The analysis of green growth indicators in predicting the economic development of southeast Asian Countries[1]

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Abstract

Green Economic Accounting and reporting through various green growth indicators is needed because it maintains the balance between profit, people, and the planet. This study examines the green growth indicators and economic development from 2010-2019 of four countries in Southeast Asia, namely: Philippines, Singapore, Indonesia, and Cambodia. The green growth indicators were examined in four aspects and are measured through the growth rates of environmental and resource productivity, environmental dimension of quality of life, economic opportunities and policy responses, and socio-economic context in specific measures, while the economic development is captured by the growth rates of gross domestic product and gross national income per capita. This paper asserts that the four countries have different economic statuses and green growth performances. It then goes on to claim the following. First, the green growth indicators tested in the study have no significant relationship with the economic development variables. Second, the green growth indicators have no significant influence on the gross domestic product per capita. Third, two of the green growth indicators tested in the study have a significant influence on the growth rates of gross national income per capita. Fourth, the means of green growth indicators and economic development presented in the study are statistically different from each other. Finally, it evaluates whether the green growth indicators can predict the Economic Development of Southeast Asian Countries. The study conducts country-panel regression analyses through random-effects and variability econometrics based on presupposes conceptual basis of empirics and practices.

1. Introduction

Society must grow and progress in economic dimensions and environmental aspects. There are various strategies to achieve greener growth that is currently being introduced to various countries. It can be measured by several indicators that can make progress in living standards. The balance between economy, health, environment, and cultural aspect should be construed and maintained (Gurría, 2011). Protection and conservation of natural capital should be prioritized while utilizing these resources into revenue-producing services.

To monitor progress towards green growth, indicators are required based on internationally comparable data. There is a need to scrutinize green growth data based on embedded measures in a conceptual framework per organization or nation. Effective measurement is based on valid indicators. While this system is newly introduced and most information is estimated, a study analyzing its effects and influence should be pursued.

Green growth aims to integrate economic and environmental pillars of sustainable development into a single intellectual and policy planning process, thus recasting the very essence of the development model so that it is capable of producing versatile and sustainable growth simultaneously (Samans, 2013). Furthermore, fostering

economic growth and development are the primary goals of green growth. It also ensures that natural assets are used efficiently, sustainably, and continuously providing resources and environmental services on which the growth and well-being depend (OECD, 2011). The World Bank in 2012 stressed the growth that is efficient utilizing natural resources, minimizing pollution, and lessening environmental impacts should be promoted. Thus, the researcher believed that a study analyzing green growth and economic development among the countries in Southeast Asia should be developed. In Asia-Pacific, most countries are not fully oriented yet of the green growth and further development should be introduced for the betterment of the society and economy. However, information concerning green growth is accessible and countries in the region are cooperating by providing data to the advocates of green growth. To evaluate the status of green growth specifically in Southeast Asia, a study concerning indicators and their implications to economic development should be conducted. Thus, this paper is produced.

1.1 Statement of the problem

Recently, viable measurements of green growth were developed. These measures are referred to as green growth indicators. Many economists, environmentalists, policymakers, and experts have differing claims about green growth and its impact on economic growth. Furthermore, few types of research were conducted as of the present concerning this economic evolution. Countries that are members of the Association of Southeast Asian Nations (ASEAN) are not hardly devoted yet to green growth movements. There is a necessity to evaluate the influence of green growth on the economic development of the nations in Southeast Asia. To promote green growth and uplift economic status, an analysis of these Indicators as Predictors of Economic Development should be conducted.

1.2 Objectives

This study aims to analyze the Green Growth Indicators in predicting the Economic Development of Selected countries that are members of ASEAN, namely: Philippines, Singapore, Indonesia, and Cambodia. Specifically, it desires to:

1. compare the green growth through green growth indicators of the four aforementioned countries in Southeast Asia;

2. analyze the relationship of selected green growth indicators to the economic development variables of four selected countries in Southeast Asia; and

3. evaluate the influence of Green growth indicators on the economic development of four selected countries in Southeast Asia.

1.3 Scope and limitation

This research is limited to the four countries that are members of the ASEAN, namely: Philippines, Singapore, Indonesia, and Cambodia. These are objectively selected because the researcher wants to compare and analyze the influence of Green growth indicators on the economic development of the countries that have a different level of GDP and GNI per capita. The Philippines and the extremes of ASEAN Members in terms of economic performance with the median-like country have been evaluated. No comprehensive study has been conducted yet in the Philippines regarding the analysis of Green Growth Indicators to the Economic Development of these four countries which are ASEAN Members. Besides, no study has been conducted yet in Bicol Region focusing on Macroeconomic perspectives, incorporating environmental and developmental economics. The green growth has five indicators/variables, environmental and resource productivity, natural asset base, environmental dimension of quality of life, economic opportunities and policy responses, and socio-economic context based on OECD Framework. The researcher preferred OECD framework for comparability clauses, data adequacy, and borderless economics. However, in the study, only four variables are utilized. The Natural asset base was excluded because of scarce data which may affect significantly the result of the study.

2. Research methods

This study used research mixed-method (qualitative and quantitative method). The qualitative data (case study) of the study are the findings based on the documentary analysis/data mining on the environmental status and institutional policies and regulations regarding Green growth. On the other hand, the quantitative data (causal-explanatory research design) emerged from the secondary data which was used as an input for data analysis (i.e., Green Growth Indicator values, GNIs, and GDPs).

2.1 Sources of data

The study utilized secondary data from Organization for Economic Co-operation and Development (OECD) and World Bank (WB). The researcher employed data mining to generate necessary information which served as input for the conduct of the analyses.

2.2 Data collection/gathering procedure

The secondary data were mined from OECD and WB open stat data repository. The data were downloaded through excel files, and ccv, and were filtered or screened objectively to select the inputs that would be useful for the study. The researcher utilized MS Excel, SSR, and Stata for data treatment and analyses.

2.3 Population and sampling design

The researcher used four countries among ASEAN members where the comparison and statistical treatment were based. The Philippines was selected since that the study is being conducted in the Philippines (Rank 8). Moreover, the three countries have been impartially selected based on the Gross Domestic Product Per Capita measured through Purchasing power parity (PPP), which allows comparison of economic productivity and standards of living between countries. Please refer to Table 1 for complete details. The country which has the highest per Capita (Rank 1), the country which has the median GDP per Capita (Rank 6), and the country with the lowest GDP Per Capita (Rank 10). These countries are Singapore, Indonesia, and Cambodia, respectively.

Table 1. Vital Economic Statistics of ASEAN Countries as of Third Quarter of year 2020

No.	Country	Population in million	GDP Nominal millions of USD	GDP Nominal per capita USD	GDP (PPP) millions of USD	GDP (PPP) per capita USD
	ASEAN	654.306	3,173,141	4,849	8,454,651	12,921
1	*Indonesia* (Rank 6)	*266.998*	*1,088,768*	*4,038*	*3,328,288*	*12,345*
2	Thailand	67.913	509,200	7,295	1,261,485	18,073
3	*Philippines* (Rank 8)	*108.307*	*377,362*	*3,372*	*933,913*	*8,574*
4	Vietnam	96.801	340,602	3,498	1,047,318	10,755
5	*Singapore* (Rank 1)	*5.67*	*337,451*	*58,484*	*578,204*	*95,603*
6	Malaysia	32.801	336,300	10,192	900,426	27,287
7	Myanmar	53.019	71,690	1,333	275,513	5,179
8	*Cambodia* (Rank 10)	*16.494*	*26,316*	*1,572*	*74,348*	*4,441*
9	Laos	7.163	18,653	2,567	59,736	8,221
10	Brunei	0.447	13,469	23,117	28,470	61,816

Source: TradingNomics's Quarter 3-2020

2.4 Econometric modeling and data analysis

This study used descriptive statistics as statistical tools and panel econometrics models as an analytical tool. The researcher utilized *Panel Regression Analysis.* It is employed to examine the effects/influence of Green Growth Indicators on the Economic Development of ASEAN Countries. The econometric models below were used for panel regression analysis. There are two econometric models used in this study, these are following:

Model 1

GRGDPC = B1 + αi + B2EcoDevit + B3EnResProdit + B4EnviDiQLiit + B5EconOppPolResit + B6SocEconCon + εit

Model 2

GRGNIPC = B1 + αi + B2EcoDevit + B3EnResProdit + B4EnviDiQLiit + B5EconOppPolResit + B6SocEconCon + εit

Where:

αi (i=1….n) = is the unknown intercept for each sample (n entity-specific intercepts).

Yit = is the dependent variable (DV) where i = entity and t = time.

Xit = represents one independent variable (IV),

β1 = is the coefficient for that IV,

uit = is the error term

Dependent Variables

1. Growth Rate of Gross Domestic Product Per Capita (GRGDPC)

2. Growth Rate of Gross National income (GRGNI)

Independent Variables

1. Environmental and resource productivity

2. The environmental dimension of quality of life

3. Economic opportunities and policy responses

4. Socio-economic context.

Table 2. List of Variables used in the Study

Variables		Description	Measures
Dependent Variables	GRGDPC	Growth Rate of Gross Domestic Product Per Capita	The Gross Domestic Product per capita or person is the ratio of total GDP to the total population. The Growth Rate can be computed by dividing the quantity of the difference of Current Year's GDP per capita by the Preceding Year's per Capita divided by the Preceding Year's per Capita
	GRGNIPC	Growth Rate of Gross National income Per Capita	The Gross National Income per capita or person is the ratio of total GNI to the total population. The Growth Rate can be computed by dividing the quantity of the difference of Current Year's GNI per capita by the Preceding Year's per Capita divided by the Preceding Year's per Capita
Independent Variables	EnResProd	Environmental and resource productivity	The Growth rate of Production-based CO_2 productivity, GDP per unit of energy-related CO_2 emissions. This variable indicates whether the economic growth is becoming greener with more efficient use of natural capital and to capture aspects of production which are rarely quantified in economic models and accounting frameworks.
	EnviDiQLi	Environmental dimension of quality of life	The Growth Rates of Access to Water and Sewage Treatment. It indicates how environmental conditions affect the quality of life and wellbeing of people.
	EconOppPolRes	Economic opportunities and policy responses	The Growth Rate of Environmental taxes and transfers. It indicates the effectiveness of policies in delivering green growth and describes the societal responses needed to secure business and employment opportunities.
	SocEconCon	Socio-economic context	The Growth Rates of Value-Added in Agriculture. It indicates the socio-economic transformation of values towards a greener and progressive society.

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Summarized by E. Onsay, 2021.

The Analysis on Variance was also used to compare the means between the groups and determines whether any of those means are significantly different from each other.

2.5 Statement of hypotheses

The null hypothesis proposes that there are no differences or relationships between the characteristics of the data observed. There is no significant relationship between green growth indicators and economic development variables. There is no significant difference between the means of green growth indicators and economic development variables. The green growth indicators cannot be used effectively as a predictor of economic development among the four nations of the ASEAN region.

3. Results and Discussions

3.1 Economic development
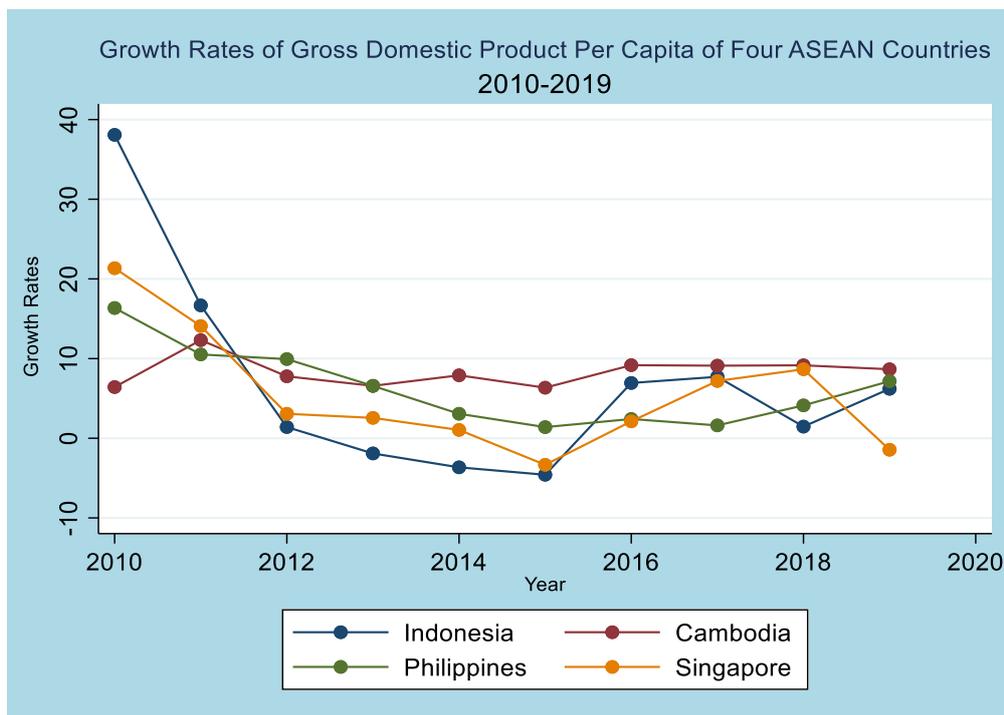
Figure 1. Growth rates of GDP per capita of four ASEAN countries

Source: World Bank, Graphed/Illustrated by E. Onsay, 2021)

The Nominal Gross Domestic Product was used in the observation. The GDP Per Capita was computed by dividing the GDP by the entire population of respective ASEAN Countries. The researcher preferred Nominal GDP because it is not adjusted with inflation and reflects the current values. To match with Green Growth Indicators that are reflected with the current values, the current GDP has been utilized. It is in consonance with the assertion of Dylan, et. al (2019) and Summer (2014) that the nominal GDP is best used for comparison of current values. Based on the graph, the Growth Rates of GDP Per Capita of Four ASEAN Countries significantly differ.

Singapore which has the highest Nominal GDP and GDP Per capita reflects a lower plot of growth rates due to base effects since that they already achieved higher bases, thus changes are immaterial. Cambodia which has the least nominal GDP and GDP Per capita among ASEAN neighbors reflects an almost stable growth rate of GDP per capita. The GDP per capita is being affected by the number of populations. Indonesia has the highest population while Singapore has the least. The Philippines and Indonesia are almost at par, but the latter has greater GDP per Capita than the former, but the trend of the growth rates of the latter is declining. This is the first dependent variable that serves as an indicator of economic development.
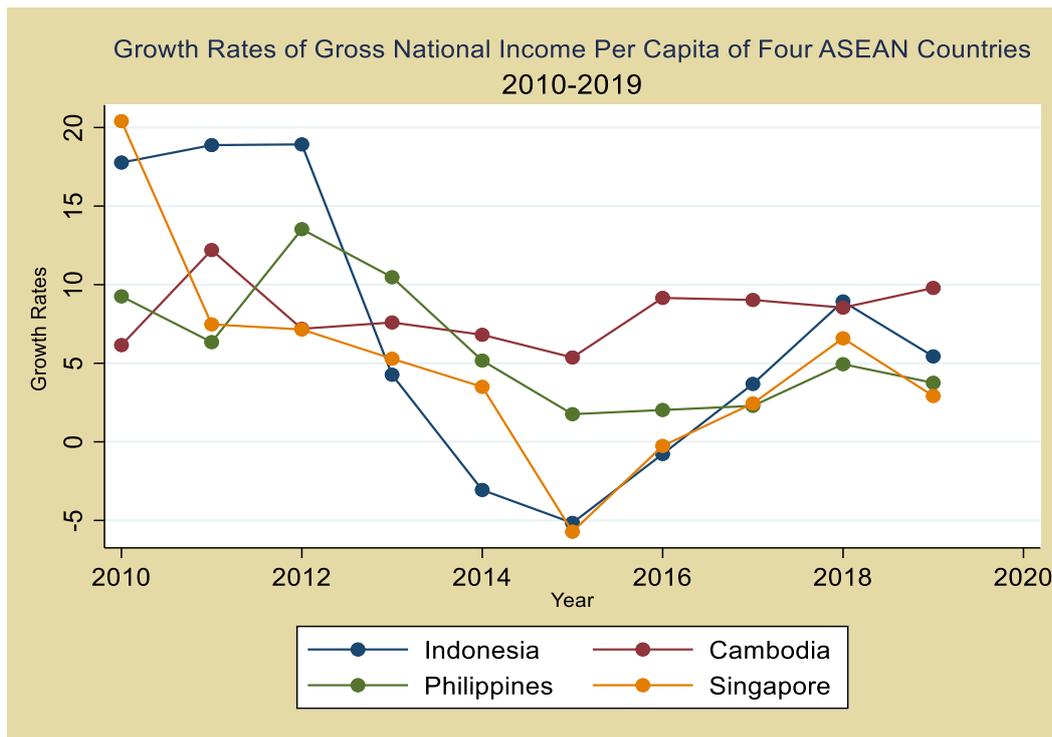
**Figure 2.** Growth Rates of GNI per capita of four ASEAN countries

**Source:** World Bank, Graphed/Illustrated by E. Onsay, 2021

The GNI per capita is the gross national income of selected ASEAN countries, converted to U.S. dollars using the World Bank Atlas method, divided by the total population of respective countries. The GNI is the sum of value added by all resident producers plus any product taxes (fewer subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad (World Bank, 2020). The researched used GNI as a variable of economic growth because according to august economists, the GNI is GDP plus the income earned by residents from abroad minus income earned in that country by residents of other countries abroad. Thus, the GNI is higher compared with the GDP. Based on the graph, it is noticeable that Singapore which has the highest GNI per capita has an average to lower GNI growth rates because they already reached the optimal level of GNI which could be possibly generated through satisfying their population and land area constraints.

Indonesia has significant declines in its GNI per capita growth rates, although the GNI is increasing, its population is booming. Thus, it compensates for the corresponding increase by a greater denominator of an economic variable. Moreover, the Philippines and Cambodia are almost stable with a slightly increasing trend of growth rates as developing countries. The GNI per capita growth rate is the second utilized variable of economic development.

3.2 Green growth indicators

Selected indicators towards green growth in monitoring progress was contained in OECD Green Growth database. This aims to inform the public in general, and support policy making and decisions (OECD, 2021). The researcher studied, filtered, and scrutinized the information and the green growth indicators to facilitate the relevance of these variables as a determinant, indicator, or predictor of economic development in the modern context.
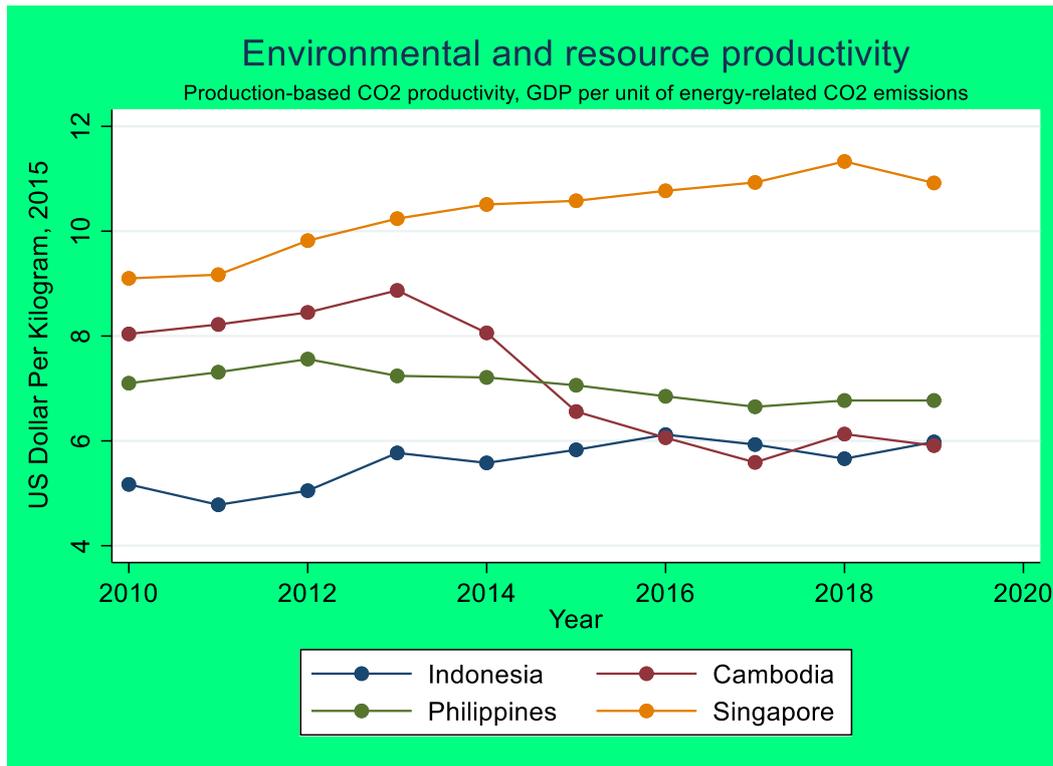
Figure 3. Environmental and resource productivity

Source: Organization for Economic Co-operation and Development (OECD), Graphed/Illustrated by E. Onsay, 2021

The Environmental and Resource productivity in the study utilized the Production-based CO2 Productivity, GDP per unit of energy-related CO2 emissions. These are used in sustainability measurement as it attempts to decouple the direct connection between resources and environmental depreciation. The growth rates can be used as a metric for both economic and environmental cost. It formed part of environmentally adjusted multi-factor productivity which gives a complete picture of an economic productivity by accounting for inputs from natural resources and for the generation of pollution (OECD, 2021).

Based on statistical analysis, the Singapore is the most productive, which can be justified by its innovation in technology (Quah, 2018). This is being followed by Cambodia and Philippines, while the Indonesia has the lowest Environmental Productivity among four countries. It concurs with the findings of Hidayat, et al 2019, that the Indonesia is a developing country that must deal with technical innovation to enhance productivity in economic capacity. The country has a huge room for improvement since that the country contains undeveloped and undiscovered resources for productivity (Musa, 2012).
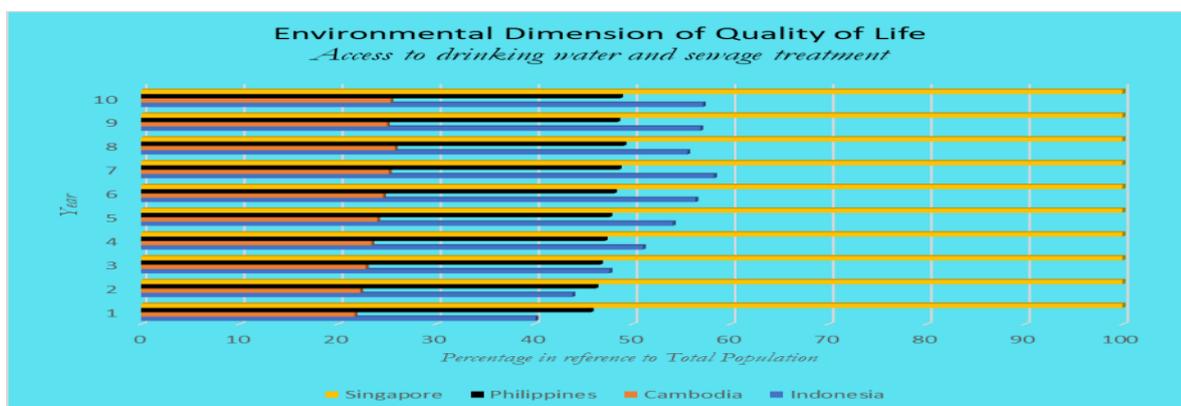
Figure 4. Environmental dimension of quality life

Source: Organization for Economic Co-operation and Development (OECD), Graphed/Illustrated by E. Onsay, 2021

Concerning the environmental dimension of Quality of life, the researcher employed the percentage of access to drinking water and sewage treatment. The main aim of sustainable development is the improvement in quality of life and is being evaluated by various factors that enhance the welfare of people (Streimikiene, 2015).

Based on the results, the total population in Singapore has access to drinking water and sewage treatment. This is being followed by Indonesia and the Philippines. While, in Cambodia, the majority of people have no access to drinking water and sewage treatment. This is justified by the results of the study conducted by Nguyen (2010) and Hipsher (2016) that Cambodia is one of the least developed economies, facing various poverty problems, but the creation of new job and livelihood opportunities also opened progress.
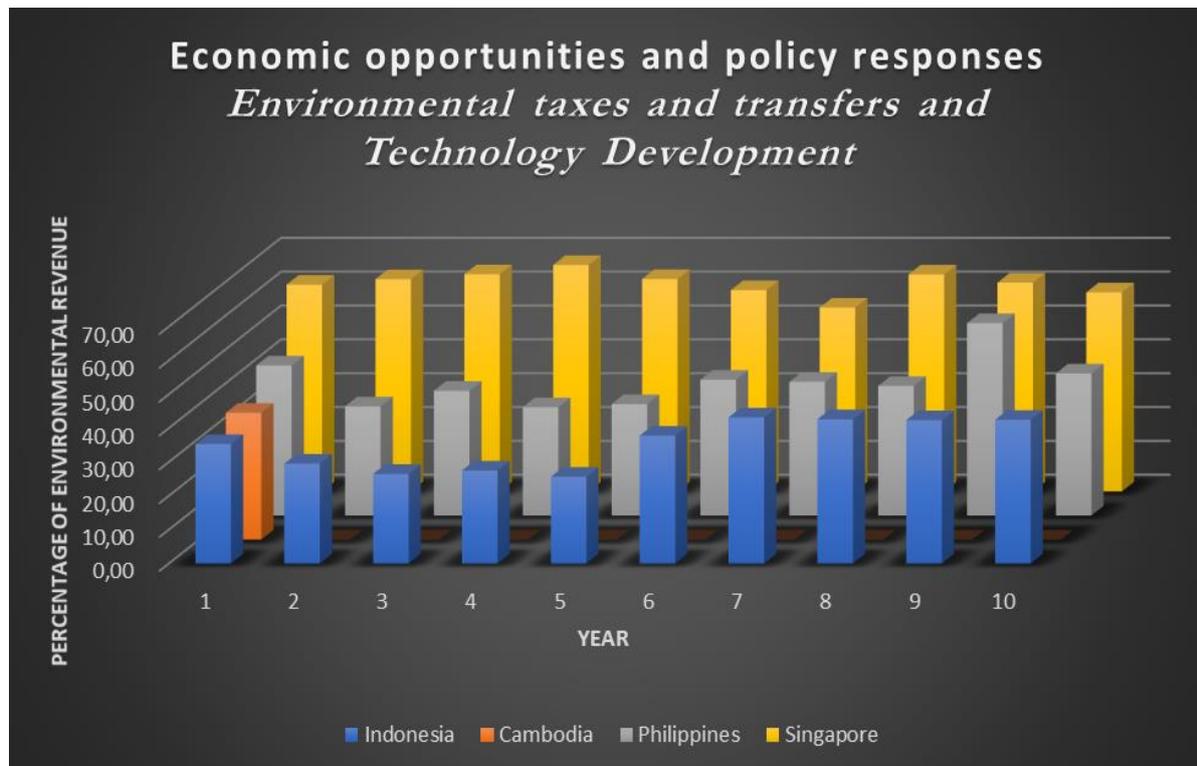
Figure 5. Economic opportunities and policy responses

Source: Organization for Economic Co-operation and Development (OECD), Graphed/Illustrated by E. Onsay, 2021

While businesses are established primarily to earn profit in particular, they must also promote the welfare of people and health of the planet in general. The Environmental Taxes and transfers and technology development in the Philippines is increasing and above Cambodia and Indonesia because the SEC Memorandum Circular on Sustainability Reporting Guidelines for Publicly-Listed Companies took effect in 2019. The revenue being generated by the government in Singapore from environmental taxes are substantial and above the aforementioned three countries.
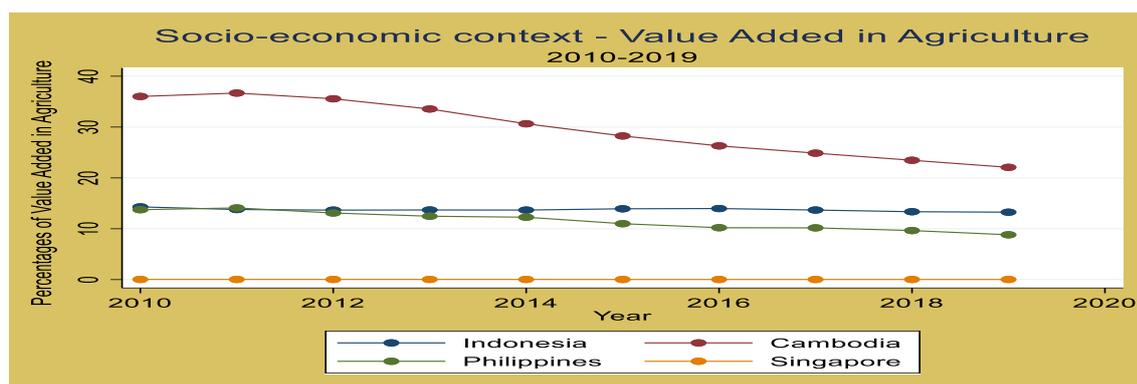
Figure 6. Socio-economic context

Source: Organization for Economic Co-operation and Development (OECD), Graphed/Illustrated by E. Onsay, 2021

Agricultural Value-Added productivity is shown by the table above. Singapore has the least value-added on Agriculture due to their land area constraints and most of their population are employed in the industrial sector (Ong, 2019 and Han et. al, 2002). The Indonesia and Philippines are agricultural lands, but there is a slight downward shift lately in agricultural value-added due to industrial improvement and projects. Some agricultural lands are being traded for housing projects and commercial establishment leading to the decline of crop production in the Region. It conforms to the study of Lakitan, (2019) and Tada (2009) that agricultural areas are affected by industrial improvement and projects. The number of farms and agricultural area in the Philippines decreased by 11.6 percent and 16.3 percent, respectively over the 1991 estimates, and the average farm size likewise decreased from 2.20 hectares per farm in 1991 to 2.08 hectares per farm in 2002 (PSA, 2021).

Furthermore, Cambodia has the highest agricultural value-added since most of its people are engaged in agricultural production and agricultural-related industry. There is twenty-two percent of agriculture accounts for Cambodia's GDP and employs about 3 million people. They have agricultural exports of 4.2 million tons of various commodities in 2018, and lots of potential agricultural growth (USECambodia, 2018).

3.3 Profile of four countries in Southeast Asia

Table 3. Characteristics of green growth indicators and economic development variables of the four ASEAN countries

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Country	40	2.5	1.132277	1	4
Growth rate of gross domestic product per capita	40	6.757257	7.577573	-4.580379	38.08144
Growth rate of gross national income per capita	40	6.502448	5.933537	-5.715972	20.40271
Environmental and resource productivity	40	.4070128	5.835479	-18.53393	14.23286
Environmental dimension of quality of life	40	1.71204	2.761662	-4.671349	9.305797
Economic opportunities and policy responses	40	-1.288731	21.54913	-100	48.36588
Socio-economic context	40	-2.888932	3.755314	-10.39126	4.270668

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Analyzed and Presented by E. Onsay, 2021.

Table 3 presents the characteristics of the variables used. There are 40 observations used in the study. These 40 were formed from 10 year representations of 4 ASEAN Countries with corresponding green growth indicators and economic development variables.

All inputs were growth rates which were manipulated to achieve reliability and comparability clauses. First, the mean GDP per capita growth rate is 6.76% with a standard deviation of 7.58. The minimum and maximum values are -4.58, and 38.08, respectively. Moreover, the mean GNI per capita growth rate is 6.50% with a standard deviation of 5.93. The minimum and maximum values are -5.71 and 20.40, respectively. The measures of the central tendency of dependent variables are also shown in table 3.

3.4 Examining the relationship of green growth indicators and economic development variables of the four ASEAN countries

Table 4. Relationship of green growth indicators to GDP per capita and GNI per capita of the four ASEAN countries

Variables	Growth rate of gross domestic product per capita	Growth rate of gross national income per capita	Environmental and resource productivity	Environmental dimension of quality of life	Economic opportunities and policy responses	Socio-economic context
Growth rate of gross domestic product per capita	1.0000					
Growth rate of gross national income per capita		1.0000				
Environmental and resource productivity	0.0417	0.0179	1.0000			
Environmental dimension of quality of life	0.1124	0.3063	0.0060	1.0000		
Economic opportunities and policy responses	-0.2238	-0.2993	0.0670	-0.1189	1.0000	
Socio-economic context	-0.0170	-0.0504	0.3824	0.1945	-0.1830	1.0000

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Analyzed and Presented by E. Onsay, 2021.

The results show that the relationship between dependent and independent variables is not significant. They have negligible to moderate positive and negative associations. It implies that the chosen Green growth indicators have no significant relationship with the chosen economic development variables of selected ASEAN Countries. It argues with the contexts of EaP GREEN (2016), that green growth indicators are significant drivers of economic growth while balancing and preserving the exchange of environmental and economic resources and natural capital. It also differs from the study of Koçak (2020) claiming that environment-related technology and emissions of carbon dioxide are the most essential indicators in achieving green growth globally for economic growth. The result of this study may affirm with Koh (2016) in counter context his findings reveal a discrepancy between social development and resource efficiency in many successful production economies worldwide. The index of productivity and efficiency is a robust macro-level methodology that requires deeper analysis and treatment of data.

The researcher here believes that in ASEAN Countries, Green growth indicators are not highly considered. None of the four countries are members of the OECD. In recent years, they have started supporting OECD in data provision and compilation, but statutory policies concerning these indicators are not fully established in macro-perspectives. Moreover, no concrete framework as to the measurement of information involved and some indicators have lacking inputs which might affect the statistical treatment of the data. Some records of these four ASEAN countries are incomplete and cannot be generated, moreover, some values are estimated and disclosed by OECD Databases.

3.5 Evaluating the influence of green growth indicators to the economic development of the four ASEAN countries

Table 5. Panel regression results (GDPPCGR) for the green growth indicators and economic development variables of four ASEAN members

Growth rate of gross domestic product per capita	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Environmental and resource productivity	0.134434	0.231927	0.58	0.562	-0.32013	0.589004
Environmental dimension of quality of life	0.293147	0.45808	0.64	0.522	-0.60467	1.190968
Economic opportunities and policy responses	-0.08446	0.059082	-1.43	0.153	-0.20026	0.031335
Socio-economic context	-0.24489	0.371594	-0.66	0.51	-0.9732	0.483418
_cons	5.384329	1.923556	2.8	0.005	1.614229	9.154429

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Analyzed and Presented by E. Onsay, 2021.

Table 5 presents the panel regression result of the variables used in the study for the Growth Rate of GDP per capita. Based on the results, the Environmental dimension of quality of life and Environmental and resource productivity indicators are positive but insignificant to the Growth Rate of GDP per capita (GRGDPPC).

The Economic opportunities and policy responses and Socio-economic context indicators are negative but insignificant also to the Growth Rate of GDP per capita (GRGDPPC). It means that the higher the access to drinking water and sewage treatment, the greater the growth rates of GDP per capita are, but at an insignificant level. The higher the Production-based CO_2 productivity, GDP per unit of energy-related CO_2 emissions, the higher the GDP per capita is, but an insignificant level. Furthermore, the higher the Environmental taxes and transfers and value-added to agriculture, the growth rates of GDP per capita tend to decline but an insignificant level.

Table 6. Panel regression results (GNIPCGR) for the green growth indicators and economic development variables of four ASEAN members

Growth rate of gross national income per capita	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Environmental and resource productivity	0.119947	0.168594	0.71	0.477	-0.21049	0.450384
Environmental dimension of quality of life	0.66646	0.33299	2	0.045	0.013813	1.319107
Economic opportunities and policy responses	-0.08513	0.042948	-1.98	0.047	-0.16931	-0.00095
Socio-economic context	-0.33557	0.270121	-1.24	0.214	-0.865	0.193855
_cons	4.23347	1.398279	3.03	0.002	1.492894	6.974046

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Analyzed and Presented by E. Onsay, 2021.

Table 6 presents the panel regression result of the variables used in the study for the Growth Rate of GNI per capita. Based on the results, the Environmental dimension of quality of life and Environmental and resource productivity indicators are positive but the former is the only significant to the Growth Rate of GNI per capita (GRGNIPC). The Economic opportunities and policy responses and Socio-economic context indicators are negative but only the former is significant to the Growth Rate of GNI per capita (GRGNIPC). It means that the better the access to drinking water and sewage treatment yields better growth rates of GNI per capita and insignificant level. The higher the Production-based CO2 productivity, GNI per unit of energy-related CO2 emissions, the higher the GNI per capita is, but in insignificant level. Furthermore, the higher the Environmental taxes and transfers, the growth rates of GNI per capita tend to increase and are significant. While as the value-added of agriculture increases, the GNI per capita tends to decrease at an insignificant level. The results of table 6 argue and oppose some results in table 5.

Table 7. Analysis On Variance of green growth indicators and economic development of ASEAN countries

Groups	Count	Sum	Average	Variance
GRGDPC	4	27.02902789	6.757256973	1.408895447
GRGNIPC	4	26.00979239	6.502448098	1.866178354
EnResProd	4	1.628051126	0.407012781	5.437742008
EnviDiQLi	4	6.848158276	1.712039569	3.496922126
EconOppPolRes	4	-5.154924458	-1.288731114	28.04965531
SocEconCon	4	-11.55572849	-2.888932122	3.156825694

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	320.5403873	5	64.10807746	8.85956	0.00022	2.772853
Within Groups	130.2486568	18	7.23603649			
Total	450.7890441	23				

Source: World Bank and Organization for Economic Co-operation and Development (OECD), Analyzed and Presented by E. Onsay, 2021.

Table 7 reveals that there is a significant difference between the means of green growth indicators and economic development variables of four ASEAN countries. The P-value is 0.00022 which is lower than the critical value, thus the null hypothesis should be rejected. The green growth indicators of the four countries and their economic development are statistically different.

4. Conclusion

This study aims to examine the influence of green growth indicators on the condition of economic development of four countries in Southeast Asia. Based on the findings, it is concluded that the green growth indicators have no significant relationship and influence on the growth rates of GDP and GNI per capita. The first two indicators of green growth have a positive effect on GDP per capita growth rates, while the last two indicators of green growth have a negative effect on GDP per capita growth rates, but both are insignificant. The Economic opportunities and policy responses have a significant influence but are negative on the Growth Rate of GNI per capita. Moreover, the Environmental and resource productivity indicator is also significant to the growth rate of GNI per capita and is positive. The GDP per capita growth rates were derived from GDP and total population. Scrutinizing GDP as the total market value of all finished goods and services produced within a country in a set period, the green growth indicators do not significantly influence the aforementioned measures. The Environmental dimension of quality of life and Environmental and resource productivity indicators are positive because as the environmental welfare and productivity increases, cost decreases, waste decreases, inputs become cheaper, efficiency heightens, leading to optimal production while maximizing wealth.

The Economic opportunities and policy responses and Socio-economic context indicators are negative because as the environmental taxes and value-added increases, the cost and expenses on the part of firms and businesses tend to increase. Regular corporate and business taxes lessen the revenue and earnings of companies. By adding additional taxes for environmental concerns, production and working capital may be affected.

On the other hand, the Value-added is the difference between the price of a product or service and the cost of producing it. As agricultural products undergo new processes and stages of conversions, or as the agricultural sector chooses innovative practices, the cost is primarily affected, and working capital is lowered. Unless, higher yield returns, the production declined thus affecting output negatively. These conclusions were drawn based on the business theory of production by Dorfman, and working capital theories by Pass, 1984. The OECD framework was also analyzed by the researcher and these conclusions were inferred.

Furthermore, the Environmental and resource productivity which is positive, and the Economic opportunities and policy responses that are negative, influence significantly the GNI per capita growth rates. The GNI per capita growth rates were derived from Gross National Income and total population. This measure refers to the total income received by the country from its residents and businesses regardless of whether they are located in the country or abroad. The researcher concludes that the GNI growth rate is significantly affected because most countries tested in the study have large income receipts or outlays from abroad. Those income items include profits, employee compensation, and taxes. If green growth indicators in other countries are effectively utilized, and the CO_2 and Energy Productivity are achieved, then maximizing profits will turn in, thus accounting for higher GNI. Moreover, if the incremental or newly environmental cost will be lumped with expenses on business operations, and be charged by the government, then it may result in a decrease in GNI.

The green growth indicators are not yet emphasized holistically in the economic settings of ASEAN. The green growth indicators as of the moment cannot be supposed as a useful predictor of economic development. Moreover, the four countries have significantly different growth indicators and economic development variable measures. The variables involved that were used in the study have no significant relationship to economic growth. Their coefficients had no significant effect on predicting economic development. Therefore, the results fail to reject the null hypothesis.

Recommendation

Drawing from the findings of the study, economists in ASEAN Region should devote time to model the green growth and how it would be more useful in economic setting. For policy makers and government, concrete policies should be crafted and well-defined objectives must be laid out to promote greener society while maximizing productivity and profitability of the country. The results are expected to provide feedback on the current status of green growth indicators in the Southeast Asia particularly in the four countries. For firms and businesses, this research would serve as evidence that organization should emphasize good governance and corporate social responsibility through environmental stewardship and initiatives for better financial position. For researchers, the results of this study can be replicated to validate the findings in micro or macro perspectives. Alternative variables beyond the scope of the study concerning green growth and economic development could be evaluated to test the validity of this research's claims.

Better steps may be laid out towards promoting green economic concerns. Well-crafted policies may be categorized per country and should be implemented according to the demographic and economic profile of a country. Compliances for large multi-national firms and publicly-listed companies including MSMEs, non-profit entities, and government institutions, should be proposed. Concerning measurements, proper economic valuation procedures, techniques, and guidelines on relevant costing, environmental cost, economic cost, and opportunity cost should be developed (concrete steps must be established for reliability clauses). Well-defined penalties and sanctions for those entity which may not depart from environmental guidelines. Provision of awards, incentives, or recognition for those economic players that religiously follow the guidelines towards green growth. Incorporating sustainability accounting and reporting to GDP and GNI measurement. Collaboration of accountants and economists may be done. Recognizing and hiring sustainability accountants and environmental economist could also be defined in every country. Providing regular positions across industries/services of economist should be done. It will open for job opportunity. Incorporating Green Growth topics and environmental economics should also be infused and introduced to students in high school and specialization in tertiary education concerning such aspect may be developed.

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