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A study on investigating the effectuation of renewable energy for sustainable development in construction sector

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ABSTRACT

Sustainable development is the organizing principle for meeting the human development goals while at the same time sustaining the ability of natural systems to provide the natural resources and ecosystem services upon which the economy and society depend. Even though the possibility of sustainable practices are wide, the effectuation of these practices are still a hinderance in the construction sector due to multiple factors. The main objective of the study is to analyse the ways of using renewable energy and to identify the best source among it to achieve sustainable development. Identifying the various factors which affect the effectuation of sustainable practice were analysed through questionnaire survey. The questionnaire was distributed in and around the district of Erode. The comparative results were drawn using the SPSS. The findings reflect the problems in achieving the sustainable development. On conclusion the prime factor that favours the hinderance were found to be negligence of knowledge towards various sustainable practices and their added advantage to enhance sustainability followed by factors like cost overrun.

Keywords: Sustainability, Hinderance, SPSS, Cost overrun.

INTRODUCTION

The term sustainability should be viewed as the humanity's target goal of human-ecosystem equilibrium while, sustainable development refers to the holistic approach and temporal processes that lead us to the end point of sustainability. The pathway to the future is sustainable development. It helps to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance. The organizing principle for sustainable development includes the four interconnected domains ecology, economics, politics and culture. Sustainable energy is an energy system that satisfies the needs of the present without compromising the ability of future generations to meet their energy needs. Not all renewable energy is sustainable. Where renewable

energy is defined as the energy sources that are naturally available which will be replenished on a human timescale. The commonly available renewable energies are solar, wind, geothermal, hydroelectric, biomass etc. Where off all the sources solar energy can be easily harnessed and used in for energy consumption. [1-3]

LITERATURE REVIEW

Palanisamy et al., (2017) observed that the research suggests that sustainable building delivery process attributes which are effective in the U.S. will also be effective in India and vice versa. Despite differences between the U.S. and India, the process maps showed that the delivery of the Soundarya project in India was similar to the

delivery of the Toyota project in the U.S. Because of the similar processes and process attributes, each country could potentially leapfrog directly to best practices for sustainable project process attributes used in the other. [4-6]

Kashani et al., (2015) explored the theoretical limitations of current real options models and create a new real options model to evaluate investment options for renewable energy systems under uncertainty. This theoretically well-founded and practical model is used in the context of investment decision making for building energy improvements. The primary contribution of this research to the body of knowledge is the creation of a method to account for uncertainty about energy savings due to renewable energy systems in buildings, a method to estimate the volatility of renewable energy projects subject to uncertainty and an investment valuation approach to identifying the best time to implement renewable energy systems in buildings along with the investment option value.

Rajendran et al., (2009) explained the study was to investigate the impacts of green building design and construction on construction workers safety and health. And it appears to be little or no difference between green and non-green projects in terms of construction workers safety and health. Because no difference in safety performance is experienced, LEED projects are perhaps sustainable environmentally but not sustainable in terms of worker safety and health [7-10].

OBJECTIVES

Objectives of adopting Renewable energy in Construction Sector includes

- To investigate the various practices of using renewable energy for sustainable development in construction industry.
- To identify and analyse the various motivational and perplexity factors for adopting solar energy for sustainable development.

RESEARCH METHODOLOGY

From the extensive literature study, it is much clearer that factors which contribute directly for sustainable development are achieved by using

renewable energy. In particular, researches were conducted in small extent to explore about renewable energy in construction sector. The factors in this study investigate all the problems and risks associated with the solar energy implementation on construction sector.

Questionnaire survey was conducted among construction professionals to spot their opinion towards solar energy in their construction sector. The obtained data will be analysed to find out the frequency of response for various factors.

Questionnaire preparation

Based on the literature and factors considered, a Questionnaire was designed as a measurement of problems and risks that tends to arise while implementing solar energy. The questionnaire consists of 25 questions relating factors influencing general profile and morbidity profile of respondent. Also, the respondents were asked to rate their response according to the respective five-point rating scale.

FACTORS AFFECTING EFFECTUATION OF SOLAR ENERGY

Following factors are identified as a Potential Source of problems and Risk in effectuation of solar energy. The factors are classified as motivational factors and barrier factors.

Financial motivation

It is one of the vital factors which directly relates to the cost overrun. The cost overrun first starts at the initial investment stage where it can be prevented with the subsidies offered by the government. The cost of conventional electricity is to be compared with the cost of renewable energy which might encourage more people to follow sustainable construction without cost overrun.

ENVIRONMENTAL MOTIVATION

Environmental protection is the main and foremost reason for the adoption of any renewable energy project because the energy produced from the sun, wind etc. is renewable and non-GHG emissive energy moreover it is more environment

friendly. People should be addressed well with the current condition of the environment by means of seminars, lectures, advertisements etc. in order to make them realise the importance of renewable energy. The environmental motivation should be cost oriented to client in order to make them construct sustainable houses.

Energy supply motivation

The next motivational factor for achieving sustainable development is the energy supply motivation. It deals with promoting the use of affordable sustainable energy for all constructions. This involves promoting the reliability of energy to make sure that continuous supply of it is available to ensure in case of grid failure. It also ensures to make them produce and conserve energy rather than using conventional energy for day to day use.

Financial barrier

The Financial barrier is considered as one of the important factors that prevent people from moving towards sustainable development. It relates with various financial barriers like installation costs which may be high if proper investigation towards the technology, installation processes are not properly executed. The payback period and the Return on Investment (ROI) is also considered in it in order to ensure that the costs expended are recovered within a particular period of time.

Technical barrier

The use of renewable energy for sustainable development with low cost is only possible by using good quality materials and good installation procedures. Because poor installation procedure can damage the structural roof and may increase the cost. The aesthetic value of the structure may get affected which may lead to an increase in the

cost. A structure with a sustainable feature is very much efficient in reducing the cost.

Insufficient knowledge

Insufficient knowledge is also an important factor in preventing sustainable development. The client should be well aware of the type of solar photo voltaic cells available in the market with its cost, operative procedures, installation procedures, maintenance procedures, and its complete benefits to ensure the project to do at its correct price. The seminars, workshops, events for users are to be conducted regularly to give them knowledge and to promote sustainable development.

Institutional factor

The institutional factor deals with the good knowledgeable companies where they provide good consulting and installation towards sustainable development with estimated costs. Generally, there is lack of knowledge about the various subsidies, offers and promotions done by these companies which contribute towards the cost overrun. It also deals with selling back the excess energy generated to the by connecting it to the grid system.

RESULTS AND DISCUSSION

The questionnaires were distributed through Google forms. 70 responses were received from site engineers, project managers, owners, students to assess the risk factors influencing the effectuation of solar energy.

Financial motivation

From the responses it is observed that 39% feel Existing subsidies reduce the initial investment cost, 37% feel that price of normal grid electricity will not be affordable enough in future.

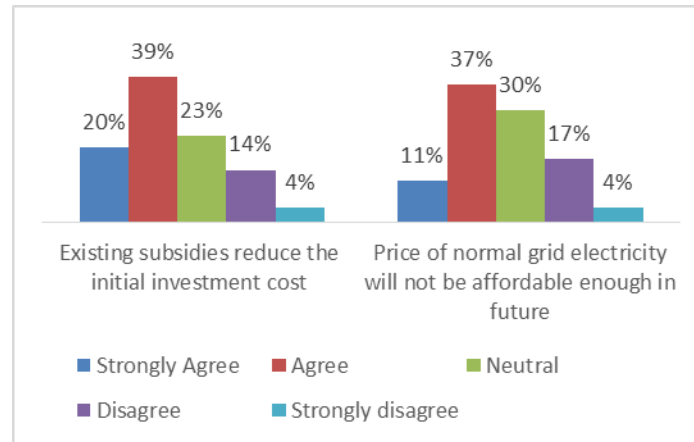


Figure 1 Financial motivation

Hence, we can infer that most of the respondents feel that the subsidies are the only way to motivate people to adopt solar energy for sustainable development.

ensures consistent supply of electricity if grid supply fails, 30% client's feel to produce own energy rather than using government energy to reduce cost.

Energy supply motivation

From the responses it is observed that 50% accept that the use of solar photo voltaic cells

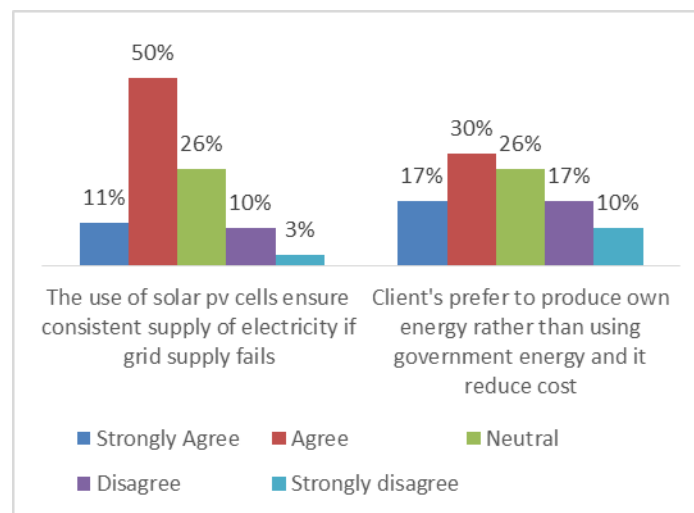


Figure 2 Energy supply motivation

Hence, we conclude that the energy supply is consistent in using solar which is used to encourage people to move towards sustainability.

Environmental motivation

From the responses 30% client's desire to help in preserving the environment in order to achieve sustainable development.

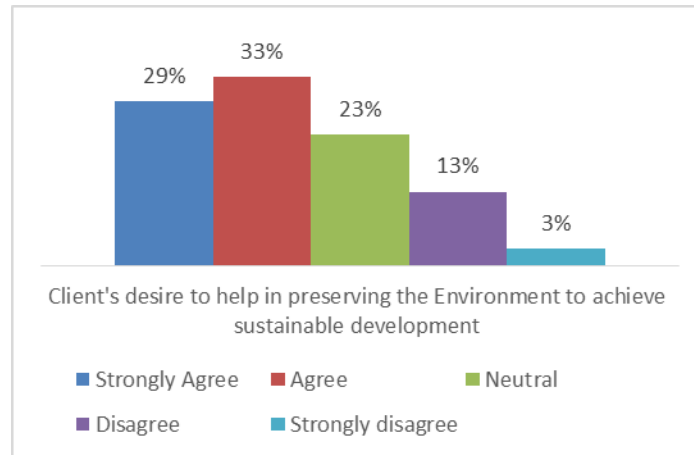


Figure 3 Environmental motivation

Hence, we conclude that most people are intended to preserve environment in order to achieve sustainable development.

payback period affects implementing towards sustainable practices, and 43% feel that the return on investment is certain.

Financial barrier

From the responses it is observed that 36% feel that high installation cost, 31% feel that long

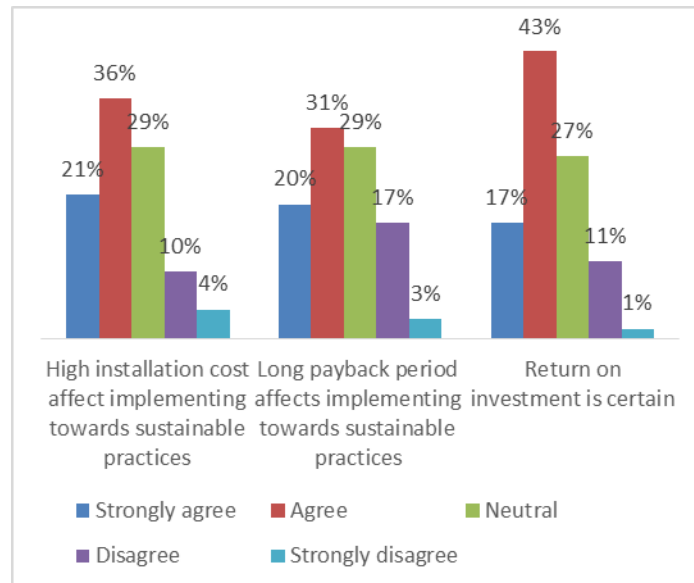


Figure 4 Financial barrier

Hence, we conclude that the high installation cost and return on investment affect people from achieving sustainable development.

feel that daily variations in solar doesn't meet demand, and 33% feel that solar photo voltaic system is static and doesn't take full advantage of solar.

Technical barrier

From the responses it is observed that 34% feel that lack of quality materials increase cost, 46%

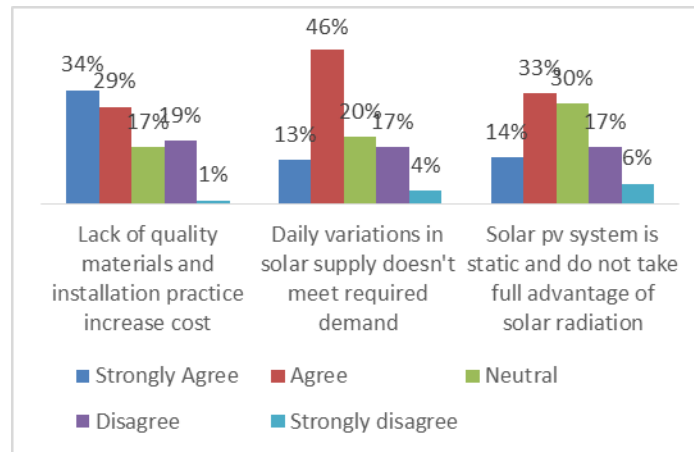


Figure 5 Technical barrier

Hence, we conclude that daily variations of solar and static solar system affect people to adopt towards sustainable development.

Insufficient knowledge

From the responses it is observed that 33% feel difficult to compare the cost between various photo

voltaic systems and installers, 40% people see only low number of successful installations, and 37% feel the household lack the knowledge on proper maintenance.

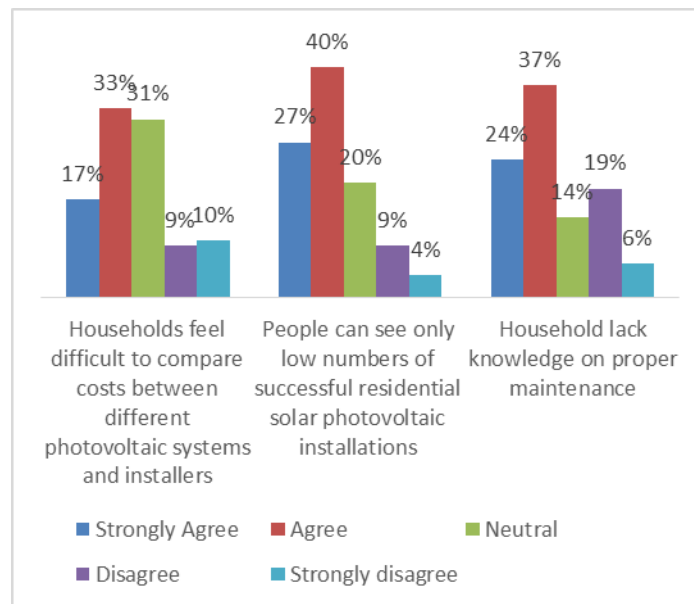


Figure 6 Insufficient knowledge

Hence, we conclude that low number of successful installations and lack of knowledge on proper maintenance decrease people to tend towards sustainable development.

Institutional factor

From the responses it is observed that 47% feel that there is a scarcity of attractive offers and promotions and 39% lack the knowledge of selling back the excess energy to the government.

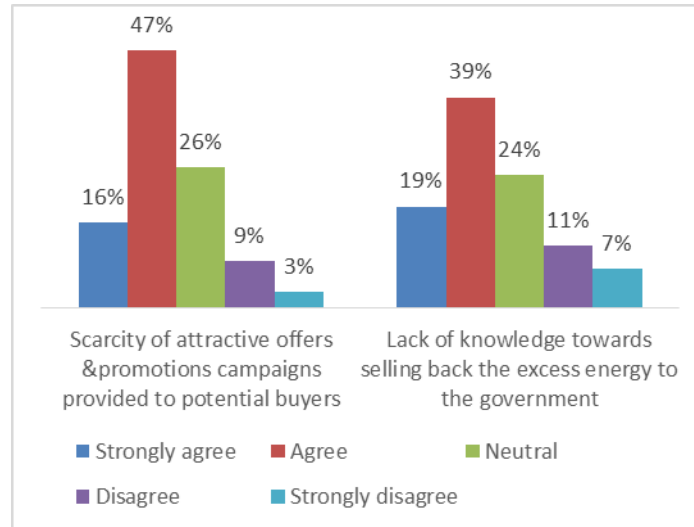


Figure 7 Institutional factor

Hence, we conclude that the scarcity of attractive offers and promotions prevent people from converging towards sustainable development.

CONCLUSION

There are numerous ways to achieve sustainable development in construction industry but it starts with the use renewable energy. Though there are many sources of renewable energy available the solar is the only best source to harness easily and use it for households. This study investigates the risks and problems associated with it in order to improve the sustainable development in the future.

The online survey result shows that 39% feel Existing subsidies reduce the initial investment cost in financial motivation. 50% feel that the use

of solar photo voltaic cells ensures consistent supply of electricity if grid supply fails in energy supply motivation. 30% client's desire to help in preserving the environment in order to achieve sustainable development in environmental motivation. 43% feel that the return on investment is certain in financial barrier. 46% feel that daily variations in solar doesn't meet demand in technical barrier. 40% people see only low number of successful installations in insufficient knowledge. 47% feel that there is a scarcity of attractive offers and promotions in institutional factor.

Finally, we conclude that the scarcity of attractive offers & promotions to the potential buyers and low number of successful installations mostly affects the effectuation of renewable energy for sustainable development.

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