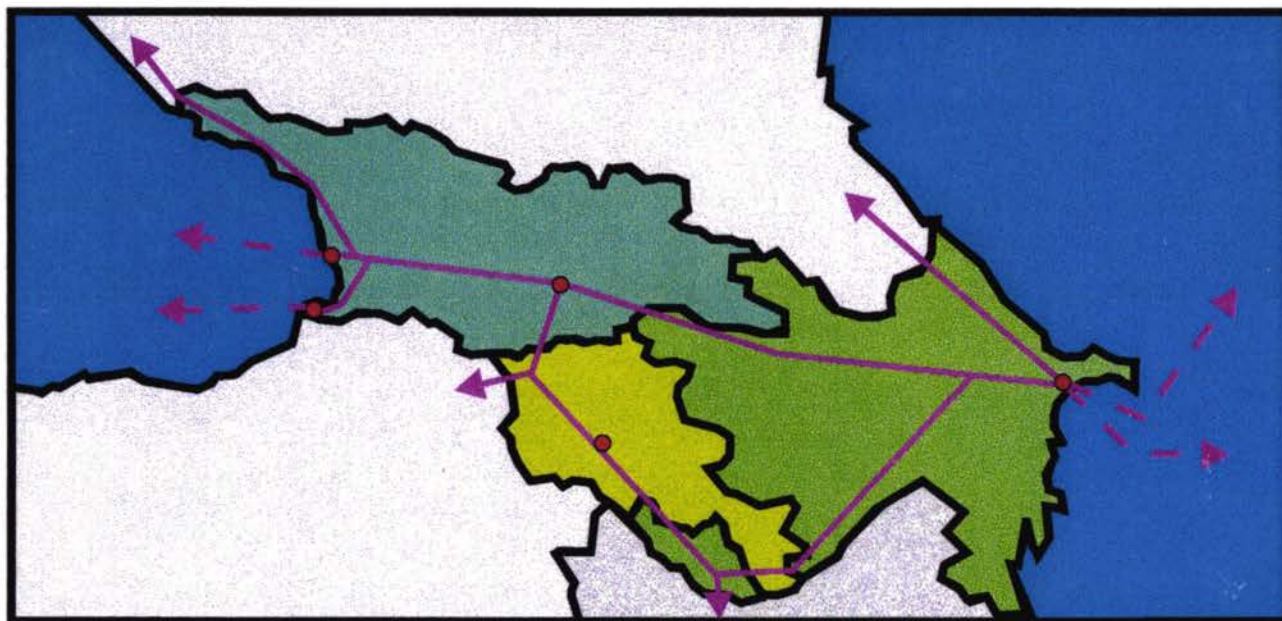


COMMISSION OF THE EUROPEAN UNION

Directorate General IA External Relations  
DG IA/E/6 Tacis

Technical Assistance to the Southern Republics of the CIS  
and Georgia - TRACECA  
(TNREG 939401)

**Joint Venture(s)  
for the  
Caucasian Railways**



Draft

**FINAL REPORT**  
**Executive Summary**

October 1997

**TEWET**

TRANSPORT EAST WEST EXPERT TEAM GMBH

in association with

**DE-Consult**



## Contents

	<b>Executive summary</b>	
<b>Chapter 1</b>	<b>Present technical conditions of railway infrastructure and rolling stock</b>	<b>Volume I</b>
<b>Chapter 2</b>	<b>Legal, organisational and financial conditions</b>	<b>Volume II</b>
<b>Chapter 3</b>	<b>Traffic forecast</b>	<b>Volume II</b>
<b>Chapter 4</b>	<b>Business strategy of the railways</b>	<b>Volume III</b>
<b>Chapter 5</b>	<b>Financial forecast</b>	<b>Volume III</b>
<b>Chapter 6</b>	<b>Development of joint ventures</b>	<b>Volume IV</b>
<b>Chapter 7</b>	<b>Port and ferry services</b>	<b>Volume V</b>

# Executive summary

## Contents:

<b>I</b>	<b>Introduction and background</b>	<b>3</b>
<b>II</b>	<b>Development of traffic flows</b>	<b>9</b>
<b>III</b>	<b>Financial situation</b>	<b>18</b>
<b>IV</b>	<b>Infrastructure rehabilitation needs and investment plan</b>	<b>20</b>
<b>V</b>	<b>Development of Joint Ventures</b>	<b>29</b>



## I. Introduction and background

The disintegration of the former Soviet Union, amongst others, led to significant structural and administrative changes for the railways of the Caucasus region. The Trans-Caucasian Railways (Georgia, Armenia) and the Azerbaijan Railways were one administration each in the network of the former Soviet Railways (SZD). After the Soviet Union was dissolved, national railways were established in all three republics.

The following table shows some selected parameters for all three railways (as in 1995):

	Armenia	Azerbaijan	Georgia
Size of network (km)	798	2,123	1,839
electrified (%)	98.0	60.0	100.0
double-track (%)	0.8	38.0	18.5
Network density (km/1000 km <sup>2</sup> )	26.8	24.7	26.4
Locomotives	91	226	230,5 <sup>1</sup>
Freight wagons	5,236 <sup>2</sup>	29,118 <sup>2</sup>	21,095 <sup>2</sup>
Coaches	236	853	1,085
staff ( '000 persons )	4.7	40.6	25.3
productivity ( '000 tkm/employee)	93	97	60

<sup>1)</sup> 0.5 means part of a double-section locomotive

<sup>2)</sup> taken over from SZD, not completely available in part, as they are in other CIS states

Because of the economic situation, but also due to the political development in the region, there is a dramatic decline in the transport volume of all three railways. This quantitative drop was accompanied by a deterioration in quality of the transport services.

The comparison of the transport values of 1989 and 1995 in the tables and the graph to follow give an idea of how much transport volumes and transport performances were reduced in passenger transport and freight transport.:

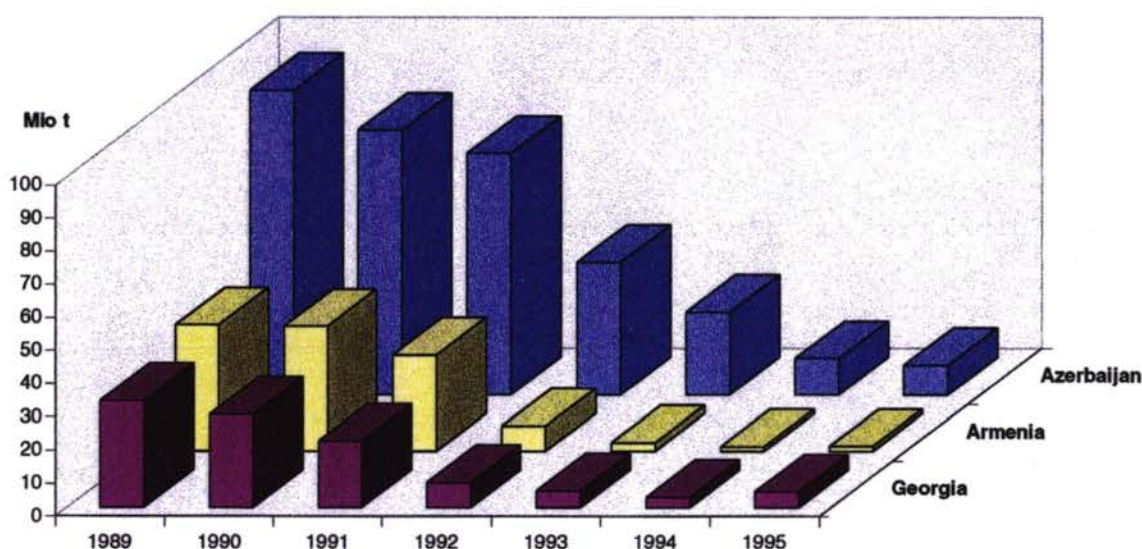
### *Passenger Transport*

	Year	Armenia	Azerbaijan	Georgia
passengers transported (1,000 pass.)	1989	4.575	19,600	17,000
	1995	2,969	10,600	3,676
transport performance 1,000,000 pkm	1989	380.5	2,042.9	2,135
	1995	165.9	1,111.9	371

### Freight Transport

	Year	Armenia	Azerbaijan	Georgia
transport volume 1,000,000 tons	1989	33.9	91.4	36.2
	1995	1.2	9.1	4.7
transport performance 1,000,000 tkm	1989	5,121	41,895	12,591
	1995	351	2,409	1,246

### Freight transport volumes of the railways

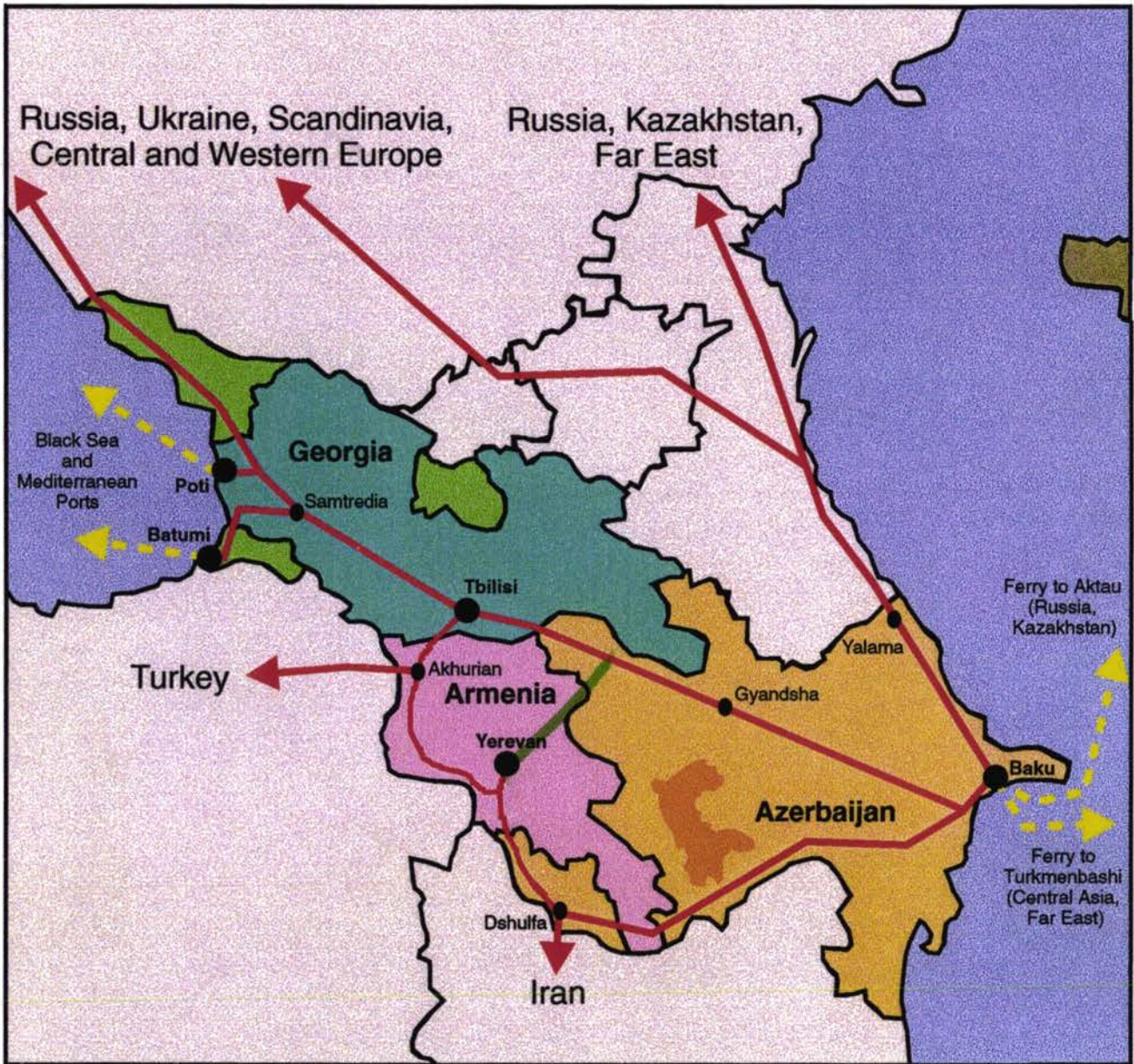


The quoted decline in the transport volumes both in goods and in passenger transport, combined with the general economic difficulties in these countries has led to a significant reduction in the revenue of the three railways. One of the consequences was that over the past few years next to no financial means were available for maintaining or extending the infrastructure or the rolling stock, which led to a dramatic deterioration of the technical condition in these areas. The situation in communication technology and information systems is especially critical.

Because of their geographic location, all three countries are important transit countries for international rail traffic. Unfortunately, the political development in the region has led to the situation that especially transit traffic, and thus the international significance of the Caucasian railways, has dwindled. The shutting down of such important railway corridors as Baku - Yalama - Russia, Baku - Nakhichevan - Dshulfa - Iran or Tbilisi - Sukhumi - Russia, Tbilisi - Armenia - Dshulfa - Iran and the Baku - Aktau railway ferry link has had especially negative effects. International rail traffic via the railways of these countries has stopped more or less completely.



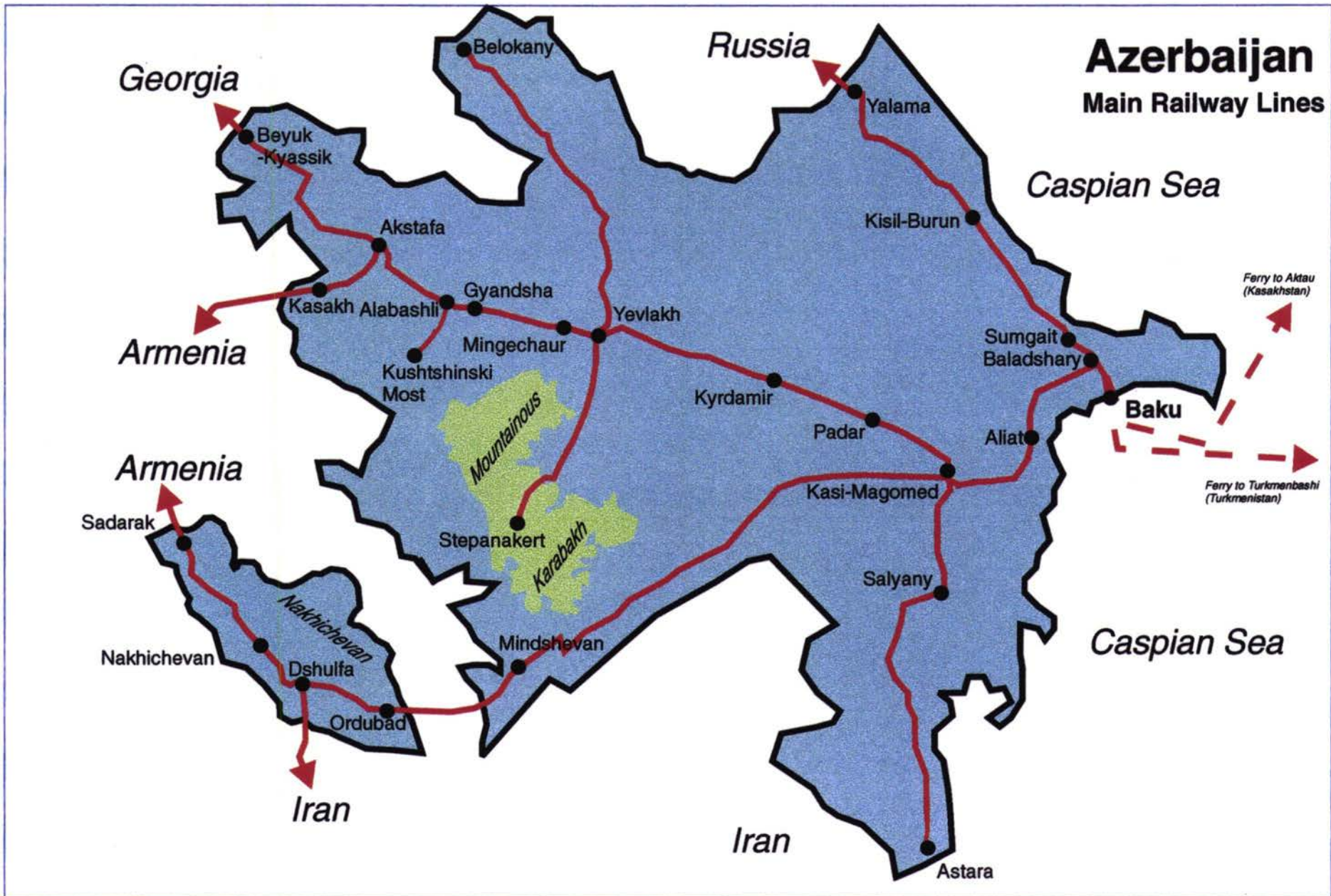
### Main railway transport corridors in the Caucasus region

















The main topics of the given project are

- passenger and freight traffic forecast
- assessment of infrastructure rehabilitation needs
- investment plan for infrastructure rehabilitation
- assessment of financial, legal and institutional conditions and development
- identification of possibilities for forming Joint Ventures
- economical, financial and institutional appraisal of proposed Joint Ventures.

In the following a short description is given of the main findings and conclusions/proposals regarding the most important tasks of the work performed.

## II. Development of traffic flows

### 1. Freight traffic forecast

Apart from the general problems in drawing up a forecast for traffic development under the current political and economic conditions in the region, there were additional difficulties due to existing problems in making available the necessary statistical reference data. Whereas relatively detailed internal statistical data on the development of traffic could be made available by the Azerbaijan Railways, the Armenian and Georgian Railways have not got available such detailed data. Unfortunately, there is scarcely reliable data on road transport in all three countries.

Due to the data availability described above, assumptions or own calculations were necessary in many cases to work on. These cases are explained in detail in the following.

There was close coordination and data exchange with other running relevant TRACECA projects, especially with:

- Regional traffic forecasting model
- Forwarding / Multimodal transport system
- Technical assistance for the development of the Port of Baku
- Port network plan and improvement programme

Traditional mathematical and statistical methods of traffic forecasts, normally used under West European conditions, do not apply to the prognosis of traffic flows under the current situation in East European countries. These methods would lead to very imprecise results, under the conditions prevailing in the successor states to the For-

mer Soviet Union (FSU), at the moment. The most important reasons, which make a different methodological approach necessary, are:

- The disintegration of the Soviet Union and the transition from the centrally planned economy to market economy structures have led to thoroughgoing structural changes in politics and the economy;
- The traditional economic, trade and clearing relations between the former Soviet republics have more or less all collapsed. The trade relations of the republics investigated are currently undergoing a completely new geographical and structural orientation;
- The former strong central influence on the role of the individual modes of transport led to a state approved modal split, which is now being influenced more and more by the conditions prevailing on the market;
- There is no detailed statistical data base on production, trade and traffic. Existing data is partly incomplete or the information is severely limited. Statistical time rows for the previous period of time are without informative value due to the considerable structural amendments or the changed statistical registration methods.

Due to the reasons mentioned, a methodology was applied in drawing up the traffic volume forecast, tailor-made for the conditions of the East European reform states.

This special methodology of the Consultant includes the following main elements:

The most important initial item to be analysed for assessing the future traffic volume is the development of the main economic indices, especially the Gross Domestic Product (GDP). The assumption is that there is a close connection between the development of the GDP and the total traffic volume of a country, which has been extensively proved by analogue investigations in various East European countries and for different periods of time.

The development of selected branches of the economy, which are of special importance for the traffic volume of the railways, have been assessed in detail to further verify the forecast. These are above all the oil processing industry, the chemical industry, the non-ferrous and ferrous metallurgy, the building materials industry as well as agriculture, for the respective period of investigation.

The foreign trade relations are of special significance for the development of the freight traffic volume. That is why very detailed investigations were conducted on the current and the future structures and trade volumes. The studies also included the foreign trade relations of other countries, which are of interest especially for the transit traffic of the region, e.g. the Central Asian republics, Russia, Turkey, Iran.

The possible development of the mentioned factors is depicted in two scenarios, an optimistic and a pessimistic one.



On the basis of assessing all these above-mentioned factors and a special inter-linking of them annual growth rates were deducted for the development of the transport volume in the mentioned railway traffic for the period up to 2015, divided according to domestic traffic, export, import, transit and that in the respective two scenarios. The statistical data for 1995 served as reference figures. Separate assumptions on the production and trade volume were made for individual types of goods, which are of particular importance for the total traffic volume. This applies especially to the oil processing sector, cotton, and container traffic.

The traffic volume for important transport corridors was established on the basis of these statements on the development of the total traffic. In doing so, the pertaining development rates for the individual segments (export, import, transit, domestic traffic) were used, and where necessary, they were harmonised with the data of neighbouring railways. The establishment of a reliable starting level posed a problem for those transport corridors along which there is no or a very limited freight traffic due to the political tensions in the region.

The main findings and conclusions concerning the development of freight traffic up to the year 2015 are:

### **Armenia**

#### **Transport volume of the Armenian Railway up to the year 2015**

	1996	2000		2010		2015	
		opt.	pess.	opt.	pess.	opt.	pess.
<b>transport volume</b> (‘000 t)	1,177	2,269	1,535	3,357	2,242	4,238	2,726
<b>transport performance</b> (‘000 000 tkm)	351	703	476	1,041	695	1,314	845

The future development of transit traffic will play an important role for the Armenian Railways. The following transport volumes per year are assumed as a starting level for transit traffic through Armenia upon a normalisation of the political situation (2000/2005):

Turkey - Azerbaijan / Central Asia v.v.	130,000 tons
Turkey - Georgia v.v.	40,000 tons
Iran - Georgia v.v.	105,000 tons
Iran - Russia v.v.	210,000 tons
Iran - Ukraine v.v.	150,000 tons
Iran - Black Sea ports v.v.	50,000 tons

The current trade flows between the quoted countries and regions served as a basis, taking into consideration the role of competing, traditional transit corridors

### *Azerbaijan / Georgia*

#### Transport volume of the Azerbaijan Railways up to the year 2015

	1995	2000		2010		2015	
		opt.	pess.	opt.	pess.	opt.	pess.
<b>transport volume</b> (‘000 t)	9,073	20,102	12,992	29,690	20,519	34,825	23,685
<b>transport performance</b> (‘000 000 tkm)	2,409	8,805	5,469	13,004	8,638	15,253	9,971

#### Transport volume of the Georgian Railways up to the year 2015

	1995	2000		2010		2015	
		opt.	pess.	opt.	pess.	opt.	pess.
<b>transport volume</b> (‘000 t)	4,700	9,525	4,477	15,268	7,611	17,470	9,135
<b>transport performance</b> (‘000 000 tkm)	1,246	3,238	1,522	5,191	2,588	5,940	3,106

The forwarding of the petrochemical products produced in Azerbaijan will maintain a dominating position in the rail freight traffic of the country. Their share in the total amount of goods transported was 70.7 per cent in 1995. It will have reached 59.1 per cent (optimistic scenarios) by the year 2000, in 2010 it will be 62.7 per cent and in 2015 the share will stand at 61.5 per cent. Parallel, the share of transit transports will rise considerably during the period under investigation. Whereas the share of transit transports was still 2.4 per cent in 1995, it will have reached 20.8 per cent (in the optimistic scenario) already in the year 2000. In the following years it will remain at about that level.

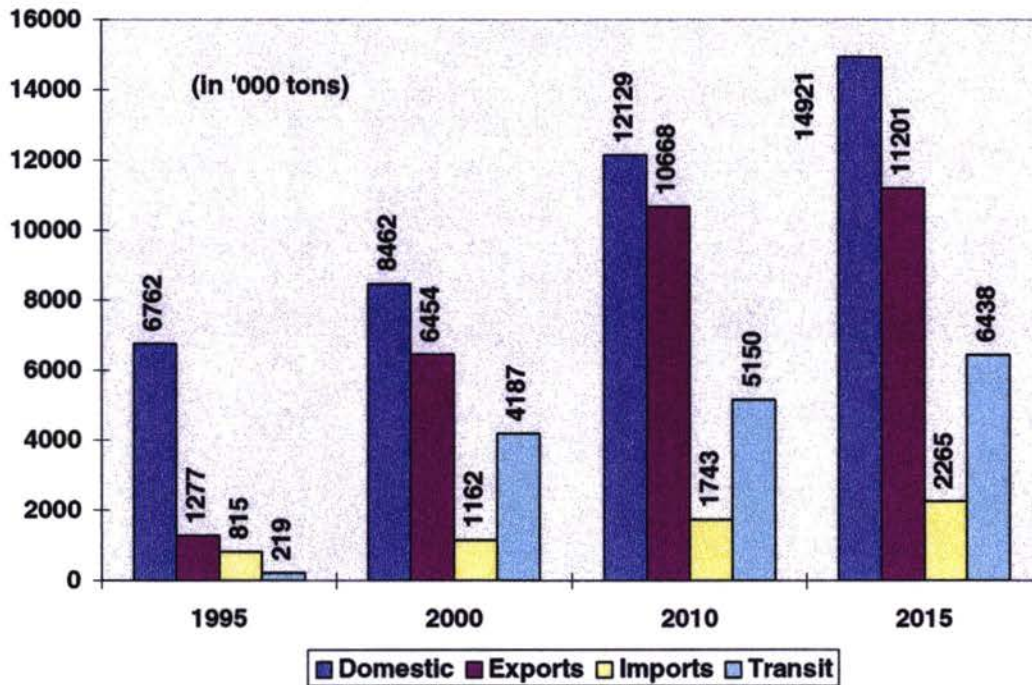
Transit traffic will gain a dominating role in the rail freight traffic of Georgia. Already in 1995, the share of transits in the total amount forwarded was high at 37.8 per cent, as compared to Azerbaijan. This share will already be 63.1 per cent (optimistic scenario) in the year 2000, and after that it will raise to about 70 per cent by the year 2015.

There will only be insignificant changes, as compared to the current situation, in the goods structure of rail traffic of the two countries.

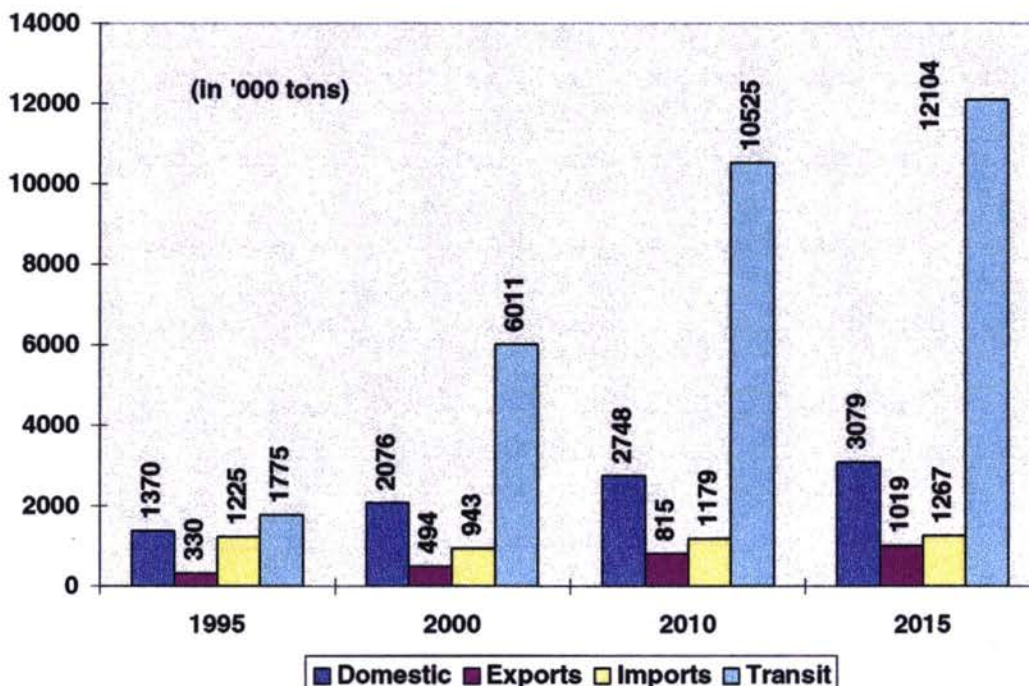


The dominant importance of transit transports especially for Azerbaijan and Georgia can also be seen in the following figures, showing the development of the individual components of rail freight traffic:

**Development of Azerbaijan rail freight traffic up to 2015 (optimistic scenario)**



**Development of Georgian rail freight traffic up to 2015 (optimistic scenario)**



## 2. Passenger traffic forecast

The forecast of the volume in passenger traffic was based on the following general political and economic development in the region:

The internal political situation in all three countries will remain more or less stable over the next few years and will have a relatively insignificant influence on the number of passengers. The political situation in the region as a whole is of much greater importance, as this is what the development of international rail traffic but also national domestic long-haul traffic depend on. As regards the re-introduction of rail passenger traffic on the main lines, the two scenarios are based on the following development:

<i>Relation</i>	<i>optimistic</i>	<i>pessimistic</i>
re-introduction of passenger transport on the Tbilisi - Yerevan line	1998	2000
regular traffic Baku - Yalama - (Makhachkala/ Russia)	1997/98	2000
re-introduction of rail traffic via Nakhichevan	2000	2005
unimpeded rail traffic through Abkhasia	2000	2003

### *Armenia*

The economic situation in the country will stabilise further. This will be reflected also in a gradually growing passenger volume. However, the individual modes of transport will participate to a differing degree in this growth. The proportion of road transport, both individual and public, will increase further. Whereas the number of people transported will grow in total, there will be a further decline in rail transport in 1997. Only as of 1998, the railways will register an increase in passengers whereas in the pessimistic scenario the year is 2000.

Following the start of the Yerevan - Tbilisi service as of 1998 (optimistic) or 2000 (pessimistic), international passenger rail traffic will develop moderately once more. As of the year 2000 (or 2005), there will be a further increase through the reinstatement of traffic to and through Nakhichevan.

As of 1997, the following average transportation distances are to be expected:

Regional traffic	40 km
Domestic traffic	210 km
International traffic	250 km

Thus, the following passenger volumes may be deduced for the Armenian Railway:



## Rail passenger traffic in Armenia up to the year 2015

	1997	2000	2005	2010	2015
					(,000)
Passengers ('000)					
<i>optimistic</i>	1,796	1,975	2,224	2,532	2,801
<i>pessimistic</i>	1,701	1,665	1,785	2,013	2,122
Pkm ('000,000)					
<i>optimistic</i>	77.9	100.0	120.8	140.5	156.4
<i>pessimistic</i>	73.8	78.8	91.7	103.3	110.1

The number of passengers transported will be 94 per cent of the 1995 level in the year 2015 in the optimistic scenario and only 71 per cent in the pessimistic scenario. Detailed figures on the individual transport segments are to be found in Annex 3.2.4-1. The share of regional traffic will continue to be over 90 per cent of the people transported, its proportion in transport performance will drop to 65 per cent by the year 2015.

### **Azerbaijan**

In Azerbaijan, too, the modal split will continue to shift in favour of transport by road. The total traffic volume will continue to decrease until 1997 and only slightly rise as of 1998. In railway traffic, a growth in passengers transported may be reckoned with as of 1998 at the earliest (optimistic scenario), but an increase is more likely only after the year 2000.

A growth in international traffic may be expected as of 1989 (optimistic scenario) or 2000 (pessimistic) with the normalisation of traffic on the Baku - Yalama - Russia line. A further increase will take place as of 2000 (optimistic) or 2005 (pessimistic) with the re-instatement of services to and through Nakhichevan. The start of operations on this line will also lead to a significant increase in domestic traffic.

As of 1997 the following average transport distances are expected:

Regional traffic	25 km
Domestic traffic	250 km
International traffic	295 km

This results in the passenger traffic volumes for the Azerbaijan State Railways as shown in the table below.

## Rail passenger traffic in Azerbaijan up to the year 2015

	1997	2000	2005	2010	2015
					(,000)
Passengers ('000)					
<i>optimistic</i>	4,333	5,205	7,316	9,396	10,717
<i>pessimistic</i>	3,644	3,292	3,928	4,457	4,709
Pkm. ('000,000)					
<i>optimistic</i>	426.8	563.3	889.9	1,153.1	1,330.0
<i>pessimistic</i>	392.9	380.6	518.9	590.9	628.6

The number of people transported in the optimistic version will rise to 119 per cent of the 1995 level by the year 2015, and in the pessimistic scenario the level is a mere 52 per cent of the 1995 figure. These large differences between the two scenarios result above all from the assumed repeated serious drop in the period of 1997/98 in the pessimistic scenario and the much later opening of important lines in long-haul traffic.

### Georgia

In Georgia, the volume of the overall passenger traffic has risen since 1995 once more. However, the railways cannot profit from this yet, even in 1997. Thus, in Georgia, too, there will be a further increase in the proportion of road transport.

Impulses for an increase in the volume of Georgia's railway passenger transport will emanate from the re-instatement of services to and through Abkhasia. This applies both to the domestic long-haul as well as international traffic. A further increase of traffic will be linked with the start of traffic to Armenia.

The following average transport distances are assumed for the Georgian Railways as of 1997:

Regional traffic	45 km
Domestic traffic	185 km
International traffic*	75 / 210 km

\* 210 km as of 2000/2003 (optimistic/pessimistic) with re-instatement of traffic through Abkhasia

As a result, passenger volume and passenger transport performance of the Georgian Railways will develop as follows until 2015:



### Rail passenger traffic in Georgia up to the year 2015

	1997	2000	2005	2010	2015
	(,000)				
Passengers ('000)					
<i>optimistic</i>	3,218	3,632	4,417	5,700	6,920
<i>pessimistic</i>	3,094	2,907	3,595	4,260	4,773
Pkm ('000,000)					
<i>optimistic</i>	348.4	412.4	516.5	715.6	897.3
<i>pessimistic</i>	337.7	320.5	449.1	550.1	620.2

In the optimistic scenario, the number of people transported will rise to 188 per cent of the 1995 level by the year 2015, and only to 130 per cent in the pessimistic version. These relatively high growth rates, compared with the other two countries, result, above all, from the comparatively low starting level in 1995, only 33 per cent of the 1991 level (Azerbaijan stood at 57 per cent and Armenia at 66 per cent).

In Georgia, the share of regional passenger transport will drop from 82 per cent in 1995 to 41 per cent in 2015 (optimistic scenario).

In order to check the forecast results achieved as to their plausibility, they were compared with the current situation in other European countries. Greece and Turkey suggested themselves as comparison, as their railway passenger traffic features a comparable initial situation. Both countries have a similar density of railway network as the three Caucasus republics. The degree of private car ownership is also comparable.

	Network density (km / 1,000 km <sup>2</sup> )	Car ownership (cars / 1,000 inhab.)	Mobility (trips per year)
Turkey	10.8	43	2.2
Greece	18.8	178	1.2
Armenia	12.1	72	0.7
Azerbaijan	24.1	52	1.4
Georgia	52.7	77	1.3

The figures on network density and car ownership relate to 1995, mobility means trips by railway per inhabitant, for Greece / Turkey 1994, for the Caucasus republics in 2015 (optimistic scenario).

According to these figures, the three Caucasus republics will reach a similar level as regards the use of the railways for passenger traffic by the year 2015, as it currently prevails in Greece and Turkey.

### III. Financial situation

The development of the financial situation of the three railways is of special importance for the development of the railway transport and the transport system of the countries as a whole.

For carrying out the financial forecast the calculation model examines three scenarios regarding the price level:

- **Scenario 1:** The existing price level remains unchanged until 2015;
- **Scenario 2:** The 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 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.

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.

Adding together the costs of all rehabilitation measures needed 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" had to be proposed (Scenario 2A). In this programme, investments for permanent ways and stations are limited to the first and second priorities; the rolling stock gets only slight rehabilitation with no reconstructed locomotives.

The results of the financial calculations are as follows:



### **Armenia (ARM)**

Profits before tax in '000 US\$

	2000	2010	2015
scenario 1	-29,505	-33,243	-32,258
scenario 2	-27,166	-26,401	-23,873
scenario 3	-22,021	-11,347	1,283
scenario 2A	-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.

### **Azerbaijan (AGZD)**

Profits before tax in '000 US\$

	2000	2010	2015
scenario 1	-113,004	-85,824	-73,188
scenario 2	-78,334	20,732	50,668
scenario 3	9,139	267,412	447,415
scenario 2A	-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 results for the middle scenarios especially for 2A, are however encouraging as they show clearly that Azerbaijan Railways are able to cover their costs before 2010.

### **Georgia (GRZD)**

Profits before tax in '000 US\$

	2000	2010	2015
scenario 1	-83,992	-66,195	-58,590
scenario 2	-69,224	-17,560	-1,793
scenario 3	-32,228	142,286	248,124
scenario 2A	-40,638	11,026	26,794

The profitability is negative for scenario 2, marginal for scenario 2A and, of course, excellent for scenario 3. The result for scenario 2A, is however encouraging as it shows that Georgian Railways are able to cover their costs before 2010.

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

Full investment programme, total amount	2,511 million US\$
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\$
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.

#### **IV. Infrastructure rehabilitation needs and investment plan**

Already more than 100 years ago, the railway came into being in this region, when in 1872 (in 1865 routing and start of construction) the first line was put into operation from Russia to Tbilisi. In 1883 it was connected with Baku. In 1895 the construction of the Tbilisi - Alexandropol (today Gyumri) - Kars (today situated in Turkey) line was started which was extended to Yerevan in 1902.

In the years after World War II, these railways received a fresh impetus as regards equipment and technology owing to comprehensive investment made. Thus, a type of superstructure was laid which was fit for the operation of heavy goods trains. The capacity of the routes was increased by electrification and conversion to automatic



or semiautomatic section blocks, the adoption of electric interlocking cabins and use of powerful vehicles in freight and passenger traffic. But for about 10 years now, a period of stagnation in technical innovation and neglect of maintenance has prevailed, owing to a lack of financial funds and materials. This development was aggravated extremely after the breakdown of the Soviet Union, resulting in a deplorable state of railway premises and rolling stock, which has to be overcome in the next few years if these railways are to fulfil their appropriate role in the TRACECA transport corridor in future.

In the framework of this study special attention was given to the infrastructure rehabilitation needs in the following fields:

- track and bridges
- signalling and telecommunication
- power supply
- freight and passenger station
- rolling stock
- container terminals
- workshops

That means that the main components of infrastructure needed for a regular and proper railway service are covered by the survey performed.

The definition of investment needs was carried out using so called different „priorities“. That means:

- 1st priority - urgent needed repair work in the next 2-3 years
- 2nd priority - medium-term measures (up to the year 2005)
- 3rd priority - long-term measures (up to the year 2015)

The main deficiencies identified are:

### **1. Track and bridges**

The last 10 years have seen the growth of a huge backlog of scheduled maintenance and renewal work on the track systems. Only the most vital repairs were carried out, with the consequences becoming blatantly obvious on all lines in the lack of reliability, safety and speed of rail travel. Urgent renewal and maintenance work had to be put off due to a lack of funds. Comprehensive track renewal according to accepted technical rules is therefore necessary as soon as possible, to prevent a further disintegration of the railway infrastructure.

The load reserves and the tolerable wear of the rails have been exceeded for a wide range of the networks.

This results in permanently more speed limitations. The speed restrictions are reducing the average line speed significantly.

Besides tracks and switches the bridges are of critical condition too.

Many bridges have an average age of 100 years and have passed the end of their service life. Material fatigue in the steel structures makes it necessary to repair or replace some of the bridges.

The permanent-way districts are not suitably equipped to perform their tasks for scheduled track maintenance either. Therefore, they have to be provided with complete basic equipment, including tools and small track machines.

The permanent-way workshops also are handicapped with ancient track building machines and equipment so that they are not capable of carrying out modern track construction according to valid technical rules. Comprehensive renewal of the machinery is therefore necessary. A re-motorisation programme for the existing UK machines and accessories is advisable.

The summarised investment needs for track and bridges are as follows:

#### Investment costs for track and bridges of 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
<b>total</b>	<b>99.3</b>	<b>332.8</b>	<b>249.3</b>	<b>681.4</b>

## 2. Signalling / telecommunication

The technical condition and the operability of the installation of station and line equipment is not satisfactory enough to ensure a safe operation of trains. The trains are run mainly by means of radio service onboard the trains and by operation measures. The necessary replacement of worn-out signalling equipment was carried out only to a small extent during the last few years. The installations have always been repaired using the available means only. Yet, with the increasing age of the equipment employed it is to proceed from an aggravation of the condition and an increase in the frequency of equipment failing.

The desolate condition of the telecommunication connections within the railways and between adjacent railways has become a priority.

The issue of how to achieve a common level of equipment for the telecommunication channels has been considered within the framework of the project. It will be impera-



tive to use such equipment at the border stations of the railways which will ensure an exchange of information between one another. Using optical fibre cables, laid along the line, was considered as an alternative to the cable ducts existing now. In this connection, both underground laying and suspension of an appropriate optical fibre cable along overhead line poles were considered.

A special proposal for fitting the Caucasian main railway lines

- Baku - Tbilisi - Poti
- Tbilisi - Gyumri - Yerevan

with modern communication and computer technology as a measure of first priority was elaborated.

The overall investment needed for repair work in the signalling / telecommunication systems of the three Caucasian railways is as follows:

**Investment costs 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
<b>total</b>	<b>67.5</b>	<b>186.5</b>	<b>166.4</b>	<b>420.4</b>

**3. Power supply**

The power supply networks of the three Caucasian railways in general are designed adequately. Differences only exist in the installed equipment, which results in different operational requirements. Each railway uses a DC power supply for the catenary system. The electrified network is supplied by a 3,000 V DC system. The nominal output voltage level of the substations is 3,300 V DC. The voltages on the overhead line contact system are limited to:

- Minimal 2,700 V
- Nominal 3,000 V and
- Maximal 4,000 V.

The main high voltage (HV) power supply of the railways is provided by the local energy supplier companies, organised in Arm-Energo (Armenia), Az-Energo (Azerbaijan) and Sak-Energo (Georgia).

Feeding voltages are normally AC 110 kV, 35 kV and 6 kV, 50 Hz. Each line is supplied by substations every 10 to 20 km. Technically they are normally equipped with 2 transformer sets for the traction power supply, including the rectifier units, and transformers for additional power supply (auxiliary railway supply, signalling supply and some times non-railway supply).

In general it can be mentioned, that the electric networks of the Azerbaijan and Georgian Railways are in a better condition than the Armenian one. The whole networks are workable and meet at the moment the operational requirements. A major problem for the Armenian network is the lack of spare parts. Maintenance work can only be done by looting of spare parts from other stations. In Georgia and partially also in Azerbaijan the power supply provided by the energy suppliers is a problem for reliable and safe railway operation, especially during winter months. A priority of power supply for the railways is not yet available.

A general problem in all three countries is the high average age of the installations of about 20 - 35 years.

The investment needed for urgent maintenance and repair work for all three Caucasian railways is as follows:

#### Investment costs concerning power supply of the Caucasian railways

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

For the ARM power supply system only urgent measures for safeguarding the present operational situation have been included, because of the open future of ARM as an electrified railway in connection with the slight traffic flows.

#### 4. Stations / container terminals

The condition of many stations is poor due to age and maintenance backlog. Since 1990, maintenance expenditures have been drastically reduced due to the lack of funds. The operation of trains is not hindered by the extent of facilities, but rather by their poor condition. Taking into account the current passenger and freight traffic as well as the projected traffic levels, many stations are also generally characterised by overdesign and lack of efficiency.



The track condition of important stations is poor and hampers train operations and operating safety. The number and length of the tracks more than satisfy present and future requirements.

Based on the traffic forecast it can be stated, that the Caucasian railways will probably never recover transport volumes as high as those during the Soviet era. Therefore, the number of tracks for operational purposes can be reduced especially at the marshalling yards. Depending on future requirements, a decision has to be prepared on the number of sorting lines and secondary tracks to be scraped in the future.

The number of the existing loading and unloading facilities and their distribution within the network can be assessed as satisfactory. In addition, there are several branch lines or private sidings connecting the major factories to the railways.

The main passenger stations are in good to satisfactory condition; the existing facilities for passenger traffic do not hamper passenger service. There are sufficient ticket offices and platforms. The number and length of the platforms more than satisfy the requirements. Due to the lack of demand, ticket reservation offices are not open at the present time. However, it will be necessary to perform maintenance on many passenger stations, mainly repair of the roofs and platforms.

The investment needed for repair work on stations is as follows:

#### 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	<b>29.5</b>
Facilities for freight loading and unloading	0.8	8.3	15.1	<b>24.2</b>
building, platforms and other facilities for passenger traffic	1.6	9.3	3.7	<b>14.6</b>
<b>total</b>	<b>7.1</b>	<b>31.5</b>	<b>29.7</b>	<b>68.3</b>

The network of at present 10 container terminals in these countries is sufficient to meet the demand (including the facilities in the seaports). The catchment area of each terminal is sufficiently widespread as to ensure complete coverage of the territory by the multi-modal system. Existing terminals are located adjacent to the most heavily industrialised regions. However, the physical condition of the container terminals and the poor equipment are weak points which must be mentioned in connection with the multi-modal transport system.

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.

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.

### **5. Rolling stock / workshops**

The Caucasian railways' rolling stock is firstly suffering from its high age. Resulting from the bad condition of the equipment and tools of the depots and repair plants as the responsible parties for the maintenance performances the rolling stock is mainly in a backlog to the maintenance standards. A further point is the unregular supply of spares.

Due to the lack of heavy cranes and lifting jacks in the depots there are existing drawbacks of TR-3 repair stage with 159 locomotives, that means more than 174 % of a yearly TR-3 volume. The maintenance types KR-1 and KR-2 were carried out in former times only abroad, except small capabilities in Tbilisi (1 place) and Gyumri (1 place). Thus, at all 223.5 locomotives require these maintenance types which is more than 243 % of the yearly repair volume referring to the inventory.

Besides the lacking regular maintenance for the existing freight and passenger wagon stock, due to different reasons like war, earthquake, theft and so on 35,522 freight wagons are damaged and cannot be operated. The expense for catching up this drawback is to be added to the regular planned maintenance types.

Mainly there are carried out actually only light repair works in the passenger depots for ensuring the limited passenger train service. The higher repair stages KR-1 and K-2 are not carried out. The drawback in KR-1 and KR-2 is estimated at all with about 1,800 coaches of an overall fleet of 2,174 coaches.

The investment requirements for rolling stock are as follows:



### Costs requirements for rolling stock rehabilitation

	case	ARM	AGZD	GRZD	total
in mill. US\$					
Electric locomotives	opt	214.1	5,6.6	476.7	1,197.4
	pess	83.2	269.1	52.0	404.3
Diesel locomotives	opt	13.5	96.3	18.0	127.8
	pess	9.0	32.0	13.5	54.5
Wagons	opt	30.8	282.5	83.1	396.4
	pess	22.2	111.5	46.5	180.2
Coaches	opt	23.2	165.9	129.1	318.2
	pess	12.6	59.1	70.2	141.9
EMU	opt	13.8	116.0	96.1	225.9
	pess	10.3	59.2	38.3	107.8
<b>total</b>	<b>opt</b>	<b>295.4</b>	<b>1,167.3</b>	<b>803.0</b>	<b>2,265.7</b>
	<b>pess</b>	<b>137.3</b>	<b>530.9</b>	<b>220.5</b>	<b>888.7</b>

For the workshops engaged in the maintenance and repair of rolling stock the following funds are required:

### Costs requirements for workshop rehabilitation

	ARM	AGZD	GRZD	total
in mill. US\$				
Locomotives	0.8	1.4	0.8	3.0
Wagons	0.5	0.7	0.9	2.1
Coaches	0.4	0.6	1.6	2.6
Baku wagon repair factory	-	0.1	-	0.1
<b>total</b>	<b>1.7</b>	<b>2.8</b>	<b>3.3</b>	<b>7.8</b>

The resulting overall infrastructure and rolling stock investment needs, according to stages of priority, are summarised in the following table:

**Investment plan for infrastructure by priorities in '000 US\$**

	1 <sup>st</sup> priority				2 <sup>nd</sup> priority			
	ARM	AGZD	GRZD	Total	ARM	AGZD	GRZD	Total
Track and bridges	57,506	129,454	193,225	380,185	10,356	45,824	34,839	91,019
Signalling	6,568	13,450	22,650	42,668	8,215	52,500	51,100	111,815
Telecommunication	3,290	4,980	5,583	13,853	9,075	12,755	7,460	29,290
Power supply	465	13,040	10,874	24,378	800	22,157	4,080	27,038
Freight and passenger stations	4,679	13,914	10,916	29,509	772	8,297	15,084	24,153
Container terminals	211	410	487	1,108				
Total infrastructure	72,719	175,247	243,735	491,701	29,218	141,533	112,563	283,315
Rolling stock, opt								
Rolling stock, pess								
Workshops								
Total, opt								
Total, pess								

	3 <sup>rd</sup> priority				Total			
	ARM	AGZD	GRZD	Total	ARM	AGZD	GRZD	Total
Track and bridges	31,384	157,565	21,200	210,149	99,246	332,843	249,264	681,353
Signalling	27,724	82,100	61,200	171,024	42,507	148,050	134,950	325,507
Telecommunication	12,682	20,774	18,260	51,716	25,047	38,509	31,303	94,859
Power supply	245	42,722	3,107	46,075	1,510	77,919	18,061	97,491
Freight and passenger stations	1,645	9,274	3,663	14,582	7,096	31,485	29,662	68,244
Container terminals					211	410	487	1,108
Total infrastructure	73,680	312,436	107,430	493,545	175,618	629,216	463,728	1,268,561
Rolling stock, opt					200,200	716,860	517,900	1,434,960
Rolling stock, pess					69,200	285,900	59,100	414,200
Workshops					1,723	2,868	3,279	7,869
Total, opt					352,494	1,310,435	953,603	2,711,390
Total, pess					221,494	879,475	494,803	1,690,630



## V. Development of Joint Ventures

Based on the analysis of the main deficits of the three Caucasian railways in the fields of

- infrastructure
- freight traffic
- passenger traffic

the main possibilities were identified suitable for cooperation between the railways and countries concerned, with and without European participation.

The legal, financial and organisational general conditions for the formation of Joint Ventures were assessed.

Using a special rating methodology the following possibilities for formation of Joint Ventures were checked with regard to their suitability:

- 7 possibilities in the infrastructure field
- 6 possibilities in the field of rolling stock / workshops
- 8 possibilities in freight / passenger transport.

The following four options were selected for more detailed investigations:

- production of prestressed concrete sleepers
- maintenance /overhaul / reconstruction of electric locomotives
- improvement of the railways communication system
- creation of operating company(ies) for combined transport

For each of these options

- the management and ownership strategy,
- the organisational structure
- the operating of the Joint Venture
- the financial basis and development
- the possible financing sources and
- the human resources

were checked and corresponding conclusions and recommendations were developed.

### Production of concrete sleepers

The selection was mainly influenced by the following reasons:

- condition of the railway track networks (especially superstructure)
- backlog of maintenance and repair works
- improvement of the traffic security on main lines
- technological lack of know how for sleeper production
- dependence on imports
- high import prices
- possibilities to reduce maintenance and repair costs
- access to domestic raw materials and production capacities

Considering the results of the demand analysis and the optimum operation values, one should assume two consumer markets: Azerbaijan (the East supply area) and Armenia/Georgia (the West supply area). Since more than two factories are economically not viable, Dollyar (Azerbaijan) and Tbilisi (Georgia) are recommended as location for the sleeper production. This recommendation was influenced, particularly, by the given geographic and economic preconditions. It reflects the main idea of mutually beneficial economic co-operation in the whole region, but is contrary to the intention of each of the three countries to have a factory of their own.

Based on the bad experience with concrete sleepers of Russian design (especially of the fastening system) it is recommended to use concrete sleepers of European design in future.

The creation of a sleeper production of European type, irrespective of the implementation form, is recommended due to the following reasons:

- due to the new technology, the life time will increase from 15 to 25 years on the average, thus reducing maintenance costs;
- the high quality of the European prestressed concrete sleepers (DSA Type) and the new W-fastening technology significantly reduce the maintenance costs;
- 10% reduction of sleepers per kilometre due to the possible increased distance between two individual sleepers, thus reducing investment costs per kilometre.

Three possible management strategies for the creation of an enterprise for sleeper production have been studied, depending on the specific character of the investigated region.



1. Enterprises without participation of foreign technology partners
2. BOT mode (Build - Operate - Transfer)
3. Enterprises with participation of foreign technology partners

As a conclusion it is recommended to form the Joint Venture for the concrete sleeper production as an enterprise with limited liability and with participation of a foreign (European) technology partner as shareholder.

The financial evaluation shows, that the two sleeper plants resemble each other regarding the costs, except for the investment costs for the buildings, which are lower in Azerbaijan due to existing buildings, and for the costs of raw materials, additives and electric energy.

It has been supposed that the sleeper demand of all three railway systems is met by the two plants in such a way that the Azerbaijan plant works for the Azerbaijan network and the Georgian plant for the Georgian plus the Armenian ones.

Initial replacement programme 1999-2002 (unrestricted):

for the Armenian network	83,000	sleepers/year
for the Georgian network	200,000	"
for the Azerbaijan network	250,000	"

Routine replacement: about 86% of above figures

Calculations are first carried out for the case of an unrestricted sleeper replacement programme. After having completed the renewal of the sleepers on the main lines, the routine replacement would still occupy the capacity of the Georgian and the Azerbaijan plants, if an operation in two shifts is assumed. It is stated that, if the railways buy the calculated number of sleepers at the unit price of 40 US\$ net of VAT ex factory against 50 ... 60 US-\$ for sleepers imported from Russia /Ukraine (also assuming the railways pay 100% of the invoiced amounts), the sleeper plants are financially viable. The internal rate of return (IRR) is then 10.7% for the Georgian plant and 13.9% for the Azerbaijan one.

Taking into consideration the financial limitations of the railways concerned there was also examined a restricted sleeper production with the following demand figures:

Initial replacement programme 1999-2002 (restricted):

for the Armenian network	75,000	sleepers/year
for the Georgian network	130,000	"
for the Azerbaijan network	180,000	"

Routine replacement: about 86% of above figures

At the same conditions as in the unrestricted demand, the IRR is 5.7% for the Georgian plant and 8.7% for the Azerbaijan one. If a sleeper unit price of 42 US\$ instead of 40 US\$ is assumed, which is still very reasonable, the IRR is 12.6% and 14.9% respectively.

Repair of electric locomotives

Reasons and objectives for investigating the creation of a Joint Venture for repair / overhaul of electric locomotives are:

- no adequate repair capacities in the whole region
- reduction of costs for repair and modernisation
- modernisation of the locomotives and thus increase of the operation and traffic security
- independence from repair capacities in other regions
- reduction of energy consumption
- increase of service quality and availability
- creation of operative reserves for railway operation

The establishment of the Joint Venture should be realised in two stages:

- 1<sup>st</sup> stage - repair of electric locomotives
- 2<sup>nd</sup> stage - reconstruction of old / production of new electric locomotives

In the first phase, one should not attempt a company formation with potential West European technology partners, but rather a contractually secured cooperation through syndicate agreements. Participants should be the three Caucasian railways. Only in the second phase, a company may be set up involving the previous mentioned potential technology partners.

A company of limited liability seems to be the suitable form for setting up a joint venture in the area of locomotive repair. The following participation is suggested due to the location established (in %):

**Overview of the participation for the TECF Electric Locomotive Repair Plant**

Ownership strategies	GRZD	AGZD	Tech- nology partner
<b>Management strategy</b>			
<b>1st Phase</b> company without participa- tion of technology partner	51.0	49.0	--
<b>2nd Phase</b> company with participation of technology partner	24.5	24.5	51.0



At the beginning, Armenia will not be included as a partner in the joint company due to the political situation and the lowest repair requirements. The relationship with Armenia should be established with the help of service agreements during the first phase. The later integration of Armenia into the company should be conducted in the long-term, given the political prerequisites. Within the framework of this later integration, the repair or supply of partial components could be transferred to Armenia.

The number of electric locomotives to be repaired, reconstructed or newly built is as follows:

#### Development of TECF performances (optimistic scenario)

horizons	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
new		0	58	202

The financial evaluation gives the following results:

On the basis of the assumptions of the optimistic traffic forecast scenario it can be stated, that the locomotive plant is financially viable, with an internal rate of return of 10.2 %.

The results of the pessimistic scenario are clearly negative at the assumed conditions. They would only become fairly positive if some costs could be saved. If labour costs were reduced by 20%, the internal rate of return would be 5.1%.

#### Rehabilitation and operation of the railway communication networks

The area of signalling and telecommunications is an integral part of the respective railway companies and constitutes an important prerequisite for the operational and transport safety of rail operations.

The necessity of founding a company in the area of **telecommunications** results from the strategic importance of this area for the railways, which can be used by third parties, at the same time.

Telecommunication technology is the basis for the introduction and use of further modern information technologies in the railways and at the same time a basic condition for the introduction of new transport technologies. Using telecommunications sensibly and purposefully, it serves as a catalyst for increasing competitiveness of the railways towards other modes of transport.

The main reasons and objectives for investigating the creation of a Joint Venture in this field are:

- precondition for the re-establishment of the full security of operation and traffic for the railway transports on main lines
- strategic significance for the whole national economy under the simultaneous use by the third parties
- basis for the introduction and use of modern information technologies
- basic precondition for the introduction of new transport technologies
- measures for the increase of the competitiveness of the railways against other transport modes

it is recommended to organise the implementation of a communication Joint Venture according to the following phases:

### **Phase 1 - Preparatory phase**

Phase 1 is the starting point of all necessary activities in the telecommunication area of the railways. Phase 1 will be implemented in two stages.

#### *Stage 1*

During the first stage the main lines are to be equipped with the respective transmission technology. This forms the basic technical prerequisite for any further technical development.

As a result of the work during the first stage, there will be a maximum of 30 channels available. The railways will use approx. 22 channels themselves. The remaining 8 channels do not really permit to offer them to third parties for commercial use. This is also the main reason that it does not make sense to hive off telecommunications from the railways during this phase. Furthermore, the legal and organisational conditions have not yet been put into place.

#### *Stage 2*

It is the primary task of the second stage to provide all stations with new transmission technology.

This 2<sup>nd</sup> stage is to comprise all further planning and implementing activities coordinated by a so-called planning company for the respective railways. This type of company to be set up should at first be 100% subsidiary of the respective railway companies.

The technical standards, the interfaces, the communication and the compatibility of the hard- and software systems or further technical and organisational details have to be coordinated between all three planning companies for the respective countries.



Further tasks of planning companies are:

- planning the future technical installations;
- controlling and organising the preparatory work;
- preparing, implementing and evaluating tenders;
- preparing the independence of the individual areas within the railways for a later hive off;
- drawing up and concluding utilisation contracts with third parties.

The telecommunication service remains an organisational and a legal component of the railways during the first phase.

## **Phase 2 - Extension phase**

The primary objective during this phase is to close the ring structure of the total network by laying the second optical fibre cables and to increase the number of usable channels by employing respective technical equipment, as for instance more efficient multiplexors.

From a technical point of view, some 1920 channels are to be available per line at the end of this second phase, which would permit a broad based rental/marketing to third parties. And through this rental/marketing activities to third parties the total investment will be refinanced.

It is necessary for the fulfilment of the tasks during the second phase to hive off the existing area of telecommunications legally and organisationally from the railway companies and to bind foreign technology partners directly to a joint venture functioning as an operating company.

The initial investment of phase 1 should be financed by an EU grant of ECU 15 million at present under consideration. According to the cash flow analysis, out of the total of some US\$ 72 million investment volume (phase 1 + 2 excluding EU grant) the financial requirement of US\$ 13.7 million (Azerbaijan US\$ 3.9; Georgia US\$ 5.0; Armenia US\$ 4.8) is necessary until a positive cash flow is expected. This will happen after year 2002. Since this will be at the beginning of phase 2, a substantial financial contribution can be expected from a potential foreign joint venture partner. If not, in order to overcome the initial investment period financially, a grant or loan with the maximum amount of US\$ 13.7 million from EU or EBRD must be anticipated.

After completion of the investments for the second phase which will basically be achieved by the end of 2002, each of the three Railway administrations can lease part of the capacity of the network to their respective national telecommunication administration, which in turn would install its own transmitting equipment and then create individual connections.

Based on this assumption, the telecommunication divisions of each of the three Railway administrations will be able to achieve fairly good commercial returns on

their investments, which will be paid back when the investment programme ends in 2014 (except for Azerbaijan, where it will take two more years). It can be concluded that the communication network of the Railways can be financed by its commercial use. Only the negative cash flows appearing in the years during which the network is not yet operational commercially will have to be covered by the main activities of the Railways.

#### Operating company for combined transport

The main reasons and objectives for investigating the creation of a Joint Venture in the railway operation field are:

- application of future oriented and modern transport technologies
- creation of a competitive offer for services involving the railways and other participants of transports
- creation of competitive transport corridors for the connection of important industrial areas (Europe-Asia)
- catalyst for the increase of the transport volumes of railways and thus
- precondition for the profitability of the planned infrastructure measures by increasing the revenues of the railways.

Although the transportation of containers in the networks and terminals of the three Caucasian railways is realised under the same technical and organisational conditions and regulations, due to the political situation, at least two operating companies have to be set up:

- Georgia / Azerbaijan operating company
- Georgia / Armenia operating company.

Short and medium-term objectives are:

- economical operation of container trains,
- providing transport services in combined transport,
- providing customer and market oriented transport service offers,
- private service provider for all forwarding and transport companies or other clients,
- comprehensive service as of FOG (Free on Ground) at the receiving ports or terminals, i.e. customs clearance, transshipment onto rail wagons, rail transport to the recipient terminal, including transport monitoring, organising the delivery or picking up of consignments to or from the clients respectively, plus information, communication and billing.
- Increase in the railways' share of the total transport volume in container transport from a current 20% to 40% for 1997 to 65% in year 2000



The limited partnership with a limited liability company as the general partner is one of the most tried and tested company forms for combined transport in Western Europe, thus it is suggested as the corporate form. The 'Company for Combined Freight Transport Ltd.' is the general partner and owner.



A possible distribution of the shares could be (in %):

**Poti - Tbilisi - Baku operating company**

Ownership strategies	Poti Port	GRZD	AGZD	Baku Port	Casp. Ship. Comp.	Tech-nology partner
Management strategy						
Technology partner - with majority share	9.8	9.8	9.8	9.8	9.8	51.0
- without majority share	14.0	14.0	14.0	14.0	14.0	30.0

**Poti - Tbilisi - Yerevan operating company**

Ownership strategies	Poti Port	GRZD	ARM	Tech-nology partner
Management strategy				
Technology partner - with majority share	16.0	16.0	16.0	52.0
- without majority share	22.0	22.0	22.0	34.0

Local and foreign interested parties, such as forwarding and shipping companies etc., are shareholders of the entire company as limited partners.

The establishment of the two different operating companies requires rather little financial investment compared to other joint ventures.

The investment volume contains

- office establishment and equipment
- computer system
- working capital.

The total investment costs amount to US\$ 339,000 for the Georgian/Armenian J.V. and US\$ 315,000 for the Georgian/Azerbaijan J.V., respectively. It can be expected that the initial investment costs plus possible starting losses (year 1-3) will be covered by the shareholders. According to the cash flow analysis performed, the Georgian/Armenian J.V. will expect a positive cash flow already after one year of operation, the Georgian/Azerbaijan J.V. after two years of operation. According to the traffic and tariff assumptions made, the two joint ventures are financially feasible.