CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study reveals that renewable energy investment (REINV) has not consistently lowered carbon emissions in the ASEAN+3 region. In the model lacking control variables, REINV was significantly positively correlated with CO_2 emissions both short-term and long-term, supporting the PHH hypothesis. These results suggest a transitional phase, where green energy infrastructure development still depends on fossil fuels and carbon-heavy supply chains. Consequently, although renewable energy policies are underway, the emission reduction benefits of these investments will take more time to emerge. After the break point, the investment in renewable energy became positive and significant in reducing CO2 emissions in ASEAN+3 countries.

In all models, the results of the estimates show that industrialization is consistently the main factor that increases carbon emissions, both in the short and long term. On the other hand, economic growth (GDP) tends to be negatively related to emissions, even though its significance is marginal, thus giving an early indication of the symptoms of decoupling between economic growth and pollution. However, no strong evidence was found against the Environmental Kuznets Curve (EKC) hypothesis, as the quadratic variable GDP (GDP^2) was not significant in most models, both in ASEAN and non-ASEAN.

Furthermore, urbanization shows different outcomes across regions. In ASEAN, urbanization helps reduce carbon emissions, likely due to urban energy efficiency, infrastructure improvements, and green city policies. In contrast, in non-ASEAN countries, urbanization is less significant and may increase carbon emissions, mainly because of higher per capita energy use and energy-intensive urban infrastructure. This highlights that urbanization patterns are strongly influenced by socio-economic, technological, and policy factors specific to each region. However, in both ASEAN and non-ASEAN countries, renewable energy

investment still shows a positive relationship with carbon emissions, reinforcing the argument that the quality, structure, and integration of green technologies are more important than just a nominal increase in investment. Therefore, the success of the green energy transition will depend heavily on a combination of policies that drive investment efficiency, environmentally friendly industrial transformation, and a more balanced energy mix strategy.

The analysis indicates that CO2 emissions produce positive energy investments. In other words, the theoretical investment direction is generally expected to be negative on emissions. This means that over the observation period (2000-2020) and the sample of countries used, investments in renewables did not curb carbon emissions. This agrees with the literature that states that mitigation effects of renewable energy usually take time and require large-scale investment and strong integration of technologies and policies. According to the report, GDP has a positive impact on CO2 emissions, which means that emissions could be reduced as a result of further clean economic growth. The research findings have provided answers to the research questions regarding the effect of renewable energy investment and GDP on CO2 emissions in ASEAN+3.

5.2 Recommendation

According to a study, several recommendations are given on energy policy in the ASEAN +3 area. Further, improving the quality, efficiency, and technology totaling should be the point of a quality approach and not only a quantity approach. The government must enhance research and development incentives, ensure that green energy projects are truly connected to the national system, as well as guide investment directed towards more efficient technologies to cut emissions. With uncertainty in energy supply, commodity price fluctuations, and pressure to meet the net-zero target, the current global economic conditions remain a vital consideration.

In addition, industrialization, which has proven to be a major contributor to carbon emissions, must be directed towards the green industrialization path. This strategy can be pursued through the application of low-carbon technology, fiscal incentives for environmentally friendly industries, and tightening emission

regulations. Support through green finance mechanisms and regional cooperation also needs to be increased to accelerate industrial transformation. Thus, the industrial sector is not only a motor of economic growth, but also able to contribute to the achievement of sustainable development goals and the Paris Agreement.

The difference in urbanization impacts between ASEAN and non-ASEAN countries suggests that sustainable urban development strategies should be prioritized. Countries in the region need to expand green city policies through the development of clean energy-based public transportation, energy-efficient urban spatial planning, and the use of digital technology in environmental management. Strengthening sustainable urban policies can be a strategic instrument in accelerating the energy transition and reducing carbon emissions, while maintaining economic competitiveness in the midst of global dynamics.