

ACCEPTANCE AND WILLINGNESS TO PAY FOR PV SOLAR ELECTRICITY: SURVEY EVIDENCE FROM SOUTHERN PART OF BANGLADESH

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Abstract- *The importance of solar electricity has been renowned and well accepted worldwide for the generation of electricity, but unfortunately, Bangladesh has yet to apply efforts on the development of this source of energy. The main objective of this research is to explore the public acceptance and their willingness to pay for PV solar electricity. The result of the survey indicates that 78% respondents showed high interest in the uses of PV solar electricity. Almost 85% of the respondents expect that government provision of incentives could be the best way to boost the use of PV solar electricity in this country. Almost 67% respondents think that by ensuring proper management and monitoring with the qualityfull solar panel in low price is the key for successful implementation of the new project. Therefore, this study provides some important aspects of the future solar electricity policy development in Bangladesh.*

Keywords: PV Solar Electricity, Acceptance of solar electricity, Willingness to Pay, Promotion of solar electricity.

1. INTRODUCTION

Electricity is one of the most important basic needs in the modern century. At present, there are 1.317 billion people globally who do not have access to the basic need of electricity and around 99.8% people are living without electricity in developing countries (IEA, 2012). Energy service is the key to the economic development of a country and to provide energy services worldwide is indeed a major challenge (WB, 2004). The arrangement of electricity to all sectors of the economy and for household consumption is a big challenge faced by the developing countries, especially in their rural areas (Rebane *et al.*, 2011). Provision of electricity according to the demand has become a major challenge for Bangladesh as a developing country (Hassan *et al.*, 2012). Grid electricity can be used for this purpose, but that is accompanied by huge investment such as the construction of power stations, substations, transmission lines etc. Further, it will be dependent on fossil fuels that emit greenhouse gases and other harmful substance in the surrounding which have the various negative impact in the environment (Zhou *et al.*, 2017).

Therefore renewable energy sources have become popular as it is an alternative to fossil fuel and negligible impact on the environment (Ashnani *et al.*, 2014). PV solar electricity has become a reliable energy source which can satisfy the basic energy need such as light (Mondal *et al.*, 2011) because the lighting is generally considered to be in the top three energy uses in developing countries. Moreover, solar technology is playing a prominent role in the reduction of poverty, providing comfort and improving the quality of life and living convenience, because dwellers will have more time for entertainment, study and family business

(Azimoh *et al.*, 2015). As the amount of sunshine, we get every day, PV solar energy has become a viable option for the people to use PV solar electricity as an alternative source of electricity. In a study done by International Energy Agency (IEA), estimated that in 2050, about 11% of electricity production would be provided by solar energy worldwide (Katinas *et al.*, 2013; Moosavian *et al.*, 2013).

Nowadays it has become a global issue to balance the energy demand and supply relative to consumption. The World Bank report revealed that major challenge is to provide energy services to 1.6 billion people who do not have access to electricity and the other 2.4 billion who use traditional biomass for heating and cooking. About 58% of the total energy is consumed by the world 20% richest population, whereas the poorest 20% consume less than 4%. The majority of the poor reside in Sub-Saharan Africa and Asia (WB, 2004). In the developing countries, household energy demand has become an important part of the overall energy demand in rural areas. The choices made by the household about lighting fuels and cooking will have a greater influence to shape the energy system of those countries and hence energy access has become an important topic for both academics and practitioners (Cook, 2011; Javadi *et al.*, 2013).

Renewable energy technologies (RETs) offer developing countries like Bangladesh some prospect of self-reliant energy supplies at national and domestic levels, with potential economic, social, ecological, and security benefits (Hassan *et al.*, 2012). Bangladesh Government has historically been focused on conventional energy with many policy analysts seeing coal and to a lesser extent nuclear, as the solution to the energy crisis (UNDP,

2008). The Renewable Energy Policy, the ambition for power generation from renewable is 10% by 2020 (MPEMR, 2008). Moreover, future images of the energy system seem to be based on a largely centralized national grid approach, with appropriate state of the art 'identified as being large-scale, expensive and relatively untested (e.g. carbon capture and storage). There appears to be little current focus on establishing community-level distributed energy systems (Rahmatullah *et al.*, 2008).

The public acceptance and willingness to pay for PV solar electricity will be examined to determine the acceptance of PV solar energy technology in Bangladesh. Keeping in view the current global energy trend and future energy scenarios in Bangladesh, this study reviews the existing utilization of solar energy and aims to investigate the perspective of the general public on the acceptance of PV solar electricity. The result of the survey indicates that nearly 96% of the respondents somehow heard about PV solar energy but their level of knowledge is very low. Even among potential consumers of renewable energy, the knowledge about this PV solar electricity is marginally low.

More specifically the purpose of this study is to understand the willingness to pay for PV solar electricity of the southern part of Bangladesh. Determine the major constraints for PV solar electricity promotion in Bangladesh. The study will investigate the difficulties faced by the PV solar electricity user in the study area and finally, the study will examine the perspectives of public on the enhancement of PV solar electricity in Bangladesh.

2. METHODOLOGY

This study is designed as an exploratory investigation because limited knowledge is available regarding the social acceptance and their willingness to pay for PV solar electricity in Bangladesh. The study was based on a survey, developed to collect descriptive data on the background characteristics of respondent's education, occupation, knowledge about PV solar technology, acceptance and willingness to pay for PV solar electricity, major constraints to solar energy development and their expectation about the solar energy promotion in Bangladesh.

This study utilizes both primary and secondary type of data. The survey method was employed to collect primary data from the respondents. For this purpose, a survey questionnaire was developed and door to door survey was conducted among the local inhabitants in the southern part of Bangladesh. Information was collected from both rural and urban areas. The survey was completed between February and March 2017. The language of the questionnaire was kept simple and only limited

number of technical terms had been included in it so that respondents with a different background, education, and exposure to PV solar electricity can easily understand this. In the sample design of the survey, three criteria were considered important. First, the respondent should be a permanent resident of district Bagerhat. Second, they should be mature i.e. 18 and above years of age. Third, both rural and urban respondents will be included in the study. Before collecting information, respondents were asked some general questions related to renewable energy (RE) such as information about global warming, familiarity with renewable energy technologies, interest in environmental issues and interest in PV solar technology. Hence, those respondents who replied somehow positively or negatively to the aforementioned questions were considered for survey questionnaire. The method of convenience sampling technique was utilized to collect data. The size of the sample was taken only 181. Our study aims to contribute positively to literature by providing perspective and acceptability of PV solar electricity disregarding, income class, ethnicity, and caste. Moreover, the survey is not a representative of the entire nation and its scope is only limited to southern part of Bangladesh (Bagerhat).

3. RESULTS AND DISCUSSIONS

In this section, we present, the demographic characteristics of the respondents, the attitude and interest of public towards utilization of PV solar electricity, public opinion on the difficulties they face in PV solar electricity uses, expectations of the public about PV solar electricity promotion in Bangladesh and public views on the implementation of new PV solar electricity projects. The survey was completed without discrimination in gender, ethnicity and residential areas of respondents. The age of all respondents were 18 and above. Moreover, the survey was completed by personal interaction with the respondents. The analysis of the data was carried out using SPSS and Microsoft Excel software.

Table 1

Demographics of the participants (n= 181)

Respondent character	Frequency	Percentage
Gender		
Male	101	56%
Female	80	44%
Age		
Less than 18–20	12	7%
20–29	57	32%
30–39	42	23%
40–49	38	21%
50–59	23	13%
60 and above	9	5%

Education		
Illiterate	16	9%
Primary	58	32%
High school	54	30%
College	35	19%
Graduate	18	10%
Area		
Urban	88	49%
Rural	93	51%
Occupation		
Shopkeeper	16	9%
Businessman	19	10%
Student	22	12%
Farmer	31	17%
Govt. servant	17	9%
Daily wager	20	11%
House wife	56	31%

The general demographic characteristics of the respondents are shown in Table 1. Almost 56% of the respondents are male and rests 44% are female. More than one-third of the respondents aged between 20 and 29 years. In terms of education, 9% respondents are illiterate, 32 % have primary schooling, 30% have a high school, 19% have college and only 10% have graduation. The respondents are approximately equally distributed between urban (48.6%) and rural (51.4%) areas. A large portion of the respondents is housewife (31%) and farmer (17%). Where the rests are the shopkeeper, businessman, student, daily wager or govt. servant.

Table 2
Public knowledge about PV solar electricity

Public Knowledge about PV solar electricity	Yes (%)	No (%)
Do you hear about PV solar electricity	96%	4%
Do you have PV solar panel installed in your house?	23%	77%

Public knowledge about PV solar electricity is represented by this Table 2. Almost 96% respondents somehow hear about PV solar electricity. Only 23% respondents have installed the solar panel in their house and the rest 77% is not the potential user of PV solar electricity.

Table 3
The interest of public in PV solar electricity

Public interest in PV solar electricity	Frequency	Percent age
Interested	141	78%
Not Interested	13	7%
Neutral	27	15%
Total	181	100%

The interest of the public in PV solar electricity has been represented by Table 3. The survey was conducted to determine the public attitude towards

the uses of PV solar electricity. The respondents from both rural and urban area are surveyed to understand the public attitude about the PV solar electricity installation at home. The result of the survey indicates that around 78% of the respondents are interested overwhelmingly, whereas 7% are not interested and about 15% are neutral. Therefore, a high level of interest is observed among the respondents, which represented a high potential for the uses of PV solar electricity.

Table 4
Public interest in purchase of PV solar electricity (n=181).

Public interest in PV solar electricity	Yes (%)	No (%)	Unsure (%)
The possibility of buying solar panels if the total cost is subsidized by 50% by the government	72%	10%	18%
The possibility of using solar generated electricity if the price is same to that of fossil fuel generated electricity	29%	46%	26%
The possibility of using solar generated electricity if the price is reduced to that of fossil fuel generated electricity.	87%	4%	9%

The public interest in the purchase of PV solar electricity is represented by Table 4. The survey finding shows that 72% of the respondents are willing to purchase solar panel if the total cost is subsidized by 50% by the government. Only 29% of the respondents are interested if the price is same to that of fossil fuel generated electricity. But 87% of the respondents are willing to buy solar electricity if the price is reduced to that of fossil fuel generated electricity. The overall result indicates that reducing 50% of the price of the solar panel and decreasing the price of solar-generated electricity can be a viable option to introduce in order to increase the uses of PV solar electricity.

The public response regarding the difficulties in consumption of PV solar electricity is represented by the Figure1. It indicates that 70% of the respondents think Initial installation cost of PV solar electricity is the most difficult one where 20% found it difficult. Almost 59% respondent think the

availability of right information about the PV solar electricity is very difficult. Where only 17% respondent found it either less difficult or not difficult. High price and the low-quality solar panel is another problem for them.

The responses of the public regarding the difficulties in consumption of PV solar electricity are represented by the Figure 1. Almost 80% of the respondents find it either very difficult or only difficult. Where only 20% respondents found it less difficult or not difficult at all. Availability of solar panel and the service quality of provider is also denoted as a difficulty in consumption of PV solar electricity.

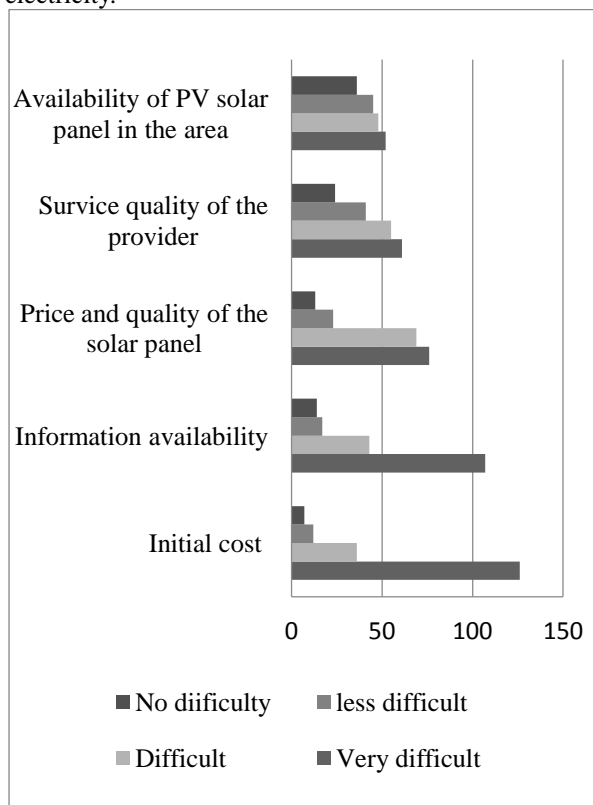


Fig.1: The responses of public regarding the difficulties in consumption of PV solar electricity

Almost 64% of the respondent find the service quality of the provider make it difficult to use PV solar electricity where 36% of the respondents does not think so.

Almost 55% respondents think the availability of PV solar panel is either very difficult or difficult and 45% respondents find it not so difficult to have the PV solar panel in their area. The opinion of the public is important in meeting the objectives of the government regarding renewable policy. The aim of this study is to determine the expectations of public regarding PV solar electricity usage in Bangladesh by taking into account the opinion and attitude towards new PV solar electricity policy implementation.

Public opinion to enhance the use of PV solar

electricity is represented by Figure 2. The result of the survey indicates that almost 85% of the respondents claimed that government subsidy is the best way to enhance usage of PV solar electricity all over the country. Almost 65% respondents think that decrease the taxes on PV solar electricity equipment can increase the uses of solar electricity. In addition, nearly, 69% believe that Ensure high-quality product availability and nearly 63% think that ensure better service by finding a trustworthy contractor is a good idea, whereas only 22% supports the increase taxes on fissile fuel electricity can increase the uses of solar electricity.

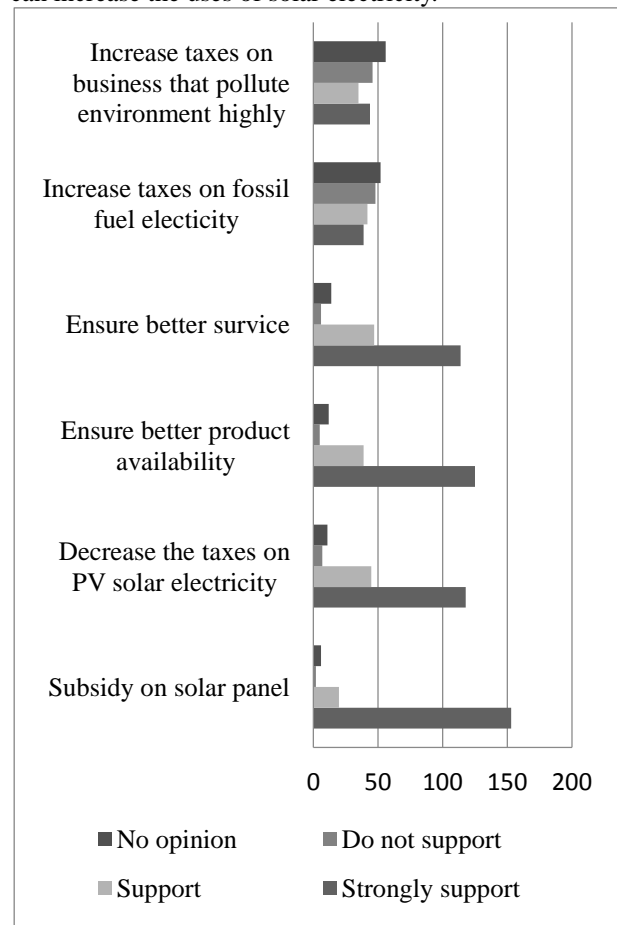


Fig.2: Public opinion to enhance the use of PV solar electricity

Beside this some 43%, respondents support the increase taxes on business that pollute environment highly. The results show that majority of the respondents considered government to be the main responsible body for the promotion of PV solar electricity in Bangladesh.

Public Attitude towards implementation of new PV solar electricity project is represented by Figure 3. The result revealed that almost 67% think Proper management and monitoring is very important for the successful implementation of new PV solar electricity project in Bangladesh. Almost 77% respondents think that providing the quality full

solar panel in low price can make the new PV solar electricity project successful. Some 61% respondents think to increase the installation in public and private building can provide big support. Around 70% respondents found it very important to increase the awareness among the stakeholders and about 46% considered it necessary to have access to full information; nearly 34% suggested that huge amount of funding for the purpose of independent research to ensure the sustainable development and promotion of PV solar electricity of Bangladesh.

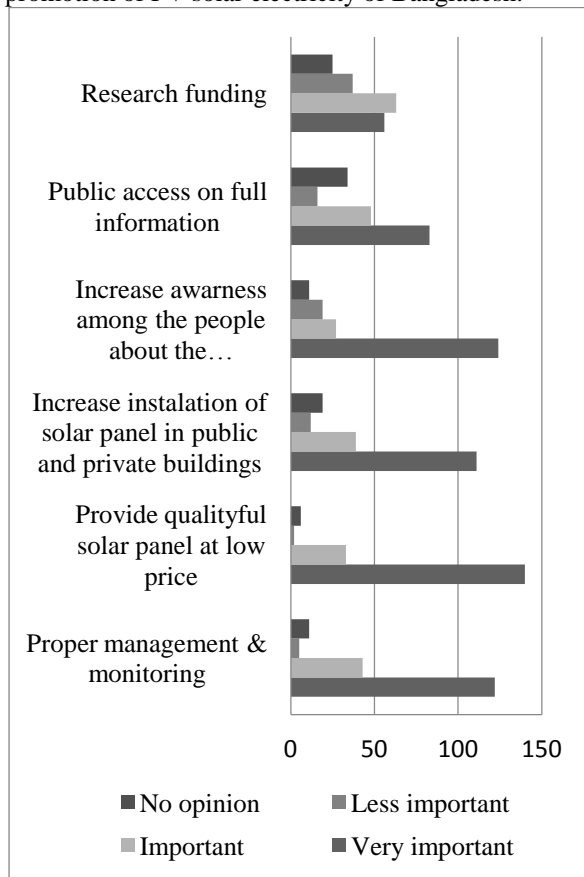


Fig.3: Public attitude towards implementation of new PV solar electricity project

The result of the survey shows that government can enhance the project on PV solar electricity by providing various incentives (subsidies) and providing quality full solar panel at the low price. In addition, this study also recommends that government should provide full information to the general public, research funding for PV solar electricity and should initiate projects that increase the installation and usage of PV solar electricity.

4. CONCLUSION

Economic development of a country is mostly depended on its energy demand and supply balance. In Bangladesh, there is a huge demand for electricity but the supply is inadequate. There is always a shortage of electricity. Therefore, the government emphasized to diversify the energy mix to overcome the shortage of energy in the country. Solar energy is deemed to be an

appropriate source of energy of Bangladesh as it has an abundant amount of sunshine throughout the year. The purpose of this study is to investigate the social acceptance and willingness to pay for PV solar energy in the southern part of Bangladesh. The key findings of the study are- Almost 78% of the respondents are very interested in PV solar electricity in southern part of Bangladesh. Around 80% of the respondents are willing to purchase solar panel if the 50% cost of solar panel subsidies by the government. The major difficulty in the use of PV solar electricity is its initial cost. Although some of the respondents claimed that the lack of proper information about this is also a hinder for the uses of PV solar electricity. The development of PV solar electricity in Bangladesh is very important and the government should step up for this by initiating new project, ensuring proper management and monitoring, lowering the cost of solar panel, proper policy of pricing, increasing awareness among the people and most importantly the government needs to provide support in the form of subsidy both consumer subsidies and product subsidies.

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