CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The aim of this research is to examine the correlation between carbon dioxide (CO_2) emissions, economic growth, the consumption of renewable energy and non-renewable energy, and trade openness in Indonesia in the years 1966 2024 based on the Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM). The results of the bounds testing show that there is a cointegration relationship meaning that there is long-run relationship between the two variables under study. The ECM estimation results show that the error correction term (ECT) is negative and statistically significant. This observation would confirm the postulation that the system of CO_2 emission in Indonesia has an adjustment process of the system to the long run equilibrium in response to short run shocks. Nevertheless, the trend and the strength of the long-run coefficients suggest that this process of adjustment is yet to lead to a lasting decrease in carbon emissions, so the economic development of Indonesia is still accompanied by the stressors on environmental quality.

Using the results of the long-term estimation, this research concludes that the Environmental Kuznets Curve (EKC) hypothesis is not valid in Indonesia. The coefficient of the linear growth of the economy is not significant, but coefficient of the quadratic GDP is positive and significant, this implies that increase in income level is linked with consequent increase in CO_2 emission. This suggests that the scale effect of economic growth continues to outweigh the technical and composition effects and hence economic growth in Indonesia is still energy- and carbon-intensive.

Moreover, the research findings indicate that renewable energy has never made a huge difference in terms of decreasing CO_2 emissions in the long run. This observation reveals that the use of renewable energy in Indonesia is still complementary and has not been able to substitute the leading position that fossil energy occupies in the Indonesian energy mix. On the other hand, there is a positive coefficient on the CO_2 emissions of non-renewable energy but not statistically

significant meaning that the consumption of fossil fuels is still a significant structural factor in raising carbon emissions.

Trade openness on the other hand does not exhibit any significant impact either in the long or short term on CO_2 emissions. This means that the impact of international trade on the carbon emission in Indonesia is indirect and is compounded over the period in the form of modification in the economic pattern and structure of production.

In this study, structural changes between 1973 and 2003 were also identified to indicate that there were significant changes in the energy system and the economy in Indonesia. These structural changes aid the conclusion that the association between economic growth and the energy and CO 2 emissions through time is not linear that dynamic models such as ARDL and ECM can be applied to the environment issues in Indonesia.

5.2 Recommendation

In accordance with the results and conclusions of this study, it is possible to propose the following policy recommendations. To begin with, the Indonesian government must change the orientation of the development policy away of mere economic growth to enhancing the quality of economic growth. Since the EKC hypothesis is not true, a high economic growth, but without structural transformation, can intensify environmental degradation. As such, economic and environmental policies must be integrated.

Second, it requires an accelerated energy transition, which means that renewable energy should be a true substitute of fossil fuels, rather than a complement. Government must invest more, provide fiscal incentives and develop renewable energy technologies to make their contribution to the national energy mix more meaningful and have a direct effect on negative carbon emissions.

Third, since non-renewable energy (especially coal) is dominant in the Indonesian energy system, policies should be implemented to help regulate fossil fuel, such as energy subsidy reform and greater energy efficiency in industrial and electricity sector. This is necessary in order to curb the increase of the CO_2 emissions without necessarily stagnating the economy.

Fourth, despite the fact that trade openness has not had a significant direct effect on CO 2 emission, the government must make sure that the policies regarding international trade are in line with the sustainable development objectives. This can be done by introducing environmentally oriented export-import activities standards and by promoting investment geared towards environmental friendly technologies.

Fifth, in future studies, it is advisable to incorporate other variables like urbanization, energy efficiency, or even institutional quality and also take nonlinear methods or cross-country panel data to get a more detailed account of the carbon emission dynamics in Indonesia.


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