# Chapter 5
# Impact of Digital Infrastructure on Renewable Energy Consumption Across Countries

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## ABSTRACT

*This chapter develop empirical model to observe the implication of digital infrastructure (DI) on renewable energy consumption (REC) as compiling a country-wise imbalanced panel data during 2004 – 2022. Three functional forms of empirical models are formulated to achieve its objective. REC is considered as a core explained variable. Mobile cellular subscriptions and individuals using the internet promote DI, thus both the variables are considered as core explanatory variables. Moreover, education expenditure, inflation, per capita GDP, energy use per capita, popula-*

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*tion growth and technological development are applied as CVs in the regression analysis. DTs are found beneficial to increase REC. Population growth and carbon intensity have a negative impact on REC. It suggests crucial policy implications to increase the renewable energy management and energy security as using DTs. Finally, this chapter discovers the scope of further research in different dimensions is explicated in this study.*

## 1. INTRODUCTION

High economic growth is caused to increase the demand for non-renewable energy consumption (NREC) in global countries. NREC is highly harmful for environmental quality and human health (Pan et al., 2024), and it also enhance ecological footprint (EF) (Anser et al., 2021), and $CO_2$ emissions ($CO_2E$) (Hu et al., 2021). NREC is caused to increase $CO_2E$ and resource depletion (Sharma et al., 2021). NREC, thus, is creating an obstacle for sustainable development and SDGs. While renewable energy consumption (REC) may be an essential driver to increase economic growth in a sustainable manner in the long-run. However, increasing REC is a crucial challenge for global countries to sustain energy security (Zhou et al., 2023). Use of clean fuels, green innovation and technologies would be effective to reduce $CO_2E$ (Hu et al., 2021). Practices of renewable energy would be imperative to increase sustainability of growth and its determinants (Venkatraja, 2020).

Creation and development of energy is an important option to increase sustainable development. Thus, renewable energy creates a clean production path and reduces occurrence of climate change (Su et al., 2022; Akan, 2024; UNEP, 2025). REC can work as climate resilience. The users can increase the energy intensity (EI) using DTs. While renewable energy is crucial for environmental development (Hu et al., 2021; Ashfaq et al., 2024; UNEP, 2025). Climate change and global warming are crucial challenges for sustainable development and SDGs (Adebayo et al., 2023). Therefore, REC would be a key driver for mitigating climate change impacts as renewable energy reduces emissions (Zarrad et al., 2025; Liu et al., 2025). Raza et al. (2020) noted a significant impact of residential energy consumption on environmental degradation in BRICS nations.

Application of DTs can avoid the additional wastages and enhance the multiple uses of energy. DTs provide the best alternatives to increase energy efficiency. Mobile communication can be effective to increase energy efficiency as it reduces its costs (Chen et al., 2024). Energy efficiency would be positive to attain SDG 7.3 (Wu et al., 2023), and sustainable development in firms (Guan et al., 2025). Around 40% of greenhouse gas can be minimized as improving energy efficiency (Chen et al., 2024). DTs can be used as an innovative tool to increase the sources of renewable energy