

2. Infrastructure scope, legacy and impact of transition

Access at the beginning of transition

At the time of the break down of the Soviet Union, the countries in the region inherited a legacy of extensive infrastructure facilities designed to meet the perceived demand outlook under the central planning parameters of the Soviet Union and the Soviet Satellite economies; and access to services was widespread.

- Nearly 100% of the population had access to electricity, water supply and sanitation. Compared to the developing countries in other regions and in relation to their income levels, such an extensive access was considered remarkable (see table 2.1).

Table 2.1: Percentage of Households with Access to Electricity and Sanitation in 2000

Region	Per Capita GDP (Current \$)	Electricity			Improved Water supply		Improved Sanitation	
		Urban	Rural	Total	Urban	Rural	Urban	Rural
East Asia	888	99	81	87	93	67	73	35
Europe & Central Asia	1,998	100	97	99	95	82	97	81
Latin America	3,888	98	52	87	94	66	86	52
Middle East & North Africa	2,304	99	79	90	95	77	93	70
South Asia	441	68	30	41	94	80	67	22
Sub-Sahara Africa	496	51	8	23	83	44	73	43
World	5,216	91	57	73	--	--	--	--
All Developing Countries		--	--	--	92	69	77	35

Source: For electricity IEA 2002; World Bank 2003. Figures for ECA from the WBG Household survey data. For water supply and sanitation Water Supply and Sanitation Sector Board paper of January 2004 on WBG Program (World Bank Water Sector Board website).

- Natural gas supply networks covered both urban and rural areas extensively in areas where gas transmission trunk pipelines passed through. In the region, about 75% of the households in the capital areas, 60% in other urban areas and close to 40% in the rural areas had access to gas supply networks.
- Most urban areas had district heating facilities. IEA estimates that about 75% of the households in the region have access to district heating. A study covering 19 countries in the region estimates that about 60% of the households in the capital cities, 35% in the other urban areas and about 10% in rural areas had district heating service connections.⁴
- Telephone connections were available to about 80% of households in capital areas, 60% of the households in other urban areas and about 35% of the households in rural areas.
- Rail networks were extensive with total route length exceeding 208,000 km⁵ and network density varying from 2.1 km/sq.km in Latvia to 120.2 km/sq.km in Czech Republic. Rail network covered enormous distances (such as in Russia, Ukraine and Kazakhstan) and were built primarily for the long distance haulage of raw materials, intermediate and finished goods of the heavy industries. Nonetheless its passenger traffic density is considerable. In Russia, which has the largest network in the region, the traffic density measured as passenger traffic units per route kilometer is five times more than the EU average.

⁴ See Ellen Hamilton and others, *Dimensions of Urban Poverty in ECA*, World Bank, March 2004. The low percentage in rural areas is not surprising as the low housing density in such areas is not conducive to the district heating option.

⁵ Of this, the largest share was in Russia (41%) followed by Ukraine (11%) and Kazakhstan (6.5%)

- While road networks were not designed with a particular focus on transportation of goods (especially in the CIS countries) most communities had access to an all weather road. In the region about 89% of the roads were paved. In Russia for example, out of the 900,000 km of road network only about 16% of the roads serving about 10% of the population was not paved. Percentage of paved roads in total road network length varied from a low of 30% in Ukraine to 80% in Bulgaria, Croatia, Moldova and Serbia. Based on data relating to 15 countries in the region including Russia, road density expressed as road length in kilometer per square kilometer of the area was in the range of 0.04 to 0.61, the exception being Hungary with a ratio of 1.85. Worldwide the above ratio varied from 0.01 to 4.9 with a median value of 0.20. Based on data relating to five CIS countries, Albania and Bulgaria, the percentage of rural population with access to an all weather road within a distance of 2 km varied from 31% in Albania to 74% in Tajikistan.⁶

Infrastructure legacy

Such an extensive stock of infrastructural assets did not prove an unmixed blessing to the newly independent states, especially during the first stage of transition. When GDP contracted by 15% in CEE and SEE, and by 44% in the CIS, the supply capacities in the region became quickly excessive in relation to the greatly reduced demand. The problem of excess capacity was much more acute in Russia, Ukraine, Georgia, Moldova and Tajikistan, where the GDP contraction was greater or the duration of the recession much longer than the average. The facilities designed in the central planning era during the Soviet regime became also unsuitable for the developments towards the market economy.

- Most of the thermal power and heat generation assets had already exhausted their useful life of 25 to 30 years and were in a state of disrepair requiring extensive rehabilitation to keep them going. Power and heat generation technologies and equipment with low levels of efficiency of energy conversion chosen in the context of plentiful supply of fuels at artificially low administered prices, quickly became white elephants in the context of the fuel prices rising rapidly to regionally or internationally traded levels. In the Soviet days, the power transmission and distribution system was designed to meet a large share of total consumption at high voltage levels by industrial complexes and a relatively modest share at low voltage level by the population. During the recession not only did the total electricity demand decline, but its composition radically changed with a steep decline in the share of the high voltage demand by industries and a large rise in the share of the low voltage demand by the households, the emerging service sector and small enterprises. The transmission and distribution systems, (especially the latter) called for extensive reconfiguration and reinforcement, to avoid excessive technical losses. Though most consumers were metered, the quality of meters was poor. Tajikistan for example used three digit meters where the household average annual consumption was higher than 4,800 kWh.
- The efficiency of the Combined Heat and Power (CHP) plants in the region was only 70% to 75% compared 80% to 90% in Western Europe. The design of the generally over-dimensioned district heat systems was also based on the inefficient constant flow regime, lack of system controls and insufficient insulation of pipes resulting in high levels of heat losses which were three times as much as in Western Europe. Annual make up volume of the circulating water was 6 to 10 times of the volumes encountered in the west.⁷ System metering and consumer metering even at the level of substations and buildings were practically non-existent and unreliable. Consumers could only be charged on the basis of norms for the volume of space heated or the number of persons occupying the heated buildings. Worse still the consumer had no way of adjusting the level of his consumption based on the price of heat and his ability to afford it. It has been estimated that an investment of \$25

⁶ The data here is from the WB Infrastructure Data Base and from World Bank/Infrastructure and Energy-Transport Website.

⁷ Meyer, A and Mostert 2000

billion would be needed in the course of the next five to seven years to improve the energy efficiency of the district heating systems by 20% in eleven transition economies.⁸

- The gas distribution systems also did not provide a significant percentage of consumers with meters and bills were made on the basis of consumption norms relating to the size of the dwelling and the number of persons occupying it. In addition, in certain Central Asian Countries, even the import/export meters for gas were non-existent resulting in the need for a great deal of complex calculations to determine the volume of gas imported or consumed. The billing norms for gas and heat almost always tended to be substantially lower than the actual level of consumption and were often subject to abuse.
- Overall power, water supply and waste disposal facilities had been designed without adequate environmental safeguards. To conform to the environmental standards considered necessary under the EU program, significant investments would be needed.
- Water supply systems adopted consumption norms three times as high as in OECD countries; pipe lines and related facilities were oversized; and water was often piped over long distances. The pumping equipment used was also energy inefficient; and household and commercial connections were without meters. Further, the quality of equipment and materials used was low. Water transmission pipes for example tended to corrode heavily, as they lacked corrosion protection.
- The railway networks were designed to link the republics to Russia. Thus the rail network in Central Asia extended to Russia in the north-south direction, but left underdeveloped the links among the Central Asian Republics and their neighbors such as China, Iran and Afghanistan, thus causing the region to lag behind in trade.
- The freight transport was essentially by rail. Road networks in Russia and CIS were not designed to handle heavy freight traffic. They were designed with a maximum width of 10 meters and a tight radius to minimize construction costs and were suitable for maximum axle loads of six to eight tons per axle. This proved inadequate for the operation of much larger trucks of European dimensions with axle loads of 11 to 16 tons on double axles.⁹ Such large trucks came to be used when modal shift in freight transport occurred during transition.
- Telecommunication technologies for the civilian use were outdated and inefficient.

Dimensions to suit sub-regions rather than republics

Often infrastructural facilities tended to be of large dimensions, as they were designed, especially in the Soviet Union, to meet the demand in large sub-regions covering several constituent republics, rather than the demand in each republic. Thus for example the Toktogul reservoir in Kyrgyz Republic was designed to operate providing water for irrigation in Uzbekistan and south Kazakhstan during summer and feed the electricity produced into the Central Asian Power Grid¹⁰ covering Kyrgyz Republic, Tajikistan, Uzbekistan and South Kazakhstan with a central load dispatch center located in Tashkent. During winter, when water was stored in the reservoir, the power needs of Kyrgyz Republic were met by mostly by the supply of electricity from the regional grid or gas and coal from Uzbekistan and Kazakhstan. Gas pipelines network was thus designed to allow the flow of gas from Uzbekistan and Turkmenistan to South Kazakhstan, Kyrgyz Republic and Tajikistan. Oil refineries were located in the oil rich republics of Kazakhstan, Uzbekistan and Turkmenistan with facility to transport refined oil products to Tajikistan and Kyrgyz Republic. Similarly rail network enabled the transport of coal from the mine heads in Kazakhstan and Uzbekistan. These arrangements which worked smoothly when they were all a part of the Soviet Union, became difficult to maintain when they all became independent republics each with its own

⁸ These are Russia, Ukraine, Romania, Poland, Czech Republic, Hungary, Lithuania, Estonia, Bulgaria, Croatia and Slovenia. (Gochenour, C, 2001)

⁹ Ben Eijbergen and others, *Russia: The Transport Sector*, World Bank Policy Note August 2004

¹⁰ This was one of the 11 such power grids each covering several constituent republics of the former Soviet Union. Trans-Caucasian grid covering Armenia, Azerbaijan and Georgia is another example of the national power systems of the newly independent countries becoming unbalanced upon the dissolution of FSU.

national energy self sufficiency objective. What was previously a matter of national allocation of resources became a matter of international agreements and trade exacerbating: (a) summer water shortage for irrigation and winter flooding problems of the downstream countries; and (b) summer power export problem and winter power and fuel shortage problems of the upstream countries.

Similarly the location of large nuclear power plants in a small republic like Lithuania was based on the demand of several adjoining republics. It became over-dimensioned for the small economy when it became independent and had to rely on exports to Belarus, which had great difficulty in making timely payments for the imports.¹¹ The location of a 2,500 MW thermal power station in the Transnistria region of Moldova is another example of this type of approach to plant sizing.

An associated consequence of the large dimension of the infrastructure and related facilities in the region was the development of the so-called company towns in relatively remote places, built around large coal mines, oil and gas facilities, major power plants and railway workshop and production facilities. These towns were mostly populated by the workers in these production units and their dependents. The agencies operating the production facilities were also responsible for providing the town with all urban services such as housing, education, public health, medical and recreation facilities, as well as utility services. Significant costs of such social responsibilities were thus associated with these production facilities.¹²

Changed political and economic environment

Upon the collapse of the Soviet Union and the CMEA/COMECON arrangements, the political and economic environment under which the infrastructural services were provided underwent a sea change.

- Armed internal conflicts in countries such as Armenia, Azerbaijan, Georgia, Moldova, Kyrgyz Republic and in certain provinces of Russia such as Chechnya in the CIS and full scale ethnic wars in the Balkans and armed conflicts in Albania in SEE resulted in a great deal of damage and destruction of infrastructural facilities and also created operational problems. Georgia and Moldova, for example, could not control their key electricity generation assets located in rebel areas, nor could they hope to collect the payment dues from the consumers from such areas.
- The newly independent states moved away from the previous regional operational regimes for the provision of services and adopted national self sufficiency approaches, even though such approaches proved economically disadvantageous. Costs and availability could now be managed, only through trading and cooperation agreements among the new nations and this proved difficult.
- The government owned enterprises and agencies providing services were not organized as financially sustainable entities and were dependent on state budgets for much of their operational and investment resources. In the context of rapid collapse of the economy and the vastly increased fiscal deficit problems, government budgets could no longer provide support to these enterprises, as before. This led to a sharp reduction of public investment in the infrastructure.
- Nor could the agencies look to the consumers for resources. In an environment of raging inflation, steeply falling production, rapidly rising fiscal deficits and sharp drop in household incomes, consumers (whether they were production enterprises, government departments or agencies or households) could not pay the bills. Non-payment problem became intense and proved intractable for a length of period.
- Administered prices for services determined under the earlier regime were no longer relevant, as the prices of fuels and other traded materials rapidly tended to rise and match the border prices. Greatly reduced demand, rising prices of inputs and severe non-payments as well as hyper inflation tended to push up service costs and most services providers became insolvent. The infrastructure entities accumulated wage arrears, tax arrears and arrears to their suppliers. Often thermal power stations and

¹¹ This nuclear plant is scheduled to be shut down under a program agreed with EU on safety and age considerations.

¹² Similar company towns also existed around major state owned industrial complexes (or Kombinats).

district heating facilities and gas networks had to be shut down, as they could not pay for the imported fuels. Thus actual level of the services could not meet even the greatly reduced demand and a downward spiral ensued. Service quality and reliability plummeted.

- Cash strapped service enterprises had to abandon or suspend all their new investment projects and could not find resources even to carry out the normal maintenance resulting in a further reduction of operable assets.
- Nor could these cash strapped entities provide the support needed for the company towns resulting in an adverse impact on spending for health and education. Municipalities were created for them or they were attached to other municipal towns. In either case they all suffered for want of resources during the prolonged recession. In respect of company towns surrounding uneconomic coal mines closed down, there were large scale migrations of people to the towns of other economic mines or to the normal urban areas increasing pressures for services in those areas.

Impact of transition on infrastructure across the region

The extent of impact of the new environment varied across the region. Broadly in line with the macroeconomic changes, the impact was modest and adjustment/recovery was earlier in the CEE. The decline in economic activity was short lived and the adverse impact of under-investment in maintaining facilities was also relatively limited. Investments are required to bring the quality of infrastructure services up to the standards prevalent in the rest of the EU, but this is projected to be manageable and affordable over time.

In the power sector, for example, Hungary and Poland, faced decline in electricity sales by 16% and 12% during 1990-1993, but the deterioration in the quality of supply was arrested and adjustments to meet the changing pattern of demand made relatively quickly. The demand reached the 1990 levels by 2000/2001. In the case of Lithuania sales dropped nearly 50% reflecting the changed production structure of the economy and stabilized at that level with gradual improvements in the quality of supply. Since 2000 demand is also rising slowly.

In the SEE states, as a whole, gross electricity demand dropped from about 150 TWh to 145 TWh during 1991-1994 on account of the economic downturn and the war, but grew thereafter at an average rate of 1% per year till 2001 to reach the level of 163 TWh. The share of the industrial consumers went down from 55% to 47% while that of residential consumers went up from 32% to 39% during this period. Electricity generation at 167 TWh in 1991 could comfortably meet the demand, while generation of 165 TWh in 2001 was inadequate to meet the demand, due to the export of power to countries outside the region. The tight supply situation is attributable, in part, to the dependence on hydroelectric power to the extent of 24% to 35% and fluctuations in hydrology. It is also attributable slower pace of reforms needed to moderate demand through cost recovery prices and ensuring financial viability of supply entities to secure finance for rehabilitation of the generation facilities.

- Within the region performance varied. Albania and Montenegro faced major problems while Romania and Bulgaria fared as well as the CEE states, as they were spared from wars and conflicts.
- In Albania, demand for electricity dropped by 21% during 1989-92 due to the fall in industrial production arising from the discontinuation of CMEA. However it increased dramatically at the rate of 10.4% per year through 2000 and beyond. The incremental demand came from households, who were getting free household appliances from abroad from their friends and relatives in large quantities.¹³ Inability of the government to control theft of power and enforce payment discipline greatly accelerated such growth in demand. With reduced hydroelectric generation caused by weather

¹³ A high level of rural to urban migration may have also contributed to the increase in household consumption.

changes and inability to import on account of financial constraints, extensive load shedding became the routine.

- Bulgaria's electricity generation dropped from 49.2 TWh in 1988 to 35.6 TWh in 1992 as a result of the economic decline and the sudden drop in the industrial demand, but bounced back to 42.8 TWh by 1996 and maintained generation at about that level thereafter. It was able to restore and maintain acceptable service standards and also maintain an electricity export level of 5 TWh to 8TWh (or about 20% of its generation), through a vigorous implementation of reforms in the areas of payment discipline, price adjustments and enterprise reform and finally through privatization of distribution assets and part of the generation assets in the last two years. Romania also achieved similar results with a slightly longer time lag. The prospect of EU accession in the immediate future had been a powerful incentive for reform in these two countries. Integration of UCTE 2 (to which the SEE countries belong) with UCTE 1 (to which most of the west European states belong) had also been a major incentive for reform and realignment of the power sector.
- In the other Balkan states such as Bosnia-Herzegovina and Serbia-Montenegro the problems of transition were compounded by internal conflicts and ethnic wars causing extensive damage to the infrastructure facilities. Since the restoration of peace, they are attempting to restore the facilities and services to an acceptable standard.

The adverse impact of the first stage of transition was most pronounced and lasted longest in the CIS countries. Available generation capacities contracted and could not meet even the greatly reduced demand. Supply quality dropped dramatically; supply interruptions increased in frequency and duration, caused by severe shortage of liquidity in the system arising from the phenomenon of nonpayment and payment through barter, offsets and promissory notes.

- Russia had the largest power system in the CIS with a total installed generation capacity of 216 GW (70% Thermal power plants, 20% hydropower plants and 10% nuclear power plants). However on account of the age and lack of maintenance of the generation assets, the available capacity decreased by about 17 to 20% during the 1990s. Many large thermal units among the available ones could not operate for want of funds to pay for the fuel. During 1990-1998 generation and consumption of electricity dropped by about 24% and 30%. Both the demand and supply have grown since 1999 in line with the notable GDP growth of the country. The investments needed to rehabilitate the generation plants in Russia had been estimated by International Energy Agency (IEA) to be of the order of \$21 billion through the year 2030. The consumption at the level of 618 TWh in 2002 is forecast to grow at the rate of 1.3% per year through 2030, the rate being slightly faster during the next 5 to 10 years. While the supply position is reasonable now (except perhaps in the far eastern and southern parts on account of transmission restrictions) and is likely to be so till about 2015 on account of the current overcapacity, investments may be needed for incremental demands thereafter. For the period up to 2010 IEA estimates generation investments of about a \$1.0 billion per year, while annual investments in transmission and distribution is estimated at \$1.0 billion and \$ 3.4 billion respectively.¹⁴
- Ukraine which had the second largest power system with an installed capacity of 55 GW (68% Thermal, 9% hydro and 23% nuclear) faced even greater asset deterioration. Only 78% of its capacity was available and generation and consumption during 1990-1999 dropped by 47% and 45%. Here too, both demand and supply have grown since 2000 in line with GDP growth. Investment needs for the next five years have been estimated at \$1.5 billion per year (20% for thermal plants rehab, 20% for distribution, 33% for rehabilitation of nuclear units, and 27% for transmission and dispatch).
- In Kazakhstan which had an installed capacity of 18.3 GW (89% Thermal and 11% hydro) the available capacity contracted by about 24% and electricity generation declined during 1992-1999

¹⁴ The data here is drawn from *World Energy Outlook*, International Energy Agency (2004)

by about 43% and gross domestic supply including net imports declined by about 44%. Supply condition deteriorated to well below acceptable levels during 1900-1996. Driven by oil exports, the economy has registered remarkable growth in GDP since 1999; and electricity generation has increased by about 48% by 2004. Supply conditions have notably improved.

- The problem was even more acute in the low income CIS countries like Georgia, Moldova, Armenia, Azerbaijan, Tajikistan, Uzbekistan and Kyrgyz Republic. In these countries power supply could not be provided for more than few hours even in the capital cities and the quality of supply was extremely poor during the early years of the recession. Gas supply was greatly curtailed for want of money to pay for imported gas. District heating systems were too dilapidated in the rural areas and even in urban areas service coverage was greatly reduced on account of the inability to pay for the fuel. The available power generation capacities decreased by about 30% in these countries (except in Georgia where the decrease was about 70%) largely because of the deterioration caused by lack maintenance of the thermal power plants and the lack of cash to pay for the fuel. Even the hydro facilities had gone into disrepair on account of armed conflicts in Georgia. Such regional conflicts affected Armenia greatly by disrupting the supply of fuels from the other republics. By adopting the needed reforms the deterioration had been arrested and 24 hour supply restored in Armenia, Azerbaijan, and Moldova. Tajikistan and Kyrgyz Republic continue to have supply shortages in winter season on account of their inability to fund the rehabilitation of their thermal plants and inability to pay for the import of fuel. Uzbekistan has provided extensive natural gas access to most households and has been able to raise its gas and electricity tariffs substantially in the recent past, but still has difficulties of meeting the peak demand in the electricity sector on account of the need to rehabilitate its extensive thermal generation assets. Georgian power system is still deeply distressed (financially and otherwise) and is unable to provide reliable supply, despite a range of reform initiatives undertaken.
- The four Central Asian Republics (Kazakhstan, Kyrgyz Republic, Tajikistan and Uzbekistan) together had at the end of 2002 a total installed power generating capacity of 38 GW of which only a capacity of 25GW was available. They had a total generation of 134.6 TWh and a small net export to outside systems of 150 GWh. Their domestic demand was expected to grow at a very modest annual rate of 0.31% during 2005-2010. Their investment needs during this period to rehabilitate distribution systems and some transmission assets and thermal generation units are estimated at \$3.4 billion. This would enable them to export by 2010 about 25TWh of electricity to outside systems.

The *district heating sub-sector* was perhaps least equipped (in terms of technical design, organizational arrangements, structure of pricing and cost recovery policies) to withstand the upheavals caused by the transition. Heat production in the region declined dramatically during 1990-1994. Despite some moderate increases in heat generation in certain countries since then, production levels in 2002 were considerably behind the levels in 1990.

Table 2.2: Heat Production in 2002 as a percentage of 1990 Production Level

Country	Poland	Hungary	Lithuania	Latvia	Estonia	Russia	Ukraine	Moldova	Kazakhstan
Percentage	47	84	45	39	29	67	42	23	58

Source: IEA 2004

The demand reduction was attributable to a sharp fall in the industrial heat demand and serious supply disruptions. The industrial demand is unlikely rebound in most economies (except perhaps Russia and Ukraine) on account of the structural shift from the heavy to light industries. Industrial consumers thus would no longer be able to cross subsidize as before the residential consumption. The near collapse of the district heating systems in many of the countries (caused by much of the same reasons as those in the power sector) created the greatest discomfort in the region, a great part of which experiences severe

winter weather and where heating is a basic human need during the long winter seasons. In many low income CIS countries such as Georgia, Moldova, Armenia, Tajikistan, and Kyrgyz Republic most of the district heating facilities in the rural areas and secondary towns have deteriorated to such a state that they have to be discarded. Even in the capital cities, the systems need extensive rehabilitation and serve a greatly reduced customer base. In countries and areas where gas supply networks were accessible, consumers switched to gas for heating. In other places consumers switched to electricity to space heating; this caused serious problems in countries like Tajikistan, Kyrgyz Republic, and Georgia, where power supply (which is mostly from hydroelectric sources) diminishes greatly during winter. In such countries consumers in most rural areas resort to the use of dirty fuels (coal and biomass), which impacts negatively on their health and environment.

In the case of *water supply and sanitation sector*, the quality of water dropped in relation to high quality standards nominally in force. The operation of waste water treatment plants ceased in many places. Maintenance and rehabilitation work was postponed over several years accelerating the process of asset deterioration. In several countries hours of system operation were reduced in the context of cash constraints. National surveys indicate that less than 65% of households in capital cities and less than 50% of the households in secondary cities and rural areas reported 24 hour access to water services. The average continuity of water supply is 17 hours and the average number of breaks is 2 per km a year. This compares very unfavorably with international standards (table 2.3). Less than 24 hour water supply is far more than consumer inconvenience. During supply interruptions, the pressure in the distribution pipe lines falls and allows intrusion of liquids in the soil around the pipe breaks or loose joints and results in contaminated water supply when the supply resumes. Furthermore, pressure swings reduce the service life of everything from pipes to meters. Over time pipe breaks and service continuity display a high negative correlation.

Table 2.3: Hours of Supply and Pipe Breaks in Water Supply (2003)

Country	Hours of Supply per day	Number of pipe breaks/km/year
Albania	6.0	-
Armenia	8.0	1.7
Azerbaijan	8.0	0.9
Belarus	24.0	-
Bulgaria	24.0	-
Georgia	19.0	2.6
Kazakhstan	23.5	1.3
Kyrgyz Republic	22.0	0.9
FYR Macedonia	24.0	-
Moldova	11.5	7.5
Russia	23.8	0.8
Tajikistan	13.1	1.7
Turkmenistan	15.0 to 20.0	-
Ukraine	19.0	2.3

Source: WB ECA Infrastructure Data Base; Note: Data for Armenia and Russia relate to 2002. Non-availability of data is indicated by -

Reduced maintenance and reduced hours of supply led to increased leakage of water and equipment failures, both high by the standards of OECD countries (table 2.4). When these problems became significant, water pressure in the pipes fell and end of the pipe consumers began to lose service. However, forecasts of catastrophic system failure, so common in the late 1990s, have rarely come to pass because utility engineers have proven quite resourceful in keeping basic systems functioning. That said, rural water users have often found their network supply entirely gone and have had to shift to other supply

sources. And the consumers now receiving intermittent supply, suffering low pressure, being forced to carry water to the top floors of apartment buildings have experienced a severe deterioration in their living standards.

Table2.4: Water sector losses in selected ECA countries in 2003

Country	Unaccounted-for water (% of water produced)	Country	Unaccounted-for water (% of water produced)
Albania	>50	Georgia	43
Armenia	72	Kazakhstan	36
Azerbaijan	8	Kyrgyz Republic	56
Belarus	25	Moldova	45
Bulgaria	55	Poland	41
Czech Republic	20	Romania	40
Estonia	51	Russian Federation	24
Latvia	20	Serbia	50–80
Lithuania	22	Tajikistan	15
		Ukraine	31

Source: World Bank ECA Infrastructure Database.

Although the figures in the table are derived from official sources, they highlight one of the management challenges that face both utility operators and their government overseers. The figures reported for Azerbaijan and Tajikistan rival best practice in OECD countries. World Bank teams working in the sector in both countries see evidence that performance cannot be nearly as good as the reported figures suggest. A pervasive lack of system metering makes the actual figures unknowable in either of those countries. By reporting excellent performance the utility operators leave government unable to understand the level of intervention needed and—if the utilities use the figures to guide interventions—managers unable to target their rehabilitation efforts accurately.

Levels of unaccounted-for water average 31 percent in CEE, 32 percent in the CIS, and 52 percent in SEE. Although some unaccounted-for water is unavoidable in any water distribution system, the accepted economic level is about 20 percent. The fact that unaccounted-for water is much higher in many ECA countries suggests both that systems may be in a state of disrepair and that there are fundamental problems with billing.

In the CIS countries the term *communal sector* refers collectively to hot and cold water supply, sewerage, district heating, gas and power supply at the municipal level. The Federal Agency for Construction and Housing and Communal Sector (CHCS Agency) in Russia estimates that communal assets in Russia are deteriorating at the rate of 2 to 3% a year. Between 1995 and 2003, the level of asset deterioration¹⁵ has increased from 39.1% to 46.3%. It also estimates the investments needed for rehabilitating the communal assets to be of the order of \$36 billion. These estimates may have an upward bias, but nonetheless indicative of the order of magnitude of rehabilitation investment needs in the urban areas.¹⁶

In the *railways sector*, which was mainly designed to meet the transport demands of the primary and heavy industries, the major impact was a sharp drop in the volume of freight caused by the decline in industrial production during 1990-1997. The impact was most adverse in systems which had a high percentage of passenger traffic density, since the ability of the reduced freight volumes to cross subsidize the passenger transport was greatly diminished and the traditional need for the budget support for

¹⁵ By the term asset deterioration, CHCS agency means the percentage of the assets which have been fully depreciated under Russian Accounting Standards (i.e., useful life exhausted).

¹⁶ World Bank, Infrastructure Financing Options for Russia, Background paper on Financing of municipal and communal services, 2005

passenger traffic became unsustainable or out-of-control. Thus the most financially distressed railway systems were in Albania, Croatia, Former Yugoslavian Republic of Macedonia and Turkey followed by Bulgaria, Czech Republic, Romania and Poland, which experienced serious financial distress difficulties.¹⁷ This led to constraints on funding for maintenance and fresh investments. Increases in coal and oil trade, especially after 1997, reversed the declining freight traffic trend and large railway systems such as those in Russia, Kazakhstan, Uzbekistan, as well as smaller systems such as those in Latvia, Lithuania, Estonia, Azerbaijan and Georgia were able to manage the problem on account of low percentage share of passenger traffic and increasing freight and transit traffic.

Table 2.5: ECA railways: Traffic Task, Density and Traffic Mix, 2003

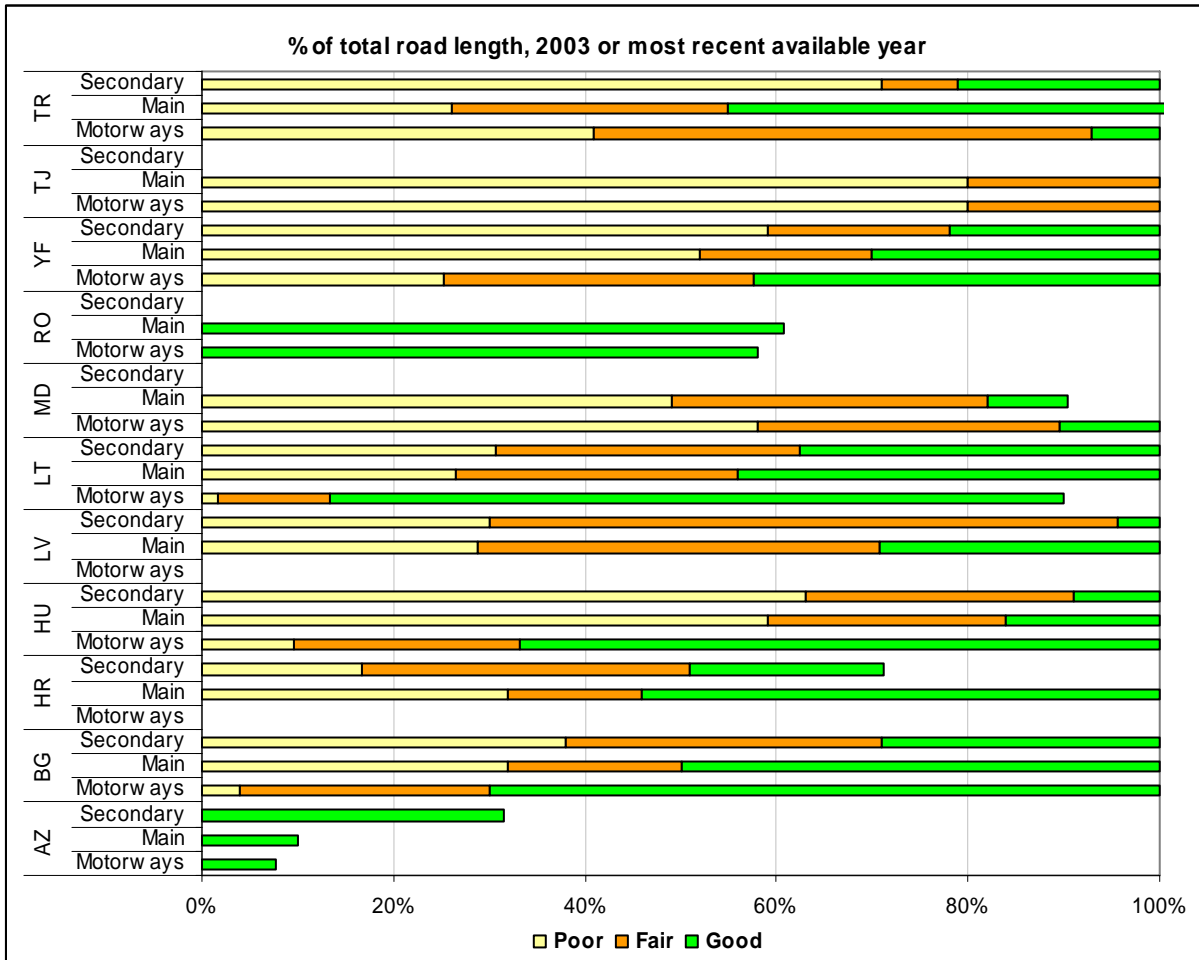
Country	Total traffic units (passenger-km +tonne-km) (millions)	Traffic density (traffic units/route- km) (thousands)	Traffic mix (proportion of Passengers) (%)
Albania	144	327	85
Armenia	500	703	10
Azerbaijan	7,564	3,565	8
Belarus	48,518	11,236	30
Bosnia and Herzegovina	361	350	14
Bulgaria	7,225	1,673	36
Croatia	3,401	1,247	35
Czech Republic	22,369	2,355	29
Estonia	9,874	8,270	2
Georgia	5,476	3,584	7
Hungary	18,283	2,366	58
Kazakhstan	143,537	10,557	7
Kyrgyz Republic	438	1,050	10
Latvia	15,764	6,944	5
Lithuania	10,265	5,856	5
Macedonia, FYR	432	618	23
Moldova	3,030	2,705	10
Poland	63,873	3,158	27
Romania	25,699	2,261	33
Russian Federation	1,663,100	19,442	9
Serbia and Montenegro	3,286	863	31
Slovak Republic	13,065	3,573	21
Tajikistan	1,126	1,824	4
Turkey	13,352	1,540	41
Turkmenistan	8,603	3,410	13
Ukraine	243,685	11,037	21
Uzbekistan	20,446	4,955	10

Source: Amos 2004

The impact of transition on *the road transport sector* was complex. Fiscal deficits in the first phase led to cuts in allocation for roads sector and road maintenance was the first casualty. The condition of roads in the region became worse and a major percentage of roads came to be classified as poor or fair (Figure 2.1 sourced from World Bank Infrastructure Data Base).

¹⁷ Financial distress is evidenced in many ways including escalating accounting losses, chronic cash flow problems and debt crises, rapidly increasing need for budget support and deterioration of assets due to a lack of maintenance and investment.

Figure 2.1: Condition of the Roads in Select ECA countries



Even by 2000, outlays in road maintenance were well below requirements in many countries despite higher collections of road related revenues (table 2.6).

Table 2.6: Ratio of Actual to Required Road Maintenance Expenditures 1999-2000 (Amount in \$ million)

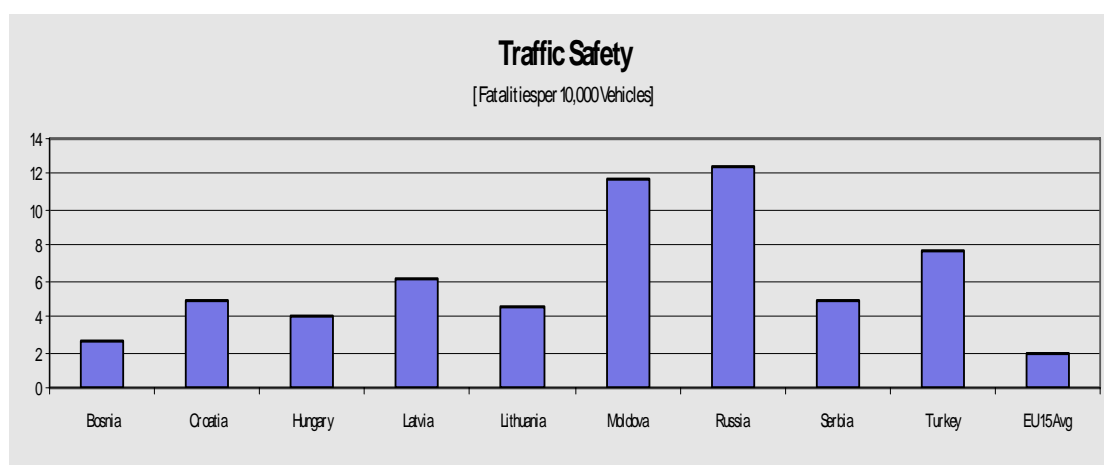
Country	Road User Revenue	Actual Maintenance expenditure	Required Maintenance expenditure	Actual/Required Ratio (%)
Bulgaria	597	43	213	20
Romania	1,279	115	213	54
Czech Republic	1,939	165	533	31
Estonia	94	10	45	22
Hungary	342	153	341	45
Latvia	105	59	53	111
Lithuania	176	48	69	70
Poland	4,907	364	933	39
Slovakia	121	72	171	42
Slovenia	310	72	64	113

Source: Kenneth Clare, Cesar Quiroz and Lauri Ojala (Eds), Transport Sector Restructuring in Baltic States: Towards EU Accession, World Bank, March 2004

Conflicts in various parts of the region damaged road infrastructure and interrupted flow of trade. Creation of many new independent states meant far more border crossings than before and consequent delays. Transition also meant a shift away from the transport of heavy industrial goods to light industrial goods and farm produce. The transport intensity of the economy (the number of freight tons/km needed to produce a given value of GDP) tended to fall to less than half of its original value. As the transition progressed, the average size of consignment tended to decline, while the diversity of freight origin and destinations increased. These created much greater freight demand for road services than before. Since few of the new freight generators (typically the numerous new small and medium industries) had rail connections, greater coordination between road and rail services, and provision of multimodal transport and integrated logistic services became necessary to sustain trade. The design standards of the soviet regime for roads were no longer adequate for use of trucks with substantially higher axle loads. These larger trucks were causing more damage to the roads at a time when maintenance outlays were shrinking.

Road safety became a major concern. Russia is believed to have one of the highest fatality rates at 12 per 10,000 vehicles in the world (Figure 2.2).

Figure 2.2: Road Sector Fatalities per 10,000 Vehicles in the ECA region and EU



Source: World Bank, ECA Infrastructure Data Base

It compares with a rate of 2 per 10,000 vehicles in EU. Its ratio of one fatality for every eight persons seriously injured is also one of the highest in the world. The fatality rates (per 100,000 of the population) for some of the ECA countries are given below.

Table 2.7: Fatality Ratios in road Transport for Select Countries in ECA

Country	Fatality/100,000 population	Country	Fatality/100,000 population
Albania	8.06	Czech Republic	14.0
Bulgaria	11.7	Hungary	14.0
Croatia	14.0	Latvia	22.0
FYR Macedonia	8.69	Lithuania	19.0
Romania	10.7	Estonia	16.0
Serbia	10.2	Russia	21.8

Source: World Bank Transport website

Financial outlays needed to make up for the past deferred maintenance, to carry out the regular annual maintenance for the roads, and to expand the system to support a growth of 5% per year in Russia, have been estimated at 4.25% of GDP or \$13 billion per year. This compares with \$2 billion per year currently being spent.