CHAPTER 4

Infrastructure

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This chapter looks at trends and issues in the main sectors of economic infrastructure—power, water, and transport (railways and roads)[1]—and their implications for the Europe and Central Asia (ECA) region's prospects for continued growth and fiscal sustainability. From a public finance perspective, infrastructure occupies an important share of public investment as well as of recurrent expenditure, either through the government budget or through publicly owned enterprises that depend to various degrees on fiscal funding. The relationship between public finance and infrastructure is inherently different for roads (which are public goods)[2] than for the utility subsectors (power and water) and railways, which are tariff-based. For utilities, the basic public finance commitment should be to (a) compensate for operational expenses that cannot be funded by tariffs—namely, public service obligations and essential service to users genuinely unable to pay, and (b) create fiscal space for necessary investments where these also cannot be covered by tariffs, ideally through medium- or long-term loans to be repaid by the utility revenues, or through loan guarantees. However, governments often assume greater public finance commitments to infrastructure than appropriate on these terms because operators fail to achieve standards of commercial viability or because of weak governance (includ-

ing political pressure and corruption) in the public agencies and ministries involved.

At the outset of transition in ECA (with the partial exception of Turkey), all infrastructure facilities were owned and operated by the public sector, with little commercial orientation and weak incentives for cost recovery. In most of the countries the systems have come a very long way in 15 years toward a more economically rational relationship to public finance. Public finance data on infrastructure sectors (recurrent and investment expenditure and tax revenues) are rather unreliable in ECA countries, as indeed in most regions. Interpretation of such data requires knowledge of the performance and reform status of sectors to determine if public expenditures are appropriate given the demand and supply situation, operational efficiency, and financial viability of operations. Therefore, the analysis here focuses on the conditions, performance, and policy and institutional frameworks for the sectors as essential background to understanding their public finance implications. Because comparisons of public expenditure over time or across countries are largely unreliable, the chapter relies mainly on real sector indicators as available and on more qualitative and anecdotal evidence,[3] with particular attention to the 10 focus countries in ECA.[4]

This chapter argues that while infrastructure was not a significant constraint to growth in the early transition years, it is becoming a bottleneck for growth in the future. Of greatest concern is the need for rehabilitation and for enhancements in service quality, as well as for more adequate supply in some countries. These requirements will entail additional improvements in the governance and management of systems to further increase efficiency, as well as new investments. Although most countries have initiated reforms to strengthen the financial viability of utilities, important contingent liabilities remain that, if not addressed, could threaten both the sustainability of services and fiscal stability in the future.

Infrastructure and Economic Growth

A large and diverse literature has arisen in recent decades on the relationship between infrastructure development and economic outcomes (Estache 2006; IMF 2004b; Poot 2000). There are major methodological issues in empirical estimation (for example, to separate two-way causality), and many differences in sectors covered (usually telecommunications, electricity, and transport) and in identification of the independent variables (public investment or real

stocks). Data limitations dictate that most studies look at physical assets (stocks) rather than the flow of services, and expenditure-based measures have yielded less conclusive results than physical measures in determining growth effects (Serven 2006). However, on the whole, this global research—especially the studies focusing on developing countries—confirms that infrastructure contributes positively to economic output, growth, or productivity (or all three) (Briceño-Garmendia, Estache, and Shafik 2004).

Among the more robust studies, Calderon and Serven (2004) use a large global panel data set covering 40 years that takes account of both quantity and quality measures and controls for potential endogeneity of infrastructure. They find that growth is positively affected by the stock of infrastructure assets, and that higher infrastructure quantity and quality also reduce income inequality. The positive effects of infrastructure appear stronger in low- or lower-middle-income countries and subregions, such as found in ECA, than in more highly developed economies (Canning and Bennathan 2000). However, careful analysis of infrastructure investment in Spain during the early stages of accession to the European Union (EU) indicates that infrastructure spending was a major determinant of growth and productivity convergence across regions of the country (de la Fuente 2002). Ireland has also invested in infrastructure strategically with positive effects for national growth (Davies and Hallet 2002).

Relatively few of the published empirical studies include many of the ECA countries or give them special focus. Preliminary findings of an ongoing research effort applying the Calderon and Serven (2004) methodology to the ECA countries suggest a robust relationship between infrastructure stock and quality and productivity growth (box 4.1). A review of social rates of return from World Bank projects completed between 1960 and 2000 finds especially high rates in transport (25 percent), telecommunications (22 percent), and energy and mining (18 percent), with the highest rates observed in Eastern Europe (Briceño-Garmendia, Estache, and Shafik 2004). In short, there is every reason to believe from the available research evidence that infrastructure matters for growth in countries of the ECA region.

There are several important methodological shortcomings in most existing analyses, however. Impacts depend on the efficiency with which facilities are used and the quality and reliability of services actually delivered, and stock data do not measure these aspects. Furthermore, past stocks do not indicate effective demand where supply is inelastic and prices misspecified or little used. Affordability constraints mean that services may be underconsumed, especially by the poor. In ECA countries during socialism and in the early period of

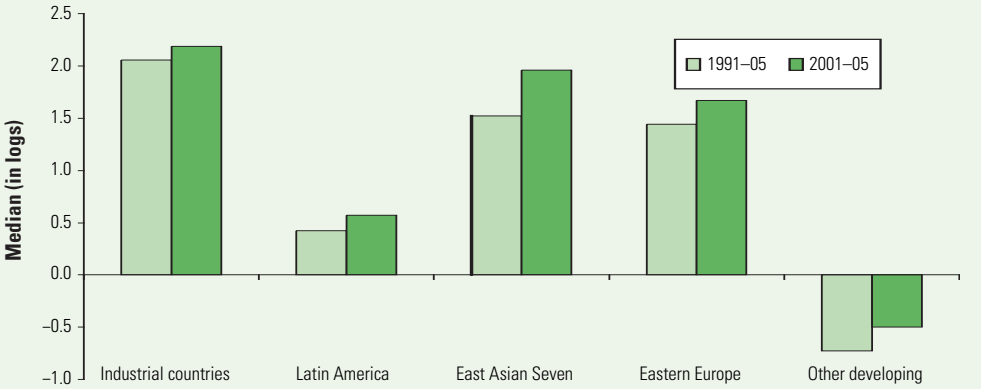
BOX 4.1

Economic Impacts of Infrastructure in ECA

An ongoing research study looks at trends in access and quality of three infrastructure sectors (telecommunications, electricity, and roads) in a sample of 18 ECA countries[a] from 1991 to 2005 to assess impacts on output per worker, using the methodology developed in Calderon and Serven (2004) and comparing with a global database. The study has developed composite indexes of the stock and quality of the three sectors (figures below).[b] These illustrate that the ECA countries were close to the seven East Asia "miracle" countries (EAP-7)[c] in stock indicators in the beginning of transition and well above Latin America, although ECA lost ground relative to EAP-7 by 2005, mainly because of Asia's investment push. For quality, however, the ECA sample started off much worse than EAP and remains far behind, closer to the average for Latin America and other developing countries.

Aggregate Index of Infrastructure Stock and Quality
(Aggregate Indices Obtained using Principal Components Analysis)

a. Aggregate Infrastructure Stock, 1991–2005



(continued)

transition, the quantities of services supplied had little relation to cost (especially of energy), and prices to users were suppressed and distorted by heavy state subsidies or internal cross-subsidies. While input prices and tariffs have been adjusting closer to market levels in most countries in the last several years, pervasive issues of poor governance and weak financial sustainability continue, resulting in inadequate or worsening levels of service and problems of affordability, especially in certain countries and secondary cities.

BOX 4.1 (continued)

The econometric analysis finds a positive and robust relationship between aggregate indexes of infrastructure stock and quality and growth in real output per worker. The model estimates changes in productivity growth due to the evolution of infrastructure over 2001–05 relative to 1991–95 for the ECA countries, breaking down the effect of changes in the accumulation of infrastructure assets as compared with changes in quality. Although the impacts are heterogeneous between the two indexes, it seems clear that for the EU-8 countries both stock accumulation and quality improvements contributed to productivity growth, whereas in the Kyrgyz Republic and Ukraine a worsening of infrastructure quantity and quality seem to explain a decline in productivity growth.[d] The study also calculates the potential payoff of infrastructure improvement for the productivity growth premium that could be gained by raising sector performance to certain benchmark levels. Achieving the infrastructure levels of the ECA leader,[e] for example, would raise the average productivity growth rate of the ECA sample countries by 1.8 percent per year. The benefit would be even larger for the ECA countries currently lagging behind, such as Ukraine. The potential payoff to ECA countries of reaching the infrastructure stock and quality levels of the EAP-7 leader would be a productivity growth premium of 1.3 percent per year.

Source: Calderon (2007) .

a. The sample includes the EU-10 (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, and Slovenia); Croatia and Serbia and Montenegro in SEE; four middle-income CIS (Belarus, Kazakhstan, the Russian Federation, Ukraine); the Kyrgyz Republic; and Turkey (of current ECA focus countries, Albania, Armenia, and Georgia are not included). The quality indicators reflect quality of access (waiting time for phone installation, share of paved roads) and efficiency of operation (power transmission and distribution losses) rather than quality of service flows to users.

b. To construct the aggregate indexes of infrastructure stock and quality of infrastructure services, principal components analysis is used (Theil 1970). This method takes n specific indicators and yields new indexes ("principal components") that capture information of the different dimensions of the data and that are mutually uncorrelated.

c. Including Hong Kong (China), Indonesia, Republic of Korea, Malaysia, Singapore, Taiwan, and Thailand.

d. Most of the contribution of infrastructure development to growth is related to improvements in the quality of telecommunications.

e. Within ECA, the Czech Republic is the leader for the infrastructure stock index, and Slovenia for quality.

The Legacy of Transition and Recent Performance

Even after disinvestment during the turbulent 1990s, ECA countries enjoyed high rates of access to most categories of infrastructure. Table 4.1 compares ECA's nearly universal access to electricity, water, and sanitation to that of regions with comparable or greater average income (especially Latin America and the Caribbean). ECA's rural access remains notably better than that of the comparator countries, with the exception of Thailand.

TABLE 4.1

Percentage of Households with Access to Electricity, Water, and Sanitation

Region and focus countries	GDP per capita (constant 2000 US$)	Electricity				Improved water supply				Improved sanitation			
		Urban		Rural		Urban		Rural		Urban		Rural	
		2000	2002	2000	2002	1990	2004	1990	2004	1990	2004	1990	2004
East Asia and Pacific	*1,352*	*99*	*96*	*81*	*83*	*97*	*92*	*61*	*69.8*	*65*	*72*	*15*	*36.1*
Korea, Repub. of	13,210	—	—	—	—	97	97	—	71.0	—	—	—	—
Thailand	2,440	—	—	—	—	98	98	94	100.0	95	98	74	99.0
Vietnam	539	—	—	—	—	90	99	59	80.0	58	92	30	50.0
Europe and Central Asia	*2,604*	*100*[a]	*100*	*97*[a]	*99*	*97*	*99*	*85*	*80.4*	*94*	*93*	*72*	*71.1*
Albania	1,535	—	100	—	100	99	99	94	94.0	99	99	—	84.0
Armenia	1,128	—	99	—	98	99	99	—	80.0	96	96	—	61.0
Croatia	5,138	—	—	—	—	100	100	100	100.0	100	100	100	100.0
Georgia	971	—	100	—	100	91	96	67	67.0	99	96	94	91.0
Kyrgyz Republic	319	—	98	—	100	98	98	66	66.0	75	75	51	51.0
Poland	5,194	—	100	—	100	100	100	—	—	—	—	—	—
Romania	2,259	—	99	—	94	—	91	—	16.0	—	89	—	—
Slovak Republic	4,761	—	—	—	—	100	100	99	99.0	100	100	98	98.0
Turkey	3,390	—	100	—	100	92	98	74	93.0	96	96	70	72.0
Ukraine	959	—	96	—	98	99	99	90	91.0	98	98	92	93.0
Latin America	*4,037*	*98*	*98*	*52*	*61*	*93*	*96*	*60*	*73.2*	*81*	*86*	*36*	*49.2*
Chile	5,747	—	—	—	—	98	100	49	58.0	91	95	52	62.0
Middle East and North Africa	*1,790*	*99*	*99*	*79*	*83*	*96*	*96*	*79*	*80.7*	*87*	*92*	*52*	*57.9*
South Asia	*562*	*68*	*69*	*30*	*33*	*89*	*94*	*65*	*81.3*	*50*	*63*	*6*	*26.6*
Sub-Saharan Africa	*560*	*51*	*52*	*8*	*8*	*82*	*80*	*36*	*42.5*	*52*	*53*	*24*	*28.1*
Uganda	267	—	—	—	—	80	87	40	56.0	54	54	41	41.0
Developing and Transition countries		*86*	*85*	*51*	*52*	*92*	*93*	*64*	*71.0*	*72*	*77*	*34*	*45*

Sources: World Bank, World Development Indicators, 2006; for electricity, IEA, World Energy Outlook, 2002 and 2004. Figures on ECA from World Bank, "People and Power, Electricity Sector Reforrms and the Poor in Europe and Central Asia," November 2006.

a. World Bank, "Infrastructure in Europe and Central Asia," June 2006.

At the start of transition, natural gas supply networks extended to both urban and rural areas wherever trunk pipelines existed. Most large urban areas had district heating services (an option that is feasible only in relatively dense settlements). Telephone connections were sparse in rural areas but available to most urban households, especially in capital cities. Rail networks were vast and designed mainly for hauling raw materials and heavy goods across long distances, especially to support the intraregional trading arrangements of the Council of Mutual Economic Assistance. Most communities had access to an all-weather road, and about 89 percent of the network was paved, even though it was not designed (especially in the Commonwealth of Independent States [CIS]) to serve substantial transport of goods.

However, this physical legacy created problems and challenges during transition that remain a struggle for many countries, especially in the CIS. The initial contraction in output and demand caused overcapacity, making it difficult to maintain the systems or to pay for imported fuel—still an issue for countries suffering the longest recessions, such as Ukraine. Systems were oversized relative to effective economic demand, especially in electricity and district heating and, to some extent, in gas supply. Water facilities were overdimensioned and inefficiently designed, and wastewater treatment was highly inadequate relative to modern environmental standards. District heating, gas, and water consumption levels per customer far exceeded averages in market economies because the distribution was not metered and leakage was typically high.

The imbalances at the time of transition were more qualitative in transport, reflecting the need for adjustments to respond to the changing nature of demand. The shift of production away from heavy freight and changes in the direction of trading relationships required restructuring and rationalization of rail networks, while primary and secondary roads had to absorb rapidly growing truck and private car traffic.

Excess capacity is less an issue now that most of the ECA countries have undergone considerable structural change in their production and have resumed economic growth. However, the inability to fund normal operations and widespread neglect of maintenance during the early transition years has left much of the stock, already heavily depreciated and outmoded, in a dismal state. In some countries, especially the low-income CIS[5] and the southeast Europe[6] subregions, shortages of electricity are a growing concern, as evidenced by blackouts or reduced periods of service even in the capital city (figure 4.1).[7] Because much of the inherited stock has outlived its useful life or deteriorated badly, expenditure priorities include rehabilitation and

modernization or upgrading, and, in some cases, even expansion of facilities (especially in power generation and gas networks). In the CIS, district heating plants have become almost unusable or require major investment to improve their energy efficiency. In Ukraine, heat production in 2002 was 42 percent of its 1990 level, and even in Poland the figure was only 47 percent (IEA 2004).

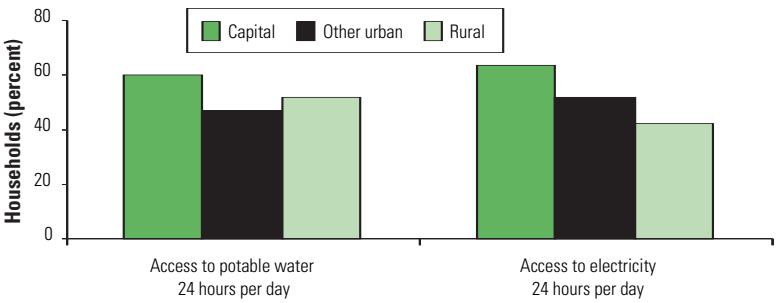
In the water sector, problems of access, reduced reliability, and less frequent service have emerged, especially outside capital cities. In Albania less than 40 percent, and in Armenia less than 20 percent of urban settlements had water 24 hours a day in 2000. In Armenia and Georgia, the capital cities were more than twice as likely to have full water service as other urban areas (World Bank 2006d). However, much progress has been made in recent years in both countries, and continuous water supply was available to more than 50 percent of the population in 2005.

In the road sector the recession led to neglect of maintenance as public funding dried up, while increased traffic of heavy vehicles and private cars placed new burdens on the existing stock. Lack of regular maintenance led to accelerated degeneration of roads and worsening safety in the face of growing traffic.

With the return to growth and the adoption of sectoral reforms, which have permitted improvements in operational efficiency and revenue mobilization as discussed below, problems of intermittent availability and poor quality of service have lessened. The 2005 Business Environment and Enterprise Performance surveys (BEEPS) found improvements, albeit modest, in electricity services in most

FIGURE 4.1

Reliability of Infrastructure and Energy Services in ECA in Early 2000



Source: Household survey data (World Bank 2006b).

Note: Average among eight ECA countries for potable water; eight for electricity.

countries and subregions, with the worst ratings for Albania, Georgia, and Turkey (table 4.2). Transport services were considered unchanged or somewhat worse, especially in Armenia and Georgia, probably reflecting the declining road quality and congestion. However, the BEEPS reported dramatic improvements in regulatory certainty and the prevalence of unofficial payments. Significant problems remained in 2005 with prevalence of power outages or surges in Albania (194 days in previous 12 months on average), Georgia (57 days), and the Kyrgyz Republic (14 days), although only Albania's figure had increased since 2002.[8] The problems of intermittent or insufficient water supply had sharply declined in all countries except Albania.

To conclude, the installed infrastructure at the start of transition permitted the ECA countries to withstand the early years of recession and structural transformation without major new investment, and in fact many facilities were mothballed or simply run down. It was not infrastructure that impeded growth in this early transition period,

TABLE 4.2

Percentage of Businesses Reporting Problems, 2002 and 2005

Subregion / and country	Problems with electricity services		Problems with transport services		Regulatory uncertainty		Unofficial payments for electricity & water	
	2002 (%)	2005 (%)	2002 (%)	2005 (%)	2002 (%)	2005 (%)	2002 (%)	2005 (%)
Baltics	13	11	11	11	60	45	1	1
Central and Eastern Europe	10	12	12	14	59	62	3	3
Poland	14	11	15	13	84	66	3	2
Slovak Republic	15	7	17	7	67	39	3	1
Middle-income CIS-MI	10	8	9	9	64	49	6	4
Ukraine	14	11	9	10	76	58	8	4
Low-income CIS-LI	27	22	15	14	58	45	8	7
Armenia	30	10	19	13	63	36	2	6
Georgia	49	48	16	27	76	73	11	5
Kyrgyz Republic	21	15	13	9	57	69	9	11
Southeastern Europe	25	23	19	18	72	59	10	7
Albania	76	57	35	26	71	55	14	17
Croatia	6	4	11	8	67	45	3	5
Romania	19	18	19	19	73	64	5	2
Turkey	32	23	19	21	79	60	13	5
ECA average	19	17	14	14	63	51	7	5
Non-ECA (ICAs)								
Uganda	45	--	23	--	28	--	22	

Sources: EBRD-World Bank Business Environment and Enterprise Performance Surveys (BEEPS) for the ECA countries. Uganda Investment Climate Survey, 2004.
Note: "Problems with electricity," "Problems with transport services" and "Regulatory uncertainty" shown as the sum of "Moderate obstacle" and "Major obstacle." "Unofficial payments" is sum of "Frequently," "Usually," and "Always." For Uganda, "Unofficial payments" figure is for electricity only. Comparable information for other non-ECA Investment Climate Assessments not found in BankWB Investment Climate Assessment database.

although the rapid unraveling of services to households certainly added to their personal hardships. However, as most of the countries return to a more favorable output trend, the problems of service quality and reliability are becoming more evident and could hamper competitiveness. The EU accession countries[9] and the rest of southeast Europe in particular are now facing the challenge familiar to the rest of the developing world: how to find the financial means to expand and modernize infrastructure to support durable economic growth. This task will require continued efforts to reform the management and governance of the sectors, as discussed below.

Financial Sustainability: Hidden Costs and Priorities for Structural Reform

The financial performance of utilities has important implications for fiscal and macroeconomic stability in a country. Power and water systems in transition economies have relied heavily on the public budget to sustain operations. They generally have had low technical efficiency, centralized controls on tariff levels, and low rates of bill collection, especially from other state enterprises. If the sector is operated by public sector agencies, commercial practices to recover costs have often not been implemented because such services have been treated as vehicles for promoting political interests, and in the socialist context underpriced services were a supplement to low wages and considered a social entitlement. Violations of commercial and economic principles have led to nonviable financial performance with direct impacts on state budgets in the form of utility bailouts and accumulation of tax arrears. It also has had repercussions for the sustainability of services, reflected in reduced access and deteriorating service quality.

This section discusses three dimensions of the problem: the extent of (a) unaccounted losses (in excess of normal technical losses of power or water distributed through the network), (b) low efficiency of bill collection, and (c) tariffs below cost recovery. Together these problems comprise hidden costs or implicit subsidies that result in indirect or eventual claims on public budgets, as well as burdens to consumers through reduced or deteriorated service (box 4.2). The stringent fiscal restraints needed for macroeconomic stability led governments in the late 1990s to recognize the importance of commercializing the infrastructure sectors. In each country, reforms have been made along each of these dimensions, leading to generally improving trends in hidden costs, but there is still a way to go for many of them.

BOX 4.2

Assessing the Economic and Fiscal Burden of Poor Infrastructure Management

High losses, nonpayment of bills, and tariffs set below cost recovery hurt the financial performance of a utility sector, creating direct and indirect—or hidden (implicit)—subsidies that raise demands for eventual bailouts by government.[a] These hidden subsidies are not usually recorded or made transparent, but their impact is felt in the form of reduced investments, delay of essential maintenance, and deterioration of service. Postponed maintenance leads to further deterioration in the value of assets, increased per unit cost of service provided, and higher technical losses in the systems. Inefficient service delivery and high losses result in greater electricity and fuel consumption, increasing fuel imports and thus the debt burden of a country.

International partners, the International Monetary Fund (IMF), and the World Bank, have devised a model called the Hidden Cost Calculator. Hidden costs refer to the difference between actual and potential collected revenue, determined as the sum of three subsidy components:

- Excessive system losses (difference between actual system losses and normative losses, multiplied by the economic price of the service)
- Collection inefficiency (the difference between billed revenue and actual collected revenue)
- Pricing inefficiency (the difference between the cost recovery price and the actual price or tariff charged, multiplied by the billed quantity of service)

These calculations take account of normative losses and collection rates prevailing in comparable, well-run utility systems. The economic or cost recovery price is determined on the basis of long-run marginal cost, or on-border prices adjusted for delivery costs.

The Hidden Cost Calculator Model draws on data compiled by Bank staff for a four year period, 2000–03.[b] The sources of data include Enerdata; ERRANET; existing World Bank publications and reports; and data obtained from country experts, World Bank staff, and IMF staff. The model has been applied to the power, water, and gas sectors.

Sources: Ebinger 2006; World Bank 2006f.

a. The total hidden subsidies form part of quasi-fiscal deficit. This term implies that the hidden cost is effectively covered by the state budget in some form eventually, although much of it is borne in reality by consumers, through reduction or deterioration in service, for indefinite periods.

b. See World Bank (2006f) and Ebinger (2006) for a more detailed explanation. By mid-2007 the model is scheduled to be updated for 2004 and 2005.

Power

Electricity has been by far the largest recipient of implicit subsidies among the infrastructure sectors in ECA countries, because of its sheer size and the degree of disparity between the cost recovery price and weighted average tariff. The energy intensity of growth in the ECA region ranges from four times (in the CEE) to 13 times (in the CIS) the average for Organisation for Economic Co-operation and Development (OECD) countries.[10] Power (as well as water and gas) networks in ECA during the first decade of transition were typically characterized by high system losses (output generated and not billed) caused by poor design and inadequate upkeep of facilities, theft, or unofficial connections, and the absence of metering. The total hidden costs in the power sector as a share of GDP were as high as 18 percent in some countries in the mid-1990s.

Hidden costs have been declining in almost all ECA countries in recent years as a result of tariff adjustments and improved efficiency in managing losses, and in billing and collections, as well as increases in GDP. Technical losses have been reduced through better maintenance, rehabilitation, and, where necessary, decommissioning of facilities. Metering and vigilance against illegal connections have reduced commercial losses. Improvements in collections have been achieved by reforms in utility governance and legal and administrative changes that have made it easier to pursue nonpayment claims and to disconnect services. Tariff restructuring has also been pursued, reducing cross-subsidies of residential tariffs by industrial users. As of 2003, the weighted average end-user tariffs[11] in Armenia, Croatia, and Turkey approached the level of medium-term cost recovery—that is, not only covering operation and maintenance costs but also contributing to investment needs (at least for rehabilitation and meter installation).[12]

Because demand is reemerging strongly in the CEE and SEE countries, the targeted cost recovery tariff will need to rise to permit adequate investment in rehabilitation and new generating capacity. In countries where appropriate fiscal space has been created by reducing the public debt ratio and the fiscal deficit, investment to meet growing demand could also be partly financed through borrowing—that is, by taxation of future incomes. The situation in the CIS countries varies. Because most of them still have excess generating capacity and modest demand forecasts (remaining below their 1990 levels) for the next 5–10 years, the cost recovery tariff levels presently estimated are less than in the more buoyant economies. However, in parts of the CIS, notably the Kyrgyz Republic, tariffs have not even reached short-

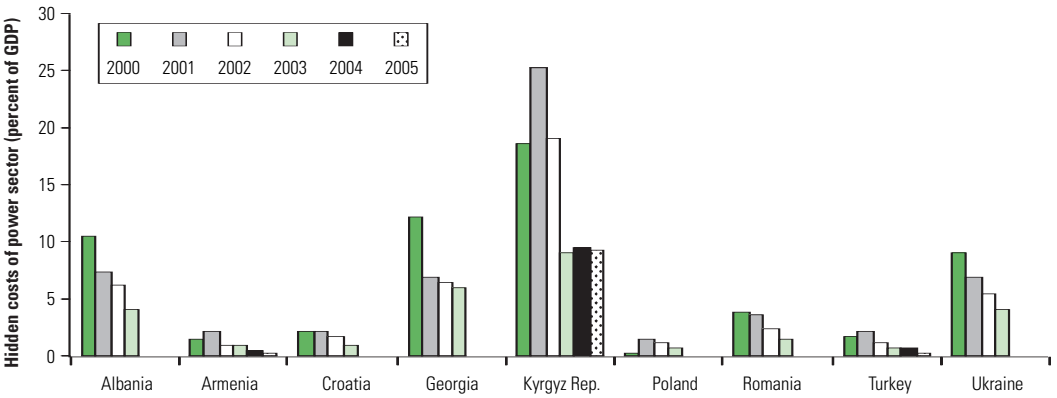
term financial viability (covering costs of fuel, operation, and basic maintenance).

Figure 4.2 shows total hidden costs in the power sector (that is, the sum of unaccounted losses, collection failure, and tariffs below cost recovery price) as a percentage of GDP across the focus countries during 2000–05. In Armenia, Turkey, Poland, and Croatia, total hidden costs had been almost eliminated by 2003. The Kyrgyz Republic has maintained the highest share of hidden costs among the sample, although its 9.4 percent of GDP in 2003–05 was still much lower than in earlier years. Albania, Georgia, and Ukraine also more than halved their shares of hidden costs from 2000 to 2003. Armenia has gained through improved sector efficiency promoted by power sector reforms (box 4.3). This reduced hidden costs or implicit subsidies to less than 0.5 percent of GDP in 2005.

In the composition among the three components, inadequate tariffs account for the bulk of the hidden costs estimated in Ukraine, Romania, and Poland. The potential revenue losses from tariffs below cost recovery alone amounted to 3 percent of GDP in Ukraine and the Kyrgyz Republic in 2003 (down to 2 percent in the Kyrgyz Republic in 2005). Unaccounted losses were the biggest share of hidden costs in Turkey, the Kyrgyz Republic, Georgia, Armenia, and Albania. Although each country made considerable improvements, unaccounted losses still represented over 3 percent of GDP in Georgia in 2003 and 2.4 percent in the Kyrgyz Republic in 2005. Losses

FIGURE 4.2

Total Hidden Costs of Power Sector, 2000–05



Source: World Bank 2006f and updated staff estimates.

from poor collections were the smallest component of hidden subsidies, yet in 2003 remained an unacceptable 1.0–1.5 percent of GDP in the Kyrgyz Republic and Georgia. Only in Croatia did collection failures dominate.

Lower hidden costs indicate progress in sector reform but do not necessarily mean that the contribution of infrastructure services to growth is maximized. The reduction of hidden costs means that tariffs are better aligned with costs as a result of tariff increases and cost savings, reflecting better efficiency in the provision of services. However, if costs remain uncompetitive, higher tariffs may detract from competitiveness and deter growth. For example, despite Turkey's progress in reducing hidden costs, electricity prices for industrial users are higher than the average in OECD countries, which is a potential obstacle to competitiveness and higher growth (World Bank 2006i).

Water

Transition also brought major shifts in public policies with respect to water services. At the outset of transition, consumption levels in the region were three times as high as in OECD countries. Reform had to start with promoting the public image of water supply as an economic good rather than a social privilege.

In the early years of transition, water services were decentralized and assets transferred to the municipal level throughout the ECA region, with the exception of the Slovak Republic and Bulgaria. However, most countries (other than the Czech Republic) have reversed or modified this trend in recent years. Recent moves have aggregated municipal water services, dramatically reducing the number of utilities and creating regional water companies. The intent has been to simplify tariff regulation, introduce economies of scale, and ease mechanisms for public investment in the sector (World Bank 2006d).

Wide regional disparities characterize ECA water systems. In Poland and the Slovak Republic, water is supplied largely by commercialized utilities that offer high-quality water and sanitation services. The new entrants have a high level of institutional capacity, tariff levels sufficient to cover operating and maintenance costs, and sufficient market scale to attract domestic and external capital. The key institutional challenge will be meeting high EU standards, especially for wastewater treatment, which requires substantial investment. For Romania and the EU pre-accession countries Croatia and Turkey, tariffs may be covering operation and maintenance costs but sector efficiency is not yet high enough to attract large inflows of domestic and foreign capital. Moreover, issues related to wastewater

BOX 4.3

Armenia: The Long Road to Success in Power Sector Reform

Armenia suffered extreme collapse of output and electricity generation during the early 1990s, when the only source of oil and gas for the national thermal power grid was cut off by the economic blockade imposed by Azerbaijan and Turkey. Gas supply from the pipeline built in 1993 through neighboring Georgia was regularly interrupted by sabotage. The massive earthquake in 1988 had already prompted the closure of the Medzamor nuclear plant. Dependence on Lake Seven for hydro power led to its depletion, because it was also providing irrigation and drinking water. Despite brutal winters, electricity supply was reduced to only two hours per day. Financial performance of the sector suffered, with bill collection of less than 50 percent and commercial losses of at least 25 percent. Fiscal and quasi-fiscal subsidies to the power sector reached roughly 11 percent of Armenia's GDP by 1995.

The adverse conditions strengthened the government's commitment to power sector reform. By late 1996, 24-hour supply was restored with the reopening of the Medzamor nuclear plant, abatement of the gas pipeline sabotage, and enhanced generation through improvements in the hydrology of Lake Seven. The government also initiated a campaign aimed at establishing a link between service quality and payment discipline, while gradually adjusting tariffs for all customers to remove cross-subsidies among users and to achieve cost recovery. A targeted family benefit program was introduced to provide a social safety net to needy households through cash transfers, replacing previous subsidy schemes. Donors also provided needed financial support for the reform agenda.

Unbundling of the sector into generation, transmission, and distribution companies in 1995 was accompanied by establishment of an independent regulator, the Armenian Energy Regulatory Commission, which became the champion of reform. The government also initiated privatization of the distribution company as part of the reform program, although two tenders offered in 2001 failed. Thereafter, the government altered the privatization plan to seek a management contractor rather than a private owner. Midland Resources Holding, a small strategic investor, took control of Armenia's distribution system at the end of 2002.

Bill collection and theft were addressed by installation of new tamper-proof meters. An automated metering and data acquisition system established customer information that helped to identify the source and extent of unaccounted losses and other systemic problems. Enforcement of payment discipline has resulted in a collection rate above 96 percent.

The power utility turned around its deficit of 2.4 percent of GDP in 1995 to a surplus of 3.3 percent of GDP in 2002. Financial flows are starting to move from the power sector to the government, freeing up fiscal space for social spending. Behind all these achievements has been a strong government commitment to ensuring a financially viable sector.

Source: Sargsyan, Balabanyan, and Hankinson 2006.

treatment pose a particular challenge for their acceptance in the EU. The southeast European countries[13] have competent human resources in the sector but need institutional reorganization and modern management methods. Armenia, Georgia, the Kyrgyz Republic, and Ukraine face severe challenges with declining service levels, low institutional capacities, and very limited ability to mobilize additional resources by tapping government budgets.

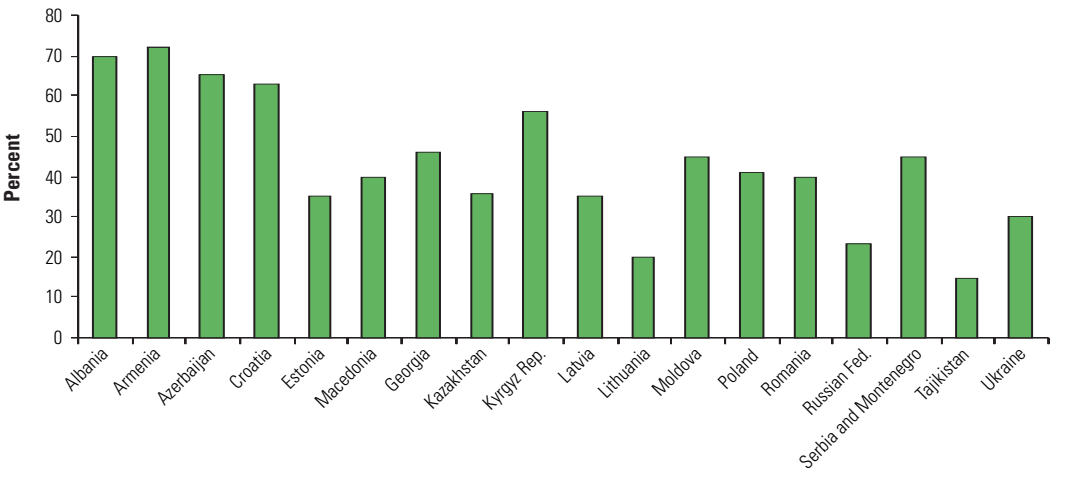
Hidden costs have been estimated for the water sector as a function of system losses, tariffs below cost recovery, and collection performance.[14] Nonrevenue water (NRW) is a good summary measure of sector inefficiency. It measures the percentage of water produced that is not actually invoiced and is a combination of technical losses (leaks) and administrative losses, such as from illegal connections.

Figure 4.3 presents NRW in 2002 for a sample of ECA countries, including eight of the focus countries: Albania, Armenia, Croatia, Georgia, the Kyrgyz Republic, Poland, Romania, and Ukraine. Six of these, all but Romania and Ukraine, had NRW above the ECA average of 38 percent in 2002. The international benchmark for unaccounted losses is about 20 percent, representing unavoidable (technical) loss in the distribution system.

An adequate level and structure of tariffs is a key policy instrument to promote demand management and financial sustainability of utilities. Despite the urgent need for adjustments, raising the level of tariffs is one of the most politically controversial aspects of infrastructure

FIGURE 4.3

Nonrevenue Water in ECA Countries, 2002



Source: Global Water Intelligence 2005.

reform, especially in the water sector. In most CIS countries municipalities are responsible for setting tariffs. Tariffs often do not cover operational costs, let alone required maintenance and capital costs. As a result, investment may fall short by a factor of five to ten times the level that would be required to maintain and renew existing water infrastructure.

Table 4.3 presents water tariffs in US$ per cubic meter in the selected countries, for the most recent available years.[15] With the exception of Armenia, average industrial tariffs were higher than average residential tariffs in 2003, indicating in most cases a continuation of internal cross-subsidies. Average tariffs (2004 data) were the highest in Croatia, followed by Turkey. The average water supply tariff was US$0.70 per cubic meter in metropolitan areas but considerably less in the smaller municipalities in Turkey (population below 100,000), which were less able to fully cover their costs.

Table 4.3 also presents estimates of the tariff required for cost recovery. The cost recovery tariff has been defined as the cost of supplying 24 hours of water,[16] including the cost of operation, maintenance,[17] and necessary investments. The cost recovery tariff acts as a benchmark for assessing the financial gap that needs to be recovered either by further raising tariffs or reducing the cost of supply. If operational inefficiencies were reduced, reflected in falling NRW and energy and labor costs, the pressure to raise tariffs could be eased, at least in the short run. However, EU standards require major investments by EU accession countries and may make the cost recovery tariff unaffordable for large segments of users.

Unlike in Romania and Poland, tariffs in many other countries do not account for environmental charges. Tariffs have increased in

TABLE 4.3

Average Water Tariffs in Selected Countries (US$/cubic meter)

Selected countries	Residential	Industrial	Weighted tariffs	Cost recovery tariff
Albania (2005)	0.30	1.08	0.44	0.65
Armenia (2005)	0.24	0.24	0.24	0.35
Croatia (2004)	0.47	2.02	0.87	0.65
Georgia (2005)	0.04	0.41	0.08	0.12
Kyrgyz Republic (2003)	0.03	0.14	0.08	0.08
Poland (2003)	0.55	0.62	0.56	0.68
Romania (2004)	0.15	0.62	0.39	0.65
Turkey (2004)	--	--	0.70	0.70
Ukraine (2003)	0.08	0.17	0.11	0.13

Source: World Bank ECA database.
Note: -- = Not available.

recent years in most countries, but production costs have also increased at the same or a higher pace. Ukraine introduced a law on Communal and Housing Services in 2004 that requires the regulator to compensate utilities for below-cost tariffs. This policy has provided incentives to local authorities to effectively implement cost-recovery tariffs.

For countries that are still a long way from cost recovery, a carefully planned phasing of tariff increases would ease the burden on poor households. While each country needs to assess this trade-off, the optimum approach would be to provide an effective social safety net to underpin relatively rapid tariff reform. ECA countries have introduced various social protection schemes during the transition period to replace the earlier reliance on general subsidies, internal cross-subsidies, and lax collection (box 4.4).

Cost recovery also requires payment discipline and metering. Most ECA countries are now approaching the international benchmark of an average of three months between the billing and collection of payments (OECD 2005). Metering used to be considered an infringement of basic rights, especially in CIS countries. Recently, some countries, such as Georgia and Armenia, have achieved high levels of metering. In Armenia, tariffs increased substantially in 2004, and collection rates have been improving over time with the Household Arrears Restructuring Program. In 2002, a legal framework was introduced that provided incentives for bill collection. Consumers were allowed some write-off of their past arrears if they agreed to meter installation. By 2005, collection ratios improved to 100 percent. Households have been willing to accept metering because it reduces billing amounts and has raised public confidence in the bills issued. Not only the financial viability of Armenian utilities but also transparency and sector governance have improved.

Albania has traditionally had the worst collection rate and lowest operating cost ratio among the focus countries, though the collection ratio improved to 74 percent[18] in 2006 (World Bank 2006a). Utilities rarely resort to cutting off illegal connections and nonpaying customers, although an existing policy allows for disconnections. Despite very low residential tariffs in Albania, domestic customers are the worst payers.

Table 4.4 indicates that the share in GDP of total hidden subsidies for water declined in Georgia between 2000 and 2003 but rose in Ukraine and Armenia (improving again in Armenia in 2004 and 2005). The share was much lower than in the power sector, however (figure 4.2). Water subsidies in Ukraine and Poland represented less than 0.5 percent of GDP in the period 2000 to 2003.

BOX 4.4

Ensuring a Social Safety Net for Infrastructure Pricing Reform

Safety nets in ECA countries vary in their targeting effectiveness, fiscal cost, and efficiency impacts. The Kyrgyz Republic and Ukraine still rely on poorly targeted budget transfers that are fiscally costly. In Ukraine, utility subsidies in recent years have represented almost 0.8 percent of GDP and are biased against the poor, and are one of the most expensive means of reducing poverty. Armenia and Georgia have implemented better-targeted family benefit programs to provide cash transfers to poor households, although the administrative requirements have been formidable. Poland has supported unemployment benefits and lump sum housing allowances from the general budget in place of energy price subsidies, thus setting the practice of transparent allocation from the budget. In mid-2006, Albania decided to replace the compensation of consumers unable to pay utility bills with a direct cash transfer to socially vulnerable households. The introduction of lifeline tariffs (a low rate applied to a quantity of basic consumption) for electricity in Romania has provided a relatively effective means of targeting the poor and supporting energy efficiency.

Social protection policies have also been critical for labor retrenchment, especially in railway restructuring. Poland has made successful strides in improving labor productivity in the railway sector in the period between 1998 and 2005 through a 58 percent reduction in employment achieved without labor tension, as consensus with key stakeholders was made part of the labor restructuring process. Social protection (severance pay, preretirement benefits, leave, labor redeployment services including training, labor mediation) and social monitoring became the core elements of the program. Labor productivity rose 19 percent despite traffic decline of 32 percent during this period.

Source: Authors' summary from various documents.

The recent "Public Expenditure and Institutional Review" in Albania (World Bank 2006a) determined potential savings from eliminating annual hidden costs in the water systems. If problems with collection failures, underpricing, unaccounted losses, and other inefficiencies such as overstaffing were addressed, Albania could save more than US$74 million annually—or 0.9 percent of GDP in 2006. The unaccounted losses alone absorb US$51 million annually. It should be noted, however, that upfront expenditure would be needed for metering to improve billing and collections, even though metering is expensive and not easily justified everywhere. Adequate investment in rehabilitation is urgently needed to reduce enormous losses in the systems from leakage.

TABLE 4.4

Share of Total Hidden Cost for Water in GDP

	Total hidden costs as % of GDP (2001 US$)					
	2000	2001	2002	2003	2004	2005
Armenia		0.88	1.55	1.59	1.09	0.69
Georgia	1.35	1.62	1.28	1.06	0.86	0.57
Poland	0.15	0.15	0.17	0.16	--	--
Ukraine	0.11	0.28	0.34	0.32	--	--

Source: World Bank 2006c,
Note: -- = Not available.

Land-Based Transport

Given the geographical location of ECA countries between the large EU markets and rapidly growing East Asia, land-based transport services are important for growth. Efficient and cost-effective transport is a key requirement for deepening the integration of ECA countries into transnational production networks and global markets. Railways and road transport are the two principal land-based transport modes where outcomes are to a large extent interdependent, reflecting evolving competition in network use.

Many of the transition countries face the challenge of sustaining a railway system of similar network density as Western Europe with less than half the traffic density, around a third of the total labor productivity, and a fraction of per capita income. The railway network density (rail route kilometers per thousand square kilometers) varies greatly among the ECA countries, from a high of 74 in the Slovak Republic to 2 in the Kyrgyz Republic. The economic importance varies as well. Except in the CIS countries of Armenia, Georgia, the Kyrgyz Republic, and Ukraine, the share of railways in surface transport has declined over the transition, most notably in Poland, the Slovak Republic, and Romania. The growth rate of rail traffic in 1999–2003 exceeded GDP growth only in Georgia and Ukraine. Both countries have also maintained a much higher share of freight (which is most related to economic activity) in total rail traffic. With sustained economic recovery, it is envisaged that the declining trend in traffic will end.

The road sector has seen increased traffic from both passengers and freight. The rising private ownership of vehicles resulting from higher per capita incomes and the liberalization of trucking (responding to the increased demand for just-in-time movement of high-value goods over short distances) have been the main factors behind the new motorization. Shifting trade relationships have also created new

regional opportunities for transit traffic, mainly toward the West. The modal shift toward road transport intensifies the need for sufficient budgets to ensure that the existing network is maintained in a sustainable manner.

Railways. To observe the use of railway network capacity in each country and evaluate financial implications, *traffic density*[19] has been determined for the selected countries and compared with *traffic mix* (the share of passenger traffic in total traffic volumes). Together, they provide an important indication of yield per traffic unit (table 4.5). The higher the traffic density, the higher the network utilization to cover the operating costs of running the railways. However, railways with a higher share of passengers in the traffic mix may not be recovering all their operating costs, even with financial support for discounted passenger travel by the governments, given that passenger traffic units are more resource intensive than freight traffic units.

Traffic density in Ukraine has remained by far the highest among all countries, although Georgia's grew most rapidly from 1999 to 2003. In contrast, traffic density in Poland and Romania declined by 2–5 percent per year on average. This may be at least partly the result of a modal shift of traffic with industrial restructuring during the period. Despite signs of improvement in traffic densities, it is envisaged that in none of the countries are railways likely to recover the share of traffic they had in the 1980s.

Georgian railways, with a relatively lower proportion of passenger traffic and higher intensity of use than some other countries, have

TABLE 4.5

Railways: Trends in Total Activity, Density, and Traffic Mix (1999 and 2003)

	Total traffic units (passenger-km + freight tonne-km, -millions)		Traffic density (traffic units /route-km , thousands-'000) (A)		Traffic mix (% of passenger kms in total traffic units) (B)	
	1999	2003	1999	2003	1999	2003
Albania	147	144	329	327	82	85
Armenia	370	500	434	703	13	10
Croatia	2,985	3,911	1,095	1,435	38	30
Georgia	3,573	5,476	2,217	3,584	10	7
Kyrgyz Republic	433[a]	612	1,038	1,050	--	10
Poland	81,647	67,056	4,082	3,353	32	29
Romania	28,231	25,100	2,470	2,282	44	34
Slovak Republic	12,830	13,065	3,498	3,573	23	21
Turkey	14,592	14,545	1,695	1,678	42	40
Ukraine	203,936	243,685	9,075	11,037	23	21

Source: 1999 data collated from various sources; 2003 data from Amos (2005) and other Bank reports.
a. 1995.

been less vulnerable to financial distress during the transition period and have required no government subsidies.[20] In countries where traffic density is low and share of passenger traffic is high, such as Turkey, Croatia, and Romania, railways have faced financial difficulties. In Albania, the decline in total traffic units and an unusually high and growing share of passengers in the traffic mix (85 percent in 2003) result in extremely low yields per traffic unit, leading to a precarious financial state in the railways.[21] In Ukraine, most of the transit traffic is from the Russian Federation to the Black Sea ports and involves heavy commodities (oil and iron ore).

Railway reform entails tailoring of physical infrastructure to expected demand, through selling obsolete assets, closing railway units, outsourcing and privatizing noncore activities, and reducing remaining operational costs, especially of labor. EU membership further requires harmonizing with the directives of the acquis communautaire, which involve separating rail infrastructure from operations, imposing a track access fee, and establishing commercialized operations with defined public service obligations for socially necessary but unprofitable services. As a further direction of reform, cross-country initiatives are being promoted to address declining traffic density and continuing deterioration of national railways and to focus resources in market segments where railways have a viable future. Studies have been undertaken to establish regional "core" networks and priorities for investment on those networks, such as the Transport Infrastructure Regional Study (Berger 2002) and Regional Balkans Infrastructure Study (REBIS) completed in 2003 (COWI 2003).

A recent report ranked the countries of the region into high, medium, and low reformers as of yearend 2004 (Amos 2005). Among the focus countries, Poland, Romania, and the Slovak Republic were ranked as high reformers, though they had not completed all reforms in the sector. Medium reformers included Armenia, Croatia, and Georgia, which had achieved some commercial orientation and undergone some labor adjustment. Albania, the Kyrgyz Republic, and Ukraine were ranked as low reformers.

Table 4.6 presents financial and fiscal performance indicators in selected countries in the most recent available years. As already noted, the increasing share of rail freight due to buoyant commodity trade has brought financial health to railways in Georgia and Armenia, and to some extent in the Kyrgyz Republic and Ukraine. Georgia and Armenia have shown short-term financial viability as reflected by the working ratio less than unity.[22] The working ratio in Albania, Croatia, and Turkey is higher than 2.0, indicating extreme financial distress. In Romania, the working ratio is also more than unity.Even

TABLE 4.6

Railways: Financial Performance and Government Subsidy in Selected Countries

Country	Subsidy (% of GDP)		Subsidy (US$ millions)	Working ratio excluding subsidy	
	2002	2004	2004	2000/01/02	2004/05
Albania	0.10	0.10	8	—	2.52
Armenia	None	None	None	1.35	0.79
Croatia	1.00	2.20[a]	544	1.87	2.22
Georgia	None	None	None	0.62	0.69
Kyrgyz Republic	—	None	None	—	—
Poland	0.10	0.13	304	0.99	0.93
Romania	0.60	0.50[a]	501[a]	1.16	1.12[a]
Slovak Republic	0.68	—	166[b]	0.92	—
Turkey	0.20	0.40[a]	1,410[a]	3.85	3.20[a]

Source: Data collated from various World Bank data reports.
Note: — = Not available.
a. 2005 data.
b. 2001 data.

a low ratio, however, does not imply that these systems have been working efficiently and require no substantial reforms[23] or that they can pay for needed investment. Maintenance programs may have been delayed, contributing to the loss of asset value of railway companies through obsolescence and depreciation. Although Armenia and Georgia have been modest in their reform efforts, they continue (in 2007) to require no budget support from the government. Information on subsidies is incomplete in the Kyrgyz Republic and Ukraine, which have been even slower to reform.[24]

When reform measures to rationalize the size, infrastructure, and labor force do not keep pace with declining traffic density, operating costs increase and the financial health of railways deteriorates. Turkey and Croatia have initiated restructuring and modernization of their railways. In Croatia, traffic density has increased with modest growth in freight volumes. With a hike in tariff charges, share of revenues rose from 0.7 percent of GDP in 2002 to 1.1 percent in 2005, albeit the share of subsidies more than doubled in this period to 2.2 percent of GDP—the highest among the focus countries with data. In absolute terms, subsidies are the highest in Turkey but form only about 0.4 percent of GDP. Poland has managed to keep the share of subsidies in GDP constant and the working ratio fairly low, due to improvements in sector performance. However, driven by the downward spiral of the railway's output together with inadequate compensation for the socially necessary but unprofitable passenger services and high access charges, the main challenges facing the Polish railway include a liquidity crisis and the need to fund investment in rail infrastructure, facilities, and equipment.

When subsidies are compared with the length of the network, the allocation appears highest in Croatia with US$200,000 per route km, followed by US$172,000 in Turkey and $46,000 in Romania, in 2005. The subsidy levels in these countries also reflect high borrowing and debt servicing requirements for the implementation of ongoing reforms.

Roads. This study looked at national or state roads (including motorways and trunk roads), which are by definition lengthy, carry relatively high volumes of traffic, and compete for public resources from the central government.[25] Table 4.7 presents the network density (total length of the road network per thousand square kilometers of land area) in the selected countries compared to regional averages. Coverage rates vary considerably for historical, political, and locational reasons. Poland, the Slovak Republic, and Romania have higher densities than others in the sample, with Poland leading at 1.4 km per thousand square kilometers. Road network densities in Romania and the Slovak Republic (at about 0.9) are higher than the ECA regional average, though fall short of the comparator average for upper-middle-income countries. The road network density in Turkey is below the regional average and that of other upper-middle-income countries, while Albania has relatively high density (though not necessarily better quality road facilities overall) compared to its neighbor, Croatia. Countries in the CIS also fall below the ECA average but have road densities similar to lower-middle-income countries in other parts of the world, and access to the main urban centers has been considered adequate. The Kyrgyz Republic has the lowest road density among the focus countries.

The portion of roads that are paved indicates the degree of access and mobility and general efficiency of the road network. Poland and

TABLE 4.7

Road Network Densities

Country	Road network density (km/1,000 sq. km)	Country	Road network density (km/1,000 sq. km)
Albania	0.66	Turkey	0.46
Armenia	0.27	Ukraine	0.29
Croatia	0.51	France	1.50
Georgia	0.29	Germany	2.00
Kyrgyz Republic	0.10	Europe & Central Asia	0.60
Poland	1.38	Upper middle income (UMI)	1.10
Romania	0.86	Lower middle income (LMI)	0.30
Slovak Republic	0.89	High-income OECD	1.30

Sources: Collated from Vvarious Bank reports and the International Road Federation (IRF).

the Slovak Republic lead the focus sample in paved road length per 1,000 people, with eight and seven kms/1,000 residents, respectively, while Georgia and Turkey fall at the low end of the sample (each with about 2 kms/1,000 people). Scaling the paved road length against economic output gives yet a different picture of adequacy. Using this criterion, the CIS countries Armenia, Georgia, and Ukraine, with about 2–3 km per US$ million GDP, exceed figures for the EU member and candidate sample, while the Kyrgyz Republic comes in far above all, at 8 km per US$ million GDP. These higher rates indicate a greater burden of maintenance relative to the size of the economy.

Virtually all the ECA countries have seen growth in total road traffic (for example, 10 percent per year in Albania). Ukraine has relatively low road utilization and experienced a sharp decline in road freight traffic during the 1990s. This trend, which reflected the slow and comparatively prolonged transition period, has recently reversed. However, fierce competition from the railway industry, which continues to dominate in Ukraine as well as in Georgia, is likely to continue.

Despite increases in traffic volumes, road network density in ECA countries is considered adequate for the foreseeable future. Overall, the poor quality of the network rather than its extent has been an impending issue for the region, because poor quality has negative effects on competitiveness and economic growth. Economies need coherent and properly maintained road networks that allow for flow of traffic, both passenger and freight, with reduced time, less congestion, and greater safety. Increasingly, high volumes of passenger cars and heavy truck freights are adding stress to the existing network structures, whose maintenance and rehabilitation needs have been long neglected. Proper road maintenance contributes to reliable transport at reduced cost, because there is a direct link between road condition and vehicle operating costs that have to be borne by the users. According to studies undertaken in the region, poor or limited road quality can raise transport costs by 28–56 percent (World Bank 2003c).

Consistent and adequate allocation of expenditures for annual and periodic maintenance would also promote efficiency in public investment by protecting public assets and reducing needs for rebuilding. Heggie and Vickers (1998) report that rehabilitation of a paved road is three times more expensive than maintaining it if measured in current terms, and around 35 percent more if measured in net present value. The importance of timeliness in road maintenance has been illustrated by research conducted in Turkey based on 20 years of historical data (cited in World Bank [2003c]). It found

that if road maintenance is not completed by the end of the 12th year, roads start deteriorating eight times faster than in the first few years of their lifetimes.

Many countries have started to rationalize their national road networks by reclassifying and devolving segments to local authorities. The transfer of responsibility for secondary roads to local governments can scale down maintenance requirements and promote expenditure efficiencies in the maintenance of main roads.[26] Poland reduced its national road network by 61 percent, retaining for high-level maintenance the segments with highest traffic volumes that involve international transit and most directly affect economic activity. In Albania, Georgia, and the Kyrgyz Republic, the road networks are also being realigned among levels of government, although it is unclear how well municipalities can meet the necessary costs.

Expenditure priorities remain an issue in many countries, with implications for road quality and for public sector financing. During the early 1990s, most road investments funded by external donors were in the form of piecemeal project support, as emergency measures to rebuild the most deteriorated infrastructure. It is increasingly recognized that institutional reforms for good management of road infrastructure is the key challenge for the public sector. For example, the EU's Stabilization and Accession Process imposes a requirement that capacity of the public sector for planning and budgeting road maintenance expenditures be strengthened, along with improvement in road safety, encouragement of private sector participation, and use of modern road technologies.

However, many countries continue to prioritize new investment over maintenance. In Albania, the expansion of the Durres-Kukes-Morine road link has detracted from maintenance expenditures, while the share of roads rated in poor condition remains at 67 percent and the share in good condition is only 16 percent World Bank 2006a. Croatia spends one of the highest shares of GDP on roads among the ECA focus countries (3.4 percent in 2001–04), but 75 percent of this amount is allocated to motorways, such as the Zagreb-Karlovac-Rijeka highway that is part of the Trans-European Highway network. This ambitious program was initiated despite a 1999 survey's finding that Croatia's motorway traffic density was only about a third of the Western Europe average and insufficient to economically justify a four-lane motorway. While traffic has picked up in recent years, above the levels projected at the time, the current focus on motorways has resulted in a serious maintenance backlog, deteriorating road conditions, and a growing burden of sovereign- and subsovereign-guaranteed debt.

Toward Better Management of Public Investment in Infrastructure

The design and management of public investment programs in infrastructure can be a major factor determining the impact of public investment on sector performance. Key issues include

- the need for realistic design of the investment program, in the context of a medium-term framework, to insulate infrastructure from expenditure cuts forced by fiscal stabilization;
- adequate budgeting for operations and maintenance expenditures over time;
- selection of projects based on sound cost-benefit analysis; and
- ensuring value for money in public procurement.

Such measures depend not only on good technical and strategic analysis but also on good governance, including transparency in decision making about priorities and oversight of public investment.

Because of the need to restore fiscal sustainability, many ECA countries (especially in the CIS) have been affected by a dramatic decline in the overall level of public investment as well as a residual approach to investment budgeting. Turkey is an example where public investment has been clearly pro-cyclical as a result of weak portfolio management, overprogramming, and lack of a realistic medium-term perspective. The brunt of fiscal adjustment from 2000 to 2004 was borne by investment in infrastructure. Total public investment (inclusive of local administrations and state-owned enterprises) was cut to 4.2 percent of GNP in 2004 from 6.8 percent in 2000 (World Bank 2006i). Excluding local administrations, the annual allocation for infrastructure investment fell from above 3 percent of GNP in 2000 to below 2 percent in 2004.[27] Total maintenance expenditures were also hit hard, declining from 0.5 percent of GNP in 2000 to 0.3 percent in 2004. With progress on fiscal adjustment, public investment in 2005 rebounded by close to 1 percent of GNP. In Turkey and other ECA countries, the volatility of annual investment allocations has hampered implementation and increased total costs and average completion times of projects.

Ensuring sustainability in medium-term infrastructure investment calls for strengthening the budgetary and investment planning process. A prerequisite to achieving stable and foreseeable annual investment allocations is macroeconomic stability and sustained fiscal discipline. A medium-term expenditure framework can help to insulate infrastructure investment from pro-cyclical volatility. Replacing the annual process of budgetary allocations with a rolling medium-

BOX 4.5

ECA Experiences with Road Funds

Starting in the 1990s, a number of ECA countries created road funds, following practices in other regions, in an attempt to sequester road user charges and ensure their allocation to necessary road expenditures without competition from other sectors. A strong governance mechanism, such as a board representing road users and other stakeholders, was typically favored by advocates of road funds, although not consistently implemented in practice. Critics of road funds, in contrast, argued that further earmarking of proceeds from road funds would reduce the fiscal flexibility and prioritization of expenditures in accordance with sector needs (Gwilliam and Shalizi 1999).

Several ECA countries found that road funds did not bypass difficult resource allocation questions and fell victim to underlying governance problems. Collections of the road fund in Georgia steadily declined from 1999 after governance issues started to emerge. The government attempted to move the fund's management toward a more commercial orientation as well as to improve the governance structure, but the outcome was unsatisfactory because of lack of commitment. The new government abolished the road fund in 2003 and decided to increase funding for maintenance through direct budget transfers. The commitment to a multiyear program and direct budget transfers have helped raise revenues threefold, and have been a stable alternative to the road fund in Georgia (World Bank 2004d).

(continued)

term (usually three-year) process can smooth out cash flows for multiyear projects. Sound cost-benefit analysis and realistic programming are important for ensuring that economically justified projects are indeed selected and, once included in the public investment program, are completed on time. For new EU member countries, the availability of large amounts of structural and cohesion funds for investment provides a unique opportunity to improve infrastructure, if indeed the countries pursue good practices in project selection and in budgeting subsequent operations and maintenance expenditures.

Along with general improvements in investment planning and budgeting, good practices within sectors in prioritizing investments and providing adequate operations and maintenance funding are just as important. In the power sector, for example, investment planning should begin with the identification of a least-cost expansion program. In the water sector, the environmental agenda is beginning to drive the allocation of investment and rehabilitation expenditures as

BOX 4.5 (continued)

Croatia and Romania also are no longer depending on road funds as a vehicle for resource mobilization to meet the annual cost of maintenance. Romania abolished the road fund and has resorted to short-term commercial loans for maintenance and new investments. Increasing reliance on commercial loans and declining state budgets implies a rising level of debt service obligations, and it has become evident that there is still a need to identify a mechanism for raising user revenues. To improve the transparency of financial control in the General Directorate of Roads, Albania has considered some sort of commercial road fund for maintenance, which would be managed by an independent board of public and private stakeholders.[a]

In an interesting departure from the recent regional experience, Poland established a new road fund, called the National Road Fund (KFD), in January 2004. The objective of KFD is to enhance the transparent allocation of resources for upgrading and modernization of the road network. KFD is subject to annual audit and is expected to generate €250 million (US$330million) per year from a special fuel surcharge. Collection of KFD revenues is entrusted to the customs department, and administration and management of EU grant funds to the Polish Central Bank with terms and conditions defined by the Ministry of Finance. Revenues from the fund are used as collateral for floating bonds and raising loans from international financial institutions. Other qualifying expenditures include loans to concessionaires, shadow tolls, and costs of administering the road fund. In the future, the fund may also finance road safety interventions. The Road Administration prepares an approved list of funded projects each year and disburses payments to contractors and concessionaires directly. With strong attention to governance and transparency, Poland's KFD has a better chance of success than the road funds of its neighbors.

Source: Authors, from various sources.

a. The Public Expenditure and Institutional Review on Albania has cautioned against the establishment of the road fund (World Bank 2006a).

a result of growing concerns with water quality, especially for countries joining or hoping to join the EU. In the roads sector, investment strategy sometimes starts with rationalization of the road network, as in Poland. Georgia has established a multiyear framework for maintenance of secondary roads. Planning tools to predict traffic volumes and assess maintenance requirements are being used in some cases. Bosnia and Herzegovina, for example, has a functioning and established asset-management system in the road sector that prioritizes expenditure requirements using the Highway Design and Maintenance-4 highway design decision model. Poland has pursued a consistent increase in its budget for road maintenance in the last few years, with corresponding improvements in the road network. Insti-

tutional innovations have also been introduced to increase transparency through annual public disclosure of maintenance expenditures and of technical road quality.

Alignment with the EU *acquis* has been a guiding and motivating factor as EU accession countries strive to improve investment programming and procurement. As part of preaccession negotiations, these countries have to prepare sector operating plans (SOPs) for the use of structural funds, with multiyear investment frameworks. These efforts are still evolving—in Romania, for example, the capacity to program, prioritize, and implement investments remains below EU benchmarks. For both the railway and road sectors, expenditure plans need to be rationalized, particularly to reflect implementation capacity constraints. For the water sector, EU funds require cofinancing from national sources, and these amounts are not currently visible in Romania's medium-term expenditure framework. As experience progresses, the SOP approach may be useful for other ECA countries, especially those in the EU neighborhood who also have some access to associated funding.

Ideally, road maintenance and rehabilitation costs should be met with a combination of budget allocations and cost recovery measures that generate resources from the network users. Road user charges should be linked to the costs of road maintenance, and the social costs of road use. In other words, the user pays principle should form the basis of charges imposed on road users to cover cost of wear and tear in infrastructure, and promote competition between modes of inland transport. The difficulty has often been less with charges to users than with management of the revenues collected. Funding from road user charges has typically covered 30 to 40 percent of maintenance expenditure. Albania and Croatia, for example, have raised significant revenues from user charges, including a fuel levy, but these funds have not ensured an adequate flow of maintenance expenditures. Several countries have experimented with road funds, but these have not often solved fundamental problems of governance (box 4.5).

Building Partnerships with the Private Sector

In the early to mid-1990s, many governments in the region thought that the private sector would be willing to finance and operate major components of the infrastructure sectors, and this hope motivated much of the initial reform effort. Private sector participation can be valuable, not only as a source of cash, technology, and management expertise, but also as a way of transforming the paradigm of service

provision from social entitlement to economic good. However, governments need first to set policies to ensure a minimum of financial viability and establish confidence for both investors and consumers.

From 1990 through 2004, private funding flowed predominantly into telecommunications, with energy attracting about one-quarter of the investment and transport and water together obtaining less than 10 percent of the total regional inflow. The majority of transactions took the form of divestiture, with greenfield projects (such as build-own-operate) a close second. Concessions, leases, and management contracts were rarer (6 percent of the total). Half of the private investments in infrastructure were in the CEE countries.

Power generation and distribution attracted much of the private involvement. Among the focus countries, Armenia, Poland, and Georgia privatized significant portions of their generation assets. Only the Slovak Republic privatized its entire power distribution system, although Poland, Romania, and Ukraine have done so for portions of the distribution network. In Albania, the state-owned utility is operated under a management contract, an arrangement that does not involve private risk capital. Management contracts are also being used in Georgia for both distribution and transmission.

On the whole, private sector participation in the power sector has produced beneficial results because private operators have succeeded in improving collections and the reliability of supply. Tariff-related disagreements have been more troublesome in the CIS, and in two cases resulted in disinvestment. A decision by the Georgian regulatory authority in 2002 to raise tariffs, in line with a contractual agreement between the private distribution company and the government, was reversed by the constitutional court, which ordered a rollback. This created conflicts between the company and the government and resulted (together with systemic problems of nonpayment) in departure of the private investor.

The experience with private participation in power has provided some useful lessons. Countries have learned that their emphasis on seeking strategic (mainly Western) investors will not produce major turnarounds in performance in the absence of credible reforms in the basic conditions for financial sustainability. It has become clear that creating payment discipline, bringing tariffs close to at least medium-term cost-recovery levels, and putting in place credible regulatory arrangements are preconditions for success and should be ensured before divestiture, as with Armenia (box 4.3). Setting appropriate conditions for competition is also critical. Unbundling is often called for, and vertically integrated monopolies need to be dismantled before sale. Competition and transparency in the awarding of contracts, such

as leases and concessions, are also critical to their success, as well as to public acceptance. Care is also needed to mitigate the risk of contingent liabilities resulting from poorly designed concessions to private operators. In Turkey the government provided guarantees to private operators in electricity generation that subsequently led to legal challenges, arbitration, and further liabilities for the budget.

The water supply and sewerage sector has received only 3 percent of total private investment in the region. Among the focus countries, privately owned and operated water systems are now found in some cities in Poland, the Slovak Republic, and Romania, although they are nowhere as extensive as those in the Czech Republic. A water concession is under way in one city in Albania. Management contracts are the more common of the various forms of private sector provision and are found in Albania, Armenia, Turkey, and Ukraine. Under a management contract the private operator receives a fee with incentives for achieving good performance, but does not finance investment. The Armenian (Yerevan) experience has been so good that the government has decided to make the subsequent arrangement a lease, implying more extensive responsibility for the private partner. A concession is much longer term (at least 15 years) and the contractor finances agreed on investment; the benefits can be much greater but so are the risks if the government (as regulator) does not live up to commitments regarding tariff approvals or associated investments. The results from two high-profile water and wastewater system concessions, one in the Czech Republic and the other in Sofia, Bulgaria, have been quite positive. However, private sector participation in water is not spreading widely throughout ECA, in part because of global retrenchment by the major private water investors. Creditworthy municipal governments are beginning to look at opportunities for borrowing directly on domestic or international capital markets for their needed water investments, provided basic utility performance is satisfactory.

The transport sector has absorbed only about 4 percent of the privately financed investment in the region since 1990. Among the focus countries, the largest recipients have been toll roads in Croatia, Hungary, and Poland. In Hungary, the toll road concessions proved overoptimistic in projecting market demand, and they have been revised to protect the toll operators from traffic risk by transferring the risk to the state. This provides a cautionary note to the Croatian motorway program mentioned earlier, 60 percent of which is funded by sovereign- and subsovereign-guaranteed debt. This experience with private sector participation in major road programs underscores the critical importance of realistic demand forecasts and of risk-shar-

ing arrangements between the public and private sectors, to ensure that the expected benefits for the country are sustainable without undue burden on the government. The road sector has had broader but less visible private sector participation for periodic maintenance, through competitive awarding of contracts. The shift from reliance on government maintenance units to contracting out to the private sector has improved efficiency, although possibly less than could be achieved if legal frameworks and contracts were more transparent (Willoughby 2006).

For most of the region the challenge for railways is to establish commercialization as a basic prerequisite to attract more private involvement. Poland and the Slovak Republic have separated the railways' lines of business, and Romania has converted the three major business lines into legally independent companies (for track infrastructure, freight, and passenger operations) and is investigating privatization of the freight company. In response to EU influence, these three countries have also opened track access for third-party railway operators to allow for competition. Georgia features some private competition in rail supply industries (Amos 2005), and the government in Armenia has recently decided to seek a private concessionaire for its railway.

Conclusions

Adequate infrastructure is essential to economic growth. This overview of status and reform progress in four infrastructure sectors in ECA leads to several conclusions with implications for public finance policy. First, transition countries in ECA inherited more infrastructure stocks than typical in countries at similar levels of per capita income. Thus, they did not face pressures for investment in expansion or suffer absolute supply constraints in the 1990s. However, this cushion—which was much softer and deeper for some countries than others—is no longer evident in most economies. The countries where growth rebounded most strongly are now outgrowing much of their asset base, especially in power, while the less dynamic countries face massive replacement and rehabilitation requirements as a result of years of undermaintenance and the effects of poor technical design (which have contributed to system losses). Quality and reliability of infrastructure are a persistent concern throughout ECA, and past neglect of environmental impacts has also created a backlog of investments in such areas as wastewater treatment.

Second, most ECA countries have adopted policy reforms designed

to enhance operational efficiency, financial sustainability, and commercial orientation. The record and results are generally better in the CEE countries of the sample than in the SEE or low-income CIS countries (with the exception of Armenia, which has followed some notable good practices to date). This suggests that an overall environment of better governance and prospects for EU accession are also helpful in spurring reform. The major investment funding becoming availability in the prospective EU member countries can greatly enhance their infrastructure, provided the recipients pursue sound project selection and operations and maintenance practices.

Third, significant hidden costs or implicit subsidies remain in several ECA countries, especially for power and, to a lesser extent, for water, and they create current or contingent liabilities for the public sector. Addressing unaccounted losses, low collection rates, and tariffs below cost recovery should be a priority for both the sectoral and the broader public finance reform agendas.

Fourth, although tariffs set at cost-recovery levels appear to be affordable in the CEE countries,[28] full and rapid adjustment to full cost recovery might be less affordable in many of the SEE and CIS countries, particularly for the lowest income group. Most countries will need to make further improvements in social safety nets to enhance targeting and strengthen administrative efficiency to ensure access of poor households to basic infrastructure services. Such safety nets obviously have fiscal implications, but these can be less burdensome to the general budget and more effective in protecting vulnerable users than the traditional tariff subsidies that persist in many of the countries.

Fifth, governments need to ensure adequate funding not only for needed investments but also for ongoing maintenance. Although experience with dedicated road funds has been largely disappointing to date, institutional arrangements are needed to facilitate user funding to the extent possible and allocate that funding between maintenance and new investment.

Sixth, most ECA countries have transferred responsibility for managing certain types of infrastructure to municipal governments. However, it is unclear whether municipalities have the capacity to enforce financial and operational discipline and to provide appropriate levels of fiscal support. The incentives for municipal investment and the capacity and creditworthiness of municipal governments are becoming increasingly important issues for the public finance agenda.

Finally, scope exists for greater private sector participation in infrastructure, which has expanded rather slowly in recent years. But private sector participation is unlikely to materialize and succeed unless

the policy framework ensures financial viability and promotes fair competition. Furthermore, some transactions and contractual arrangements undertaken to date indicate the need for strong vigilance to ensure that private sector participation contributes to improved governance. In any case, the private sector is unlikely to provide the bulk of necessary funding, and provision of infrastructure services will continue to claim an important share of the public budget.

Notes

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1. Telecommunications, ports and airports, and gas networks are also economic infrastructure but are not discussed here. These are all tariff-based and amenable to fully commercialized operation as well as to private sector provision, and therefore less of a concern to public finance analysis. The chapter also refers only briefly to sewerage, district heating, solid waste disposal, or public transport systems—activities that generate tariff revenues but are typically not fully cost covering even under efficient operation, and generate social externalities. Many of the infrastructure services delivered to households (often called "communal services" in the region) fall under the jurisdiction of municipalities, which bear the public finance responsibility.
2. Toll roads are an exception, although they occupy a very small share of the total road network in most countries.
3. The public expenditure data series collected for the present study has figures on "Transport" or "Transport and Communications" and on "Fuel and Energy." Aside from the fact that these categories are too imprecise to permit sectoral analysis, comparisons across countries or over time, even as shares of GDP, are not likely to be accurate for several reasons. There may be differences in whether the accounts of publicly owned utilities are included in government budgets. If so, whatever costs are recovered from users should not be considered public expenditures. Countries also differ in the extent to which infrastructure providers are privatized or are decentralized to local governments, making it difficult to define comparable expenditure aggregates from the reported public sector data. In countries of most regions, including ECA, water utilities, local roads, and suburban passenger rail services have been largely devolved to local authorities. However, information on municipal budgets tends to be incomplete or missing in national level data sources. It is safe to say that during the socialist period in the ECA transition countries, virtually all infrastructure was developed by centralized public expenditure with little attempt at cost recovery, and that this situation

has been changing at a varied pace in all the focus countries as discussed here. Of the non-ECA focus countries, only Vietnam and possibly Uganda have a similar recent history.

4. Albania, Armenia, Croatia, Georgia, the Kyrgyz Republic, Poland, Romania, the Slovak Republic, Turkey, and Ukraine.
5. The Kyrgyz Republic, Moldova, Tajikistan, and Uzbekistan.
6. Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, and Serbia and Montenegro.
7. All of the ECA focus countries are energy resource–short, so meeting necessary demands requires imports of fuels or electricity.
8. Power supply in Albania shows effects of constraints in hydropower output from drought, high costs of imported fuel, and lack of adequate investment in new generating capacity to keep up with economic growth.
9. The transition countries of central and eastern Europe that have joined the European Union to date include Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, and the Slovak Republic.
10. EBRD *Transition Report* 2001, cited in World Bank 2006d (p. 36, table 43.2). The ratio of per capita annual kWh of electricity consumed to per capita GDP is about 0.8 in middle-income countries, versus 1.4 in Armenia, 1.6 in Georgia, 2.9 in Ukraine, and 4.4 in the Kyrgyz Republic.
11. The weighted average end-user tariff (WAET) is the average tariff rate actually charged taking into account differences in residential and nonresidential tariff rates and respective quantities consumed.
12. Turkey will require major energy sector investments (estimated by the Ministry of Energy at US$4 billion annually) to meet its future electricity needs. The cost recovery tariff of US$07.74/kWh estimated in 2003 was actually slightly below the actual 2003 WAET.
13. Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, and Serbia and Montenegro.
14. Available data are reported for individual utilities, often comprising less than the complete number of utilities in the country. This makes it difficult to compare data over time and across countries because samples may not be consistent. Illustrations provided are based on utility-specific data in each country sample that may not be representative of conditions in the national water sector.
15. The figures for the Kyrgyz Republic represent only Bishkek and Osh, and should not be interpreted as reflecting sector efficiency in the country overall. Only 10 percent of water service in the country is metered.
16. Assumed savings incurred through interrupted water supplies are equal to one-quarter of the cost of maintaining supplies around the clock. Savings reflect reduced need for short-term maintenance and energy consumption. A reduction in the duration of water supplies does not necessarily mean a reduction in consumption.
17. To ensure service standards, necessary maintenance is assumed to be based on the value of assets, at 4 percent per year, based on asset life span of 25 years. This is also consistent with the standard under Soviet rule.
18. Average 2006 figure for 62 utilities, based on the Monitoring and Bench-

marking Program Results in the Water Supply and Sewerage Sector in Albania.

19. Traffic density is measured by the ratio of total traffic units (freight tons-km + passenger-km) to total network capacity.
20. The Georgian railway does not receive any government subsidy, although it is requesting that the government end the cross-subsidization of passenger service from freight and provide a public service obligation fiscal subsidy for passenger services. Georgia railway is profitable and has growing traffic because it carries large volumes of oil and oil products from Kazakhstan and Turkmenistan for onward movement to Europe.
21. World Bank 2006a, chapter on Transport.
22. Working ratio is defined as operating expenses (excluding depreciation) divided by operating revenues (including other operating and nonmonetary income, but excluding government subsidies and privatization proceeds). The higher the working ratio, the higher the degree of financial distress.
23. At least until recently, Armenia Railway has been a very poor example of a railway taking action to downsize and cut costs. The railway may be operating a sharply reduced network (from 800 km down to 350 km), but they keep open facilities on the whole network, including staff for stations that have no traffic. While the railway is modestly profitable, cash flow from operations—US$200,000–400,000 per year in recent years—could fund only US$3–6 million of US$400 million in investment needed to replace or rehabilitate severely deteriorated assets. The Armenian government has recently decided to concession the railway to a private operator, which may make a difference in performance. A better example of a railway in the region (although not in the present sample) that has done well at cutting costs and putting operation on a business footing is Kosovo.
24. World Bank (2004e) reported that no public funds were allocated to railways as of that year.
25. Regional (provincial or secondary roads) and communal roads often have significant social functions compared to their economic functions; they are mostly access roads in either rural or urban areas, span relatively shorter lengths than major roads, and carry low levels of motorized traffic. These roads are usually the financial responsibility of provincial or local governments.
26. Maintenance of secondary roads will be at lower standards and hence lower cost, because of lower traffic density.
27. Some of these infrastructure investment cuts were probably overdue and occurred in the context of the rationalization of the public investment portfolio. In the past, the investment program seems to have been overloaded with low-priority projects. Unclear criteria and processing rules had resulted in "overprogramming" of the public investment program. As a result, the stock of approved but unfinished projects grew to an average of more than 5,000 during the latter half of the 1990s, and the average completion time increased to about 10 years. Many projects received "trace" allocations, that is, amounts nowhere near enough to implement the project, but assigned merely to keep it in the PIP. Ratio-

nalization of the investment portfolio initiated in 2001 has been quite effective, by eliminating about 1,000 projects in the 2001 program (mostly transport, energy, and agriculture projects) and by reducing the number of multiyear projects. The total number of projects further declined from over 5,000 in 2001 to 2,627 in 2005, while the average completion times (based on actual annual investment spending) was reduced to 5.5 years in 2006.

28. At least before taking account of the EU-required environmental investments (for wastewater treatment, for instance).