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Energy Security, Poverty, and Vulnerability in Central Asia and the Wider European Neighbourhood

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Contents

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Abstract

This paper seeks to disaggregate concerns about energy security within the wider European neighbourhood from the nation-state to the household, and particularly to poor households in the transition and developing economies of the former Soviet Union. It argues that two decades of under-investment in Soviet-era energy, water, and communal service infrastructures threaten significant reductions in access to these services in the poorer countries of this region, particularly Tajikistan and Kyrgyzstan. These problems are manifesting themselves both in terms of growing physical restrictions on access to energy, water, and communal service networks in these countries, and in terms of rapid growth in tariffs for these services which could price some vulnerable households "out of the market". The paper also suggests that these problems are apparent to various degrees in a number of other former Soviet republics, and that the impact of the global economic crisis is likely to exacerbate these problems. By calling attention to growing household vulnerability to energy and water insecurities, particularly in Central Asia, the paper seeks to bring an economic development perspective to bear on energy policy debates in the wider European region.

1. Poverty, energy, and household vulnerability in wider Europe

Until recently, the thinking of many actors working in the transition and developing economies of wider Europe was broadly informed by three sets of beliefs: (i) the strong economic growth enjoyed by most of the region for most of the past decade would continue more or less indefinitely; (ii) this growth would continue to both reduce income poverty and generate the resources needed to address (if not immediately resolve) non-income poverty issues (including barriers to access to environmental and social services); and (iii) institutional development in state, private, and third-sector structures, whose often inadequate capacities reflect the region's transition legacies, would likewise continue. This combination of expanding resources and deepening institutional capacity would increasingly address issues of absolute poverty/deprivation, and of unequal access to/exclusion from the benefits of economic growth.

Developments during the past 18-24 months have increasingly called such beliefs into question. The most obvious challenges are now posed by the global economic crisis—the impact of which has pushed much of the wider region (including its most populous countries—Russia, Turkey, and Ukraine) into deep recessions. Large declines in household incomes and employment, and significant growth in socio-economic vulnerabilities, have resulted. But even before the regional impact of the global economic crisis had become apparent, numerous warning signals indicated that the sustainable development returns to economic growth were diminishing—particularly in the region's poorer countries.

Following a decade of apparent recovery from 1992-1996 civil war and strong economic growth, Tajikistan during the winter of 2007-2008 experienced a "compound crisis" of interlinked water and energy insecurity. Already weakened by two decades of under-investment, the national electrical energy infrastructure buckled under the strains of severe winter weather. Although the winter of 2008-2009 was much milder, drought conditions aggravated these water/energy tensions in Tajikistan and caused them to spread to neighbouring Kyrgyzstan—necessitating emergency humanitarian appeals in both countries. Hundreds of thousands of households and small businesses in these countries lost access to reliable electricity supplies, and often to water and sanitation services. Evidence of accumulating water and energy insecurities in Uzbekistan, while less transparent, can also be found. These local drought conditions during 2008 also interacted with spiralling global

food prices to raise new food security concerns: official statistics indicate that food prices in 2008 rose by some 25-35 percent across Central Asia.[1]

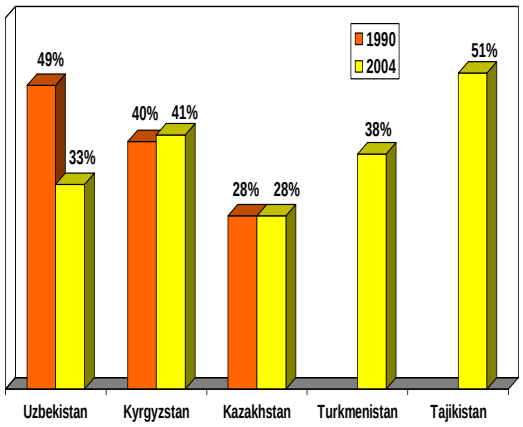
Although the drought of 2008 has now ended, questions concerning the management of Central Asia's water resources continue. These include such perennial issues as the region's extremely high per-capita water consumption levels; the desiccation of the Aral Sea and land degradation in the Aral Sea basin; continued reliance on the unsustainable water-intensive cotton monoculture in Uzbekistan, Turkmenistan, and Tajikistan.[2] More recently, a new wave of tensions between upstream and downstream countries have appeared regarding the prospective construction of the Roghun and Kambarata-1 hydropower plants in Tajikistan and Kyrgyzstan, respectively, and the recent decisions by Kazakhstan and Uzbekistan to withdraw from the integrated Central Asian electricity grid.[3] Although global food prices collapsed during the second half of 2008, food security concerns in Central Asia continue; national statistics indicate that food prices across Central Asia during the first half of 2009 were 8-10 percent above year-earlier levels. Electricity/gas/water/communal service tariffs paid by households increased at double or triple this rate during this time.

[1] For more on the "compound crisis" of interlinking water, energy, and food insecurities in Tajikistan and Kyrgyzstan see *Central Asia Regional Risk Assessment*, UNDP, January 2009 (available at http://europeandcis.undp.org/home/show/60B55B69-F203-1EE9-B99CA6F9ED93A5B8). See also Rahaman and Varis, eds., *Central Asian Water: Social, Economics, Environmental and Governance Puzzle*, Helsinki University of Technology, November, 2008; IFAS Executive Committee, *Action Report for the Period of 2002-2008*, Dushanbe; *Regional Market Survey for the Central Asian Region*, World Food Programme, June – August 2008; Barlow and Tippett, "Variability and Predictability of Central Asia River Flows: Antecedent Winter Precipitation and Large-Scale Teleconnections", *Journal of Hydrometeorology*, December 2008; and Fumagalli, "The Food-Energy-Water Nexus in Central Asia: Regional Implications of and Responses to the Crises in Tajikistan", EU-Central Asia Monitoring, October 2008.

[2] For more on these issues, see International Crisis Group, *Central Asia: Water and Conflict*, 30 May 2002, and *The Curve of Cotton: Central Asia's Destructive Monoculture*, 28 February 2005. See also World Bank, *Water Energy Nexus in Central Asia: Improving Regional Cooperation in the Syr-Darya Basin*, January 2004.

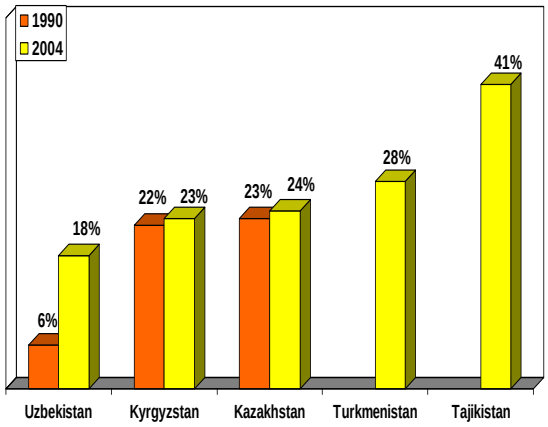
[3] These developments, which follow on Turkmenistan's 2003 withdrawal from the integrated Central Asian electricity grid, reflect the fact that problems in the joint management of inherited Soviet-era energy assets are not limited to the gas and oil pipelines running through Ukraine and Belarus, which supply EU countries with hydrocarbons from Siberia and the Caspian basin.

Chart 1: Share of population without access to improved sanitation services



2004 data. Source: UNDP *Human Development Report 2006*, pp. 306-307.

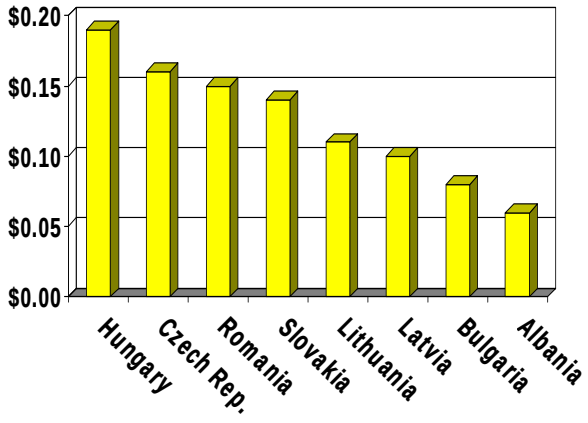
Chart 2: Share of population without access to improved water sources



2004 data. Source: UNDP *Human Development Report 2006*, pp. 306-307.

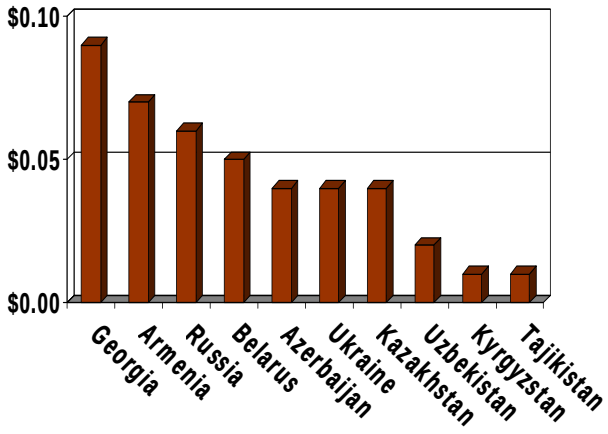
Longer term, Central Asia faces the challenges of climate change adaptation, particularly in the form of melting glaciers, anticipated declines in river flow from snowmelt, and the possibility of "severe water shortages".[4] Some 87 percent of the runoff in the Aral Sea basin is generated by snow and glacier melt in the mountainous upstream countries;[5] numerous studies report significant shrinkage in glacier coverage during the past decades. All this despite the fact that, as the data in Charts 1 and 2 above show, problems of access to improved water sources and sanitation services were important even before the compound crisis.

Chart 3: Effective electricity tariffs (I)



Nominal tariffs (per kWh) multiplied by collection rates. 2007 EBRD data.

Chart 4: Effective electricity tariffs (II)



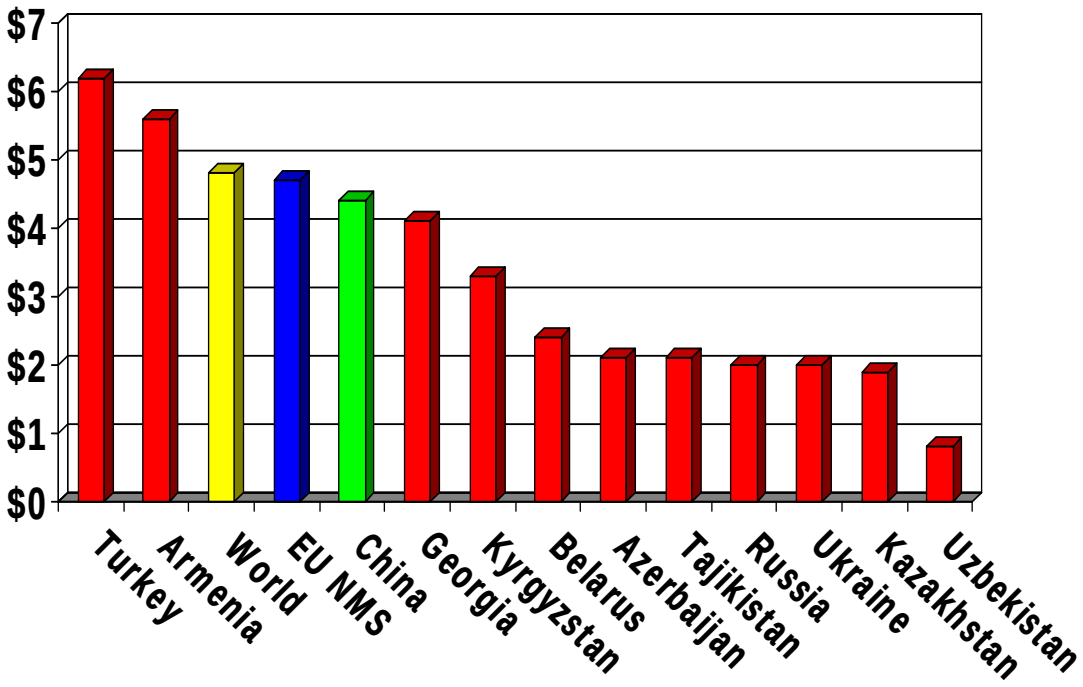
Nominal tariffs (per kWh) multiplied by collection rates. 2007 EBRD data.

[4] World Bank, *Adapting to Climate Change in Central Asia*, June 2009, p. ix.
[5] Source: "Central Asia – Regional and National Water Sector Review", UNDP, 2008; available at http://waterwiki.net/index.php/Central_Asia_%E2%80%93_Regional_and_National_Water_Sector_Review.

Water, energy, and food insecurities may be particularly sharp in Central Asia, but they are hardly unique to this sub-region. UNDP's Human Development Report Office reports that, in 2004, 23 percent and 46 percent of the population in Azerbaijan did not have access to improved water and sanitation services, respectively; these figures for Moldova were 8 percent and 32 percent. Power shortages are all too common in much of Kosovo and (during times of drought) parts of Albania. Deforestation (and its associated consequences of soil erosion, increased flooding and landslides, biodiversity loss) in parts of the Caucasus and the Western Balkans reflect reductions in access to energy services (due in part to sharp increases in heat, electricity, and gas tariffs) and increased reliance of wood fuel for heating and cooking. Despite significant increases in energy prices in the region, with the exception of a handful of new EU member states, household electricity tariffs in most transition economies remain well below cost recovery levels (see Charts 3 and 4 above). According to one World Bank publication, nominal residential electricity tariffs in 2002 were at cost-recovery levels in only 14 of 19 European and Central Asia countries studied. In Tajikistan and Uzbekistan, these tariffs were at 24-25 percent of cost-recovery levels; in Albania, Azerbaijan, Kyrgyzstan, and Russia, they were at 50-55 percent of cost-recovery levels.[6] These data predated the global commodity price surge of 2003-2008: IMF data indicate that global energy prices more than quadrupled between 2003:Q2 and 2008:Q2.

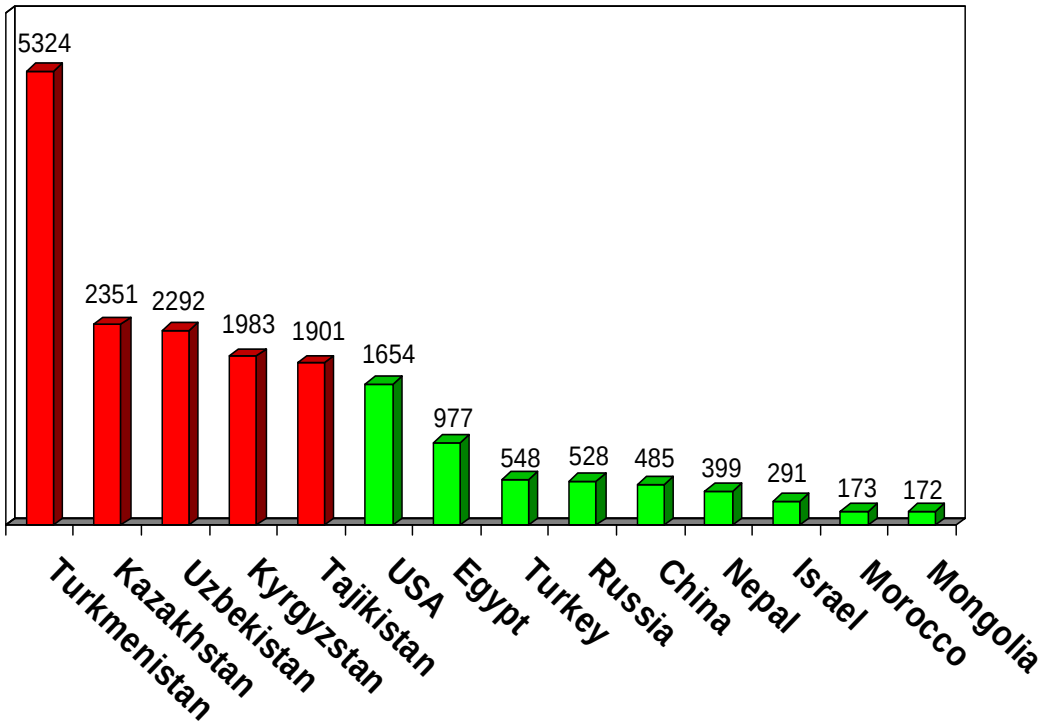
[6] Source: Lampietti *et al.*, *Power and People: Electricity Sector Reforms and the Poor in Europe and Central Asia*, World Bank, 2006, p. 166.

Chart 5—Energy efficiency: Globally, in Europe, and in Central Asia



In PPP$/kt of oil equivalent, 2004 data. Source: UNDP Human Development Report Office.

Chart 6—Per-capita water use: Globally and in Central Asia



In cubic metres per annum. From various years, 1998-2007.
Source: (http://www.fao.org/nr/water/aquastat/dbase/index.stm

These price trends have three important implications for wider Europe's transition and developing economies. First, two decades of holding tariffs below cost-recovery levels (without offsetting fiscal subsidies) have resulted in the significant decapitalisation of energy, water, and communal service infrastructure. Hundreds of thousands of households and small businesses in Central Asia now spend much of the winter without access to these basic services—which, for many users, had been available previously. Second, and paradoxically, these declines in access are accompanied by significant levels of energy inefficiency and wasteful water use (see Charts 5 and Chart 6 above). The social objectives ostensibly served by low tariffs are increasingly facing the spectre of catastrophic infrastructure failure. Third, the combination of urgent infrastructure spending needs and sharply higher global energy prices is now pushing up household energy, water, and communal service tariffs at rates significantly above national and global inflation rates, particularly in the former Soviet Union and Turkey.

Table 1—Select vulnerability indicators in Wider Europe

Country	Those living below the poverty line:[7]		Food price inflation[8]	Energy price inflation[9]	Population without access to improved:[10]		GDP change (2009:H1)[11]
	millions	population (%)			water	sanitation	
Belarus	0.7	7%	17%	38%	0%	16%	0%
Kazakhstan	7.5	50%	8%	17%	14%	28%	-2%
Kyrgyzstan	4.6	90%	9%	30%	23%	41%	0%
Russia	27.9	19%	12%	25%	3%	13%	-11%
Tajikistan	5.9	90%	10%	58%	41%	49%	3%
Turkey	26.0	36%	9%	21%	4%	12%	-14%[12]
Ukraine	7.1	15%	14%	30%	4%	4%	-20%[13]

All data are from national statistical offices unless specified otherwise.

Rising food prices and utility tariffs are affecting household incomes and vulnerability even in middle-income countries where physical access to food, water, and energy is generally not an issue. In Ukraine, for example, despite the economic crisis and collapsing domestic demand, communal service tariffs rose 30 percent during the first half of 2009 (over the same period in 2008), while food prices were up 14 percent. Similar trends are apparent in Belarus: official data show that household electricity tariffs were up 38 percent in the first half of the year; food prices rose 17 percent. For Turkey, the corresponding figures were 21 percent and 9 percent, respectively. The anticipated repricing of carbon—key to climate change mitigation prospects (both globally and in the region), as well as helping to further reduce energy inefficiencies—will put further strains on the region's energy inefficient economies, as well as on low-income household budgets. It will also reinforce the importance of alternative, renewable energy sources, and of reforming legal, regulatory, and commercial structures to strengthen incentives for their use.

Quantifying degrees and trends in household vulnerability in light of these trends is not a simple task. However, a set of rough-and-ready macro- and socio-economic vulnerability indicators is presented in Table 1 above, in the form of first-half 2009 food- and energy-price inflation in select CIS countries (and Turkey), World Bank income poverty data (comparable across countries), data on access to improved water and sanitation services, and GDP trends during the first half of 2009 (showing the overall impact of the economic crisis). Regrettably, the income poverty data (measured against a threshold of $4.30 in daily per-capita expenditures, in purchasing-power-parity terms) are from 2005; income poverty levels

[7] 2005 World Bank data, calculated vis-à-vis a PPP$4.30/day threshold.
[8] January-June 2009 compared to January-June 2008.
[9] Alternatively electricity, gas, fuels, or other communal service tariffs. Data are for January-June 2009 compared to January-June 2008.
[10] 2004 data. Source: UNDP *Human Development Report 2006*, pp. 306-307.
[11] Sources: CIS Statistical Committee, national statistical offices.
[12] First quarter of 2009 compared to the first quarter of 2008.
[13] First quarter of 2009 compared to the first quarter of 2008.

in all the countries shown in Table 1[14] clearly fell further during 2006-2008. But even if income poverty rates were cut in half during these three years, then at the end of 2008 (i.e., at the start of the crisis) some 40 million people in the Europe and Central Asia region would still have been living on PPP$4.30/day, or less. Since expenditures on food and utilities comprise between one- and two-thirds of the consumer price index in these countries, and since (with the advent of the economic crisis) household incomes in these countries are either stagnant or declining, food- and energy-price inflation trends of the magnitudes now being reported can have a significant impact on real household income, food security, and access to basic energy, water, and sanitation services. The data also remind us that, for millions of low-income households in wider Europe, energy security is about physical access to, and affordability of, energy (and water, and communal) services; media reports about the "great energy game" between the Europe, US, Russia and China are an abstraction.

2. Poverty, energy, and household vulnerability in Central Asia

Because the three countries in the region classified by the World Bank[15] as low income countries (Kyrgyzstan, Tajikistan, Uzbekistan) are located in Central Asia; since the poverty/energy/vulnerability nexus is particularly relevant in this sub-region; and as this sub-region may face particularly difficult longer-term challenges of climate change adaptation (e.g., due to the melting of the glaciers), this section of the paper focuses on Central Asia, and particularly on Kyrgyzstan and Tajikistan.

Efforts to address household energy insecurity in these countries face three sets of "unanswered questions" pertaining to the poverty/energy/vulnerability nexus, concerning: (i) the quality and quantity of data on access to reliable energy, water, and sanitation services; (ii) the prospective impact of higher energy, water, and consumer tariffs on vulnerable households; (iii) appropriate mitigating strategies (for governments and donors); and (iv) the technological and economic feasibility of decentralised renewable energy technologies (small hydro, solar, etc.).

[14] According to this data set, these seven countries accounted for 57% of all those living at or below the PPP$430/day poverty threshold in the Europe and CIS region in 2005. If Uzbekistan is added, the share rises to 75%.

[15] See: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20487070~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html.

3. Access to reliable electricity, water, and sanitation services

Energy policy discourse in Central Asia sometimes suffers from a certain disconnect. On the one hand, it is not uncommon to encounter recent statistical references to near-100 percent household access to electricity services in the region, including in Kyrgyzstan and Tajikistan.[16] Such references reflect a certain approach to energy issues in the former Soviet Union, according to which most countries inherited quasi-universal access to power (and water, sanitation, and other) service grids from the Soviet period, and have since then managed to maintain this access (perhaps with a few hiccups during the transition turbulence of the 1990s). On the other hand, serious manifestations of inadequate access to energy services—such as extensive deforestation and land degradation, due to growing household reliance of wood fuels for heating and cooking—were likewise well known in Central Asia, even before the advent of the compound crisis.[17] Likewise, numerous studies have generated a variety of different (often conflicting) estimates of access to electricity, gas, water, and sanitation services—most of which likewise precede the 2007-2008 compound crisis. The quality and quantity of national statistics in these areas are not always satisfactory, or mutually compatible.

The deterioration in access to electricity services that has occurred during the last two winters in Kyrgyzstan and Tajikistan further complicates the picture, in a number of respects. First, reduced access to electricity often means reduced access to water, sanitation, irrigation, health, and other social services whose provision requires adequate electric power supply (e.g., for pumping water). Households that previously have enjoyed universal service access may in recent years have experienced growing deprivation due to planned or unplanned electricity cut-offs. Second, while some of the reductions in access to electricity services may be measurable (e.g., planned black-outs in distinct geographical areas), others (e.g., unplanned power outages in distant locations) are not. This complicates the definition and monitoring of deprivation of electricity, water, sanitation, and other social services.

On the other hand, some of the reductions in access to power from the grid have been offset by increased use of off-grid resources (e.g., diesel-fired generators, coal, firewood, dung). But while increased reliance on off-grid power sources can mitigate the consequences of inadequate supplies through the grid, it often has undesirable side effects. These include deforestation, greater air pollution (including greenhouse gas emissions), increases in respiratory illnesses and domestic fire hazards, etc. Moreover, the marginal private costs of

[16] See, for example, Lampietti *et al.*, p. 186.

[17] The extensive and growing use of (hydro)electricity for urban residential heating in Kyrgyzstan and Tajikistan, due to these countries' post-Soviet substitution away fossil fuels toward hydropower, plays an important role here.

generating off-grid energy are generally higher than those via the grid (particularly during non-peak periods), due to the diseconomies of scale often associated with off-grid supplies. In principle, the measurement and monitoring of deprivation of electricity, water, sanitation, and other services should reflect these variables as well.

These conceptual and data ambiguities have not surprisingly generated confusion in energy policy discourse in Central Asia, *inter alia* among governments and donors. In Tajikistan, for example, it is possible to encounter reasonable people making the following arguments about higher electricity tariffs—all of which seem equally probable:

- Higher tariffs will mean increased hardship for the millions of people who are living in poverty, due to both monetary factors and to the environmental and health side effects of increased reliance on off-grid energy sources (e.g., deforestation, dung burning). Instead of pushing the burden of energy sector adjustment onto vulnerable households, efforts should focus on improving management within the electricity sector, to reduce technical and commercial grid losses and thereby obviate the need for higher tariffs.

- While managerial and regulatory improvements within the electricity sector are important, higher tariffs are still needed to generate the cash flow required to extend grid services to those vulnerable households who do not now have them, and to improve the reliability of services for those vulnerable households who do have access to the grid. Higher tariffs can also reduce the explicit and implicit fiscal burdens associated with below cost-recovery tariff levels, thereby freeing up budget resources for expanded social protection of vulnerable households.[18]

- The extensive losses already present in the system mean that many vulnerable households already have at least partial (albeit informal) access to the grid, for which they may not be paying anything at all. Higher tariffs are therefore irrelevant. Measures to reduce losses and improve the quality of management are most needed to improve cash flow and investment prospects for services providers.

In light of these uncertainties, the degrees, trends, and implications of changing access to energy, water, and sanitation, and other basic services can perhaps best be measured and monitored via the application of survey techniques to vulnerable communities where there is clear *a priori* evidence of declining or inadequate access to these services (e.g., isolated mountain or rural communities, low-income households in town and small cities that have

[18] According to World Bank research, the magnitude of these subsidies in 2003 was 19% of Tajikistan's GDP. (Source: "Tajikistan Energy Utility Reform Review: A Strategic Approach to Sector Development", World Bank, 2004.)

suffered sharp reductions in on-grid energy supplies, etc.). Wherever possible, such work should be done by official statistical agencies, within the framework of on-going census, household budget, labour force, and living standard measurement surveys. However, when this is not possible, these problems could be addressed by building on the survey methodologies developed by UNDP researchers to generate quantitative measures of socio-economic vulnerabilities experienced by Roma and displaced (refugees, IDPs) communities in Central and Southeast Europe.[19] That is, representative samples of vulnerable communities could be identified (on the basis of consultations with local authorities, community-based organisations, and statistical offices) and surveyed, in order to develop quantitative primary data on such variables as:

- The extent, nature, and frequency of lost/inadequate access to energy, water, sanitation, and other grid (and off-grid) services;

- The extent to which this deprivation is correlated with other vulnerability indicators (e.g., income levels and sources; household gender, ethnicity, age, size characteristics, access to health care facilities, food security, presence of migrant workers in the household, etc.);

- The coping methods employed by vulnerable households (e.g., increased use of diesel generators, coal, firewood, dung; migration to urban areas or other countries to increase household incomes to pay for these coping methods; etc.)—and their environmental, social, and health consequences; and

- Possible household responses to such changes in the commercial and policy environment as the introduction of higher (or differentiated) tariffs, increases or decreases in social protection payments (including possibly conditional cash transfers), and the like.

Such survey methodology could in principle be integrated with/build upon the technological possibilities for mapping presented by Google Earth and by the "heat mapping" methodologies developed by the Growing Inclusive Markets initiative.[20]

The resulting *mapping of energy and related water, sanitation, and social service deprivation* could provide valuable information about poverty/energy/vulnerability linkages in Kyrgyzstan and Tajikistan, thereby strengthening the evidentiary basis for policies in the energy, water, and social services sectors. In addition to being closely coordinated with the work of state statistical offices, such a survey exercise could be informed by—and ideally contribute to—

[19] For a full description of this methodology, see *At Risk: Roma and the Displaced in Southeast Europe*, UNDP, 2006, pp. 113-17. Available at http://europeandcis.undp.org/home/show/1F158B1F-F203-1EE9-B8384A4FF5BF9916.

[20] See http://www.growinginclusivemarkets.org/index.php?option=com_content&view=article&id=50&Itemid=59.

regional and national energy and social policy reform discussions, within the framework of these countries' national development strategies. This is particularly pressing in Tajikistan, where sustainable, regular poverty measurement and monitoring systems are not in place. The only source of poverty data is the Living Standards Survey, which is supported by the World Bank. However, this survey is carried out only once every three years (the last one in 2007) and is not representative at the district level.

4. How vulnerable are the poor to tariff increases? What are appropriate policy responses?

Once households and communities with inadequate access to energy/water/sanitation services have been identified, attention could turn to appropriate mechanisms to address problems of access. In broad terms, these mechanisms can be divided into two categories:

- *Price mechanisms*: Higher prices for these services are generally regarded by the international community as central to prospects for rationalising and modernising their provision. In principle, higher prices induce conservation, increase the financial viability of alternative energy technologies, and generate the cash flow service providers need to extend services to users for whom uninterrupted access has not yet been achieved (or has been lost). On the other hand, higher prices may have undesirable effects on vulnerable households—particularly for those who are already connected to the relevant grids, and whose low incomes may not easily permit additional expenditures for more expensive basic services. This raises questions of:
    - The timeline by which prices/tariffs are to reach cost-recovery levels (i.e., rapid or gradual adjustment);
    - The definition of the "costs" that are to be recovered. Various possible definitions—the choice of which can have very large and differentiated effects on the financial viability of the investment in question—include the:
        - Short-run marginal costs of extending services to users/areas not (fully) covered;
        - Full private costs of ensuring the longer-term financial viability of the network, infrastructure, or company in question (including the large anticipated future costs of replacing depreciated Soviet-era capital stock); and

- External costs (greenhouse gas emissions, air/water pollution, biodiversity loss, etc.) associated with service provision.

- How best to mitigate the social and environmental impact of higher tariffs. Here, the options include:
  - *Differentiated ("lifeline") tariff schemes,* whereby small amounts of services provided through the grid can be consumed at little (or no) cost, but greater consumption occurs at higher per-unit tariffs;

  - *Compensatory payments*, whereby social benefits are targeted to those vulnerable users for whom payment of "full user costs" would be a hardship. This approach is consistent with simpler, more transparent tariff structures, and can reduce the administrative costs associated with measuring consumption, billing, and collecting fees for service. On the other hand, its effective implementation requires significant administrative capacity among social policy institutions (typically ministries of labour and social policy, and local authorities; sometimes also the ministry of finance)—capacity that may not be present.

- *Non-price mechanisms:* This more general category pertains to measures to modernise the management of utility companies, change the ownership, institutional, and regulatory structures within the energy and water sectors, and attract additional capital, technology, and know-how to these sectors (typically from abroad). Specific issues here include:
  - The extent to which the privatisation of state-owned assets within these sectors is to be permitted, and to which classes of potential buyers (e.g., foreign, domestic, etc.);
  - Of those assets that are to remain in state ownership, the designation of central- and local-government agencies that will execute the state's ownership and regulatory functions (including price/tariff regulation);
  - The extent to which otherwise centralised assets will be "unbundled", to permit (or encourage) the emergency of competitive forces in these sectors;
  - The consolidation of modern commercial principles into the management of energy suppliers, in such areas as:
    - More effective metering and billing for services provided;
    - Technical measures to reduce grid losses; and

- The expansion of pay-per-use cards (prepaid cards as for mobile telephones).[21]

- The extent to which the companies themselves, and the relevant state authorities, are willing to enforce payment discipline on recalcitrant users. This can involve:
  - Ending formal and informal tariff subsidies for favoured users (e.g., the TALCO aluminium company in Tajikistan);
  - Being willing to invoke criminal sanctions and law enforcement mechanisms against large free riders ("fat cats") who use water and energy without paying for them (in part or in full);
  - Developing and implementing flexible solutions (i.e., short of criminalisation and "cold turkey" service cut-offs) for vulnerable households and communities whose access to energy and water grids has an informal or extra-legal character; and
  - Communicating these steps to users and the public in such a way as to end the "culture of non-payment".

- The possible impact of public-information campaigns to encourage households and businesses to voluntarily reduce energy and water use; and
- Increased budget or donor support for energy efficiency, alternative energy, and other related environmentally sustainable activities. Support for the introduction of florescent light bulbs, low-energy pumps and appliances, building renovations, or for environmentally friendly income-generating activities (e.g., reforestation) that can offset some of the unintended side effects of higher energy tariffs (e.g., deforestation), could be particularly important in this context.

Important linkages between price and non-price mechanisms are often present. For example, the consolidation of modern commercial principles within a utility's internal management is often a precondition for accurately measuring costs and revenues, and then determining

[21] These cards, which have been successfully used in Africa by major utilities, can reduce metering, billing and collection costs, as well as the amount of unpaid bills.

which activities do, and do not, recover their full costs. Decisions about the speed at which tariffs are to rise toward cost-recovery levels often have implications for the privatisation, unbundling, and regulatory strategies that can be pursued. These linkages necessitate some common approaches to and sequencing of various steps.

In both Kyrgyzstan and Tajikistan, electricity, communal service, and (to a lesser degree) gas tariffs are generally regarded as being set at below cost-recovery levels—although it is not always clear exactly how these "costs" are defined. Tariffs for these services, and for water and sanitation services, are therefore rising steeply, as shown in Table 1 above. Both countries are moving away from lifeline tariff regimes in favour of simple, more transparent tariff structures and compensatory payments—and both (particularly Tajikistan) face difficult questions about the institutional capacity of state agencies charged with delivering these subsidies. However, whereas Kyrgyzstan (like most transition economies) has unbundled its electricity and gas producers (independent state-owned generation/extraction and transmission/distribution companies have been created) and is seeking their privatisation, unbundling in Tajikistan is limited to the gas sector. The Barqi Tojik electricity utility remains a vertically integrated state-owned monopoly; legislation was passed in 2009 prohibits the privatisation of strategic state energy assets. Both countries have sought at various times and in various ways to attract foreign investment, technology, and know-how into these sectors—thus far with modest results. Grid losses in both countries are extensive, particularly for electricity and water. Responsibilities for the provision of water and sanitation services in the two countries are shared (not always transparently) between local municipalities, ministries of water and agriculture, and other state bodies.

5. Viability of decentralised renewable energy technologies

In principle, the adoption of technical, managerial, and legal measures to reduce corruption and grid losses and improve revenue collection (particularly from large industrial users) within the two countries' energy sectors offers the best short-term prospects for improving energy security in Tajikistan and Kyrgyzstan. Important work is on-going in this area, supported *inter alia* by the World Bank's Energy Loss Reduction project. However, as the promise of efforts in these areas has for years dramatically exceed their results (especially in Tajikistan), and since the international community's abilities to impose such reforms on unwilling political elites are currently weaker than they have been for some time, significant improvements in corporate governance and management within the energy sector do not seem likely in the near term.

Instead, the governments of Kyrgyzstan and Tajikistan are placing a growing emphasis on the construction of additional hydroelectric generation capacity, *inter alia* with large, multi-year storage reservoirs like Kambarata-1 (Kyrgyzstan) and Roghun (Tajikistan). These dams have become flash points in relations between these "upstream" and Central Asia's "downstream" countries, particularly Uzbekistan. But while reasonable people may disagree about their legal, economic, and environmental desirability, it is clear that these dams—if they are ever built—are at best long-term (10-15 year) solutions (or threats) to the sub-region's water and energy insecurities. By contrast, smaller scale, less capital-intensive projects based on renewable energy technologies like small/micro/mini hydro, solar, wind, biogas, and geothermal power have much shorter gestation periods, and do not, as a rule, generate intra-state tensions. A growing recognition of the potential importance of alternative energy sources was apparent in President Rahmon's January 2009 call for significant increases in small/mini/micro-hydro generation capacity, to be put in place in Tajikistan by the end of the year. Kyrgyzstan's National Energy Programme (through 2010) and the Development Strategy for the Fuel and Energy Complex (through 2025) likewise call for the rapid expansion of renewables.

Are decentralised renewable energy sources really the answer to Central Asia's energy challenges? Is small really beautiful? It is tempting to answer "yes" to these questions. In addition to helping to reduce Central Asia's carbon footprint, the expansion of decentralised renewable energy technologies could offer labour-intensive, community-based solutions to the energy insecurities now facing many vulnerable households and communities.

Unfortunately, efforts to promote the rapid expansion of decentralised renewable energy technologies in Central Asia face serious obstacles, in four areas:

Commercial viability: Under current electricity tariff structures, decentralised renewable energy technologies are not commercially viable in much of the region. In Tajikistan, donors who support micro/small/mini hydro projects (e.g., the Aga Khan Foundation, the Swiss Development Corporation, UNDP) generally provide significant subsidies to their projects. Other decentralised renewable energy technologies are either in their infancy or remain on the drawing board. More generally, in international practice decentralised renewable energy technologies often operate at a relative (private) cost disadvantage, due to their diseconomies of scale vis-à-vis plants using larger-scale hydro- , thermal, or nuclear power generation technologies. And while the prospective internalisation of the external costs associated with large-scale power generation could change this calculus, Central Asian governments are not distinguished by their willingness (or capacity) to adopt the internalisation measures introduced elsewhere (as is apparent in the region's low electricity tariffs).

Hydrology: Micro/small/mini hydro plants that rely on run-of-river technologies are more likely to be negatively affected by drought, flooding, or other hydrological anomalies than large hydro plants, with their own reservoirs. For example, during the drought of 2008-2009, three of the six micro/small/mini hydro plants supported by UNDP-Tajikistan were unable to generate electricity full time, due to inadequate water flow.

Seasonality: Water flow for micro/small/mini hydro plants is most plentiful in mountainous or upland communities. These are also the areas that are most likely not to be fully serviced by existing power grids—particularly in the winter, when demands on the grids are greatest. However, winter is also the season in which the water needed for micro/small/mini hydro plants is most likely to freeze, and therefore be unusable for power generation.

Legal obstacles: The legal frameworks required by decentralised renewable energy technologies (e.g., feed-in tariffs, green certificates), via guarantees of third-party access to electricity grids, are not in place anywhere in Central Asia. Barqi Tojik's disinterest in purchasing summer electricity produced by small/micro/mini hydro power stations—which would in principle allow for more rapid accumulation of water in its reservoirs along the Vakhsh river cascade, or for increased summer electricity exports or water releases for downstream irrigation—can be explained in part by the absence of such an enabling legal environment.

As a result of these obstacles, both Tajikistan and (especially) Kyrgyzstan are looking to expand reliance on coal-fired thermal power for electricity and heat, either via the reconstruction and expansion of the Bishkek, Osh, Dushanbe, and Yavan thermal power stations, or via the smaller-scale application of thermal technologies. Kyrgyzstan is currently installing coal-fired boilers in hundreds of schools that had previously relied on electric heat, and which were forced to close during the winter of 2008-2009. According to Tajikistan's 2007-2015 National Development Strategy, annual coal production is to increase from neglible amounts to 445,000 tons in 2010 and 815,000 tons in 2015.

In light of the financial incentives—including unsure prospects for carbon finance under the clean development mechanism—now facing these countries, such an approach is understandable. Still, it would be ironic if—at a time of unprecedented global warming concerns—two low-income countries blessed with some of the world's greatest hydropower bounties were to address their energy security challenges via increased reliance on (high sulphur) coal. Not surprisingly, the donor community in Central Asia is somewhat uncertain about how to respond to these issues.

6. Conclusion

This paper does not mean to suggest that conventional approaches to energy security, in which the nation state is the lowest common denominator, are without justification. However, the events of the last 18 months have taught us that the conceptual paradigms underpinning (often implicitly) national, regional, and global economic and financial governance structures may contain important weaknesses, which are sometimes not recognised or appreciated until it is too late. Likewise, the impact of the global crisis on wider Europe is now pushing millions of people into poverty who had not been there before—or who had only recently escaped from its clutches. Despite falling global energy prices, household energy, water, and communal service tariffs in much of the wider neighbourhood seem likely to continue rising for the foreseeable future—particularly in low-income countries like Kyrgyzstan and Tajikistan, where household energy security is threatened by unfolding infrastructure collapse as well as by rising tariffs. In such circumstances, it may be best to treat the household or individual as the lowest common denominator when examining energy security and vulnerability questions. Putting vulnerable individuals, households, and communities at the centre of the search for post-crisis consensus may help to limit the damage done by the crisis itself.