3,00	5,99	6,92	7,85	8,77	10,07	11,37	12,67	13,96	15,26	15,26	15,26	15,26	15,26	15,26	15,26	15,26	15,26	12,11
Georgia																			
Perm. ways	3,06	6,11	6,27	6,42	6,59	6,74	6,91	7,08	7,25	7,42	7,42	7,42	7,42	7,42	7,42	7,42	7,42	7,42	
Bridges, tunn.	0,14	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	
Mach.& equip.	0,98	1,96	2,56	3,17	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	
Total	4,18	8,36	9,12	9,87	10,64	10,79	10,96	11,13	11,30	11,47	11,47	11,48	11,48	11,48	11,48	11,48	11,48	11,48	10,54
Armenia																			
Perm. ways	0,72	1,45	1,56	1,67	1,78	2,03	2,28	2,53	2,79	3,04	3,04	3,04	3,04	3,04	3,04	3,04	3,04	3,04	
Bridges, tunn.	0,03	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	
Mach.& equip.	0,87	1,35	1,40	1,45	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	
Total	1,63	2,86	3,02	3,19	3,35	3,60	3,85	4,10	4,35	4,60	4,60	4,60	4,60	4,60	4,60	4,60	4,60	4,60	3,97

Rolling stock and maintenance equipment pertaining to it a) High case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Azerbaijan																			
Locomotives			0,80	0,80	0,80	0,80	0,80	10,80	11,62	11,62	11,62	11,62	11,62	127,20	127,20	127,20	127,20	127,20	708,90
Waggons			3,75	3,75	3,75	3,75	3,75	3,75	24,85	24,85	24,85	24,85	24,85	10,05	10,05	10,05	10,05	10,05	196,96
Repair shops	1,13	0,96	0,53	0,07	0,18														2,87
Total	1,13	0,96	5,07	4,62	4,73	4,55	4,55	14,55	36,47	36,47	36,47	36,47	36,47	137,25	137,25	137,25	137,25	137,25	908,73
Georgia																			
Locomotives			3,25	3,25	3,25	3,25	3,25	31,92	29,87	29,87	29,87	29,87	29,87	48,28	48,28	48,28	48,28	48,28	438,90
Waggons			2,33	2,33	2,33	2,33	2,33	2,33	5,20	5,20	5,20	5,20	5,20	7,80	7,80	7,80	7,80	7,80	79,00
Repair shops	1,62	0,85	0,35	0,06	0,42														3,28
Total	1,62	0,85	5,93	5,64	6,00	5,58	5,58	34,25	35,07	35,07	35,07	35,07	35,07	56,08	56,08	56,08	56,08	56,08	521,18
Armenia																			
Locomotives			1,10	1,10	1,10	1,10	1,10	11,10	11,32	11,32	11,32	11,32	11,32	23,20	23,20	23,20	23,20	23,20	189,20
Waggons			0,67	0,67	0,67	0,67	0,67	0,67	0,40	0,40	0,40	0,40	0,40	1,00	1,00	1,00	1,00	1,00	11,00
Repair shops	0,59	0,62	0,39		0,12														1,72
Total	0,59	0,62	2,16	1,77	1,89	1,77	1,77	11,77	11,72	11,72	11,72	11,72	11,72	24,20	24,20	24,20	24,20	24,20	201,92

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$
Azerbaijan																		
Locomotives	5,04	5,74	6,04	6,24	3,64	3,64	3,64	3,64	3,77	3,77	3,77	3,77	3,77	5,29	5,29	5,29	5,29	5,29
Waggons, EMU	19,30	19,30	17,77	17,77	17,77	17,77	17,77	17,77	20,83	20,83	20,83	20,83	20,83	21,52	21,52	21,52	21,52	21,52
Total	24,34	25,04	23,81	24,01	21,41	21,41	21,41	21,41	24,60	24,60	24,60	24,60	24,60	26,81	26,81	26,81	26,81	26,81
Georgia																		
Locomotives	3,49	3,49	3,49	3,49	2,39	2,39	2,39	2,39	2,88	2,88	2,88	2,88	2,88	3,56	3,56	3,56	3,56	3,56
Waggons, EMU	10,98	10,98	10,98	11,23	11,23	11,23	11,23	11,23	14,10	14,10	14,10	14,10	14,10	13,68	13,68	13,68	13,68	13,68
Total	14,47	14,47	14,47	14,72	13,62	13,62	13,62	13,62	16,99	16,99	16,99	16,99	16,99	17,24	17,24	17,24	17,24	17,24
Armenia																		
Locomotives	2,15	2,15	2,15	2,15	1,88	1,88	1,88	1,88	2,06	2,06	2,06	2,06	2,06	2,40	2,40	2,40	2,40	2,40
Waggons, EMU	2,77	2,77	2,77	2,85	2,85	2,85	2,85	2,85	3,26	3,26	3,26	3,26	3,26	3,57	3,57	3,57	3,57	3,57
Total	4,92	4,92	4,92	5,00	4,72	4,72	4,72	4,72	5,32	5,32	5,32	5,32	5,32	5,97	5,97	5,97	5,97	5,97

Rolling stock and maintenance equipment pertaining to it b) Low case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Azerbaijan																			
Locomotives			0,80	0,80	0,80	0,80	0,80	0,80	1,62	1,62	1,62	1,62	1,62	45,60	45,60	45,60	45,60	45,60	240,90
Waggons									8,60	8,60	8,60	8,60	8,60	0,40	0,40	0,40	0,40	0,40	45,00
Repair shops	1,13	0,96	0,53	0,07	0,18														2,87
Total	1,13	0,96	1,33	0,87	0,98	0,80	0,80	0,80	10,22	10,22	10,22	10,22	10,22	46,00	46,00	46,00	46,00	46,00	288,77
Georgia																			
Locomotives			2,75	2,75	2,75	2,75	2,75	2,75	1,20	1,20	1,20	1,20	1,20	1,32	1,32	1,32	1,32	1,32	29,10
Waggons								0,83	0,83	0,83	0,83	0,83	0,83	5,00	5,00	5,00	5,00	5,00	30,00
Repair shops	1,62	0,85	0,35	0,06	0,42														3,28
Total	1,62	0,85	3,10	2,81	3,17	2,75	2,75	3,58	2,03	2,03	2,03	2,03	2,03	6,32	6,32	6,32	6,32	6,32	62,38
Armenia																			
Locomotives			1,10	1,10	1,10	1,10	1,10	1,10	1,32	1,32	1,32	1,32	1,32	9,60	9,60	9,60	9,60	9,60	61,20
Waggons			0,50	0,50	0,50	0,50	0,50	0,50	0,20	0,20	0,20	0,20	0,20	0,80	0,80	0,80	0,80	0,80	8,00
Repair shops	0,59	0,62	0,39		0,12														1,72
Total	0,59	0,62	1,99	1,60	1,72	1,60	1,60	1,60	1,52	1,52	1,52	1,52	1,52	10,40	10,40	10,40	10,40	10,40	70,92

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$
Azerbaijan																		
Locomotives	3,95	3,95	3,95	3,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	3,56	3,56	3,56	3,56	3,56
Waggons, EMU	10,15	10,15	9,14	9,14	9,14	9,14	9,14	9,14	10,15	10,15	10,15	10,15	10,15	10,19	10,19	10,19	10,19	10,19
Total	14,10	14,10	13,09	13,09	12,08	12,08	12,08	12,08	13,10	13,10	13,10	13,10	13,10	13,75	13,75	13,75	13,75	13,75
Georgia																		
Locomotives	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02
Waggons, EMU	6,61	6,61	6,61	6,61	6,61	6,61	6,61	6,61	6,76	6,76	6,76	6,76	6,76	7,31	7,31	7,31	7,31	7,31
Total	8,63	8,63	8,63	8,63	8,63	8,63	8,63	8,63	8,78	8,78	8,78	8,78	8,78	9,34	9,34	9,34	9,34	9,34
Armenia																		
Locomotives	1,90	1,90	1,90	1,90	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,75	1,75	1,75	1,75	1,75
Waggons, EMU	1,99	1,99	1,99	2,04	2,04	2,04	2,04	2,04	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06
Total	3,89	3,89	3,89	3,94	3,67	3,67	3,67	3,67	3,69	3,69	3,69	3,69	3,69	3,81	3,81	3,81	3,81	3,81

Rolling stock and maintenance equipment pertaining to it c) Medium case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum	
Azerbaijan																				
Locomotives	0,00	0,00	0,80	0,80	0,80	0,80	0,80	5,80	6,62	6,62	6,62	6,62	6,62	86,40	86,40	86,40	86,40	86,40	474,90	
Waggons	0,00	0,00	1,87	1,87	1,87	1,87	1,87	1,87	16,72	16,72	16,72	16,72	16,72	5,22	5,22	5,22	5,22	5,22	120,98	123,85
Repair shops	1,13	0,96	0,53	0,07	0,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2,87	
Total	1,13	0,96	3,20	2,75	2,85	2,67	2,67	7,67	23,34	23,34	23,34	23,34	23,34	91,62	91,62	91,62	91,62	91,62	598,75	
Georgia																				
Locomotives	0,00	0,00	3,00	3,00	3,00	3,00	3,00	17,33	15,53	15,53	15,53	15,53	15,53	24,80	24,80	24,80	24,80	24,80	234,00	
Waggons	0,00	0,00	1,17	1,17	1,17	1,17	1,17	1,58	3,02	3,02	3,02	3,02	3,02	6,40	6,40	6,40	6,40	6,40	54,50	57,78
Repair shops	1,62	0,85	0,35	0,06	0,42	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3,28	
Total	1,62	0,85	4,51	4,22	4,58	4,17	4,17	18,92	18,55	18,55	18,55	18,55	18,55	31,20	31,20	31,20	31,20	31,20	291,78	
Armenia																				
Locomotives	0,00	0,00	1,10	1,10	1,10	1,10	1,10	6,10	6,32	6,32	6,32	6,32	6,32	16,40	16,40	16,40	16,40	16,40	125,20	
Waggons	0,00	0,00	0,58	0,58	0,58	0,58	0,58	0,58	0,30	0,30	0,30	0,30	0,30	0,90	0,90	0,90	0,90	0,90	9,50	11,22
Repair shops	0,59	0,62	0,39	0,00	0,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,72	
Total	0,59	0,62	2,07	1,68	1,80	1,68	1,68	6,68	6,62	6,62	6,62	6,62	6,62	17,30	17,30	17,30	17,30	17,30	136,42	

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Azerbaijan																			
Locomotives	4,49	4,84	4,99	5,09	3,29	3,29	3,29	3,29	3,36	3,36	3,36	3,36	3,36	4,43	4,43	4,43	4,43	4,43	3,97
Waggons, EMU	14,73	14,73	13,45	13,45	13,45	13,45	13,45	13,45	15,49	15,49	15,49	15,49	15,49	15,86	15,86	15,86	15,86	15,86	14,83
Total	19,22	19,57	18,45	18,55	16,75	16,75	16,75	16,75	18,85	18,85	18,85	18,85	18,85	20,28	20,28	20,28	20,28	20,28	
Georgia																			
Locomotives	2,75	2,75	2,75	2,75	2,21	2,21	2,21	2,21	2,45	2,45	2,45	2,45	2,45	2,79	2,79	2,79	2,79	2,79	2,56
Waggons, EMU	8,80	8,80	8,80	8,92	8,92	8,92	8,92	8,92	10,43	10,43	10,43	10,43	10,43	10,50	10,50	10,50	10,50	10,50	9,76
Total	11,55	11,55	11,55	11,68	11,13	11,13	11,13	11,13	12,89	12,89	12,89	12,89	12,89	13,29	13,29	13,29	13,29	13,29	
Armenia	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Locomotives	2,03	2,03	2,03	2,03	1,75	1,75	1,75	1,75	1,84	1,84	1,84	1,84	1,84	2,08	2,08	2,08	2,08	2,08	1,93
Waggons, EMU	2,38	2,38	2,38	2,44	2,44	2,44	2,44	2,44	2,66	2,66	2,66	2,66	2,66	2,81	2,81	2,81	2,81	2,81	2,60
Total	4,41	4,41	4,41	4,47	4,20	4,20	4,20	4,20	4,51	4,51	4,51	4,51	4,51	4,89	4,89	4,89	4,89	4,89	

Signalling, power supply, stations and container terminals

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Signalling																			
Azerbaijan	6,73	6,73	17,50	17,50	17,50	16,42	16,42	16,42	16,42	16,42									148,05
Georgia	11,33	11,33	17,03	17,03	17,03	12,24	12,24	12,24	12,24	12,24									134,95
Armenia	3,28	3,28	2,74	2,74	2,74	5,54	5,54	5,54	5,54	5,54									42,51
Power supply																			
Azerbaijan	8,40	8,40	7,81	7,81	7,81	7,54	7,54	7,54	7,54	7,54									77,93
Georgia	10,84	4,04	3,02	0,02	0,02	0,02	0,02	0,02	0,02										18,04
Armenia	0,78	0,39	0,39																1,55
Stations and container terminals																			
Azerbaijan	7,16	7,16	2,77	2,77	2,77	1,85	1,85	1,85	1,85	1,85									31,89
Georgia	5,64	5,64	5,03	5,03	5,03	0,73	0,73	0,73	0,73	0,73									30,01
Armenia	2,45	2,45	0,26	0,26	0,26	0,33	0,33	0,33	0,33	0,33									7,31

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Signalling																			
Azerbaijan	1,35	2,69	6,19	9,69	13,19	16,47	19,76	23,04	26,33	29,61	29,61	29,61	29,61	29,61	29,61	29,61	29,61	29,61	21,40
Georgia	2,27	4,53	7,94	11,34	14,75	17,20	19,65	22,09	24,54	26,99	26,99	26,99	26,99	26,99	26,99	26,99	26,99	26,99	20,40
Armenia	0,66	1,31	1,86	2,41	2,96	4,07	5,17	6,28	7,39	8,50	8,50	8,50	8,50	8,50	8,50	8,50	8,50	8,50	6,03
Power supply																			
Azerbaijan	0,84	1,68	2,46	3,24	4,02	4,78	5,53	6,28	7,04	7,79	7,79	7,79	7,79	7,79	7,79	7,79	7,79	7,79	5,89
Georgia	1,61	1,49	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,76
Armenia	0,23	0,23	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,30
Stations and container terminals																			
Azerbaijan	0,71	1,42	1,70	1,97	2,24	2,43	2,81	2,79	2,98	3,17	3,17	3,17	3,17	3,17	3,17	3,17	3,17	3,17	2,64
Georgia	0,56	1,11	1,62	2,12	2,62	2,69	2,76	2,84	2,91	2,98	2,98	2,98	2,98	2,98	2,98	2,98	2,98	2,98	2,56
Armenia	0,24	0,48	0,50	0,53	0,55	0,59	0,62	0,65	0,68	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,62

Depreciation	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Signalling																			
Azerbaijan	0,45	0,90	2,06	3,23	4,40	5,49	6,59	7,68	8,78	9,87	9,87	9,87	9,87	9,87	9,87	9,87	9,87	9,87	7,13
Georgia	0,76	1,51	2,65	3,78	4,92	5,73	6,55	7,37	8,18	9,00	9,00	9,00	9,00	9,00	9,00	9,00	9,00	9,00	6,80
Armenia	0,22	0,44	0,62	0,80	0,99	1,36	1,72	2,09	2,46	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,01
Power supply																			
Azerbaijan	0,47	0,94	1,37	1,80	2,22	2,63	3,03	3,44	3,84	4,25	4,25	4,25	4,25	4,25	4,25	4,25	4,25	4,25	3,22
Georgia	0,81	0,54	0,74	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,87
Armenia	0,06	0,06	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08
Stations and container terminals																			
Azerbaijan	0,29	0,59	0,70	0,81	0,92	0,99	1,07	1,14	1,21	1,29	1,29	1,29	1,29	0,13	1,29	1,29	1,29	1,29	1,01
Georgia	0,23	0,46	0,66	0,86	1,06	1,09	1,12	1,15	1,18	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,04
Armenia	0,10	0,21	0,22	0,23	0,24	0,25	0,27	0,28	0,29	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,27

Global forecast of the costs and revenues of the three railways

Scenario 2A: Development at fairly increased prices with improved marketing, with reduced investments

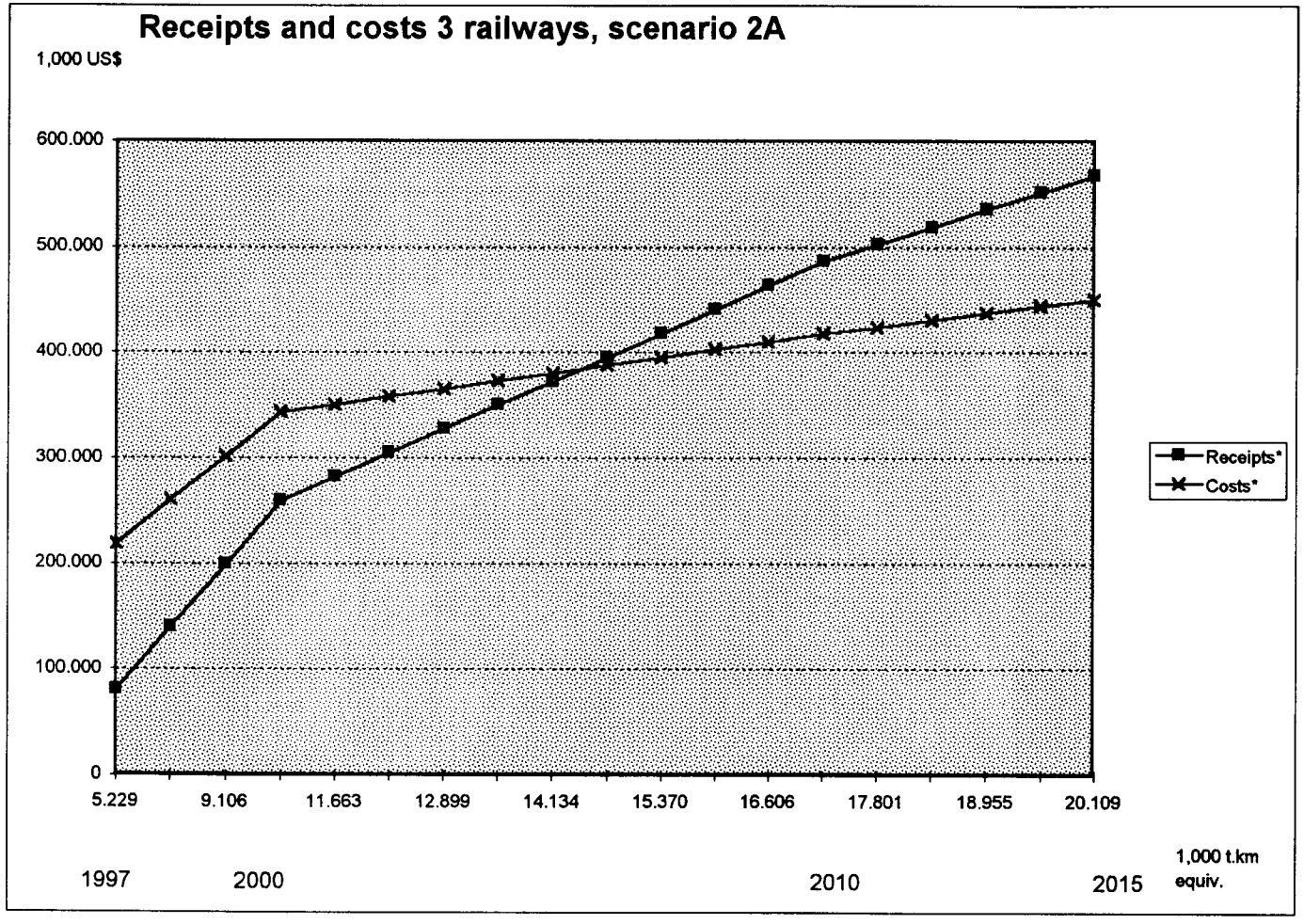
3 railways

	Unit	Present	1997	2000	2010	2015
Level of activity						
10^3 t.km equiv.		5.307.842	5.228.900	11.044.900	17.224.000	20.108.900
Revenues	1000 US$					
% of revenues actually received	%					
Receipts	1000 US$	70.272,0	79.078,2	258.881,7	486.100,7	567.118,2
Costs excl. interests	1000 US$		217.993,6	342.856,0	417.140,9	449.926,6

3 railways

Year	10^6 t.km equ.	Receipts*	Costs*
1997	5.229	79.078	217.994
1998	7.168	139.013	259.614
1999	9.106	198.947	301.235
2000	11.045	258.882	342.856
2001	11.663	281.604	350.285
2002	12.281	304.325	357.713
2003	12.899	327.047	365.141
2004	13.517	349.769	372.570
2005	14.134	372.491	379.998
2006	14.752	395.213	387.427
2007	15.370	417.935	394.855
2008	15.988	440.657	402.284
2009	16.606	463.379	409.712
2010	17.224	486.101	417.141
2011	17.801	502.304	423.698
2012	18.378	518.508	430.255
2013	18.955	534.711	436.812
2014	19.532	550.915	443.369
2015	20.109	567.118	449.927

* in 1000 US$, excl. interests


Receipts and costs 3 railways, scenario 2A
1,000 US$
600.000
500.000
400.000
300.000
200.000
100.000
0
5.229
9.106
11.663
12.899
14.134
15.370
16.606
17.801
18.955
20.109
1997
2000
2010
2015
1,000 t.km equiv.
Receipts*
Costs*

Global cash flows of the three railways

Scenario 2A: Development at fairly increased prices with improved marketing, with reduced investments

3 railways

	Unit	Present	1997	2000	2010	2015
Level of activity						
10^3 t.km equiv.		5.307.842	5.228.900	11.044.900	17.224.000	20.108.900
Revenues	1000 US$					
% of revenues actually received	%					
Receipts	1000 US$	70.272,0	79.078,2	258.881,7	486.100,7	567.118,2
Curr. expenses** excl. interests	1000 US$		166.158,6	291.021,0	365.305,9	398.091,5

** = Current expenses = costs excluding depreciation

3 railways

Year	10^6 t.km equ.	Receipts*	Curr. exp.**	Investments*	3 Railways Cash flow*	C.flow cum.*
1997	5.229	79.078	166.159	0	-87.080	-87.080
1998	7.168	139.013	207.779	250.775	-319.542	-406.622
1999	9.106	198.947	249.400	241.166	-291.619	-698.241
2000	11.045	258.882	291.021	59.395	-91.534	-789.775
2001	11.663	281.604	298.449	54.882	-71.728	-861.504
2002	12.281	304.325	305.878	55.472	-57.024	-918.528
2003	12.899	327.047	313.306	16.082	-2.341	-920.869
2004	13.517	349.769	320.735	16.082	12.952	-907.917
2005	14.134	372.491	328.163	28.669	15.659	-892.258
2006	14.752	395.213	335.592	43.909	15.712	-876.546
2007	15.370	417.935	343.020	43.887	31.027	-845.519
2008	15.988	440.657	350.449	36.347	53.861	-791.658
2009	16.606	463.379	357.877	36.347	69.154	-722.504
2010	17.224	486.101	365.306	92.053	28.741	-693.763
2011	17.801	502.304	371.863	127.930	2.511	-691.252
2012	18.378	518.508	378.420	89.305	50.783	-640.469
2013	18.955	534.711	384.977	89.305	60.429	-580.040
2014	19.532	550.915	391.534	89.305	70.075	-509.965
2015	20.109	567.118	398.092	-730.039	899.066	389.101
					IRR=	2,5%

* in 1000 US$, excl. interests

Existing long term physical assets, rehabilitation investments, re-investments. Overall recapitulation (in million US$) **Reduced programme**

Railway administration of Items with depreciation period of ... years		Armenia 5-15	15-30	30-50	Roll.stock (20 years)	Total	Azerbaijan 5-15	15-30	30-50	Roll.stock (20 years)	Total	Georgia 5-15	15-30	30-50	Roll.stock (20 years)	Total	3 railways Total
Existing long term physical assets, resid. value																	
a) official figures of balance sheet of end 1996						16,28					578,40					123,30	
b) estimated present value						100,00					550,00					450,00	1.100,00
Rehabilitation investments and re-investments according to investment plans	1998-201	52,14	52,22	3,35	65,92	173,63	129,87	218,37	5,97	384,75	738,97	143,30	209,09	14,37	163,78	530,54	1.443,14
	Year																
	1998	12,03	21,80	1,68	0,59	36,10	19,60	64,68	2,99	1,13	88,39	24,08	93,41	7,18	1,62	126,29	250,77
	1999	12,03	20,91	1,68	0,62	35,24	19,60	64,18	2,99	0,96	87,72	24,08	86,10	7,18	0,85	118,21	241,17
	2000	0,67	3,43		2,07	6,17	8,58	17,27		3,20	29,05	7,83	11,83		4,51	24,17	59,39
	2001	0,67	3,04		1,68	5,39	8,58	17,28		2,75	28,60	7,83	8,83		4,22	20,89	54,88
	2002	0,67	3,04		1,80	5,51	8,58	17,28		2,85	28,71	7,83	8,83		4,58	21,25	55,47
	2003				1,68	1,68		7,54		2,67	10,21		0,02		4,17	4,19	16,08
	2004				1,68	1,68		7,54		2,67	10,21		0,02		4,17	4,19	16,08
	2005				3,52	3,52		7,54		7,67	15,21		0,02		9,92	9,94	28,67
	2006				3,45	3,45		7,54		23,34	30,88		0,02		9,55	9,57	43,91
	2007				3,45	3,45		7,54		23,34	30,88				9,55	9,55	43,89
	2008				3,45	3,45				23,34	23,34				9,55	9,55	36,35
	2009				3,45	3,45				23,34	23,34				9,55	9,55	36,35
	2010	12,03			3,45	15,49	19,60			23,34	42,94	24,08			9,55	33,63	92,05
	2011	12,03			7,00	19,03	19,60			48,82	68,42	24,08			16,40	40,48	127,93
	2012	0,67			7,00	7,67	8,58			48,82	57,41	7,83			16,40	24,23	89,31
	2013	0,67			7,00	7,67	8,58			48,82	57,41	7,83			16,40	24,23	89,31
	2014	0,67			7,00	7,67	8,58			48,82	57,41	7,83			16,40	24,23	89,31
	2015				7,00	7,00				48,82	48,82				16,40	16,40	72,22
	Res. val.	-16,71	-15,76	-2,24	-53,83	-88,54	-45,95	-77,99	-4,00	-331,36	-459,30	-49,68	-62,03	-9,63	-133,09	-254,42	-802,26
Actual average depreciation																	
Permanent ways						3,20					8,14					10,03	
Rolling stock, locomotives						1,82					8,70					3,53	
Rolling stock, waggons & PMU						0,37					4,13					1,93	
Signalling						0,43					0,87					1,47	
Power supply						0,08					3,22					0,87	
Stations & cont. terminals						0,23					0,85					0,95	
Total						6,13					25,91					18,78	
Actual average maintenance costs																	
Permanent ways						7,36					19,06					24,69	
Rolling stock, locomotives						1,81					3,64					2,33	
Rolling stock, waggons & PMU						2,60					14,83					9,76	
Signalling						1,28					2,62					4,40	
Power supply						0,30					5,89					1,76	
Stations & cont. terminals						0,53					2,07					2,34	
Total						13,88					48,10					45,28	

Permanent ways and maintenance equipment pertaining to them

Investment	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	Sum
Azerbaijan																			
Perm. ways	48,62	48,62	6,69	6,69	6,69														117,32
Bridges, tunn.	2,99	2,99																	5,97
Mach.& equip.	12,87	12,87	8,58	8,58	8,58														51,49
Training	0,50																		0,50
Total	64,98	64,48	15,27	15,27	15,27														175,28
Georgia																			
Perm. ways	76,43	76,43	3,78	3,78	3,78														164,20
Bridges, tunn.	7,18	7,18																	14,37
Mach.& equip.	12,75	12,75	7,83	7,83	7,83														49,00
Training	0,50																		0,50
Total	96,86	96,36	11,61	11,61	11,61														228,07
Armenia																			
Perm. ways	18,08	18,08	2,79	2,79	2,79														44,51
Bridges, tunn.	1,68	1,68																	3,35
Mach.& equip.	8,75	8,75	0,67	0,67	0,67														19,50
Training	0,50																		0,50
Total	29,00	28,50	3,45	3,45	3,45														67,86

Maintenance	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Annual
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	average
Azerbaijan																			
Perm. ways	4,86	9,72	10,39	11,06	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	11,73	
Bridges, tunn.	0,15	2,58	2,92	3,25	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	3,58	
Mach.& equip.	1,29	2,57	3,43	4,29	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	5,15	
Total	6,30	14,88	16,74	18,60	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	20,47	19,06
Georgia																			
Perm. ways	7,64	15,29	15,66	16,04	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	16,42	
Bridges, tunn.	0,36	4,18	4,37	4,56	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	4,75	
Mach.& equip.	1,28	2,55	3,33	4,12	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	4,90	
Total	9,28	22,02	23,37	24,72	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	26,07	24,69
Armenia																			
Perm. ways	1,81	3,62	3,89	4,17	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	4,45	
Bridges, tunn.	0,08	0,99	1,13	1,27	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	1,41	
Mach.& equip.	0,88	1,75	1,82	1,88	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	1,95	
Total	2,77	6,35	6,84	7,32	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,81	7,36

Depreciation	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Annual
	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	10^6 US$	average
Azerbaijan																			
Perm. ways	1,95	3,89	4,16	4,43	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	4,69	
Bridges, tunn.	0,06	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	0,12	
Mach.& equip.	0,99	1,98	2,64	3,30	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	3,96	
Total	3,00	5,99	6,92	7,85	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,77	8,14
Georgia																			
Perm. ways	3,06	6,11	6,27	6,42	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	6,59	
Bridges, tunn.	0,14	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	0,29	
Mach.& equip.	0,98	1,96	2,56	3,17	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	3,77	
Total	4,18	8,36	9,12	9,87	10,64	10,64	10,64	10,64	10,64	10,64	10,64	10,65	10,65	10,65	10,65	10,65	10,65	10,65	10,03
Armenia																			
Perm. ways	0,72	1,45	1,56	1,67	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	1,78	
Bridges, tunn.	0,03	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	
Mach.& equip.	0,87	1,35	1,40	1,45	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	1,50	
Total	1,63	2,86	3,02	3,19	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,35	3,20

Rolling stock and maintenance equipment pertaining to it a) High case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Azerbaijan																			
Locomotives			0,80	0,80	0,80	0,80	0,80	10,80	11,62	11,62	11,62	11,62	11,62	70,20	70,20	70,20	70,20	70,20	423,90
Waggons			3,75	3,75	3,75	3,75	3,75	3,75	24,85	24,85	24,85	24,85	24,85	10,05	10,05	10,05	10,05	10,05	196,96
Repair shops	1,13	0,96	0,53	0,07	0,18														2,87
Total	1,13	0,96	5,07	4,62	4,73	4,55	4,55	14,55	36,47	36,47	36,47	36,47	36,47	80,25	80,25	80,25	80,25	80,25	623,73
Georgia																			
Locomotives			3,25	3,25	3,25	3,25	3,25	13,92	11,87	11,87	11,87	11,87	11,87	18,68	18,68	18,68	18,68	18,68	182,90
Waggons			2,33	2,33	2,33	2,33	2,33	2,33	5,20	5,20	5,20	5,20	5,20	7,80	7,80	7,80	7,80	7,80	79,00
Repair shops	1,62	0,85	0,35	0,06	0,42														3,28
Total	1,62	0,85	5,93	5,64	6,00	5,58	5,58	16,25	17,07	17,07	17,07	17,07	17,07	26,48	26,48	26,48	26,48	26,48	265,18
Armenia																			
Locomotives			1,10	1,10	1,10	1,10	1,10	4,77	4,99	4,99	4,99	4,99	4,99	8,60	8,60	8,60	8,60	8,60	78,20
Waggons			0,67	0,67	0,67	0,67	0,67	0,67	0,40	0,40	0,40	0,40	0,40	1,00	1,00	1,00	1,00	1,00	11,00
Repair shops	0,59	0,62	0,39		0,12														1,72
Total	0,59	0,62	2,16	1,77	1,89	1,77	1,77	5,43	5,39	5,39	5,39	5,39	5,39	9,60	9,60	9,60	9,60	9,60	90,92

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$
Azerbaijan																		
Locomotives	5,04	5,74	6,04	6,24	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64	3,64
Waggons, EMU	19,30	19,30	17,77	17,77	17,77	17,77	17,77	17,77	20,83	20,83	20,83	20,83	20,83	21,52	21,52	21,52	21,52	21,52
Total	24,34	25,04	23,81	24,01	21,41	21,41	21,41	21,41	24,47	24,47	24,47	24,47	24,47	25,16	25,16	25,16	25,16	25,16
Georgia																		
Locomotives	3,49	3,49	3,49	3,49	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39	2,39
Waggons, EMU	10,98	10,98	10,98	11,23	11,23	11,23	11,23	11,23	14,10	14,10	14,10	14,10	14,10	13,68	13,68	13,68	13,68	13,68
Total	14,47	14,47	14,47	14,72	13,62	13,62	13,62	13,62	16,49	16,49	16,49	16,49	16,49	16,07	16,07	16,07	16,07	16,07
Armenia																		
Locomotives	2,15	2,15	2,15	2,15	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88
Waggons, EMU	2,77	2,77	2,77	2,85	2,85	2,85	2,85	2,85	3,26	3,26	3,26	3,26	3,26	3,57	3,57	3,57	3,57	3,57
Total	4,92	4,92	4,92	5,00	4,72	4,72	4,72	4,72	5,14	5,14	5,14	5,14	5,14	5,44	5,44	5,44	5,44	5,44

Rolling stock and maintenance equipment pertaining to it b) Low case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Azerbaijan																			
Locomotives			0,80	0,80	0,80	0,80	0,80	0,80	1,62	1,62	1,62	1,62	1,62	17,00	17,00	17,00	17,00	17,00	97,90
Waggons									8,60	8,60	8,60	8,60	8,60	0,40	0,40	0,40	0,40	0,40	45,00
Repair shops	1,13	0,96	0,53	0,07	0,18														2,87
Total	1,13	0,96	1,33	0,87	0,98	0,80	0,80	0,80	10,22	10,22	10,22	10,22	10,22	17,40	17,40	17,40	17,40	17,40	145,77
Georgia																			
Locomotives			2,75	2,75	2,75	2,75	2,75	2,75	1,20	1,20	1,20	1,20	1,20	1,32	1,32	1,32	1,32	1,32	29,10
Waggons								0,83	0,83	0,83	0,83	0,83	0,83	5,00	5,00	5,00	5,00	5,00	30,00
Repair shops	1,62	0,85	0,35	0,06	0,42														3,28
Total	1,62	0,85	3,10	2,81	3,17	2,75	2,75	3,58	2,03	2,03	2,03	2,03	2,03	6,32	6,32	6,32	6,32	6,32	62,38
Armenia																			
Locomotives			1,10	1,10	1,10	1,10	1,10	1,10	1,32	1,32	1,32	1,32	1,32	3,60	3,60	3,60	3,60	3,60	31,20
Waggons			0,50	0,50	0,50	0,50	0,50	0,50	0,20	0,20	0,20	0,20	0,20	0,80	0,80	0,80	0,80	0,80	8,00
Repair shops	0,59	0,62	0,39		0,12														1,72
Total	0,59	0,62	1,99	1,60	1,72	1,60	1,60	1,60	1,52	1,52	1,52	1,52	1,52	4,40	4,40	4,40	4,40	4,40	40,92

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$
Azerbaijan																		
Locomotives	3,95	3,95	3,95	3,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95
Waggons, EMU	10,15	10,15	9,14	9,14	9,14	9,14	9,14	9,14	10,15	10,15	10,15	10,15	10,15	10,19	10,19	10,19	10,19	10,19
Total	14,10	14,10	13,09	13,09	12,08	12,08	12,08	12,08	13,10	13,10	13,10	13,10	13,10	13,14	13,14	13,14	13,14	13,14
Georgia																		
Locomotives	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02	2,02
Waggons, EMU	6,61	6,61	6,61	6,61	6,61	6,61	6,61	6,61	6,76	6,76	6,76	6,76	6,76	7,31	7,31	7,31	7,31	7,31
Total	8,63	8,63	8,63	8,63	8,63	8,63	8,63	8,63	8,78	8,78	8,78	8,78	8,78	9,34	9,34	9,34	9,34	9,34
Armenia																		
Locomotives	1,90	1,90	1,90	1,90	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63
Waggons, EMU	1,99	1,99	1,99	2,04	2,04	2,04	2,04	2,04	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,06
Total	3,89	3,89	3,89	3,94	3,67	3,67	3,67	3,67	3,69	3,69	3,69	3,69	3,69	3,69	3,69	3,69	3,69	3,69

Rolling stock and maintenance equipment pertaining to it c) Medium case

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum	
Azerbaijan																				
Locomotives	0,00	0,00	0,80	0,80	0,80	0,80	0,80	5,80	6,62	6,62	6,62	6,62	6,62	43,60	43,60	43,60	43,60	43,60	260,90	
Waggons	0,00	0,00	1,87	1,87	1,87	1,87	1,87	1,87	16,72	16,72	16,72	16,72	16,72	5,22	5,22	5,22	5,22	5,22	120,98	123,85
Repair shops	1,13	0,96	0,53	0,07	0,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2,87	
Total	1,13	0,96	3,20	2,75	2,85	2,67	2,67	7,67	23,34	23,34	23,34	23,34	23,34	48,82	48,82	48,82	48,82	48,82	384,75	
Georgia																				
Locomotives	0,00	0,00	3,00	3,00	3,00	3,00	3,00	8,33	6,53	6,53	6,53	6,53	6,53	10,00	10,00	10,00	10,00	10,00	106,00	
Waggons	0,00	0,00	1,17	1,17	1,17	1,17	1,17	1,58	3,02	3,02	3,02	3,02	3,02	6,40	6,40	6,40	6,40	6,40	54,50	57,78
Repair shops	1,62	0,85	0,35	0,06	0,42	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3,28	
Total	1,62	0,85	4,51	4,22	4,58	4,17	4,17	9,92	9,55	9,55	9,55	9,55	9,55	16,40	16,40	16,40	16,40	16,40	163,78	
Armenia																				
Locomotives	0,00	0,00	1,10	1,10	1,10	1,10	1,10	2,93	3,15	3,15	3,15	3,15	3,15	6,10	6,10	6,10	6,10	6,10	54,70	
Waggons	0,00	0,00	0,58	0,58	0,58	0,58	0,58	0,58	0,30	0,30	0,30	0,30	0,30	0,90	0,90	0,90	0,90	0,90	9,50	11,22
Repair shops	0,59	0,62	0,39	0,00	0,12	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,72	
Total	0,59	0,62	2,07	1,68	1,80	1,68	1,68	3,52	3,45	3,45	3,45	3,45	3,45	7,00	7,00	7,00	7,00	7,00	65,92	

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Azerbaijan																			
Locomotives	4,49	4,84	4,99	5,09	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,29	3,64
Waggons, EMU	14,73	14,73	13,45	13,45	13,45	13,45	13,45	13,45	15,49	15,49	15,49	15,49	15,49	15,86	15,86	15,86	15,86	15,86	14,83
Total	19,22	19,57	18,45	18,55	16,75	16,75	16,75	16,75	18,79	18,79	18,79	18,79	18,79	19,15	19,15	19,15	19,15	19,15	
Georgia																			
Locomotives	2,75	2,75	2,75	2,75	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,21	2,33
Waggons, EMU	8,80	8,80	8,80	8,92	8,92	8,92	8,92	8,92	10,43	10,43	10,43	10,43	10,43	10,50	10,50	10,50	10,50	10,50	9,76
Total	11,55	11,55	11,55	11,68	11,13	11,13	11,13	11,13	12,64	12,64	12,64	12,64	12,64	12,70	12,70	12,70	12,70	12,70	
Armenia																			
Locomotives	2,03	2,03	2,03	2,03	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,75	1,81
Waggons, EMU	2,38	2,38	2,38	2,44	2,44	2,44	2,44	2,44	2,66	2,66	2,66	2,66	2,66	2,81	2,81	2,81	2,81	2,81	2,60
Total	4,41	4,41	4,41	4,47	4,20	4,20	4,20	4,20	4,41	4,41	4,41	4,41	4,41	4,57	4,57	4,57	4,57	4,57	

Signalling, power supply, stations and container terminals

Investment	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Sum
Signalling																			
Azerbaijan	6,73	6,73																	13,45
Georgia	11,33	11,33																	22,65
Armenia	3,28	3,28																	6,57
Power supply																			
Azerbaijan	8,40	8,40	7,81	7,81	7,81	7,54	7,54	7,54	7,54	7,54									77,93
Georgia	10,84	4,04	3,02	0,02	0,02	0,02	0,02	0,02	0,02										18,04
Armenia	0,78	0,39	0,39																1,55
Stations and container terminals																			
Azerbaijan	7,16	7,16	2,77	2,77	2,77														22,63
Georgia	5,64	5,64	5,03	5,03	5,03														26,36
Armenia	2,45	2,45	0,26	0,26	0,26														5,66

Maintenance	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Signalling																			
Azerbaijan	1,35	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,69	2,62
Georgia	2,27	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,53	4,40
Armenia	0,66	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,28
Power supply																			
Azerbaijan	0,84	1,68	2,46	3,24	4,02	4,78	5,53	6,28	7,04	7,79	7,79	7,79	7,79	7,79	7,79	7,79	7,79	7,79	5,89
Georgia	1,61	1,49	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,79	1,76
Armenia	0,23	0,23	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,30
Stations and container terminals																			
Azerbaijan	0,71	1,42	1,70	1,97	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,24	2,07
Georgia	0,56	1,11	1,62	2,12	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,34
Armenia	0,24	0,48	0,50	0,53	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,55	0,53

Depreciation	1998 10^6 US$	1999 10^6 US$	2000 10^6 US$	2001 10^6 US$	2002 10^6 US$	2003 10^6 US$	2004 10^6 US$	2005 10^6 US$	2006 10^6 US$	2007 10^6 US$	2008 10^6 US$	2009 10^6 US$	2010 10^6 US$	2011 10^6 US$	2012 10^6 US$	2013 10^6 US$	2014 10^6 US$	2015 10^6 US$	Annual average
Signalling																			
Azerbaijan	0,45	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,87
Georgia	0,76	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,47
Armenia	0,22	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,43
Power supply																			
Azerbaijan	0,47	0,94	1,37	1,80	2,22	2,63	3,03	3,44	3,84	4,25	4,25	4,25	4,25	4,25	4,25	4,25	4,25	4,25	3,22
Georgia	0,81	0,54	0,74	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,90	0,87
Armenia	0,06	0,06	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08
Stations and container terminals																			
Azerbaijan	0,29	0,59	0,70	0,81	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,85
Georgia	0,23	0,46	0,66	0,86	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	1,06	0,95
Armenia	0,10	0,21	0,22	0,23	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,24	0,23