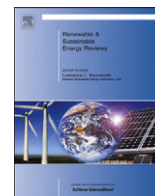




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Pro-environmental attitudes of users and non-users of fuelwood in a rural area of Greece

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ABSTRACT

Bioenergy is today considered to be a renewable energy source that can be used, on a short and long-term basis, to replace fossil fuel and reduce the emission of greenhouse gases. Fuelwood is an important source of biomass and plays a significant role in addressing the energy requirements, particularly of the third world.

Concern for the environment has been a dominant social theme over the last decades, and public awareness regarding environmental risks is today greater than ever before. The present study aims to investigate the association between environmental attitudes and the use of biomass energy (bio-energy), especially fuelwood. To achieve this objective, firstly, a measure derived from the survey responses is used to classify individuals according to their evaluation of a number of selected items and secondly, the relation between individual pro-environmental measurements and the use of fuelwood is examined. Thirdly, the introduction of other factors into the analysis, such as income, age, gender and educational level serves to provide further evidence.

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1. Introduction

In the past, fossil fuels in various forms have constituted the main source of energy and have catered for the energy requirements of

humans for thousands of years. Around 80% of global energy requirements are covered by fossil fuel [1]. However, successive energy crises from the early 1970s onwards have gradually underlined the importance of using renewable energy sources (wind, hydropower, solar, biomass).

Biomass is one of the most important renewable energy sources that can effectively cater for the energy needs of modern society in both developed and developing countries [2–4,1,5].

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A very important source of biomass is wood and especially fuelwood [3].

Biomass can play an important role in increasing the participation of RES in electricity production, according to the EU RES Directive 2001/77 [6]. The applications of biomass-produced energy are constantly improving and can be better understood through various research and development programs, as well as a growing number of practical uses [7].

In 2005, bioenergy accounted for 10% of the total primary energy production worldwide and 78% of the energy globally produced from renewable energy sources [8].

In many developing countries, the proportion of total primary energy production is 80%; however, in many industrialized countries, this figure is less than 5% [9].

Developing countries present a very high dependency on traditional biomass for energy production [10–12]. About 40% of the world's population continues to traditionally use biomass (mainly fuelwood and coal) for cooking [10]. The number of people who depend on the traditional use of biomass is expected to increase from 2.7 billion at present, to 2.8 billion in 2030 [13].

In China, fuelwood plays a significant role in covering the energy requirements of rural households [14,15]. Nevertheless, despite having abundant biomass resources, China has not yet utilised them on a broad basis [16]. In India also, which is a rapidly expanding economy, fuelwood continues to be the main resource used to cover the energy demands of rural households [17].

During the last few years however, fuelwood is also being widely used in countries which are suffering from the economic crisis, such as Greece [18,19]. On the other hand, this great dependency of people worldwide on biomass fuels is one of the main causes of deforestation. Furthermore, there is an increase in the household demand for fuelwood, due to the inefficient way in which it is being used [20].

Bioenergy is considered to be a crucial factor in enhancing the sustainable development of rural areas, through the promotion of crops that are not food-related; at the same time, priority is given to the development of energy crops and to the afforestation of agricultural land [1]. The successive reforms of the CAP since the early 1990s have significantly contributed to the afforestation of agricultural land and, consequently, to an increase in wood production [4].

In this study, we have carried out an empirical analysis in the prefecture of Larissa, to investigate the association of environmental attitudes and the use of biomass energy (bioenergy), especially fuelwood, according to data obtained from 385 households (respondents). The data were gathered using a questionnaire and descriptive statistical analysis was utilized. Furthermore, the relation between pro-environmental behavior – as measured in the current study through a confirmatory factor analysis (CFA) model – and the use of renewable energy sources, such as fuelwood, is investigated.

2. Fuelwood production in Greece

Greece is a mountainous country, since 2/3 of the country consists of mountainous and semi-mountainous areas. According to the census of 1992, forests and other forested areas cover 6513,068 ha, i.e., 49.3% of its total area [21]. The productivity of Greek forests is low, when compared to the average productivity of forests in Europe [22].

As expected, the investments that are made in Greek forestry are also very limited, when compared to the investments made in other productive sectors of Greece. However, the products produced in Greek forests and forested areas, as well as the services they provide, play a significant role for the economy of the country and the life quality of its people [23]. More specifically,

the production of fuelwood in recent years has exceeded 70% of the total wood production volume [24,25].

The annual average production of fuelwood in Greece is estimated at 400,000–500,000 t of oil equivalent, which means that the produced energy covers 1.5–2% of the total energy needs of the country [22].

This contribution is not considered to be small or negligible nationally, since it is a subsidy for imported energy worth millions of Euros; on a regional and local scale, the impact is much greater and supports the overall effort of decentralized growth.

The apparent consumption of woodfuels in all periods of Greek forestry has been covered almost entirely by the domestic production. The imports of woodfuels, particularly up to 1960, were minimal, and limited mainly to the import of coal, especially from the neighbouring Balkan countries. Exports were also minimal [26]. In 1922, the apparent consumption and domestic production amounted to 5.0 million cubic meters, while in 2005 the domestic production amounted to approximately 1.1 million cubic meters, and the apparent consumption to about 1.3 million cubic meters, presenting thus a continuously decreasing trend. In the past few years, a reduction in the amount of produced fuelwood has been observed in Greece [25]. The consumption of fuelwood is covered almost entirely by the domestic production, which cannot increase without a simultaneous reduction in the produced volume of the more valuable industrial wood.

In the past, a large demand for fuelwood existed. However, the said demand gradually decreased in rural areas and its use in urban housing was very limited [27]. More specifically, during the period 1960–1970, a significant reduction in demand for fuelwood was observed, since it was replaced by other modern heating materials (i.e. oil, electricity) [28]. After the oil crisis of 1973 and the rise in liquid fuel pricing, a relative shift in the demand for fuelwood as a means of heating was observed in the rural provinces of Greece. In general, the reduced demand for timber, as a raw material for heating, had resulted in a crisis concerning the disposal of fuelwood and in the effort to exploit it for other uses [28].

In mountainous regions, the demand for fuelwood is rather constant and not income-related, since heating is substantially linked to the citizens' living conditions.

3. Measuring environmental attitudes

Environmental attitudes (EA) are a crucial construct in environmental literature and an exceptionally large number of EA measures have been presented in the relevant literature [29]. EA have a significant influence on public policies. Each community may have different characteristics that should be taken into consideration during the planning and application of public policies, concerning the production and consumption of fuelwood in Greece. Consequently, it is essential to be able to measure the environmental attitudes of a community. Previous studies have shown that environmental responsibility and the concern for energy sources can be directly or indirectly linked with our daily energy-based actions [30].

Certain studies have highlighted the importance of investigating preferences regarding total energy consumption, while others [31–34] have investigated norm-motivated behaviour for switching to green electricity, and [35] the psychological determinants of attitude toward willingness to pay for green electricity.

Another study [36] has shown that a generalised ecologically-minded behaviour is to a large extent determined by peoples' environmental knowledge and environmental values. The above-mentioned studies provide evidence that pro-environmental behaviour is associated with concerns about the environment

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