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Implementation of renewable energy in Scottish rural area: A social study

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ABSTRACT

Nowadays, renewable energy is considered one of the valuable sources of energy in the energy sector. It is contributing major role in fulfilling the increasing level of global energy crisis. Although most of study of renewable energy is done through its technological development and a few are done in its acceptance level socially. In such consequences, this research considers the social acceptability of renewable energy in terms of economical, environmental and cultural perspectives. As a test bed, Scottish rural areas were considered for this social study, where the areas are regarded as lacking of continuous energy supply due to weak grid and socio-economic growth. This research investigates the intimate and sensitive nature of the social issues in rural Scotland that are important in the communities when decisions are made on renewable energy supply and demand. The social interactions are investigated by means of both interviewing the local residents and distributed questionnaires among them. The responses from the interviews and the questions are analyzed according to the predefined criterion of renewable energy such as willingness to accept, changes of life style, income and pay, and education and employment.

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1. Introduction

Growing concern over environmental issue globally, pushing energy business to move from traditional source of energy from fossil fuel to renewable source of energy [17,20]. The rural areas, where the energy crisis are usually high in terms of demand and supply level need to be figured out for stability. The renewable sources of energy could be better solutions for this comparatively remote and underdeveloped region of any country [10]. The nature of renewable energy matches very closely to that of rural communities. The renewable energy resource is widely distributed such that even the most remote communities have access to some of it and of a relatively low energy density. As a form of energy generation, renewable is essentially very cheap once the initial capital expenditure has been overcome [14]. Its generation is clean in comparison to traditional energy generating methods. For isolated communities, it is a sustainable form of power [27].

Renewable energy generation can be implemented in different formats such as wind farm, hydro scheme, and solar energy. All these sources can easily overcome the ever increasing demands on energy in rural as well as urban areas and ever more pressing difficulties in the supply and generation of traditional centrally generated electricity [21,22]. The investment in renewable energy is being promoted as a new means of diversifying rural development.

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The investment over renewable sources of energy also has limitations in terms of socio-economic impacts over the rural areas such as natural tourism, wildlife, landscape, and air pollution. Therefore, before implementing any formats of renewable energy source in rural area, care should be taken from designing the instrumental features to the operating conditions with the objectives to ensuring the lowest possible adverse socio-economic and environmental impacts.

The very nature of many isolated places makes excellent sites for renewable which makes a large potential energy resource. The Spartan distribution of population in many rural areas makes centralized generation and grid connection costly and problematical and is better suited to the decentralized nature of renewable for energy. In particular, it is the smaller scale systems which have low environmental impacts that are most appropriate to sensitive areas and remote communities. This study as concentrated within the Scotland's rural communities is regarded as lacking adequate development and need to find means to achieve sustainable socio-economic growth. Given that rural Scotland is endowed with a huge natural and sustainable energy source in the form of renewable [1,29–32]. The role of this research project was to develop knowledge about the potential for widespread implementation of renewable energy [36].

This research is particularly focused towards the smaller scale renewable system, where there is particular scope for development. According to Sadler and Spencer [28], five broad areas were identified when considering renewable energy developments namely Environmental, Political, Technical, Geographical and Social Issues. Technical issues have been covered in detail in recent years [25]. Environmental issues have similarly received much attention in recent years too as they have taken their place in the political forum. Through a literary review, a lack of any substantial work on social issues in the renewable energy field was identified which lead to the need for the detailed social study in this research. The economics and performance of renewable systems have also been highlighted.

The remainder of the paper is organized as follows. In Section 2, current literature on renewable energy development is reviewed. The objectives of the research are presented in Section 3, while the research methodology is described in the Section 4. In Section 5, the overall impact of renewable energy development over socio-economic factors is interpreted. The results are analyzed and discussed in Section 6. The implications of the research study are elaborated and concluded in Section 7.

2. Literature review

The development of renewable energy is growing faster due to the era of costly oil and abundant fossil energy. The increasing rate of global energy crisis, ecological responsibility and awareness, political bindings, etc., is forcing energy industries globally to move towards the development of renewable sources of energy [11,15,16,19]. Renewable sources of energy especially suitable for the remote rural areas from where the young and skilled person often leaves due to economical crisis of the region. This is especially true in case of European villages and rural cities that suffer from a continuous decline in population [5,37]. In such areas, the development of renewable energy can be considered as a new economic branch.

The development of renewable energy might contribute to the rural community in three different perspectives such as by creating jobs, by creating local tax income from sold off energy and by reducing the costs of energy after initial set up cost [3,23,38]. The set up of renewable energy is also quite easy as it needs the required space which is mostly available in the rural areas [34]. It is also suggested to emphasize the renewable development in the rural areas due to the regional value creation through the measure for productive economic activity [37]. Other than economical point of views, the renewable development should also be characterized by the generic opinions of rural population about its acceptance. Most market research on public views over the development of renewable energy is descriptive rather than probabilistic statistical analyses to illustrate public beliefs and responses to specific technologies [9].

The social study for the acceptability of renewable energy is considered as an important issue for the widespread implementation in terms of its technologies and the achievement of energy policy targets [2,9]. The social or public acceptance about renewable provides a novel classification of personal, psychological and contextual factors that justify the proper and profitable implementation [6,13]. Conducting the social study needs coherent theoretical frameworks and innovative methodological tools that cover up the prerequisite for more systematic research on affective aspects of public acceptance [39]. The social acceptance also varies from one source of renewable energy to another one. For instance, several studies found that over 70% of respondents widely recognized wind, solar and hydro-power, while in contrast approximately 20% of respondents accept biomass as the source of renewable source of energy [7,8,24].

3. Research objectives

This study starts with an overview of social issues and trends in rural Scotland with the view to establish the need for rural development and the issues it should be addressed. It was decided to investigating the relationship of societal impact with the development of renewable energy and the possible effects with each other. This was done through the social survey that could result particularly in terms of rural development in Scotland. This survey was followed by a discussion of the various issues considered individually; largely identified from interviews, discussions, reading and hypothesizing. The use of questionnaires is explored using Clydesdale, Scotland as a test bed and important inferences and conclusions regarding social factors and renewable drawn in the results and discussion. The social study was conducted to achieving the objectives as identified below:

i. To help in the promotion of renewable energy in Scotland.
ii. To identify the social issues that affect renewable energy developments.
iii. To classify and prioritize the issues and draw some correlations to social indicators such as class and sex.
iv. To identify the issues as aids to or barriers against the development of renewable energies.
v. To demonstrate a simple methodology to asses the interaction between social factors and the renewable energy development at a site.
vi. To investigate the role of renewable energy in rural development.

4. Research methodology

The methodological steps as taken during this study were confined with the pre-defined questionnaires as distributed within the study region and face-to-face interviews with the local inhabitants (Clydesdale, Scotland). The questionnaires and the interviews were related to the social interaction with renewable energy and the essential information was collected and assessed critically. Due to the inadequacies of available resources, at all stages an intrinsic analysis had been made to determine the strengths, weaknesses