Impact of Information and Communication Technology on The Welfare of Population in Eastern Indonesia

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Abstract. During the Covid-19 pandemic, many countries in the world are expected to experience a slowdown or decrease in Human Development Index (HDI) growth including Indonesia. The disparities in development among regions to be one of the main issues in Indonesia. The gaps are not only occurring in HDI, but also in Information and Communication Technology (ICT) facilities between Western Indonesia and Eastern Indonesia. The purpose of this study is to analyze how Information and Communication Technology affects the Welfare of the Population in Eastern Indonesia. Research methods use multiple linear regression methods. The data is sourced from the BPS-Statistics Indonesia which consists of 17 provinces. The results showed that the percentage of internet users had a positive and significant effect while the percentage of the poor population had a negative and significant effect on the welfare of the population in eastern Indonesia. Therefore, the distribution of infrastructure, especially ICT infrastructure, does not only focus on western Indonesia. Therefore, it is expected that the population welfare gap will be reduced. The increasing use of the internet during the Covid-19 pandemic can be used as an opportunity to be used as a bridge for the distribution of information, communication, and digital-based economic development in order to achieve equitable welfare, especially in eastern Indonesia.

1. Introduction

The COVID-19 pandemic that hit many countries in the world including Indonesia caused various impacts on human life. One of the impacts felt is on the achievement of the Human Development Index (HDI). HDI is an important indicator used to measure success in efforts to build the quality of human life. However, during the Covid-19 pandemic, some countries in the world are expected to experience a slowdown or decrease in HDI growth. In similar, Indonesia's HDI growth in 2020 also experienced slowing growth compared to previous years [1]. In 2020, the national HDI figure was 71.94, an increase of only 0.02 points compared to 2019 with 71.92.

In addition, there is still a disparity in development between regions to be one of the main issues in Indonesia. In the National Medium Term Development Plan 2020-2024, territorial development is one of the national priorities aimed at resolving the problem of disparity. Regional development targets that are the priority of the current government are the equalization of inter-regional development (Western Indonesia dan Eastern Indonesia) increasing the competitive advantage of regional growth centers, improving the quality and access of basic services, competitiveness and regional independence, and synergy of regional space utilization [2]. Therefore, it is expected that the development gap between regions and in various aspects can be resolved, including gaps in human development [1].

In Figures 1a and 1b, it can be seen that in the last five years, in general the development of HDI in 34 provinces in Indonesia has increased, but there is still a disparity in HDI achievement rates between western Indonesia and eastern Indonesia. Variations in the HDI numbers of western Indonesia are in the range of 67 to 80 and above (there are provinces that fall into the medium, high, and very high category), while the variation in HDI in eastern Indonesia is in the range of 58 to 75 and above (there are provinces that fall into the low, medium, and high categories).
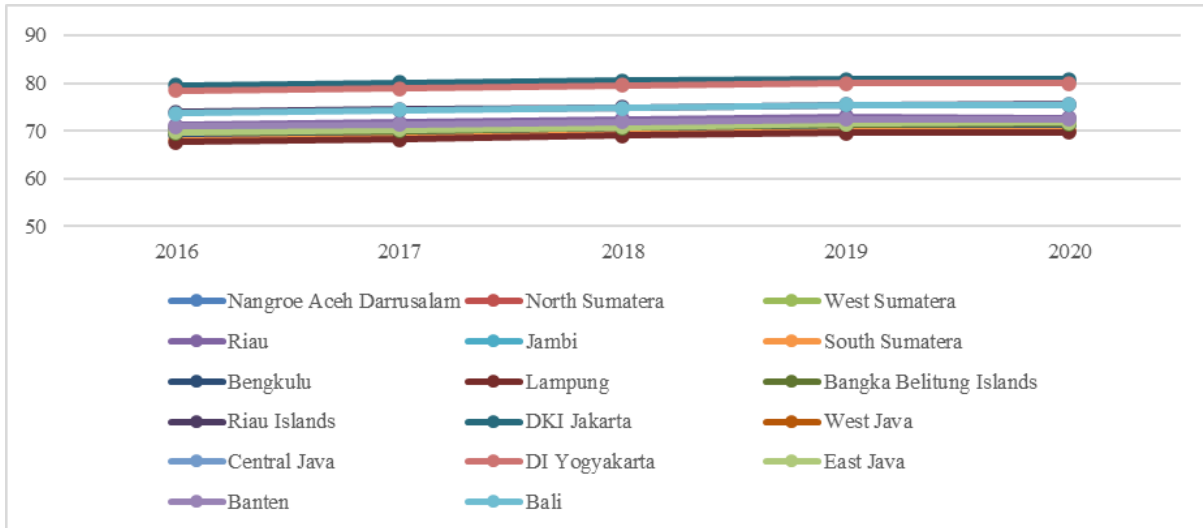
(a)
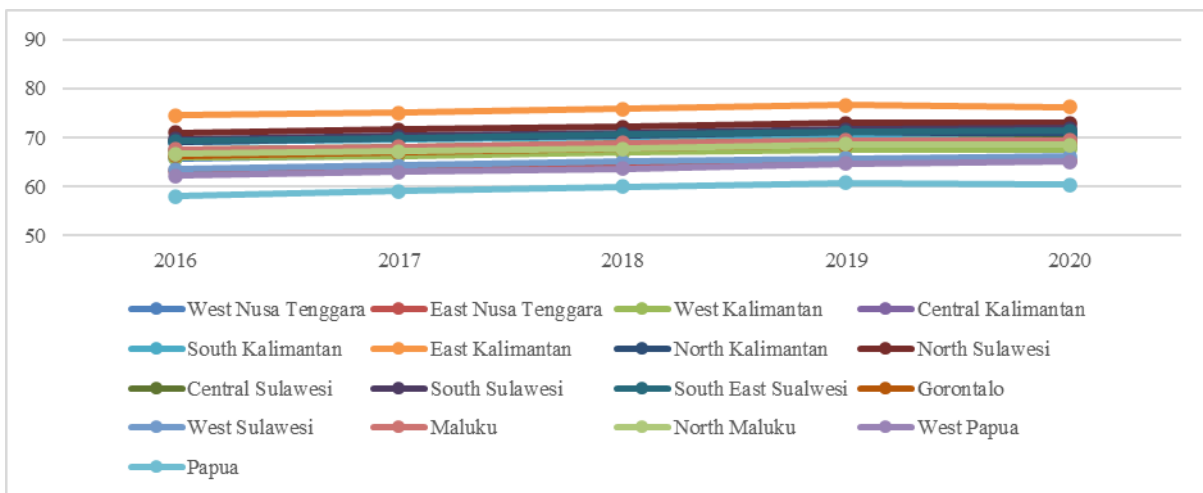
(b)

Figure 1. Human Development Index (HDI) by Province in Western Indonesia and Eastern Indonesia 2016-2020
Source: BPS-Statistics Indonesia (processed)

The equitable development of the region continues to be improved. The outer region of Java Island, especially eastern Indonesia, is driven to grow higher than the Java Island while maintaining the momentum of growth in Java Island. In the next 30 years, the role of Outside Java Island and Eastern Indonesia is expected to increase to 48.2 percent and 25.1 percent of the national economy [3].

Human Development Index (HDI) is a global indicator developed by the United Nations Development Program (UNDP). HDI is an index measuring national socioeconomic development, based on combining measures of education, health, and adjusted real income per capita [4]. The HDI appears to be a well-balanced indicator of welfare, close to the semantic center of the structure. HDI can be used

as a proxy to see the level of welfare of the population [5]. BPS-Statistics Indonesia explains that HDI measures the success in efforts to improve the quality of human life, determines the development ranking of a region/country, measures the government's performance, as well as the allocator for determining the General Allocation Grant (DAU). HDI is a very important indicator where in the 17 SDGs goals, there are three targets that are closely related to human development, namely the third goal, the fourth goal, and the eighth goal. Those goals are to ensure healthy lives and promote well-being for all at all ages; ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all [6].

The level of population welfare can be influenced by three main factors: income per capita, poverty, and income inequality [4]. A previous study about the determinants of the disparity in population welfare level in Indonesia using HDI as a proxy found that the percentage of poor people and the Gini coefficient have a negative effect on HDI values between 34 provinces in Indonesia, while GRDP per capita and the ratio of health spending to Regional Government Budget (APBD) have a positive effect on HDI [5]. A previous study about the determinants of the disparity in population welfare level in Indonesia using HDI as a proxy found that the percentage of poor people and the Gini coefficient have a negative effect on HDI values between 34 provinces in Indonesia, while GRDP per capita and the ratio of health spending to Regional Government Budget (APBD) have a positive effect on HDI [7][8][9]. Capital expenditures are based on regional needs for facilities and infrastructure, both for the smooth implementation of government tasks and public facilities. Increasing the quality of public services will simultaneously affect the level of public welfare.

The era of human development today faces challenges along with the advancement of information technology, namely the era of digital society including in Indonesia. Information and Communication Technology (ICT) is growing very rapidly, especially in the telecommunications industry that occurred over the past few years. This is characterized by a shift from the use of fixed-wire phones to the use of mobile phones and the rapid use of the internet through mobile phones. In 2015 the percentage of the population using the internet was only 21.98, a figure that increased almost 2.5-fold to 53.73 percent by 2020 [10]. The phenomenon of increased internet use occurs both in urban and rural areas in Indonesia. Telecommunications has eliminated distance boundaries and reduced the differences between communities in urban and rural areas. Time differences, location distances, and heterogeneity of population characteristics are no longer barriers in the speed of information dissemination [11].

One of the unique findings is that at the beginning of the Covid-19 pandemic, namely in March 2020 internet usage increased by 53.73 percent (increased by 6.04 percent) when compared to the previous year, which was 47.69 percent. [10]. In addition, currently the use of the internet is not only used to communicate and search for information, but also used for economic activities [2].

Economic activity is inseparable from the use of ICT infrastructure. ICT infrastructure is a major driver for economic growth in various countries. Indonesia is the largest island nation in the world. Infrastructure development, including ICT infrastructure is still uneven. The acceleration of infrastructure development in eastern Indonesia has been done in a better direction but the information infrastructure gap between the Western Region of Indonesia and eastern Indonesia still exists [12].

The telecommunications sector has a very important role to improve the efficiency of economic activities, trade, administration, improving the effectiveness of social services, emergencies, distributing more evenly the social, cultural and economic benefits of development outcomes to whole communities and countries [13].

On the other hand, the development of information technology is closely related to the development of a region related to exploration of the relationship between the use of ICT and development in Africa [14]. Indonesian Ministry of National Development Planning had studied about the development of eastern Indonesia. They found that the improvement of communication facilities is positively correlated with regional development and business activities of a region [12].

In this study we use the internet as a proxy in measuring the level of ICT infrastructure in a region. The use of ICT (one of which is the use of the internet) which is increasing during the Covid-19 Pandemic, becomes an opportunity as well as a challenge for the government in improving population welfare. This study aims to provide an overview of the development of HDI and the percentage of

internet users in eastern Indonesia and analyze the influence of ICT on population welfare in eastern Indonesia.

2. Methodology

2.1. Data Coverage

The data used in this study is secondary data obtained from the BPS-Statistics Indonesia in eastern Indonesia in 2020. The data used in the form of cross sections data on several variables include, Human Development Index (HDI), percentage of internet users, percentage of poor population, capital expenditure, and per capita income.

The analytical methods used in this study are descriptive analysis and inference analysis. Descriptive analysis is useful for describing HDI and percentage of internet users as well as other variables in the form of thematic maps. Meanwhile, inference analysis is useful for knowing the effect of independent variables on dependent variables. In this study, HDI was a dependent variable and the rest was an independent variable. Inference analysis in this study used multiple linear regressions

2.2. Multiple Linear Regression

Regression analysis is one of the data analysis techniques that is often used to study the relationship between several variables and predict a variable [15]. A multiple linear regression model is an equation that states the relationship between one dependent variable and one or more independent variables [16]. Therefore, the multiple linear regression model formed is as follows:

$$HDI_i = \alpha + \beta_1 INT_i + \beta_2 PR_i + \beta_3 BM_i + \beta_4 PPK_i + \varepsilon_i \tag{1}$$

Note:
i	: 1,2,3, …, N province in Western Indonesia
α	: Interception
HDI_i	: Human Development Index
INT_i	: Percentage of internet users
PR_i	: Percentage of poor population
BM_i	: Capital expenditure
PPK_i	: Per capita income

3. Results and Discussions

3.1. Overview of HDI and Other Variables

Figure 2a shows HDI in eastern Indonesia presented in the form of thematic maps. Dark brown areas indicate areas with high HDI, orange areas indicate areas with moderate HDI, and yellow areas indicate areas with low HDI.

In 2020, East Kalimantan Province is the province with the highest HDI in Eastern Indonesia with a value of 76.24. The magnitude of the HDI value is not spared from the performance of each dimension of the HDI constituent. There are three constituent dimensions of HDI, namely longevity and healthy living, knowledge, and a decent standard of living. East Kalimantan province in 2020 has a Life Expectancy of 74.33 years, a school-length expectation rate of 13.72 years, an average length of schooling of 9.77 years, and per capita expenditure as a viable standard of living proxy of 11.73 million per year. This achievement can be realized, one of which is thanks to government support that makes improving the quality of human resources as the first goal in the regional spending revenue budget [17].

The province in eastern Indonesia that has the lowest HDI in 2020 is Papua Province. Judging from the dimensions of IPM forming in Papua Province in 2020, including Life Expectancy of 65.79 years, the old school expectation rate of 11.08 years, the average length of school 6.69 years, and per capita expenditure of 6.954 million per year. The quality of human resources in Papua Province is low because of the mindset of people who prioritize ceremonies and parties rather than education. In addition, the character of the community that tends to be quickly satisfied makes the productivity of the community less optimum.

Figure 2b shows the percentage of internet users in eastern Indonesia presented in the form of thematic maps. Dark brown regions show regions with a high percentage of internet users, orange regions show regions with moderate percentages of internet users, and yellow regions indicate regions with low percentages of internet users.

In 2020, East Kalimantan Province is the province with the highest percentage of internet users in eastern Indonesia with a value of 66.24 percent. Meanwhile, the province with the lowest percentage of internet users in eastern Indonesia in the same year was Papua Province. Based on data from the BPS-Statistics Indonesia, East Kalimantan had an ICT development index of 6.26 in 2019 and became a province of medium ICT development index category. Papua province in the same year had an ICT development index of 3.33 and became a province with low ICT development index. ICT development index is a measure of ICT development that can be compared between time and between regions. The higher ICT development index indicates ict development in the region is optimal otherwise, low ICT development index reflects the development of ICT development index in the region is less than optimum.

Based on Figure 2a and Figure 2b it is known that the province with a high percentage of internet users is the province with the highest HDI as well. Not only that, the province with a low percentage of internet users is the province with the lowest HDI. Therefore, it can be stated that the percentage of internet users affects the magnitude of HDI in eastern Indonesia. This is reinforced through research conducted by [18] and [19] which states that the increase in internet users has a significant effect on human development in West Africa.
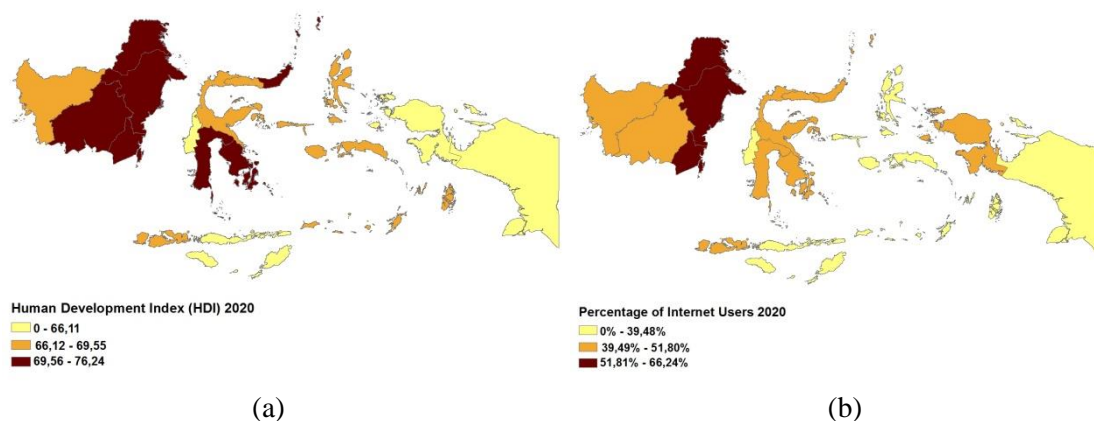

Human Development Index (HDI) 2020
- 0 - 66,11
- 66,12 - 69,55
- 69,56 - 76,24

Percentage of Internet Users 2020
- 0% - 39,48%
- 39,49% - 51,80%
- 51,81% - 66,24%

(a)   (b)

Figure 2. HDI and Percentage of Internet Users in Eastern Indonesia 2020
Source: BPS-Statistics Indonesia (processed)

Other variables that are suspected to also affect HDI in the eastern region of Indonesia are the percentage of the poor population and capital expenditure. Other research conducted states that in Central Java Province, poverty has a negative and significant effect on HDI [20]. In other words, the lower the poverty, the higher the HDI.

Figure 3 shows the percentage of poor people in eastern Indonesia in the form of thematic maps. Dark brown areas indicate areas with a high percentage of poor population, while areas in orange and yellow indicate areas with a percentage of moderate and low poor populations.
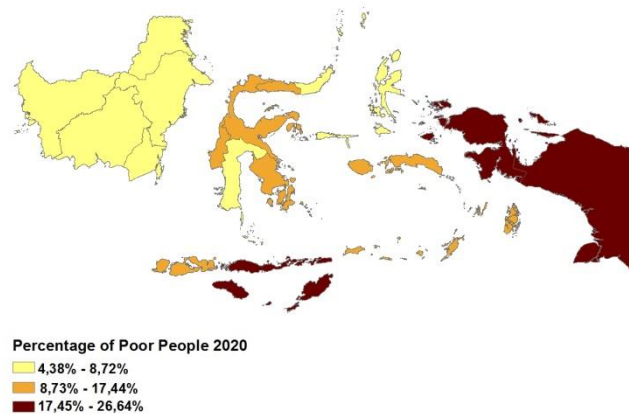
Figure 3. Percentage of Poor People in Eastern Indonesia 2020
Source: BPS-Statistics Indonesia (processed)

In 2020, Papua Province is the province with the largest percentage of poor people in eastern Indonesia with a value of 26.64 percent. The provinces with the highest poverty tend to have difficult-to-reach topography that hinders population mobility, distribution of goods and services, as well as basic community services such as energy and health facilities. Natural disasters and prolonged conflicts have also exacerbated poverty in the region. In addition, poverty is also affected by the ineffective use of special funds in order to accelerate human development [21].

South Kalimantan is the province with the lowest percentage of poor people in eastern Indonesia in the same year with a value of 4.38 percent. South Kalimantan province has a flagship program in poverty alleviation called Gerbangmas-Taskin. The flow of savings and loan funds for the efforts conducted by Gerbangmas-Taskin succeeded in powering the economy of the community [22].

In addition, government spending is suspected as one of the factors that affect HDI. The amount of expenditure incurred by the government is a measure of how much attention the government has to improve the quality of human resources [23]. One of the government expenditures is capital expenditure. Mirza [20] and Sasana [24] stated that capital expenditure has a positive and significant effect on HDI. Figure 4 shows capital expenditure in eastern Indonesia in the form of thematic maps. Dark brown areas indicate areas with high capital expenditures, while areas that are orange and yellow indicate areas with moderate and low capital expenditures.
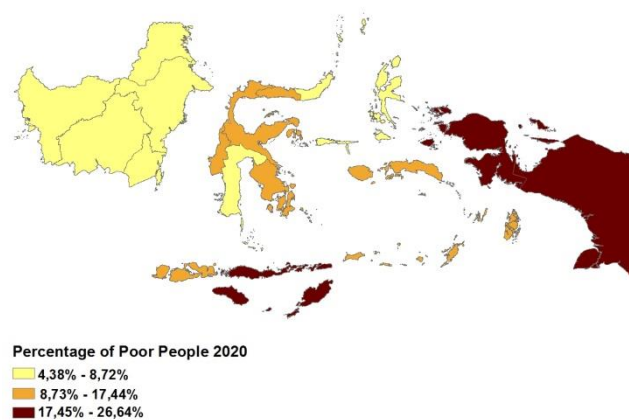

Figure 4. Capital Expenditures in Eastern Indonesia 2020
Source: BPS-Statistics Indonesia (processed)

The capital expenditure, per capita income, and regional native income partially and simultaneously have a positive and significant effect on the HDI [25]. Figure 5 shows the condition of per capita income in eastern Indonesia in the form of thematic maps. Dark brown areas indicate areas with high per capita incomes, while areas that are orange and yellow indicate areas with moderate and low per capita incomes.

In 2020, East Kalimantan is the province with the highest per capita income in eastern Indonesia with a value of 124.662 million rupiah. This is because the natural resources in East Kalimantan are very abundant plus the number of residents is not much. Based on data from the BPS-Statistics Indonesia, the population of East Kalimantan in 2020 amounted to 3664.7 thousand people with a high Gross Regional Product, which amounted to 472.864 trillion rupiah. This is inversely proportional to East Nusa Tenggara which is the province with the lowest per capita income. East Nusa Tenggara's population in 2020 is higher than the population of East Kalimantan, but not followed by a high Gross Regional Product.
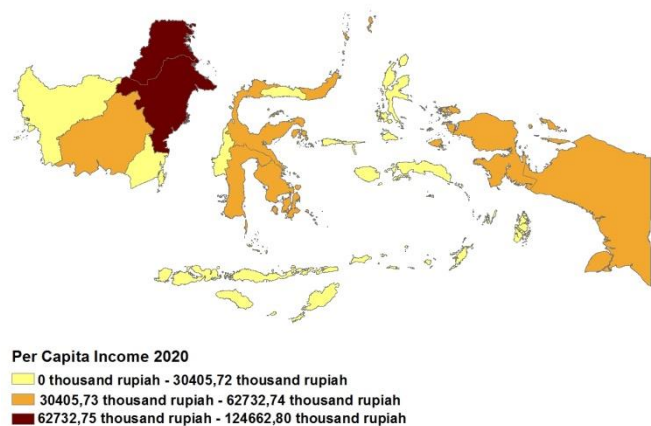

Per Capita Income 2020
- 0 thousand rupiah - 30405,72 thousand rupiah
- 30405,73 thousand rupiah - 62732,74 thousand rupiah
- 62732,75 thousand rupiah - 124662,80 thousand rupiah

Figure 5. Per Capita in Eastern Indonesia 2020
Source: BPS-Statistics Indonesia (processed)

The Influence of ICT and Other Variables on The Welfare of Population in Eastern Indonesia

Based on the explanations discussed earlier, the percentage of internet users and the variables involved in this study is suspected to improve the welfare of the population in eastern Indonesia which is projected with HDI values. Inference analysis is used to analyze the percentage of internet users and other variables on HDI in eastern Indonesia. The results of multiple linear regression estimates are selected as presented in Table 1.

Table 1. Estimation of Multiple Linear Regression

Independent Variable	Coeficient	Prob.
Interception	66.865	0.002
Percentage of Internet Users	0.245	0.023*
Percentage of Poor People	-0.203	0.087*
Capital Expenditure	0.217	0.776
Per Capita Income	-1.07	0.424
R-squared		0.77

alpha = 10%

The equation can be written as follows:

$$HDI_i = 66,865 + 0,245INT_i - 0,203PR_i + 0,217BM_i - 1,07PPK_i \qquad (2)$$

The estimate shows an R-squared value of 0.77. This shows the percentage of internet users, the percentage of the poor population, capital expenditure, and per capita income is able to explain HDI in eastern Indonesia at 77 percent. The rest was explained by other variables not involved in the study.

Based on Table 1 when viewed partially shows internet users have a positive and significant effect on HDI in eastern Indonesia. If there is an increase of one percent of internet users, it will increase HDI in eastern Indonesia by 0.245 percent if other variables are considered constant. The internet use can improve the welfare of the population [26].

Increased internet use, especially during the Covid-19 Pandemic, is a golden opportunity. This is because inevitably people have to master the use of technology. The existence of a policy of limiting activities outside the home so that the use of technology is one of the alternative steps in doing these activities even though it does not have to be on site.

Based on data from the BPS-Statistics Indonesia, the number of internet users has increased in most provinces in eastern Indonesia. For example, the number of internet users in Papua Province always increased in 2015 to 2019. In 2015, internet users in Papua Province amounted to 8.98 percent. In 2019, internet users in Papua province amounted to 21.70 percent.

The government is currently working on a sky toll program. The Langit Toll Program is a concept of accelerating growth and equitable development, availability of telecommunications network infrastructure and communication in connecting all regions of Indonesia. Based on Presidential Instruction No. 9 of 2020 on accelerating the development of the welfare of Papua Province and West Papua Province, the government strives to always make efforts in improving various developments in Papua. Efforts are made such as the promotion of tourism and local products typical of the land of Papua through the Indonesian Proud National Movement (Gernas BBI) and the Proud Movement of Travel in Indonesia [27].

The Gernas BBI program can encourage national branding of superior local products so as to create jobs and boost economic growth. In addition, the program is considered able to accelerate digital transformation and national creative industries that can encourage micro, small, and medium enterprises to the digital ecosystem.

Internet use is not only able to improve welfare in urban areas, but also applies in rural areas. The internet use can improve the food and nutrition of smallholder farmers in Ghana. Therefore, efforts to improve internet connectivity across the country are indispensable as they greatly help affect the well-being of rural households [28].

Currently, the Ministry of Communication and Informatics through the Information Technology Accessibility Agency has built about 9 signal reinforcement stations in remote papua, precisely in Puncak Jaya Regency and Mamberamo Raya Regency. This effort is done so that the area is connected to internet access. In the early stages, the internet is prioritized in supporting the field of education, health, and better public services [29].

When viewed from the side of the poor population, the percentage of the poor has a negative and significant effect on HDI in eastern Indonesia. If there is an increase of one percent of the poor population, it will reduce HDI in eastern Indonesia. Increasing the poor population can reduce the welfare of the community [18]. This is because the poor people sometimes still have difficulty in making ends meet. In addition, children born in poor families, some of them prefer to help their parents rather than attend school so that their knowledge and skills are inadequate.

Papua province is one of the areas that are difficult to reach in eastern Indonesia so that economic activity and growth are difficult to develop. In addition, there are still some areas in Papua Province experiencing isolation and away from civilization, such as mountainous areas so that the welfare of papuan people is uneven.

Improving the welfare of people in eastern Indonesia, the role of the government is needed. Roles in question such as allocation, distribution, and stabilization. The role of the Government in providing assistance should be done evenly so that the welfare of the community increases. But based on Table 1

shows that capital expenditure has no significant effect on the welfare of people in eastern Indonesia. The district government spending has a positive but insignificant effect in reducing the amount of poverty. If people are still living poor, it will interfere with their welfare [30].

With regard to per capita income, Sakamoto (in [31]) income distribution between provinces or between city districts shows a fairly high income gap. This is due to several factors such as geographical conditions and inadequate human resource conditions.

4. Conclusion and Recommendation

In 2020 the condition of HDI and the percentage of internet users in eastern Indonesia is still uneven although in general every year has increased. In addition, the percentage of internet users has a positive and significant effect on the welfare of the community while the percentage of the poor people has a negative and significant effect on the welfare of the community. Therefore, the expansion of infrastructure, especially ICT infrastructure, not only focuses on the Western Region of Indonesia, but also the Eastern Region of Indonesia. Because ICT also affects human development. That way it is expected that the welfare gap of the population will shrink.

The increasing use of the internet during the Covid-19 pandemic can be used as an opportunity to be used as a bridge for the distribution of information, communication, and digital-based economic development in order to achieve equitable welfare, especially in eastern Indonesia. Based on the background and results of the discussion, the author submits some suggestions. First, the central government should cooperate with local governments in addressing the uneven welfare of the people in Indonesia, especially in the eastern region of Indonesia by involving factors that can affect welfare. If you have held previous programs should be evaluated about the implementation of the program. Whether the program has been successful or not, whether the program has run effectively and efficiently, and so on. In further research it is advisable to add independent variables that affect the welfare of people in the eastern region of Indonesia. This is because the independent variables used in this study do not adequately describe the welfare characteristics of people in the area.

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