How Does Education, Economic Growth and Internet Literacy Affect Climate Change in Malaysia? : ARDL analysis

Abdulloh Satar[1], Eny Lestari Widarni[2], Meinarti Puspaningtyas[3]
[1,2,3]STIE Jaya Negara Tamansiswa Malang, Indonesia

Abstract

This study aims to examine the effect of education, economic growth, and internet literacy on climate change in Malaysia. This research is important because climate change is one of the most urgent global issues and has an impact on human welfare and the environment. We use the World Bank as a complementary source of statistical data, namely data from 2000 to 2016, the variables we use are climate change, education, economic growth, and internet literacy. We found that in the short term, education and climate change in the previous year have a significant positive effect on the current climate change, while in the long term, economic growth and internet literacy have a significant negative effect on the current climate change. These findings indicate that education can increase public awareness and participation in climate change mitigation and adaptation efforts, but economic growth and internet literacy can increase energy consumption and greenhouse gas emissions. These findings are largely consistent with previous research that found complex relationships between social, economic, and environmental factors and climate change.

Background

Education is one of the important factors affecting a country's economic growth. Education can improve the quality of human resources, develop knowledge and skills, and create innovation and technology. Education can also open up opportunities for people to access information, participate in social and economic activities, and improve their welfare and opportunities (Maneejuk & Yamaka, 2021; Irawan, Sasongko, Mukhlis, Yanto, & Wulandari, 2022).

One of the most widely used sources of information today is the internet. The internet is a global communications network that connects various electronic devices, such as computers, cell phones, tablets and more. The internet allows its users to access, share and create various types of digital content, such as text, images, video, audio and more. The internet can also be used for various purposes, such as studying, working, doing business, playing, socializing, and others (Wang, et al., 2022; Rusminingsih, Askar, Mutia, Fitria, Wahyudi, 2023).

However, not everyone can use the internet properly. There are several factors that affect a person's ability to use the internet effectively and responsibly. One such factor is internet literacy. Internet literacy is the ability to access, understand and use information from the internet effectively and responsibly. Internet literacy includes aspects such as technical, cognitive, social, emotional, ethical, and critical skills. Internet literacy is very important for modern society living in the digital era. Internet literacy can help people to take advantage of the internet's potential for educational and economic purposes. Internet literacy can also help people avoid the risks and challenges that exist on the internet, such as misinformation, cyberbullying, online addiction, cyber crime, and others (Haini, 2022; Priyanto, Widarni, & Bawono, 2022).

Malaysia is one country that has a high level of internet access in Southeast Asia. According to data from

the World Bank, by 2020, around 85% of Malaysia's population has internet access. However, the level of internet literacy in Malaysia is still low. This shows that there is still a digital divide between internet access and use in Malaysia. This digital divide can lead to social and economic inequality between different groups of people. This digital divide can also hamper the development of education and economic growth in Malaysia (Rosnawintang, Tajuddin, Adam, Pasrun, & Saidi, 2021).

Therefore, efforts are needed to increase internet literacy in Malaysia. This effort involves various parties, such as the government, private sector, educational institutions, civil society organizations, mass media, families and individuals. This effort also covers various aspects, such as the provision of infrastructure and equipment that supports equitable and quality internet access; developing curricula and learning methods that integrate effective and ethical use of the internet; organizing training and guidance for teachers and students in improving internet literacy skills; provision of relevant and quality digital content for educational and economic needs; regulatory arrangements and policies that protect the rights and responsibilities of internet users; as well as increasing public awareness and participation in utilizing internet literacy for positive purposes (Omar, Fadzil, & Bolong, 2019; Sasongko, Nehruddin, Musriyatun, Siswanto, 2023).

Thus, internet literacy can be one of the factors that support the development of education and economic growth in Malaysia. Internet literacy can help Malaysians access, understand, and use information from the internet effectively and responsibly. Internet literacy can also help Malaysians to improve the quality of human resources, develop knowledge and skills, and create innovation and technology. Internet literacy can also help Malaysians to open up opportunities for jobs, trade, investment and cooperation. Internet literacy can also help Malaysians to improve their welfare and opportunities (Rusuli, Halim, & Yaziz, 2021).

Climate change is a long-term change in the pattern and intensity of climate elements, such as temperature, precipitation, wind and other weather phenomena. Climate change can occur due to natural factors, such as variations in the Earth's orbit, solar activity, volcanic eruptions, and internal climate oscillations. Climate change can also occur due to human factors, such as the burning of fossil fuels, deforestation, agriculture and industrialization. These factors can increase the concentration of greenhouse gases in the atmosphere, leading to the greenhouse effect and global warming (Tang, 2019). Climate change has a significant impact on human life and nature. Climate change can cause an increase in global temperatures, sea level rise, shifts in seasons, changes in rain patterns, an increase in the frequency and intensity of natural disasters, changes in ecosystems and biodiversity, and a decrease in human health and welfare. Climate change can also affect economic, social and political sectors, such as agriculture, fisheries, energy, water, health, education, trade, migration, conflict and cooperation. Education can affect greenhouse gas emissions that cause climate change, because education can affect factors such as population size, consumption levels, production patterns, and technology used. Education can also increase people's awareness and behavior towards environmental issues, as well as their ability to adapt and mitigate climate change (Abu Samah, Shaffril, Hamzah, & Abu Samah, 2019).

Internet literacy can affect climate change, because internet literacy can affect the use of energy and resources associated with online activities. Internet literacy can also affect access to and dissemination of information about climate change, as well as community participation in actions that support sustainable development (Mahmood, Rajaram, & Guinto, 2022). Economic growth can affect climate change, because economic growth can affect the level of greenhouse gas emissions produced by economic sectors, such as industry, transportation, agriculture, and others. Economic growth can also affect countries' capacities and priorities in dealing with climate change, both in terms of mitigation and adaptation (Raihan & Tupekova, 2022).

Climate change can affect education, internet literacy, and economic growth in Malaysia, because climate change can cause various negative impacts on society and the environment in Malaysia, such as

increasing temperatures, variations in elevation, sea level rise, and changes in ecosystems. These impacts can reduce the quality of life, health, employment opportunities, and people's income. These impacts can also disrupt teaching and learning processes, internet infrastructure and equipment, and economic activity in Malaysia. Researching climate change in Malaysia is important because climate change can have a big impact on human life and nature in this country. Climate change can cause various negative impacts, such as increasing temperatures, variations in elevation, sea level rise, and changes in ecosystems (Raihan & Said, 2022). These impacts can reduce the quality of life, health, employment opportunities, and people's income. These impacts can also disrupt teaching and learning processes, internet infrastructure and equipment, and economic activity in Malaysia. This study aims to prove how education, internet literacy and economic growth can affect climate change in Malaysia.

Research Method

We use the World Bank as a complementary source of statistical data, namely data from 2000 to 2016, the variables we use are climate change, education, economic growth, and internet literacy. We use the following econometric model:

$$CE_t = \beta_0 + \beta_1 CE_{t-1} + \beta_2 CE_{t-2} + \beta_3 ED_t + \beta_4 EG_t + \beta_5 IL_t + e_t$$

Where the Climate change is CE, ED is Education, Economic growth is EG, and internet literacy is IL, the error term is e, and time series is t.

Result and Discussion

Table 1 shows the results of the stationarity test.

Table 1. ADF 1st stationary tets

Variable	ADF Test stat.	Signif.	Description
Climate change (CE)	-10.94819	0.0000	Stationer
Education (ED)	-3.414387	0.0288	Stationer
Economic growth (EG)	-7.838796	0.0000	Stationer
Internet literacy (IL)	-3.490779	0.0238	Stationer

The data for CE, ED, EG, and IL are stationary in the first difference data, as can be seen from the table above. We may continue with the ARDL estimate because all the data are steady.
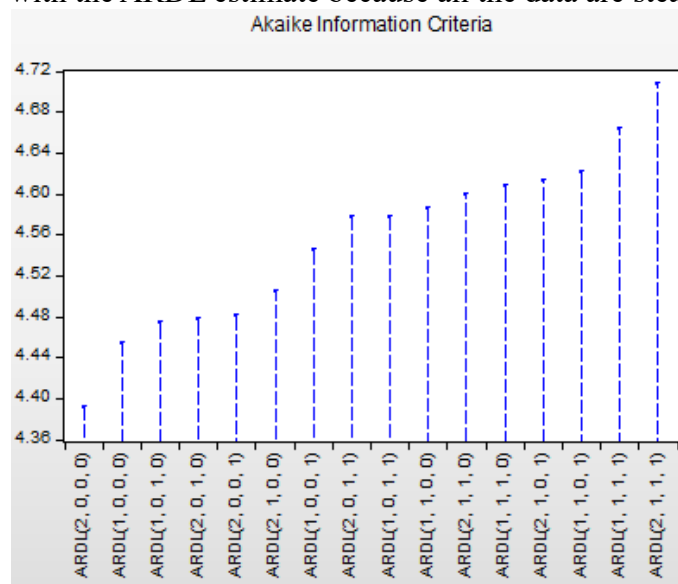

Figure 1. Optimum Lag Test

the results of the lag test show that the best lag is lag 2,0,0,0. Now that the ideal latency has been identified, and next we perform an ARDL analysis.

Tabel 2. ARDL analysis results

	Coef.	Std. Error	t-Stat.	Prob.*
CE(-1)	-0.418154	0.251617	-1.661865	0.1309
CE(-2)	-0.317382	0.227413	-1.395620	0.1963
ED	-0.461873	0.134325	-3.438472	0.0074
EG	-0.474044	0.261278	-1.814328	0.1030
IL	-0.007455	0.071512	-0.104253	0.9193
C	93.34233	19.91209	4.687721	0.0011
R-squared	0.800692	Adjusted R-squared		0.689965

From the estimation results of the ARDL model, it is known that the adjusted R-squared and R-squared values vary between 0.80 and 0.68. The R-squared value of 0.80 indicates that the independent variables in the ARDL model can explain variations in the dependent variable, namely climate change, by 83 percent. This shows that this research model is good for use in research.

The education factor, which is represented by the ED variable, has an influence on climate change, with a coefficient value of -0.461873. The economic growth factor, which is represented by the EG variable, also has an influence on climate change, with a coefficient value of -0.474. That is, if the current rate of economic growth increases by 1 percent, climate change will increase by 47.4 percent.

Table 3. The long term and short term test

	Coef .	Std. Error	t-Stat.	Prob.
C	93.34233	19.91209	4.687721	0.0011
CE(-1)*	-1.735536	0.375493	-4.622017	0.0013
ED**	-0.461873	0.134325	-3.438472	0.0074
EG**	-0.474044	0.261278	-1.814328	0.1030
IL**	-0.007455	0.071512	-0.104253	0.9193
D(CE(-1))	0.317382	0.227413	1.395620	0.1963

As seen in the table above, there is a significant negative relationship between the CE variable and CE(-1) as well as a significant negative relationship between the CE variable and the ED variable. This indicates that in Malaysia, education and climate change were the two most significant short-term influences, with economic growth having the most significant long-term influence on climate change.

Conclusion

We discovered that education and past climate change had a considerable favorable impact on the present climate change in the near run, while in the long term, economic growth and internet literacy have a significant negative effect on the current climate change. These findings indicate that education can increase public awareness and participation in climate change mitigation and adaptation efforts, but economic growth and internet literacy can increase energy consumption and greenhouse gas emissions. These findings are largely consistent with previous research that found complex relationships between social, economic, and environmental factors and climate change.

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