5. Affordability of the infrastructure services

A. Can the consumers afford the price of services?

The first phase of transition impoverished the population of the region to such an extent that by 1998, nearly 21% of the population (or 102 million people) were classified as poor living on a daily income of $ 2.15 or less.[45] Another 34% of the population (or 161 million people) were classified as economically vulnerable living on a daily income of $4.30 or less. The existence of such widespread poverty made the utility reform process difficult and called for social protection measures to mitigate the impact of increased cost of utility services on the family budgets of the poor households.

Largely because of the resurgence of economic growth in CIS, during 1998-2003, the situation has improved to some extent. By 2003, the share of the poor in the total population fell to 12.8%, the share of the vulnerable fell marginally to 32%, while the share of the non-poor increased to 55%. Variations within the sub-regions were notable. The percentage of the poor was less than 5% in CEE, between 5% and 20% in SEE and middle income CIS and greater than 40% in low income CIS.

To ensure financial sustainability of the utility services, reform programs focus on adoption of improved metering and billing systems, enforcing payment discipline and improving collections and even more importantly setting levels of tariffs to generate adequate internal cash to contribute to the investment needs for rehabilitation after meeting all operational expenses and debt service obligations. In addition, tariff reform also focuses on correcting the distortions in the structure of tariffs and eliminate the cross subsidization of residential tariffs by industrial and commercial tariffs. A reform program focused on this set of objectives directly impacts on the share of utility services cost in the total household expenses of residential consumers. In the case of poor households, the increase in utility bills may force them to: (a) reduce their consumption to a level lower than desirable; (b) switch to unhealthy, dirtier and environmentally unsound choices; and or (c) reduce consumption in respect of other basic needs such as nutrition, clothes, and healthcare.

Affordability ratios

Affordability ratio for any particular utility service is the percentage share of the expenses on that utility service in the total household expenses. An analysis of this ratio across income slabs (usually quintiles or deciles) with reference to a normative ratio (or threshold) provides useful insights, especially for understanding what happens to the poorer households when tariffs are raised. When a tariff increase or a collection enforcement program results in the affordability ratio of the poor exceeding the threshold, it usually indicates the need for social intervention to offset the adverse impact. For the power sector in the region, a threshold ratio of 10% to 15% has often been used for countries in which electricity is also used for space heating, cooking and hot water and a ratio of 10% if other fuels are used for these purposes. Tepic and Frankhauser suggest a ratio of 25% for all utility services covering electricity, heat, water supply and sanitation.[46]

Household Budget Surveys (HBS) and Living Standards Measurement Surveys (LSMS) which are periodically carried out by the government authorities in these countries are the main sources of information for affordability analyses. The survey data provides only limited or partial insights into the

[45] In other region regions of the world people living on a daily income of $1.0 or less are classified as poor. In the ECA region a higher level of $2.15 is adopted to allow for the cold climate which requires heating and warm clothes.
[46] Sladjana Tepic and Samuel Frankhauser, *Can Poor Consumers Pay for Energy and Water? An Affordability Analysis for the Transition Countries,* Working Paper No. 92, EBRD, May 2005. This paper also suggests that to even out seasonal variations in expenditure, the ratio should cover a full year.

access, quality and affordability of the utility services, as the objectives of the surveys are much wider in scope than utility expenses. Until special utility business oriented surveys are commissioned and the results are reconciled with the utility records, HBS / LSMS is the only available source for affordability analyses. The interpretation of the raw survey data by different authors could give different results and comparisons have to be handled with caution.

Tepic and Frankhauser estimate that in the 27 transition countries, the average electricity payment accounts for no more than 5% to 6% of the total household expenditures. A summary of their disaggregated affordability ratios for electricity, heat and water sectors in 2003 both for all households and for the households in the lowest income decile is given in Table 5.1

Table 5.1: Affordability Ratios for Utility Services (2003)

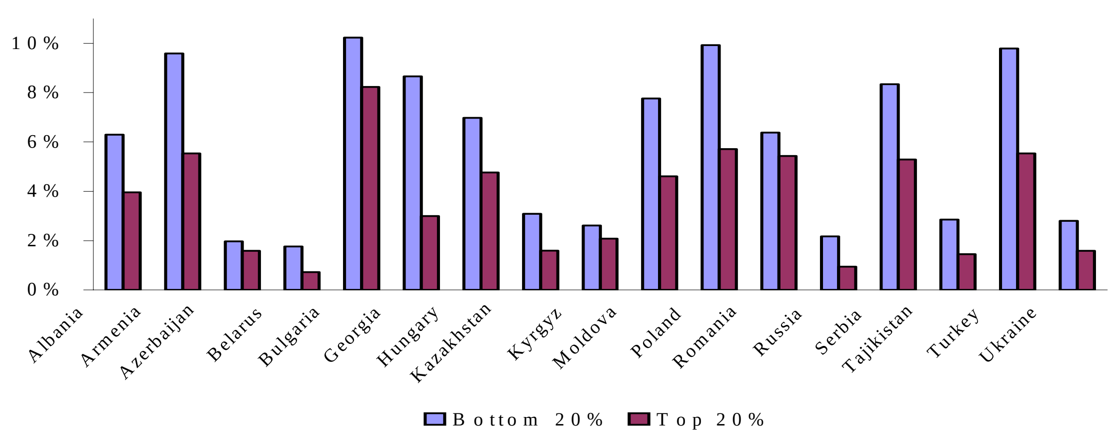
Area/ Sub-region	Affordability ratio for Electricity (%) Average		Affordability Ratio for Heat (%) Average		Affordability Ratio for Water (%) Average	
	For all households	For bottom decile	For all households	For bottom decile	For all households	For bottom decile
CEE	3.8	6.5	3.7	5.7	1.6	2.3
SEE	5.2	8.3	1.6	1.9	1.5	1.9
CIS	2.3	4.1	1.4	1.5	1.0	1.2
ECA Region	3 to 4	6 to 6.5	2.0	3	1 to 2%	1.8

Source: Tepic and Frankenhauser (2005)

They have also estimated that if payment discipline were to be enforced fully the electricity affordability ratios would rise from 8.5% to 10% in SEE and from 4.1% to 6.6% in CIS.

The above analysis is based on the published secondary data relating HBS/LSMS and it also takes into account households which make no payments for utility services. The Bank carried out a special review and analysis of the raw survey data, eliminated the households which make no payments for electricity and estimated the electricity affordability ratios for the lowest and the highest quintiles of the population for 17 countries. On the basis of this analysis, the average electricity affordability ratio for all households for 2002 was 5% for the region, 6.5% for CEE, 7.6% for SEE and 3.2% for CIS. The impact was more adverse on the households in the bottom income quintile. The affordability ratio for them in 2002 was 6.5% for the region, 8.5% for the CEE, 10% for the SEE and 4.5% for the CIS (Figure 5.1).

Figure 5.1: Electricity Affordability Ratios in 17 ECA Countries (2002)

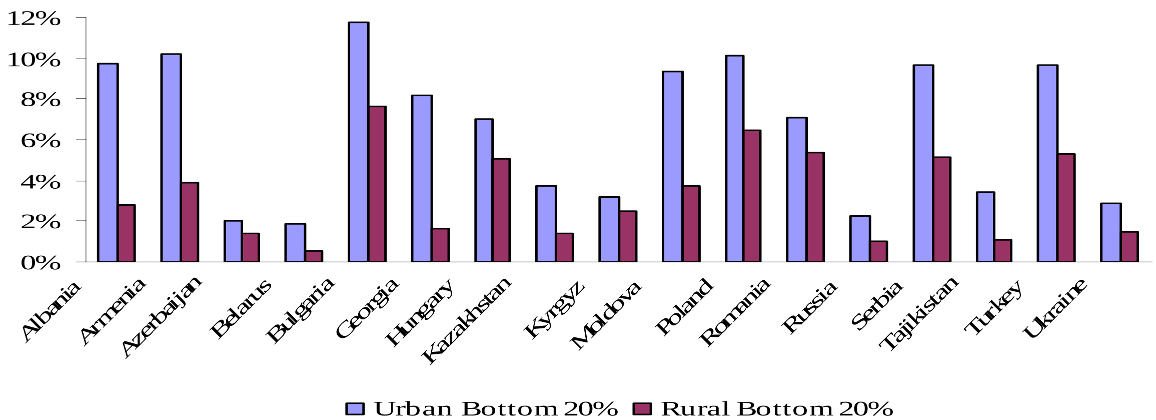


Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS

Note: Data for Bulgaria and Tajikistan relate to 2003.

The ratio is high in SEE since its income levels are not as high as in CEE and its power supply costs are not as low as in CIS. Further, in many SEE countries electricity is the only resource for space heating. The ratios are high in Armenia, Bulgaria, Georgia, Moldova, Poland, Serbia and Turkey, reflecting the results of significant tariff increases and in some cases collection enforcement. The ratios are lower in Azerbaijan, Belarus, Russia and Tajikistan reflecting lower supply costs and lower tariffs and slow tariff reform. Despite extensive use of electricity for space heating in Kyrgyz Republic, the ratio is low because of low tariffs and poor collections. It is relatively lower in Romania (because of the extensive use of gas for space heating) and Hungary (because of effective social protection measures).

Figure 5.2: Electricity Affordability Ratios in the Bottom Quintile in Urban and Rural Areas (2002)

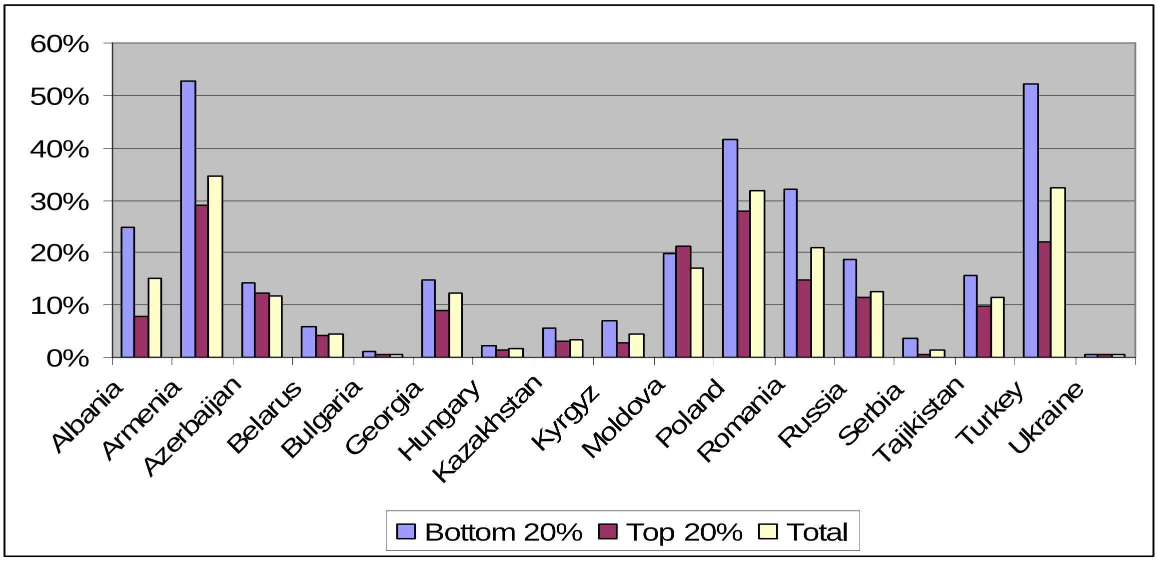


Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS Note: Data for Bulgaria and Tajikistan relate to 2003.

The poor households in urban areas have worse affordability ratios than the poor households in rural areas (Figure 5.2). This however does not imply that the affordability concerns of the rural poor are insignificant. The lower expenditure of the rural households on network utility services is often due to lack of power supply to rural areas. Poor rural households may also be prone to use dirtier fuel substitutes such as coal, biomass and animal dung for cooking and heating, both on account of lack of power supply and district heating and on account of their inability to pay for electricity.

The above analysis excludes all households which reported no payments to utilities. They constitute a significant percentage (12% to 13%) of total households. The percentage of such households in the poorest quintile is high (18% for the region) compared to the highest quintile (10% for the region) (Figure 5.3). Part of this could be attributable to the range of social protection mechanisms already in operation such as, 50-100% tariff discounts for 12 to 16 different categories of privileged consumers such as pensioners, war veterans, handicapped persons, Chernobyl victims and the like and other energy compensation payments. Part of this could also be attributed to the simple failure to pay the bill on the part of the consumers and failure to send bills on the part of the utilities. The rest is difficult to explain except in terms of the survey design and mechanisms not having been made to address our concerns. The high percentages in Turkey, Romania, Poland and Armenia are otherwise inexplicable.

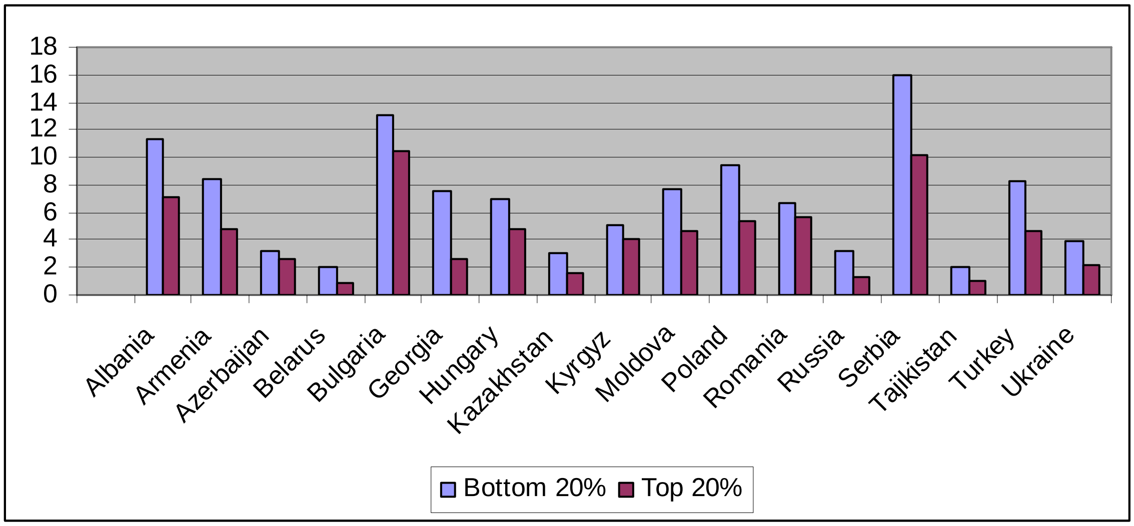
Figure 5.3: Percentage of Households which make No Payment to Power Utilities



Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS

Note: Data for Bulgaria and Tajikistan relate to 2003.

Figure 5.4: New affordability Ratios, if Cost Recovery Electricity Tariffs Are Used



Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS

Note: Data for Bulgaria and Tajikistan relate to 2003.

The household budget data had also been used to simulate to impact of an instantaneous tariff increase to the cost recovery level indicated in Table 4.1 and assuming a price elasticity of – 0.15 (i.e., 10 percent increase in the price of electricity would reduce demand by 1.5%) in 12 countries.[47] The results are in Figure 5.4

The results indicate that affordability ratios of the poor households would remain the same or decrease slightly in respect of nine countries (Armenia, Belarus, Georgia, Hungary, Kazakhstan, Moldova, Poland, Turkey and Ukraine), as their tariffs in 2002 were equal to or slightly higher than the cost recovery tariff levels. In respect of the remaining, the new ratios are well within the 10% thresholds except in the case of three countries (Table 5.2). Albania, Bulgaria and Serbia would have ratios in the range of 11% to 16% because of the extensive use of electricity for space heating, cooking and hot water.

Table 5.2: Impact of Power Tariff Increase on the Affordability Ratios of the Poor Households

Country	Affordability Ratio in 2002	Affordability Ratio with cost recovery tariffs	Increase in the ratio
Albania	6	11	5
Armenia	10	8	(2)
Azerbaijan	2	3	1
Belarus	2	2	0
Bulgaria	10	13	3
Georgia	9	8	(1)
Hungary	7	7	0
Kazakhstan	3	3	0
Kyrgyz Republic	3	5	2
Moldova	8	8	0
Poland	10	9	(1)
Romania	6	7	1
Russia	2	3	1
Serbia	8	16	8
Tajikistan	3	2 (?)	?
Turkey	10	8	(2)
Ukraine	3	4	(1)

Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS

Note: Data for Bulgaria and Tajikistan relate to 2003.

Further, the analysis is meaningless in respect of Tajikistan, where the 2002 tariff/kWh of 0.3 cents has to be increased by 700% to reach the cost recovery level of 2.1 cents. Such cases highlight the need to adopt a phased approach to tariff increases, while designing and adopting social protection for the poor households. When tariff increases are phased over the medium term, the income increases of households and their ability to replace inefficient household appliances would help to moderate consumption and pay for it.

Access to gas supply, district heat and piped water and affordability ratios for these services estimated from the HBS raw data for the poor households (lowest quintile) are provided in Table 5.3, which also provides the estimated affordability ratio for all energy related expenditures (power, gas, liquid fuels, wood, coal and central heating).[48]

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[47] Price elasticities from –0.15 to –0.75 have been used in Taiwan (Holtedahl and Joutz 2004), India (Filippini and Pachauria 2004) and Ethiopia(Kebede, Almaz and Kedir 2002).

[48] The sum of the ratios for individual items will not be the same as the ratio for total energy expenditure as different households will have a different mixture of energy sources.

Table 5.3: Access and Affordability Ratios for Gas, District Heat and Water (2002)

Country	Gas access (% of poor popu lation)	Gas expenditur e (% of house hold income)	District heating access (% of poor popu lation)	District heating expenditure (% of household income)	Total energy expenditure (% of household income)	Water access (% of poor popu lation)	Water expendi ture (% of house hold income)
Albania	—	—	0	—	—	48	1
Armenia	28	7	3	—	—	91	2
Azerbaijan	57	2	13	1	4	64	1
Belarus	93	—	79	—	—	78	
Bulgaria	1	3	13	12	16	90	4
Georgia	13	8	0	8	14	75	1
Hungary	53	11	10	15	20	90	4
Kazakhstan	15	3	10	12	9	44	1
Kyrgyz Republic	17	4	9	7	4	24	1
Moldova	23	9	20	19	9	21	3
Poland	34	7	20	10	13	93	3
Romania	21	7	14	12	—	30	3
Russia	66	3	60	4	—	79	1
Serbia	4	7	12	1	15	82	—
Tajikistan	16	—	3	7	—	36	2
Turkey	1	29	1	—	13	85	4
Ukraine	57	4	36	7	9	66	1

Source: World Bank Staff estimates based on WB archived data base of HBS/LSMS

Note: Data for Bulgaria and Tajikistan relate to 2003. –denotes that data are not available.

The number of households with access to gas in the ECA region is lower than the number with access to power. Access is highest in urban areas, where average access for the poor across the region is about 47 percent. Access of the urban poor to gas is more than 50 percent in Central and Eastern Europe, about 55 percent in the CIS, and 10 percent in Southeastern Europe (this figure, however, excludes Romania, where there have been historically abundant gas supplies, and where the gas infrastructure is well developed).
Average access of the urban poor to district heating is about 30 percent across the region and in each sub-region.

The average affordability ratio for gas for poor consumers in the ECA region is 7.4 percent. For district heating, the ratio is about 9 percent. Total energy affordability is about 8 percent for poor consumers in the CIS, 15 percent in Southeastern Europe, and 16 percent in Central and Eastern Europe.

Access rates for piped water are substantially lower in rural areas (56 percent) than urban (91 percent). The biggest difference between water and energy relates to expenditure as a share of income: Households spend substantially less on water (some 1 percent to 2 percent of income) than on energy.

Tariffs are near cost recovery levels in CEE, while they lag behind cost recovery levels in SEE and much more so in CIS. The region as a whole and the CIS in particular are registering notable rates of GDP growth and household incomes. In this context rates of tariff increases needed to catch up with full cost recovery level[49] by 2007 and to maintain them in real terms, would be lower than the rate of household

[49] The full cost recovery tariff assumed for this purpose are: (a) Electricity—8 cents/kWh in CEE and SEE and 6 cents/kWh in CIS countries; (b) District Heat—4 cents/kWh in CEE and SEE and 3 cents/kWh in CIS; and Water--

income growth in CEE, while the opposite would be the case in SEE and CIS. Taking into account the GDP and household income growth, income elasticity and price elasticity and assuming a set of cost recovery tariffs for each sub-region to be reached by 2007, Tepic and Frankhauser have estimated the affordability ratios for the poor households (bottom income decile) for 2007. They have also estimated the ratios for 2010 on the basis of assuming that full cost recovery tariffs would be in place only by 2010. Both are summarized in table 5.4.

Table 5.4: Future Affordability Ratios

	Affordability Ratios 2007 (%)			**Affordability Ratios 2010 (%)**		
Region/Scenario	Electricity	Heat	Water	Electricity	Heat	Water
CEE Scenario I	5.2	6.1	3.2	4.7	5.6	2.9
CEE Scenario II	5.2	5.9	2.9	4.7	5.6	2.9
SEE Scenario I	10.9	7.6	6.8	10.0	7.2	6.3
SEE Scenario II	9.9	3.8	4.4	10.0	7.2	6.3
CIS Scenario I	5.9	8.2	10.3	5.2	7.4	9.4
CIS Scenario II	4.5	3.8	6.3	5.2	1.4	9.4

Source: Sladjana Tepic and Samuel Frankhauser 2005

Scenario I involves cost recovery tariffs by 2007. Scenario II implies Cost recovery tariffs only by 2010

A phased tariff increase on the basis of a well planned medium term tariff plan to reach full cost recovery level would clearly ease the affordability concerns to some extent in the poorer CIS countries. However the delay in the utilities reaching financial viability would adversely affect the quality of supply to industries and commerce leading to a slowing down of the economic growth needed to lift the low income households out of poverty. Appropriate trade offs will have to be made in each country depending on its growth factors. Relatively rapid tariff reform complemented by effective social protection of the poor appears to be the optimal course of action.

How the governments tended to cope with affordability problems?

In the context of significant tariff increases which took place during the transition to offset the effects of inflation, and steeply rising costs, the governments in the region had been adopting a variety of methods to ease the burden of the people. They include:

- Allowing the tariff for industrial and commercial consumers to cross-subsidize residential tariffs
- Tolerating nonpayment of utility dues and not disconnecting supply to nonpaying residential customers, especially in the district heat supply;
- Providing 50% to 100% tariff discounts to 12 to 16 different classes of privileged persons such as pensioners, war veterans, handicapped persons, Chernobyl victims, military and police personnel, war widows, and persons decorated for acts of bravery, patriotism and other great achievements. Often these discounts covered as much as 50% of the population
- Life line rates under which the lowest block of consumption was charged at a rate substantially lower than the average tariff
- "Burden Limits" approach under which the households were expected to pay a specified percentage of their household disposable income. Payments above that are to be paid by the government to the utility. Such payment was generally limited to the notional amount of service to which the household is "entitled" (a predetermined basic needs level of consumption)
- Earmarked cash transfers under which cash payments are made to selected households for payment of a part of the utility bills to ensure that the families meet a specified household income target. These

$1.4/cubic meter of piped water in CEE and SEE and $1.0/cubic meter in CIS (all figures are at constant 2007 dollars) amounts could be used only for payment of utility bills. Energy vouchers which are payable to the utilities instead of cash belong to this category, and

- Non-earmarked cash transfers under which the households get an income supplement enabling them to have the stipulated minimum monthly incomes, but the households have the freedom to spend it as they like.

Evaluation of options

The first two options are clearly not conducive to the financial viability of the utilities and the focus of the reform had been to minimize cross subsidies and enforce payment discipline. The privileged tariff discount system was not designed to alleviate poverty but to reward services or achievements and to compensate for injury or illness and it is not surprising that its coverage of the poor is low, its leakage of benefits to non-poor is very high and that it lends itself to high levels of billing abuse. It still lingers in its original or modified form in many CIS countries and the focus of the reform is to monetize the (reward or compensatory) benefits, so that they do not distort the prices of services and erode the finances of service providers.[50]

The appropriateness of any of these options for any sector in any country has to be evaluated with reference to criteria such as:

- Coverage—what percentage of the poor is being reached by this instrument?
- Targeting—what percentage of the subsidy goes to the poor?
- Predictability—can the poor be sure how they will receive and plan accordingly?
- Price distortion—does the scheme cause price distortions and economic welfare costs in the system?
- Administrative cost—how expensive is the scheme to administer? How practical is it under the country circumstance?
- Target consumption—how good is the scheme in ensuring that households achieve a minimum level of consumption considered socially desirable?
- Balanced approach—how good is the scheme in balancing the financial viability needs of the utility and the ability to pay by the consumers
- Cross subsidization—within the sector(e.g., electricity) and between sectors (e.g., between electricity and heat)

Laszlo Lovei et ale provided one of the earliest generic quantitative evaluations among the alternatives and recommended detailed surveys of the consumers and analysis of the sector before applying them in any country, especially for deciding on the relative weights to the criteria.[51] A more recent evaluation of these options was made in the context of a social protection review of the energy sector in Tajikistan and Uzbekistan is reproduced below to indicate how choices are to be made for the circumstances of the country and the sector (Table 5.6). This was the result of a review of experiences in a range of countries in the region and the related literature.

[50] Laszlo Lovei et ale, 2000, Maintaining Utility Services for the Poor, World Bank Report 20874, Washington DC.
[51] Ibid.

Table 5.6: Evaluation of Options for Social Protection in the Utility Services

Options/ Criterion	Lifeline tariffs			Burden limit	Other ear-marked cash transfer	Non ear-marked cash transfer
	Two blocks	Three blocks	Floating blocks			
Coverage	Elec: good Gas: med DH: poor	Elec: good Gas: med DH: poor	Elec: good Gas: med DH: poor	Poor	Medium	Medium
Targeting	Poor	Medium	Medium	Poor	Good	Good
Predictability	Good	Medium	Good	Medium	Medium	Good
Price distortion	Medium	Good	Medium	Poor	Poor	Strong
Administration cost	Good	Good	Medium	Poor	Poor	Poor
Target consumption	Good	Good	Good	Poor	Good	Medium
Balanced approach	Medium to good	Medium to good	Medium to good	Medium	Medium	Good
Cross subsidies	Good to medium	Medium to poor	Good to medium	Good	Good	Good
Fiscal sustainability	Good to medium	Good to medium	Good to medium	Medium to poor	Medium to poor	..

Source: Design of Sustainable Social Protection Schemes under Energy Sector Reforms in Tajikistan and Uzbekistan, Shaw Stone and Webster Consultants, April 2005.

By and large, the relative benefits and shortcomings of the key options can be summarized as in table 5.7 below.

Table 5.7: Relative Benefits and Shortcomings of the Options

Mechanism	Benefits	Shortcomings
Notional burden limits approach	Benefits can be predicted with reasonable certainty; relatively low administration costs	Coverage and targeting of the poor is usually relatively low; there are heavy administrative burdens on the poor associated with its application; it is one of the most distortionary mechanisms of all utility subsidy mechanisms on the demand side; costly for the budget; a network of offices needed to administer the scheme.
Life-line tariffs	High coverage of the poor; targeting ratio improves as the size of the initial block decreases; the benefits received are highly predictable, especially through a two-block life-line tariff; the scheme is simple to administer.	Since the poor tend to be under-represented among those with utility connections, many would not benefit; it requires reliable (tamper-proof) metering or a reasonable proxy (such as apartment size for heating) to estimate consumption; disciplined meter readers/controllers are needed; there is a significant burden on the budget, on the finances of the utility, or on other (industrial) consumers (if the cost is recovered through a higher industrial tariff).

Mechanism	Benefits	Shortcomings
Other earmarked cash transfers	The targeting ratio is relatively high; the net financial burden on utilities is low.	Coverage of the poor as achieved by earmarked cash transfer schemes is highly uncertain, and in most surveyed countries was low; it is administratively demanding.
Non-earmarked cash transfers	Coverage depends on the ability and willingness of the poor to meet the eligibility criteria; it is the least distortionary of the utility subsidy mechanisms; there are no additional administrative requirements if a social assistance system is already in place; there is no financial burden for utilities or other (non-household) consumers.	The targeting ratio of the poor is usually at a medium or low level; there is a significant fiscal cost.

Source: Azerbaijan: Issues and Options Associated with Energy Sector Reform, World Bank (2005)

Lifeline rates are in use in Albania, Bulgaria, Hungary, Serbia, Kyrgyz Republic and Tajikistan. In Moldova and Romania consumers have the option to choose between a two block system and the normal uniform pricing system. Armenia, Hungary, Kazakhstan, Romania and Tajikistan operate dedicated energy or water assistance programs. Bulgaria and Georgia have seasonal programs to assist vulnerable consumers during the heating season. Burden limits approach had been adopted in Russia, Ukraine, Kazakhstan, Kyrgyz Republic, Slovakia and Latvia. In Russia the federal government sets the policies and standards while the provincial and municipal governments implement them. In Ukraine the program is administered at the national level. Earmarked cash transfers are adopted in Hungary, Latvia, Romania (Heating Assistance Program) and Bulgaria. Armenia, The list of countries which do not operate lifeline tariffs and also do not provide utility services specific earmarked cash transfers include, Armenia, Azerbaijan, Bosnia, Croatia, Kazakhstan[52], FYR Macedonia, Montenegro, Turkey, Turkmenistan, and Uzbekistan. They rely on non-earmarked cash transfers like pension and social security payments. Kyrgyz Unified Monthly Benefit and Armenian Poverty Family Benefit schemes are examples of non earmarked cash transfer schemes. As is evident, many countries operate more than one option simultaneously in an attempt to improve coverage and targeting.

Cash transfers

Theoretically non-earmarked cash transfers intended to ensure a minimum level of family income is the most desirable and causes the least distortion. This can be achieved by increasing pensions, social security payments and minimum wages. This would be practical only in those countries where poverty levels are low (generally less than 10%) and state budgets can accommodate the administrative and substantive costs, and informal incomes are low or insignificant so as not to distort means testing necessary to design the levels of income supplement. Further, payment discipline must be strictly enforced, since the recipients of cash transfers would have the freedom of choice as to how they use their income supplement. Examples of such countries would be Hungary and Poland.[53]

Analysis of the HBS data (2002) relating to 17 countries indicates that the coverage by cash transfers such as pensions, family allowance, child benefit, unemployment benefit, housing allowance and means tested benefits is on average 69% of the poor for the region, the range being 25% in Turkey to 100% in Hungary.[54] Also in terms of targeting, the percentage of these cash transfers reaching the poor rarely

[52] Kazakhstan changed over from burden limits approach to non-earmarked cash transfer approach in 2002, but still in many oblasts the former is believed to be in operation.
[53] Julian Lampietti (Ed), Power's Promise, World Bank Working Paper No.40 , 2004
[54]Poland, Romania and Bulgaria had coverage of 90%, 92% and 93% respectively.

exceeds the percentage of the poor in the population. Thus the design of any targeted subsidy for the poor based on these cash transfer systems would also have only a moderate coverage of the poor and high levels of leakage to the non-poor.[55]

Given the decade old culture of nonpayment for services and the extensive poverty prevailing in the region (especially in the CIS and some SEE states), as well as the compelling need to raise rapidly tariffs for utility services to cost recovery levels, reliance on non-earmarked cash transfer may not be practical in many CIS states. More importantly fiscal space would be problematic and non-payment culture may still jeopardize the financial health of utilities. Earmarked cash transfers or burden limits approach based on the notions of realistic basic minimum needs might be somewhat better, if the amounts are transferred directly to the utility or paid to the consumers only up on production of receipts for full payment of utility bills.[56] The administrative costs to identify and target the poor would still be considerable.

Lifeline rates

Lifeline rates would be practical only if all consumers are effectively metered and meter reading, billing and collection practices are efficient. Thus in respect of district heat and water, it would be unpractical. Even in respect of gas supplies, where a significant number of consumers remain without meters, its use would be limited. It may be relevant in the power sector, where metering is relatively more extensive. Also in countries where poverty levels are high making the other choices more difficult and administratively more challenging, life line rates would be a reasonable option, provided metering discipline is in place. In the absence of such discipline, billing abuses and fraud can take place. Armenia gave up on the use of lifeline rates in 1999 because of extensive fraud. In Kyrgyz Republic and Tajikistan the full consumption of almost all residential customers was billed at the lifeline rate.

In many countries using lifeline rates, the cost of subsidy provided to the lowest block(s) is recovered from the consumers in higher blocks by charging them at rates higher the cost of supply. Where the consumption at lifeline rate is a high percentage of the total sales, it may be more prudent for the state budget to reimburse the costs of the subsidy to the utility to avoid distorting the tariff structure. Box 5.1 outlines the other key variables which need to be taken into account while using the lifeline rate alternative.

In the case of district heat (as well as water and gas till extensive metering is in place) lifeline rate would not be possible and reliance has to be on earmarked targeted subsidies. Even in the case of power, lifeline rate approach may have to be supplemented by a targeted subsidy to improve targeting. As experience is gained in the targeted subsidy mechanism, the lifeline rate may be phased out, and the targeted subsidy may take over the social protection role fully.

Other steps

In addition to lifeline rates and income transfers, there are other actions which could mitigate the effects of tariff reform on the poor households. They include:

- Linking tariff increases to service quality improvements such as 24 hour supply and better voltage and frequency regulation. When supply is short, or of poor quality, the poor households suffer disproportionately, as their ability to use substitutes is limited and they resort to the use of dirty fuels. Public relation campaigns highlighting the benefits to consumers arising from higher tariffs could build support for tariff reform.

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[55] Bank staff estimates based on an analysis of HBS raw data in the Bank archives.
[56] The latter course was successfully used in Kazakhstan

Box 5.1: Design of lifeline tariffs to protect the poor and support energy efficiency

The appropriate size of the first consumption block in a lifeline tariff structure will be country specific. It will depend on whether electricity is the only reasonable option for cooking, space heating and hot water.

The range for the first block in the region is from 80 kWh per month in Romania—where power is typically used for lighting and appliances only, gas being the available alternative for cooking, space heating and hot water—to 350 kilowatt hours per month in Serbia, where power is the only viable source for heating in Belgrade and other cities.

Where power is used for heating it would seem reasonable to have *seasonal* lifeline tariffs, with the first consumption block increasing during winter. A first block that covers some or all heating needed in winter will be overgenerous through the rest of the year and create perverse incentives for energy efficiency.

If power is used for heating only by a part of the population that can be reflected in the design of the lifeline. Doing so requires calculating the amount of power required for heating, tailoring the first block to this level, and making only households with consumption above a minimum threshold (derived according to how much power is required for heating), below a maximum threshold (to preserve incentives for energy efficiency), and with no connection to either gas or district heating eligible for the lifeline.

Small groups within the poor may remain at home through the day (single pensioners and families with young children might fall into this category). They may need to consume above-average levels of power to remain warm. Special discounts or allowances might be made available on the basis of whether a household is registered for a specific benefit or can prove itself to be poor.

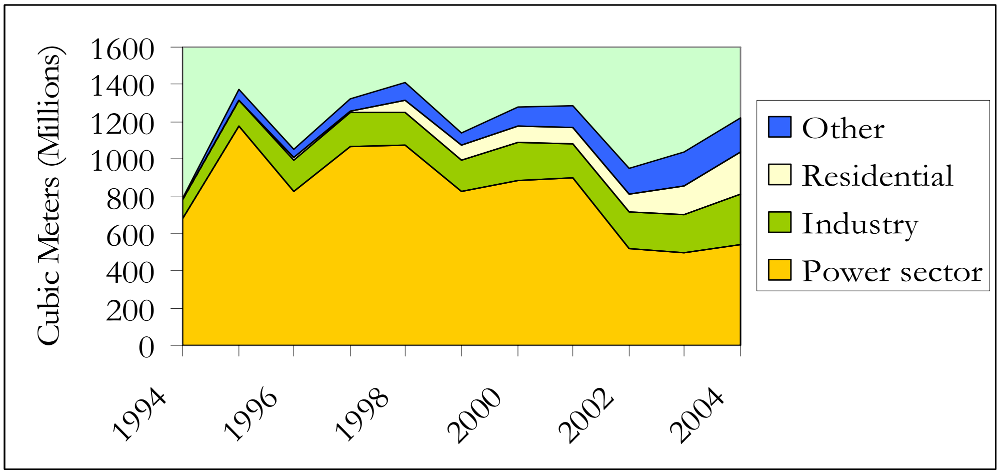
In Romania a hybrid mechanism has introduced some targeting. Customers can choose to pay a low marginal rate for the first consumption block and a higher marginal rate for additional consumption. Alternatively, they can choose optional tariffs which are based on constant marginal tariffs that fall somewhere between the two rates of the block tariff structure. Tariffs are set so that the block tariff is attractive to customers who consume only to cover basic needs and no more. For other customers with higher consumption, alternative options are more attractive.

This sector-specific safety net targets the poor, assuming that consumption is related to income (so the block tariff supports low-consumption, low-income customers). Under this assumption the subsidy covers the poor effectively, though less so for the poor consuming in the second block. The block tariff is not ideal from a pricing perspective, because the marginal tariff for the second consumption block is high relative to marginal cost and encourages under-consumption for one class of customers. Nevertheless, the Romanian model may be regarded as a good interim solution that could be replicated in other similar ECA countries.

- Using medium term tariff plans and phased adjustment of tariffs. This would help avoid tariff shocks, allow time for people to minimize their welfare losses by reducing their demand and increasing the use of substitutes and take advantage of income growth
- Increasing access to clean and reliable substitutes such as gas. HBS data indicate that electricity affordability ratios are lower for house holds with gas connection. This may be a good strategy in Central Asia and in SEE states like Serbia, where people use electricity for heating and cooking while there is scope for increasing gas access. Promoting fast growing fuel wood plantations and promoting the use of fuel efficient stoves using biomass in a clean way could help in the rural areas.
- Promoting energy use efficiency. There is scope for high return investments in residential energy and water use. Better insulation of houses to reduce heat losses and use of energy efficient appliances and lighting could help households to reduce energy consumption. However, given the design of district heating systems in which the consumer has no way of reducing his consumption, the home insulation programs should be applied only in residences with decentralized heating.

The experience of two of the poorer CIS countries, Armenia and Moldova, which have been able to raise tariffs to cost recovery levels and maintain payment discipline, is relevant in this context. Armenia restored 24 hour power supply since 1996 in most areas and generally maintained the quality of supply during the reform period. Also during 1997-2004, nearly a quarter of million residential consumers were connected to the natural gas network, enabling people to switch over to gas for cooking, space heating and hot water (Figure 5.5).

Figure 5.5: Increase in Residential Gas Consumption in Armenia



Source: Gevorg Sargsyan, Lessons from Armenia's Power Sector Reforms, World Bank (2005)

In Moldova too, both the private sector operator and the public sector operators improved the quality of supply and ensured 24 hour supply. This is believed to have benefited the poor disproportionately. The availability of gas and district heating options in the urban areas also helped.[57] Anecdotal evidence from the power distribution company in Georgia suggests that monthly collections fall or increase depending on whether the supply in the previous month was reliable or not.

Overall, the region has come a long way since the days of regional economic collapse, and most of the countries are experiencing dynamic growth. The number of people below the poverty line is reducing. In a majority of countries in the region power tariffs are already close to cost recovery levels. With suitable social protection in place, the affordability problems of the poor households should broadly be manageable. In a country like Tajikistan, where the tariffs are to rise substantially to match the cost recovery level, special efforts (both national and international) might be needed. In most of the low income CIS countries, international assistance would be needed to design suitable and practical social protection measures and to enable the governments to meet the social protection costs.

B. Can governments afford the funding needed for the provision of services?

The level of access for services in the region, especially in the low income CIS countries, are substantially high compared to those in countries in other regions of the world with similar GDP levels. The per capita consumption levels assumed for designing the facilities are even higher than those in OECD countries in respect of many services. This raises questions of affordability at the level of the state to operate and maintain systems of these sizes and support such high levels of consumption through subsidies in the absence of full cost recovery. To this also is added the burden of having to protect the poorer households

[57] Moldova Sharing Power: Lessons learned from the Reform and Privatization of Moldova's Electricity Sector, World Bank Report No. 30376-MD, December 2004

when tariffs are raised. When the Soviet Union was dissolved, and the economies of the region collapsed and all customers lost the ability to pay even the minimal prevailing tariffs, the stock of infrastructural facilities became excessive in relation to the greatly reduced demand. This is often referred to as the problem of over-dimension of infrastructural facilities.

Problem of over-dimension

The phenomenon of over-dimension has to be looked at in terms of its sectoral, spatial and temporal aspects. Its extent and the ability of governments to cope with it varied across countries and over time as a function of the extent of contraction of GDP and pace and extent of subsequent economic recovery. It also varied across sectors. Over-dimension is more relevant to electricity and possibly heat and, in a much more limited way, railways. In respect of waste water treatment and telecommunications, the access was substantially lower and the problem was one of creating additional assets to service the economy. While some of the gas distribution networks were allowed to deteriorate for want of funds to pay for gas imports, gas sector on the whole did not represent a case of over-dimension. In the case of water, over-dimension was more technical in the sense of using pipes of larger diameter, and pumps of higher HP and lower efficiency than normally used in other countries and the use of pumped sources, rather than gravity sources of water supply. There can not be much quarrel about universal access to safe water. The problems in the transport sector had a different flavor. The new passenger traffic and freight traffic from the large number of new small and medium industries called for expansion and reinforcement of road networks. Though the railways lost freight from heavy industry, a good part of such reduction was made up by the rising demand for the transport of energy products and minerals and chemicals and rail sector called only for a certain amount of rationalization and no large scale abandonment of assets.

Problems of over-dimension loomed large during the first phase of transition and abated to some extent as growth and demand for services resumed and as payment discipline was restored in the region. Still considerable over capacity existed in respect of electricity generation even in the in the second phase of transition. The rehabilitation of the generation assets (especially in countries such as Russia, Ukraine, Belarus, Kazakhstan and Uzbekistan) will have to be linked to the prospects of growth in domestic demand or firm electricity exports. Mothballing expenses relating to such generation assets were effectively transferred to the private sector in Kazakhstan by privatizing them at low prices, thus transferring to them also the responsibility for funding the rehabilitation costs when the domestic or export demand emerges. Transmission overcapacity was moderate and tolerable, while distribution capacity was highly strained and called for extensive reinforcement as growth gained dynamism since 2000. It is in the district heating sector, the collapse was more dramatic and many heat distribution systems substantially curtailed their coverage or were totally abandoned in the smaller CIS countries which simply could not pay for the imported fuel. Thus the intensity of the problem and the speed of its abatement varied (and will continue to vary) as a function of the growth and export prospects of each economy.

Spatially the problem was relatively minor and lasted only for a short time in CEE. Most countries in CEE have substantially commercialized their infrastructure sectors and transferred the investment responsibilities for electricity, water, gas, telecommunication, and heat and also parts of the rail and road systems to the private sector. The government budget provides for social protection and for the remaining portion of the infrastructure facilities (such as passenger traffic in rail, road transport other than toll roads) which are not easily amenable to commercialization or privatization. In SEE the situation was some what similar and the states are proceeding on similar lines. For all practical purposes, the problem in these states now (as in the case of most developing countries in the world) is to find resources to expand infrastructural capacity to support further economic growth.

It is worrisome and long lasting in the low income CIS countries, and especially in some of the Central Asian Republics. In CIS the problem was acute in the initial phase of transition, when several heat distribution systems and gas distribution systems were abandoned for want of funds to operate and maintain. Power generation assets proved excessive to the greatly declined demand and were allowed to languish without operating and maintaining them. These power assets are being rehabilitated as domestic demand revives and as export opportunities arise. Most infrastructural assets (such as those in power generation, railways and water) require rehabilitation to make them fully operational again and the pace of rehabilitation will depend on the growth in solvent demand.

In the larger middle income CIS countries (such as Russia, Ukraine, Kazakhstan and Belarus) with secure fuel supplies, growth dynamism since 2000 helped to overcome the problem to a notable extent. Economies are growing and demand is rising and fiscal deficits have narrowed and have become fiscal surpluses. In all four middle income CIS countries no significant new power generating capacities are needed till 2010 or even 2015. On the other hand most countries would need significant investments in telecommunication, road networks, and wastewater treatment systems.

Estimates of needed investments

How much investment the ECA region should make to maintain its growth dynamism? Though there is clearly a high degree of correlation between the availability of adequate infrastructure and the rates of growth, the nature of the causal relationship is not clear. Infrastructure is known to improve the welfare of the people, reduce costs of production and enlarge markets and thus lead to increased output. It is also known that countries with high outputs are the ones which are able to increase the stock and quality of infrastructure further. Clearly there is a mutual or cyclic causality—increased infrastructure leads to increased output and the latter, in turn, enables further increases in infrastructure. Further, an adequate stock of infrastructure assets is a necessary but not a sufficient condition of growth. They have to be functional; and the quality of service is a key ingredient. The problem (in this region and elsewhere) often is not so much to provide the infrastructure stock as to improve the quality of its service. Using data relating to 127 countries over the period 1960-2000, Cesar Calderon and Loius Serven have demonstrated not only the positive correlation between infrastructure stock and long term growth, but also the robust negative impact of infrastructure stock and quality on income inequality.[58]

In most other regions of the world, the question relates to how much investments should be made to increase the infrastructure stock to support the desired economic growth. In the transition economies, the question often raised is how much of the stock of infrastructure assets should be rehabilitated and kept operational to enable the recovery of the economies to at least the level of growth prevailing in 1989. In other words how much investment is needed in ECA region in relation to infrastructure to keep up the growth momentum?

Without carrying out a detailed appraisal of the assets in each sector in each country and forecasting the demand growth, it is not possible to build up from the bottom an infrastructure investment estimate for the region for the next five or ten years. Estimates for certain sectors in certain countries are available, but that does not help to estimate regional infrastructure investment needs. Marianne Fay and Tito Yepes analyzed the data relating to 147 countries covering the period 1960 to 2000 and developed a regression model which helps to understand the correlation between infrastructure investments and growth levels and thus estimate the infrastructure investment levels for the various regions of the world.[59] The sectors covered in their analysis were electricity generation, fixed and mobile phones, roads, railways, water and

[58] Cesar Calderon and Loius Serven, The Effects of Infrastructure Development on Growth and Income Distribution, World Bank, Washington. D. C.
[59] Marianne Fay and Tito Yepes, Investing in Infrastructure: What is needed from 2000 to 2010?, Policy Research Working Paper No.3102, World Bank, July 2003

sanitation. Based on this model they estimated the annual infrastructure investment needs in the ECA region during 2005-2010 to be of the order of $98 billion (or 7% of the GDP) including the annual maintenance needs estimated at $59 billion (or 4% of the GDP). This compares with an estimate of $465 billion (or 5.47% of GDP) for annual investment including $232 billion (or 2.73% of GDP) for annual maintenance for all developing countries of the world. Their paper projects sector wise investment needs also (see table 5.7)

Table 5.7: Sector-wise Annual Investment Estimates for the ECA Region for 2005-2010

Item	Power	Land phones	Paved roads	Rail Roads	Mobile	Water	Sanitation	Total
Investment ($million)	12,643	5,157	9,800	743	9,740	235	750	39,069
Maintenance($ million)	20,333	6,677	16,454	4,035	7,298	1,436	2,616	58,849
Total ($ million)	32,976	11,834	26,254	4,778	17, 038	1,671	3,366	97,918
Investment as a % of GDP	0.89%	0.36%	0.69%	0.05%	0.69%	0.02%	0.05%	2.76%
Maintenance as a % of GDP	1.44%	0.47%	1.16%	0.29%	0.52%	0.10%	0.18%	4.16%
Total as a % of GDP	2.33%	0.83%	1.85%	0.34%	1.21%	0.12%	0.23%	6.92%

Source: Marianne Fay and Tito Yepes (2003)

The above estimate does not provide fully for rehabilitation needs arising from backlog of maintenance and *may be taken as indicative of the lower bound of the investment needs of the region.*

Further studies on these lines by Cecillia Briceno-Garmendia, Antononio Estache and Nemat Shafik would appear to further increase these estimates for all developing countries from $465 billion (or 5.47% of GDP) to $550 billion to $650 billion (or 6.5% to 7.7% of GDP).[60] Efficiency improvements and reduction of corruption are believed to have the potential to reduce these investment needs to the level of $400million to $450 billion. These authors suggest that investment needs as a percentage of GDP would be higher for low income countries (7.5% to 9%), compared to lower middle income countries (5.5% to 7%) and upper middle income countries (3%). ECA region consists mostly of the first two categories of countries. Within ECA region the burden would be greatest on the low income CIS, followed in the descending order by the SEE states, middle income CIS and CEE.

Are the investments affordable?

Are investments of this order affordable by the governments of transition economies?
Given the ubiquitous role of the governments and the innumerable and changing demands made on them by societies, no government in the world (except perhaps the major oil exporting economies in the middle east) can confidently answer the question in the affirmative. According to the American Society of Civil Engineers, even United States of America is believed to have a backlog of needed infrastructure investments of the order of $1.6 trillion to bring its aging national infrastructure (roads, bridges, and from schools to sewer lines) up to reasonable standards.[61] Overall the economic outlook in the transitional economies has become much better. Seven percent of their combined GDP of $ 1.5 trillion in 2004 is higher than the annual investment level of $98 billion estimated by Marianne Fay and Tito Yepes. Driven by oil and gas exports the CIS states are registering notable rates of growth. Inflation in the region is in single digit. Fiscal deficits and current account deficits are moderate and a number of countries (Russia, Kazakhstan, Georgia, Estonia, Azerbaijan, Bulgaria, Moldova and Uzbekistan have reported fiscal

[60] Cecillia Briceno-Garmendia, Antononio Estache and Nemat Shafik, Infrastructure Services in Developing Countries: Access, Quality, Costs and Policy Reform, World Bank Policy Research Working Paper No.3648, December 2004
[61] Felix G. Rohatyn and Warren Rudman, *It is Time to Rebuild America-A Plan for Spending More and Wisely on Our Decaying Infrastructure*, Washington Post, Issue dated 13 December 2005

surpluses for 2004. Russia, Kazakhstan, Ukraine and Uzbekistan have recorded notable current account surpluses. After a few years of dormancy, foreign direct investment seems to be reviving again (Table 5.8).

Table 5.8 Overall Macroeconomic status of Transition Economies (2004)

Region/ Sub-region	GDP $ billion	Mean Inflation (%)	Fiscal Deficit as a % of GDP	Current Account Deficit as a % of GDP	Net Foreign Direct Investment $ billion
CEE	568.4	4.3	-2.4	-6.6	16.29
SEE	176.6	5.4	-1.6	-10.3	9.16
CIS	752.2	8.9	-1.3	-2.3	13.70
ECA Region	1498.2	6.7	-1.8	-5.6	39.15

Source: Transition Report 2005, EBRD

Note: The GDP of CIS consists of $710.9 billion for the four middle income countries and only$41.3 billion for the eight low income countries.

The annual infrastructure investment needs of 7% of the GDP compares with the present fiscal deficit of 1.8% of GDP and quasi fiscal deficit of about 7% of GDP in power, water, gas and heat sectors. While the situation is clearly much better than in the last decade, fiscal stability could prove fragile in the oil and gas importing economies. Fiscal space could continue to be scarce in the low income CIS economies and in many of the SEE states.

Possible strategy

Under these circumstances, the strategy for governments would be to transfer the responsibility for operation, maintenance, rehabilitation and investment from the state budget to the state owned corporate entities and facilitate their running on commercial lines, generating net internal cash (after meeting all operational expenses and debt service) adequate to meet at least 30% to 40% of the rehabilitation and investment needs. These entities should be enabled to borrow the remaining funds from domestic banks, commercial sources and IFIs on the strength of their balance sheet and on the basis of limited sovereign guarantees (if necessary). To the extent private investors are forthcoming, transfer of investment responsibilities to them by way of asset sales, or concessions or through joint ventures would be sensible. Focus on the development of domestic financial markets and the promotion of the regional and municipal governments to become credit worthy is a complementary strategy to promote such a development. Direct funding from the budget is best limited to those infrastructure sectors which do not directly lend themselves to cost recovery mechanisms, such as roads, some segments of water and sanitation systems and to meet the costs of social protection arrangements in respect of power, gas and heat for the targeted poor. *In the continuum from rural roads at one end and mobile phones at the other the approach to investment funding from private sources or public sources would vary as a function of the extent to which the activity lends itself to commercial operation.* An approach such as this would be able to isolate investments which has to be in the public domain. The state budget then will have to accommodate such investments and social protection costs for the poor as well as the contingent liability arising from exposure to the guarantees it has provided for public sector companies and to the private investors in the context of PPP arrangements.

Fiscal space has to be found for these. Traditional approaches to this are to prioritize and prune possible present expenditure items, raise additional tax revenues by imposing new taxes and improving tax collection efficiency, maximizing the receipt of external grants, and increasing borrowing.[62] Increased borrowing or increased resort to sovereign guarantees has to be moderated by considerations of additional debt service and contingent liabilities they would impose in the future and thus endanger fiscal

[62] Peter S. Heller, *Understanding Fiscal Space*, IMF Policy Discussion Paper, March 2005