The photovoltaic in Moroccan buildings: energy, environmental, economic and job creation forecast analyses

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Overview

Morocco is committed to increasing the energy produced from renewable sources by around 52% of installed capacity by 2030. This energy strategy aims, among other things, to reduce energy import bills and the energy dependence on the outside. Morocco has to multiply its efforts in order to diversify its energy supply resources and enhance its national resources, in particular through the promotion of renewable energies and energy efficiency. Based on the conducted literature review, many studies have been carried out to study photovoltaic cells and the application of forecasting methods in energy consumption, in electricity supply and demand, in consumption energy from buildings and renewable energy. Knowing that in Morocco in 2017, after the transport sector, which utilizes 38% of all energy, the building sector consumes 25%, although there is no published study on the forecast of PV in Moroccan buildings. For good policy formulation, it is crucial to have reliable forecasts of photovoltaic (PV) power generation in buildings. This article proposes to predict the installed surface of photovoltaic panels in buildings, its energy analysis and its environmental, economic and social impact.

Methods

Based on Moroccan data from 2000 to 2018, this paper adopts two times series data estimation techniques: the autoregressive integrated moving average (ARIMA) and Holt-Winters (HW). These methods are used to forecast the installed area of PV panels in buildings, the energy installed and the PV panels market annually in Morocco by 2040. Also, the study analyses the social (jobs created) and environmental (CO_2 avoided) impact of PVs technologies, this is achieved by examining the results of bolstering this industry's development and the distinctive features of jobs along the value stream. The statistical analyses were performed using the R Studio software.

Results

The findings showed that the surface of PVs installed in 2040, is predicted at 182962m² for the ARIMA model and an area of 346672m² for the HW model. Indeed, the values of the predicted energy production were 41MW, 77MW for ARIMA and HW models, respectively. If these forecasts were achieved, it would result in a reduction in CO_2 emissions in Morocco in 2040, of 54,388 tonnes (ARIMA model) or 103,048 tonnes (HW model). Beyond the environmental concerns, this result confirms that the jobs created by industry, installation and maintenance of PV panels installed in buildings would be 755 (ARIMA model) and 1432 (HW model) in 2040 which represent more than 11,460 cumulative jobs created.

Conclusions

This research contributes to highlighting decision-making processes regarding the utilization of photovoltaic technology. Through this energy policy, Morocco can reduce its CO2 emissions and create more employment opportunities. Likewise, the use of renewable energies can also contribute to regional development by injecting rural areas with a valuable and sustainable source of income.

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