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Analysis of the Relationship of Economic Growth to the Human Development Index in East Nusa Tenggara (*Analisis Pengaruh Pertumbuhan Ekonomi Terhadap Indeks Pembangunan Manusia di Nusa Tenggara Timur*)

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Abstract - Stable economic growth can help solve several problems in the economy, such as poverty, unemployment, illiteracy, improve the quality of life for the people, and give more attention to health and education. Therefore, it is believed that economic growth has implications for human development. The purpose of this study is to analyze the relationship between economic growth and human development index. The scope of this research was conducted in 22 regencies/cities in the East Nusa Tenggara Province using a cross-sectional approach with panel data (time series) over 7 years (2019-2025), resulting in 198 data observations. The data used is secondary data obtained through documentation techniques. The analysis was carried out descriptively on economic growth and human development index, characterized the regions based on Klassen typology, and then examined the relationship between economic growth and human development index using unit root tests and cointegration tests. The results showed that economic growth in East Nusa Tenggara Province has grown and developed quite well, but it is not followed by significant growth and development in the human development index. According to Klassen typology, all the regencies/cities in East Nusa Tenggara Province are categorized as developing areas but are under pressure. The relationship between economic growth and human development index shows a stationary relationship based on the unit root test, but does not have a long-term relationship based on the cointegration test.

Keywords: *Economic Growth; Human Development Index; Stationary; Cointegration*

Abstrak – *Pertumbuhan ekonomi yang stabil dapat mengatasi masalah-masalah dalam perekonomian antara lain masalah kemiskinan, pengangguran, buta huruf, meningkatkan kesejahteraan masyarakat, dan memberi perhatian lebih di bidang kesehatan dan pendidikan. Oleh karena itu, disinyalir bahwa pertumbuhan ekonomi memiliki implikasi terhadap pembangunan manusia. Tujuan penelitian ini adalah untuk menganalisis hubungan pertumbuhan ekonomi dan indeks pembangunan manusia. Ruang lingkup penelitian ini dilakukan di 22 kabupaten/kota di Provinsi Nusa Tenggara Timur secara cross section menggunakan jenis data panel (time series) selama 7 tahun (2019-2025) sehingga membentuk jumlah data observasi sebanyak 198 data. Jenis data yang digunakan adalah data sekunder yang diperoleh menggunakan teknik dokumentasi. Analisis data dilakukan secara deskriptif terhadap pertumbuhan ekonomi dan indeks pembangunan manusia, dilakukan pangkarakteristik wilayah berdasarkan tipologi Klassen, dan selanjutnya dilakukan hubungan antara pertumbuhan ekonomi dan indeks pembangunan manusia menggunakan pengujian akar unit dan uji kointegrasi. Hasil penelitian menunjukkan pertumbuhan ekonomi di Provinsi Nusa Tenggara Timur bertumbuh dan berkembang cukup baik, tetapi tidak diikuti oleh pertumbuhan dan perkembangan indeks pembangunan manusia secara signifikan. Sesuai tipologi Klassen seluruh kabupaten/kota yang ada di Provinsi Nusa Tenggara Timur tergolong dalam karakteristik daerah berkembang tetapi tertekan. Hubungan antara pertumbuhan ekonomi dan indeks pembangunan manusia menunjukkan hubungan yang stasioner berdasarkan uji akar unit, tetapi tidak memiliki hubungan jangka panjang berdasarkan pengujian kointegrasi.*

Kata Kunci: *Pertumbuhan Ekonomi; Indeks Pembangunan Manusia; Stasioner; Kointegrasi*

1. INTRODUCTION

Economic growth is closely linked to the human development index. Soliman & Beram (2025) explains that stable economic growth can help solve problems like poverty, unemployment, and illiteracy, and also improve well-being and attention to health and education. Well-being can be measured through the human development index, which includes life expectancy, literacy rates, years of schooling, and per capita GDP. If economic growth increases, the human development index also increases, and conversely, a decline in economic growth has a negative impact on the development of this index. UNDP (2026) argue that economic growth provides more resources for human development, while human development also helps drive economic growth. The two are closely linked in the long term, influencing each other continuously.

To understand the long-term relationship between economic growth and human development, we need to look at it from two perspectives: how economic growth affects human development, and vice versa. This relationship is influenced by factors that connect the two. To explain this relationship, testing is needed using a method called cointegration, which examines the possibility of a long-term equilibrium relationship between economic variables. Two or more non-stationary variables are said to be cointegrated if their linear combination remains stable over time, indicating a stable long-term relationship (Ryan et al., 2025).

The province of East Nusa Tenggara (NTT) needs to be encouraged and further studied regarding its economic growth and human development index, because:

1. High levels of corruption in NTT have led to structural poverty and slowed economic growth, as shown by the low Human Development Index (HDI). According to Habaora et al. (2020), the corruption behavior index in NTT was 2.0 between 1999 and 2017. NTT ranks fourth in Indonesia for corruption-related legal issues and is known as the most corrupt province by FITRA (Forum Indonesia untuk Transparansi Anggaran). Celik & Kostekci (2025) explains that corruption disrupts the economy and is a main cause of low income, while Riwu Kore et al. (2019) highlight the negative impact of corruption on human development.
2. BPS Indonesia (2024) reported that NTT Province is one of the poorest provinces in Indonesia, with a poverty rate of 20.05 percent in the first semester of 2022, higher than the national average of 9.54 percent. Riwu Kore & Haba Ora (2019) explained that poverty negatively impacts economic growth and the human development index.
3. The IPM in NTT province remains in the lowest category in Indonesia, with a score of 65.28 and a ranking of 32 out of 34 provinces. Issues related to education, health, and community well-being are still critical. Haba Ora et al. (2026) notes that IPM is an important indicator for economic development, as it assesses the quality of life for the population. Economic growth and human development are closely linked.

Similar studies have been conducted, but they mostly looked at the relationship between human development index (IPM) and economic growth in one direction or the other. This study, however, examines the relationship between the two in both directions and provides policy recommendations related to their long-term connection. Based on the background of this research, the aim is to analyze economic growth and the human development index in the districts and cities of East Nusa Tera Province. For this purpose, the research problem is formulated as: (1) what is the pattern of the relationship between economic growth and the human development index in the districts and cities of East Nusa Tera Province? and (2) is there a long-term equilibrium or co-integration between economic growth and the human development index in the districts and cities of East Nusa Tera Province?

2. RESEARCH METHODS

This study uses panel data that combines a 9-year time series and cross-sectional data from 22 regencies/cities, resulting in 198 data points from the Central Bureau of Statistics regarding economic growth and Human Development Index in East Nusa Tenggara. The analysis method in this research uses quantitative analysis with panel data. The analysis model applied is Typological Klassen analysis and cointegration test to examine the long-term equilibrium relationship.

Typological Klassen. Each area has different levels of progress and economic growth, with some growing rapidly while others remain stagnant or even decline. The Klassen typology can be used to compare the level of development between different regions. Classifications categorize regions based on the Human Development Index (HDI) and economic growth rate, creating four categories: rapidly growing areas, moderately growing areas, struggling areas, and relatively underdeveloped areas.

Table 1. Regional Classification Based on Klassen Typology Analysis

r \ y	$y_i > y$	$y_i < y$
$r_i > r$	Quadrant I Advanced and Fast-Growing Regions	Quadrant II Rapidly Developing Regions
$r_i < r$	Quadrant III Developing but Depressed Regions	Quadrant IV Relatively Underdeveloped Regions

r_i = Economic growth rate of region i

Notes:

y_i = Human Development Index (HDI) of region i
r = Economic growth rate of the reference region
y = Human Development Index (HDI) of the reference region

Unit root test is used to check whether panel data is stationary or not. Panel data combines time series data with cross-sectional data, so the stationarity test is different from time series data because it accounts for individual and time effects. The unit root test in panel data is an extension of the test used in time series.

$$y_{i,t} = \varrho_t\, y_{it} + x_{it}\, \delta_{it} + \varepsilon_{it} \quad \text{..... (1)}$$

Notes: i = 1,2, ..., N (number of individuals)
t = 1,2, ..., T (number of time periods)

If it is assumed that $\alpha = \varrho - 1$ with lag ϱ_i varying across cross-sections, then the hypothesis test is formulated as follows:

H0 : $\alpha = 0$ (contains a unit root)
H1 : $\alpha < 0$ (does not contain a unit root)

If the value of $\varrho_i = 1$, the random variable Y has a unit root. Panel data with a unit root behaves randomly and is non-stationary. Regressing Y_{it} on its lagged value lag Y_{it-1} with $\varrho_t = 1$ indicates that the data is non-stationary. The unit root test is conducted using the Augmented Dickey-Fuller (ADF) test.

$$\Delta Y_{it} = \alpha\, Y_{it\text{-}1} + \sum_{f=1}^{Fi} \beta_{tf}\, \Delta Y_{it\text{-}f} + X_{it}\, \delta + \varepsilon_{it} \quad \text{..... (2)}$$

If it is assumed that $\alpha = \varrho - 1$ with the lag ϱ_i varying across cross-sections, then the hypothesis testing is formulated as follows:

H0 : $\alpha = 0$ (has a unit root)
H1 : $\alpha < 0$ (does not have a unit root)

The process for determining if data is stationary involves comparing the statistic value with the critical value. If the absolute value of the statistic is greater, the data is stationary; if it is smaller, the data is not stationary.

Cointegration Test. Cointegration refers to a long-run relationship among variables that are individually non-stationary, but whose linear combination becomes stationary. Several methods commonly used to test cointegration in panel data include the Pedroni test, Kao test, and the Combined Individual Test.

The regression formula for conducting the cointegration test is:

$$Y_{it} = \alpha_t + \delta_t + \beta_{1t}X_{1it} + \beta_{2t}X_{2it} + \ldots + \beta_{Mt}X_{Mit} + \varepsilon_{it} \quad \text{..... (3)}$$

Then the residual is obtained, namely:

$$\varepsilon_{it} = \varrho_{it}\, \varepsilon_{it\text{-}1} + u_{it} \quad \text{..... (4)}$$

or

$$\varepsilon_{it} = \varrho_{it}\, \varepsilon_{it\text{-}1} + \sum_{f=1}^{\rho i} \varphi_{it}\, \Delta\, \varepsilon_{it\text{-}1} + u_{it} \quad \text{..... (5)}$$

Based on the estimated statistical value, it is then compared to the critical value. The statistical value is obtained from the ϱ_t statistic. If the statistical value is higher than the critical value, it means the observed variables are cointegrated or have a long-term relationship. On the other hand, if the statistical value is lower than the critical value, the observed variables are not cointegrated.

3. RESULTS AND DISCUSSION

Economic Growth of Regencies/Municipalities in East Nusa Tenggara Province

PDRB is an indicator that shows how well the government is managing resources. High growth and contribution from PDRB indicate the potential revenue for the region. See Table 2 for economic information on NTT. According to the data in Table 2, the average economic growth rate of East Nusa Tenggara province is 5.04 percent per year, with a contribution of 4.55 percent, which is better than the average economic growth rate of Indonesia, which is 4.41 percent.

Table 2. Average Growth Rate and Contribution to Economic Growth of Regencies/Municipalities in East Nusa Tenggara Province

No	Regency/Municipality	Economic Growth Rate %)	Contribution to Economic Growth (%)
1	West Sumba	4,98	4,50
2	East Sumba	5,00	4,51
3	Kupang	4,97	4,48
4	South Central Timur	4,68	4,22
5	North Central Timur	4,73	4,27
6	Belu	5,61	5,07
7	Alor	4,81	4,34
8	Lembata	4,94	4,46
9	East Flores	4,76	4,30
10	Sikka	4,67	4,21
11	Ende	4,95	4,47
12	Ngada	5,14	4,64

13	Manggarai	5,03	4,54
14	Rote Ndao	5,04	4,55
15	West Manggarai	4,89	4,41
16	Central Sumba	4,79	4,33
17	Southwest Sumba	5,09	4,59
18	Nagekeo	4,62	4,17
19	Easr Manggarai	5,30	4,79
20	Sabu Raijua	5,18	4,67
21	Malaka	5,15	4,65
22	Kupang City	6,48	5,85
East Nusa Tenggara		**5,04**	**4,55**
Indonesia		**4,41**	**2,94**

Source: Processed data (2025)

The rate of development and contribution to economic growth in East Nusa Tenggara Province is highest in Kupang City, Belu, East Manggarai, and Nagekeo. This variation is influenced by differences in how economic resources are managed, including human resources, natural resources, knowledge, technology, culture, and capital. The better economic growth rate of NTT Province compared to the national average shows improvement in the region's economy. According to Riwu kore et al. (2019), slow economic growth can increase the number of poor people. On the other hand, good economic growth means more people are employed, which reduces unemployment and poverty, along with improvements in education and healthcare. Mabugu & Hlongwane (2025) emphasize that economic growth is needed to reduce poverty, but it also needs to take into account inflation, population growth rate, industrialization, and human capital accumulation.

Human Development Index Trends of Regencies/Municipalities in East Nusa Tenggara Province

The Human Development Index measures human development achievements based on living standards, knowledge, and purchasing power. A high growth rate in the index shows a good quality of life. Table 3 shows the growth rate and contribution of human development in NTT.

Table 3. Average Human Development Progress and Contribution of Regencies/Municipalities in East Nusa Tenggara Province

No.	Regency/Municipality	Human Development Index			
		HDI Growth Rate (%)	HDI Contribution Rate (%)	Average HDI Scale	Category
1	West Sumba	0,76	3,03	61,63	Medium
2	East Sumba	0,90	4,42	63,03	Medium
3	Kupang	0,83	2,95	62,24	Medium
4	South Central Timur	1,00	3,79	60,02	Medium
5	North Central Timur	1,04	5,03	61,09	Medium
6	Belu	1,14	5,14	60,32	Medium
7	Alor	1,01	5,28	58,76	Low
8	Lembata	1,08	3,87	62,20	Medium
9	East Flores	1,11	4,19	61,54	Medium
10	Sikka	0,98	5,35	62,30	Medium
11	Ende	0,73	2,38	65,49	Medium
12	Ngada	0,87	3,95	65,54	Medium
13	Manggarai	1,19	6,41	61,33	Medium
14	Rote Ndao	1,25	5,84	59,17	Low
15	West Manggarai	1,13	6,07	60,68	Medium
16	Central Sumba	1,01	6,13	58,62	Low
17	Southwest Sumba	0,92	2,60	60,48	Medium
18	Nagekeo	0,84	3,26	63,66	Medium
19	Easr Manggarai	1,14	6,18	57,62	Low

No.	Regency/Municipality	Human Development Index			
		HDI Growth Rate (%)	HDI Contribution Rate (%)	Average HDI Scale	Category
20	Sabu Raijua	1,66	8,34	53,57	Low
21	Malaka	0,81	3,03	58,01	Low
22	Kupang City	0,57	2,75	77,94	High
East Nusa Tenggara		**1,00**	**4,55**	**61,60**	**Medium**

Source: Processed data (2025)

The human development index in NTT province has fluctuated between 0.57% and 1.25% per year, with an average growth rate of 1.00%. This rate is still low, showing a big gap between different districts and cities. Sabu Raijua has the highest contribution rate, which causes the gap, followed by Manggarai Raya and Sumba Tengah. The average Human Development Index (HDI) in the Province of NTT is 61.60, which falls into the medium category. Kupang City has the highest HDI, while Malaka, Sabu Raijua, East Manggarai, Rote Ndao, Alor, and Central Sumba have lower HDI. Riwu Kore et al. (2021; 2019) reported that development in education, health, and living standards remains low.

Based on the research findings, the quality of the indicators in the Human Development Index for the province of NTT needs to be improved, especially in education, health, and the well-being of the community. Herdiansyah & Kurniati (2020) argue that maximum educational development will lead to a better index. Riwukore & Habaora (2019) highlight that education is an important sector for the country, offering positive benefits even though its effects may not be felt for several years. Riwukore et al. (2019) also add that education improves social and economic life by increasing knowledge and skills, and it is expected to produce a workforce with high quality. Maryozi et al. (2022) explain that health is very important in human life because good health helps improve productivity. They also mention that health plays a key role in assessing human development. Si'lang et al. (2019) say that factors like GDP, government spending, private investment, and open unemployment rates have a big impact on the human development index, which shows why it's important to pay attention to these welfare indicators.

Regional Classification Based on Klassen Typology

The Typology Analysis classifies Indonesian regencies and cities into four growth characteristics: Quadrant I (rapid development and growth), Quadrant II (fast development), Quadrant III (rapid development but under pressure), and Quadrant IV (relatively lagging). The results can be seen in Table 4.

Table 4. Results of Klassen Typology Analysis Based on Growth Rate and Contribution of Economic Growth and Human Development Index of Regencies/Municipalities in East Nusa Tenggara Province

No.	Regency/Municipality	Klassen Typology	
		Quadrant	Category
1	West Sumba	III	Developing but Depressed Region
2	East Sumba	III	Developing but Depressed Region
3	Kupang	III	Developing but Depressed Region
4	South Central Timur	III	Developing but Depressed Region
5	North Central Timur	III	Developing but Depressed Region
6	Belu	III	Developing but Depressed Region
7	Alor	III	Developing but Depressed Region
8	Lembata	III	Developing but Depressed Region
9	East Flores	III	Developing but Depressed Region
10	Sikka	III	Developing but Depressed Region
11	Ende	III	Developing but Depressed Region
12	Ngada	III	Developing but Depressed Region
13	Manggarai	III	Developing but Depressed Region
14	Rote Ndao	III	Developing but Depressed Region
15	West Manggarai	III	Developing but Depressed Region
16	Central Sumba	III	Developing but Depressed Region
17	Southwest Sumba	III	Developing but Depressed Region

No.	Regency/Municipality	Klassen Typology	
		Quadrant	Category
18	Nagekeo	III	Developing but Depressed Region
19	Easr Manggarai	III	Developing but Depressed Region
20	Sabu Raijua	III	Developing but Depressed Region
21	Malaka	III	Developing but Depressed Region
22	Kupang City	III	Developing but Depressed Region

Source: Processed data (2025)

According to Klassen's typology, all districts and cities in East Nusa Tenggara province are classified as being in quadrant III, or developing areas that are under pressure. This is due to low rates of economic growth and human development index. Asnidar (2018) and Siregar & Tanjung (2021) state that economic growth and human development index affect regional development. Lumbantoruan & Hidayat (2014) also mention that this province shares similar characteristics with relatively slow growth. The province of NTT has a good economic growth rate that is higher than the national average, but it has a low human development index. As a result, all the districts and cities in NTT are considered developing areas but are facing difficulties.

According to Klassen's typology analysis, the good economic growth of regencies and cities in NTT, especially in terms of GDP, places NTT as a developing region. Hasanah (2021) states that an improving GDP reflects continuous economic changes. Novriansyah (2018) explains that economic growth increases the production of goods and services as well as the prosperity of the local community.

The economic growth in NTT shows that the region is considered a developing area. The rising PDRB indicates that economic activities in NTT are improving, as stated by Romhadhoni et al. (2018) regarding the relationship between economic growth and regional development. Even though the regencies and cities in NTT province are considered developing areas, they still face pressure. The human development index in these regions is low, with an average growth rate below 65, except for Kota Kupang. Garnella et al. (2020) stated that this index is important for measuring the quality of human life and can show the ranking and level of development of a region. Low human development can lead to stagnation in regional growth.

This study shows that economic growth affects the development of growing regions, but these areas are struggling due to low levels of human development. The findings align with what was reported by Riwukore et al.(2022), which states that human development issues, including poverty, cannot be solved simply by boosting economic growth and financial sector growth in the hope that benefits will trickle down to the lower levels. There is a need to make efforts to improve the quality of development in NTT, which is a developing region but is facing challenges.

Results of Unit Root Test

The stationarity of the data is determined by comparing the statistical value with the critical value. If the absolute value of the statistic is greater than the critical value, the data is considered stationary; conversely, if it is smaller, the data is not stationary. The results of the unit root test for the variables economic growth and human development index are presented in Table 5 and Table 6.

Table 5. Results of the unit root test for the economic growth variable

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.131144	0.0263
Test critical values:	1% level	-5.119808	
	5% level	-3.519595	
	10% level	-2.898418	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 6

Table 6. Results of the unit root test for the human development index variable

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.760569	0.0141
Test critical values:	1% level	-5.119808	
	5% level	-3.519595	
	10% level	-2.898418	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 6

The results from the panel data unit root test are shown in Tables 5 and 6. The economic growth variable has a coefficient of 4.131144 and a probability value lower than 0.05, which means we reject the idea that the data is not stationary. The Human Development Index (HDI) variable has a coefficient of 4.760569 with a probability value also below 0.05, so we reject the null hypothesis and find that this variable is stationary. Both economic growth and HDI are stationary at the same level, which matches the findings of Lumbantoruan & Hidayat (2014), who said data is stationary when the statistical value is higher than the critical value.

Since both variables are stationary, they don't show big changes over time, making them reliable for use in analysis. Stationary data have consistent variance, so economic growth and HDI can be used effectively as factors to explore their connection. These results show a clear link between HDI and economic growth that can guide development plans. According to Garibaldi & Hidayat (2015), there is a stable relationship between HDI and economic growth. When HDI improves, economic growth tends to increase, and when HDI declines, economic growth usually decreases.

Results of Cointegration Test

Cointegration is a way to show a long-term connection between variables that might not be stable on their own but become stable when combined in a certain way. To check for cointegration, you compare a calculated statistical value with a critical value. This statistical value comes from the rho-t value. If the calculated value is higher than the critical value, it means the variables are cointegrated, which shows they have a long-term relationship. If not, there's no long-term connection. The results of the cointegration test between economic growth and the Human Development Index (HDI) are shown in Table 7.

Table 7. Results of the cointegration test for economic growth and the human development index

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None	0.843197	12.97735	15.49471
At most 1	0.001139	0.007974	3.841466

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value
None	0.843197	12.96938	14.26460
At most 1	0.001139	0.007974	3.841466

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

To test for cointegration, we compare the trace statistic and max-eigen statistic with critical values. If the values are lower, there is no long-term relationship; if they are higher, there is a relationship. The test results show a trace value of 12.97735 and a max-eigen value of 12.96938, both of which are below the critical values. This means that economic growth is not related to the human development index. This is because economic growth keeps increasing while the human development index remains stable. These results align with previous studies that show economic growth has a negative impact on the human development index (Noviatamara et al., 2019; Rahmadhani & Idris, 2019). The cointegration test shows that economic growth does not have a long-term effect on the Human Development Index (HDI) in NTT Province. Even though the economy is growing, the HDI remains low. The Klassen typology analysis also indicates that the region is developing, but it is still constrained due to the low HDI.

4. CONCLUSION

The analysis of the relationship between economic growth and the human development index in East Nusa Tenggara shows that the economy is growing well, but the human development index is not improving significantly. All the districts and cities in this region are classified as developing but face challenges. The relationship between the two is stationary, meaning there's no long-term connection. To improve the situation, there needs to be a focus on improving health and education. The policy recommendation is to enhance the human development index through better education, healthcare, and welfare, in order to support economic growth and improve the quality of life for the community.

5. SUGGESTION

Further research using a system dynamics approach is needed to predict the levels of economic growth and the Human Development Index based on their respective influencing predictors.

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