UNIVERSITY OF CENTRAL ASIA
GRADUATE SCHOOL OF DEVELOPMENT
Mountain Societies Research Institute

CAARF Brief

CAARF Project
Policy Brief
June 2017

Figure 1: Chopping firewood for burning leads to deforestation and erosion in rural Tajikistan. **Photo: Murodbek Laldjebaev**

Understanding and Alleviating Energy Poverty in Rural Communities in Tajikistan

Energy poverty is prevalent in rural Tajikistan, especially in terms of access to energy and to derived services.

Rural communities continue to rely on solid biomass such as wood, straw and animal dung to meet their energy needs. Removing crop residues and animal dung from fields to burn for heating and cooking leads to soil degradation and lower agricultural productivity. Air pollution from burning biomass indoors adversely affects human health. Women and children also spend many hours each day to collect biomass from distant locations as nearby woodlands have been depleted. Deforestation increases soil erosion and habitat loss is detrimental to wild plants and animals, the biodiversity upon which mountain communities often depend for food, medicine, clothing and household tools and that also contributes to local cultures **(Figure 1)**.

Although over 90% of households are connected to the electricity grid, actual access to electricity is neither reliable nor affordable. During winter, when energy needs are particularly acute, households experience daily blackouts. This lack of access is due to key vulnerabilities of the energy system that include insufficient energy production capacity, unreliable and expensive energy imports, dwindling power infrastructure causing technical and economic losses, inadequate transparency within the power sector, a lack of regional cooperation in energy and water resource sharing, and inadequate financial resources to address all of the above.

Securing access to energy for improved resilience and livelihoods

In rural communities of Tajikistan, access to energy is crucial to improve livelihoods. Beyond satisfying basic needs such as cooking and heating, reliable access to electricity increases

Key Messages

- Access to energy is critical to improve rural livelihoods, and therefore should be made a policy priority for rural development.
- Small-scale energy-generation technologies, such as solar home systems, micro-hydro units, biogas digesters, improved cooking stoves, residential wind turbines and thermal insulation of homes can be powerful mechanisms that help to alleviate energy poverty in rural areas.
- Business opportunities should be created to facilitate expansion of small-scale energy technologies in local markets and also their uptake by rural households, possibly to be encouraged through financial instruments.
- A shift is necessary from conventional approaches to power that focus on provision of energy sources (electricity, gas, wood) towards satisfaction of energy-based services (cooking, heating, lighting), particularly allowing for a diversification of energy sources at the household level, in ways that can help address a range of energy needs. The socioeconomic context and the cultural appropriateness of technologies also should be given due attention.

productivity as people mechanize agricultural activities such as milling and processing, run factories and shops with better lighting, and extend the shelf lives of products and vaccines through temperature control. Evidence suggests that such improvements in turn contribute to greater resilience because communities can tap into their enhanced capacities and diversify their socioeconomic livelihoods. Educated and healthy men and women with access to energy are more productive, and therefore are generally better-off than people who are not as well educated or healthy. Furthermore, energy supply systems provide jobs and livelihoods for many people.

Building the potential of small-scale energy-generation technologies

To improve access to energy, a mutually beneficial sharing of water and energy resources among Central Asian countries is a possibility that is much lauded, yet it often breeds more controversy than cooperation. Another potential solution to reduce energy poverty, currently underexplored, rests with small-scale technologies such as solar systems, micro-hydro units, biogas digesters, improved cooking stoves, residential wind turbines and thermal insulation of homes **(Figure 2)**. Easily deployed, maintained and configurable to needs, as well as cost-effective and environmentally sustainable in the long-term, such technologies often are optimal to rural areas. They also can help lead the transition from energy poverty to security, thereby enhancing prospects for rural development.

Developing business opportunities for small-scale energy technologies in rural areas

Ensuring rural energy access is an untapped business opportunity in Tajikistan. Lack of business activity in rural areas often is attributed to unreliable electricity supply. Put simply, no rational actor would start a business if electricity were not sufficiently reliable to maintain business activities. Attempts to attract investors into the energy generation sector have mostly been directed toward large energy complexes. For rural areas, however, much potential lies in small-scale technologies. Several pilot projects by NGOs have helped to disseminate solar home systems, install biogas digesters, train craftsmen to make more energy efficient doors, windows and cooking stoves, and provide materials for thermal insulation. These interventions also have raised awareness among households of alternative ways to harness and conserve energy **(Figure 3)**. Market response, however, is slow. In the present early stages, the government could step in to provide financial support (incentives) for providers and/or customers – to spur development and sales of alternative technologies. Flexible payment options, including loans and leases, could be structured to facilitate their adoption. Provision of energy technologies would thus extend beyond buyers and sellers and also include service providers, from technicians to bankers. Greater access to household energy in rural areas also can help reduce demand for grid electricity, which could in turn be channelled to other sectors of the economy.

Rethinking community energy priorities for development

Energy is valued for the services it enables. For households, these services include lighting, cooking and water heating, space heating, cooling, telecommunications, mobility and income generation. In rural areas, energy services are often derived from multiple energy sources such as grid electricity, candles, kerosene, wood, agricultural residues, animal dung, or draught animal power. Such a complexity of energy setups moves us away from adopting one-size-fits-all solutions, and to expanding access to energy services in context-specific ways. For example, electricity is a very flexible form of energy that is available in summertime and generally suitable for many locally desired services. However, many rural households continue to use wood and dung for cooking even when electricity is available **(Figure 4)**. This paradoxical situation hints at issues of affordability and appropriateness (suitability) of technologies. Access or provision do not automatically translate into use. To facilitate increased consumption, either the price of electricity should be lowered, or a safety net should be

Figure 2: These solar home systems provide electricity for lighting, watching TV and charging phones.
Photo: Murodbek Laldjebaev

Figure 3: Even meat can be cooked in solar cookers where and when there is sufficient sunlight.
Photo: Murodbek Laldjebaev

designed to reduce part of the burden. Another option is to increase cash availability for households through increasing their income earning opportunities. For example, if dung were not burned but used as fertilizer, yields would increase, which in turn would reduce the need for purchased food, and thus free up cash for alternative uses. The money could be used to pay for additional electricity consumption to displace dung use as an energy source. Further, dung can be converted to biogas that is used for cooking and the remaining sludge can still be used as fertilizer. Assisting rural farmers in installation of biogas digesters would be more beneficial and locally relevant as it enhances energy access while also improving food security (by using dung to replenish the soil).

Energy sources must be culturally appropriate

Beyond cost and availability, other factors also influence household energy choices. Social expectations and cultural beliefs are a pertinent example. Children and women engage in biomass collection and cooking because these activities are considered to be their jobs. Another factor that influences household decisions to select certain energy use patterns is food preference. Food is well recognised as a cultural product. Within Tajiks cuisine, bread is baked in traditional tanoors (vertically installed clay ovens, of cylindrical shape) on wood and/or dung fuelled fires (**Figure 5)**. The different types of bread that are baked in tanoors cannot be baked in electric ovens. Another reason that people rely on solid fuels is that they allegedly feel that warmth of burning wood is qualitatively better than that coming from electric heaters. Heat from wood-burning stoves is also perceived to be good for health, particularly relieving leg and back pain. Conversely, electric heaters reportedly cause headaches. Efforts to eliminate energy poverty, therefore, would need to take cultural factors into account in addition to efficiency, cost-effectiveness and environmental considerations.

Energy use factors interact in myriad ways. Nevertheless, programs and projects aiming to eradicate energy poverty and to improve energy security need to take all these factors into account in order to be successful. Reliance only on technical and economic efficiency is insufficient. Demographic and cultural characteristics of target groups should be studied and the findings incorporated into program deliverables. Local people should be involved in all stages throughout the project implementation to ensure their needs are met in congruence with their maintenance of agro-pastoral systems.

A case for change…

Private sector engagement in energy provision should receive greater attention in policies that target energy poverty. Small-scale technologies such as solar home systems, micro-hydro units, biogas digesters, improved cooking stoves, residential wind turbines and thermal insulation of homes are appropriate in rural areas and their distribution could be promoted through private entrepreneurship. However improved incentive structures may be needed to set up the supply (value) chain for alternative technologies. Clear policy directives supporting such technologies should be provided by the government, including financial incentives. Such incentives could include tax breaks, removing import tariffs for companies that bring appropriate technologies to local markets, direct subsidies or low-interest loans for households choosing to install such technology, or some combination of the above instruments. Funding also should be made available for local developers who are already experimenting with adapting and improving technologies to local conditions, and new avenues of research should be encouraged and financed in order to pioneer locally-designed technologies.

Such avenues are not new to policymakers in Tajikistan. However, their relevance and significance have not always been duly appreciated. Small-scale technologies that are promoted through private sector engagement can help to demonstrate appropriateness to help alleviate, and eventually even to eradicate, energy poverty in Tajikistan.

Figure 5: Cultural preferences often dictate choice of energy source. In Tajikistan, despite access to electricity and modern electrical appliances, traditional Tajik bread still is baked in tanoor clay ovens since it cannot be baked satisfactorily in an electric oven.
Photo: Murodbek Laldjebaev

Case Study: Khatlon Region

CAARF Fellow Murodbek Laldjebaev conducted a survey of 386 households in 2015, along with interviews and focus group discussions, in mountain areas of the Khatlon region, Tajikistan. His goal was to assess the energy access situation and understand the implications for rural peoples' livelihoods. Findings reveal that inadequate access to lighting constrains households' ability to enjoy their meals, socialize or engage in some productive activities. Rural households mostly use coal, wood, dung and straw to cook meals and heat homes. Electricity is intermittent in rural areas, so households keep perishable food under cold water, tree shade or in underground wells. When electricity is available, it is mostly used to watch television and charge mobile phones, which are needed to obtain information and communicate in rural areas. Poor road conditions and high transport costs are the main obstacles to traveling to markets, health clinics and visiting relatives. These findings demonstrate considerable lack of access to energy services in rural areas of Khatlon region. A proposed suite of measures to address this deficiency includes improvements in energy efficiency, expansion of electricity supply through the grid as well as with provision of power through small-scale technologies. Communities should be directly involved in addressing their energy challenges.

Definitions

Energy poverty: A condition characterized by both a lack of access to reliable electricity and a reliance on burning solid biomass for cooking in polluting stoves.

Biomass: Organic matter that can be used as fuel such as wood, straw or animal dung.

Solar home system: A system that is set up to generate electrical power from solar panels, generally placed on the roof, which can be stored in batteries or converted into alternating current for household appliances (Figure 1).

Residential wind turbine: A household power system that generates electrical energy from a small wind turbine situated in a nearby field, which can be stored in batteries or converted into alternating current for household appliances.

Biogas digester: The above-ground element of biogas power production systems that separates the gas emissions from the slurry (such as a mix of animal dung and water), feeding the emissions through pipes into a gas stove used for cooking and heating.

Improved cooking stove: A cooking stove that has been remodelled to improve fuel-to-energy efficiency ratio; specific designs and components vary by use and location.

Further Reading

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Katherine Hall *has provided guidance and editorial support to the CAARF Policy Brief series.*

Central Asia and Afghanistan Research Fellowships (CAARF) were awarded by the University of Central Asia's Mountain Societies Research Institute to qualified researchers from Afghanistan, the Kyrgyz Republic, and Tajikistan. Fellows' research was centred around learning from and for sustainable development in mountain societies of the Tien Shan, Pamir and Hindu Kush ranges in Central Asia, with a special focus on environmental change, natural resources governance, and the social and economic impacts of mountain development.

Mountain Societies Research Institute

The University of Central Asia Graduate School of Development's Mountain Societies Research Institute (MSRI) is an interdisciplinary research institute dedicated to addressing the challenges and opportunities within Central Asian mountain communities and environments. MSRI's goal is to support and enhance the resilience and quality of life of mountain societies through the generation and application of sound research.

MSRI has five objectives: To generate knowledge on mountain societies through original scientific research; to serve as a knowledge hub for scholars, development practitioners, and policy makers; to enhance regional capacity to conduct sound research relevant to mountain societies; to inform policy and practice through engagement with key development partners; and to disseminate knowledge among mountain stakeholders, including the co-development and co-teaching of UCA's academic programmes. MSRI, together with its partners, actively works to transfer knowledge to policy and practice aimed at improving the quality of life for people of the mountain areas in Central Asia. For more information on MSRI, please visit: http://www.ucentralasia.org/msri.

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