

RENEWABLE ELECTRICITY GENERATION, ENERGY SECURITY AND LOW-CARBON TRANSITION IN PAKISTAN

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Overview

The rising concerns related to energy supply, energy demand, energy security, and environmental issues encourage global consciousness. The effect of energy imports, fuel costs, energy security, and carbon dioxide emissions (CO₂e) has become a serious issue for Pakistan, which is closely associated with social, environmental and economic growth. Like many countries, Pakistan has set determined goals for a reasonable transition towards renewable energy resources, which is an efficient mechanism to help Pakistan's endeavors to save energy independence and mitigate CO₂e. With the background, renewable electricity generation growth, an energetic part of sustainable development, is linked with energy security [1], CO₂e mitigation and energy infrastructure from the Pakistani perspective. Renewable energy could be the substitute for traditional energy sources (i.e., oil and coal) for energy supply security and become a clean energy source to confront energy consumption security and energy poverty [2]. On this basis, the study explores the contributions of various energy and economic factors in Pakistan. For the economic growth cases, these factors are forecasted until 2035, taking into account that total electricity has contributed 16.9% to the country's final energy consumption [3]. Thus, there is a wide-range of possibilities for long-run planning of maximum renewable energy saturation rates, highlighting the need for a holistic sustainability assessment framework and ensuring economic progress.

Methods

The logarithmic mean Divisia index method is adopted to analyze the key factors leading to renewable energy progress in Pakistan from years 1991-2020, involving energy supply mix, energy security, energy intensity, carbon-economic, and CO₂e effects, and forecast these factors for the years 2021-2035 under the constraints of the renewable energy vision-2035 and Pakistan's national 5-year economic plan. This method is preferable than other methods due to its theoretical basis, interpretation and adaptation [4] in the field of environmental, cross-country and regional analysis. The renewable energy generation scenarios are developed under economic (economic growth, CO₂e, energy consumption, and renewable energy) conditions under business as usual (BAU), lower bounds and upper bounds, while renewable energy indicators are estimated using all the factors under BAU, low clean and higher clean scenarios during 2025, 2030 and 2035.

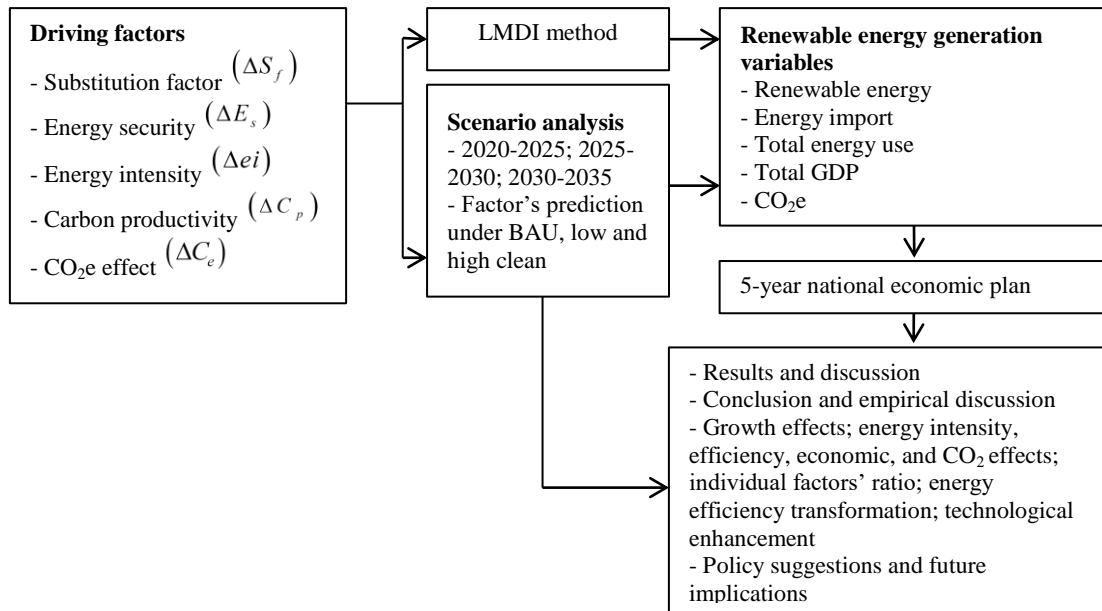


Fig. 1. Overview of the main factors and inputs considered in the LMDI model.

Source: the author

Results

The results during the period show that (i) energy security, substitution from renewable energy generation to energy import and energy intensity makes a major contribution to renewable energy development. (ii) Energy security, carbon productivity and CO₂e are positively contributing to the growth of renewable energy consumption. Economic planning changes from renewable energy to energy imports are maximally moving towards negative contribution to renewable growth. This indicates that the substitution effect shows the opposite trends between renewable energy and the substitution rate. (iii) The scenario analysis forecast that energy and economic factors highlighted that sustainability and energy security could be guaranteed by adapting environmental policies and technical progress. This will help Pakistan attain sustainable growth and a strong synergy between renewable energy and energy security in the future.

References

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