CHAPTER 6

THE NEXUS BETWEEN SELECTED MACROECONOMIC INDICATORS, ENVIRONMENTAL DEGRADATION, AND RENEWABLE ENERGY SHARE IN TOTAL ENERGY USE: EVIDENCE FROM G8 COUNTRIES

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INTRODUCTION

Due to their limited supply, conventional fuels were depleted because of the excessive usage during the industrial era. Global climate change has numerous harmful impacts on human health (Farhad et al., 2008). Recently, clean energy3 is vital for economic expansion and the reduction of environmental damage. Therefore, industrialized countries are interested in developing and using clean energy sources such as solar, biomass, geothermal, wind, and hydroelectric energy (Saidi & Omri, 2020:1).

The energy consumption of a country is a core part of its economic sustainability. Since energy consumption is a crucial issue, many countries have taken steps to use clean energy sources. In addition, the energy consumption rate is a good indicator of whether life is well-developed in a country (Khan et al. 2021:479). Primary and inexhaustible clean energy resources meet 14% of the world's energy demand (UNDP, 2000:14). Renewable energy resources are directly related to sustainable development (Khan et al. 2021:479).

The idea of sustainable development was initially brought up during the UN Human Environment Conference in Stockholm in 1972. The Brundtland Report

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[3] In this chapter, the terms "renewable energy" and "clean energy" are used interchangeably, referring primarily to renewable sources such as solar, wind, hydro, geothermal, and biomass.

DOI: 10.37609/akya.3842.c1165

REFERENCES

Abid, A., Mehmood, U., Tariq, S., & Haq, Z. U. (2022). The effect of technological innovation, FDI, and financial development on CO_2 emission: evidence from the G8 countries. *Environmental Science and Pollution Research, 29*(8), 11654–11662. Doi: 10.1007/s11356-021-15993-x

Alper, A., & Oguz, O. (2016). The role of renewable energy consumption in economic growth: evidence from asymmetric causality. *Renewable and Sustainable Energy Reviews, 60*, 953–959. Doi: 10.1016/j.rser.2016.01.123

Amri, F. (2017). The relationship amongst energy consumption (renewable and non-renewable) and GDP in Algeria. *Renewable and Sustainable Energy Reviews, 76*, 62–71. Doi: 10.1016/j.rser.2017.03.029

Apergis, N., & Payne, J. E. (2010). Renewable energy consumption and economic growth: Evidence from a panel of OECD countries. *Energy Policy, 38*(1), 656–660. Doi: 10.1016/j.enpol.2009.09.002

Apergis, N., & Payne, J. E. (2011). The renewable energy consumption–growth nexus in Central America. *Applied Energy, 88*(1), 343–347. Doi: 10.1016/j.apenergy.2010.07.013

Ben Mbarek, M., Saidi, K., & Amamri, M. (2018). The relationship between pollutant emissions, renewable energy, nuclear energy and GDP: Empirical evidence from 18 developed and developing countries. *International Journal of Sustainable Energy, 37*(6), 597–615. Doi: 10.1080/14786451.2017.1332060

Deka, A., & Dube, S. (2021). Analyzing the causal relationship between exchange rate, renewable energy and inflation of Mexico (1990–2019) with ardl bounds test approach. *Renewable Energy Focus, 37*, 78–83. Doi: 10.1016/j.ref.2021.04.001

Deka, A., Cavusoglu, B., & Dube, S. (2022). Does renewable energy use enhance exchange rate appreciation and stable rate of inflation? *Environmental Science and Pollution Research, 29*, 14185–14194. Doi: 10.1007/s11356-021-16758-2

Farhad, S., Saffar- Avval, M., & Younessi- Sinaki, M. (2008). Efficient design of feedwater heaters network in steam power plants using pinch technology and exergy analysis. *International Journal of Energy Research, 32*(1), 1–11. Doi: 10.1002/er.1327

Fuso Nerini, F., Tomei, J., To, L. et al. (2018). Mapping synergies and trade-offs between energy and the sustainable development goals. *Nature Energy, 3*(1), 10–15. Doi: 10.1038/s41560-017-0036-5

Hsiao, C. (2007). Panel data analysis—advantages and challenges. *TEST, 16*(1), 1–22. Doi: 10.1007/s11749-007-0046-x

Inglesi-Lotz, R. (2016). The impact of renewable energy consumption on economic growth: A panel data application. *Energy Economics, 53*, 58–63. Doi: 10.1016/j.eneco.2015.01.003

Khan, A., Chenggang, Y., Hussain, J., et al. (2021). Impact of technological innovation, financial development and foreign direct investment on renewable energy, non-renewable energy and the environment in Belt & Road Initiative countries. *Renewable Energy, 171*, 479–491. Doi: 10.1016/j.renene.2021.02.023

López-Menéndez, A. J., Pérez, R., & Moreno, B. (2014). Environmental costs and renewable energy: re-visiting the environmental Kuznets curve. *Journal of Environmental Management, 145*, 368–373. Doi: 10.1016/j.jenvman.2014.07.017

Menegaki, A. N., & Ozturk, I. (2016). Renewable energy, rents and GDP growth in MENA countries. *Energy Sources, Part B: Economics, Planning, and Policy, 11*(9), 824–829. Doi: 10.1080/15567249.2014.949392

Naqvi, S. A. A., Shah, S. A. R., Anwar, S., et al. (2021). Renewable energy, economic development, and ecological footprint nexus: fresh evidence of renewable energy environment Kuznets curve (RKC) from income groups. *Environmental Science and Pollution Research, 28*, 2031–2051. Doi: 10.1007/s11356-020-10619-3

Ntanos, S., Skordoulis, M., Kyriakopoulos, G., et al. (2018). Renewable energy and economic growth: Evidence from European countries. *Sustainability, 10*(8), 2626. Doi: 10.3390/su10082626

Patterson, A., & Theobald, K. S. (1995). Sustainable development, agenda 21 and the new local governance in Britain. *Regional Studies, 29*(8), 773–778. Doi: 10.1080/00343409512331349383

Saidi, K., & Omri, A. (2020). The impact of renewable energy on carbon emissions and economic growth in 15 major renewable energy-consuming countries. *Environmental Research, 186*, 109567. Doi: 10.1016/j.envres.2020.109567

Schmidt, T. S., Steffen, B., Egli, F., et al. (2019). Adverse effects of rising interest rates on sustainable energy transitions. *Nature Sustainability, 2*(9), 879–885. Doi: 10.1038/s41893-019-0338-3

Sharif, A., Baris-Tuzemen, O., Uzuner, G., et al. (2020). Revisiting the role of renewable and non-renewable energy consumption on Turkey's ecological footprint: Evidence from quantile ardl approach. *Sustainable Cities and Society, 57*, 102138. Doi: 10.1016/j.scs.2020.102138

Sugiawan, Y., & Managi, S. (2016). The environmental Kuznets curve in Indonesia: Exploring the potential of renewable energy. *Energy Policy, 98*, 187–198. Doi: 10.1016/j.enpol.2016.08.029

Tugcu, C. T., Ozturk, I., & Aslan, A. (2012). Renewable and non-renewable energy consumption and economic growth relationship revisited: Evidence from G7 countries. *Energy Economics, 34*(6), 1942–1950. Doi: 10.1016/j.eneco.2012.08.021

Uchiyama, K. (2016). Environmental Kuznets curve hypothesis. In *Environmental Kuznets curve hypothesis and carbon dioxide emissions* (pp. 11–29). Springer, Tokyo. Doi: 10.1007/978-4-431-54910-9_2

Wang, Q., & Wang, L. (2020). Renewable energy consumption and economic growth in OECD countries: A nonlinear panel data analysis. *Energy, 207*, 118200. Doi: 10.1016/j.energy.2020.118200

Climate Council. (2022). *11 countries leading the charge on renewable energy.* Retrieved July 31, 2024, from https://www.climatecouncil.org.au/11-countries-leading-the-charge-on-renewable-energy/

Ember. (2025). *France—Country profile.* Ember. Retrieved August 27, 2025, from https://ember-energy.org/countries-and-regions/france/

Four Corners Clean Energy Alliance. (2023). *Evolving energy technologies in the renewable energy industry.* Four Corners Clean Energy Alliance. Retrieved July 31, 2024, from https://fourcornerscleanenergyalliance.org/evolving-energy-technologies-in-the-renewable-energy-industry-2/

Government of Canada. (2023). *Montreal Protocol and ozone layer protection.* Retrieved July 31, 2024, from https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-organizations/ozone-layer-depletion-montreal-convention.html

Government of Canada. (2024). *About renewable energy in Canada*. Retrieved July 31, 2024, from https://natural-resources.canada.ca/energy-sources/renewable-energy/about-renewable-energy-canada

Rodriguez, A. (2021). *Evolution of renewable energy.* Rated Power. Retrieved July 31, 2024, from https://ratedpower.com/blog/evolution-renewable-energy/

Stallard, E. (2024). *Climate change: renewable energy race.* BBC News. Retrieved November 17, 2024, from https://www.bbc.com/news/science-environment-35073297

Tardi, C. (2024). *Kyoto Protocol.* Investopedia. Retrieved July 31, 2024, from https://www.investopedia.com/terms/k/kyoto.asp

United Nations Development Programme. (2000). *World energy assessment: Energy and the challenge of sustainability*. New York: United Nations Development Programme. Retrieved August 28, 2025, from https://www.undp.org/sites/g/files/zskgke326/files/publications/World%20Energy%20Assessment-2000.pdf

United Nations Development Programme (UNDP). (2021). *Affordable and clean energy – Goal 7.* Retrieved August 27, 2025, from https://www.undp.org/arab-states/sustainable-development-goals/affordable-and-clean-energy

U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. (n.d.). *Renewable energy pillar.* U.S. Department of Energy. Retrieved July 31, 2024, from https://www.energy.gov/eere/renewable-energy-pillar

World Bank's Database (2021). *World Development Indicators*. World Bank. Retrieved June 1, 2021 from https://data.worldbank.org/