

## **GIS-BASED TREND ANALYSIS ON RENEWAL ENERGY CONSUMPTION AND PRODUCTION IN AFRICA**

*(Analisis Trend Berasaskan GIS Mengenai Penggunaan dan Pengeluaran Tenaga Boleh  
Baharu di Afrika)*

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### *ABSTRACT*

In Africa, there has been a rise in human activities because of technological advancements and population growth, which have led to the transformation of some African villages into towns and towns into cities, increasing the region's energy demand. Utilization of advanced and appropriate renewable energy technologies stands as a critical solution to address the increasing energy demand in Africa. This study employs GIS-based analysis to examine the evolution and shifts in renewable energy generation and consumption within the region from 1990 to 2020, to enhance awareness of the geospatial aspects of energy dynamics. The analysis detects a shift in both renewable production (REP) and renewable energy consumption (REC) over the past four decades in Africa, which signifies growth in both sections. In many cases, a disparity was observed between the renewable energy consumed and that produced, while REP, REC, and GDP have increased significantly across the continent in recent years. In addition, two models are estimated, and the results found a significant growth relationship between renewable energy production (REP) and GDP, and feedback relationships were confirmed between GDP and CO<sub>2</sub> EM. REP improves environmental degradation, and REC has a negative impact on GDP. This study recommends further research and investigation of the data, as GIS statistical analysis still needs more attention to statistics such as the evaluation of neighboring relationships between entities and effects using spatial models.

*Keywords:* trend-analysis; GIS; renewable energy; model; residual

### *ABSTRAK*

Di Afrika, terdapat peningkatan dalam aktiviti manusia kerana kemajuan teknologi dan pertumbuhan penduduk, yang telah membawa kepada transformasi kampung-kampung Afrika ke bandar-bandar dan bandar-bandar ke bandar-bandar, ini meningkatkan permintaan tenaga rantau ini. Penggunaan teknologi tenaga boleh baharu yang inovatif dan sesuai adalah salah satu penyelesaian yang paling penting untuk permintaan tenaga Afrika yang semakin meningkat. Berdasarkan analisis GIS, kajian ini menyiasat trend dan peralihan pengeluaran dan penggunaan tenaga boleh baharu di Afrika antara tahun 1990 dan 2020 untuk kesedaran geospasial tenaga di rantau ini. Analisis ini mengesan peralihan dalam kedua-dua pengeluaran boleh baharu (REP) dan penggunaan tenaga boleh baharu (REC) sejak empat dekad yang lalu di Afrika, yang menandakan pertumbuhan dalam kedua-dua bahagian. Dalam banyak kes, perbezaan diperhatikan antara tenaga boleh diperbaharui yang digunakan dan yang dihasilkan. manakala REP, REC, dan KDNK telah meningkat dengan ketara di seluruh benua dalam beberapa tahun kebelakangan ini. Di samping itu, dua model telah dianggarkan dan keputusan mendapati hubungan pertumbuhan yang ketara antara pengeluaran tenaga boleh baharu (REP) dan KDNK, dan hubungan maklum balas telah disahkan antara KDNK dan CO<sub>2</sub> EM. REP meningkatkan kemerosotan alam sekitar, dan REC mempunyai kesan negatif terhadap KDNK. Kualiti model kereta api dinilai menggunakan ujian yang baik. Kajian ini mengesyorkan penyelidikan dan penyiasatan lanjut mengenai data, kerana analisis statistik GIS masih memerlukan lebih banyak perhatian kepada statistik seperti penilaian hubungan jiran antara entiti dan kesan menggunakan model spasial GIS.

**Kata kunci:** trend-analisis; GIS; tenaga boleh diperbaharui; model; sisa

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