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Article

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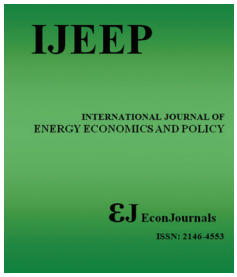

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Does the Clean Development Mechanism Exist in Developing Countries After an International Agreement?

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ABSTRACT

The Kyoto Protocol is a key document on climate change agreements by the United Nations Framework on Climate Change. The latest commitments agreed in 2012. Its agreed to reduce CO_2 emissions by about 20% or less of all global carbon emissions. A strong commitment is needed to reduce greenhouse gas emissions by governments from various countries. This study aims to figure out the progress of clean development mechanism of reducing CO_2 emissions in the Asia and Middle East Region countries after the Kyoto Protocol Commitment. Variable CO_2 emissions, economic growth, foreign direct investment, trade activities which covered from 2013 to 2017 were analysed using a panel data model. The alteration after agreement were evaluated using a Klassen Typology. The results show that economic growth and trading activities have a significant effect on clean development mechanism in Asia and the Middle East, but still have differences in the patterns and behavior of each country in implementing commitments to reduce CO_2 emissions. Overall, attempts are needed to align economic growth with efforts to reduce emissions so that prudent policies are needed in forming realistic and sustainable mitigation and adaptation steps to address the problem of climate change.

Keywords: CO_2 Emission, Clean Development Mechanism, Agreement, Klassen Typology, Mitigation
JEL Classifications: Q5, Q28, Q54, Q540

1. INTRODUCTION

The issue of global warming has become an environmental issue that is much discussed because of its complexity. Global warming occurs due to increased greenhouse gas emissions in the earth's atmosphere. This greenhouse gas can actually come from nature itself, and can also come from human activities. Consumption and the use of very high technology results in increased concentration of emission in the atmosphere which results in climate change which impacts various sectors on economic development.

In economic development or other human anthropogenic activities, it couldn't be separated from the use of energy resources that produce residues, such as the release of CO_2 (CO_2 emissions). Based on the International Energy Agency's Report in July 2020, that the highest record global CO_2 emissions reached 33.5 $GtCO_2$ in 2018. The existence of CO_2 emissions greatly affects a country's economic growth (Borhan et al., (2012); Muhammad and Khan (2019); Rahman et al. (2020)). Mitigation efforts to reduce CO_2 emissions have been carried out since the Kyoto Protocol agreement in 1997 and continued monitoring in its implementation.

International agreements such as the Kyoto Protocol are considered economically disadvantageous. So, a tendency that is not easy for developed countries to ratify this agreement. Research conducted by (Kumazawa and Callaghan, 2012) found that carbon dioxide emissions decreased for industrialized countries and the effect of per capita income was much greater during these years since undersign of this international agreement. The emergence of a negative effect at that time, that is the decreasing scale of production, did not only occur in developed countries. The same condition also occurs in developing countries. That is the reason

that some developed countries such as Russia, Japan, and Canada are reluctant to ratify the agreement.

Developed countries, which have persisted and agreed to ratify the Kyoto Protocol, believe that the most effective way to achieve this goal is to set specific targets for emission reductions and then use economic instruments (such as emissions trading and/or carbon taxes) to help achieve these goals, in the most efficient way. Other countries, particularly developing countries, worried about the negative impact of direct emission reduction on the level of economic development and growth. So, they prefer to leave the open options and therefore do not agree to direct emission reductions (Truong, 2010). Several conditions in some countries after the Kyoto agreement were disclosed by Wang et al. (2019). CO_2 emissions in Taiwan have increased sharply in line with the rapid growth of the manufacturing industry. Only Germany was able to maintain the downward trend in earnings due to the EKC turning point during the financial crisis. Meanwhile, India shows a downward trend in income from the EKC turning point.

In the earlier of Kyoto Protocol 1997 to the end of the first period in 2012 has been abandoned by some countries such Russia, Japan, and Canada. Nevertheless, the optimism of the second Commitment in the period 2013–2020 for climate change mitigation efforts emerged with the signing of the Paris Agreement in 2015 as a result of the COP 21st UNFCCC (Pramudianto, 2016). Paris Agreement has more flexibility when compared to the Kyoto Protocol's first commitment. In the first Kyoto Protocol, the total percentage of greenhouse gas emissions that must be reduced has been determined by about 20% or less of all global carbon emissions. Meanwhile, the Paris Agreement gives member countries the freedom to adjust their respective capabilities. Its concept called a Intended Nationally Determined Contribution (INDC), meaning that countries have the right to determine their own greenhouse gas production targets (Fa'iz, 2018).

Finding out the progress of clean development mechanisms to reduce CO_2 emissions in Asian and Middle Eastern countries after the Kyoto Protocol Commitment is the main objective of this study. This is urgent to conduct considering the Paris Agreement in 2015 which provides the widest possible opportunity for developing countries to participate in climate change mitigation measures by controlling the development of CO_2 emissions. How much progress has been made by developing countries is expected to furnish an overview of the commitment of developing countries in participating to reduce CO_2 emissions which cause climate change. In addition, the significant role of developing countries to reduce CO_2 emissions was also pointed out by (Grunewald and Martinez-Zarzoso, 2016) who stated although the Kyoto target was achieved by developed countries, it was only partially successful. Complete achievement to solve global warming can occur by integrating more countries into a commitment, including developing countries, to assert a tax of international carbon on GHG emissions. Therefore this research is significant as an evaluation of the agreement so that subsequently, strategic policies can be generated to minimize injurious effects, including the effects on international trade, as well as on the economy, especially in developing countries as parties affected by these emission flows from developed countries.

Furthermore, the systematics of this paper will discuss several previous studies that have been carried out to determine how the interaction patterns between carbon emission variables with every variable; economic growth, foreign investment, and exports-imports which are summarized in international trade. The next session is a research method that proposes the design, variables and analytical tools used, then followed by a discussion of the research findings and finally, the conclusion.

2. REVIEW OF LITERATURE

2.1. Studies with CO_2 Emission and Economic Growth

Economic growth plays a bigger role in contributing to CO_2 emissions (Chandran and Tang, 2013), (Jalil, 2014), (Balogh and Jámbor, 2017). Environmental studies often use CO_2 emissions as a representative of environmental quality. The relationship between CO_2 emissions and economic growth is often associated with the use of energy consumption in the process. The literature on environmental quality and studies of economic growth exist which focuses on examining the presence of the Kuznets Environmental Curve (EKC). Saboori and Sulaiman (2013) states Singapore and Thailand have a significant non-linear relationship in the long run between CO_2 emissions and economic growth, thus support Kuznets's hypothesis.

Hossain (2011) dan Hossain (2012) state although many findings of research in developed and developing countries show growth and energy consumption have a causal relationship, in real life, it is difficult to establish a relationship such as an inverted U curve. Several clusters of research findings; the first category is a one-way causality goes from CO_2 emissions to Economic Growth or vice versa, as happened in Africa (Ameyaw and Yao, (2018); Chontanawat, (2019). Second is the two-way relationship between output growth and energy used, as in South Asia (Rahman et al., 2020). The last is no causality relationship between economic development and CO_2 emissions. Different behavior is also shown by countries with high growth and countries with low growth on CO_2 emissions (Aye and Edoja, 2017).

Economic growth, environmental degradation, energy consumption and transportation, and population can empirically increase CO_2 emissions (Ben Abdallah et al., (2013); Mendonça et al. (2020); Ahmed et al. (2017)). However, if managed wisely, it can be used to increase energy efficiency. Policy makers can make efforts to reduce emissions such as planning sustainable urban transportation, increasing gas-fired vehicles and enacting laws to control the process through policies and strategies for low-carbon development.

Meanwhile, studies in 34 Asian countries show that CO_2 emissions affect economic growth. (Muhammad and Khan, 2019) found that there were differences in CO_2 emissions on economic growth between host countries and recipient countries. In Asia, CO_2 emissions have a positive and significant effect on the host country on economic growth in the recipient country. Meanwhile, government support in law enforcement and consciousness from citizens can affect the negative relationship between per capita income and CO_2 emissions (Arouri et al., 2012).

2.2. Studies with Carbon Emission and Foreign Direct Investment (FDI)

Carbon emission caused by foreign direct investment. It supported by (Shahbaz et al., 2019) and (Nasir et al., 2019) that find environmental degradation, which is a proxy for CO_2 emissions, has a long-term relationship with FDI in an economy. Furthermore, the negative effect of the large use of energy on the environment cannot directly vanish along in the process of economic development (Özokcu and Özdemir, 2017). Distinct results are shown by (Balogh and Jámbor, 2017) state that FDI and carbon emission has a negative impact. It exists if the foreign investment can bring technology more efficient compared with domestic investment.

2.3. Studies with CO_2 Emission and International Trade

Studies on CO_2 emissions has been developed, one is international trade as a production and consumption activity carried out in a country. Production activities are carried out as a step to produce output that can be traded to other regions or countries. Meanwhile, consumption activity shows how a country strives to meet its economic needs. Its the basis of trade between regions. These activities require energy consumption in their implementation. The higher energy consumption is required in the rapid economic, so the impact on the environment will be more pronounced. Moreover, the deindustrialization of developed countries that benefit developing countries causes a shift in pollutant activity to developing countries without reducing the consumption of manufactured goods in developed countries (Boitier, 2012).

Hossain (2011) and Hossain (2012) state that income, energy used and trade are determinant of CO_2 emissions in Turkey. The finding of that study shows CO_2 emissions have been determinated not only by income and trade, but its influenced by energy consumption. Other result shows CO_2 emission, energy consumption, and foreign trade, lead an important part of Turkey's income level. Last, this study state that the transport process in open trade can produce CO_2 emissions. Exports result more CO_2 emissions than imports

Exports are generated from the production process which produces residues from the use of resources. Import is an activity of consuming goods or output that uses resources and technology to bring it, for example the transportation process from the country of origin. The more output or commodity that is imported, the more impact it will have on the environment. Studies conducted in the European Union show that CO_2 emissions will be rise if country do more imports. Otherwise, carbon emission will be pull down with higher exports (Pié et al., 2018). Especially with the existence of trade integration (Ahmed et al., 2017). In addition, exporting countries, whose products are consumed are not responsible for the emissions produced, thus ignoring the emissions contained in trade (Fezzigna et al., 2019). That is why the influence of international trade is very important to be assessed as a cross-country commitment and mitigation policies to reduce CO_2.

Trade openness has negatively related to CO_2 emissions. Inline with Pollution Havens Hypothesis that states industries with pollution-intensive will shift to remote areas or developing countries which relatively have loose environmental standards when trade openness increases (Dong et al., 2019). Consequently, the country or region has very poor environmental quality.

3. MATERIALS AND METHODS

3.1. Research Type and Design

This study employed a descriptive quantitative approach to describe a phenomenon. The Clean Development Mechanism is seen from the Influenced factors in CO_2 emissions. The panel data analysis was carried out by combining time-series data and cross-section data. Then, a classic typology model was employed to see differences in the development of an area; (Ai Munandar and Wardoyo, 2015), (Purnama and Mitomo, 2018). The indicator used was Economic Growth with Per Capita Income for the region. Further, Klassen Typology Approach was applied to seek the differences of clean development mechanism that conducted by a country's economic development is on the growth position of the CO_2 emissions produced.

In accordance with the development of Klassen Typological Approach, changes in economic growth and CO2 emissions can be classified into 4 quadrants (Table 1). The position of Asian and Middle Eastern countries were mapped at the end of the first commitment Kyoto Protocol period in 2012 and after the second Kyoto Protocol agreement was signed in 2013 until the end of the year of 2017.

The secondary data were obtained from the International Energy Agency in 2020 and the World Development Report in 2020. Meanwhile, time-series data were taken from 2013 to 2017 due to in 2013 to 2020 is the time span in which the Dowa amendment, known as the second commitment period of the Kyoto Protocol, is enforced. The data from 27 countries in Asia (apart from China and Hong Kong) and the Middle East were used. The Asian region was chosen because the largest CO_2 emissions were generated from the Asian region, which reached 19 billion tones of CO_2 or 53% of world emissions in 2017. Several upper-middle-income countries in the region, such as Singapore, Bahrain, and Jordan, were selected as a comparison to the clean development mechanism which is carried out by developing countries.

In addition, more than 50% population in the globe lives in the Asian region. So, the CO_2 emission per capita is slightly lower than the average countries around the world. The Middle East region

Table 1: Classification of Economic Growth and CO2 Emissions matrix modified from the Klassen Typology Model

	CO2 emission	
	Low (CO_2i<CO_2)	High (CO_2i>CO_2)
Economic Growth		
High (Gi>G)	Quadrant II (CO_2i<CO_2, Gi>G) High growth, Low emission	Quadrant I (CO_2i>CO_2, Gi>G) High growth, High emission
Low (Gi<G)	Quadrant III (CO_2i<CO_2, Gi<G) Low growth, Low emission	Quadrant IV (CO_2i>CO_2, Gi<G) Low growth, High emission

was chosen because it contributes most to the oil supply of the world and its per capita emissions of carbon experienced rapid growth. In 2008, three Middle Eastern countries are Qatar, United Arab Emirates, and Bahrain had the highest national levels of CO_2 emission. The highest carbon emissions reached 14.58 metric tons of carbon per person in Qatar, the United Arab Emirates at 9.43 metric tons of carbon per person, and Bahrain reached 7.90 metric tons of carbon per person (Boden et al., 2011).

Based on theoretical reviews and previous research, there are five variables to investigate. The dependent variable is CO_2 emissions then the growth of economy (EG), foreign direct investment, export and import are the independent variables. The research variables are shown in the Table 2.

3.2. Model Specifications

According to the theory, framework, and previous research, the research model can be written as eq (1)

$$lCO_{2it} = \alpha_0 + \alpha_1 EG_{it} + \alpha_2 lFDI_{it} + \alpha_3 lEXP_{it} + \alpha_4 lIMP_{it} + \mu_{it} \quad (1)$$

Where as CO_2, EG, FDI, EXP and IMP are respectively CO_2 emission (Mt), economic growth (%), foreign direct investment (million $), Export (million $), and import (million $). While α is coefficient; i referring to country (i = 1,2,3...26; and t is year$_{-t}$ (2013–2017); μ_{it} is the sum of $e+v_i+w_t$, where as e is the common set of error, v_i is the country-specific component, and w_t the time-specific component.

In panel data analysis, common effects model, fixed effects model, and random effects model were applied. The common effects model assumes the data behavior of countries in the ASEAN region and the Middle East is similar over time. The ordinary least square approach or least-squares technique was carried out to estimate the panel data model (see eq (1)). Meanwhile, the fixed effects model assumes that there are differences between countries in the two regions observed from the differences in the intercept. Intercept differences were captured by entering dummy variables. Even though they have different interceptions, the slope is the same between countries. Fixed effects model estimation model is often referred to as the least squares dummy variable (LSDV) technique. The least squares dummy variable can be written as eq (2):

$$lCO_{2it} = \alpha_0 + \alpha_1 EG_{it} + \alpha_2 lFDI_{it} + \alpha_3 lEXP_{it} + \alpha_4 lIMP_{it} + \mu_{it} \quad (2)$$

Where

$$\mu_{it} = e + \sum_{i=1}^{N-1} D_i^c v_i + \sum_{t=1}^{T-1} D_t^\tau w_t \quad (3)$$

Table 2: Variables and units of measurement

Variable	Units
CO_2 emissions	Metric tons per capita
Economic growth	Percentage
Foreign direct invesment	Million U.S. $
Export	Million U.S. $
Import	Million $

D_i^c and D_t^τ are dummy variables. While $N-1$ and $T-1$ function to show the identity of the specific residual components of the country and time series which are constant. Meanwhile, the v_i and w_t components are called unobserved heterogeneity because they arise from the results of data estimation. By using eq (3) into eq (2), obtained an eq (4):

$$lCO_{2it} = \alpha_0 + \alpha_1 EG_{it} + \alpha_2 lFDI_{it} + \alpha_3 lEXP_{it} + \alpha_4 lIMP_{it} + \sum_{i=1}^{N-1} D_i^c v_i + \sum_{t=1}^{T-1} D_t^\tau w_t + e \quad (4)$$

The last approach is a random-effects model. In panel data, it is possible to have a linkage of the disturbance variables between individuals and over time. In a random-effects model, diverse interceptions will be patched by the error terms in every country. To get random effects model, recall eq (2). However, α_0 is no longer fixed (nonstochastic) but random. It can be written as eq (5);

$$\alpha_0 = \overline{\alpha_0} + \varepsilon_i \quad (5)$$

where i = 1,2,…, n, $\overline{\alpha_0}$ is an unknown parameter indicating the average intercept of the population. Meanwhile, ε_i is a random disturbance variable to explain the differences in the behavior of countries.

Disturbance variables have characteristics

$$E(\varepsilon_i) = 0 \text{ dan } var(\varepsilon_i) = \sigma_\varepsilon^2 \quad (6)$$

Therefore, it is formulated as follows:

$$E(\alpha_0) = \overline{\alpha_0} \text{ dan } var(\alpha_0) = \sigma_\varepsilon^2$$

Equation (5) is substituted for equation (2), then the following equation is obtained

$$lCO_{2it} = (\overline{\alpha_0} + \varepsilon_i) + \alpha_1 EG_{it} + \alpha_2 lFDI_{it} + \alpha_3 lEXP_{it} + \alpha_4 lIMP_{it} + \mu_{it} \quad (7)$$

$$= \overline{\alpha_0} + \alpha_1 EG_{it} + \alpha_2 lFDI_{it} + \alpha_3 lEXP_{it} + \alpha_4 lIMP_{it} + \theta_{it}$$

Where, $\theta_{it} = \mu_{it} + \varepsilon_i$ (8)

Eq 8 is random effects model where the disturbance variable of θ_{it} has 2 components, namely the overall disturbance variable μ_{it} and the individual-state disturbance variable of μ_{it}. The advantage of using a random-effects model, the problem of heteroscedasticity can be eliminated. The error component model or generalized least square (GLS) technique is other designations of this model random-effects model.

4. RESULT AND DISCUSSION

4.1. Panel Data Estimation

After processing the data, comparisons can be made in determining the panel data analysis model, which is summarized in Table 3. In

Table 3: CO_2 emission panel data model parameters

	Panel OLS	Fixed Effect Model	Random Effect Model
Constanta	−7.673201 (−11.99062)**	−2.444731 (−3.570500)**	−5.452188 (−6.933117) **
Fixed Effects (Cross);		ε_i	
_BGD--C		−0.017387	
_BRN--C		−0.615131	
_CAM--C		−0.777288	
_PRK--C		−0.026169	
_IND--C		1.037453	
_INA--C		0.584524	
_MLY--C		0.250662	
_MNG--C		−0.252770	
_MYA--C		−0.372574	
_NPL--C		−0.757581	
_PAK--C		0.328318	
_PHI--C		0.049401	
_SGP--C		−0.587667	
_SRL--C		−0.438487	
_THA--C		0.280825	
_VNM--C		0.156424	
_BAHN--C		−0.231861	
_IRN--C		0.964348	
_IRQ--C		0.280353	
_JOR--C		−0.358298	
_KWT--C		0.135504	
_LBN--C		−0.418649	
_OMAN--C		0.008228	
_QATR--C		0.027682	
_SAU--C		0.618357	
_ARE--C		0.145297	
_YAM--C		−0.317810	
EG	0.002944 (0.496695)	0.001202 (2.030326)*	0.001107(0.977160)
LFDI	−0.219459 (−4.008322)**	0.018344 (2.929779)**	0.013197 (0.719335)
LEXP	0.463774 (2.630886)**	−0.113208 (−3.552563)**	−0.038482 (−0.545252)
LIMP	0.615984 (2.900486)**	0.497538 (7.425005)**	0.708004(6.806390)**
Chow test	520.758763(0.0000)**		
Hausman test		9.897490(0.0422)*	
Adjusted R^2	0.691813	0.997370	0.406307
N	129	129	129

* significance at the 5% level and ** significance at the 1% levels

common effect model, all variables except the growth of economy have a necessary effect on carbon emission.

Meanwhile, fixed-effect model, all variables are significant and in the random-effects model, only import that influences CO_2 emissions. Adjusted R2 shows the fixed-effect model has a high R^2, which is above 0.90. It means the variation of the independent variables (EG, FDI, EXP, and IMP) can explain the CO_2 emission variable by more than 90%.

A model determination was carried out using the Chow test and the Hausman test. The Chow test resulted from the Chi-square probability of 0.000. It is smaller than α 5%, H0 is rejected and Ha is accepted. It means FEM is better than CEM. The Hausman test result, with a df of 4, has a very significant Chi-square (9.89) with P = 0.04, smaller than α 5%. Decision is null hypothesis (H0) is rejected, Ha is accepted. FEM is better than REM.

Based on the tests, the final panel data regression model for CO_2 emissions in the ASEAN and Middle East regions were obtained, namely the Fixed Effect Model (FEM) with Cross Section Weight.

Therefore, by referring to the basic model in equation (2), then the final research model is made as in equation (8)

$$l\widehat{\mathrm{CO}}_{2t} = -2.44 + 0.001EG_{it} + 0.02lFDI_{it} - 0.113l\mathrm{EXP}_{it} + 0.497l\mathrm{IMP}_{it} + \hat{\mu}_i \quad (8)$$

The amount of intercept (θ_{it}) varies as presented in Table 4.

Table 4 shows the different intercepts between cross-section units. Its means the determinant effect on efforts to reduce CO_2 in each country is different from each other. The greater intercept of a country, the greater of CO_2 in the country can be reduced. The findings show that India and Iran are the slowest countries in efforts to reduce CO_2, likewise with Indonesia and the United Arab Emirates. According to the World Bank, high-income countries, such as Singapore, Brunei Darussalam, Bahrain, Jordan, and Lebanon, have had a significant effort to reduce CO_2.

4.2. Klassen Typology Methods

Klassen Typology Methods was applied to figure out the circumstances of countries in Asia and the Middle East, related

Table 4: Intercept θ_{it}

No	Countries	θ_{it}
1	Bangladesh	−2.46212
2	Brunei Darussalam	−3.05986
3	Cambodia	−3.22202
4	DPR of Korea	−2.4709
5	India	−1.40728
6	Indonesia	−1.86021
7	Malaysia	−2.19407
8	Mongolia	−2.6975
9	Myanmar	−2.81731
10	Nepal	−3.20231
11	Pakistan	−2.11641
12	Philippines	−2.39533
13	Singapore	−3.0324
14	Sri Lanka	−2.88322
15	Thailand	−2.16391
16	Viet Nam	−2.28831
17	Bahrain	−2.67659
18	Islamic Rep. of Iran	−1.48038
19	Iraq	−2.16438
20	Jordan	−2.80303
21	Kuwait	−2.30923
22	Lebanon	−2.86338
23	Oman	−2.4365
24	Qatar	−2.41705
25	Saudi Arabia	−1.82637
26	United Arab Emirates	−2.29943
27	Yemen	−2.76254

Source: Data processes

to the attempted to harmonize the growth of economic and carbon emission. It also used to reinforce the finding of panel analysis. The result shows that at the end of the first commitment period in 2012, Malaysia, Thailand, India, Indonesia, Saudi Arabia were countries that had high economic growth and high carbon emissions. The quantity of CO_2 emissions and economic growth is above average; 175.84 metric ton per capita for CO_2 emissions and economic growth of 5.3% (Figure 1).

Countries in quadrant 2 mean that they have high economic growth in 2012 and low CO_2 emissions. They are Mongolia, Sri Lanka, Oman, Cambodia, Myanmar, Iraq Bangladesh, the Philippines, and Kuwait. Kuwait and Oman are countries that are in the high-income level but are able to have low CO_2 emission growth. While in the third quadrant there are Nepal, Qatar, Bahrain, Singapore, Jordan, Yemen, Lebanon, PRK, Brunei, Vietnam, United Arab Emirates, and Pakistan.

The results of Klassen Typology Approach shows that after the signing of the 2012 Dowa agreement, the countries classified in first quadrant 1 are Indonesia, Iran and Malaysia, and India. The average value of economic growth and CO2 emission was high from 2013-2017, exceeding the overall average value in the same time span, respectively 3.69 % and 196.25 metric tons per capita.

Figure 2 illustrated the countries that are below the average score are Saudi Arabia and Thailand, thus in the fourth quadrant. The countries which have high growth of economy but low CO_2 emission, as well as the second quadrant are Mongolia, Sri Lanka, Cambodia, Myanmar, Pakistan Bangladesh, the Philippines, Vietnam, Nepal, Bahrain, and Iraq. Meanwhile, Qatar, Jordan, Lebanon, PRK, Brunei, Kuwait, Oman, United Arab Emirates, and Yemen Singapore are in the third quadrant with low economic growth and low CO_2 emission.

Prior to the 2012 Kyoto Protocol commitment, out of 26 countries in ASEAN and the Middle East, there were 9 countries (34.61%) having high economic growth rates and low CO_2 emissions. The nine countries are Mongolia, Sri Lanka, Oman, Cambodia, Myanmar, Iraq, Bangladesh, the Philippines, and Kuwait. After signing commitment 2, during the period from 2013 to 2017, the number of countries with high economic growth rates but low CO_2 emission levels increased by 22% to 11 countries in which there were four classified into this category; Nepal, Bahrain, Vietnam, and Pakistan.

5. DISCUSSION

Environmental degradation is dominated by upper middle income and high-income countries such as Malaysia, Indonesia, Iran, Saudi Arabia, Thailand, and India. There is a quite huge expectation on the role of these countries in mitigating emission reduction. India and Indonesia, although not in the Annex I category, are included in the category of leading emmiters. The results of the study is that it has a high level of economic growth but its CO_2 emissions are still high, which is above the average of 3.69. This shows that the existing growth process is not efficient and environmentally friendly due to high pollutants produced in the development process for economic growth. High CO_2 emissions occur because activities, such as investment, can move economic growth and it will require large energy consumption (Shahbaz et al. (2019); Nasir et al. (2019)), as well as, production and consumption which represented by the export and import of the country (Hossain (2011); Hossain (2012); Pié et al. (2018); Dong et al. (2019)). The findings shows that Malaysia, Indonesia, Iran, Saudi Arabia, Thailand, and India have large intercept values. Its confirmed by Bhat and Mishra (2018) that energy consumption and free trade can increase CO_2 emissions in India. Meanwhile, for developing countries that benefited from geographic location and rely a lot on the agricultural sector, CO_2 emissions could be minimized. Study Wang et al. (2019) states that CO_2 emissions tend to be high in countries that are the industrial-based economy, while India, which represents developing countries, is found to have the ability to reduce emissions by relying on low carbon-based industry. One of the reasons developed countries have a more prominent tendency of pollution concentration and inefficiency is temporary mismanagement in developing countries because of technological gaps (Soares et al., 2018). The data also illustrate that Oman and Kuwait, despite their commitment to keeping CO_2 emissions low, their average economic growth in 2013–2017 was not considered good. Hence, to tackle this kind of issue, an effective policy should be made to keep CO_2 emission low without affecting its competitiveness. Otherwise, it will affect economic development in the long term.

The Clean Development Mechanism process at least has occurred in several developing countries. CO_2 emission is always produced when economic activities occur. A strong commitment is required to reduce CO_2 emissions which must be aligned with the goal of increasing economic growth. Some countries such as Bahrain,

Figure 1: Typology Klassen at 2012

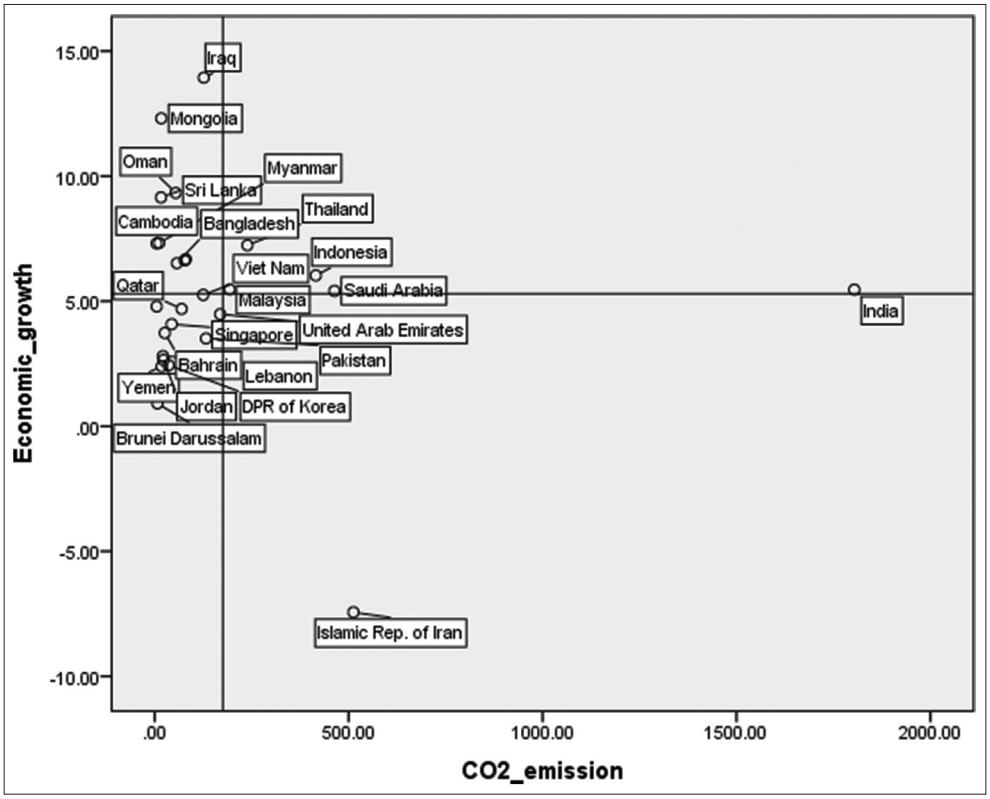
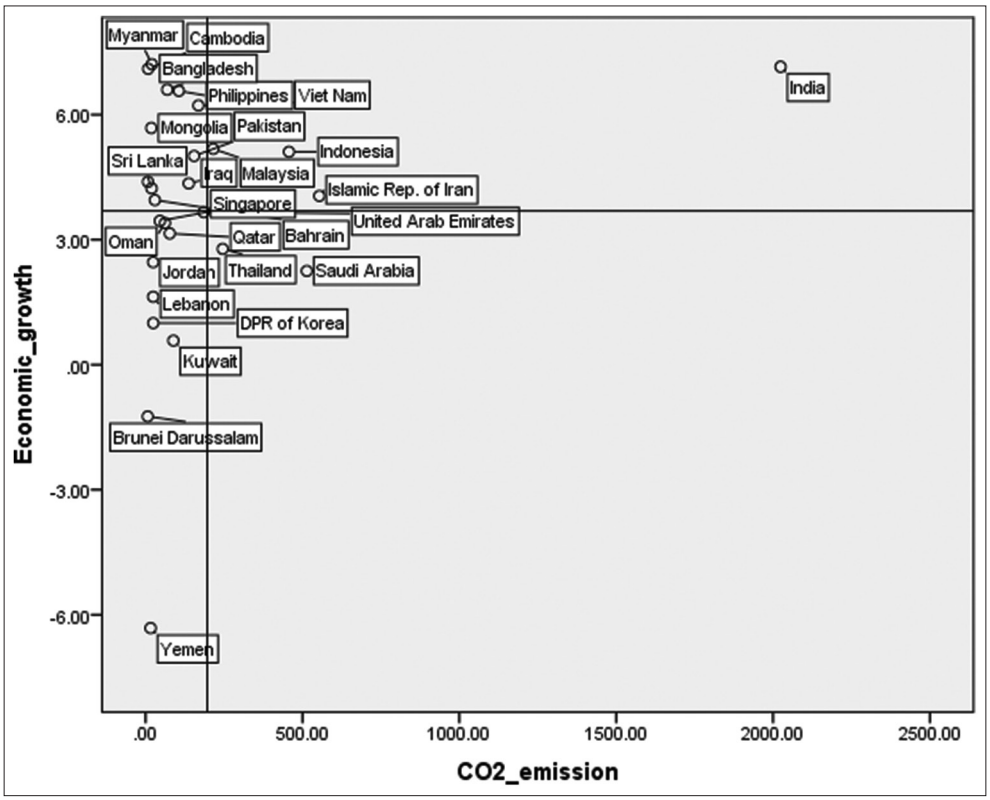


Figure 2: Typology Klassen 2013–2017



Pakistan, Vietnam, and Nepal were successful to keep CO_2 emissions low and they keep maintaining to improve their position of economic growth. Nonetheless, Kuwait and Oman were unable to maintain a stable level of economic growth even though they can maintain the emissions low. Currently, Oman and Kuwait have a responsibility that by 2030, they will reduce 2% of GHG emissions

and have a target to reduce approximately 23 million tons by 2035. Absolutely, It requires an appropriate strategy so that it can still focus on increasing economic growth and technological reform, but on the other hand diversify energy with fewer hydrocarbons (Charabi et al., 2018).

Reducing carbon emission takes a big effort and sometimes the policies in economic activities have an externality to the environment. For example, Oman is making a policy to fulfill local domestic needs by producing its own oil refinery. As a consequence, it can reduce imports of these products, but domestic carbon emissions increase due to higher consumption of fossil and liquefied natural gas. (Abdul-Wahab et al., 2015). Saudi Arabia (KSA) leads the Gulf Cooperation Council (GCC) on the biggest CO_2 emissions. During its development, KSA CO_2 emissions have grown rapidly since 2005 caused by the increasing demand for world oil, the high demand for electricity generation for industrial development in the country (Qader, 2009). Like several countries that depend on hydrocarbon production, KSA also ratified the Kyoto protocol in 2005, but it seems difficult for KSA to reduce its CO_2 emissions.

6. CONCLUSION

This paper aims to seek the commitment of developing countries, especially in Asia and the Middle East region, to bring down CO_2 emissions following the second Kyoto Protocol. Overall, until the end of 2017, there has not been huge change compared to the end of period 1 of the year 2012. The findings indicate that Indonesia, Iran, Malaysia, and India still need to develop mitigation policies to align economic growth with CO_2 emissions.

It is reported that Malaysia, India, and Indonesia have a high average economic growth, but also have a high growth rate of CO_2 emissions. Even Thailand and Saudi Arabia experienced a shift with an average CO_2 emission that was still high, but the average growth rate decreased in the 2013–2017 time period. Therefore, monitoring and supervision are required to evaluate the commitments of these countries on the Kyoto Protocol or other multilateral agreements. This step has actually been initiated with the existence of the APAEC (ASEAN Plan of Action for Energy Cooperation) in the ASEAN Region or RCREEE (The Regional Center for Renewable Energy and Energy Efficiency) in Pan-Arab countries. Both have a common goal that is to ensure the implementation of a sustainable future of energy or cost-effective renewable energy. The struggle to make a shift towards changing the structure of the economy which is oriented towards a more ecological modernization is considered not easy. This condition occurs in several Middle Eastern countries (Arouri et al., 2012).

The result of the study shows that foreign direct investment and export-import trade activities play vital roles in development. Nonetheless, the government is expected to be aware of their decision related to strategic national policies or regulations as operational standards. Hence, the incoming investment or output flows can be directed towards technology that is environmentally friendly and yet somehow efficient to achieve sustainable development goals. The achievement of clean development mechanism requires cooperation between Annex I countries and non-Annex I countries in order to fulfill their emission reduction obligations through investment in emission reduction projects and carbon trading. A more comprehensive policy and strategy as a clean development mechanism of emission reduction after the Dowa agreement can be obtained by conducting further research in many countries or inter-regional because each area must have its own treatment in dealing with climate change, especially CO_2 reduction. In addition, the using of more specific variables from investment and technological innovations in developing countries to reduce carbon dioxide emissions, hopefully can be used as a more efficient evaluation material related to the clean development mechanism process.

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