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“CLEANER PRODUCTION FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS”

## Eco-efficiency Assessment of a Photovoltaic Solar Energy Installation in Accommodation and Lodging Establishments (ALE). A Case in the Guajira, Colombia

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### Abstract

Eco-efficient technologies for the production of electricity are those that when compared with other technological options generate lower environmental impacts and their cost within the energy system is less expensive. In Colombia and specifically in La Guajira, the potential of renewable energy (ER) is presented as an eco-efficient technological alternative to improve the environmental impacts caused in the production and consumption of electricity in the housing sector. In this sense, this document shows part of the results of a research developed as a doctoral thesis, carried out in the Accommodation and Lodging Establishments (EAH) of the department of La Guajira. The objective of this research is the development of a methodological model of eco-efficient technological solutions as a management tool that contributes to the environmental sustainability of the EAH taking into account that this region has great potential for the development of photovoltaic solar technology. In the current work, part of the results obtained in this doctoral thesis is presented. These results were obtained under a mixed experimental approach to a population of 375 ALE that had at least 5 years of operation and active registration at the Chamber of Commerce of La Guajira in 2016. A questionnaire of 58 items was designed and applied to a sample of 169 LAE. Likewise, for the construction of the Methodological Model of Eco-efficient Technological Solutions two methodologies were used: Methodology 1, consists in the technical evaluation through which the components of the solar photovoltaic system are dimensioned, either for autonomous systems or connected to the network, although in this research it was only designed for autonomous systems; Methodology 2, evaluates the eco-efficiency of photovoltaic solar technology by applying the Colombian Technical Norm NTC-ISO 14045 (2013). In this evaluation 2 methods were used, Method 1 involving environmental evaluation through the Cycle Analysis of Life (LCA), through the application of ISO 14040 and ISO 14044 with the help of SIMAPRO software and the 2011 ILCD environmental impact method. Method 2 to assess the value of the product system. In this case, the solar photovoltaic system for the generation of electricity through the software HOMER PRO was created. Results show that although photovoltaic technology is more eco-efficient than the technology that currently works in the EAH (reduces the emission of CO<sub>2</sub> by 74 %). From economical point none of the two technologies; it is eco-efficient because they do not have a rate of return on investment. This fact highlights the need to continue in this line of research.

**Keywords:** Solar Photovoltaic Energy; Eco-efficiency Technologies; Sustainability management; Accommodation and Lodging Establishments

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