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MORALITY BEFORE KNOWLEDGE

Comparative study of infrastructure development and its impact on human development index: Economic and geographical insights

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ABSTRACT

Background: Urban-focused development can lead to disparities in infrastructure and transportation development. The lack of adequate infrastructure causes many people to live isolated in remote areas, hindering their access to resources and basic services. **Methods:** This contributes to high poverty levels and low human development in those regions. The absence of infrastructure results in many communities being trapped in impoverished, remote areas, making it essential to open access to facilitate development. **Findings:** The Human Development Index (HDI) is an important indicator to ensure the achievement of the goal that people have a good quality of life, including the ability to live healthily and for a long time, access education, gain knowledge, and have access to employment opportunities, social protection programs, and other resources needed to achieve a decent life. The acceleration of HDI growth in 2023 is partly driven by the standard of living dimension, represented by real per capita expenditure, health (life expectancy at birth), and knowledge (average years of schooling and expected years of schooling). **Conclusion:** To achieve sustainable and just development, infrastructure is needed to improve accessibility and connectivity between regions to encourage economic growth and community well-being. **Novelty/Originality of this article:** This study highlights the critical role of infrastructure in reducing regional disparities and accelerating human development, emphasizing its impact on HDI growth—an aspect often overlooked in previous research.

KEYWORDS: development; education; health; human development index; infrastructure.

1. Introduction

Ministry of National Development Planning/National Development Planning Agency Republic of Indonesia, through Long Term Development Plan Intermediate National (RPJMN) 2024 – 2029 promotes the development of mass public transportation in several cities across Indonesia. The development of transportation infrastructure, particularly mass transportation, aims to reduce the use of private vehicles, thereby minimizing CO2 emissions from vehicles. The expansion of service coverage and the improvement of facilities and infrastructure supporting transportation connectivity are planned to be focused on 10 metropolitan cities in Indonesia: Medan, Palembang, Jakarta, Bandung, Semarang, Surabaya, Denpasar, Banjarmasin, Makassar, and Manado. The infrastructure that needs to be developed in Indonesia includes transportation, covering land, sea, and air transportation, as well as the development of roads, clean water infrastructure, education, and healthcare. According to Suripto & Lestari (2019), road infrastructure is

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one of the essential facilities for the development of the economy and the well-being of the community in a region.

The Sustainable Development Goals (SDGs) is a concept for sustainable development adopted by countries within the United Nations, starting in 2015 with targets set for 2030. Urban-focused development can lead to disparities in infrastructure and transportation development. According to SDG goal number 10, related to reducing inequality, the uneven development will impact human development in each region. The presence of transportation infrastructure is crucial for the economy of a region, as it supports economic activities, education, and the welfare of the community. The lack of infrastructure causes many people to live trapped in remote areas with high levels of poverty, and thus, opening access is essential to ease the development of these regions. Various issues that affect communities, such as poverty, infectious disease outbreaks, malnutrition, illiteracy, and underdevelopment (Siregar, 2020), are often linked to inadequate infrastructure. The United Nations Development Program (UNDP) introduced the Human Development Index (HDI) in 1990, which measures the average achievements in three basic dimensions of human development: health (long life), education, and a decent standard of living.

Human Development Index (HDI) is a statistical measure used to evaluate human progress and quality of life in a country. The goal of HDI is to ensure that people can live a healthy and long life, gain knowledge, and have access to the opportunities and resources needed to achieve a decent life. Education plays a critical role in helping a country absorb modern technology and fostering sustainable growth and development (Todaro & Smith, 2015). Transportation infrastructure impacts access to education in a region. A major issue affecting the uneven distribution of education in Papua is the lack of infrastructure, transportation, and educational resources, which highlights the need for special attention to meet educational needs in hard-to-reach areas (Salehuddin, 2023). Educational disparities limit Papua's children from receiving quality education. In contrast, urban areas, especially the Greater Jakarta area (Jakarta, Bogor, Depok, Tangerang, and Bekasi), have high accessibility to education. Several transportation infrastructures programs, such as free school buses, *Jaklingko (minibus)*, busways, Mass Rapid Transit (MRT), Light Rail Transit (LRT), and Electric Trains/*Kereta Listrik* (KRL), provide the public with transportation options to access education.

The provinces of Papua and West Papua are still lagging in infrastructure, prompting the government to focus on infrastructure development programs for disadvantaged regions. One such program is the provision of adequate healthcare, which is a basic right for citizens. The government has an obligation to ensure and protect its citizens by providing essential services to meet their rights (Mongan, 2019). The availability of equitable healthcare facilities will significantly influence human development. Health is measured through life expectancy from birth. Another HDI indicator is Standard of Living, which is measured by real per capita expenditure adjusted for purchasing power. This indicator is considered representative of the welfare dimension, reflecting the community's purchasing power. Based on this, communities with higher purchasing power are considered more prosperous. Gross Domestic Product (GDP) and Human Development Index (HDI) are cointegrated, meaning they have a long-term relationship (Hariyanto & Purwanti, 2020). The success of regional development can be seen in its economic growth rate, with high and sustainable economies being critical for development (Suparno, 2014). However, high economic growth does not automatically solve socio-economic issues such as unemployment, rural poverty, income inequality, which require the concept of social justice in the economic development of each region (Tiwari et al., 2013).

The country with the highest HDI in the world is Switzerland, with a score of 96.7, while Indonesia ranks 112th with an HDI of 71.3 in 2022. Somalia holds the lowest HDI ranking with a score of 0.38. Indonesia's HDI has been classified as high (above 70) since 2016, continuing a consistent upward trend from 2020 to 2023 (BPS, 2023). The acceleration of HDI growth in 2023 is partly driven by the standard of living dimension,

represented by adjusted real per capita expenditure, which grew by 3.66% from 2022 to 2023. National HDI growth impacts the dimensions of long life and good health, knowledge (education), and a decent standard of living. Although there has been national HDI growth, regional disparities persist in Indonesia, with DKI Jakarta having the highest HDI at 83.55, while Papua Province has the lowest at 63.01. The following is the achievement of the Human Development Index for each province in Indonesia in Fig.1.

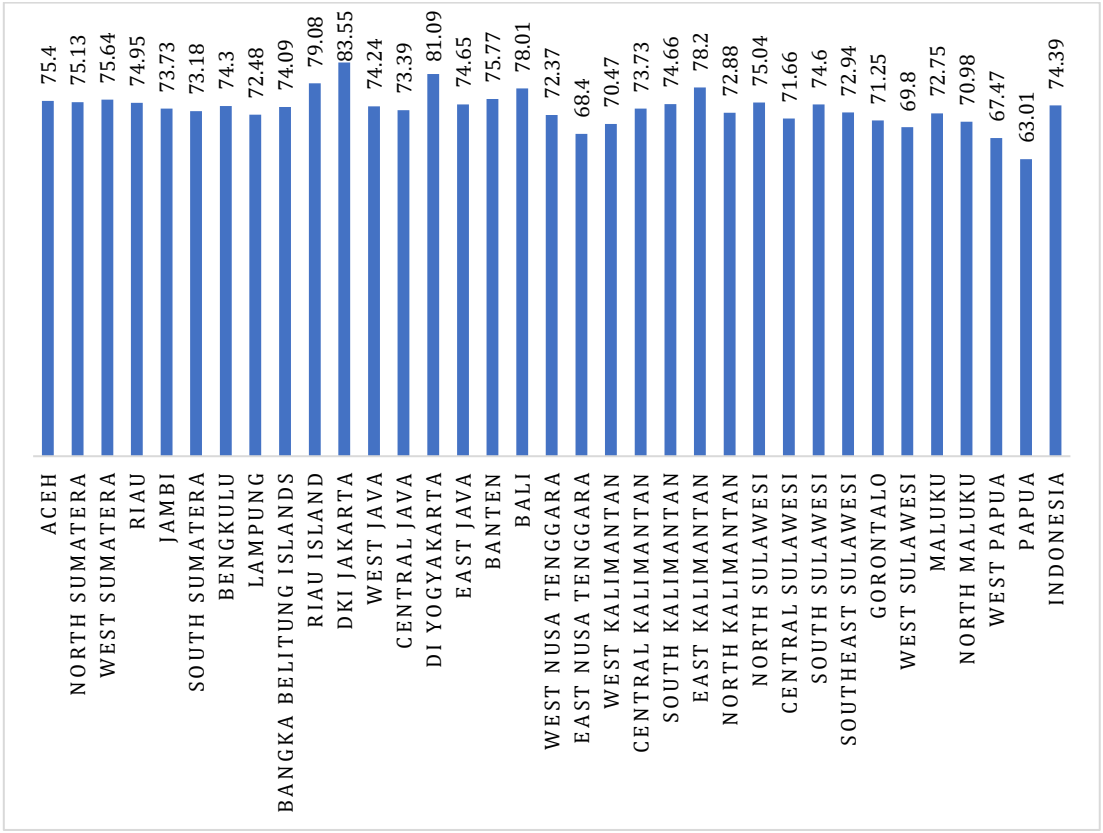

Fig. 1. Achievements human development index every provinces in Indonesia (BPS Indonesia, 2023)

Human Development Index (HDI) Categories are divided into four groups: very high (HDI ≥ 80), high (70 ≤ HDI < 80), moderate (60 ≤ HDI < 70), and low (HDI ≤ 60). Based on the Human Development Index achievement data for 2023, all provinces on the island of Sumatra are categorized under "high" human development. In the islands of Java, Bali, and Nusa Tenggara, all provinces have achieved a "high" and "very high" status, except for East Nusa Tenggara, which remains in the "moderate" category. All provinces on the island of Kalimantan are classified as having "high" human development. On the island of Sulawesi, only West Sulawesi has a "moderate" human development status. Meanwhile, in the Maluku and Papua islands, only West Papua and Papua still hold the "moderate" status of human development.

The unequal development across Indonesia can affect the HDI values of each region. Based on the HDI achievement data of each province in Indonesia, this study discusses two provinces with the highest HDI (DKI Jakarta and DI Yogyakarta) and two provinces with the lowest HDI (Papua and West Papua). DKI Jakarta and DI Yogyakarta have the highest HDI values, with scores of 83.55 and 81.09, respectively. On the other hand, Papua and West Papua have the lowest HDI values, with scores of 63.01 and 67.47, respectively. Given these disparities, it is necessary to compare the HDI in regions with the highest and lowest values, along with their supporting factors. Infrastructure development, as a supporting factor for regional development, is addressed through the National Medium-Term Development Plan (RPJMN), a framework established by the government through the Ministry of National Development Planning (Kementerian PPN/Bappenas), which

emphasizes social, economic, governance, rule of law, social resilience, cultural, and ecological transformations. Infrastructure development plays a significant role in influencing the achievement of HDI.

2. Methods

This study uses a qualitative method, with the steps including literature review, secondary data collection, and data analysis. Data interpretation is systematically conducted in three stages: finding relevant literature sources, selecting and analyzing literature gradually, and ensuring consistency in data coding. Data and information analysis is carried out using descriptive analysis methods.

The nature of this research is descriptive analysis, where data that has been obtained is organized and then explained to provide a clear understanding for readers. The literature collection is obtained from scientific articles, journals, and books relevant to the research topic, which is "Infrastructure Development and Its Impact on the Human Development Index". A comparative analysis is conducted by comparing the highest and lowest HDI regions in Indonesia, focusing on the dimensions of health, education, and a decent standard of living.

3. Results and Discussion

The development of physical infrastructure and human development are two intertwined concepts of development. National development refers to the planned and sustainable efforts of a country to achieve progress and improve the welfare of its people. This concept touches on all societal aspects, such as economic, social, political, security, cultural customs, and infrastructure (UNDP, 2022). However, the current focus on development in large cities has led to uneven development, therefore this pattern can affect human development. Based on the technocratic design of Long-Term Development Plan Intermediate National (RPJMN) 2025 – 2029, it is stated that transportation infrastructure connectivity development will be focused on 10 metropolitan cities in Indonesia. Therefore, this study will attempt to provide a comparison between infrastructure development in provinces with the highest and lowest HDI score.

3.1 Infrastructure development

Infrastructure plays a significant role to support development in subnational areas. Infrastructure issues often deemed as investments inhibitor which affects the Indonesia economic growth (Suripto & Lestari 2019). In addition, to support local development, a decent infrastructure also has an influence on improvement quality life and well-being humans. Indonesia indeed faces challenges with uneven infrastructure development, as the current focus on urban areas has left some regions lagging behind. To address this, the Indonesian government has incorporated equitable development across all provinces into the National Medium-Term Development Plan (RPJMN) for 2025–2029.

For Java Island, the RPJMN 2025–2029 designates the theme: A Megapolis that is Superior, Innovative, Inclusive, Integrated, and Sustainable. In the Special Region of Jakarta (DK Jakarta), development directions are outlined across several sectors. In the health sector, DK Jakarta will prioritize hospital construction, tackling and preventing stunting, enhancing water resilience and availability, optimizing waste management, implementing a circular economy, and providing safe, centralized sanitation. Health and sanitation are the main priorities for DKI Jakarta, given its status as the most densely populated province in Indonesia (16,165 people/km^2). These efforts emphasize the critical need for clean water, sanitation, and health services.

Beyond the health sector, DKI Jakarta will continue to develop physical infrastructure under the vision of becoming a green global city and Southeast Asia's economic hub.

National priorities include expanding mass public transportation systems, such as road-based Bus Rapid Transit (BRT) and feeder systems, and rail-based MRT and LRT. These initiatives aim to boost public transportation usage. Supporting the transition to electric vehicles, the city will develop Electric Vehicle Charging Stations (SPKLU). Housing development is another focus, addressing slum areas through the provision of affordable, decent, and sustainable housing, alongside high-rise residential projects and housing solutions for low-income communities. This ensures better access to housing with proper sanitation for residents. Additionally, DKI Jakarta's development agenda emphasizes strengthening higher education in STEAM (Science, Technology, Engineering, Arts, and Mathematics) and fostering global innovation. The University of Indonesia serves as a pilot project for advancing these initiatives in the province.

The comparison of infrastructure development between Java and Papua shows significant differences, with distinct development themes. Based on the National Medium-Term Development Plan (RPJMN) 2025–2029, Papua's development theme is Accelerating Development in Papua Towards a Healthy, Smart, and Productive Papua. Regarding infrastructure development plans, West Papua Province adopts the theme of Agricultural and Fisheries Industry Centers, Basic Chemical Industry Hubs, and Premium Marine Tourism Destinations. The development of agricultural and fisheries industry centers includes establishing clusters for agriculture and plantations (prioritizing cocoa and nutmeg), as well as fisheries (prioritizing shrimp, tuna, skipjack, and mackerel), integrated with processing centers, cooperatives, SMEs, MSMEs, village enterprises (BUMKam), and markets. This also involves preparing downstream industries based on oil, gas, and basic chemicals and optimizing strategic zones based on existing industries. To improve the local economy, the government will focus on developing these industries.

As a coastal province, West Papua also serves as a center for fisheries, making economic growth driven by natural resources a primary government focus. The establishment of sago and rice production centers to promote local food independence is also part of the government's development plans to support food security in Papua Province. Economic growth in Papua has so far been concentrated in coastal areas, while inland regions, such as the highlands, remain economically reliant on agriculture and central government funds for sustenance. Infrastructure development in Papua often experiences delays and misalignment with planned work sequences. These delays are attributed to constantly changing weather, geographical and topographical conditions in areas such as coasts and mountains, material shortages, and security challenges (Weya & Lubis, 2022).

Beyond the economic sector, infrastructure development in health is also a government priority. Improving the competency of medical and health workers and building health facilities are dimensions that support community welfare. Ensuring equitable health infrastructure is critical to regional development. Accelerating access to safe, sustainable, and inclusive drinking water and sanitation services is also part of efforts to improve sanitation for everyone. The education dimension is another focus of government development, as outlined in the RPJMN 2025–2029, which includes providing education services through boarding schools, all-day schools, and adaptive, contextual curricula for Papua. This plan also involves improving connectivity and access to education. Physical infrastructure development in West Papua includes port expansion, enhancing airport connectivity, and accelerating the equitable development of information and communication technology infrastructure, which is a key factor in reducing disparities and speeding up development.

The development theme for Papua Province, according to the RPJMN 2025–2029, includes Agricultural and Fisheries Industry Centers, Logistics Hubs, and Premium Marine Tourism Destinations. Development programs in Papua and West Papua share similarities, such as a focus on healthcare, accelerating access to safe water and sanitation, improving school and higher education, and expanding access to education. Economic growth in Papua Province will be supported by developing agricultural and plantation clusters

(prioritizing cocoa and coconut) and fisheries (prioritizing tuna, skipjack, mackerel, and small pelagic fish), integrated with processing centers, cooperatives, SMEs, MSMEs, village enterprises, and markets. Planned physical development includes renewable energy power plants, logistics port hubs, improved airport connectivity, and accelerated development of information and communication technology infrastructure.

Several challenges are encountered in Papua's infrastructure development, including human resources, geographical conditions, and cultural and sociological challenges (Fauzi et al., 2019). These factors hinder infrastructure progress in Papua. First, the lack of skilled human resources to support regional development is a major obstacle. Second, Papua's geography, characterized by forests, valleys, mountains, and hills, presents significant challenges for infrastructure projects. Third, cultural and sociological challenges arise from strong traditional customs and indigenous land rights governed by customary law. Indigenous land comprises territories with rights and authority protected by customary law, requiring the government to adopt a social approach in physical infrastructure development efforts in Papua.

3.2 Human development index

The Human Development Index (HDI) is an indicator used to measure human welfare in terms of education, economy (decent living), and health. The education dimension is measured by the Achievements of Expected Years of Schooling (HLS) and Mean Years of Schooling (RLS); the health dimension is measured by the Achievements of Life Expectancy at Birth; and the economic (decent living) dimension is measured by the Achievements of Real Expenditure per Capita. Additionally, it is influenced by other factors such as the availability of job opportunities, which in turn are determined by economic growth, infrastructure, and government policies (Zumaeroh et al., 2023). Therefore, the Human Development Index can improve if these factors are enhanced.

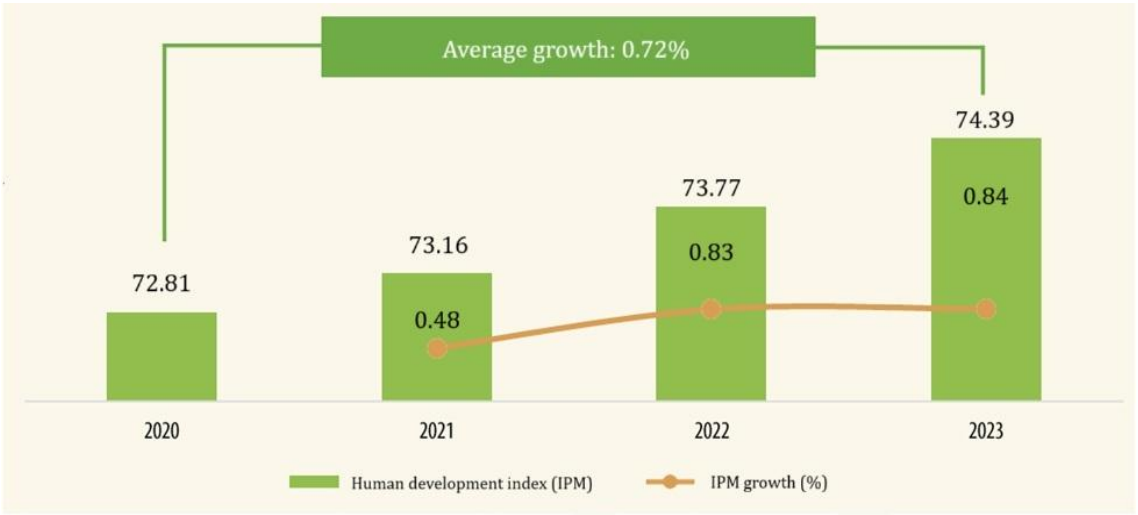

Fig. 2. Growth human development index in Indonesia
(BPS Indonesia, 2023)

Based on data from the Central Statistics Agency (Badan Pusat Statistik, BPS) in 2023, the Human Development Index (HDI) in Indonesia experienced growth from 2020 to 2023. Indonesia's HDI value was recorded at 72.81 in 2020, 73.16 in 2021, 73.77 in 2022, and further increased to 74.39 in 2023. The HDI improved by 2.17% over three years, with annual growth rates of 0.48%, 0.83%, and 0.84%, resulting in an average annual growth of 0.72%. The acceleration in the HDI increase in 2023 was partly driven by the dimension of a decent standard of living, represented by real adjusted expenditure per capita, which grew by 3.66% from 2022 to 2023 (BPS Indonesia, 2023). Among the provinces in

Indonesia, DKJ recorded the highest HDI, followed by the Special Region of Yogyakarta (DI Yogyakarta), while Papua and West Papua Provinces had the lowest HDI. Below are the HDI values for 2020–2023 for DKJ, DI Yogyakarta, West Papua, and Papua Provinces according to the Central Statistics Agency.

Table 1. Human development index 2020 – 2023

No	Location	HDI 2020	HDI 2021	HDI 2022	HDI 2023	Average Growth (%)
1.	Indonesia	72.81	73.16	73.77	74.39	0.72
2.	Jakarta	81.92	82.25	82.77	83.55	0.66
3.	DI Yogyakarta	79.95	80.22	80.65	81.09	0.48
4.	West Papua	65.94	66.11	66.72	67.47	0.77
5.	West Papua	61.22	61.40	62.16	63.01	0.97

(BPS Indonesia, 2023)

The Province of Papua has the lowest Human Development Index (HDI) in Indonesia. However, in terms of percentage growth, it has recorded the highest increase over the past three years. Papua's HDI was 61.22 in 2020 and increased to 63.01 in 2023, with an average annual growth rate of 0.97%. In contrast, DKJ, which holds the highest HDI, recorded a value of 81.92 in 2020 and 83.55 in 2023, with an average annual growth rate of 0.66%. This indicates that the higher the HDI, the smaller the annual growth rate compared to provinces with lower HDI values.

3.3 Health dimension

One of the dimensions that shapes the Human Development Index (HDI) is health, measured by life expectancy at birth (LEB). This health dimension aligns with Sustainable Development Goals (SDGs) number 3 (good health and well-being), which aims to ensure healthy lives and promote well-being for all ages. Other indicators related to health that are also analyzed include access to clean drinking water, safe drinking water, and morbidity rates. Life expectancy at birth serves as a key determinant in calculating the HDI's health dimension. In Indonesia, the LEB has reached 73.93 years, ranking 83rd globally. This indicator has shown improvement, with an increase of 0.76% from 2020 to 2023, averaging a growth rate of 0.25% per year.

Table 2. Life expectancy at birth moment born year 2023

No	Location	Life Expectancy at Birth	Average Growth 2020 – 2023 (%)
1.	Indonesia	73.93 years	0.25
2.	Jakarta	75.81 years	0.27
3.	DI Yogyakarta	75.18 years	0.10
4.	West Papua	68.51 years	0.32
5.	Papua	68.17 years	0.29

(BPS Indonesia, 2023)

The highest life expectancy at birth (LEB) in Indonesia is found in DKJ, with an age of 75.81 years, while the lowest is in Papua Province at 68.17 years. From 2020 to 2023, the average growth in life expectancy has shown an upward trend, with the highest average annual growth rate recorded in West Papua Province at 0.32%. Conversely, the lowest growth rate was observed in Yogyakarta Special Region at 0.10%. This pattern indicates that provinces with higher life expectancy levels tend to exhibit slower annual growth.

Infrastructure development, particularly adequate road networks, significantly aids patient transportation to healthcare facilities (Arcury et al., 2006). The study highlights that well-maintained roads enhance the distribution of medicines, medical equipment, and

healthcare personnel, reducing delays and improving service availability. Papua Province, with its many remote areas and challenging geographical conditions such as mountains and forests, faces considerable difficulties in road construction to improve access to healthcare services. Beyond road infrastructure, equitable distribution of healthcare facilities is crucial for improving health outcomes and increasing life expectancy. Transport infrastructure, including roads and bridges, is also deemed essential for regional development by facilitating better access for residents in Papua (Fauzi et al., 2019).

Basic infrastructure development, including transportation, electricity, water, sanitation, and healthcare facilities, plays a critical role in enhancing community welfare in underdeveloped areas (Ghosh, 2017). Clean water and sanitation infrastructure are vital for preventing disease outbreaks. The construction of clean water facilities and sanitation systems helps reduce the risk of infectious diseases such as diarrhea, cholera, and other illnesses commonly associated with poor sanitation. In Papua, programs to provide clean water and sanitation facilities have been expanded across various regions to support public health improvements.

Beyond physical infrastructure, social and economic factors also play a crucial role in increasing life expectancy. Education, for instance, has a positive correlation with life expectancy, as higher education levels tend to enhance awareness of good health practices and access to healthcare services. A previously study found that the average length of schooling significantly influences life expectancy in Bali Province (Annisaa et al., 2023)

Additionally, high-quality human resources (HR), encompassing education and health aspects, can improve productivity and economic growth, which in turn can boost investment in the healthcare sector and supporting infrastructure. Research indicates that enhancing HR quality contributes to the increase in life expectancy in Indonesia (Sontosudarmo, 1990).

Inclusive infrastructure development is also essential to ensure accessibility for all societal groups, including people with disabilities. Implementing disability-friendly public infrastructure can improve the quality of life and life expectancy for individuals with disabilities in Indonesia (Maimunah et al., 2024). Overall, a holistic approach that includes physical infrastructure development, education quality improvement, and HR development is necessary to enhance life expectancy in Indonesia. A balanced investment in these sectors will contribute to greater well-being and overall quality of life for the population.

3.4 Knowledge dimension

Aligned with SDGs number 4 on quality education, it aims to ensure inclusive and equitable education and provide lifelong learning opportunities for all. Education is one of the primary means to improve the quality of human resources (Susanto, 2019). The knowledge dimension of the Human Development Index (HDI) is measured by the Mean Years of Schooling (MYS) and Expected Years of Schooling (EYS). Mean Years of Schooling reflects the average number of years of formal education completed by individuals aged 25 years and older. On the other hand, Expected Years of Schooling represents the anticipated number of years of schooling an individual aged 7 years is expected to undertake. This expectation is based on the educational system's progress in a particular region.

Globally, Indonesia ranks 86th in Expected Years of Schooling. However, in terms of Mean Years of Schooling, Indonesia is ranked 118th. This discrepancy illustrates that while the potential for schooling in Indonesia is relatively high, the actual average duration of schooling remains relatively low.

The expected years of schooling vary across regions, with DI Yogyakarta having the highest expected years of schooling at 15.66 years. This figure is attributed to the abundance of educational infrastructure in DI Yogyakarta, which enhances the expected

years of schooling. However, the actual mean years of schooling in DI Yogyakarta remains relatively low at 9.83 years. This is because the educational infrastructure, particularly universities in DI Yogyakarta, is utilized not only by residents of DI Yogyakarta but also by individuals from other provinces. The highest mean years of schooling is recorded in DKJ, with an achievement of 11.45 years. In addition to well-distributed infrastructure in DKJ, the high mean years of schooling result from the province's implementation of a "12-year compulsory education program" since 2012. This program provides free education from elementary school to senior high school in public schools across the province, making education up to senior high school more accessible to the community.

Table 3. Expected years of schooling and mean years of schooling (year 2023)

No	Location	Expected years of schooling	Average Growth 2020 – 2023 (%)	Mean years of schooling Achievement	Average Growth 2020 – 2023 (%)
1.	Indonesia	13.15 years	0.43	8.77 years	1.13
2.	Jakarta	13.33 years	0.89	11.45 years	0.95
3.	DI Yogyakarta	15.66 years	0.15	9.83 years	0.97
4.	West Papua	13.34 years	1.10	7.93 years	1.43
5.	Papua	11.15 years	0.21	7.15 years	2.24

(BPS Indonesia, 2023)

Papua has the lowest mean years of schooling at 7.15 years, indicating that, on average, residents of Papua only complete schooling up to the junior high school level. Similarly, Papua Barat also records a low mean year of schooling at 7.93 years. However, the expected years of schooling in Papua and Papua Barat are significantly higher compared to their actual figures. The expected years of schooling in Papua Barat is 13.34 years, and in Papua, it is 11.15 years. To meet these expectations, quality and evenly distributed educational infrastructure must be provided to all communities in Papua and Papua Barat. Challenges include unpredictable weather, geographic and topographic conditions such as coastal areas and mountainous regions, material shortages, and unstable security conditions (Weya & Lubis, 2022). The average growth rate of mean years of schooling from 2020 to 2023 in Papua is 2.24%, the highest compared to DKJ, DI Yogyakarta, and Papua Barat.

Achievements in Expected Years of Schooling (EYS) and Mean Years of Schooling (MYS) serve as benchmarks in the knowledge/education dimension. Education plays a crucial role in the development of a region. Educational infrastructure contributes to providing skills, knowledge, and experience to the community, creating a quality human resource pool essential for economic actors (Suripto & Lestari, 2019). Thus, improving human resources must be a focus for regional economic growth. One way to enhance human resources is by improving the quality of education in a region. According to the research by Zumaeroh et al. (2023), the government must encourage public participation in education by developing infrastructure that facilitates access to education and making education more affordable. With the highest Human Development Index and a mean year of schooling of 11.45 years, DKI Jakarta has almost achieved universal 12-year education. This achievement is supported by comprehensive educational facilities, adequate supporting infrastructure, and high-quality teaching staff.

Coal has long been the backbone of the global energy industry. Despite global movements towards cleaner energy sources, coal still plays a crucial role, especially in developing countries and energy-intensive industries, including Indonesia. As one of the most abundant fossil energy sources, coal provides approximately 38% of the world's electricity.

Many countries, particularly in Asia, heavily rely on coal for their energy needs. In China, India, and Indonesia, for example, coal is the primary source of electricity production. This dependence is due to the abundant availability of coal and its relatively

low production costs. However, this reliance also poses challenges in reducing carbon emissions and meeting global climate change targets. The coal sector also serves as a major source of employment for millions of people, so transitioning away from coal must consider social and economic impacts.

On the other hand, coal is one of Indonesia's major export commodities and significantly contributes to the country's Gross Domestic Product (GDP). The mining sector, including coal, is a crucial pillar of Indonesia's economy, providing both direct and indirect contributions to the national economy. Indonesia is also one of the world's largest coal exporters. Coal sales to international markets generate a significant amount of foreign exchange. This revenue is vital for the country's trade balance and macroeconomic stability (Wang et al, 2023).

3.5 Standard of living dimension

Real expenditure per capita is an indicator used to determine the standard of living dimension within the Human Development Index (HDI). This indicator reflects the purchasing power of the population over a specific period. Sustainable Development Goal (SDG) number 8, focused on Decent Work and Economic Growth, aims to achieve sustainable economic development and decent employment, thereby linking the standard of living to real expenditure per capita. On a national scale, real expenditure per capita in Indonesia in 2023 amounted to IDR 11,899,000 per year, with an average growth rate of 2.61% from 2020 to 2023. Globally, Indonesia ranks 100th in the dimension of real expenditure per capita.

Table 4. Gross national income (GNI) per capita year 2023

No	Location	Gross national income (GNI) per capita	Average Growth 2020 – 2023 (%)
1.	Indonesia	IDR 11,899,000/year ≈ USD 735,81/year	2.61
2.	Jakarta	IDR 19,373,000/year ≈ USD 1.197,99/year	2.05
3.	DI Yogyakarta	IDR 14,924,000/year ≈ USD 922,87/year	2.12
4.	West Papua	IDR 8,404,000/year ≈ USD 519,69/year	1.29
5.	Papua	IDR 7,562,000/year ≈ USD 467,62/year	2.83

(BPS Indonesia, 2023)

DKI Jakarta is the province with the highest real expenditure per capita, reaching IDR 19,373,000 per year. On the other hand, Papua Province has the lowest real expenditure per capita, amounting to IDR 7,562,000/year ≈ USD 1.197,99/year. However, over the past three years, Papua has experienced growth in real expenditure per capita, with an average annual increase of 2.83%. Real expenditure per capita is often linked to poverty levels, as low income and limited access to goods and services result in lower real expenditure per capita, correlating with higher poverty rates. However, according to Mahendra (2020), partial poverty does not impact the Human Development Index (HDI) as the population's ability to meet basic needs remains relatively high.

The government seeks to maintain the population's purchasing power by ensuring the availability of basic necessities in the market and supporting the community in fulfilling its fundamental needs. Regional economic development is a collaborative process involving both the government and local communities. Government spending reflects its role in the economy to achieve the well-being of the population (Linda, 2016).

The dimension of a Decent Standard of Living, as represented by Real Expenditure per Capita, provides an overview of the economic conditions of regional populations. Economic growth is heavily influenced by adequate infrastructure. Infrastructure is a critical driver of economic growth and significantly impacts quality of life and human welfare, including increased consumption, higher labor productivity, improved access to employment opportunities, and tangible prosperity (Atmaja, 2015). Efforts to enhance Indonesia's HDI are implemented through fiscal policy instruments. Through these policies, the government allocates budgets for the provision of goods and services in public sectors where markets or private entities fall short (de Fretes, 2017).

This provision emphasizes meeting the population's basic needs, such as sufficient food and water access, healthcare and education services, housing, clothing, and non-material needs like employment, participation, protection, and political freedom (Razmi, 2012). Consequently, improving the economy, as reflected in Real Expenditure achievements, relies heavily on supporting infrastructure.

The economic disparity between regions, as reflected in real expenditure per capita, underscores the importance of regional economic policies aimed at fostering equitable growth. While Jakarta (DKI Jakarta) remains the province with the highest real expenditure per capita, Papua's steady increase in expenditure highlights efforts to improve economic conditions in underdeveloped regions. This upward trend, averaging 2.83% annually, suggests that targeted interventions and infrastructure development may contribute to better economic outcomes (World Bank, 2021).

Economic disparities among regions are often attributed to differences in infrastructure, human capital, and sectoral economic structures (Todaro & Smith, 2020). Infrastructure plays a crucial role in reducing regional disparities and stimulating economic growth. Improved transportation networks, energy access, and digital infrastructure enhance productivity and market accessibility, leading to increased consumption and investment (Banerjee et al., 2012). Additionally, infrastructure facilitates better access to education and healthcare, ultimately improving the Human Development Index (HDI) (Bourguignon & Chakravarty, 2019).

Government policies, particularly fiscal interventions, are instrumental in bridging economic gaps between regions. Fiscal decentralization, which grants local governments greater autonomy in resource allocation, has been linked to improved service delivery and economic growth (Rodríguez-Pose & Kröger, 2009). In Indonesia, the Special Autonomy Fund allocated to Papua has supported development initiatives, yet challenges remain in ensuring efficient budget utilization and policy implementation (BPS Indonesia, 2022). Addressing these challenges requires a multi-stakeholder approach involving government agencies, private sector participation, and community engagement (McKinnon, 2010).

Moreover, the role of human capital development cannot be overstated. Education and healthcare investments directly impact productivity and income levels, thereby influencing real expenditure per capita (Hanushek & Woessmann, 2012). Empirical studies have shown that regions with higher literacy rates and better healthcare services experience faster economic growth and improved living standards (Becker, 1993). In Indonesia, initiatives such as the Smart Indonesia Program *(Program Indonesia Pintar)* and National Health Insurance *(Jaminan Kesehatan Nasional)* aim to enhance human capital, thereby fostering long-term economic sustainability (Ministry of Finance Indonesia, 2021).

In addition to government interventions, private sector engagement is critical in sustaining economic development. Foreign direct investment (FDI) and domestic private investment contribute to employment generation, technological transfer, and industrial growth (Borensztein et al., 1998). However, disparities in investment distribution remain a challenge, with urban centers attracting more capital compared to rural areas. Policymakers must create a conducive business environment in less-developed regions by offering incentives such as tax breaks, infrastructure support, and streamlined regulatory frameworks (OECD, 2020).

Despite progress in regional development, poverty remains a pressing issue in low-expenditure provinces like Papua. Multidimensional poverty, which encompasses education, health, and living standards, requires integrated policy solutions (Alkire & Santos, 2010). Social protection programs, including cash transfer schemes and food assistance, play a crucial role in safeguarding vulnerable populations (Barrientos, 2013). Indonesia's Conditional Cash Transfer Program *(Program Keluarga Harapan)* has demonstrated positive impacts on poverty alleviation, particularly in rural and underdeveloped areas (World Bank, 2020).

Furthermore, digitalization and financial inclusion serve as catalysts for economic empowerment. Access to digital financial services enhances economic participation, particularly for marginalized communities (Demirgüc-Kunt et al., 2018). In Indonesia, the expansion of mobile banking and e-commerce platforms has facilitated financial access, allowing small businesses and individuals to engage in economic activities more effectively (Bank Indonesia, 2021).

In conclusion, improving real expenditure per capita across Indonesia necessitates a multifaceted approach encompassing infrastructure development, human capital investment, fiscal policy reforms, and private sector engagement. While Papua's recent economic growth is promising, sustained progress requires consistent policy implementation, efficient budget utilization, and collaborative efforts among stakeholders. By addressing economic disparities through targeted interventions, Indonesia can achieve more inclusive and sustainable development.

4. Conclusions

The Human Development Index (HDI) in Indonesia experienced growth from 2020 to 2023. In a 2020, Indonesia's HDI stood at 72.81, increasing to 74.39 in 2023. DKI Jakarta, as the highest-ranking province, recorded an HDI of 81.92 in 2020, which rose to 83.55 in 2023. Meanwhile, Papua Province, with the lowest HDI, showed an increase from 61.22 in 2020 to 63.01 in 2023. Life Expectancy at Birth (LEB) was highest in DKI Jakarta, at 75.81 years, while Papua Province had the lowest, at 68.17 years. From 2020 to 2023, the average growth in life expectancy showed improvement, with Papua Barat achieving the highest growth rate of 0.32% per year.

Adequate infrastructure development and equitable healthcare facilities significantly contribute to improvements in health and life expectancy. The average number of years of schooling in Indonesia is 8.77 years, with DKI Jakarta achieving the highest average at 11.45 years. On a national scale, real expenditure per capita in 2023 was IDR 11,899,000 per year, with an average annual growth rate of 2.61% from 2020 to 2023. The acceleration in HDI growth in 2023 was driven by improvements across three key dimensions: a decent standard of living (represented by real expenditure per capita), health (life expectancy at birth), and knowledge (average years of schooling and expected years of schooling). Enhancing the HDI is heavily influenced by the development of physical infrastructure, healthcare facilities, education systems, and transportation networks.

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