Green Economy and Social Welfare in Malaysia: ARDL Approach

Benjamin Drean[1]
[1]School Of Life and Wellness, France

Abstract

This study tries to ascertain how certain aspects of the green economy perspective relate to Malaysian economic growth using the variables of CO2 emissions, renewable energy consumption, and life expectancy which are representations of social welfare in Malaysia. We take data from the World Bank as a secondary source for the years 2000 to 2020, From our estimation results, We find that the variables we estimate have long-term and short-term correlations such as economic growth and life expectancy and economic growth with renewable energy consumption, and short-term economic expansion has a detrimental impact on life expectancy. However, the use of renewable energy is significantly correlated with economic expansion. This shows that between the two variables, with increasing economic growth, life expectancy will actually decrease, although this occurs in the short term, furthermore with increasing consumption of renewable energy will also increase economic growth in Malaysia.

Keyword : Economic growth, green economy, reneweble energy consumption, Malaysia.
JEL Classification : C31, I30, Q53

Received: November 6,2021 Accepted: Desember 1,2021
DOI : 10.54204/TMJI/Vol412022003

Background

The concept of a green economy that emerged from environmental economists has become mainstream in the political sphere in recent times. The concept emerged triggered by the economic crisis and market failure and was reinforced by the increasing risks to the environment, natural resources, and social inequality (Ali, Anufriev, & Amfo, 2021). Currently, there is growing awareness that to achieve sustainable development, proper economic development is needed. It is believed that this economic development can be met by a green economy. A "green economy" is described as economic growth that increases social justice and human well-being while greatly lowering the danger of environmental deterioration and the shortage of natural resources. A green economy can also be interpreted as an activity that is low in carbon, utilizes resources efficiently, and is socially inclusive (Martawardaya, Rakatama, Junifta, & Maharani, 2022).

The green economy concept covers a broad scope and is a new paradigm in economic development that replaces environmental policies which in the past were often focused on short-term solutions (Li, Song, Cai, Bian, & Mohammed, 2022). The green economy approach is a win-win solution in ending the endless debates of policymakers around "environmental conservation" and "economic growth". Or in other words, the Green Economy is a knowledge-based economic development model on ecological economics and green economics that aims to address the interdependence between the economy and ecosystems as well as the negative impacts of economic activities including climate change and global warming (Zhang, 2022).

Modern society's way of life has made development far more exploitative of natural resources and life-threatening. Economic growth-based development has a track record of boosting the economy, but it has fallen short in the social and environmental arenas (Yamaka, Chimprang, & Klinlumpu, 2022; Taghvaee, Nodehi, Saber, & Mohebi, 2022). For instance, rising greenhouse gas emissions resulted in shrinking forest areas, the extinction of several species, and a loss of biodiversity. Additionally, there is a difference in average income between the populations of affluent and poor nations. The green economy concept is expected to be a way out. To be a bridge between development growth, social justice as well as being environmentally friendly and saving natural resources (Dogaru, 2021).

Economic growth that is able to improve people's welfare, in general, is a development target pursued by almost all countries in the world. However, economic growth itself can sometimes create trade-offs in the form of negative externalities that can reduce people's welfare. In the case of massive negative externalities such as climate change due to carbon emissions, Osadume & University (2021) project a decrease in total welfare if the temperature rise reaches a certain point. Similar to these findings, the study of Khezri, Heshmati, & Khodaei (2022) indicates an exponentially negative impact on some sectors when the temperature rise reaches a certain level. Both studies also emphasize the potential for negative impacts that are greater than the existing projections due to the complexity of climate change impacts on various aspects of ecosystems that are difficult to measure.

Given the necessity of achieving sustainable economic growth, it has been suggested that moving from fossil fuels to renewable energy sources may reduce environmental pollution. By expanding the use of renewable energy in industries with high energy demand and pollution levels as well as by implementing environmentally friendly manufacturing methods, renewable energy may lower the number of emissions produced by economic activity (Le, 2022). For instance, Jeon's (2022) research, which looked at 48 US states' use of renewable energy, economic development, and energy-related CO_2 emissions from 1997 to 2017, is one example. An inverse U-shaped relationship between economic growth and environmental deterioration is known as the Environmental Kuznets Curve. The study's findings show the environmental benefits of promoting renewable energy and suggest policy tools for reducing emissions through processes based on energy prices. Additionally, this study supports the notion that while Day of Warming has a beneficial effect on emissions, emissions are negatively impacted by the utilization of renewable energy, electricity pricing, and basic energy costs.

Economic growth looks at how economic activity affects the increase in income of people in a country in a certain period (Li & Leung, 2021). In addition, economic growth also illustrates how an economy with a large number of goods and services can better meet the demands of households, companies, and the government. Later in its development, the neoclassical model of economic growth began to experience criticism. One of them is the thermodynamic argument. In this context, the neoclassical conception of thought in viewing the economic system is considered unrealistic because it is not based on the biosphere boundary and the laws that apply in nature, especially the laws of thermodynamics. Pata & Caglar (2021) reveal that the criticism of neoclassical growth theory by environmental economists focuses on the limitations of the substitution concept and the limitations of the concept of technological progress/change as a way to reduce resource scarcity. The depletion of energy resources raises concerns that the economy will not run smoothly. Many human efforts to avoid the scarcity of energy resources have been carried out. One of the efforts is by holding an environmental political agenda that focuses on sustainable development issues (Bashir, Thamrin, Farhan, Mukhlis, & Atiyatna, 2019). This study tries to ascertain how certain aspects of the green economy perspective relate to Malaysian economic growth using the variables of CO2 emissions, renewable energy consumption, and life expectancy which are representations of social welfare in Malaysia.

Research Method

We take data from the World Bank as a secondary source for the years 2000 to 2020, the following variables will be analyzed using two different time series models. The country's GDP is used as a measure of economic growth in this study. CO2 emissions (CE), renewable energy consumption (REC), and life expectancy (LE) are independent variables of this study because they serve as indicators of how these two variables are related in the long and short term to economic growth. We use the following econometric model:

$$EG_t = \beta_0 + \beta_1 EG_{t-1} + \beta_2 EG_{t-2} + \beta_3 EG_{t-3} + \beta_5 EG_{t-4} + \beta_6 CE_t + \beta_7 CE_{t-1} + \beta_8 CE_{t-2} + \beta_9 LE_t + \beta_{10} LE_{t-1} + \beta_{11} REC_t + \beta_{12} REC_{t-1} + e_t$$

Where,
EG : economic growth
CE : air pollution
REC : renewable energy consumption
LE : life expectancy
e : Error term
t : Time series

Dynamic ARDL was used in the study. Khan et al. (2020) claim that the ARDL model may be used to analyze, simulate, and forecast when the independent variables undergo a shock. If the study variables have a cointegration connection, ARDL simulation models may be used.

Result and Discussion

Table 1 displays descriptive data based on the study's variables.

Table 1. Descriptive Statistics

	EG	CE	REC	LE
Mean	4.559798	0.377125	3.503810	71356.00
Median	5.332139	0.337375	3.220000	74493.00
Maximum	8.858868	1.279803	5.310000	76306.00
Minimum	-5.646940	0.274473	1.960000	7317.000
Std. Dev.	3.173540	0.208713	1.020571	14716.47
Skewness	-1.961798	4.120660	0.398347	-4.207274
Kurtosis	6.695058	18.37969	2.029280	18.82859
Jarque-Bera	25.41705	266.3975	1.379892	281.1802
Probability	0.000003	0.000000	0.501603	0.000000
Sum	95.75576	7.919623	73.58000	1498476.
Sum Sq. Dev.	201.4271	0.871219	20.83130	4.33E+09
Observations	21	21	21	21

The results of descriptive statistics are expressed in terms of mean, min, max, and Std Dev. EG Mean 4,559, EG Min -5,646, EG Max 8,858, EG Std Dev 3,173. CE Mean 0,377, CE Min 0,274, CE Max 1,279, CE Std Dev 0,208, and so on. EG is Malaysia's economic growth, CE is air pollution which is represented by CO2 emissions, LE is life expectancy, and REC is renewable energy consumption.

The ARDL model should not be used to forecast the value without first performing a stationary test. Augmented Dickey-Fuller (ADF) may evaluate whether a series is stationary or not by examining the error component, which includes any potential for autocorrelation. The results are as follows:

Table 2. Unit Root Test On EG, CO2, LE And CDD Data

Variable	Unit Root	ADF Test stat.	Signif.	Description
Air Pollution (CE)	Level	-3.389194	0.0255	Stationer
Economic Growth (EG)	Level	-3.865447	0.0089	Stationer
Life Expectancy (LE)	Level	-4.249318	0.0039	Stationer
Renewable Energy Consumption (REC)	Level	-2.034638	0.2708	
	First Diff	-2.135775	0.2340	
	Sec Diff	-5.097666	0.0008	Stationer

The CE, EG, and LE data are stationary in the original data, while the REC data are stationary in the second difference. Since all data are stationary, we can proceed to estimate ARDL.

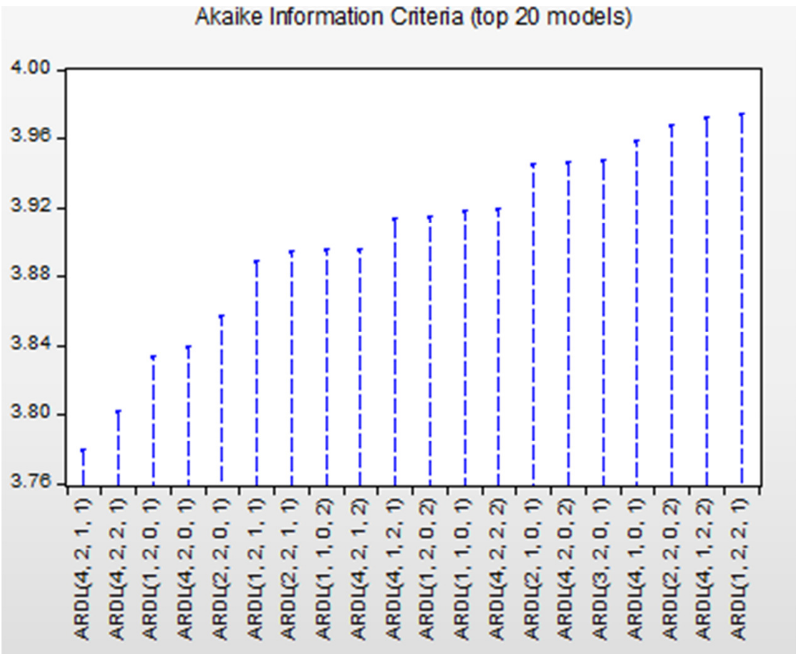

Figure 1. Optimum Lag Test

The best lag to employ in the following test is determined by optimal lag testing, and as can be seen in the image above, the best lag is 4,2,1,1.

Tabel 3. ARDL Bounds Test

Test Stat.	Value	Significant	I(0)	I(1)
F-statistic	4.748810	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

The F-statistical value of the ARDL model is 4.748810 higher than the upper limit value at the 5 percent level and even larger than the upper limit values at the 2.5 percent level and 1 percent level based on the results of the Limit test of the model, which are displayed in Table 3. This demonstrates the cointegration, or movement in the same direction, of the four variables examined in this study: economic growth, air pollution, life expectancy, and renewable energy use.

Tabel 4. ARDL Analysis Results

Variable	Coef.	Std. Error	t-Stat.	Prob.*
EG(-1)	-0.343139	0.364710	-0.940855	0.3900
EG(-2)	0.055835	0.306494	0.182174	0.8626
EG(-3)	0.240761	0.285502	0.843290	0.4375
EG(-4)	0.360160	0.248544	1.449080	0.2070
CE	-8.582263	1.973220	-4.349371	0.0074
CE(-1)	-125.4696	59.99024	-2.091500	0.0907
CE(-2)	-67.86945	47.92200	-1.416248	0.2159
LE	-0.005539	0.001477	-3.748957	0.0133
LE(-1)	3.73E-05	3.78E-05	0.987669	0.3687
REC	2.656572	1.308199	2.030710	0.0980
REC(-1)	-4.414464	1.234126	-3.576995	0.0159
C	487.9521	126.6715	3.852105	0.0120
R-squared	0.935347	Adjusted R-squared		0.793110

The R-squared and R-squared values of the adjusted ARDL models varied between 0.93 and 0.79. The Adjusted R-squared value of 0.79 implies that each independent variable in the ARDL model, namely air pollution, life expectancy and renewable energy consumption, can explain 79 percent of the variation in the dependent variable of economic growth. This shows that the research model is good for research.

Judging from the ARDL estimation results, the LE variable has a coefficient value of -0.005 which indicates that the life expectancy factor is a factor that affects economic growth. For example, an increase in life expectancy of 1% will result in a decline in Malaysia's economic growth of 0.5 percent. This shows that social welfare in the green economy which is represented by the level of life expectancy is adversely correlated with economic growth, although in the short term the impact is very small.

Furthermore, the variable EG(-4) has a coefficient value of 0.36 which indicates that the economic growth factor of the previous four years is a factor that affects the current economic growth. For example, when there was an increase in the previous year's economic growth rate of 1% it would result in an increase in Malaysia's economic growth of 36 percent today. In other words, the performance of the previous year's economic growth is quite influential on how the performance of economic growth this year.

Table 5. Analysis Results In The Long Term And Short Term

Variable	Coef.	Std. Error	t-Stat.	Prob.
C	487.9521	126.6715	3.852105	0.0120
EG(-1)*	-0.686383	0.985077	-0.696782	0.5170
CE(-1)	-201.9213	62.70543	-3.220156	0.0235
LE(-1)	-0.005502	0.001454	-3.782649	0.0129
REC(-1)	-1.757891	1.064131	-1.651950	0.1595
D(EG(-1))	-0.656756	0.718534	-0.914022	0.4026
D(EG(-2))	-0.600921	0.472660	-1.271359	0.2595
D(EG(-3))	-0.360160	0.248544	-1.449080	0.2070
D(CE)	-8.582263	1.973220	-4.349371	0.0074
D(CE(-1))	67.86945	47.92200	1.416248	0.2159
D(LE)	-0.005539	0.001477	-3.748957	0.0133
D(REC)	2.656572	1.308199	2.030710	0.0980

From the table above, the relationship between the variables EG and EG(-1) is significantly negative, as well as the CE variable which is also significantly negative, this indicates that in Malaysia, air pollution has a short-term detrimental impact on economic growth, likewas the current economic growth with the previous year. In line with this, the relationship between the variables EG and LE(-1) is also significantly negative, as well as the REC variable, this indicates that economic growth has a negative short-term effect on life expectancy and consumption of renewable energy.

Conclusion

We find that the variables we estimate have long-term and short-term correlations such as economic growth and life expectancy and economic growth with renewable energy consumption, and short-term economic expansion has a detrimental impact on life expectancy. However, the use of renewable energy is significantly correlated with economic expansion. This shows that between the two variables, with increasing economic growth, life expectancy will actually decrease, although this occurs in the short term, furthermore with increasing consumption of renewable energy will also increase economic growth in Malaysia.

References

Bashir, A., Thamrin, K., Farhan, M., Mukhlis, & Atiyatna, D. (2019). The Causality between Human Capital, Energy Consumption, CO2 Emissions, and Economic Growth: Empirical Evidence from Indonesia. International Journal of Energy Economics and Policy, 9 (2), 98-104.

Pata, U., & Caglar, A. (2021). Investigating the EKC hypothesis with renewable energy consumption, human capital, globalization and trade openness for China: Evidence from augmented ARDL approach with a structural break. Energy, 216, 79-91.

Ali, E., Anufriev, V., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. Scientific African, 12 (1), 89-98.

Dogaru, L. (2021). Green Economy and Green Growth—Opportunities for Sustainable Development. The 14th International Conference on Interdisciplinarity in Engineering, 63 (1), 70. https://doi.org/10.3390/proceedings2020063070.

Jeon, H. (2022). CO2 emissions, renewable energy and economic growth in the US. The Electricity Journal, 1 (1), https://doi.org/10.1016/j.tej.2022.107170.

Khan, A., Chenggang, Y., Hussain, J., Bano, S., & Nawaz, A. (2020). Natural resources, tourism development, and energy-growth-CO2 emission nexus: a simultaneity modeling analysis of BRI countries. Resources Policy, 68 (10), 1-17. https://doi.org/10.1016/j.resourpol.2020.101751.

Khezri, M., Heshmati, A., & Khodaei, M. (2022). Environmental implications of economic complexity and its role in determining how renewable energies affect CO2 emissions. Applied Energy, 306 (2), https://doi.org/10.1016/j.apenergy.2021.117948.

Le, T. (2022). Connectedness between nonrenewable and renewable energy consumption, economic growth and CO2 emission in Vietnam: New evidence from a wavelet analysis. Renewable Energy, 195 (1), 442-454. https://doi.org/10.1016/j.renene.2022.05.083.

Li, J., Song, G., Cai, M., Bian, J., & Mohammed, B. (2022). Green environment and circular economy: A state-of-the-art analysis. Sustainable Energy Technologies and Assessments, 52 (2), https://doi.org/10.1016/j.seta.2022.102106.

Li, R., & Leung, G. (2021). The relationship between energy prices, economic growth and renewable energy consumption: Evidence from Europe. Energy Reports, 7 (1), 1712-1719.

Martawardaya, B., Rakatama, A., Junifta, D., & Maharani, D. (2022). Green economy post COVID-19: insights from Indonesia. Development in Practice, 32 (1), 98-106, DOI: 10.1080/09614524.2021.2002817.

Osadume, R., & University, E. (2021). Impact of economic growth on carbon emissions in selected West African countries, 1980–2019. Journal of Money and Business, 1 (1), 8-23.

Taghvaee, V., Nodehi, M., Saber, R., & Mohebi, M. (2022). Sustainable development goals and transportation modes: Analyzing sustainability pillars of environment, health, and economy. World Development Sustainability, 1 (1), https://doi.org/10.1016/j.wds.2022.100018.

Yamaka, W., Chimprang, N., & Klinlumpu, C. (2022). The dynamic linkages among environment, sustainable growth, and energy from waste in the circular economy of EU countries. Energy Reports, 8 (5), 192-198. https://doi.org/10.1016/j.egyr.2022.02.122.

Zhang, Z. (2022). Evolution paths of green economy modes and their trend of hypercycle economy. Chinese Journal of Population, Resources and Environment,20 (1), 1-11.