

## Sustainable Energy for Development

Development needs energy. The reliable and efficient provision of modern energy services is a key to reducing poverty. But Bangladesh is an energy starved country: only 43% of its 160 million people are connected to the electricity grid and, in the rural areas, where over 70% of the population live, only 25% have electricity. A mere 6% of the entire population have access to natural gas, and they are primarily in urban areas. Most people in the rural areas depend on kerosene lamps for light. 90% of all Bangladeshis cook with biomass, such as rice husks, jute sticks, cow dung, or wood. In fact, 50% of Bangladesh's total energy supply is provided by biomass.

However, the smoke and particles from kerosene lamps and conventional stoves cause eye problems and respiratory diseases. In fact, the World Health Organization has estimated that 46,000 women and children die each year in Bangladesh as a direct result of exposure to indoor air pollution, while millions more suffer from respiratory diseases, tuberculosis, asthma, cardiovascular disease, eye problems, and lung cancer.

Addressing Bangladesh's energy needs is therefore one of the priority areas of Bangladeshi-German development cooperation. The Sustainable Energy for Development (SED) Program, supported by the Ministry of Power, Energy, and Mineral Resources and the German Federal Ministry for Economic Cooperation and Development through the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, is working to promote the efficient use of renewable energy through solar energy systems, biogas digesters, and improved cooking stoves and rice parboiling systems – which supply urgently needed energy to the rural areas and generate employment, thus reducing poverty in a very immediate and tangible manner. They also save tens of thousands of lives a year.

Germany and Bangladesh: World leaders in renewable energy

Germany is a world leader in renewable energy and energy efficiency: Germany produces more electricity

from photovoltaic panels than any other country in the world – approximately 9.7 billion kWh of solar electricity in 2011; 1.5 million solar plants also heat air or water in German homes. Renewable energy now contributes over 20% of gross electricity consumption, 10.2% of heat allocation, and 5.8% of fuel consumption in Germany. And this is only the beginning. The Renewable Energy Sources Act, adopted by the German Government in 2011, calls for renewable energy sources to supply at least 18% of gross final energy consumption and at least 35% of electrical power by 2020. By 2050, 60% of German gross final energy consumption and 80% of its electrical power is to derive from renewable energy sources.



Solar technology is not only an effective and environmentally sound way to provide people in the rural areas with electricity, but it has also an impact on the earnings of those whose income depend on having light for extended periods of time.

The Bangladesh Government is also actively promoting renewable energy and energy efficiency in Bangladesh. The Renewable Energy Policy of Bangladesh, which was drawn up with assistance from GIZ and UNDP and adopted in December 2008, sets a target of satisfying 5% of total power demand from renewable energy by 2015 and 10% by 2020. The new Sustainable and Renewable Energy Development Agency (SREDA) has been approved by the cabinet and will provide investment incentives for renewable energy-related technologies and set appropriate feed-in tariffs for renewable energy and marketing of green energy to ecologically aware customers.

The SED Program is now working with the Ministry of Power, Energy, and Mineral Resources to draw up rules for SREDA, as well as an Energy Conservation Act. The project is also working with the Bangladesh Standards and Testing Institution to set and certify compliance with energy efficiency standards for electrical equipment such as compact fluorescent lamps (CFLs) and light-emitting diode (LED) lamps.

However, Bangladesh is already a world leader in one area of renewable energy: The solar home systems program initiated by Infrastructure Development Company Ltd. (IDCOL), a Bangladesh-Government-owned financing company, is one of the world's most successful solar energy programs. It has installed over 1.2 million solar home systems of 20-130Wp in the country's rural villages since 2002, benefitting over six million Bangladeshis.

The German Government has been actively supporting IDCOL's solar home systems program for several years now. GIZ, with co-financing from the Dutch-German-Norwegian Partnership Program Energizing Development, provided funds for buy-down grants for over 160,000 such solar home systems, as well as other support for partner organizations to help them develop the market for these systems.

However, the price of a solar home system remains out of reach for many rural Bangladeshis. Therefore, the SED Program, with its private-sector partner organizations, developed still smaller and less expensive solar home systems that even poor households can afford. LED technology was used to design 10-21Wp solar systems that can power two to four lights and charge a mobile phone at a cost of only 10,000 to 15,000 takas (100-150 euros). An even smaller LED solar system, a PicoPV solar lantern with panel sizes of less than 10Wp is able to light a small hut much more comfortably and efficiently than the traditional kerosene lanterns. The aim



Solar power has also been used to set up hurricane-proof water pumps and purification systems in southwestern Bangladesh.

of the project is to hold the cost of this new solar lantern below the amount that a household could potentially save within two years by replacing its kerosene lamps.

In 2010, SED used solar power to address another crucial problem in southwestern Bangladesh: hurricanes repeatedly sweep over this region and destroy all available sources of clean drinking water. SED used an allocation of 500,000 euros in fast start finance for climate change adaptation from the German Federal Ministry for Economic Cooperation and Development (BMZ) to build 12 solar-powered water pump and purification systems. The systems draw water from surface ponds or underground sources and pump it into water tanks mounted on hurricane-proof overhead concrete platforms, from where a number of pipes lead to various water distribution points in the villages. In 2011, BMZ disbursed another 1.2 million euros, with

which SED has built another 66 such systems. The Comprehensive Disaster Management Programme of the Bangladesh Ministry of Food and Disaster Management has also come forward to support this initiative with around 200,000 euros.

### Using biomass efficiently

Solar energy may be the easiest way to provide electricity to rural Bangladesh, but the country's reliance on biomass for fuel will nevertheless continue for several decades to come. The SED Program has therefore been working with several partner organizations to promote the industrial and commercial use of biogas technology throughout Bangladesh, since biogas digesters are a simple, comparatively inexpensive, but highly effective way to more efficiently use and thus conserve on biomass.

Over 1500 commercial biogas plants have already been installed in slaughterhouses, dairy farms, and layer poultry farms in Bangladesh. The Dhaka City Zoo has also installed one large and three smaller biogas plants that use the animal dung and slaughterhouse waste produced in the zoo. Interest in this new technology, as well as in the diesel and petrol generators that the SED Program has retrofitted to run on biogas, is spreading rapidly, and SED has launched a full national roll-out.

Another industry which makes widespread – and inefficient – use of biomass consists of over 50,000 small and medium-sized steam-generating furnaces that parboil 90% of the Bangladesh rice harvest right at the mills. Not only are these rice parboilers burning up over half of Bangladesh's most plentiful source of biomass – rice husks; they are also very dangerous for the operators and onlookers.

In conjunction with the Bangladesh Rice Research Institute, the Energy Audit Cell of the Ministry of Power, Energy, and Mineral Resources, and Modern Erection Ltd., SED engineers worked to optimize the geometry of the boiler, furnace, and chimney for efficient combustion and heat transfer. They constructed the boiler from steel

sheets and insulated it and the steam pipeline with glass wool. They added a pressure gauge, a water-level gauge, a simple dead-weight safety device that opens automatically when pressure exceeds the safety limit, and a twelve-meter chimney to aid in combustion and remove the smoke, carbon monoxide, and particles. Rice husk is fed into the furnace with the help of a blower. This new rice parboiling system, which reduces the use of rice husks by over 50%, is now being replicated across the country.

### Bondhu Chula: Cooking safely and saving money

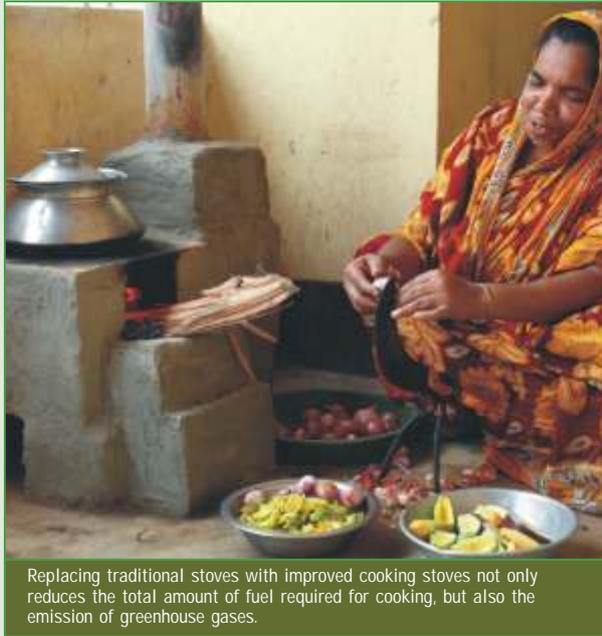
The Bondhu Chula improved cooking stove (ICS) burns biomass much more efficiently and draws off the smoke, carbon monoxide, and carcinogens that seriously threaten the health of Bangladeshi women and children in the kitchen.

"This Chula is helping us to save a huge amount of wood fuel and money," reports Kumkun, one of the ICS users in Munshigonj District. She explains that the family is saving money not only because they now need less wood fuel, but also because they no longer have to pay for respiratory treatments for his sister-in-law, who often got sick while using the conventional stove. "My sister-in-law has never been sick again...we can now use the money we save for the other needs our family has."

The SED Program has also turned its attention to the inefficient and poorly ventilated clay stoves that the vast majority of Bangladeshis still use to cook. An improved stove, originally developed by a team led by Dr. A. M. Hasan Rashid Khan at the Institute of Fuel Research and Development, reduces the biomass required to cook a meal by 50% by adding a grate at the correct depth to focus the fire on the bottom of the utensils



Large farms can produce electricity with captive biogas-powered generators. The produced biogas, can be also used as a clean fuel for cooking and lighting



Replacing traditional stoves with improved cooking stoves not only reduces the total amount of fuel required for cooking, but also the emission of greenhouse gases.

and small air holes in the wall of the stove just below the grate. The addition of a chimney eliminates the smoke and particles which so threaten the health of women and children near the stove.

So far over 400,000 of these improved domestic stoves and over 3000 commercial stoves have been sold under the brand name Bondhu (friend) Chula by over 200 SED partner organizations. In 2010, SED began promoting a version of the stove made from concrete that incorporates bits of broken brick. Metal molds allow pre-fabrication of standardized stove parts, which can then be quickly installed in a customer's home. Sanitary shops throughout the country have added these improved stoves to the products they sell.

Replacing traditional stoves with improved cooking stoves not only reduces the total amount of fuel required for cooking, but also the emission of greenhouse gases. Under the Clean Development Mechanism, a market for these "carbon credits" has recently emerged. JP Morgan Ventures Energy Corporation has recently begun



Improved Rice Parboiling System

purchasing the certified emission reductions created by improved cooking stoves in Bangladesh and selling them to developing countries, which use them to meet their emission reduction commitments under the Kyoto Protocol.

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