

Towards Sustainable Energy Development in Bangladesh- The Perspective of Renewable Energy Technology

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Energy conservation is the practice of decreasing the quantity of energy used. Energy conservation may result in increase of financial capital, national security, personal security, and human comfort and also to increase environmental value. Use of fossil fuels contributes to air and water pollution and also global warming of the earth. This is why the human settlement pattern that supports contemporary civilization must become the focus of every energy consumption and energy conservation discussion. Because of the limited amount of nonrenewable energy sources on world, it is important to conserve our current supply or to use renewable sources so that our natural resources will be available for future generations. Dhaka, capital of Bangladesh is one of the most electricity deprived cities in the world. Despite large potential for renewable energy sources in Bangladesh, currently their contribution to the electricity supply remains insignificant. The aim of the research is searching for alternate technology such as use of solar energy to preserve the limited resources of Bangladesh. The research select some case study was done in suburban areas of Bangladesh. Result shows that the Bangladesh, has very limited natural resources, application of renewable energy should become one of the pioneers in the energy regeneration especially for rural. Architects have a bright prospect to become the leaders in this journey towards saving the world from energy exhaustion.

Keywords: Solar energy, alternate technology, Bangladesh, Dhaka city, sustainability

Introduction

Energy is considered as an enabling medium for economic development. Energy helps people in cooking, heating or cooling their homes, pumping water, lighting houses and workplaces, receiving information and entertainment. Energy is also closely linked to health care, educational attainment, job creation and climate change. There are many regions in the world with a limited accessibility to grid based electricity. Due to economic, geographic and other factors, conventional grid may not be viable for a few decades. Renewable specially solar photovoltaic based electricity generation may be a viable technical option for meeting lighting and other low-energy needs of people living in these rural and remote areas. Renewable based electricity would normally provide clean, safe and environmentally friendly electricity. Especially PV can also have many positive impacts in terms of education, community welfare, employment and income generation.

Methodology

A descriptive study is done without trying to make inferences or causal statements. In general, there are three primary reasons to conduct such a descriptive study:

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1. To identify areas for further research.
2. To help in planning resource allocation (need assessment)
3. To provide informal information about the present condition.

This methodology is also helpful in revealing patterns and connections that might otherwise go unnoticed. Also we studied some case reports to incorporate some new areas of renewable energy in the context of Bangladesh too.

Renewable Energy and Development

The Role of Technology in Economic Growth

- Energy as the core input to technological advancement
- Energy as a necessary factor for production

In Digital Divide

- Extreme differentials in access to energy between rich and poor, developed and less-developed countries
- Economic divergence of the rich and the poor
- Access to energy as a polarizing factor in this divergence

In Millennium Development Goal's

- 'Energy is central to sustainable development and poverty reduction efforts. It affects all aspects of development -- social, economic, and environmental -- including livelihoods, access to water, agricultural productivity, health, population levels, education, and gender-related issues. None of the Millennium Development Goals (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries' – UNDP (United Nations Development Programme)

In Business Development

- Energy for operation of machinery and lighting
- Energy to access ICT's (and 'outside world'

In Knowledge-based Economy Era

- Some countries have exhibited the quickest economic catch-up ever observed (Asian Tigers, China)
- Process of structural change is changing
 - India and Indonesia skipped the manufacturing stage of development straight to information and services stage
 - There is no set way of economic evolution anymore
- Quick diffusion of technology throughout world

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- Globalization of knowledge and technology, among other factors of production
 - This generation has the greatest capacity to achieve such economic catch-up, and access to energy is absolutely crucial to this.

Alternative Energy Contribution

The roles of men and women differ and as such their usage of renewable energy differs. Women, especially in the rural areas, tend to use energy for domestic purposes and for subsistence. Men, on the other hand, tend to use energy more for income generating activities. Women in particular have greatly benefited from access to energy in general as it helped them cut down on long hours of vigorous manual work at home and in the field, as these tasks are now served by engines and machines. Access to energy services and the shift to modern energy for lighting, cooking and productive activities, have positively impacted women's literacy, education, economic opportunities and involvement with community affairs. Women in rural households typically devote 25 percent or more of total domestic labor to wood collection¹. Water collection is another difficult and time-consuming chore for rural populations, traditionally, the responsibility of females, preventing many girls from attending school (Clancy and Joy, 2004). Because women spend many hours performing domestic tasks inside and outside the households, women and girls are likely to gain benefits due to time saving especially in water and fuel collection and improved health if they use clean fuels. If this time saved issued to receive better education or to engage in income-generating activities, then indeed use of various sources of energy would lead to more gender equality and as such lead to more women empowerment. Energy can also contribute to gender equity with regard to domestic work, as men are more willing to take over some domestic tasks, if these tasks are facilitates by energy-dependent household appliances.

Improve Health Condition of People

Shifting to renewable energy in particular, has positively impacted women's health as they no longer have to be exposed to smoke and carbon monoxide when they cook as they did before when they used wood and charcoal for cooking. An estimated 570 million households worldwide rely on traditional biomass for cooking (Anderson, 1999). These represent almost one-third of the global population. Since women are the ones who traditionally cook in the household, research shows that women are typically exposed to very high levels of indoor air pollution, many for 3–7 hours a day over many years. By providing clean energy for cooking, renewable energy resources reduce the disproportionate health burden of indoor air pollution on women (Andrade, 2004). Renewable energy substitutes the need for traditional biomass, alleviates the drudgery of fuel wood collection and promotes gender equality and women's empowerment.

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Examples of People's Needs and Energy Form

Energy Form	Need and Issues		
	Practical Needs Strategic Needs	Productive Needs	
Electricity	pumping of water supplies - reducing the need to haul and carry mills for grinding lighting to improve working conditions at home.	increase possibility of activities during evening hours provide refrigeration for food production and sale power for specialized enterprises such as hairdressing and internet cafes	make streets safer allowing participation in other activities (e.g. evening classes and women's group meetings) opening horizons through radio, TV and internet
Improved Biomass (supply and conversion technology)	improved health through better stoves less time and effort in gathering and carrying firewood	more time for productive activities lower cost for process heat for income generating activities	control of natural forests in community forestry management frameworks
Mechanical	milling and grinding transport and portering of water and crops	increases the variety of enterprises	transport allowing access to commercial and social/political opportunities

Source: Clancy, Skutsch and Batchelor (2003)

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Government Program of Renewable Energy in Bangladesh

62 kW solar PV installed by Rural Electrification Board of Bangladesh 10 KWp solar photovoltaic systems installed by Local Government and Engineering Department in 30 cyclone shelter.

Private Sector

1. **Grameen Shakti**, A “not-for-profit” company involved in promotion of renewable energy resources for poverty alleviation Installed 2695 Solar Home Systems up to July 2000

2. **Rahimafrooz**: Leading battery manufacturing company and supplier of PV system, installed 3000 solar systems upto this year.

Grameen Shakti

It was initiated in 1996 to ‘rescue the rural people from energy poverty which hinders their social and economic development’. Its main objective is ‘to produce electricity to fulfil the minimum requirement of electrical power after dusk in the remote rural areas Bangladesh where conventional electricity could not reach in foreseeable future (social goal).’It effectively captures synergy between renewable energy technology and micro-credit in order to give the rural people a chance to improve their quality of life and also take part in income generating activities.

Key products

- Solar Home Systems
- Biogas
- Improved Cook Stoves

It Faced Initial Challenges Like

- Lack of rural network
- No knowledge or awareness among the rural people
- Lack of trained manpower
- High upfront cost of renewable energy technologies
- Lack of funding sources

Key Programs

Solar Program - for marketing solar home systems through a network of branch offices with a soft loan program

Wind Program - distributing electricity through micro-enterprises in cyclone shelters in coastal areas of Bangladesh.

Bio-gas Program –for promoting bio digester to produces cooking fuel and fertilizer.

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Bio-mass Gasification Program - producing electricity from bio-mass and sells the power in rural market.

Training Program - creating employment for rural people specially women and a base of necessary skills

R &D Program - exploring appropriate technologies, marketing and financing mechanisms, creating local manufacturers of components

PV Program of Grameen Shakti

1. Operating through 23 offices in Rural Areas
2. Encourages the use of these technologies for income generating activities
3. Marketing strategy:
 - Provides soft financing scheme to the customers
 - Helps in using the SHSs for income generating activities for women
 - Ensures proper after sales maintenance
 - to make the system more easily accessible by rural households GS sells PV systems on credit.

Now the credit system is as follows:

- Customers pay 15% as down payment, and the remaining 85% is paid in monthly installments within a 3 year period.

Income Generation for Using Renewable Energy

Case 1: Mobile Phone Charging by Solar PV

Ms .Abeda, a member of Grameen Bank using a solar home system for lighting and charging phone. She can communicate with her relatives working in towns and cities at home and abroad. This communication facility can be availed by other villagers of the locality by making payment to the above mentioned lady and thus providing her with a significant income. Before the introduction of solar system it was rather unthinkable to have a telephone communication with the rest of the world from a remote village in Bangladesh.

Case 2: The ongoing off-grid electrification program of Char Montaz constitutes the following activities.

Solar Home System (SHS) sale on cash and credit, and providing maintenance service

The women's co-operative has sold SHS to more than about 260 households in the islands of Char Montaz, Rangabali and other islands. They offer complete services of installation, training of consumers and after sale maintenance service to the households. Monthly installments are collected from the households covering the cost of SHS, installation and follow up services. The SHSs being sold at a market price face competition from other subsidized programs operating in the same area. It is the local

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presence of the co-operative in Char Montaz and the quality of products that enable them to maintain the market.

Assembling DC lamps and Charge Controllers for SHS:

A major activity of the micro-enterprise is assembling efficient DC lamps and electronic charge controllers of international standard. The lamps are used with 12 V batteries, which may be charged with Diesel charging systems or solar home systems. Production facility of charge controllers has assembled and sold more than 600 controllers for SHS. The lamps and controllers produced by the co-op have been certified for use in the Rural Electrification and Renewable Energy Development (RERED) Project, the national solar electrification program of Bangladesh. A permanent factory premises has recently been constructed in Char Montaz for operation of the micro-enterprise. The women's cooperative is supplying components of solar systems to ongoing projects of other organizations engaged in solar electrification. The same study has shown that access to electricity at the household level significantly increases the knowledge-base among women living in villages, (radio and TV being the main sources of this knowledge). Even for non-electrified households, information from neighbors and relatives can play a significant role. This means that ensuring access to electricity will have a significant impact in reducing the existing knowledge-gaps in the non-electrified households. Thus, it may also be said that access to electricity at the household or in the area can be a major way to increase the level of women's empowerment.

Diesel Operated Battery Charging Service and Energy Service Centers (ESC):

Battery Charging Stations (BCS) located in different market places in the project area are providing important service to the permanent and weekly shops. In addition to supplying electricity on a commercial basis to more than 200 shops for 4-5 hours a night, the enterprises provide battery charging facilities for hundreds of households that do not have access to SHSs yet. Various other electrical goods such as solar panels, cables, batteries, switches, transistor radios, cassette players, etc. are sold in the BCSs. One of the other major activities of the BCS outlets is dissemination of information about RET products and their availability to the rural communities.

Solar Battery Charging Station and Communication Center:

One of the most recent activities of the micro-enterprise is operation of a 1.6 kW solar array for building lighting and a solar battery charging station for the lowest income families. This offers battery charging with high quality charger system that allows 16 batteries of different states of charge to be charged simultaneously. The cooperative charges a commercial rental fee for the batteries with 2 free charges per month. A communication center with computers, phone and fax, all powered by solar energy is also operating from the new premises.

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Supplying to the National SHS Program:

The Government of Bangladesh has undertaken a very important project of providing solar electrification to 64,000 households in the country, within 5 years, through the public and private sector. The micro-enterprise of Char Montaz in collaboration with four new enterprises is supplying components for SHS to NGOs participating in this project.

Conclusion

It is clear that renewable energy technologies have great potential for contributing to a sustainable energy mix in the Bangladesh. However, more action is needed and should include: (1) integrating renewable energy policies into national energy policies with defined and targeted contributions; (2) strengthening relevant national institutions; (3) encouraging renewable energy technology transfer and supporting local industries seeking to develop or use renewable energy technologies; (4) enhancing resource assessment activities for wind and biomass; (5) intensifying capacity building and public awareness programmes; and (6) initiating new financial mechanisms for supporting renewable energy adopting, particularly in rural areas.

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